Hans Groth · John F. May *Editors*

Africa's Population: In Search of a Demographic Dividend

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Foreword

Africa! This huge, diverse continent – rich in natural treasures, rich in a young, dynamic population. Africa – for too long in the past sidelined in the political agenda of Europe. The continent suffered under the burden of slavery and colonialism, still embedded in the collective consciousness of its people and nations. In Europe, the image of Africa has until now been linked with poverty and underdevelopment, with civil unrest, weak governance, and corruption.

This picture does not reflect the whole reality of Africa in our time. As the executive director of the United Nations Environment Programme (UNEP), I had the chance to live for 8 years in Nairobi, Kenya, the headquarters of UNEP. Needless to say, there are still many problems – hundreds of thousands of people living in slum areas, high unemployment rates especially among young people, limitations in the quality and reliability of governance, and a weak and vulnerable situation in all parts of the infrastructure – to mention but a few. On the other hand, I witnessed the dynamism of the young generation, the development of schools and universities, the openness to the world, and the integration on a global level due to an incredible increase in IT and in mobile telephones and Internet access. This young generation is more and more a partner on the global level, networking, learning, and teaching, proud of their cultural heritage while also aware of the gift of biodiversity, of the treasures of the creation.

The median age of the population in Africa is just above 20 years, compared with the median age in Germany, which is now up to 44 years of age. A young, dedicated population is first and foremost an immense opportunity for Africa, offering a paradigm shift in development – a development which will be better and better integrated into the protection of the natural environment, more able to extract its capital without destroying it. It is a development which is not dividing society, but instead is allowing for the possibility of a new middle class, which can stabilize African society beyond ethnic borders.

Of course, to realize this potential is an immense challenge, and it comes with a price tag. These young people, better educated and trained than their parents and grandparents, want to use their skills and need employment which reflects their investment in knowledge. It is calculated that, annually, Africa needs at least 18

million new jobs! This requires investment and a new entrepreneurial spirit. It is necessary to make energy available, keeping in mind that economic progress is always dependent upon the availability of achievable, competitive, environmentally safe, and socially integrated energy sources. In my time in Kenya, only 10% or so of the population had access to electricity or to any other form of modern energy – clearly not a solid basis upon which to realize the "right of development" already enshrined in the "Rio Principles" at the Rio Conference in 1992. The likelihood that the African dream of becoming a young, prosperous, and self-conscious partner in the globalized world will be a reality depends on those investments. First and foremost of course is investment in the brains of the young people, and next is in energy technologies and in a spirit of reliability and future orientation.

This broad-based publication, *Africa's Population: In Search of a Demographic Dividend*, is a great contribution to the understanding of perspectives on Africa and its requirements. This is not a reflection of "silo thinking". It uses many kinds of knowledge, both to form its analysis and, primarily, to form a diagnosis of the given situation. Its aim is to offer a reliable basis of knowledge, necessary for tailoring strategic perspectives and for implementing them in an open, flexible way. I sincerely hope that this book is successful in motivating politicians but also entrepreneurs in the private business sector and members of civil society more generally to understand Africa better and to bring this marvelous continent into the center of common coordinated action.

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Klaus Töpfer

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Second, thanks are due to our many authors and scholars. Despite their busy schedules, they have contributed important chapters to this volume. We appreciate their patience during the many stages of peer reviewing and editing of their manuscripts and are most grateful for their efforts to provide high-quality contributions.

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Danielle Pearson, our copy editor, read and edited all the chapters of the book, and we are most indebted to her sharp eyes and her great professionalism.

Last but not least, particular thanks are due to two outstanding research assistants who provided major support, namely, Vincent Barras and Anna Zuber. We could not have completed this book without their efficient help. Anna Zuber, in particular, played a pivotal role during the preparation of the entire manuscript, and we want to acknowledge her major contribution.

In many different ways, every person we contacted during the lengthy preparation of this volume provided help and offered comments, ideas, and suggestions. Needless to say, the remaining errors are entirely ours.

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List of Key Abbreviations

AFD	Agence Française de Développement
AfDB	African Development Bank Group
AIDS	Acquired Immune Deficiency Syndrome
AQIM	Al-Qaeda in the Lands of the Islamic Maghreb
ARR	Annual Rate of Reduction
ART	Antiretroviral Therapy
AU	African Union
BCG	Bacillus Calmette-Guérin Vaccine
CBD	Community-Based Distribution
CBOT	Chicago Board of Trade
CDC	Centers for Disease Control and Prevention (USA)
CPR	Contraceptive Prevalence Rate
CPS	Contraceptive Prevalence Survey
CRVS	Civil Registration and Vital Statistics
DALY	Disability-Adjusted Life Year
DHS	Demographic and Health Survey
DPT	Diphtheria, Pertussis, and Tetanus
DR	Dependency Ratio
Ed.	Editor
Edit.	Edition
Eds.	Editors
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FDI	Foreign Direct Investment
FGM	Female Genital Mutilation
FP	Family Planning
GAVI	Global Alliance for Vaccines and Immunisation (now GAVI Alliance)
GBD	Global Burden of Disease
GCI	Global Competitiveness Index
GDP	Gross Domestic Product
GFATM	Global Fund to Fight AIDS, Tuberculosis, and Malaria

GIZ	Gesellschaft für Internationale Zusammenarbeit
GNI	Gross National Income
GTZ	Gesellschaft für Technische Zusammenarbeit (German Technical Cooperation Corporation)
HDI	Human Development Index
HDSS	Health and Demographic Surveillance Systems
HIV	Human Immunodeficiency Virus
Ibid.	Ibidem (same place)
iCCM	Integrated Community Case Management
ICD	Infectious and Communicable Disease
ICPD	International Conference on Population and Development (Cairo 1994)
ICT	Information and Communications Technology
IEC	Information, Education, and Communication
IHME	Institute for Health Metrics and Evaluation
ILO	International Labour Organization
IMAGE	Comparing Internal Migration Around the Globe
IMCI	Integrated Management of Childhood Illness
IMF	International Monetary Fund
IOM	International Organization for Migration
IPCC	Intergovernmental Panel on Climate Change
kg	Kilogram
LARC	Long-acting Reversible Contraception
LDC	Least Developed Country
MAP	Multi-country HIV/AIDS Program for Africa
MERS	Middle East Respiratory Syndrome
MDGs	Millennium Development Goals
MICS	Multiple Indicator Cluster Survey
MMR	Maternal Mortality Ratio
MYS	Mean Years of Schooling
m	Million
NCD	Noncommunicable Diseases
NGO	Nongovernmental Organization
OCHA	United Nations Office for the Coordination of Humanitarian Affairs
ODA	Official Development Assistance
OECD	Organisation for Economic Co-operation and Development
ORT	Oral Rehydration Therapy
PAA	Population Association of America
PAC	Post-abortion Care
PARSS	Projet d'Appui à la Réhabilitation du Secteur de la Santé
PEPFAR	US President's Emergency Plan for AIDS Relief
PMTCT	Prevention of Mother-to-Child Transmission
PPP	Purchase Power Parity
PRB	Population Reference Bureau

QALY	Quality-Adjusted Life Year
RAPID	Resources for the Awareness of Population Impact on Development
RBF	Results-Based Financing
RH	Reproductive Health
SARS	Severe Acute Respiratory Syndrome
SDGs	Sustainable Development Goals
sq. km	Square Kilometer
SSA	Sub-Saharan Africa
STD	Sexually Transmitted Disease
STI	Sexually Transmitted Infection
Suppl.	Supplement
TB	Tuberculosis
TFR	Total Fertility Rate
UN	United Nations
UNAIDS	The Joint United Nations Programme on HIV/AIDS
UNECA	United Nations Economic Commission for Africa
UNESCO	United Nations Educational, Scientific, and Cultural Organization
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNFPA	United Nations Population Fund
UNHCR	United Nations High Commissioner for Refugees
UNICEF	United Nations Children's Fund
UNPD	United Nations Population Division
US	United States of America
USAID	US Agency for International Development
USD	US Dollar
Vol.	Volume
WFP	World Food Programme
WFS	World Fertility Survey
WHO	World Health Organization

Introduction

Hans Groth and John F. May

The concept of the demographic dividend (DD), i.e., the accelerated economic growth and increasing surplus resulting from an expansion of the working-age population with respect to the young dependent population, was formulated after a closer examination of the East Asian "economic miracle", which occurred between the 1960s and 1990s. In order to fully explain the rapid economic growth that took place in East Asia, demographers, economists, and social scientists were compelled to take into account the significant shifts in age structures, which were triggered by rapid fertility declines. It was estimated that the increasing weight of the number of active adults relative to their young dependents accounted for about 40% of the economic growth that had been observed in the region at the time. This analysis of the East Asian "economic miracle" led to the formulation of the concept of the DD.

Today, there is only one region in the world, namely sub-Saharan Africa (SSA) (all of Africa except Northern Africa) that has still to undergo the major demographic and age structure transformations, which have occurred almost everywhere else in the world during the demographic transition. This process is characterized by the gradual decrease from high to low birth and death rates, reaching a new equilibrium. Three African sub-regions in particular, i.e., Western, Central, and Eastern Africa are still far from having completed their fertility transition, which is the last stage of the demographic transition.

Indeed, the striking demographic feature of most of SSA is the apparent disconnect between rapidly decreasing mortality rates, especially for infants and children, on the one hand, and the slow erosion of high fertility levels, often interrupted by protracted fertility stalls, on the other. Moreover, the longer lag which occurs in

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many SSA countries between the decline in mortality and the decrease in fertility makes the African demographic transition patterns sharply different from what most developing countries experienced during the twentieth century.

Whereas the populations of all other regions of the world increased significantly between 1500 and 1900, Africa's population virtually stagnated during that period, due to the heavy toll of infectious diseases and the negative impact of the slave trade. This bleak picture, however, does not apply anymore. Ongoing decreases in mortality, slow declines of high fertility levels as well as fertility stalls, and the effect of very young age structures – a phenomenon known as the "population momentum" – all concurred to fuel the rapid and unprecedented growth of the African population in recent decades.

In the future, the African continent is poised to experience a further demographic expansion. Its population of 1.2 billion persons in 2015 could possibly reach 2.5 billion in 2050, and 4.4 billion by the end of this century, according to the 2015 Revision (Medium Variant) of the *World Population Prospects* of the United Nations Population Division. There is no doubt that the world demographic landscape of the twenty-first century will be heavily influenced by the potential quadrupling of the African population. In addition to shaping the future development prospects of the African continent itself, these trends will also influence global geopolitics and in particular the demographic trajectory of Europe due to potentially increasing migration flows.

To be sure, sub-Saharan Africa is extremely diverse in terms of geography, ecosystems, resources, history, cultures, ethnic groups, and languages. The 48 sovereign countries of SSA are also at various stages of their demographic transition (Southern African countries are the most advanced in this process). Many African countries are experiencing sustained urbanization as well as rapid uptakes in female education, which might accelerate the demographic transformations. As a whole, however, the continent is still far from reaching the necessary low levels of fertility that would transform its age structures, bring a rectangular shape to the bottom of the population pyramids, and henceforth trigger the shift between the adults of working ages and the young dependents. Many SSA countries are still several decades away from achieving the women's health improvements and the contraceptive revolution (when at least 70% of couples use a modern contraceptive method) that are needed to obtain such low levels of fertility. Therefore, the opening of the demographic window of opportunity, which is a necessary condition to capture a first demographic dividend, might remain a rather distant prospect in many SSA countries. A second demographic dividend may occur in the future when the beneficiaries of the first DD will have sufficiently saved and invested the resources generated earlier.

Nonetheless, the question of the first demographic dividend in SSA countries has become prominent in international development circles over the past 15 years and is at the heart of the current discussions pertaining to the development of Africa and its integration into the global economy. A potential sharp decline in fertility, which brings more favorable dependency ratios, does offer economic opportunities but presents also challenges when governments are unable to fulfill the aspirations of

their populations, especially of the youth–a generation which is desperate for education and knows how to maximize modern digital technology.

Could the 48 sovereign countries of SSA benefit also from an Asia-style first and thereafter second demographic dividend? Will entire countries reap a first DD, or will only the most advanced segments of their population do so? What policies should be put into place to obtain such a dividend? Are socioeconomic improvements sufficient to bring about the needed demographic transformations or are specific demographic interventions necessary as well? Should additional interventions be put also in place, including human capital investments and good governance policies? Last but not least, what interventions should be designed to achieve poverty reduction as well as shared prosperity and reduce inequality?

There are no simple answers to these multiple questions, despite the great efforts that have been applied to the examination of the concept of the demographic dividend during the past 15 years by the African governments and policymakers as well as their development partners (the multilateral and bilateral agencies, the universities and research centers, the NGOs, and the philanthropic foundations). In this context, it appears that the time is ripe for an updated, comprehensive volume on the DD in SSA that focuses specifically on: (a) the links between the demographic and epidemiological transitions, the fertility decline, the contraceptive revolution, and the demographic dividend itself; and (b) the key drivers of the DD, such as education, skills, status of women, and public policies.

However, the right combination of policies to accelerate the fertility transition in sub-Saharan Africa remains open to debate. In addition to family planning and reproductive health interventions, it has become evident that changes of reproductive norms, later age at first marriage, enhanced female education, women's empowerment, and gender equitable policies are also poised to play a paramount role. Still, one will need to intervene directly on the fertility trends. This can be achieved with some degree of efficiency, while abiding also by the framework of the reproductive rights adopted at the International Conference on Population and Development (ICPD) held in Cairo in September 1994.

The DD is not a given but must be earned through adequate and timely population dynamics as well as socioeconomic and good governance policies. SSA countries will also need to foster human capital formation, through enhanced efforts in the areas of education, health, and women's status as well as the promotion of equal opportunities for men and women. Special attention will also be needed for the youth, in particular with respect to job creation, which will require a favorable political and economic environment. This tall order calls for a true vision, a strong determination, and proactive interventions on the part of African leaders and their development partners. However, many African policymakers adhere to the view that large population numbers by themselves will warrant future economic strength, and that socioeconomic development alone will bring the necessary demographic modernization. Moreover, too few African leaders advocate for more direct interventions to bring down high fertility levels.

At this juncture, it appears that the demographic dimensions of African development prospects have yet to be fully taken into account. The current climate of

optimism about the socioeconomic prospects of SSA should not overshadow the importance of the demographic issues at hand. On the contrary, it appears that tackling the SSA population challenges will be a necessary condition for the region to reach its demographic window of opportunity, capture a first demographic dividend, and eventually join the group of the emerging market economies.

This book analyzes the possibility for SSA to reap the benefits of a demographic dividend and reviews the various conditions that must be met. It contains contributions by respected international scholars, of which more than a third are from sub-Saharan Africa (SSA).

The first section of the volume, *Sub-Saharan Africa's Population: Country and Regional Case Studies*, presents the demographic landscape of sub-Saharan Africa. The initial chapter *Africa's Population: History, Current Status, and Projections* by Jean-Pierre Guengant presents the overall demographic patterns and trends of the region, and stresses the key role that fertility will play for the future demographic situation of the continent. The three subsequent chapters focus on the three demographic heavyweights of the continent. These chapters are *Reaping a Demographic Dividend in Africa's Largest Country: Nigeria* by Emmanuel Jimenez and Muhammad Ali Pate; *The Second Biggest African Country Undergoing Rapid Change: Ethiopia* by Assefa Hailemariam; and *The Third Biggest African Country: The Democratic Republic of the Congo* by David Shapiro, Basile O. Tambashe, and Anatole Romaniuk. Only Ethiopia appears to have embarked in earnest on its fertility transition. Nigeria, the most populous country in sub-Saharan Africa, has still a high fertility and so does the Democratic Republic of the Congo. More worrisome, one can see no reasonable prospects for a rapid fertility decline in these two countries. The chapter *A Case of An Almost Complete Demographic Transition: South Africa* by Tom A. Moultrie shows that the country has almost completed its demographic transition. Unfortunately, South Africa had been unable to reap the benefits of a first demographic dividend because of the impact of the HIV/AIDS epidemic.

Then, four chapters examine the situation of SSA countries, according to their respective stage in the fertility transition. The chapter *Fertility Transitions and Schooling Dividends in Sub-Saharan Africa: The Experience of Vanguard Countries* by Parfait M. Eloundou-Enyegue and Noah Hirschl focuses on the countries that are most advanced in their fertility transition, namely the Southern African countries and two island-countries, Cape Verde and Mauritius. Another chapter *Countries with Fertility Transitions in Progress* by Jean-François Kobiané and Moussa Bougma looks at countries where fertility transition is advancing: Benin, Gabon, Ghana, Kenya, and Rwanda. The following chapter *Countries with Slow and Irregular Fertility Transitions* by Gervais Beninguisse and Liliane Manitchoko examines the countries with slow and irregular fertility transitions: Cameroon, Comoros, Côte d'Ivoire, Guinea, Mozambique, Senegal, and Tanzania. Finally, the chapter *Countries with Very Slow or Incipient Fertility Transitions* by Hamidou Issaka Maga and Jean-Pierre Guengant is devoted to the late comers in the fertility transition, e.g., Mali and Niger. These four chapters all stress that better female education outcomes and family planning programs are the key factors for accelerating or initiating a fertility decline.

Finally, the chapter *Demographic Challenges of the Sahel Countries* by John F. May, Jean-Pierre Guengant, and Vincent Barras is devoted to the demographic situation of this region. In addition to their rapid demographic growth, the Sahel countries face formidable challenges given their unfavorable geography and their fragile geopolitical situation, not to mention the threat of climate change.

The second part of the book, *Drivers of the Demographic Dividend*, looks at the triggering factors of the demographic dividend. A first, theoretical chapter *The Demographic Dividend: A Potential Surplus Generated by a Demographic Transition* by Vincent Turbat raises some key questions related to the measurement of the demographic dividend. In particular, the chapter challenges the usual definition of both the young dependents (below age 15) and the adult active population (all persons between age 15 and 64). Instead, the chapter proposes a more precise calculation of the young dependents (until age 18) and the active adults (age group 19–62, also taking out the unemployed and underemployed adults). The implications of these new measurements are less optimistic than those derived from traditional calculations.

This is followed by a series of technical chapters. The first one *African Fertility Changes* by Bruno Schoumaker examines the SSA fertility patterns. Fertility levels are still high in the region and decreasing at a slow pace. However, a few countries have experienced significant fertility declines. Furthermore, evidence from urban and educated women indicates that fertility could eventually decline in the continent should socioeconomic and literacy conditions improve and efficient family planning programs be in place.

The next chapter *Access to Family Planning and Women's Health* by Ndola Prata shows the multiple health benefits of family planning interventions as well as the cost-effectiveness of such interventions. However, family planning programs will need to be strengthened in the region, offering a larger choice of effective and long-term methods.

The following chapter *Manpower, Education, Skills, and Jobs in Sub-Saharan Africa: Past Trends and Future Outlooks* by Nicholas Eberstadt offers both a retrospective and prospective analysis and covers also productivity. The metrics of education is generally based on years of schooling but the quality of education is more difficult to measure. It appears that the poor quality of education in the region should not be conducive to major improvements in productivity. The chapter also highlights the dearth of reliable data on employment, precluding the preparation of job projections.

The chapter *Marriage Patterns and the Demographic Dividend* by Dominique Meekers and Anastasia J. Gage examines how age at first marriage, adolescent marriage rate, premarital childbearing, and the prevalence of polygynous unions may affect SSA's prospects to reap a first demographic dividend. The chapter calls for policies and programs to be put in place to expand women's access to sexual and reproductive health information and services.

The chapter *Mortality, Health, and Aging in Sub-Saharan* by Bruno Masquelier and Almamy Malick Kanté highlights that despite impressive gains in under-five mortality rates in the last decade, low survival prospects, especially among adults, are holding back development and reducing the chance of reaping a demographic dividend.

The chapter *Acute and Chronic Health Challenges in Sub-Saharan Africa: An Unfinished Agenda* by Thomas Zeltner, Farhad Riahi, and Jonas Huber examines the concept of the "Double Burden of Disease". It discusses the prospects for controlling the non-communicable diseases, an endeavor that would possibly repeat the success obtained previously in the area of communicable diseases.

The chapter *New and Re-Emerging Infectious Diseases in Sub-Saharan Africa* by Alan Whiteside and Nick Zebryk discusses this major threat to sub-Saharan populations. In particular, the chapter covers HIV and AIDS and other epidemics in SSA. It addresses the origins, evolution, mortality, morbidity, socio-economic impacts as well as the policies and programs put in place to combat these epidemics.

The chapter on *Internal Migration, Urbanization, and Slums in Sub-Saharan Africa* by Blessing Mberu, Donatien Béguy, and Alex C. Ezeh examines the impact of these trends on poverty, health, environment quality, and social welfare provision as well as the associated policy challenges and program responses.

Finally, the chapter *Internal and International Migration* by Nikola Sander and Elin Charles-Edwards highlights the impact of the migratory patterns on the relative size of the working age population, the ratio of children to the total population, and the education level of the population. The analysis points to three clusters of countries among which migration flows are concentrated. The chapter offers also an innovative visualization of the migration systems.

The third component of the volume, *Development Challenges*, addresses the specific issues that the continent will need to address.

The first chapter of this section *Economic Growth and Public and Private Investments* by Vincent Turbat identifies two main periods in SSA growth. From 1960 to around 2000, Africa experienced a "tragedy period", i.e., a period of low growth and extreme poverty. In 2000–2015, Africa entered a "hope period", resulting from improved macroeconomic policies and structural changes. To benefit from a first demographic dividend, fertility rates will need to fall sharply and rapidly. In addition, macroeconomic policies and structural reforms will need to be pursued vigorously.

The chapter *Governance, Transparency, and the Rule of Law* by Anna Zuber, Christian Blickenstorfer, and Hans Groth discusses the various concepts and measurements of good governance. The SSA countries scoring best on the different dimensions of good governance are also middle-income economies with advanced demographic transitions. These countries are most likely to benefit from a first demographic dividend in the near future, although it is difficult to isolate the specific contribution of good governance to the capturing of a first DD.

The following chapter *The Role of Natural Resources* by Daniel J. Mabrey stresses that Africa's economic development will be driven by the extraction and monetization of these resources. The chapter discusses the negative economic impacts of the natural resources (the "resource curse") and attempts to answer the key question: can natural resources development help Africa to reap a first demographic dividend?

The chapter *Population, Food Security, and Climate Change: Africa's Challenges* by Jason Bremner assesses the situation of a continent where almost one in every

four persons lacks adequate food for a healthy and productive life. The chapter stresses the importance of women's empowerment to increase agricultural productivity. It also examines the issue of the food security crises, given the challenges of rapid population growth and climate change, which causes recurrent drought in some parts of the continent.

The last chapter of this section *The Development of Organized Commodity Exchanges in Africa: An Economic Analysis* by Heinz Zimmermann and Marco Haase analyzes the commodity exchanges as a tool to address the food security challenges described in the previous chapter. The successful development of organized, standardized exchanges must be necessarily paired with steps toward improving the basic and financial infrastructure at the country level. However, the outright launch of futures markets might be an excessive step for most countries.

The fourth and last section of the book, *Assembling Sub-Saharan Africa's Jigsaw*, attempts to bring together the various threads examined so far.

The first chapter of this component *Is a Rapid Fertility Decline Possible? Lessons from Asia and Emerging Countries* by Feng Wang looks into the feasibility of a rapid fertility decline in the continent, in the light of the experience from other regions of the world. The chapter suggests that four key requirements need to be met for SSA countries to achieve a rapid fertility decline, as follows:

- Further improvement of infant/child and maternal health;
- Expansion of education, in particular female education;
- Creation of employment opportunities; and
- Expansion of state-sponsored family planning programs.

However, Africa faces greater challenges than other regions in achieving these four core conditions, in part because of its unique historical and institutional legacies.

The chapter *Demographic Dividend Models* by Scott Moreland and Elizabeth Leahy Madsen reviews the factors that are required to successfully achieve a demographic dividend. It also describes how these factors have been incorporated into various dynamics models that project the dividend, with a focus on the *DemDiv* model developed by the authors. The chapter is illustrated with an application of the *DemDiv* model to Kenya and Uganda.

The following chapter *The Roles of Governments, the Private Sector, and the International Community* by Jotham Musinguzi stresses that countries will first need to address proactively the issue of high fertility levels. Thereafter, countries will need to implement socioeconomic policies to strengthen their human capital (education, health, and gender equality) and improve their governance. This will need to be conducted in partnership with the private sector as well as with the development institutions, the NGOs, and the philanthropic foundations.

Finally, the chapter *Conflicts and the Demographic Transition: Economic Opportunity or Disaster?* by Siri Aas Rustad, Gudrun Østby, and Henrik Urdal is devoted to the conflicts' impact on the prospects for capturing a first demographic dividend. The chapter shows that the demographic transition seems to come later in African conflict countries that in those who have not experienced conflict. The chapter also explores how different factors, such as education, fertility, health, ethnic

distribution, migration, and urbanization can affect the ways in which demographic change impacts the risk of conflict.

The subtitle of this book, *In search of a Demographic Dividend*, points to the efforts that will be necessary to capture a first demographic dividend in the African 48 sovereign countries. By providing state of the art information on African demographic patterns, trends, and challenges, and by looking at the various drivers of the demographic dividend as well as the sub-Saharan African development challenges, this volume is meant to enlighten African policymakers and the international community about the tremendous challenges, but also the potential opportunities that will come with the ongoing demographic transformations of the continent.

The twenty-first century will be the century of the African demography. This evidence-based book is a clarion call for African policymakers and their partners to prepare a demography-informed development strategy for the region and, most importantly, to urgently take the necessary actions.

Part I
Sub-Saharan Africa's Population: Country and Regional Case Studies

Africa's Population: History, Current Status, and Projections

Jean-Pierre Guengant

1 Introduction

Until the 1980s, sub-Saharan Africa appeared to be the only region in the world where the demographic transition had not really started, hence the use of the term "the African exception" to describe this situation.

When it appeared in the 1990s that fertility declines had started in several sub-Saharan African countries, most researchers thought that these countries would have an accelerated fertility transition and would catch up rapidly to comparable lower fertility levels as those already achieved in most other developing countries. Thus it was thought to be the end of the African fertility exception. Nevertheless, there were still some uncertainties about the impact on mortality of the HIV epidemic, and for some people the fear was that this epidemic would depopulate sub-Saharan Africa.

Today, the demographic situation of the 48 sovereign countries of sub-Saharan Africa is to a large extent quite different from what observers expected 20 or 30 years ago. Only a handful of countries (6) with a very high HIV prevalence rate have experienced a decline in their life expectanciesat birth, but in a majority of the other countries life expectancies at birth have increased significantly. This is largely the result of very rapid infant and under-five mortality declines, thanks to massive public health interventions in favor of mothers and young children.

However, efforts to reduce the high fertility levels of most countries through efficient family planning programs have not received the same attention. To be sure, fertility has declined in most countries, but 62% of the sub-African population lives in 19 countries where women still have five children or more. Outside Africa, this is the case only in Afghanistan and Timor-Leste.

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Therefore, the current population dynamics of sub-Saharan Africa can be considered as unique (Bongaarts and Casterline 2012). Compared to other regions of the world, not only have fertility declines started later, but they are also slower, and in several countries fertility declines have stalled in recent years. Besides, the recent rapid decline of under-five mortality has led to natural increase rates, as high as 4% per year in Niger, a rate which has historically never been observed before.

This chapter begins with an examination of the various sources of data available in sub-Saharan Africa, allowing us to assess with some accuracy the population dynamics of all sub-Saharan-African countries. Next, the peculiar history of the region characterized by long population stagnation is briefly addressed in order to better understand the lukewarm commitment in the region to population and family programs aimed at reducing population growth. Then, the levels and trends of mortality in 1980–1985 and 2010–2015 in the countries of the region are described through an examination of life expectancies at birth and under-five mortality rates. This is followed by an assessment of the levels and trends of fertility in 1980–1985 and 2010–2015, through an examination of total fertility rates and a brief discussion of the determinants of fertility. Lastly, we describe the results of the different population projection assumptions about sub-Saharan Africa adopted in the 2015 World Population Prospects of the United Nations Population Division, which were released in July 2015 (United Nations 2015). We focus on the age structure by 2050, in order to determine, depending on the assumptions, how many of these countries could have the lower dependency ratios which characterize "the demographic window of opportunity", the prerequisite needed for capturing a first demographic dividend.

2 Sources of Data

The lack of reliable data for sub-Saharan Africa has often been mentioned as a major obstacle in correctly assessing the past, present, and future population dynamics of the region. In our view, this has been overstated.

In fact, as far back as the sixteenth century, there was enough documentation or description of various parts of the world to build rough but nonetheless documented population estimates, including for sub-Saharan Africa. Thereafter, in the nineteenth and early twentieth centuries, administrative censuses were organized by colonial authorities. These continued to be taken in some countries until the 1970s, and were sometimes complemented by national demographic surveys.

The first modern censuses were taken quite early in several sub-Saharan countries. During the 1950 census round (1945–1954), 19 countries organized modern censuses. Among these, 14 countries already had a modern census before 1945. An increasing number of countries took their first modern censuses later, 17 during the 1980 round (1975–1984) and by 1985, all but one of the countries (Chad) had carried out at least one modern census.

Between 1945 and 2014, 229 censuses were taken in the current 48 sovereign nations of the region. Among these countries, 12 have had at least seven censuses,

i.e., at least one per census round and 35 have had at least four censuses. The 13 remaining countries which have had only three censuses or less are countries which experienced long civil wars and/or major unrest. However, most of them took a census between 2005 and 2014. Finally, only three countries did not have a census over the past 20 years: the Democratic Republic of the Congo, Somalia, and Madagascar (last censuses were taken in these countries in 1984, 1987, and 1993, respectively).

In addition to the massive efforts to conduct modern censuses in all countries of sub-Saharan Africa, numerous demographic surveys were undertaken as well. In the late 1970s and early 1980s, the *World Fertility Survey program* organized surveys in ten *sub-Saharan countries*. From the mid-1980s up to now, the *Demographic and Health Surveys (DHS) program* conducted 123 surveys in sub-Saharan Africa in 40 different countries. Three to six surveys were conducted in 23 countries, covering in most cases about 20 years. In addition, Multiple Indicator Cluster Surveys (MICS)) were conducted separately from, or jointly with, DHS surveys. As a result, data on child mortality, fertility and some of its determinants (i.e., contraceptive prevalence) are available for all the countries of the region but one (the Seychelles). This data helps to compensate for deficiencies in the civil registration data, which is still incomplete in most countries of the region. However, survey data also provides important information which is not available in civil registration systems.

All in all, with a few exceptions, available data is relatively abundant for most sub-Saharan African countries. In fact, in recent years the main problem for most researchers and planners has been more to use the wealth of published data than to overcome a lack of data.

3 A Brief Historical Perspective

The present continued high population growth of sub-Saharan Africa is to a large extent a consequence of the peculiar history of the region. Because of the long quasi-stagnation of the sub-Saharan African population, several economists and demographers have considered, and some are still considering, that the region needs to recuperate its past higher share in the world population and reach a higher population density (Guengant 2007: 29).

At around the year 1500, the world population has been estimated at having been about half a billion persons, of which nearly 80 million were in sub-Saharan Africa (Table 1). Between 1500 and 1900, most regions of the world saw their populations multiply by a factor of 3–5. Sub-Saharan Africa was an exception because of the impact of the slave trade, the disturbances to traditional societies due to colonization, and the spread of deadly diseases. In 1900, the sub-Saharan population was around 100 million only. It had increased less than 25% since 1500 and it represented only 7% of the world population, against 17% in 1500.

The twentieth century witnessed the "demographic explosion"" of the Third World. Between 1900 and 1980, all developing regions experienced about a dou-

Table 1 World population by major regions at various dates between 1500 and 2015

Regions/Years	Estimated population (millions)					Ratio 1900/1500	Ratio 1900/1980	Ratio 1980/2015	Rate of growth 1950–1980	Rate of growth 1980–2015
	1500	1900	1950	1980	2015					
Europe (and Russia)	84	422	549	694	738	5,0	1,3	1,1	0,8	0,2
Northern America	3	90	172	254	358	30,0	1,5	1,4	1,3	1,0
Japan	8	44	82	116	127	5,5	1,4	1,1	1,2	0,3
China and Korea	84	415	666	1172	1609	4,9	2,8	1,4	1,9	0,9
India, Pakistan, Bangladesh	95	290	452	857	1661	3,1	1,9	1,9	2,2	1,9
Other Asia (less Japan)	56	153	194	481	996	2,7	2,5	2,1	3,1	2,1
Latin America & Caribbean	39	75	169	365	634	1,9	2,2	1,7	2,6	1,6
Northern Africa	8	23	49	107	224	2,9	2,2	2,1	2,6	2,1
Sub-SaharanAfrica	78	95	180	371	962	1,2	2,1	2,6	2,4	2,8
Eastern Africa		40	67	148	394		2,2	2,7	2,7	2,9
Middle Africa		20	26	53	152		2,0	2,9	2,4	3,0
Southern Africa		8	16	33	63		2,1	1,9	2,5	1,8
Western Africa		40	71	137	353		1,9	2,6	2,2	2,7
World	458	1613	2525	4440	7349	3,5	1,8	1,7	1,9	1,5

Sources: Biraben J.N. 2003 (Population et Sociétés, Numéro 394 October 2003) for 1500 and 1900, and United Nations, Population Division (2015). World Population Prospects: The 2015 Revision, for 1950, 1980 and 2015

bling of their population, including sub-Saharan Africa. However, thanks to the successes of population policies and family planning programs put in place in most Asian, Latin American, Caribbean, and Northern African countries in the 1960s and 1970s, population rates of growth declined quite rapidly in these regions between 1980 and 2015. By contrast, population kept increasing in sub-Saharan Africa, where population growth stood at 2.8% per year on average. The three major sub-regions of sub-Saharan Africa, namely Eastern Africa, Middle Africa, and Western Africa, which in 2015 represented 93.5% of the population of the region, had similar high recent rates of population growth, respectively 2.9%, 3.0% and 2.7% per year on average. The Southern sub-region stands apart with a rate of growth declining to 1.8% per year for the period 1980–2015, against 2.5% for the period 1950–1985.

The rapid growth of the sub-Saharan African population is, in most countries, the result of the late adoption of population policies andfamily planning programs, a lukewarm support from governments to these programs, and the poor implementation of these programs in societies that remain largely pronatalist.

By mid-2015, the sub-Saharan Africa population was estimated at 962 million, i.e., ten times its 1900 level. This represented 13% of the world population (still less than the 17% it represented in around 1500). This corresponded to a density of 44 inhabitants per square kilometer, higher than the density of Latin America and the Caribbean and Europe, of 32 and 33 inhabitants per square kilometer respectively; this figure is much lower than the density of 142 inhabitants per square kilometer observed for all Asia. However, such comparisons have a limited significance because of the heterogeneity in human carrying capacities in each region and within regions.

Overall, the unabated increase of the sub-Saharan population at about 2.5% per year since 1960 is unprecedented in the history of human population. It has huge social, economic, environmental, and political consequences, which are not fully understood by most governments and civil society's organizations in sub-Saharan Africa. This exceptional growth is the mechanical result of declining mortality and persisting high levels of fertility. It is going to continue over a long period of time, since mortality levels are going to decline further and fertility levels are likely to continue declining at a slower pace than in other parts of the world where the fertility transition is not yet fully completed.

4 Levels and Trends of Mortality

Compared to other regions of the developing world, the decline in mortality occurred later in sub-Saharan Africa and was slower than in other regions of the world. In the 1980s and 1990s, the decline in mortality slowed down in many countries, and mortality even increased in some countries because of wars, social unrest, the deterioration of health services, and the impact of HIV/AIDS, particularly in Southern Africa. However, as suggested by the estimated values of life expectancy at birth

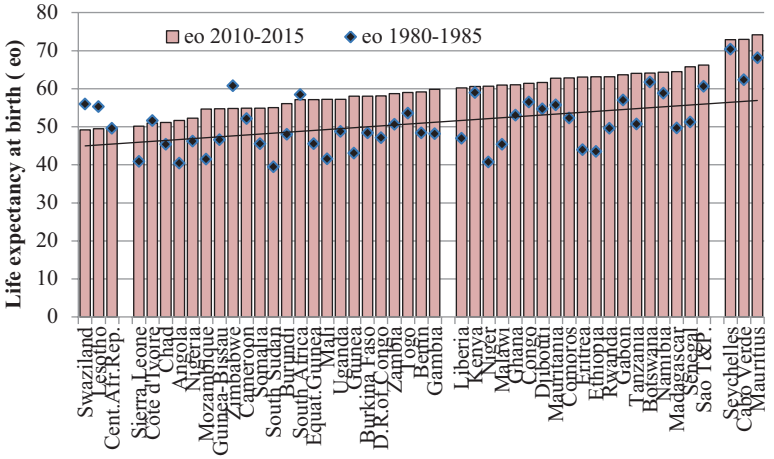

Fig. 1 Life expectancy at birth (e0 in years) both sexes combined, by country, in 1980–1985 and 2010–2015 (Source: United Nations (2015). World Population Prospects: The 2015 Revision)

and under-five mortality rates over the past 30 years, the trend has been toward declining mortality, especially in recent years although much remains to be done.

According to the 2015 United Nations estimates, life expectancy at birth, or the average number of years that a newborn would live under the mortality conditions prevailing at a given time, was lower in 2010–2015 than in 1980–1985 in only six countries: Swaziland, Zimbabwe, Lesotho (about 6 years less for the three countries), South Africa, Côte d'Ivoire, and the Central African Republic (about 1 year or less) (Fig. 1). These declines are primarily the result of the numerous deaths due to the high HIV prevalence in these countries. In the 42 other countries, increases of life expectancy at birth between 1980–1985 and 2010–2015 are very diverse. They range from about 2 to 3 years in countries like Kenya, Botswana, and Cameroon, to 10 years or more in 20 countries, and to about 15 years or more in nine countries such as Senegal, Madagascar, Guinea, Malawi, and Mali, and to 20 years in Ethiopia and Niger. Despite these impressive gains, life expectancy at birth remains low, below 60 years in 26 countries and above 70 years in only three islands countries, namely the Seychelles, Cape Verde, and Mauritius.

These gains are the result of more efficient heath systems, especially in their interventions towards mothers and children. In fact, low life expectancies at birth are largely the result of high mortality rates among children. This is why major progress in reducing mortality among children translates into an increase in life expectancies at birth.

Indeed, in almost all countries of sub-Saharan Africa, major reductions of infant and child mortality occurred between 1980–1985 and 2010–2015. During this period, under-five mortality rates have been divided by at least three in seven countries (Senegal, Cape Verde, Tanzania, Malawi, Ethiopia, Madagascar, and Niger)

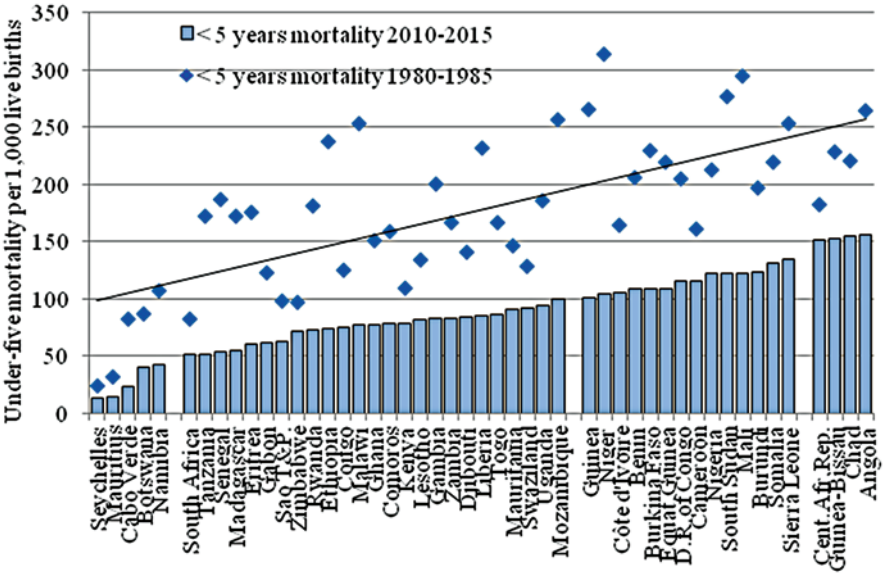

Fig. 2 Under-five mortality per 1,000 live births (both sexes combined) by country, in 1980–1985 and 2010–2015 (Source: United Nations (2015). World Population Prospects: The 2015 Revision)

and between two and three in 15 countries. Among the remaining 26 countries, under-five mortality rates have been reduced at least by 25%, except in the Central African Republic where the decrease was estimated at only 17%. These impressive declines are due to various interventions such as improved prenatal and postnatal care, better delivery conditions, vaccinations, oral-rehydration therapy programs, large-scale distributions of impregnated malaria bed nets, the provision of nutritional supplements, and comprehensive sanitation programs. Despite these progresses, under-five mortality levels remains above 100 deaths per 1,000 live births in 18 countries, and between 50 and less than 100 deaths per 1,000 live births (which is still high) in another 25 countries. Finally, in 2010–2015, only five countries have under-five mortality rates below 50 per 1,000 live births: the three islands countries of the Seychelles, Mauritius, and Cape Verde, and the two Southern African countries of Botswana and Namibia (Fig. 2).

The still high levels of infant and child mortality are well reflected by the estimated weight of the causes of deaths due to communicable diseases and maternal, prenatal, and nutritional conditions, which affect primarily children (and mothers). In 2012, these causes still accounted for more than half of all causes of deaths in all but four countries of the region, namely South Africa, Namibia, Cape Verde, and Mauritius (and probably also the Seychelles).

Thus, despite recent progress in reducing under-five mortality levels, there is still much room for improvement. In addition, programs geared at reducing adult mortality will need to be expanded in order to significantly improve survival ratios

for adults. All these interventions, which have received renewed attention and funding in recent years, are projected to continue in the foreseeable future and this will foster in most countries continued populationgrowth due to decreasing mortality.

5 Levels and Trends of Fertility

As in the case of mortality, fertility declines have been slow and uneven in the 48 sovereign countries of sub-Saharan Africa. To be sure, fertility has started to decline in most countries, but at different periods of time and at different paces.

According to the United Nations estimates, fertility levels reached their maximum in the majority of sub-Saharan countries either in the 1970s or in the 1980s. Fertility then began to decline in the 1980s or the 1990s (and in some cases later), that is 20–30 years after what was observed in most other developing countries. In a few countries, as in the island-countriescountries and countries of Southern Africa, fertility started to decline before the 1980s. But in several others, recent estimates suggest that declines are so small that it is difficult to assure that the fertility transition process has really started. This is the case in particular for Niger, Mali, Chad, Angola, and the Democratic Republic of the Congo.

Overall, however, fertility levels of the early 1980s can be considered for most countries as representative of pre-fertility transitional levels. So in 1980–1985, 40 counties had total fertility rates of 6 children or more per woman, accounting for 91% of the population of the region, and 18 countries had total fertility rates of 7 children or more per woman, accounting for 39% of the population. Among the remaining eight countries with total fertility rates below six children per woman, fertility had really started to decline only in Mauritius, the Seychelles, and South Africa (2.3, 3.5, and 4.6 children per woman, respectively), but the decline was incipient in Lesotho (5.5 children per woman). The relatively lower levels of fertility in Gabon, Equatorial Guinea, and the Central African Republic (5.7, 5.8, and 5.9 children per woman, respectively) were the result of high prevalence of sterility.

In 2010–2015, 30 years later, according to the 2015 United Nations estimates, fertility levels were still above six children per woman in seven countries, between four and less than six children per woman in 32 countries, and below four children per woman in nine countries. Consequently, it can be said that the fertility transition is underway in sub-Saharan Africa. However, a closer examination reveals a great diversity in the paths of the various fertility transitions that are observed. Using the United Nations 2015 estimates, we can establish an updated typology of fertility transitions in sub-Saharan Africa according to where each country is in the fertility transition processes (i.e., the shift from traditional high fertility levels to moderate, controlled fertility levels) (see previous typology in Guengant and May 2014: 86).

Five types of transitions were identified, as follows (Fig. 3):

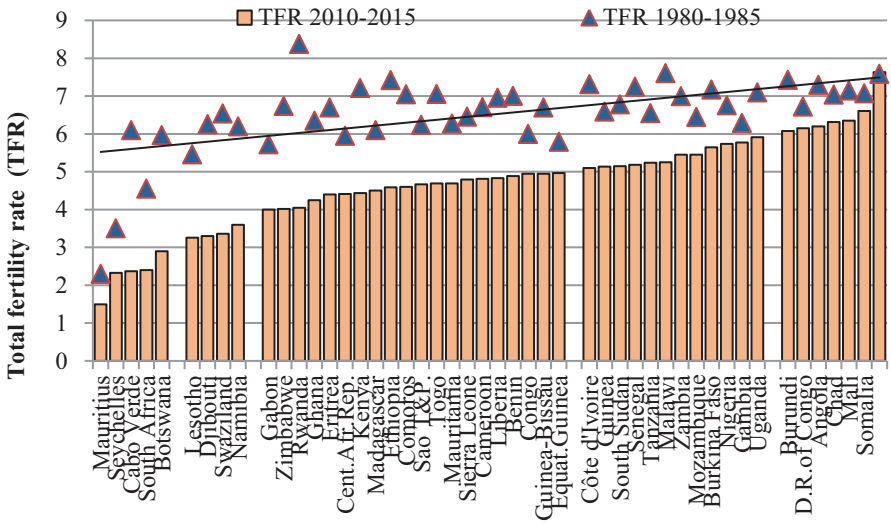

Fig. 3 Total fertility rate (TFR) by country, in 1980–1985 and 2010–2015 (Source: United Nations (2015). World Population Prospects: The 2015 Revision)

1. "*Fertility transition completed or close to completion*", when the total fertility rate (TFR)) is estimated at less than three children per woman on average in 2010–2015. Five countries fall in this group. These are, by increasing value of TFR, Mauritius, the Seychelles, Cape Verde, South Africa, and Botswana. These countries represented 6% of the population of sub-Saharan Africa in 2015. Generally, these six countries have more advanced economies and the higher GDP per capita of the region, and higher life expectancies. Fertility declines started from a maximum of between six and seven children per woman, generally earlier than in the other countries. They occurred in the 1960s in Mauritius and South Africa, in the 1970s in the Seychelles, but in the 1980s in Cape Verde and Botswana.
2. "*Fertility transition underway*", when the TFR is estimated to be between three and less than four children per woman in 2010–2015. Four countries fall in this group: Lesotho, Djibouti, Swaziland, and Namibia, representing 0.7% of the population of the region. These countries, except Djibouti, have close economic and cultural relationships with South Africa. The fertility decline started from a maximum of around seven children per woman (six children in Lesotho), generally in the 1980s.
3. "*Fertility transition initiated*", when the TFR is estimated to be between four and less than five children per woman in 2010–2015. A total of 20 countries fall in this group: Gabon, Zimbabwe, Rwanda, Ghana, Eritrea, Central African Republic, Kenya, Madagascar, Ethiopia, Comoros, Sao Tome and Principe, Togo, Mauritania, Sierra Leone, Cameroon, Liberia, Benin, Congo, Guinea-

Bissau, and Equatorial Guinea, representing 31% of the population of the region. Most of these countries (16 out of 20) are coastal countries with generally high urbanization rates. Since the early 1970s, Ghana and Kenya expressed a political commitment, albeit uneven and irregular, to lower fertility, which translated in mixed results since their fertility transitions are still far from complete, and more recently this was also the case in Rwanda and Ethiopia. In these 20 countries, fertility declines started in most cases from a maximum of between six and seven children per woman in the 1980s. But in Kenya and Rwanda, fertility reached eight children and more per woman, from 1960–1965 to 1970–1975 in Kenya, and from 1950–1955 to 1985–1990 in Rwanda, where fertility started to decline sharply only in the 1990s. Fertility also started to decline in the 1990s in Ethiopia from 7.4 children per woman in the 1980s, and in the late 1990s in Sierra Leone from about 6.5 children per woman.

4. "*Slow and irregular transition*", when the TFR is estimated to be between five and less than six children per woman. A total of 12 countries fall in this group: Côte d"Ivoire, Guinea, South Sudan, Senegal, Tanzania, Malawi, Mozambique, Zambia, Burkina Faso, Nigeria, Gambia, and Uganda, accounting for 44% of the population of the region. These countries have mixed urbanization rates and generally a weak political commitment to lower fertility. In these countries, fertility declines started in most cases from a maximum of between six and seven children per woman in the 1980s, or in some cases in the 1990s (as in Uganda and Burkina Faso).
5. "*Very slow and/or incipientfertility transition*", when the TFR is estimated at six or more children per woman. Seven countries fall in this group: Burundi, the Democratic Republic of the Congo, Angola, Chad, Mali, Somalia, and Niger, accounting for 18% of the population of the region. These countries have low levels of urbanization and a lack of strong political commitment to lower fertility. Maximum fertility has been above seven children per women and it is estimated that fertility declines are incipient.

Evidently, such classification needs to be revised periodically. It remains true that about 30 years after the onset of the fertility decline in most countries, 62% of the population of sub-Saharan Africa live in countries where women still have five or more children on average. It should also be noted that among the 21 countries of the world where women still have five children or more, all, but two (Afghanistan and Timor-Leste) are in sub-Saharan Africa.

As said before, the fertility transition in sub-Saharan Africa has not only started 20–30 years later (and even more in a few cases) than in most other developing countries, but it has also been particularly slow.

The decline of fertility over the 30-year period considered (i.e., between 1980–1985 and 2010–2015) is on average less than half a child per decade in 17 sub-Saharan African countries, accounting for 50% of the 2015 population of the region. It is more than one child per decade in only four countries (Botswana, Swaziland, Cape Verde, and Rwanda), accounting for 4% of the population of the region. By contrast, between 1970–1975 and 2000–2005, the average declines in many other

developing countries were generally about or close to one child per decade (China, Korea, Pakistan, Indonesia, Thailand, Turkey, Cambodia, Dominican Republic, Nicaragua, Brazil, Peru, etc.) and 1.3–1.5 children per decade (Bangladesh, Vietnam, Algeria, Morocco, Tunisia, Mexico), that is two to three times faster than what has been observed in most sub-Saharan African countries. Iran had even a faster fertility decline, with three children less in about 10 years.

Survey results also reveal that in certain countries, where it was deemed in the 1990s that the fertility transition was well underway, fertility decline has stalled in recent years, as in Côte d'Ivoire, Ghana, Senegal, Congo, and Zimbabwe. In some countries, fertility has even increased recently as in the Democratic Republic of the Congo, Chad, Niger, Mozambique, and Benin.

As pointed out is a recent article (Bongaarts 2016), the slow pace of the African transition can be attributed to several factors, in particular to the low level of development of most countries that is not favorable to a rapid diffusion of contraceptive use. In addition, one should mention the pronatalist nature of African societies, which implies a resistance to fertility decline, as well as the weakness of most family planning programs.

Besides that, one should distinguish two broad sets of determinants when interpreting the high fertility levels in most African countries, namely the intermediate and the proximate determinants.

The *intermediate determinants* of fertility are essentially socioeconomic in nature, and they influence fertility indirectly. Higher levels of education, health status, employment in the formal sector, and income, as well as urban or rural residence are all intermediate determinants. Policy interventions in these areas generally do not appear to affect fertility rates in the short term, and their impacts can vary from one country to another depending on other variables. Family norms, social networks, and cultural values can amplify or, on the contrary, slow down the country's reaction to changes in public policies. Raising education levels for girls (especially secondary education levels), reducing maternal and child mortality, increasing female labor participation in the formal sector, and achieving a more inclusive economic growth, are policy objectives by themselves and not just proxy policy interventions aimed at accelerating the fertility transition. In African countries, as in other developing countries, fertility levels are generally lower among the most educated and urban women (Bongaarts 2010). However, the effect on national fertility levels is limited because in most African countries relatively few women of reproductive age have post-primary education levels, and urbanization rates remain generally low. Wealthier households also have generally lower fertility levels than poorer ones. Family norms favoring large families (expressed by the ideal number of children in the Demographic and Health Surveys or DHS) are still dominant among the poorest households but can also be found among the most educated women and among women from the wealthiest households in several countries.

The *proximate determinants* of fertility are biological and/or behavioral in nature. These determinants include marriage (unions), induced abortion, temporary postpartum infecundability (postpartum insusceptibility), and/or sterility, and the use of contraception (traditional and/or modern methods), for spacing reasons and for achieving

the desired family size. Some of the proximate determinants are more amenable to policy interventions than others, especially when results are anticipated in short time periods (May 2012). For this reason, in high fertility countries, access to contraception has long stood at the top of the list of preferred population policy interventions. However, one should not underestimate the importance of the less publicized determinants of fertility, namely postpartum infecundability (which is essentially linked to the duration of breastfeeding), increasing age at marriage, and recourse to induced abortion (because of limited access to family planningservices).

Nevertheless, the high fertility levels observed today in most sub-Saharan countries are largely the result of persisting low contraceptive prevalence rates (CPR) compared to those observed in nearly all other developing countries. Over the past 40 years, in a majority of developing countries and in the few African countries which have completed their fertility transition, contraceptive prevalence rates have increased rapidly to 60% or more–a process that has been called the contraceptive revolution. But much of sub-Saharan Africa has not taken part in this contraceptive revolution (Cleland and Shah 2013), and contraceptive prevalence rates for modern methods have not reached 20% in a majority of SSA countries.

The reasons for the low use of contraceptive methods by sub-Saharan women are the result of a complex set of interrelated factors. The reluctance to use modern methods is to a certain extent rooted in traditional culture, attitudes, norms, and family structures, but it may also be that few sub-Saharan women are aware of the available choices they have today.

First, to a large extent the low use of contraception in sub-Saharan Africa is the result of a weak demand for family planning, compared to the demand in other developing countries (Fig. 4). According to the last DHS undertaken in 38 SSA

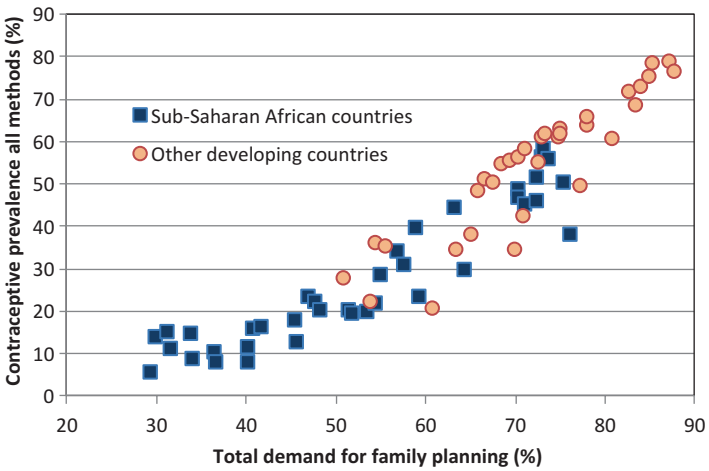

Fig. 4 Relationship between Contraceptive Prevalence (all methods) and Total Demand for Family Planning in sub-Saharan and other Developing Countries according to the last DHS Surveys (Source: The DHS Program, MEASURE DHS and STATcompiler (www.statcompiler.com))

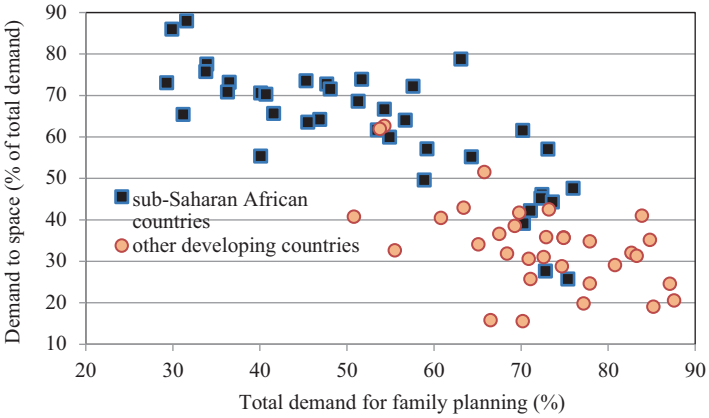

Fig. 5 Relationship between Total Demand for Family Planning and the share of the Demand to space (% of total demand) in sub-Saharan and other Developing Countries according to the last DHS Surveys (Source: The DHS Program, MEASURE DHS and STATcompiler (www.statcompiler.com))

countries, i.e., in about half of these countries, less than 50% of interviewed married individuals expressed a need for family planning. This is low, compared to the 70–90% need expressed in a majority of the other developing countries. Total demand includes all women in union in need but not using any method, plus those currently using contraception.

Second, the demand for family planning in sub-Saharan Africa is predominantly a demand for spacing reasons (Fig. 5). In half of the 38 countries considered here, more than 65% of the demand is for birth spacing, whereas it is just the opposite in the other developing countries (desire for birth limiting). In fact, in the majority of the other developing countries less than 35% of the demand for family planning is for spacing reasons, and 65% is for limiting reasons. Such percentages reflect a rather good control from the women of these countries of their fertility during their reproductive life span.

Third and last, the preference for spacing, as well as the low level of contraceptive use in sub-Saharan Africa is clearly related to persisting pronatalist attitudes (Fig. 6). In most of the SSA countries considered (30 out of 38), women indicated their ideal number of children as being above four. By contrast, in most of the other developing countries the ideal number of children ranges roughly between two and three children per woman. Persisting high desired fertility among younger African women and marriage at young ages (and sometimes child marriage) should also be taken into consideration. Indeed, the ideal number of children remains high and declines slowly, even including among young women with secondary levels of education. To a large extent, this situation is the consequence of lukewarm commitment or lack of engagement vis-à-vis family planning on the part of governments, leaders, policymakers, and donors alike.

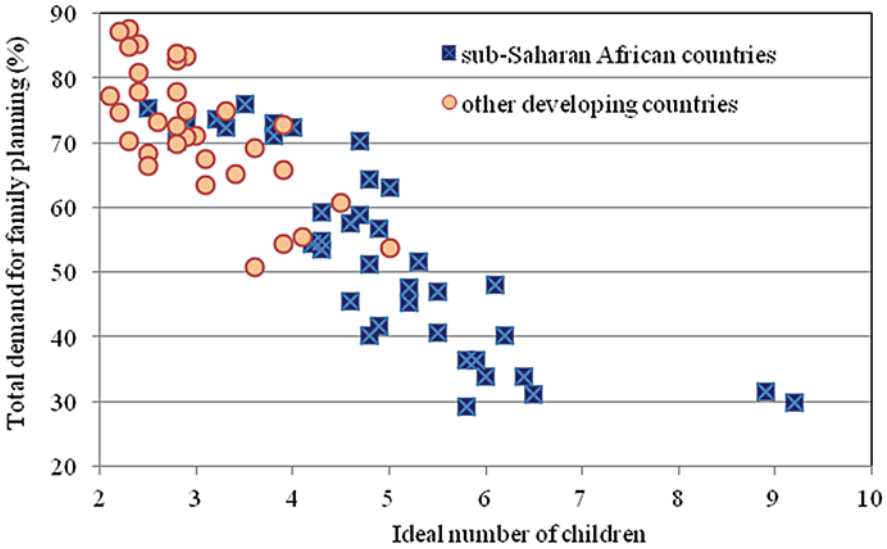

Fig. 6 Relationship between Total Demand for Family Planning and the Ideal number of Children in sub-Saharan and other Developing Countries according to the last DHS Surveys (Source: The DHS Program, MEASURE DHS and STATcompiler (www.statcompiler.com))

To be sure, in the 1970s, few countries, like South Africa, Zimbabwe Kenya, and Ghana had initiated family planning programs. However, in 2010–2015 only South Africa, with a TFR of 2.4 children per woman belongs to the group of countries where the fertility transition can be considered as close to completion, but the other three countries still have estimated TFRs between four and less than five children per women. In recent years, only two governments (Rwanda and Ethiopia) organized successful large scale campaigns in support of family planning, and registered rapid fertility declines leading to TFRs in 2010–2015 of 4.1 and 4.6 children per woman, respectively.

Finally, because of high fertility, probably about half of the total health expenditures are spent in most SSA countries on caring for the large numbers of pregnant women and young children among the population. This is largely the result of the numerous high-risk pregnancies, i.e., pregnancies that are too early, too frequent, too close, or too late. In fact, these pregnancies require additional care (and costs) to pregnant women and newborns, to try to reduce the current very high maternal mortality ratios, high under-five mortality rates, and high proportions of stunted children associated with high-risk pregnancies. Moreover, it should be noted that the future of stunted children is compromised because they have more difficulties learning in school and are also less resistant to diseases. These outcomes have the greatest impact on the poorest households and jeopardize the chances of the countries of achieving more inclusive growth and fulfilling their development objectives.

6 Population Prospects in 2050

In mid-2015, the sub-Saharan Africa population was estimated to be 962 million. According to the 2015 Revision of UN Population Division Prospects released in July 2015, the sub-Saharan Africa population might be 1.9, 2.1, or 2.3 billion by 2050, i.e., between 2 and 2.4 more times than in 2015, depending on the fertility assumptions considered.

The UN Population Projections combine for 201 countries and territories of the world several assumptions, including country-specific assumptions for mortality and international migration across all projection scenarios – with three different variants of fertility decline, i.e., Medium, High, and Low plus a Constant-fertility variant that indicates what would happen if each country's TFR remained at its 2010–2015 levels. The reason for this choice is that fertility is undoubtedly the main determinant of future population evolution. Indeed, according to additional scenarios made by the UN Population Division when combining the Medium fertility variant with a Constant mortality assumption (assuming no further progress of life expectancy), the population of sub-Saharan Africa would nonetheless reach 1.9 billion by 2050, and assuming zero migration it would be only 20 million above the result of the Medium variant that assumes the pursuit of migration.

Contrary to what many users of these projections believe, the Medium variant is not the most probable scenario. As the United Nations stated, "future trends cannot be known with certainty". That is the reason why several projections variants are produced, including the Constant-fertility variant. Of course, future total population increases between 2015 and 2050 vary from one country to another depending on the fertility assumptions made for each country.

Fertility of the Medium variant of each country is supposed to converge in a more or less distant future (in some cases beyond 2100) toward fertility replacement level (around 2.1 children per woman), according to different patterns of fertility transition depending on the country's level of fertility in 2010–2015. The combination of the different variants of fertility adopted for each of the 48 sovereign countries of sub-Saharan Africa yields for the Medium fertility variant a TFR of 3.1 children per woman by 2050–2055, which is 2 children less than in 2010–2015. By convention, the Low variant is defined to be 0.5 children less than the Medium variant, and the High variant, 0.5 children more. This corresponds to 2.6 and 3.6 children per woman by 2050–2055, respectively.

Projected fertility declines by 2050–2055 for the Medium variant depend largely on initial levels of fertility, with the assumption that fertility transition will accelerate in countries that have the highest TFRs in 2010–2015. However, for those countries with slow and/or incipient fertility transitions, the average projected TFR declines remain relatively moderate compared to what has been observed elsewhere in the world, i.e., between 0.6 and 0.7 children less per decade for the Medium variant, a bit higher for the Low variant, i.e., between 0.8 and 0.9 children less per decade, and lower for the High variant, i.e., between 0.5 and 0.65 children less per decade. For most of the other countries, the average TFR declines for the Medium

variant is comprised between 0.3 and just below 0.6 children less per decade, except for those few countries where the fertility transition is completed or close to completion. Overall, according to the Medium variant, 18 countries could still have TFRs of above three children per woman by 2050–2055 (Fig. 7), against only four countries (Niger, Zambia, Somalia, and Burundi) according to the Low variant, but 33 countries according to the High variant.

Concerning mortality, the 2015 World Population Prospects assume continued increases in the life expectancyat birth from 2010–2015 to 2050–2055. The corresponding gains range from 15 to 20 years of life expectancy at birth in seven countries (Central African Republic, Zimbabwe, Lesotho, Côte d'Ivoire, Mozambique, Mali, and Cameroon), 10 to less than 15 years in 28 countries, and 5 to less than 10 years in 13 countries.

Concerning international migration, the 2015 World Population Prospects have estimated a netmigration for all sub-Saharan Africa (immigrants minus emigrants, plus refugee movement) of 920,000 persons for the 2010–2015 period (that is about 180,000 persons per year), and this number is projected to increase to 1.7 million (340,000 persons per year) during the period 2050–2055. Such estimates and projections are very difficult to make and should be considered in any case as tentative. Of course, the magnitude of migration and refugee movements varies from one country to another. But in 2010–2015, the annual net migration rates rarely exceed plus or minus 5 per 1000 populations, and they are projected to decrease over time. This means that even in countries of traditionally important net immigration like South Africa and Côte d'Ivoire, as in countries of traditionally high net outmigration like Mali and Burkina Faso, the demographic impact of migration on the population dynamics of these countries is deemed to be negligible.

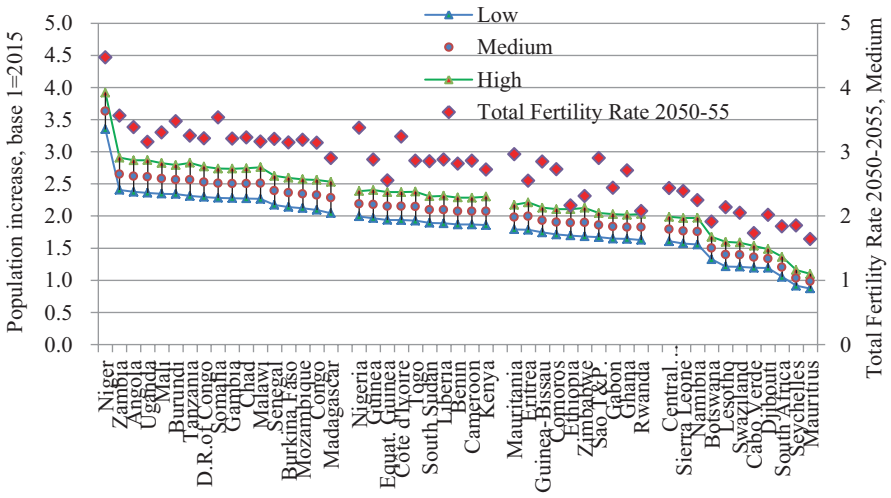

Fig. 7 Population increase between 2015 and 2050 by country according to the Low, Medium, and High fertility variants, and the TFR projected in 2050–2055 for the Medium variant (Source: United Nations (2015). World Population Prospects: The 2015 Revision)

Keeping these assumptions in mind, one can now examine what could be the future total population of the 48 sovereign countries of the region. The first striking result of the 2015 World Population Prospects is the continued population increases expected for almost all countries between 2015 and 2050 (Fig. 7). Indeed, with the Low variant, populations are expected to at least double by 2050 for 17 countries, but this will be the case for 27 countries with the Medium variant and for 37 countries with the High variant. Finally, only two island countries, Mauritius and the Seychelles, might experience a slight decline in their populations, and population increases will be moderate only for the countries that are well advanced in their fertility transition (South Africa, Cape Verde, Swaziland, Lesotho, Botswana, and Djibouti).

These results mean that because of still high levels of fertility and the youthfulness of most sub-Saharan African populations, a majority of countries will see their total populations more or less double and in some cases triple in the next 35 years. But one should stress that the differences between the Low and High fertility variants is mainly the result of the faster declines associated with the Low fertility variant as compared to the High fertility variant. This translates into a much slower increase of the number of births and children in the next 35 years, and quite different age structures as illustrated by the comparison of the age pyramids of all sub-Saharan Africa for the Low and High variant by 2050 (corresponding to a TFR by 2050 of 2.6 and 3.6 children per woman, respectively) (Fig. 8).

What is really at stake for most countries is the stabilization of the number of births and young children, as a result of a rapid fertility decline. Such stabilization will yield a change in the age structure of most countries, therefore opening what has been called the demographic window of opportunity and allowing the countries to capture a first demographic dividend.

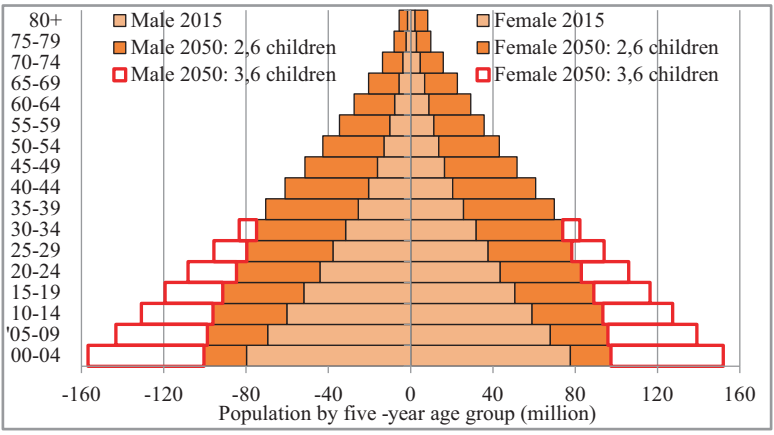

Fig. 8 Sub-Saharan Africa, Age pyramid in 2015, compared with Age pyramids in 2050 according to the Low and High variants (Source: United Nations (2015). World Population Prospects: The 2015 Revision)

The opening of the demographic window of opportunity occurs when the proportion of those in the working age group starts to exceed the proportion of the dependents, namely the children, the youth, and the elderly. The number of dependents aged less than 15 years and 65 years and more for every 100 "potentially active" people of 15–64 years, is the most common dependency ratio used. However, because of the very high unemployment and/or underemployment rate among the young people aged 15–19, and also because of the need to enroll many young people at the secondary school, vocational, and higher education levels, it is more appropriate to retain the number of dependents for every 100 "potentially active" people of 20–64 years. According to this definition, in 2015, only the six countries where the fertility transition was completed or close to completion, plus Djibouti, have a dependency ratio per 100 population aged 20–64 years below 100. Consequently, 42 countries have more dependents aged less than 20 years and 65+ years than "potentially active" people of 20–64 years.

By 2050, because of the projected declines of fertility for all countries (except Mauritius) the percentage of youth in the population decreases, and parallel to that the percentage of the 65+ years increases but remains modest (below 20 dependents, except in Mauritius, the Seychelles, and Cape Verde). As a result, more and more countries will have relatively more "potentially active" people of 20–64 years than dependents, and consequently lower dependency ratios. Therefore, by 2050, according to the Low fertility variant, all countries but one, Niger, could have a dependency ratio of below 100 and could be considered as having entered the demographic window of opportunity. However, only 38 countries could have a dependency ratio below 100 with the Medium variant, and 28 countries with the High variant, leaving the remaining countries (10 and 20, respectively) with less "potentially active" people than dependents (Fig. 9). Thus, entering the demographic window of opportunity before 2050 is not guaranteed for all countries, especially for those countries where the fertility decline will remain slow.

Entering the demographic window of opportunity is a necessary condition to envision the benefit of a first demographic dividend. But it is far from being a sufficient condition. Harnessing the demographic dividend supposes, among other conditions (a human capital of a better quality than today, an improved governance, etc.) that a large proportion of the growing labor force will be employed in productive and gainful occupations, which will necessitate large investments. This represents a daunting challenge for most sub-Saharan African countries, where the largest part of the active population is now working in low productive agricultural activities or in the informal sector. In addition, the number of youth entering the labor market in the next 35 years will continue to increase rapidly in almost all countries. Providing jobs to the youth entering the labor market has been very difficult over the past 30 years or so (hence the growing importance of the informal sector), and this will continue to be the case in the coming decades.

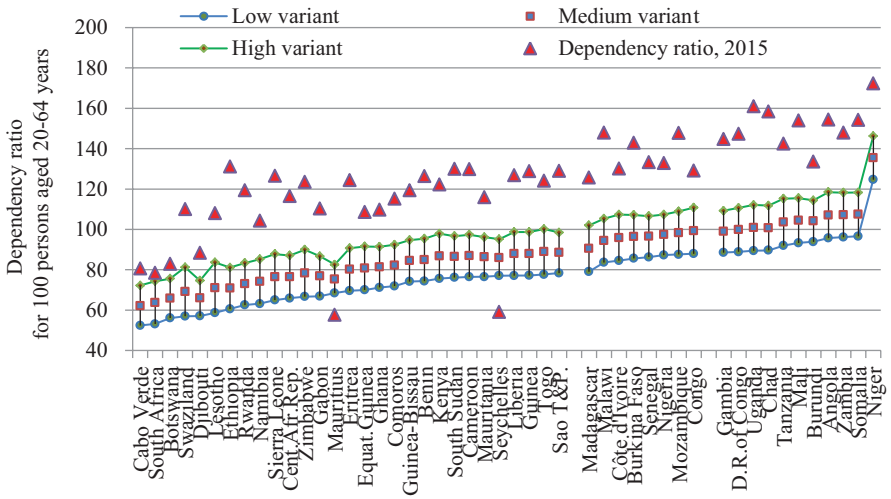

Fig. 9 Dependency ratio (dependents aged 0–19 years and 65+ years per 100 Persons aged 20–64 years) by country in 2015 and 2050 according to the Low, Medium and High fertility variants (Source: United Nations (2015). World Population Prospects: The 2015 Revision)

7 Summary and Conclusions

When talking about sub-Saharan Africa, one should never forget that we are referring to 48 sovereign countries. They share several historical, cultural, social, and economic features, but they are also very different in many respects, such as their territory and population sizes, their location and climate, their integration into the world economy, and their recent economic performances and social advances.

These differences apply also to the population dynamics and demographic characteristics. In this respect, it should be noted that the countries which are more advanced in their demographic transition and have the lower fertility levels are island-countries and countries of Southern Africa, which have generally better socio-economic indicators than the other countries less advanced in their demographic transition and with higher fertility levels.

This does not mean that their lower fertility levels explain their better socio-economic indicators. Indeed, over the last 10–20 years or more, these more advanced countries have also had high rates of economic growth, thanks to the peculiar comparative economic advantages they have, and to the economic and social policies they have put in place. However, having lower dependency ratio and lower rates of population growthhas helped these countries to increase their GDP per capita more rapidly.

The question which remains is the following: is "development the better contraceptive" or should fertility declines be accelerated through specific population and

family planning programs, as was done to accelerate mortality declines of children through health programs and specific interventions? In other words, is it possible, desirable, and legitimate to accelerate fertility declines in sub-Saharan African countries, for reasons which are altogether economic, social, and linked with human and reproductive rights?

An analysis of various development plans in sub-Saharan African countries (Guengant 2014, 2011) shows that for almost all development planners, economic growth is seen as the main engine of social and economic development, which is largely true. However, generally no attention is paid to the demographic dimensions of development, and most plans do not even include demographic projections. Overall, the dominant idea in many countries remains that their territory is still under-populated, and that a large population is an asset for their future development.

Today, a large number of sub-Saharan African countries are striving to become emerging economies in the near future. However, in adopting this objective, there is no mention in the corresponding documents that all emerging economies have already achieved their fertility transition or are near in doing so. Besides, most sub-Saharan African countries think that they are, and will soon be ready to capture a first demographic dividend on the ground that they have numerous youth, even when their number of dependents largely exceed their number of "active potential" people in the 20–64 age group.

Overall, the demographic variables are not fully integrated yet into most development plans. The commitment to implement effective population and family planning programs, in order to reduce fertility levels and population growth rates is still weak. If these conditions were to continue unchanged, the hope of capturing a demographic dividend might remain a mirage for a number of sub-Saharan African countries.

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Reaping a Demographic Dividend in Africa's Largest Country: Nigeria

Emmanuel Jimenez and Muhammad Ali Pate

1 Introduction

With an estimated population of more than 180 million, which has grown at 2.7–3.2% annually for the last several decades, Nigeria is Africa's most populous nation. By 2050, Nigeria will have a projected population of almost 400 million, and will be the 4th most populous country in the world (United Nations 2015).

The magnitude of Nigeria's population is matched by its significant and growing economic presence. With a gross national income of over USD 400 billion in PPP terms, it is, after South Africa, the second largest economy in sub-Saharan Africa and is growing economically on a per capita basis at over 3.5% per annum, a rate higher than most advanced countries (World Bank 2014a). Its economic impact on the rest of the region can only be expected to grow. Its future economic prospects will affect not only the very large Nigerian population – which alone makes it an important subject of this case study – but also those of its neighbors and the other countries in the region.

Like many other countries in the region, Nigeria is also very diverse economically and demographically. Despite having some of the wealthiest families in the region, median incomes remain very low with almost 60% of the population living on a $1 a day according to a recent survey. It is ethnically, religiously, and linguistically diverse with some 250 ethnic groups, over 500 languages spoken, and roughly equal numbers of Muslims and Christians, the former living mostly in the Northern areas, the latter concentrated in the South.

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Serving the needs of such a large, growing, and diverse population is undoubtedly an enormous challenge to all the stakeholders in Nigeria's development, whether they are government, civil society or donors, especially in an economy that is still heavily dependent on natural resource rents from the oil industry. Cultural and economic marginalization remains key factors in explaining the high rate of population growth. At the same time, the rate of population growth (excluding migration) correlates well with the incidence and distribution of poverty.

While providing for such a large population poses a significant economic challenge, its age structure can also be a potential boon to growth. In particular there can be a window of opportunity for a country to benefit from a "demographic dividend" when there are many more who are of working age relative to those not, either because they are too young or too old. In this chapter, we argue that Nigeria is poised to avail itself of such a boon. Recent estimates show that it can be substantial. But the dividend will not come automatically. To seize the opportunity Nigeria must also embark on policies that will develop its work force and ensure that it is productive. It is of equal importance that the policies must be shaped to be consistent with the varying realities of Nigeria's regions.

The purpose of this contribution is to highlight the prospects for Nigeria to reap economic growth benefits from its demographic structure, drawing insights from population analysis at sub-national levels. This draws heavily from the work that both authors did as part of the World Economic Forum's Global Agenda Council on Population Growth which was published as a case study (World Economic Forum 2014). This report also presents policy options for the Federal and State Governments, focusing on the need to accelerate the arrival of the dividend, especially in the Northern areas, and to make sure that the working age population is productively employed.

2 Nigeria's Demographic Trends

Nigeria's population has grown steadily as can be seen from Table 1. There were just over 45 million Nigerians in 1960 and according to the latest World Population Projection, this number had grown more than fourfold by 2015 to 182.2 million (United Nations 2015). The population growth rate, which had begun to decline after 1980, has risen again in the 2000s.

This rise in population has been driven by a number of factors. Average life expectancy has risen, as it has in most of the world's countries. Under-five mortality has fallen from 187 in 1960 to just over 131 per 1000 live births in 2010 and 109 in 2015. Despite this fall, the latter figure is still unacceptably high. If there is one figure that accounts for the population's continued rise and, indeed, its acceleration, it is the still high national average fertility rate per woman, which remains at the level of 6.

This high rate has not changed much despite the rise in basic education enrollment rates which is thought in other countries to lower fertility. Gross enrollment

Table 1 Demographic and social trends in Nigeria, 1960–2015

	1960	1970	1980	1990	2000	2005	2010	2015*
Population, total	45,211,614	56,131,845	73,698,099	95,617,350	122,876,727	139,585,891	159,707,780	182,202,000
Population growth (annual %)	1.99	2.29	2.86	2.58	2.51	2.60	2.75	2.6
Life expectancy at birth, total (years)	37.18	41.18	45.55	46.11	46.62	48.66	51.29	
Fertility rate, total (births per woman)	6.35	6.47	6.78	6.49	6.10	6.02	6.02	
Mortality rate, under-5 (per 1000 live births)		287	217.8	213.2	187.7	158.9	131.1	108.8
School enrollment, primary, primary (% gross)		40.8	94.6	86.3	98.4	100.9	84.8	
School enrollment, secondary (% gross)		4.4	13.6	24.6	24.5	34.7	43.8	

Source: World Bank, *World Development Indicators*, Washington, DC: World Bank Group (various years)
See http://databank.worldbank.org/data//reports.aspx?source=2&country=NGA&series=&period=#, except for 2015*, which is from the latest UN World Population Prospects, 2015 (see United Nations 2015)

rates at primary level have risen dramatically over the past 50 years and there have been gains at secondary level as well, as shown in Table 1. However, these quantitative gains likely mask deficiencies in quality which result in high dropouts and a failure to gain cognitive skills. These concerns are especially salient for girls.

Nigeria's population will continue to rise even as fertility starts to decline. By 2025, the UN expects there to be 233.6 billion Nigerians and by 2050, as mentioned, there will be almost 400 billion (United Nations 2015).

While the absolute numbers of the population will continue to grow, Nigeria's fertility rate began to decline in the 2000s. This means it is poised to reap a potential demographic dividend. What are the prospects that it will do so?

3 Nigeria's Demographic Dividend[1]

A country's population level depends on its fertility and mortality rates. Most developing countries experienced high population growth rates in the 1960s–1990s due to dramatic declines in mortality, especially among infants and children, as public health improved. Population growth began to stabilize when fertility also fell. The population age structure began to look less like a pyramid where there are many very young children and progressively fewer older cohorts. Instead, a "youth bulge" began to appear as the number of infants declined while the youth began to age – entering working age and eventually older ages.

A country can reap a demographic dividend if the size of its working age population increases while the number outside that range declines due to sustained lower fertility. A workforce with fewer dependents relative to the working age population has the potential to boost economic growth. The East Asian 'economic tigers' – economies like Hong Kong, Korea, Singapore, and Taiwan – may owe up to a quarter or even a third of their economic growth to this phenomenon (Bloom et al. 2003). Similarly, a significant portion of Ireland's growth can be attributed to the legalization of contraception (Bloom et al. 2003). Is such a demographic dividend possible for Nigeria? Recent work (Bloom et al. 2010) suggests that it is – and that, with the right policies, it can be substantial.

Up until recently, despite acceleration in the rate of GDP growth, real GDP growth per capita had languished for many decades. Part of the drag on Nigeria's economy has been its demographic structure with higher dependency. Nigeria's fertility rate, even though lower than in previous years, is higher than that of sub-Saharan Africa as a whole and more than twice the world average. These high fertility rates, in combination with the welcome decline in mortality, have resulted in what demographers and economists call a high "dependency rate" (or the inverse of the "support ratio"). The large numbers of young children who are too young to work, along with older people above 65, have to be provided and cared for, resulting in a smaller share of working-age people compared to other countries.

[1] This section draws heavily from World Economic Forum 2014.

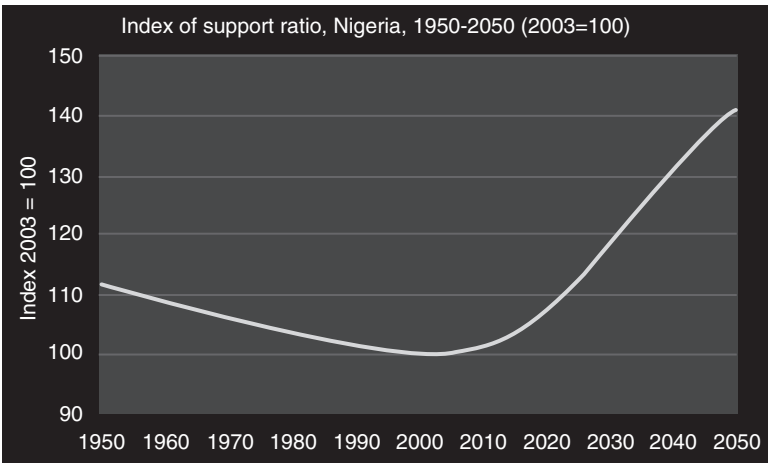

Fig. 1 Nigeria's support ratio 1950–2050 (Source: Bloom et al. 2010)

The economic support ratio for Nigeria is displayed in Fig. 1. Starting from 1950, the support ratio declined as a result of high fertility. After 2003, the ratio increased steeply as birth rates declined and the share of the working-age population rose. Assuming a continued reduction in fertility (average child per woman), the share of the working age people in the population should rise significantly by 2050. The ratio of working-age to non-working-age population will rise to about 2 by 2050. While this may seem over-optimistic, we are conservative in assuming a starting point for TFR of over 6. *If employed productively*, the working-age group can cause Nigeria to reap a first demographic dividend.

How much would this dividend be in the future? Specifically, by how much would Nigeria's economic growth be expected to increase if this dividend were to be realized?

A recent study World Economic Forum (2014) has done this exercise and gives a rough order of magnitude of the size of the effect. Before reporting the results, it is important to outline the assumptions behind the model. The model used to project economic growth is based on a 5-year panel data set for 88 countries from 1965–2005. A variety of factors are taken into account – aside from demographic variables, there are variables to describe a country's geography, its human capital (including life expectancy), its policy towards openness, and the quality of its institutions. This model is then used to project growth for Nigeria under different economic, demographic, and institutional scenarios; that is, what would Nigeria's growth be if it were to follow international trends?

The so-called "business as usual" scenario is revealing. This scenario assumes that Nigeria's average annual GDP per capita growth will be 4.02% from 2010 to 2030, or roughly the growth that Nigeria enjoyed recently from 2000 to 2008. While this is probably an over-optimistic scenario since Nigeria's recent growth is much

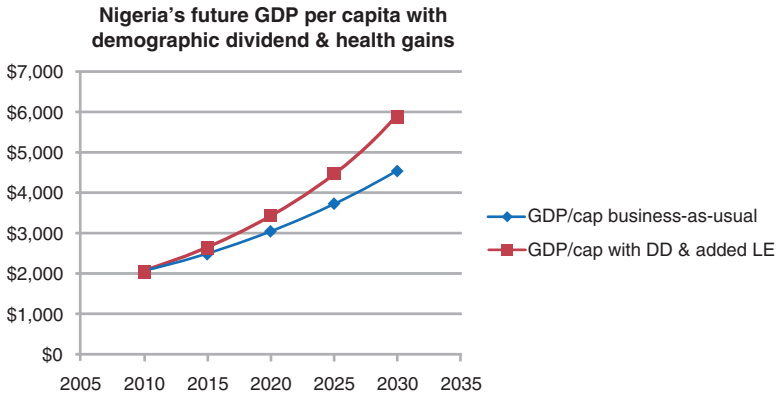

Fig. 2 Nigeria's GDP growth including a demographic dividend (Source: World Economic Forum 2014)

higher than its growth since the 1980s (which is negligible) and given the recent drop in oil prices, it is illustrative. The results are shown in Fig. 2.

Nigeria's GDP per capita would be almost 12% higher by 2020 and as much as 29% higher by 2030, simply as a result of demographic change and expected life expectancy increases. This means that "*the economy in 2030 could be more than 3 times larger than today with the demographic dividend and life expectancy increases, compared to around 2 times larger than today under the default growth scenario*" (Bloom et al. 2010).

The article also points out, however, that this dividend is not automatic. When some Latin American countries underwent a demographic transition, the growth dividend was nowhere near the one experienced by East Asian countries because the labor force was not employed as productively. In Nigeria, new jobs would have to be created for this labor force. And institutional capacity would have to be built to develop services, including the safeguarding and building up of human capital. We will return to this later.

3.1 Diversity

The Federal Republic of Nigeria is governed through three-tiers of Government, i.e., the central Federal Government, 36 States divided into six geopolitical zones, and 774 Local Government Areas and the Federal Capital Territory. How would the demographic dividend projected for all of Nigeria hold true for these various regions given that the age structures for these different regions vary so dramatically?

In order to further understand the dynamics of population growth across the various sub-national units, the World Economic Forum's Global Agenda Council (GAC)

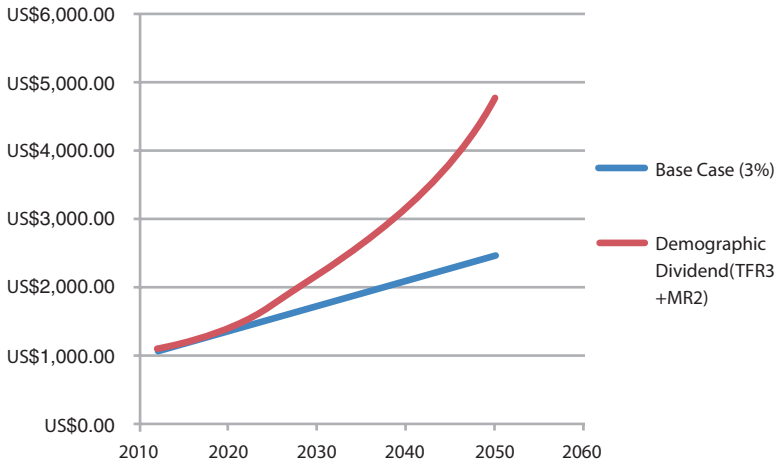

Fig. 3 North East

on Population Growth (now renamed to be the GAC on the Demographic Dividend) obtained estimates by States from the National Bureau of Statistics population and compiled them to geo-political regional units. They then applied known fertility and mortality estimates for 2012 and projected changes in population structures in the six geopolitical zones over the period to 2030 and until 2050. Using an established theoretical model, the WEF's GAC determined additional economic growth for each of the zones, based on projected demographic change and increasing life expectancy, and arrived at per capita income projections.

Population trends vary drastically across Nigeria's regions. The three Southern regions have much lower fertility rates (4.2–4.4 children per woman over her life-time) than the three Northern regions (5.4–7.2 over a woman's life-time). Life expectancy is almost 15 years more in South West relative to North East. These initial conditions will generate vastly different demographic projections and thus estimates as to the dividend.

The WEF's GAC case study assumed a base case rate of 3% growth. Figures 3, 4, 5, 6, 7 and 8 show what would happen to growth if there was rising per capita income but no demographic change and fertility change. This is given just as a reference point since the assumption obviously has no basis in reality. This reference point can then be compared to what would happen if fertility rates would continue to decline smoothly by 1.5 children through 2030 (TFR3), and mortality would be reduced as that for Nigeria as a whole (see Appendix table). In such a setting, the economies in the three Northern zones (Figs. 3, 4 and 5) would be 100–115% greater in 2030 than they are today. If, on the other hand, fertility rates do not change from what they are today, the economies would only be 69–76% greater in 2030 than they are at present.

The importance of a sustained and faster lowering of fertility levels is also evident for the South, which is already benefitting from the demographic "window of

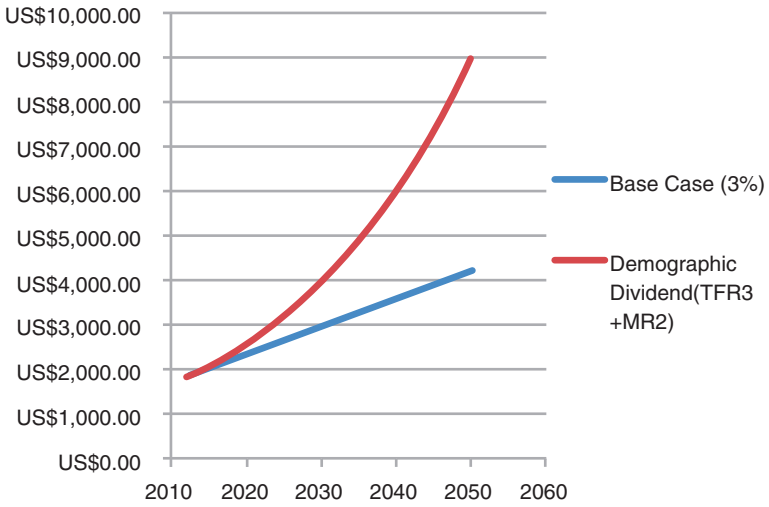

Fig. 4 North Central

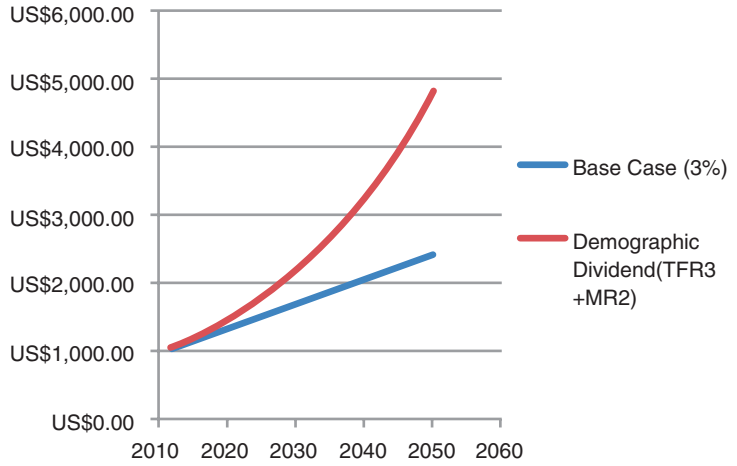

Fig. 5 North West

opportunity". This means that its dividend will be lower than that of the North. With a faster decline in fertility, the economies would be 75–82% larger in 2030 than they are today, assuming there is no further change – but if fertility does not decline, the economies would only be 45–48% greater in 2030 than they are today because of the aging of the population.[2]

[2] Note that per capita income initially does not grow as fast as the base case (no further declines in fertility) in the Southern regions because there are already large numbers of working aged people there. However, continuing declines in fertility will eventually accelerate growth as the depen-

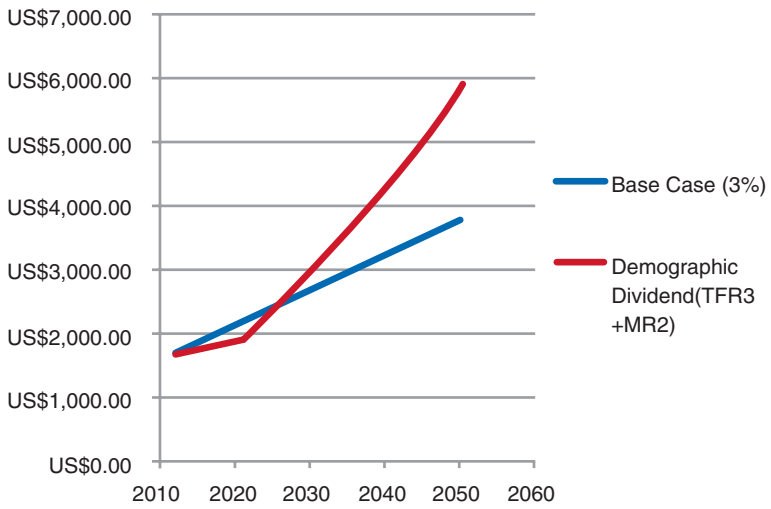

Fig. 6 South East

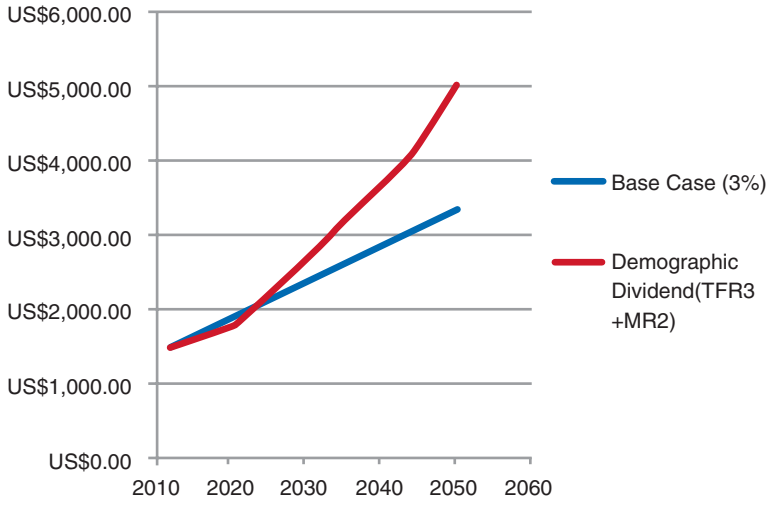

Fig. 7 South West

In either case, the demographic dividend for the Southern zones would be way smaller than for the Northern zones. The increase in the economies is significantly higher if fertility continues to decline by 1.0 from 2030 to 2050 in both North and South, but also much higher in the North.

dency ratio declines. In the North, with a relatively smaller working age population to start with, the dividend comes earlier.

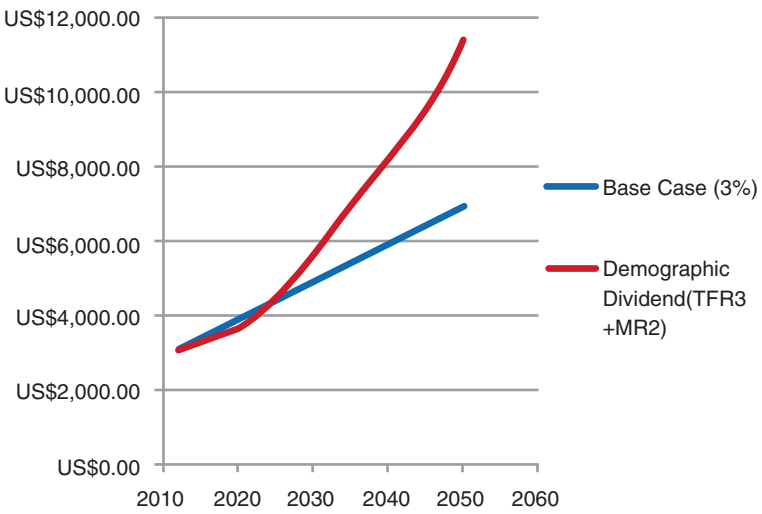

Fig. 8 South South (Source: World Economic Forum 2014)

3.2 Summary of Four Key Results

From this exercise, the WEF GAC's (World Economic Forum 2014) summarized four key lessons, as follows:

1. *There is a demographic dividend in Nigeria's future*. Clearly there are good prospects for Nigeria's demographic dividend, starting from the mid 2020s until 2050.
2. *The dividend is not automatic*. In order to reap the dividend, Nigeria will need to accelerate progress in both fertility and mortality reduction through quality reproductive health services and commodities, enhanced access and quality of education for its boys and girls, and encouraging women's participation in the labor market while enacting policies to enable meaningful job creation for its youth. Both the public and private sectors need to anticipate this and work together to create employment opportunities, as we discuss in further detail below.
3. *The timing of Nigeria's demographic dividend varies by geopolitical zones.* Clearly the Southern geopolitical zones (SS, SW and SE) are already undergoing a demographic transition, with slower population growth and favorable age structures, and thus less dependency and consequent higher per capita incomes. The Northern geopolitical zones (NW, NE, and NC) have more rapid growth and youthful age structures, with higher dependency and lower per capita income. This de-coupling of the timing of Nigeria's demographic dividend is worth noting for its policy implications, to ensure more equitable national development into the future.

4. *The magnitude of the demographic dividend also varies by geopolitical zones*. It appears from our analysis that the Northern geopolitical zones have the most to gain from the upcoming demographic dividend in terms of percentage increase in per capita income, even though all regions of the country stand to gain from the demographic dividend. The Northern geopolitical zones, which have seen the highest dependency ratios and low per capita income growth, are likely to have the most to gain from any future demographic dividend.

Finally, we note that the window of opportunity will not last forever. As many OECD countries have found out, an aging population can be a demographic burden as the dependency rates rise again. This would be even more of a challenge for countries that have not reaped the first demographic dividend and managed to get old before they got rich. Hence, for countries like Nigeria, countries need to ask if anything can be done to help them take advantage of the demographic window of opportunity.

4 Seizing the Dividend During the Window of Opportunity: A Policy Agenda for Nigeria

There is no one magic bullet for policy reform to seize the dividend. Instead, there several measures need to be taken and the doses vary by country condition, as presented in a recent World Bank review of the prospects for a demographic dividend in sub-Saharan Africa (Canning et al. 2014). But that report also usefully outlined three broad policy themes that apply for the majority of countries in the region, including Nigeria. The categories into which policy options fit are those which are meant to:

- Accelerate fertility decline to maximize the duration of the demographic window of opportunity;
- Reap the "first" economic dividend through policies that develop human capital and deploy it productively; and
- Reap the "second" economic dividend through policy and institutions for domestic saving and investment.

4.1 Accelerating Fertility Decline

As noted in the previous section, Nigeria is far from being a leader among countries in the region in making progress towards a demographic transition because of its relatively high fertility rate. The total fertility rate (TFR) for the country as a whole is above the average. Even more alarmingly, the TFR in the rural areas and in the Northern areas at over 6 is as high as some of the highest among countries in the region.

Lowering fertility for the country depends on choices and actions by individuals and families. These choices are, in turn, conditioned by social norms, some of which lead to differing views between genders – women's desired fertility is generally lower than that of men (Canning et al. 2014: 19). But these views can be heavily influenced by public policy, which can affect demand for fertility, and access to the family planning services, which allow individuals to act on their choices. This chapter argues that there are human development policies which are useful in their own right, and also often lead families to make choices which will induce fertility decline. Two primary examples are policies to reduce infant mortality and improve education.

4.1.1 Reducing Infant Mortality

Research has shown that a key driver of desired fertility is child morbidity and mortality. Fertility transition typically comes after mortality transition – the incentive to have another child declines if the probability that those already born will survive increases. Data shows that each child death is correlated with about one additional birth (Canning et al. 2014: 15).

Reducing infant mortality is a worthwhile goal in itself. If it leads to lowering the number of children per household, there are additional benefits as households, especially the poor, have more resources to invest in human capital. Women are also more likely to enter the labor force, leading to more income-earning opportunities.

While there has been recent progress, Nigeria, along with several other countries, has still very high under-five mortality rates in 2013 of around 100–167 per thousand in urban and rural areas, respectively, according to the DHS, which puts it in the top quintile of all countries. These figures help to explain why these same countries are also in the highest quintile in terms of fertility rates. One important way for Nigeria to lower fertility is to lower its infant mortality rate.

Accelerating progress in reducing infant mortality rate will require an improvement in the quality of maternal and newborn care, sustained improvement in immunization rates across all regions, enhancing breastfeeding and childhood feeding practices, and wider access to quality and effective treatment of basic ailments such as diarrheal diseases, malaria, and pneumonia. The Presidential Initiative for Saving One Million Lives through better access to quality preventive and curative care for basic ailments will need to be strengthened and sustained.

4.1.2 Addressing Malnutrition Amongst Children

Malnutrition afflicts almost 40% of Nigeria's children under-5 years of age. In addition to its effect on morbidity and mortality, childhood malnutrition particularly in the first 1000 days of life results in a significant cognitive deficit at the individual level and in the performance of children in school. It is estimated that addressing the effects of malnutrition could increase national GDP growth (Smith and Haddad

2014). Nigeria will need to aggressively reduce the prevalence of childhood malnutrition to preserve its pool of human capital.

4.1.3 Increasing Education for Girls

Another empirical regularity is that fertility rates fall drastically for women who are more educated. For example, for women with no education in Nigeria, the total fertility rate is 6.9 children per woman; but for women with 12 years of schooling (i.e., who have completed high school), it is only 3.1 children per woman according to the 2013 Nigeria Demographic and Health Survey or NDHS (National Population Commission and ICF International 2014).

Research has shown that this regularity is not just a correlation but causal. Natural experiments in Ethiopia and Kenya found that education reform, which led to a significant increase in female education levels, reduced fertility (Canning et al. 2014: 17). These reforms also led to increased human capital, which had growth effects.

Nigeria has been able to make some progress in female education levels. A study found that raising female education by a year as a result of an education reform reduced early fertility by 0.26 births (Osili and Long 2008). But there is much more to be done. Female enrollment rates at secondary levels lag behind those of boys by 14.7%, according to the 2013 NDHS.

4.1.4 Providing Access to Family Planning Services

For those women who would like to plan the number of their children, it is important to have access to the appropriate services in order to control the proximate determinants of fertility – post-partum inability to become pregnant due to extended breastfeeding; delayed age of marriage or abstinence from sexual activity; the use of contraception; and abortion.

Nigeria's population policy has incorporated aspects of all of these, but has not been well implemented. The National Population Policy (2006) was built on certain key principles: that Nigeria's population is its greatest asset; that the Government is committed to pursuing appropriate policies to ensure the sustainable development of its population; that every Nigerian has a right to attain the highest level of health; that the family is the basic unit of society; that the well-being of the child is its highest priority; that government recognizes and will provide for the needs of young people to equip them to be future leaders; that everyone has a right to information and education; that government will pursue gender equality, equity, and empowerment; and that the needs of vulnerable members of society will be attended to.

In 2008, the institutional arrangements for the implementation of the policy described above comprised a National Council on Population Management to be chaired by the President, a Population Advisory Group, and a Population Technical Working Group. A costed Strategic Plan was approved in 2008 and a multi-sector,

multi-tiered approach to its implementation was adopted. Unfortunately, that policy and its strategic plan have not been implemented.

Consequently, Nigeria's women and children still have a high burden of preventable morbidity, maternal mortality, early marriage, and adolescent pregnancy with the resulting complications, and a persistently high unmet need for contraception among women in all States and across all geopolitical zones, ethnic, and religious groupings.

Policymakers as well as private sector and civil society leaders must have an interest in harnessing the prospects for a demographic dividend in Nigeria. The dividend is a one-time opportunity that will not last indefinitely. Although disconnected from the more immediate political cycles, it has long term implications for national development which leaders have a responsibility to harness; otherwise, the dividend could turn into a disaster.

4.2 Reaping the First Economic Dividend

Once a demographic transition is initiated, further actions need to be taken in order to reap a dividend. The surge of working-age individuals needs to be deployed productively – there must be income-earning opportunities for them and they must have the human capital to take advantage of those opportunities. Both are challenges for Nigeria and its States.

4.2.1 Creating Income-Earning Opportunities

The ratio of working-age to the dependent population will produce returns sustainable only if the former are productively employed, working for others or for themselves. East Asia's economies have focused on export-led growth to drive the demand for productive employment. In this regard, Nigeria, as a dominant regional economy, has much to offer the rest of the region and even the world. It is already a leading exporter of oil and other natural resources. But as a sizeable economy in its own right, it can also generate employment in sectors that cater to a growing consumer base.

Nigeria's economy creates a lot of jobs. According to figures from the National Bureau of Statistics (NBS), over a million jobs were created in 2013, over a third of which were in the formal (private) sector – compared to almost a tenth in the public sector. Slightly more than half were created in the informal sector (NBS, Personal communication and World Bank 2014a).

Despite these numbers, and a more upbeat prognosis (at that time) due to higher oil revenues, the World Bank's recent *Nigeria Economic Report* concluded that "*the scarcity of jobs is economic problem number one in Nigeria*" (World Bank 2014a). The problem is not so much an extremely high unemployment rate at the national level. In fact, the unemployment rate in Nigeria is likely to be less than 10% by the

usual ILO definition.[3] The concerns stem from a number of factors. Firstly, the high proportion working in the informal sector are in low-productivity jobs – their problem is not that they cannot find work; they are working too much with very little to show for it.

Secondly, there is a vast geographical disparity in employment opportunities. High-productivity jobs are scarcest in rural areas and in the Northern states (World Bank 2014a).

Thirdly, there is a generational issue. The lack of opportunities for the Nigerian youth is particularly challenging. They have the highest unemployment rates and the lowest wages, which may be expected since they lack experience. Their ability to progress up the economic ladder is stymied and has led to disillusionment. While there is no hard evidence, many commentators and opinion-makers have cited this feeling of exclusion as a reason why youth are attracted to groups who want to disrupt the economic and social fabric of the country.

The policy agenda to address these issues is vast and well beyond the scope of this chapter. But in any agenda, raising the productivity of the agricultural sector is the top priority. This sector still accounts for over 70% of the labor force (African Development Bank 2014). It employs the bulk of young people. But because most of these workers are in the informal sector, they do not earn very much, which is leading to increasing pressure for migration. Adding value to agricultural trade in particular would provide a much-needed boost to the economy and to income-earning opportunities for the youth.

A recent World Bank report (World Bank and Agence française de dévelopement 2014) found that agriculture did not make the list of the most desired job destination for African youth (even though it was not the least desired). But it also pointed to various pathways that could hold promise for youth in the sector, whether they are full time employees in household enterprises or new farm starts, part-time farmers, or rural non-farm wage workers. Policies will need, however, to address constraints in access to finance and land which have made agriculture unattractive to the young. Targeted credit for young people and transparent land registration are only two examples of policies, which might be followed in many countries including Nigeria.

Even as Nigeria focuses on agriculture, it must also look to other important sources of employment opportunities, especially for the young. Many young people are also in household enterprises, a trend that is expected to persist according to a recent World Bank report. These enterprises start tiny and, more often than not, stay that way and disappear. But they can potentially be a pathway for young people to begin productive lives, and, though many should inevitably come and go, promising ones can be supported by the government, instead of being ignored, or, in the case of hawkers and vendors, seen as a nuisance to be eliminated. Providing these enterprises with legal protection, access to basic urban services, and some credit and financial services would be a start.

[3] The NBS has currently suspended publishing official unemployment statistics while reviewing its methodology.

Finally, there is a need to make sure that for young people, the inevitable transition to urban wage jobs is as smooth as possible. This requires skill building in an efficient way as we discuss next.

4.2.2 Creating Skills

In order for Nigeria's young workers to be able to take advantage of any income earning opportunities and thus be the impetus for growth during a demographic transition when there are more of them than other age cohorts, they must have the human capital to do so. This is a daunting challenge for the government because of the poor track record to date.

Nigeria's youth are entering working age ill-prepared in terms of basic skills. According to UNESCO's Global Monitoring Report, Nigeria "*has some of the worst education indicators globally*" (UNESCO 2012). Net enrollment rates at primary levels actually declined from 61 to 58% between 1999 and 2010, while Africa region's average rose from 58 to 76%. And while there are no nationwide indicators of quality (an indictment in its own right), individual studies indicate that those that do go to school are not learning what they should. Among young men and women aged 15–25 who finished at least 6 years of basic education, about a third are illiterate and almost half were semi-literate. Perhaps not surprisingly then, there were 24 million more illiterate adults in Nigeria according to the latest data than there were in 1994 (UNESCO 2012).

Sad as they are at a national level, the statistics are worse for rural as opposed to urban areas, and Northern as opposed to the Southern states, which contain the poorest households and have the highest fertility rates. The country will not reap much of a dividend from a demographic transition unless government's efforts to reform the basic education system, especially in lagging areas, succeed. This is not an easy challenge because of low capacity and poor governance in these areas, as was shown in an evaluation of an effort, supported by the World Bank, to improve education in the Northern states (World Bank 2014b). This evaluation found that in these settings, expanding school places was not enough – it was important to ensure proper coordination across levels of government and adequate attention to software such as teacher training and incentives.

Nigeria also has more young people in secondary and technical education than ever before. Here, too, quality needs to be stressed even as quantity expands. These programs require improved pedagogy, a curriculum that also enhances non-cognitive outcomes to prepare youth for work, and for those who have been out-of-school for some time, second-chance programs to allow drop-outs to recover (World Bank and Agence française de dévelopement 2014).

These efforts from early child schooling to work-related training need to be seen as part of an overall strategy to enhance learning. They need to be coordinated so that they complement each other across all tiers of government.

4.3 Reaping the Second Demographic Dividend

A second dividend can arise because the working age cohort tends to save more per person than those in other parts of the population. These savings can be used to finance much needed investments to fuel more growth, on top of those generated by having more workers.

Savings behavior will be affected by the financial inclusion strategy that Nigeria has formulated and is beginning to implement. Recent reports indicate that this strategy is paying off. Between 2008 and 2012, the number of financially excluded adults fell by some ten million, which can only enhance African's second largest banking industry. Financial literacy is improving (CGAP 2013).

Despite this progress, 40% of the adult population lacks access to financial services – and this is higher in rural areas. Efforts to enhance consumer protection and financial literacy, as well as a sound regulatory environment for formal sector banks, need to proceed as planned.

5 Concluding Remarks

Nigeria's demographic structure will affect its long-term growth. If the demographic transition can be brought about faster, especially in the Northern areas, it has the potential to reap a substantial economic dividend as a nation. This dividend will be more pronounced in the more fragile Northern regions.

But this dividend will not come automatically. It requires government action to accelerate the arrival of the dividend, to expand the income-earning opportunities of its working-age population through sound economic management and investments, and to build the skills of that population, especially its young workers, to enable them to take advantage of those opportunities. Financial inclusion can also help these workers save more and thus realize a second dividend for the country.

There is some urgency to do so because of the danger that as fertility declines, even if it does so slowly, this will start to age the population and close the demographic window of opportunity, before Nigeria has had a chance to reap the benefits.

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Appendix

Data Source for Figures

	TFR[a] in 2012	U5MR[b] in 2012	IMR[b] in 2012	LE[c] in 2012
North East	7.2	134	90	49.1
North Central	5.4	82	63	58.2
North West	7.0	132	75	49.8
South South	4.4	83	69	57.8
South East	4.4	93	78	56.1
South West	4.2	54	48	64.0

[a]TFR in 2012 is assumed to be equal with DHS 2013
[b]Combination of data in DHS 2008, DHS 2013 and "Nigeria_Demographic_Trends_12–5"
[c]Deduced from U5MR and IMR, please see the memo for details. Population and Income data Obtained from the National Bureau of Statistics, 2013

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The Second Biggest African Country Undergoing Rapid Change: Ethiopia

Assefa Hailemariam

1 Introduction

The Federal Democratic Republic of Ethiopia, with a total surface area of 1.1 million square kilometers and an estimated population of 99.4 million in 2015 (United Nations 2015), is the second most populous country in Africa. It is a landlocked country in the Horn of Africa, sharing borders with Eritrea and Djibouti to the North, Sudan and South Sudan to the West, Kenya to the South and Somalia to the East. Administratively, it is a federal democratic republic composed of nine national regional states and two chartered cities. Ethiopia is known as one of the oldest civilizations in history and home to one of the most ancient settlements of the human race dating back more than 3 million years (Hancock et al. 1983).

The country is recognized for its immense variety of ethnic, linguistic, and religious diversity, as the museum of people (Wagaw 1999). Today in Ethiopia, there are more than 85 different indigenous population groups (the largest being the Oromo, 34.6%, followed by the Amhara, 27.1% in 2007) with about 83 languages. Christianity and Islam are the two major religions. Christianity in Ethiopia constitutes 62.7% of total religious affiliation, with Ethiopian Orthodox Christianity making up 43.5%, Protestantism 18.5%, and Catholicism 0.7%. Islam meanwhile makes up 33.9%, while other religious groups altogether made up 3.4% as of 2007 (Office of the Population Census Commission 2009).

This chapter explores Ethiopia's population dynamics driven by the following questions:

1. What changes have taken place in the country's main demographic indicators during the past three decades? What are the drivers of these changes?

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2. What are the likely demographic developments and the opportunities for Ethiopia to reap the demographic dividend in the foreseeable future?

To begin, the chapter considers the availability of demographic data and examines trends in two major components of population dynamics, namely mortality and fertility. It highlights regional, rural-urban, and socio-economic differentials in mortality and fertility. It then examines the size, rate of growth, and structure of the Ethiopian population during the last three decades. The chapter also looks at trends in key factors – urbanization, education, and economic situation – that are likely to have contributed to the change in the size and composition of the population. This is followed by a discussion of the evolution of population policies. We then present population projections until 2050 and show the resulting age structure changes. In the last part of the chapter, we look at Ethiopia's opportunities for reaping a first demographic dividend. Time series data obtained from the United Nations World Population Prospects: The 2015 Revision were used, as well as data from the Ethiopian Demographic and Health Surveys, and finally data and reports from other governmental sources.

2 Availability of Demographic Data

Demographic data is of critical importance for development policy formulation and planning. In spite of this, until recently, many developing countries, particularly those in sub-Saharan Africa did not have a culture of collecting demographic data. Ethiopia is one of these countries.

Some of the reasons for the lack of demographic information in Ethiopia in the past were: (i) a lack of awareness regarding the use of demographic data in socio-economic planning, (ii) the inadequate transportation system and the difficult terrain that made most parts of the country difficult to access, and (iii) the lack of operational resources as well as technical and managerial skills in the design and execution of surveys (Hailemariam 1990). However, with the establishment in 1960 of the Central Statistical Office (CSO), now Central Statistical Agency (CSA), conditions improved gradually. Between 1964 and 1971, two rounds of multi-purpose national sample surveys – National Sample Survey First Round (NSS1) and National Sample Survey Second Round (NSS2) – were conducted. Between 1971 and 1980, CSO conducted two small-scale surveys, one in Addis Ababa and another in 17 major urban centers in 1978.

At the beginning of the 1980s, the demand for demographic information increased and CSO conceived a National Integrated Household Survey Program to collect demographic and socio-economic data on a continuous basis. Under this program, the Office carried out several demographic and socio-economic surveys and the first National Population and Housing Census was conducted in 1984. In 1990, the CSA (the former CSO) conducted the 1990 National Family and

Fertility Survey (NFFS), the first ever comprehensive survey that collected basic socio-economic and demographic data (Central Statistical Authority 1993). Since then, three rounds of censuses (1984, 1994, and 2007; see Office of the Population Census Commission 2009) and four rounds of demographic and health surveys (DHS 2000, 2005, 2011, and the 2014 Mini DHS) have been conducted (see Central Statistical Authority & ORC Macro 2001; Central Statistical Agency & ORC Macro 2006; Central Statistical Agency & ICF International 2012; and Central Statistical Agency & Ministry of Health 2014).

Despite the progress in the collection and use of demographic data, most of the surveys conducted in the 1980s and early 1990s were not complete in coverage. Regions where there was internal conflict as well as those settled by pastoralists were excluded. In addition, the data contained substantial errors of reporting and omissions. Thus, until the first DHS was conducted in 2000, the country did not have any nationally representative and internationally comparable demographic survey (Hailemariam et al. 2011). The DHS surveys are the most important sources of data for estimating fertility, infant, child, and maternal mortality as well as nuptiality. The range of information collected has now broadened in scope to include gender issues, HIV/AIDS, violence against women, etc.

Two important facts should, however, be highlighted in relation to these national survey programs. Firstly, data is provided at national or regional levels and cannot be disaggregated to lower levels such as zones or districts and, therefore, cannot be used for local planning. Secondly, these surveys provide little information regarding adult mortality.

3 Trends in Mortality and Fertility

3.1 Mortality Trends

Ethiopia has registered an unprecedented mortality decline, particularly in the second half of the twentieth century. Mortality indices such as infant and child mortality rates have been declining consistently (Fig. 1). The infant mortality rate (IMR) declined from 140 deaths per 1000 live births in 1980–85 to 114 in 1990–95, to 78 in 2000–05 and it further declined to 50 in 2010–15 (United Nations 2015). Similarly, mortality of children under the age of five (U5MR) has been declining considerably since the 1980s. It declined from about 237 deaths per 1000 live births in 1980–85 to 191 in 1990–95, to 123 in 2000–05 and to 74 in 2010–15. This is equivalent to a 56% reduction during the period 1990–2015 (Fig. 1). During the 25 years since 1990, Ethiopia has clearly registered rapid declines in both infant and child mortality (2.2% and 2.5% per year for IMR and U5MR, respectively) and has made significant progress towards achieving the UN's Millennium Development Goal 4 (MDG-4) target of reducing child mortality by two-thirds from 1990 to 2015.

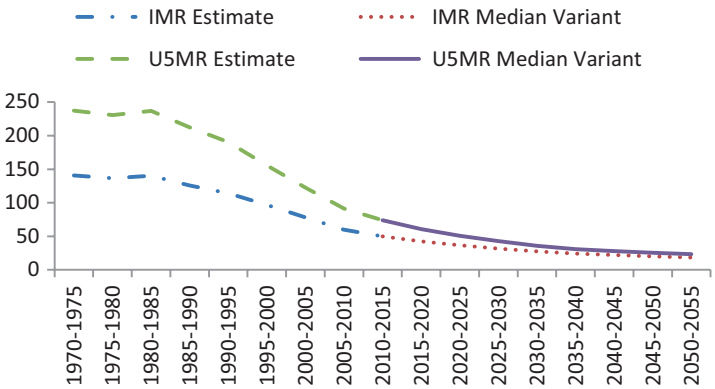

Fig. 1 Infant and under-five mortality rate per 1000 Births, 1970 – 2055 (Source: United Nations (2015). World population prospects: The 2015 revision)

Mortality has been declining in both urban and rural areas. However, urban mortality is much lower than rural mortality. For instance, in 2010 the IMR and U5MR were 59 and 88 per 1000 live births in urban Ethiopia, while these values were 76 and 114 per 1000 live births, respectively, in rural areas (Central Statistical Agency & ICF International 2012). There is also considerable difference in infant and under-five mortality by region. Benshangul-Gumuz has the highest infant and under-five mortality rates (101 and 169 per 1000 live births), while Addis Ababa has the lowest IMR and U5MR (40/1000 and 53/1000, respectively). Infant mortality rates ranged between 71 and 78 per 1000 live births in Somali, Oromia, Amhara, Gambela, and SNNPR regions, whereas in Harari, Dire Dawa, Afar, and Tigray, it ranged between 53 and 64 per 1000 live births (Central Statistical Agency & ICF International 2012).

Ethiopia has also registered significant increases in life expectancy. Life expectancy at birth increased from about 44.3 years for both sexes (45.8 years for females and 42.8 for male) during 1975–80 to 63.1 for both sexes (61.3 for males and 65.0 for females) in 2015 (United Nations 2015).

Improvement in public health measures such as malaria control efforts, access to safe drinking water, improved toilet facilities, and vaccination against infant and childhood diseases as well as improvements in health service coverage are the factors behind the decline. The decline in infant and under-five mortality triggered a decline in fertility, which is explained in the next section.

3.2 Fertility Trends

The main feature of fertility in Ethiopia is that it has been at a high level. During the 1980s and 1990s, a woman in Ethiopia gave birth to about 7 children on average. However, starting from the mid-1990s, fertility began to decline. It declined from 6.6 children per women in 1990 to 4.1 in 2014 (Fig. 2).

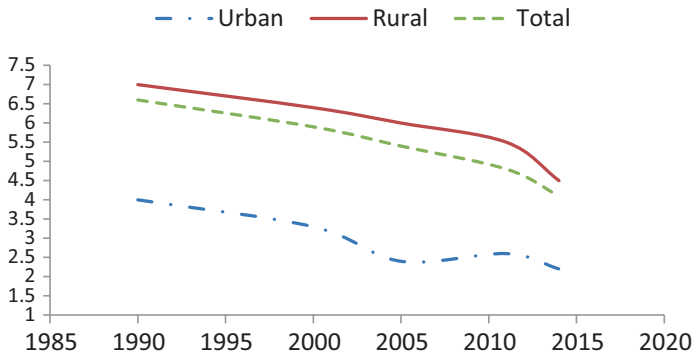

Fig. 2 Total fertility rate by place of residence: 1990, 2000, 2005, 2011, and 2014 (Sources: CSA (1993), CSA and ORC Macro (2001, 2006), CSA and ICF International (2012), CSA & Ministry of Health (2014))

Table 1 Total fertility rate in Ethiopia and in sub-Saharan Africa, 1995–2014

	Total fertility		% change	
Period	Ethiopia	SSA	Ethiopia	SSA
1995–2000	5.9	5.9	−7.8	−4.3
2000–2005	5.4	5.7	−8.5	−3.8
2005–2010	4.8	5.4	−11.1	−4.9
2010–2014	4.1	5.1	−14.6	−5.7

Sources: CSA (1993), CSA and ORC Macro (2001, 2006), CSA and ICF International (2012), United Nations (2015)

The total fertility rate (TFR) in Ethiopia showed a faster rate of decline than the decline observed in other sub-Saharan countries. Between 1995 and 2000, the TFR in Ethiopia was the same as that of the sub-Saharan average. But between 2000 and 2014, it was much lower than the sub-Saharan average and in percentage the decline is more than twice larger in Ethiopia (Table 1).

Ethiopia is considered to be in the second stage of the fertility transition. However, there are significant fertility differentials by region, place of residence, educational attainment, and household wealth status. Among the regions of the country, the Somali Region has the highest TFR (7.3 children per woman), Afar, the second (TFR = 5.7), and Benshangul-Gumuz, the third (TFR = 5.2). The Gambela, Tigray, and SNNPR regions come next with TFRs of 5.1, 4.8, and 4.4 children per woman, respectively, while Amhara and Oromia, the two largest regions had a TFR of 4.0 each, followed by Harari and Dire Dawa with TFR of 3.4 each.

Addis Ababa with a TFR of 1.7 children per woman had the lowest TFR and below replacement level fertility (Central Statistical Agency & Ministry of Health 2014). Urban fertility is less than half that of rural (TFR of 2.2 vs. 4.5). The level of fertility is inversely related to women's educational attainment, decreasing from 5.1 children among women with no education to 1.7–1.9 children among those with secondary or higher education. Fertility is also strongly associated with household

wealth, decreasing from a TFR of 5.6 among women in the lowest wealth quintile to a TFR of 2.4 for those in households with highest wealth quintile (Central Statistical Agency & Ministry of Health 2014).

The main drivers for fertility decline in Ethiopia are: changing norms, values, and attitudes regarding the desired number of children as a result of the decline in infant and under-five mortality; increasing female participation in primary education, and increased contraceptive use among currently married women.

In 1990, the contraceptive prevalence rate (CPR) was only 3.9% of all women of childbearing age (4.8% of currently married) (Central Statistical Authority 1993). It increased to about 6% among all women (8% of currently married) in 2000, to about 10% of all women (14% of currently married) in 2005, and to 19% of all women (27% of currently married) in 2011. In 2014, it further increased to 30% of all women of childbearing age (40% of currently married).

The increase in contraceptive prevalence is directly related to the increase in the number of facilities providing family planning services and the diversification of approaches in providing services. During the early 1990s, there was no government health facility providing family planning services in the country. With regard to NGOs, there was only one NGO, the Family Guidance Association of Ethiopia (FGAE), an IPPF affiliate and pioneer of family planning in Ethiopia that was providing family planning services in the country (but in only one clinic in Addis Ababa). Since the early 1990s, however, all government health service delivery facilities began providing family planning services. Moreover, the number of local and international NGOs providing family planning services or supporting such efforts increased considerably (Hailemariam et al. 2011).

Different strategies such as community based reproductive health services, social marketing, mobile clinics, and social franchising were introduced as means of increasing knowledge of and access to family planning and other reproductive health services to underserved communities and rural areas. The introduction of the Health Extension Package[1] (HEP) has further contributed to increase knowledge about and use of family planning services in the country (see also Teller and Hailemariam 2011).

4 Population Size and Growth

Ethiopia had a population of 35.2 million in 1980, which increased to 48.1 million in 1990. In 2000, Ethiopia's population was estimated to be 66.4 million and in 2015, it increased to 99.4 million (United Nations 2015). Thus, Ethiopia's population has more than doubled in just a quarter of a century, from 48.1 million in 1990 to 99.4 million in 2015 (Fig. 3).

[1] An innovative community based program introduced in 2003 with the aim of creating healthy environment and healthy living by making available essential health services at the grassroots level.

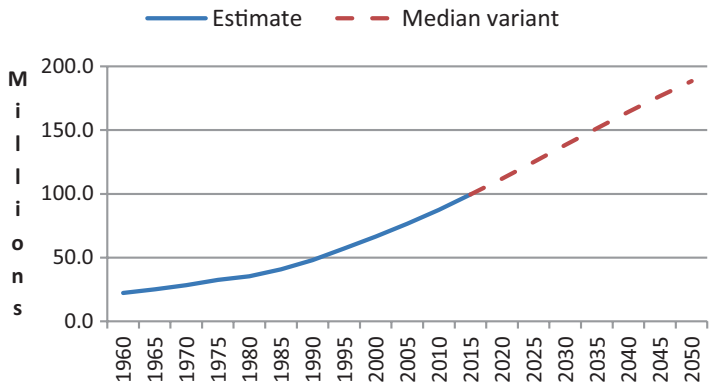

Fig. 3 Size of Ethiopia's population (millions), 1960–2050 (Source: United Nations (2015). World population prospects: The 2015 revision)

The rate of growth of the population was 2.9% during the period 1980–85, which declined to 2.5% in 2010–15 (United Nations 2015). At this rate of growth, the population may double in about 28 years and reach 200 million in 2043.

Ethiopia's population has been growing due to natural increase, that is, the difference between the birth and death rates. Due to relatively low fertility and high mortality owing to disease and famine, population grew at a lower rate before the 1980s. Subsequently, continued decline in disease-related mortality (malaria, smallpox, etc.) as well as increasing fertility due to reduced incidence of STIs, reduced adult mortality leading to longer life in union, and little to no fertility control resulted in rapid population growth in the late 1980s and 1990s. Since then, however, both mortality and fertility have been declining and the rate of population growth has also declined.

5 Drivers of Change in Population Dynamics

5.1 Urbanization and Urban-Rural Disparities

Ethiopia is one of the least urbanized countries of sub-Saharan Africa. In 1980, 10.4% of the country's population was urban compared to 14.5% for Eastern Africa and 26.7% for Africa as a whole. By 2010, the proportion of the urban population reached 17.3%, 23.5%, and 38.3% for Ethiopia, Eastern Africa and Africa, respectively. In 2015, 19.5% of Ethiopia's population lived in urban areas compared to 25.6% for Eastern Africa and 40.4% for Africa (United Nations 2014).

Regarding the rate of urban growth, the average annual rate of growth of the urban population was as low as 3.5% in the 1970s, mainly due to the Military Government's policy, which restricted rural-urban migration. As urban fertility is much lower than rural fertility, the growth in urban population is mainly the result

of rural-urban migration. In recent years, however, due to the relaxation of the restriction on rural to urban migration and the shrinking size of farmland in rural areas as a result of high fertility, large numbers of youths have migrated to urban areas seeking employment opportunities. Consequently, the rate of urban growth increased in the 1990s to 4.2% annually and in 2000, it further increased to 4.6%. Since then, Ethiopia sustained a higher rate of growth of its urban population.

The number of urban localities with a population of 2000 or more was 312 in 1984 but increased to 530 in 1994 and to 812 in 2007. However, urban centers in Ethiopia are characterized by small size settlements and the dominance of a single primate city, Addis Ababa, the national capital. In 2007, for instance, there were only 11 urban centers with a population greater than 100,000 and one of these was Addis Ababa, accounting for more than a fifth of the total urban population.

There are considerable urban-rural demographic and socio-economic disparities. Literacy is much higher among the urban population. While three-quarters (75.1%) of urban females had at least some primary education or above, more than half (52.8%) of the rural female population have no education. It appears that females living in urban areas are one and a half times more likely as those in rural areas to be literate or attend school. There is also a marked difference between male education levels in urban and rural areas. In urban areas, 13.3% of the male population had no education in 2014, whereas in rural areas the figure was 40.7%. In general, educational attainment is much higher among the urban population than among the rural population.

The disparity between urban and rural areas in terms of income also shows that per capita income is considerably higher in urban compared to rural areas. The ratio of urban income to rural income – a measure of the disparity in urban and rural incomes – was 19.1 in 1981 and it declined to 5.4 in 2011. This, however, does not mean that the gap between rural and urban income has narrowed, but rather indicates the sharp fall in the average real income per capita in urban areas compared to rural areas in recent years (Belachew 2014).

On the whole, however, urban areas are relatively more developed compared to rural areas with better access to education, health facilities, media access, and other social and economic amenities. This explains the significant differences in mortality and fertility between urban and rural areas.

5.2 Education

Ethiopia has made remarkable progress in expanding access to education at all levels. Between 1980 and 2014, enrollment at all levels increased considerably. Net primary enrollment increased from 30.4% to 95.1% during the period 1980 to 2014 (Ministry of Education 2015). Similarly, secondary education has increased, with greater numbers of students completing secondary education and continuing on to post-secondary level. Net secondary enrollment increased from around 12% in mid-1990 to 20% in 2014. Although still very low, tertiary enrollment has also increased

significantly during the period. It increased from less than 1% during the early 1980s to about 7.8% in 2014. Undergraduate enrollment increased from 34,000 in 2000/01 to more than 593,000 in 2013/14, an increase of 65.4% annually (Ministry of Education 2015).

There was significant gender gap in enrollment at all levels in pre-1990 Ethiopia. However, this is narrowing. Many children, especially girls from poor families and those living in rural or remote areas where there was no access to safe and nearby schools were not able to attend school in pre-1990 Ethiopia. However, because of the establishment of primary and secondary schools in every district, more and more girls have begun to attend school and the gender gap is narrowing. In tertiary education, however, many more men than women are benefiting from expanded access. In the 2013/14 academic year, only 30.3% of the undergraduate enrollment and 19.5% of graduate enrollment were female students (Ministry of Education 2015).

The Government has been taking measures to further reduce the gender gap in education by incorporating the issue of gender as one of the priority agenda in its policies and programs. The Education Sector Development Program III (ESDP III), a continuation of ESDP I and II, set out special steps and measures to reduce the gender gap in enrollment, academic performance, and successful graduation. Despite the progress achieved, however, the causal constraints for the prevailing gender gap in enrollment, academic performance, and graduation at different levels of the education system have not been identified. It is, therefore, necessary to closely monitor and assess the progressive measures taken by the Government, to realistically analyze the causal constraining factors and to explore possible options for reducing the current gender disparities.

5.3 The Economy

The Ethiopian economy is predominantly agricultural. Agriculture, which is the primary source of livelihood for the vast majority of the population, accounts for 41.5% of GDP, 80% of employment, and generates 70% by value of all exports. However, the sector largely depends on rains that are erratic and is also dominated by traditional farm technology. Moreover, it is affected by structural factors such as internal conflict, land degradation, low levels of household assets, and limited opportunities to diversify sources of income with the result that recurrent drought, food insecurity, and extreme poverty persisted in the country.

Since the 1980s, the country has been hit by a series of drought, food shortage, and famine. During 1983–85, it experienced the worst famine in its modern history that affected about 8 million Ethiopians. Famine vulnerability continued through the early 1990s owing to the civil war in the Northern regions and protracted drought in other regions of the country (von Braun and Olofinbiyi 2007). Another famine struck the country in 2002 that left about 6 million people in need of urgent food aid, and 15 million facing the threat of starvation (Salama and Matji 2013). These frequent famines and food shortages have long-term effects in that many of the poor

deplete their assets to deal with it and are left as even more vulnerable to poverty and crises. In 1995, more than 63% of the population lived in extreme poverty (less than $1.25 PPP a day; see United Nations 2016).

Nevertheless, Ethiopia has come a long way in reducing food insecurity and poverty through the implementation of wide–ranging and multi-faceted pro-poor programs. Poverty headcount declined from 45.5% in 1995/96 to 38.7% in 2004/05 but 5 years later this was reduced to 29.6% and in 2014–15, it further declined to 23.4% (Central Statistical Agency & World Food Programme 2014). The economy has also experienced strong and broad based growth throughout the past decade, averaging 10.8% per year, which is high compared to the regional average of 5.3%.

Agriculture and the service sectors account for most of the growth, while the performance of the industrial sector has been modest. Although agriculture, industry, and service sectors grew by 4.9%, 13.6%, and 11.1%, respectively, given the relative size of each sector, the expansion of the services and agricultural sectors explains most of the growth (57% and 26%, respectively), while the contribution of industry was relatively modest (16.7%) (see AfDB, OECD, & UNDP 2014).

In general, urbanization, education as well as the economy have all been making significant progress in the last two and half decades. Even if the level of urbanization is low by African standard, the speed of urbanization has been exceptionally high. Enrollment in primary, secondary, and tertiary education has increased considerably. Economically, the country has transformed from a centrally planned socialist economy closed to the outside world and overwhelmed by civil war, famine, low efficiency, and stagnation, to a democratic and market-based economy. It has made sustained economic progress and become one of the most dynamic and fastest-growing economies in sub-Saharan Africa.

6 Evolution of Population Policy

Prior to the 1990s, population policy was given a low priority mainly due to a lack of knowledge about the important role population variables play in the country's development process. The need for a national population policy gained recognition during the last few years of the Military Government in the late 1980s. This was partly due to the various international programs of action (the 1984 Kilimanjaro Program of Action, the 1984 Mexico City Population Conference, and the Dakar Ngor Declaration of 1992, among others) that the country had adopted. Another reason was the increasing prominence of local research findings that drew public attention to issues of resource imbalance, food insecurity, and population pressure (Hailemariam et al. 2011; see also Teller and Hailemariam 2011). Consequently, a population policy was drafted in 1988 that was never implemented and the Government was ousted in 1991. The Transitional Government that took power in 1991 realized the implications of rapid population growth on the country's development efforts, and thus formulated and adopted an explicit national population policy in 1993 (Transitional Government of Ethiopia 1993).

The general objectives of the population policy focused on closing the gap between high population growth and low economic productivity through planning a reduction of population growth and increasing economic returns; accelerating economic and social development processes; improving the carrying capacity of the environment; reducing rural-urban migration; and improving the social and economic status of vulnerable groups including children, women, and the elderly. More specifically, the population policy targeted reducing the total fertility rate from 7.7 children per woman in 1990 to 4.0 children per woman in 2015 and increasing the CPR from less than 5% in 1990 to 44% in 2015 (Transitional Government of Ethiopia 1993).

The major objectives of the National Population Policy are consistent with that of the Plan of Action of the 1994 International Conference on Population and Development (ICPD) as well as the major areas of the Millennium Development Goals (MDGs). While the overall pace of implementation is slow to date, considerable progress has been made towards achieving some of the objectives of the policy. For instance, the annual rate of population growth declined from 2.9 to 2.5%; the total fertility rate (TFR) decreased from 7.7 in 1990 to 4.1 in 2014; the CPR among currently married women increased from less than 5% in 1990 to 42% in 2014; the minimum age at marriage increased to 18 years; female enrollment in primary and secondary schools increased considerably; and infant and under-five mortality declined significantly. However, failure to institute the National Population Council, weak coordination and institutional arrangements, absence of clearly defined monitoring and evaluation strategy, lack of a comprehensive population program, and budgetary constraints are among the major challenges that hampered the effective implementation of the 1993 population policy.

7 Population Projections

Though fertility decline is in progress, the youthful age structure generated by past high fertility levels guarantees a continuing future increase in the population. The UN Population Division, using a medium fertility decline assumption, projects that Ethiopia's population will grow from 87.6 million in 2010 to 112 million in 2020, to 138.3 million in 2030 and eventually to 188.4 million in 2050 (United Nations 2015).

In principle, the population projections mirror the projected levels of fertility and mortality. The TFR used for the UN medium variant projection was 4.59 children per woman for 2010–15, 3.11 for 2025–30, and 2.28 for 2045–50. The corresponding values for life expectancy are 63.1, 69.6, and 74.5 years (both sexes) for 2010–15, 2025–30, and 2045–50, respectively. The future size and characteristics of the Ethiopian population will depend on how fast fertility declines to replacement level.

8 Age Structure Changes and the Demographic Dividend

The population's age structure influences almost all social phenomena, making age structure one of the most important population characteristics. Data on age composition is relevant for planning social services as well as for measuring and projecting school enrollment, the labor force, and the economically dependent population. The population's age structure affects and is affected by mortality, fertility, and migration. The age dependency ratio, often defined as the ratio of the dependent population – those under age 15 and those aged 65 and older – to the working-age population (age group 15–64), provides a useful summary of a population's age structure. A high age dependency ratio indicates that the economically active population is supporting a large population of children and elderly.

The Ethiopian population is characterized by a young age structure. The population pyramids presented in the first panel of Fig. 4 (for the years 2010 and 2020) broadly indicate the predominance of children under the age of 15 due to past high fertility. Children under the age of 15 constituted about 44% of the total population in 2010 (Table 2). However, due to the recent fertility decrease, a decline in the proportion of children under 15 can be observed. As a result, the child dependency ratio is also declining. According to the UN medium variant projection, the ratio will decline to about 56 in 2030 and to 39 in 2050 (Table 2).

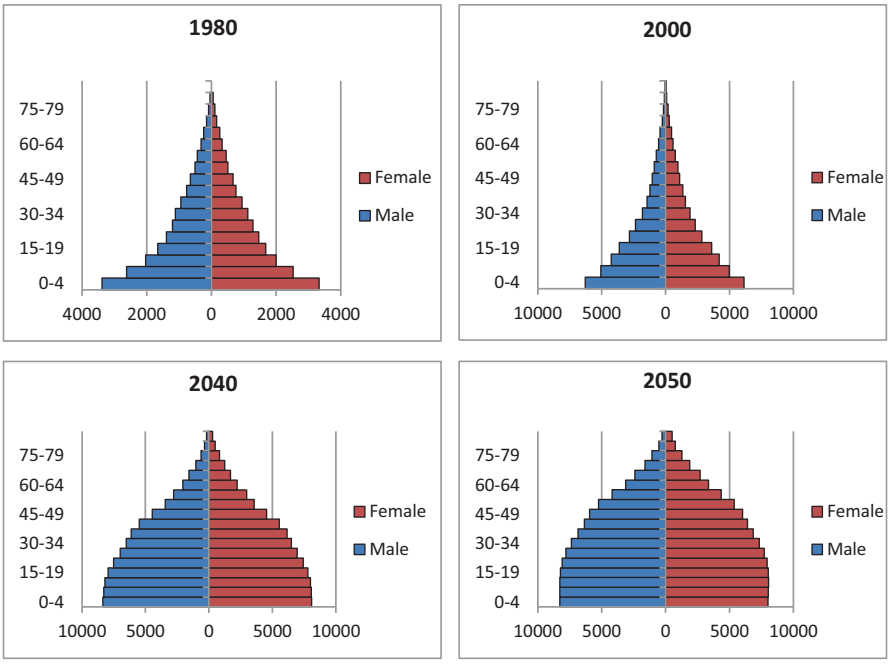

Fig. 4 Ethiopia's changing age structure, 1980–2050 (Data Source: United Nations (2015). World population prospects: The 2015 revision)

Table 2 Age structure and age dependency ratio, 1960–2050 (%)

	Broad age group			
Year	<15	<30	15–64	65 +
1960	43.5	70.3	53.9	2.6
1965	43.4	70.4	54.0	2.6
1970	44.0	70.4	53.3	2.7
1975	44.9	70.6	52.3	2.8
1980	45.1	69.7	51.7	3.2
1985	46.1	70.7	50.9	3.0
1990	46.3	71.5	50.6	3.1
1995	46.6	72.1	50.3	3.1
2000	46.5	72.9	50.4	3.1
2005	46.2	72.9	50.7	3.1
2010	44.4	72.2	52.3	3.3
2015	41.4	70.8	55.1	3.5
2020	38.6	69.0	57.7	3.6
2025	36.4	66.4	59.8	3.8
2030	34.2	63.2	61.7	4.1
2035	32.0	59.9	63.5	4.5
2040	29.8	57.0	65.1	5.1
2045	27.8	54.1	66.4	5.8
2050	25.9	51.3	67.1	6.9

Source: United Nations (2015). World Population Prospects: The 2015 Revision

On the other hand, the proportion of the working age population declined from about 52% in 1980 to 50.4% in 2000,[2] and then started to increase. While child dependency is likely to continue falling with decreasing fertility as can be observed in the second panel of Fig. 4, old age dependency is expected to increase due to increasing life expectancy. As a result, aging will soon be an issue unless policies to address the needs of the elderly are designed and implemented soon.

9 Implications of Population Dynamics for Harnessing the Demographic Dividend

The demographic dividend is the accelerated economic growth that may result from a decline in a country's mortality and fertility and the subsequent changes in the age structure of the population (Bloom et al. 2003). When there is transition from high fertility and high mortality to low fertility and low mortality, there is an increase in the number of effective workers compared to consumers and dependents. With fewer births each year, a country's young dependent population grows more slowly

[2] The HIV- and AIDS-related mortality was high in the 1990s.

Fig. 5 Growth rate of working age and total population, 1960–2050 (Source: United Nations (2015). World population prospects: The 2015 revision)

that the working-age population. With fewer people to support, a country has a window of opportunity for diverting resources from education and health care related expenditures towards promoting rapid economic growth and development. In this section, we examine the demographic developments and the opportunities for Ethiopia to reap a first demographic dividend in the foreseeable future.

From what has been presented, Ethiopia has made a significant stride in population dynamics and is in the process of considerably changing its demographic picture. Fertility, infant, and under-five mortality are declining and life expectancy is increasing, indicating that the country is in the intermediate stage of the demographic transition. As the fertility decline continues, the demographic transition leads to changes in the age structure and an increase in the working-age population. In Ethiopia, starting from 2000, the working-age population has been growing at a higher rate compared to that of total population and this is expected to continue at least until 2050 (Fig. 5).

However, growth in the working-age population alone is not sufficient for a country to reap a first demographic dividend. There must be demand for the increased supply of labor and conditions must enable its productivity, which requires effective policies in key areas. This includes: strong health and educational systems; flexibility and competitiveness in the labor market to absorb the rapidly increasing number of young people entering the job market; and openness to trade to allow growth in the number of productive and rewarding jobs. Moreover, modern infrastructure and technology are needed to reduce transaction costs and enable economic efficiency. In addition, good governance, stable macroeconomics, and a sound

financial system are also necessary in order to promote savings and investments. Finally, low levels of crime and corruption are also important preconditions.

Ethiopia, as discussed in the previous sections, has made momentous progress in reducing mortality and fertility during the past two decades. It also made significant progress in other social and economic sectors. Key development indicators (in education, health, and employment) show a striking progress (United Nations Development Programme 2014). Considerable efforts are also being made to develop the infrastructure (road network, communication, power, energy, etc.) as well as markets and financial institutions. Thus, Ethiopia has ample opportunity to reap a first demographic dividend. However, accelerating fertility decline will reduce the time required to start harvesting the benefits of the changing age structure. Improvements in the quality of education and developments in skills of the increasing number of youth joining the workforce, the creation of opportunities for more jobs to match their growing number, the encouragement of savings, and the attraction of more foreign direct investments than are already occurring will all help the country to accelerate the capturing of a first demographic dividend.

10 Summary and Conclusions

Ethiopia's population has increased from 35.2 million in 1980 to 99.4 million in 2015, and is projected to increase to 188.5 million in 2050. It has also recorded significant improvements in vital rates. Infant mortality declined from 140 to 50 deaths per 1000 live births, U5MR from 237 to 74 per 1000 live births, and TFR declined from 5.9 to 4.1 children per woman during the same period. Though still a young population with children under the age of 15 years constituting more than 40%, a shift in the age structure has been initiated. The country has already evolved to the third stage of the demographic transition. Accordingly, the proportion of the working age population is increasing.

The country has also registered considerable progress in the education, health, and economic sectors in the past two and half decades. Literacy has more than doubled and enrollment in primary, secondary, and tertiary education has increased significantly. The gender gap in education and labor force participation is narrowing. Considerable efforts are also being made to develop the infrastructure (road network, communication, energy, etc.) as well as markets and financial institutions. Great effort is taken to attract more foreign direct investment, increase domestic savings, and develop human capital. Thus, the country is in the midst of a notable demographic and socio-economic shift with profound consequences for its future (World Bank 2013).

However, as the window of opportunity presented by the demographic dividend is rather short and will not be repeated, the country needs to take appropriate steps to speed up the demographic transition. Moreover, it has to intensify efforts to increase investment in human capital, improve access to labor markets to the youth,

promote industrialization, increase domestic saving, strengthen the financial sector, and attract more foreign direct investments sooner rather than later in order to make harnessing the demographic dividend a reality. Any delay may have a harmful effect on future prospects, as unemployment rises, the social structure crumbles, and growing numbers of old people begin to overwhelm available resources.

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The Third Biggest African Country: The Democratic Republic of the Congo

David Shapiro, Basile O. Tambashe, and Anatole Romaniuk

1 Introduction

With an estimated population as of 2015 of more than 77 million people (United Nations 2015), the Democratic Republic of the Congo (DRC) is the third-ranked country in sub-Saharan Africa with respect to population size, after Nigeria and Ethiopia. Its land area of 2.345 million square kilometers (equivalent to more than four times the size of France) makes it the largest country in the region, and compared to the two countries with greater population it is relatively sparsely populated.[1]

Situated at the very heart of Africa, the DRC is surrounded by nine countries and is a cultural mosaic of hundreds of different ethnic groups. The Congo River and its confluents, with their aquatic and nautical volume second only to the Amazon, offer great potential for transport and agriculturalirrigation, as well as hydraulic potential for generating electricity for domestic uses and for export to other African countries. Two-thirds of the huge African equatorial forest has its home in the DRC. This in itself is not only a vast natural resource with potentially great economic pay-offs but also has worldwide ecological implications. What ultimately happens to this forest will affect climatic conditions worldwide. Last but not least, the DRC is rich, for its agricultural but even more so for its mineral resources. Copper, diamonds,

[1] United Nations estimates indicate that population per square kilometer as of 2015 amounted to 200 in Nigeria and 99 in Ethiopia, compared to only 34 in the DRC (United Nations 2015).

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uranium, cobalt, and much-coveted coltan (used in cell phones and many other consumer electronic devices), among other minerals, are mined in the DRC for their industrial and military values. The DRC, then, is an important country in the region for multiple reasons.

There are three broad objectives to this chapter:

(a) Depict the changes in the main demographic indicators in the past three decades;
(b) Explore the main drivers of these changes; and
(c) Provide an outlook of the likely demographic developments and the chances of harnessing a first demographic dividend in the near future.

The chapter begins with an examination of key demographic patterns and trends over the past three decades, with emphasis on mortality, fertility, and population size and growth. This review includes a look not only at national-level data but also at fertility differences by province within the country. We also look at current differentials by place of residence, education, and economic well-being in some important fertility-relevant and mortality-relevant measures. Following the overview of levels and changes in mortality and fertility, we examine urbanization, educational attainment, and the economy – three factors that are often related to demographic outcomes – and how they have changed in recent decades.

The latter part of the chapter initially focuses on family planning and population policies in the country and their evolution, and then looks at demographic projections for the DRC going on to the year 2050. The final substantive part of the chapter looks at the prospects for the DRC to capture a demographic dividend.

2 Key Demographic Patterns and Trends and Their Underlying Factors

Data on mortality, fertility, and population in the DRC from several sources spanning an extended period are provided in Table 1. Prior to gaining independence in 1960, the DRC was the colony of Belgium known as the Belgian Congo. A massive survey was carried out from 1955 to 1957, and provided the first set of national-level indicators of key demographic variables. Although that early survey precedes the period that is the focus of most of the chapter, we have included data from it in our review of data on demographic factors, as it provides a nice historical context that helps to identify longer-term trends (Romaniuk 1980, 2011b).

What is particularly striking when we look back to the colonial period is how much the demographic landscape of the DRC has changed since independence, and especially in the last two or three decades. As we shall elaborate below, the massive sterility and depopulation that historically ravaged the country's central and north/east regions have virtually disappeared, giving way to a rapid demographic recovery. Population rose from about 15 million at the time of independence in 1960 to 31 million in 1984 and to an estimated figure of nearly 75 million in 2014.

Table 1 Key demographic indicators

Indicator	1955–1957	1984	2001	2007	2013–2014
	Mortality				
Crude death rate	26.1	16.8	18.3	12.3[a]	10.7[a]
Infant mortality rate	173	137	126	92	58
Under-five mortality	291	213	213[b]	148	104
Life expectancy at birth	38.0	47.0	46.2	55.5[a]	58.1[a]
	Fertility				
Crude birth rate	45.2	48.1	48.5	44.1	44.1
Total fertility rate	5.9	6.7	7.1	6.3	6.6
	Population				
Level (millions)	12.8	30.7	55.0	59.8[a]	73.7[a]
Natural increase (percent)	1.9	3.1	3.0	3.2[a]	3.2[a]

Sources: (1955–1957) Romaniuk, A. (1968). The Demography of the Democratic Republic of the Congo. In W. Brass et al. (Eds.), *The Demography of Tropical Africa* (pp. 241–338). Princeton: Princeton University Press.
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[a]Estimate from the United Nations (2015)
[b]The stability of estimated under-five mortality between 1984 and 2001 seems peculiar, especially in light of the general trend toward declining mortality over time. Two points are worth noting here. First, United Nations estimates of under-five mortality for these periods are slightly lower in each case (209 and 202, respectively), but do show a bit of a decline. Second, the period in question encompassed the civil war in the late 1990s, and during that period, United Nations estimates of mortality increased somewhat

The first and to date the only census to have been carried out in the DRC was done in 1984 (Institut National de la Statstique 1991). This, then, marks the outset of the 30-year period on which we focus in this chapter. Since then, there have been several national-level United Nations-funded Multiple Indicator Cluster Surveys (MICS) done between 1995 and 2010, and two Demographic and Health Surveys (DHS), carried out in 2007 and 2013–2014, respectively. Our overview of national-level estimates of fertility, mortality, and population reports relevant estimates from the initial survey in the mid-1950s, the 1984 census, an early MICS (2001), and the two DHSs.

2.1 Mortality

As indicated by the different mortality measures in Table 1, the trend over the past 30 years has been toward declining mortality, especially during the latter half of the period.[2] Compared to the baseline data from the 1950s, infant mortality, under-five mortality, and life expectancy at birth have all shown substantial improvement.

Two forces have contributed to the progress recorded in the fight against early deaths (Romaniuk 2011b). The first is the direct, top-down, public health-driven medical interventions, often carried out with support from foreign donors (e.g., vaccination campaigns). These reflect the state of the arts of public health, including the education of people in matters of personal hygiene. The second is the bottom-up-driven momentum, reflecting the impact of a progressive improvement in people's awareness of health risks and their readiness to seek medical care rather than turning to traditional healers.[3]

More broadly, the downward trend in mortality in the DRC may be seen as a consequence of what Richard Easterlin (1996) has characterized as the global Mortality Revolution. Easterlin emphasizes improvements in health technology as the driving force for this Mortality Revolution, and he notes that "…despite their low levels of economic development, less developed countries were able … to implement … advances in health technology" (Easterlin 1996: 76) that in turn have resulted in reduced mortality.

While there has clearly been progress in reducing mortality in recent years, that progress has been limited. Indeed, the country is still far from achieving its epidemiological transition, characterized by a shift over time in its disease profiles from most preventable infectious diseases to chronic and degenerative diseases as more significant causes of death, in response to advancements in medical technologies and improvements in the overall public health and sanitation environment. In a recent extensive study funded by the World Bank, through the Projet d'Appui à la Réhabilitation du Secteur de la Santé (PARSS) and the Agence Française de Développement (AFD), Guengant et al. (2014: 15) report that the burden of deaths associated with infectious diseases, inadequate prenatal care, poor management of deliveries, and malnutrition accounted for 67% of all deaths in 2012, compared to 23% for non-communicable diseases (e.g., heart disease or stroke, diabetes, cancer, etc.) and 10% for accidental causes.

[2] Note that since the crude death rate and life expectancy at birth are measures not calculated for the DHS, we have used United Nations estimates of these two measures for the most recent data.

[3] For example, as shown in Table 3, close to 80% of recent births (as of 2013–2014) have taken place in a health center, representing an increase of close to ten percentage points since only 2007.

2.2 *Fertility*

In contrast to the data on mortality, data on fertility in Table 1 fail to show any clear trend over the past 30 years. Going a little further back in time, one can see that in the period between the mid-1950s and the 1984 census, fertility increased somewhat (Romaniuk 2011b). This increase reflected both a decline in the prevalence of sexually-transmitted infections (STIs), the effects of which contributed substantially to reducing fertility in the center and northeast of the country in the 1950s, and the shortening of durations of post-partum abstinence and breastfeeding (Romaniuk 1980).

With a birth rate in excess of 40 per 1,000 and a total fertility rate not far below seven children per woman (even more in some provinces, as shown in Table 2), the historically high traditional fertility typical of sub-Saharan Africa clearly still holds sway. Using the categorization defined elsewhere in this volume to describe fertility transition in the different countries of sub-Saharan Africa, the DRC would be, at most – with the notable exception of its capital city, Kinshasa – one of the countries with very slow or incipient fertility transition. Comparing provincial-level fertility estimates for 1984 to those from 2013 to 2014 (Table 2) shows that among the eight provinces for which data are available for both years, there have been sharp increases in fertility in three provinces (Kasai-Occidental, Equateur, and Province

Table 2 Total fertility per woman by Province, Rural, Urban, and total DRC

Province	1955/1957	1984	2001	2007[a]	2013/2014[a]
Kinshasa (city)	7.5	7.7[b]	5.0	3.7	4.2
Bas-Congo	7.2	7.7	7.3	5.9	6.0
Bandundu	6.7	7.0	6.9	6.7	6.3
Equateur	5.0	6.1	6.7	6.2	7.0
Province Orientale	4.0	4.8	6.5	6.7	5.9
Nord Kivu	8.0	7.4	7.3	7.0	6.5
Sud Kivu	8.5		7.8	7.4	7.7
Maniema	4.5		7.6	6.7	6.9
Katanga	8.2	7.8	7.2	5.9	7.8
Kasai Oriental	5.7	7.4	7.3	7.6	7.3
Kasai-Occidental	6.4	7.0	9.5[c]	7.7	8.2
Rural	4.8	NA	7.4	7.0	7.3
Urban	6.1	NA	6.3	5.4	5.4
All DRC	5.9	6.7	7.1	6.3	6.6

Sources: See Table 1. Data for 1955/57 and 1984 have been adjusted to reflect current provincial boundaries.

[a]Based on births reported for the 3 years preceding the survey

[b]The TFR of 7.7 for Kinshasa from the 1984 Census is what was reported. However, Shapiro and Tambashe (2003) have shown that this is most likely an overestimate of the actual TFR. We believe that the TFR for Kinshasa in 1984 was on the order of 6.4, reflecting the onset of fertility decline in the city after 1975

[c]Estimate probably distorted by sampling error

Orientale – the latter two having had especially low fertility in the 1950s), essentially no change in the Katanga and Kasai-Oriental provinces, modest declines in the Bandundu and Bas-Congo provinces, and a sharp decline only for Kinshasa.[4]

The picture that emerges from this brief analysis of levels and trends in fertility is a mixed one: fertility may have reached the plateau of continuation of the high traditional fertility trends in some parts of the country, while other provinces may be at an early stage of fertility transition (Romaniuk 2011a). In this overall high-profile fertility of the DRC, the megacity of Kinshasa, with a population approaching 12 million in 2015 (United Nations 2014), stands apart. Here the total fertility fell to about four children per women on average. The question we shall try to tackle next is, what are the forces that are shaping and are expected to shape the attitudes towards and behaviors in childbearing in the near future? In the following, we identify three sets of such forces.

The first set of forces is *modernity:* the emergence of *modern childbearing behaviors* as the population undergoes modernization prompted by such factors as education, urbanization, and a shift from traditional family farming to wage labor in the industrial and services sectors. This process is still in its infancy. Total fertility (as well as ideal fertility) by women's level of educational attainment (Table 3) shows that women with no schooling or only primary education still adhere to the traditional high fertility norms, with distinctly more than seven births per woman. Even women with secondary education have almost six children, on average.[5] Only women with post-secondary education approach low fertility, typical of modern societies, with an average of 2.9 births. However, as shown in Table 4, women with post-secondary education are only a very small minority in the DRC, hardly a significant driving force. A somewhat similar picture emerges by wealth quintiles, albeit with narrower differentials across groups. Only the highest wealth quintile women show comparatively low fertility, with just under five births per woman, while average fertility across the other four groups ranges from 6.5 to 7.6 children.

The second set of forces shaping childbearing attitudes and behaviors can be subsumed under what Romaniuk (2011a) refers to as *existential conditions* and may otherwise be characterized as hardship-driven or hardship-induced reproductive behaviors (see Shapiro 2015). This applies to urban populations, most notably, in the megacities like Kinshasa in the DRC and elsewhere in Africa. In such megacities, the masses of the population are living in the most precarious conditions, both material and socio-psychological. Material hardships, unemployment, and appalling housing overcrowding make it impossible for many city dwellers to realize their family size aspirations.

[4] By the time of finalizing this chapter, the country had just initiated a political, administrative, and territorial restructuring whereby the number of provinces has increased from 11 to 26, including Kinshasa. By virtue of this restructuring, the provinces of Bandundu, Equateur, Kasai-Occidental, Kasai-Oriental, Katanga, and Province Orientale will progressively see their respective administrative districts become full-fledged provinces.

[5] This figure reflects the fertility of many women with incomplete secondary education. Shapiro (2015) has shown that, among women in Kinshasa with secondary education, as years of school completed increase, fertility declines. Similar results have been found for a large number of countries within sub-Saharan Africa (Shapiro 2012).

Table 3 Total fertility, average parity in age group 40–49, ideal fertility, modern and traditional contraceptive prevalence rates, and proportion of births delivered in a health center, by urban/rural residence, education, and wealth quintile, women aged 15–49, 2013–2014

	Total fertility	Avg. parity, 40–49	Ideal fertility	Contraceptive prevalence[a] (%)		Delivery in health center (%)
				Modern	Traditional	
Residence:						
Urban	5.4	5.8	5.2	14.6	16.5	93.1
Rural	7.3	6.7	6.7	4.6	10.8	74.0
Education:						
No education	7.4	6.8	7.2	4.0	7.1	67.2
Primary	7.5	6.9	6.7	4.9	10.8	76.1
Secondary	5.9	5.7	5.4	12.6	16.7	90.2
Post-secondary	2.9	3.8[b]	4.3	19.4	29.3	99.7
Wealth quintile:						
Poorest	7.6	6.4	6.8	3.3	9.5	65.6
Poor	7.4	6.7	6.6	4.7	11.8	72.6
Middle	7.1	6.8	6.5	4.5	12.3	78.4
Rich	6.5	6.9	6.0	11.0	11.1	91.0
Richest	4.9	5.3	4.9	17.2	19.0	97.6
Total Congo	6.6	6.4	6.1	7.8	12.6	79.9

Source: Demographic and Health Survey, 2013–2014, Tables 5.2, 6.4, 7.4, and 9.5
[a]Women in union
[b]Based on 25–49 unweighted cases

A related aspect is the socio-psychological dimension, generally overlooked when exploring the childbearing attitudes and behaviors of city dwellers, who are subject to *social alienation*. Cut off from their kin and ethno-cultural ties for spiritual sustenance in the anonymous world of the big cities, many of its dwellers have difficulties coping with life on the psychological plane. The rapid urbanization that we are witnessing in the DRC, as in many other places in sub-Saharan Africa, is often generating more poverty than wealth. And to that extent, it is not necessarily a factor of fertility reduction as generally might be expected. To put the matter differently, the urbanization generates poverty and Malthusian reflexes rather than wealth and modernity reflexes as far as family and childbearing aspirations are concerned. "Few urban women are wage earners in the formal economy. At least as of now, the difficult dilemmas of the 'opportunity cost' of childbearing and the role incompatibility of working and parenting are hardly issues in African urban society" (Romaniuk 2011a: 14). Even among women working in the informal sector of the economy, who are much more numerous than those in the formal economy (Shapiro and Tambashe 2003), and who often work long hours, the fostering of relatives often provides childcare services, thus facilitating a combination of working and parenting.

Finally, the third set of forces finds its expression in the *deep-rooted traditionalism* of the extended family, the cult of ancestors, and desire for survival of the lineage. This cultural traditionalism remains rock solid in African societies. It shapes

and will continue for some time to shape matrimonial and reproductive behaviors, not only among the masses of rural and small-city inhabitants, but also among large-city dwellers, including even the more educated ones. "For ordinary citizens, a nuclear family is not an alternative to extended kinship with its deep-rooted sense of solidarity and lineage continuity. Moved by culture and tradition, and no less by economic rationality, they find support for their belief in the benefits of a large progeny for their own and their kin's well-being. At most, a minority seeks to moderate procreation in the face of the challenges of modernity" (Romaniuk 2011a: 21).

The interplay among these three driving forces – modernity, existential conditions (both material and psychosocial), and traditionalism – has contributed to maintaining such high fertility. This is a clear reflection of a pattern of pregnancies that are generally too early, too closely-spaced, too many, and too late, all in a context of low contraceptive use (as shown in Table 3).

2.3 Population and Growth

The bottom two rows of Table 1 show estimates of the population and of the rate of natural increase in the population over time.[6] There has been nearly a six-fold increase in the country's population over the span covered by the table, and more than a doubling in the past 30 years. During the past three decades, the rate of natural increase has been 3% per year or higher, corresponding to a doubling of population in approximately 24 years, or a generation. In brief, the combination of declining mortality and fairly stable high fertility (for the most part) has contributed to this quite rapid population growth.

3 Urbanization, Education, and the Economy: Forces of Change

3.1 Urbanization

In the presence of ongoingrural-urban migration, in conjunction with urban fertility that, apart from Kinshasa, is not substantially lower than rural fertility[7], the DRC has experienced growth in its urban population that is more rapid than the growth of

[6] International migration has been quite modest, and hence we ignore it here. Data on internal migration are not available, but some earlier studies suggest that there is not only rural-urban migration but also urban-urban migration (from smaller urban centers to larger cities like Kinshasa) that contributes to the more rapid urban population growth that will be discussed briefly below.

[7] The distinctiveness of Kinshasa within the DRC is apparent for almost any measure that one looks at, but may be readily seen by considering fertility. The total fertility rate for the DRC as of the 2013–2014 DHS was estimated at 6.6, reflecting an urban rate of 5.4 and a rural rate of 7.3.

the rural population. Hence, as elsewhere in the region, as time goes by an increasing proportion of the population resides in urban places. The United Nations Population Division (United Nations 2014) estimates that in 1980 27% of the country's population resided in urban places, while the corresponding estimate for 2015 is 43%. By 2030, the UN estimates that more than half of the DRC's population will be urban.

Kinshasa, the second-largest city in sub-Saharan Africa (after Lagos), with an estimated population approaching 12 million in 2015 (United Nations 2014), accounts at present for 38% of the total urban population. The city's especially rapid growth in part reflects the impact of urban-urban migration within the DRC in addition to the rural-urban migration to the city. The UN estimates that by 2030 Kinshasa will have a population of 20 million, and that it will be the 12th largest urban agglomeration in the world.

3.2 Education

During the 30 years between the DRC's 1984 census and the 2013–2014 DHS, there has been a sustained increase in the educational attainment of the population. This has occurred despite the adverse economic circumstances that characterized much of the period and are discussed below. In addition, there has been some narrowing of the gender gap in schooling during this period.

As shown in the first two columns of Table 4, in 1984, census data for those aged 6 and over showed that nearly 55% of females and almost 30% of males had no schooling. More than 35% of females and almost half of males had been to primary school. And roughly 10% of females as well as almost a quarter of males had reached secondary or higher education. Hence, in 1984 the median woman had no schooling and the median man had been to primary school.

By the time of the 2013–2014 DHS, fewer than one in five females had not been to school, just over half of them had reached primary school, and almost 30% had gotten to secondary or higher education. Among males fewer than 10% had not been to school by 2013–2014, a little less than half had been to primary school, 40% to secondary school, and 5% to higher education. Median education, then, had moved from none to the primary level for women and from lower primary to upper primary schooling for men, with more than 45% of men having reached at least secondary education.

The third and fourth columns of the table show the same educational distributions by sex, but limited to the capital, Kinshasa. These data highlight the uniqueness of Kinshasa within the DRC. In 1984, a much smaller proportion of women in Kinshasa had no schooling as compared to women in the country as a whole, and a

However, Kinshasa's total fertility rate was 4.2. Since Kinshasa constitutes close to 40% of the country's total urban population, these figures suggest that the total fertility rate for urban places other than Kinshasa is above 6.1 – below the rate for rural places, but not by a great deal.

Table 4 Educational Attainment in the DRC, 1984 and 2013–2014 (ages 6 and over, percentage distributions)

	DRC		Kinshasa		DRC 2013–2014	
Females	1984	2013–2014	1984	2013–2014	Urban	Rural
None	54.6	19	21.3	5.3	7.6	25.3
Primary	36.1	51.7	45.7	29.1	42.1	57.1
Secondary	9.2	27.3	31.7	55.8	44.9	17.5
University	0.2	2	1.3	9.8	5.4	0.1
Total	100	100	100	100	100	100
Males						
None	28.3	8.1	12.1	3.4	3.6	10.5
Primary	48.6	46.3	40.2	25.8	36.8	51.3
Secondary	22	40.5	41.1	49.7	47.2	37
University	1.2	5.1	6.6	21.1	12.4	1.2
Total	100	100	100	100	100	100

Sources: (1984) Institut National de la Statistique (1991). *Zaïre/Kinshasa. Recensement scientifique de la population, juillet 1984 – Caractéristiques démographiques, vol. I*. Kinshasa: Institut National de la Statistique, Ministère du plan et aménagement du territoire, République du Zaïre. (2013–2014) Ministère du Plan et Suivi de la Mise en œuvre de la Révolution de la Modernité (MPSMRM), Ministère de la Santé Publique (MSP), and ICF International (2014). *Enquête Démographique et de Santé en République Démocratique du Congo 2013–2014*. Rockville: MPSMRM, MSP, and ICF International.

much higher percentage of women had secondary or higher education. The same is true for men. The pattern is repeated in 2013–2014 for both females and males, and for the men, more than a fifth had reached post-secondary education.

Data on educational attainment by place of residence was not available in the 1984 census publications. However, the last two columns in the table show these distributions separately for females and males and for urban and rural places from the 2013–2014 DHS. Comparing the urban column with the corresponding column for Kinshasa reveals the capital's distinctly higher levels of schooling. At the same time, the educational attainment of urban residents is clearly substantially higher than that of rural residents, both for women and men. Median education of urban women has reached the secondary level, and this is also the case for urban men. By contrast, median schooling of rural women and men is at the primary level.

3.3 The Economy

In contrast to the improvements in educational attainment that took place, there was a sharp economic deterioration. During the 30 years from 1980 to 2010, there was a substantial decline of real GDP per capita in the DRC. Data from both the Penn World Tables (PWT) and the World Bank (WB) are shown in Figs. 1 and 2. Figure 1 shows the estimated levels, and both data sources tell essentially the same story.

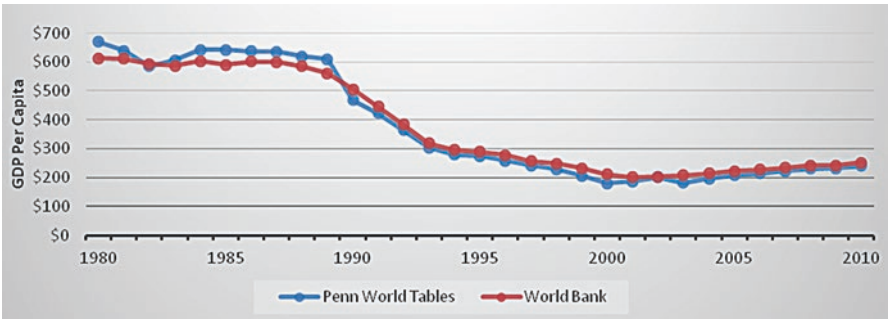

Fig. 1 Real GDP Per Capita Estimates for the Democratic Republic of the Congo, 1980–2010 (2005 Prices) (Penn World Tables: Heston et al. 2012; World Bank: World Bank 2012)

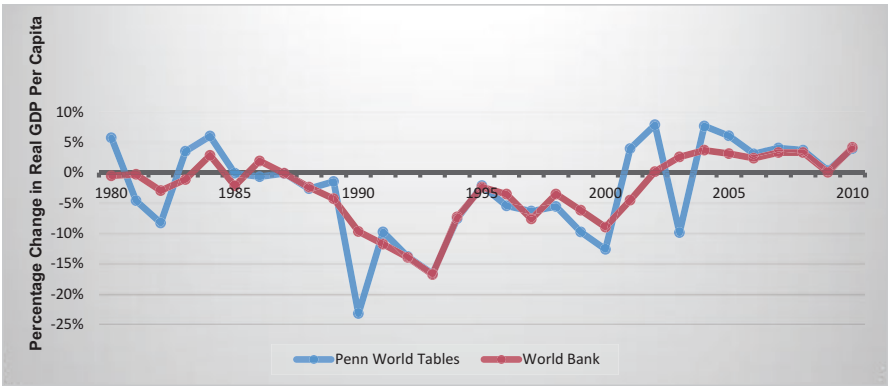

Fig. 2 Percentage Change in Real GDP Per Capita in the Democratic Republic of the Congo, 1980–2010. Calculated from data in Fig. 1

For the full period, the estimated decline in real GDP per capita was roughly 60–65% (PWT: 64; WB: 59). The downward trend that is apparent beginning in 1980 is in fact a continuation of declining real GDP per capita that began in the mid-1970s, following implementation in 1973 and 1974 by President Mobutu of policies of Zairianization and Radicalization that expropriated businesses from foreign owners and gave them to often unqualified individuals. While efforts were made to reverse some of the adverse impacts of these policies, the economy suffered. In addition, high levels of governmentcorruption contributed to the economic stagnation.

During the 1980s, the overall effects of this stagnation were comparatively modest. Both data sources indicate a 9% decline in real GDP per capita between 1980 and 1989. However, beginning in 1990 the Congolese economy experienced much more severe economic downturns, and these sharp declines persisted throughout the 1990s. Rapid inflation emerged in 1990, and in September of 1991 riots and looting broke out in Kinshasa and other cities. A second round of looting took place in

January of 1993. Civil war broke out in the east of the country in 1996, and while the Mobutu regime was replaced in May of 1997, the economy continued to perform poorly. Over all, estimated real GDP per capita fell by 62 (WB) to 70 (PWT) percent between 1989 and 2000.

Since 2000, by contrast, there have been sustained and modest increases in estimated real GDP per capita. The World Bank figures suggest an increase of nearly 20% from 2000 to 2010, while the Penn World Tables estimate is of an increase of more than 33%.

Figure 2 shows the annual percentage changes in estimated real GDP per capita, and while there are clearly some differences between the two data sources, both of them confirm the sharp differences in economic outcomes among the decades under consideration. The modest declines of the 1980s reflect the fact that there are only a few years with positive growth. But the sharp decline of the 1990s is apparent from the unremitting negative growth during the decade, and often at high levels of decline. For the 2000s, by contrast, the decade is dominated – for the first time – by positive growth.

In summary, then, the first two factors considered in this section, urbanization and education, have both increased during the past 30 years or so, while the economy deteriorated badly in the first two decades (and especially during the 1990s) before realizing some positive growth during the first decade of this century.

4 Family Planning (FP) and Population Policy

In 1972, President Mobutu endorsed the concept of "Naissances Désirables" (literally, Desirable Births), and via a presidential order the next year he created the organizational structure for the Naissances Désirables program to promote the provision of information and services. Within a few years, family planning information and services were offered at various public health facilities in different parts of the country as well as in select corporate and faith-based service delivery points.

With funding from the United States Agency for International Development (USAID), the Ministry of Health in 1982 launched the "Projet des Services de Naissances Désirables" (PSND). PSND then developed an aggressive FP program, initially in Kinshasa and subsequently in 13 other major cities across the country, setting up integrated FP units in several hundred health centers and maternity wards throughout the country.

This expanding FP program was brought abruptly to a near halt when, in 1991, civil unrest erupted in Kinshasa and other major cities, resulting in the immediate withdrawal of all forms of development assistance to the country by bilateral and multilateral partners except the United Nations. The armed conflict that broke out in 1996 and gripped the country through 2004 further compounded the situation, as most health services with which FP services were integrated virtually collapsed. As a result, the period from 1991 to 2004 witnessed a reversal of most of the gains from the early family planning program. The government was unable to provide

adequate funding to PSND, which became virtually inactive during these lean years. In 2001 PSND was succeeded by the "Programme National de Santé de la Reproduction" (PNSR), but a persisting lack of government financial support for programmatic activities has hampered PSNR's ability to carry out its mandate to ensure leadership in coordinating FP service delivery throughout the country.

Since 2004, multiple conferences and a 2012 meeting of key FP stakeholders have attempted to advance FP in the DRC. In 2014 the country adopted a national strategic plan for family planning, which, among other things, seeks to increase government commitment to FP, improve access to FP services for men and women, improve the quality of services offered, and boost the demand for FP services. The latter point is critical, as the prospects for fertility transition in the DRC to take off in the coming years depend very much on whether family planning takes hold in the country.

Results from successive national surveys indicate low levels of use of modern contraceptives among women in union: 2.3% in 1991, 4.4% in 2001, 5.8% in 2007, and 7.8% in 2013/2014. Even in Kinshasa, where fertility has declined substantially over the past 30 years, modern contraception prevalence rates were only 11, 14, and 19% in 2001, 2007, and 2013–2014, respectively. With the persistence of strongly pronatalist cultural norms and values and high ideal family sizes, and with an estimated 70% of total demand for FP in the DRC being for birth spacing, the impact of FP on fertility will remain slight in the short to medium term.

With respect to population policy more broadly, efforts to formulate a comprehensive population policy framework in the DRC date back to the 1980s. A National Population Policy document was produced in 1987, but never approved by the government. Similarly, a new population policy document, seeking to integrate the population variable in national development frameworks, was elaborated in 2008, but again, never approved by the government.

The failure to adopt a formal population policy is consistent with results from the United Nations Population Division's successive surveys of government views and policies on key population issues. The DRC has always considered its population growth to be satisfactory, while national mortality levels have been deemed to be too high and unacceptable, and prior to the most recent survey in 2013, fertility was deemed to be satisfactory and not in need of policy intervention. In 2013, however, fertility (especially among adolescents) was deemed to be too high, with support expressed for policies and programs to reduce fertility. A recent government strategy document for growth and poverty reduction explicitly recognizes the impact of the DRC's rapid population growth on its development prospects in general and social sectors in particular.

While this recent turn is encouraging, there have not been specific interventions aimed at lowering fertility and slowing population. That which Guengant et al. (2014: 107–108) refer to as a "syndrome de grandeur" (greatness syndrome) is particularly relevant here. Many Congolese, both in the general population and among the elites, view the DRC as being so rich in natural resources and vast that developing these resources will allow the country to lay claim to its leadership role in sub-Saharan Africa. From this perspective, it is neither necessary nor opportune for the

country to curb its fertility and population growth, despite its past and current inability to meet even the basic needs of the vast majority of its population.

The lack of specific interventions to operationalize the demographic dimension of development that characterizes various national development frameworks and documents reflects the prevailing view that strong economic growth is the main, if not the only, lever of action required by the DRC to meet the needs of its people and promote its development. This perspective calls for continued policy dialogue and sensitization campaigns on the adverse effects of unchecked population growth (May 2012: 235). Congolese leaders and the general public ought to understand that what matters most in any population policy dialogue is not the size of the population per se, but rather, the tempo of population growth as well as the age structure, and the burden that these aspects exact on the economy in terms of the social investments required in education, employment, housing, health, and transportation to cope with a rapid increase in population size.

5 Populations Projections to 2050

Projections of the population of the DRC and a number of other population characteristics are available from the United Nations (2015). The total population (medium variant) is projected to increase from a little more than 77 million people in 2015 to more than 195 million in 2050 – a two and a half-fold increase within 35 years. Associated with this substantial population increase is a projected slowing down of the rate of population growth, from 3.09% per year during the period from 2015–2020 to 2.18% per year for 2045–2050.

The population projections largely reflect the projected levels of fertility and mortality. The UN's estimated total fertility rate for 2010–2015 in the DRC is 6.15, while estimated life expectancy at birth at birth is 58.1 years (both sexes combined). For 2045–2050, the projected total fertility rate is 3.43, reflecting a presumed decline in fertility since the end of the 1990s, while the projected life expectancy is just over 69 years. However, in light of both the recent increase in fertility as reported by the 2013–14 DHS and the extremely slow momentum recorded and anticipated in the short to medium term with respect to contraceptive use as discussed by Guengant et al. (2014: 41–42, 121–130), we believe that the fertility decline embedded in these estimates and projections is overly optimistic. In particular, while the 2007 DHS found a TFR of 6.3, a little below the corresponding UN estimate of 6.6, the 2013–2014 DHS found that the TFR had increased to 6.6 rather than having fallen to less than 6.2. The DHS evidence counters the assumption of steadily declining fertility.

If our skepticism about the fertility rates is correct, then the corresponding population projections for 2050 are too low. In addition, the UN's projections of the dependency ratio (defined as the number of children aged 0–14 plus the number of adults age 65 and over per hundred individuals aged 15–64) show a decline in the overall dependency ratio from 96 in 2015 to 66 in 2050. However, if fertility is

higher than estimated and the projected declines in fertility will be smaller than estimated, this means that the decline in dependency (driven by declining child dependency) has been overstated in the projections.

6 The Demographic Dividend

The demographic dividend refers to the potential benefits, in the form of promoting efforts to stimulate economic development, of changes in the age distribution of a population pursuant to declining fertility. Put briefly, when fertility decline emerges in a previously high-fertility population, and is sustained, the dependency ratio in the population – the ratio of dependents, young and old, to the population of working age – declines, as the fertility decline results in slower growth of the proportion of the population consisting of young dependents. This declining dependency ratio opens a window of opportunity for reallocating consumption expenditures away from sustaining consumption, school expenditures, and health care expenditures on infants and the young, and toward efforts seeking more directly to promote economic development.

The change in age composition of the population is a necessary but not sufficient condition for a country to benefit from the demographic dividend. Sound economic, social, and health policies and the absence of corruption are complementary features (among others) that contribute to the harnessing of a demographic dividend.

In considering the prospects for a demographic dividend in the DRC, it is clear that at present, with the notable exception of the city of Kinshasa, the initial condition for emergence of the change in age composition that facilitates the dividend – a sustained decline in fertility – is not evident nor on the horizon. With an estimated total fertility rate of 6.6 from the 2013–2014 DHS, the DRC has one of the highest total fertility rates in sub-Saharan Africa. And despite the comparatively high level of educational attainment in the country, estimated fertility remains high and indeed appears to have increased modestly in the past half-dozen years or so, as noted above. Ideal fertility as measured by the most recent DHS was 6.1 children per woman. Current UN estimates for the DRC envision a TFR still in excess of 4 by 2035, and well above 3 by 2050. But as discussed in the preceding section, these estimates are part of a series that trends steadily downward over time, while it appears from the most recent DHS that fertility is not declining. Hence, the UN estimates appear to be overly optimistic regarding the pace and magnitude of fertility decline in the DRC, thus calling into question the true prospects for a demographic dividend.

Kinshasa is the one place in the country where fertility has declined over an extended period of time, and the age composition of the city's population has changed as a consequence. Even in Kinshasa, however, there is little evidence of any emerging demographic dividend. The city's economy, reflecting the country's overall poor economic performance in recent decades, has not been able to generate

a sufficient number of good jobs, and the informal sector has been the main source of employment (Shapiro and Tambashe 2003; Shapiro et al. 2011).

In short, then, there is little reason to expect that the DRC will benefit from a demographic dividend in the next couple of decades. Rather, the continued high fertility that seems most likely, in conjunction with the recent stalling of fertility decline in Kinshasa, seems to point more directly to a "social time bomb" outcome. In and of itself, the projected population growth of Kinshasa (to 20 million by 2030 and 30 million by 2050), given the current inadequate urban planning policies, will potentially trigger this social time bomb.

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A Case of An Almost Complete Demographic Transition: South Africa

Tom A. Moultrie

1 Introduction

Having fallen gradually from the late 1950s, fertility rates in South Africa are – by some distance – the lowest in continental Africa, and are currently close to replacement level. By many metrics, the demographic transition in South Africa might be regarded as being substantially complete. However, the pattern of demographic transition – experienced in the face of one of the worst HIV epidemics in the world – is atypical. At the same time, progress in addressing the structural inequalities affecting health and education, and hence the labor market and economic opportunities, brought about by apartheid policies, has been very slow.

The first part of this chapter presents the evidence relating to South Africa's demographic past, present and future, using data from the 2012 edition of the UN World Population Prospects[1] (United Nations 2013). The section that follows engages with the concept of the 'demographic dividend', defining it and considering alternative measures or tests of the potential for a demographic dividend. In the final substantive part, we consider the implications of the theory of the demographic dividend for South Africa over the period to 2050.

In addition to the 2012 WPP, this chapter draws on the recently published research by Lutz and colleagues, who have sought to integrate the conventional population projections of the WPP with data on historical levels of education in the population and projections of future change in those levels (by age and by sex). Doing so allows the future pattern of human capital formation in the country to be understood better.

[1] Abbreviated to 2012WPP (the most recent 2015 World Population Prospects of the United Nations yield similar results for South Africa).

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2 South Africa's Demographic Past, Present, and Future

Prior to the end of apartheid, only two censuses are regarded as having enumerated the South African population with any reasonable accuracy: those conducted in 1936 and 1970. After 1970, the apartheid government's granting 'independence' to so-called homelands meant that each self-governing territory conducted their own census and the results from these censuses were not combined. A DHS-type survey conducted in the late 1980s provided important indicators relating to childbearing and contraceptive use (Mostert and Lötter 1990). Since the end of apartheid, three censuses have been conducted (in 1996, 2001 and 2011); Demographic and Health Surveys (DHS) were conducted in 1998 and 2003, although problems with the fieldwork in the 2003 DHS meant that the data on fertility and contraception from that survey cannot be relied upon. A national 2% Community Survey was conducted in 2007, using a questionnaire similar to that used in the 2001 census. Other nationally representative data sources that can provide reliable demographic estimates are rare.

The data in the 2012WPP is broadly consistent with the results from the three post-apartheid South African censuses. According to the 2012 WPP, the population of South Africa has increased from 13.68 million people in 1950 to 53.49 million in 2015. Over the next 35 years, another 10 million people are expected to be added to the population, resulting in a projected population of 63.41 million in 2050.

South Africa is also the most urbanized country in continental Africa. 64.8% of the population was urbanized in 2015, while this is expected to increase to 77.4% by 2050.

Concerns about the rapid rate of population growth (and specifically about the rate of population growth among the African population) led to the roll-out of a national family planning program in the late 1960s, although it was only launched formally in 1974. Despite it being lauded as being 'super-Asian' in its intensity (Caldwell and Caldwell 1993), the program barely altered the trajectory of fertility decline in the country, with the total fertility rate falling from 6 children per woman nationally in the late 1950s, to around 3.2 in the mid-1990s (Moultrie and Timæus 2003). The reasons for the slow pace of decline have been described elsewhere (Moultrie 2005; Timæus and Moultrie 2008).

Data from the three post-apartheid censuses shows that fertility has continued to decline, and – allowing for the heightened mortality associated with the spread of HIV – is currently somewhere close to replacement level. Contraceptive use is widespread, and would appear to be associated with a desire among many women to neither limit nor space their childbearing, but with clear intentions to postpone childbearing by not having children in the immediately foreseeable future (Timæus and Moultrie 2008; Moultrie et al. 2012).

The decline in crude birth and death rates in South Africa from the 1950s in the 2012WPP portray a country that has experienced a significant demographic transition. However, in comparison with the standard depiction of the process of demographic transition, South Africa has followed a rather atypical course. Death rates began to decline in the first half of the twentieth century, and from 1950 to the

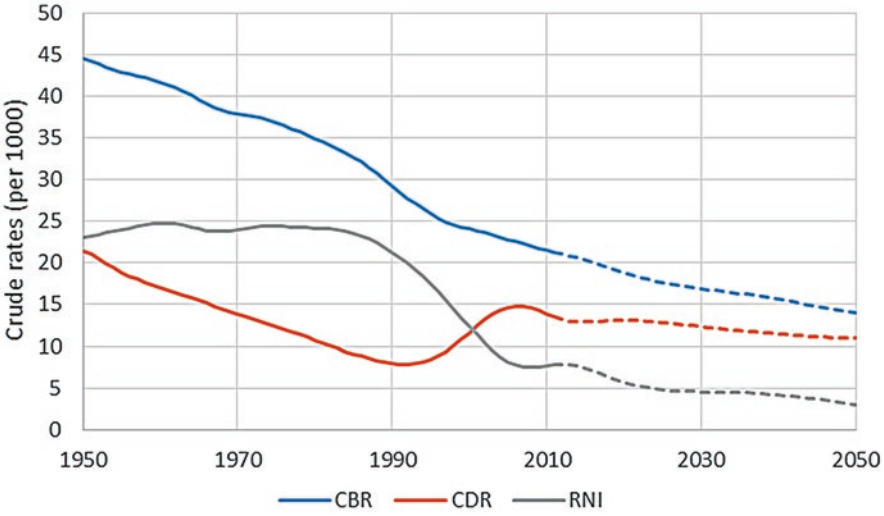

Fig. 1 Crude birth and death rates, and rates of natural increase, South Africa 1950–2050 (Source: 2012WPP. *Dotted lines* represent projections)

mid-1980s, crude birth rates fell in line with crude death rates, resulting in almost constant crude rates of natural increase, of around 2.4% per annum. The rapid spread of HIV, and its associated effects on mortality, saw the crude death rate rise to almost double, from a low of 7.8 per thousand in 1992 to 14.8 per thousand in 2006, while the crude birth rate continued to fall (Fig. 1).

By 2007, the crude rate of natural increase had fallen by almost 70% from its pre-HIV levels, and has fallen still further as fertility continues to decline. In short, the country's demographic transition has been shaped by the effects of HIV.

While the effects of HIV-related mortality have been attenuated significantly by the roll-out of antiretroviral treatment beginning in 2005, the gradual ageing of the population has meant that crude death rates have stabilized. Over the next 35 years, up to 2050, crude death and birth rates are again projected by the UN Population Division to fall gradually, with the birth rates expected to fall faster than death rates, again leading to a reduction in the crude rate of natural increase.

More nuanced indicators of the historical demographic transition can be found by looking at the changes in the age and sex structure of the population. In the mid-1980s, the age-sex structure of the population of South Africa was typical of a developing country, with a broad base, and a very narrow top. The current structure of the population is not typical of a post-transitional country (Fig. 2). The effects of HIV/AIDS can be seen quite clearly, especially among women in their 40s and men in their 50s, as can the rather odd pattern of fertility that would seem to have prevailed in South Africa around the turn of the century. As will be shown, while a slight 'youth bulge' is expected to emerge over the coming 35 years, this is unlikely to represent a cohort significantly larger than those that follow.

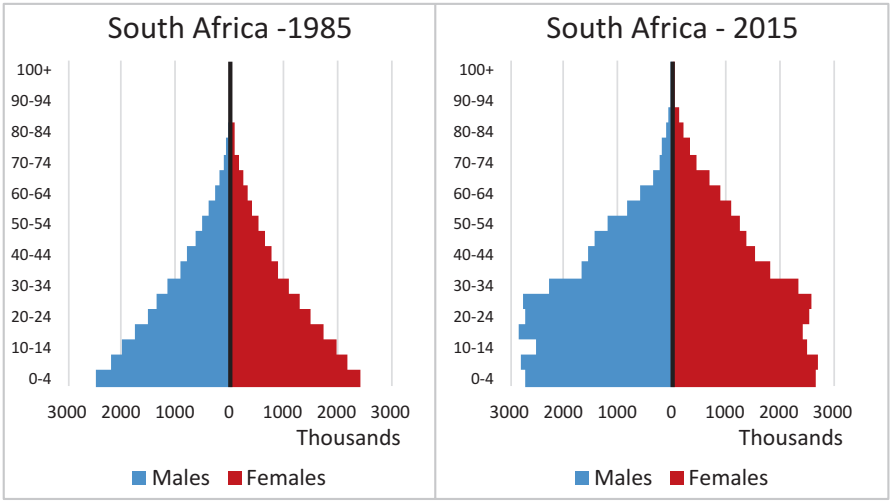

Fig. 2 Population pyramids, South Africa 1985 and 2015 (Source: 2012WPP)

3 The Demographic Dividend: Theory and Criticism

Reverting to one of the earliest expositions of the demographic dividend, Bloom et al. (2002) argue that the demographic dividend is brought about by the changing age structure of the population that typically emerges in the second half of the demographic transition. As fertility and mortality rates fall, they argue, a window is opened up as the proportion of the population that is old and young (defined respectively as those aged 65 and over, and those aged under 15) falls. A tighter definition is offered by the United Nations (2004): that the demographic window that may lead to a demographic dividend is opened when the proportion of the population aged under 15 is less than 30%; and that aged 65 and over is less than 15% of the total population. Economically, Bloom et al. continue, this shifts the balance between net producers (i.e., those who are economically active) and net consumers (those who are not). Under certain circumstances this may have the effect of lifting economic output (i.e., creating economic growth). The shifting balance between production and consumption in a life-cycle framework, and its implications for the demographic dividend, has been explored through the National Transfer Accounts framework pioneered by Lee and Mason (2011) and Mason and Lee (2012).

However, as Bloom et al. observe, the first demographic dividend is ephemeral. As societies pass through the demographic transition, their populations will age, and the 'bulge' of fairly young workers dissipates into a population that is increasingly past retirement age.[2] However, of relevance to us is that Bloom et al. also posit a second demographic dividend, occasioned by the additional resources made

[2] In its own fashion, this ageing is the cause of public policy concern in the developed world but this is several decades away in South Africa's future and need not detain us here.

available for investment by increased numbers of people making private provision for their retirement, which in turn creates capital to fund additional economic growth. There are significant assumptions underlying the transmutation of an essentially mechanical demographic process into an economic bonanza. The essential ones are discussed below.

To bring about the first demographic dividend, populations should ideally be at, or close to, full employment. Failing that, the capacity of the economy to absorb new entrants to the labor market should be sufficient to ensure that unemployment does not increase. If this is not the case, then every year of the demographic window simply adds more people of working age to the population whose labor is not going to be used productively. Bloom et al. express their concerns thus: "At worst, where an increase in the working-age population is not matched by increased job opportunities, they will face costly penalties, such as rising unemployment and perhaps also higher crime rates and political instability" (Bloom et al. 2002: 36). In other words, the first demographic dividend is not a given.

The combination of population, policy, and economics that might bring about the first demographic dividend needs to be considered. Bloom et al. claim that demography accounts for only between 25% and 40% of the East Asian economic 'miracle' (Bloom et al. 2002: 45). Evidently, the momentum of past demographic dynamics is inadequate to the task of explaining in any substantial sense the economic performance of a nation.

Finally, relating to the first dividend, there is a rarely discussed aspect that has a material impact on the possibility of such a dividend emerging, namely, that the rapid shift in the proportion of the population aged 15–64 has to be brought about by a rapid decline in fertility rates, significant improvements in adult (15–64) mortality rates, or both. Where fertility rates change only slowly over time, or where a rapid decline in fertility is offset by an increase in adult mortality, the overall population composition will change only very slowly. The implications of this will become obvious when we look at data for South Africa in the next section.

The conditions necessary for the second demographic dividend are fewer but barely less onerous. For the second demographic dividend to come about, individuals either need to be compelled (or incentivized) into making a greater provision for their retirement while they are working (again, this presumes that individuals have the choice of saving); or the state must move towards a funded public pension scheme, rather than one funded on a pay-as-you-go basis.

4 A Critical Assessment of the Prospects for a South African Demographic Dividend

Putting the theoretical and conceptual weaknesses of the demographic dividend to one side for the time being, it is important to consider the evidence available as to (first) the timing of the demographic window, and (second) the likely magnitude of the benefits that might be captured with specific reference to South Africa.

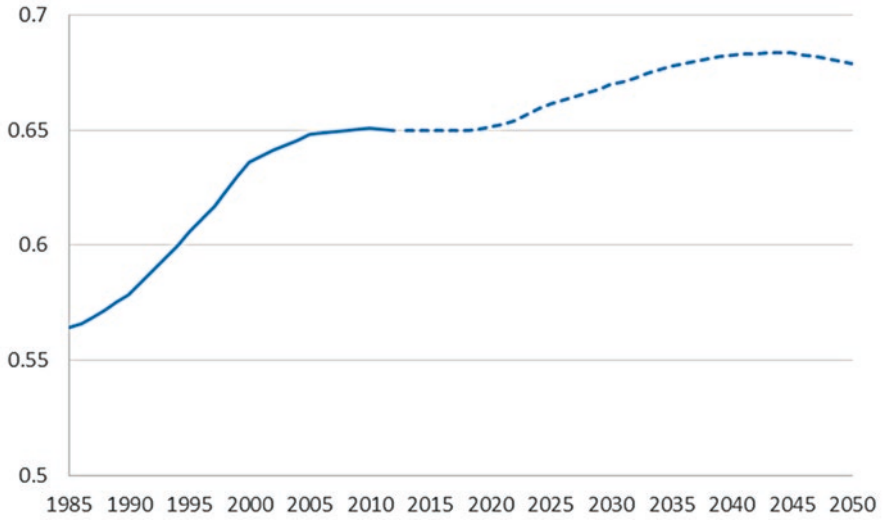

Fig. 3 Proportion of the South African population aged between 15 and 64, 1985–2050 (Source: 2012WPP. *Dotted lines* represent projections)

Figure 3 shows the estimated proportion of the South African population aged between 15 and 64 according to the 2012WPP. The first demographic dividend is brought about by an increase in the share of a country's working age population. The 2012WPP shows a sustained and substantial increase in the proportion of the population of working age between the mid-1980s and 2005, from 56.4% in 1985 to 64.8% in 2005. Between 2005 and 2020, this proportion is projected to remain almost constant, before increasing again to a maximum of 68.4% in 2044, followed by a decrease. By 2015, almost three quarters of the increase in the proportion of the population aged 15–64 that is expected to happen between 1985 and 2044 will already have occurred.

One implication of this slowly changing age structure is that measures of dependency are likely to change only very slowly over the period from 2015 to 2050. The overall dependency ratio will decline from 53.9 dependents per 100 adults aged 15–64 in 2015 to a minimum of 46.3 in 2044, before starting an upwards trend (Table 1). This reversal is directly attributable to the increasing share of the elderly in that population: the dependency ratio among the youth is expected to fall monotonically over the period. By these metrics, the demographic dividend should have begun, continuing for some three decades to come.

According to the narrower measure of the demographic dividend proposed by the United Nations (2004), the 'demographic window' opened in 2009 (when the proportion of the population under the age of 15 fell below 30%) and will remain open for some time past 2050 when the proportion of the population aged 65 and over exceeds 15%. This prolonged open window is an artifice of the measure's criteria. As already noted, the South African fertility decline has been far from

Table 1 Youth, Aged and Total Dependency Ratios (DR) per 100 population aged 15–64, South Africa, various years

	2015	2020	2025	2030	2035	2040	2045	2050
Youth dep. ratio	45.1	43.7	40.5	37.9	35.7	34.2	32.9	31.8
Aged dep. ratio	8.8	9.8	10.7	11.4	11.8	12.3	13.4	15.5
Total dep. ratio	53.9	53.5	51.2	49.3	47.5	46.5	46.3	47.3

Source: 2012WPP

rapid – it has taken nearly 50 years for fertility in South Africa to fall from six children per woman to around 2.5. This means that the rate of change in the structure of the South African population has been necessarily slow, with a commensurately slow decline in the proportion of the population under the age of 15. Compounding the slow pace of decline in the proportion of the population under the age of 15 has been the impact of the HIV/AIDS epidemic, which has greatly reduced the numbers of people aged 15–64. By virtue of the fact of this excess mortality, removal of a proportion from this subpopulation must necessarily increase the proportion in other subpopulations. For essentially similar reasons, the increase in the population aged 65 and over is restricted by the prior additional mortality of adults under the age of 65 – as fewer survive to older ages.

Finally, and related to the other points already made, the demographic dividend presumes the emergence of a 'youth bulge' in the population. For all the reasons outlined above, this bulge is unlikely to emerge in South Africa to any significant degree (Fig. 4).

While the number of working age population is expected to increase from 34.75 million in 2015 to 43.04 million by 2050, it is evident that there will be no obvious 'youth bulge' over this period. Again, this provides some strong evidence that the time for capturing the first demographic dividend might already have passed. The second demographic dividend is likely to prove as chimeric.

However, the quantification of the possible economic benefits of the dividends (Mason 2007) has – to date – only been done on a regional basis. For sub-Saharan Africa, the results from this study offer few, if any, grounds for optimism. For the period from 1970 to 2000, this region was the only one in which the first demographic dividend was negative, while the second was only marginally positive. In large measure, of course, this reflects the fact that few countries in the region have yet opened their 'demographic window'. However, for other regions of the world whose windows were substantially open in this period, the results are not encouraging either. Only the industrial nations, East and South-East Asia, and South Asia had captured a positive effect on GDP measured per effective consumer from the two demographic dividends. In Latin America, the transitional economies of Eastern Europe, and the Middle East and North Africa, the demographic dividend has not been realized. As Mason (2007) notes, the benefits of the demographic dividend do not mechanically translate into economic benefit, and the realization of that economic benefit "is very policy dependent".

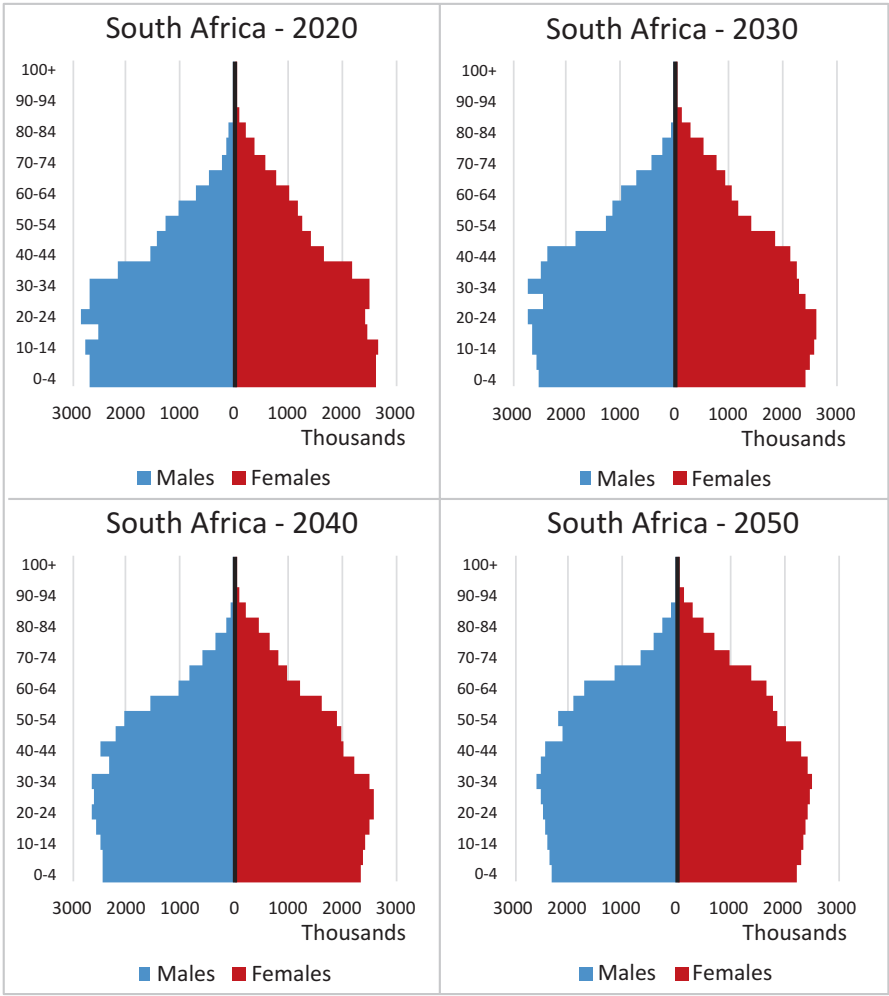

Fig. 4 Population pyramids for South Africa 2020, 2030, 2040, and 2050 (Source: 2012WPP)

Assessments of the scale and magnitude of the demographic dividend in South Africa using the National Transfer Accounts framework (Oosthuizen 2014, 2015) reach the same conclusions, that neither first nor second demographic dividends are inevitable in South Africa and that – in addition – serious interventions in the country's labor markets, as well as its health, education systems, and infrastructure, are required. None of these issues can be resolved overnight, meaning that the scope for a meaningful dividend recedes with each passing year. Furthermore, South Africa is a very long way off from creating a large pool of capital available for investment out of the aggregated pension savings of its workers. The reasons for this are twofold: limited personal saving and an unfunded state pension-scheme.

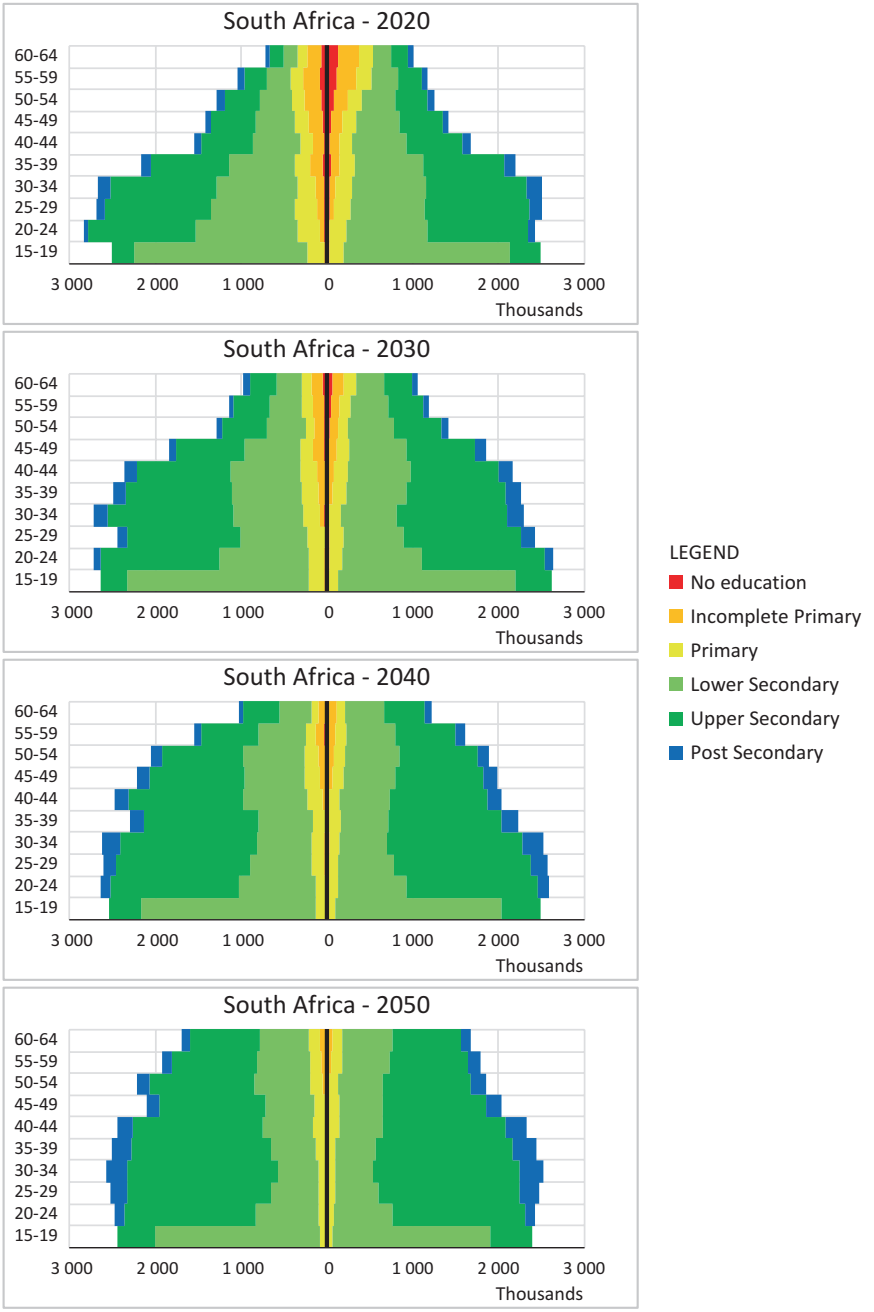

Fig. 5 Population pyramid for South Africa by Educational Attainment, 2020–2050 (Source: KC and Lutz 2014)

Indeed, the structural problems of increasing the rate of human capital formation identified by Oosthuizen are further amplified by the insights gained from the model derived by KC and Lutz (2014) to produce projections disaggregated by level of education in addition to age and sex. The proportional distribution of the population by calendar year, age, sex, and level of education can be combined with the data from the 2012WPP to produce population pyramids for South Africa showing the projected composition of the population by educational attainment for the population aged between 15 and 64 (Fig. 5).

Between 2020 and 2050, it is expected that the overall human capital stock will increase as the proportion of the population with only a primary education or less falls dramatically, and the proportion of the population (of either sex) with upper secondary or post-secondary education increases. By 2050, the vast majority of the working age population will have upper secondary or post-secondary education, although both proportionately, as well as in absolute terms, those with post-secondary education will constitute a very small minority of the population of working age for some time to come. Relative to other countries towards the end of their demographic transition, these levels of human capital are relatively low. Such relatively low proportions of the population with high-level skills, combined with the anticipated poor rates of capital formation, suggest again that the demographic dividend in South Africa is more likely to be illusory.

5 Discussion and Conclusions

While the very slow and gradual pace of fertility decline, coupled with a generalized HIV/AIDS epidemic has meant that South Africa will not be paid a substantial demographic dividend, and quite possibly there will be none whatsoever, there are some positive demographic forces at work in South Africa as it nears the end of its demographic transition. It is worthwhile reflecting on these before moving on to consider some of the implications of what has been argued here.

The first positive demographic force at work is that the total fertility rate (the number of children a woman might expect to give birth to over her reproductive lifespan) is now close to replacement level. Popular wisdom holds that replacement level fertility is around 2.1 children per woman. With the high level of child and early adult mortality in South Africa, women need to have 2.4 or 2.5 children per woman each on average to ensure that at least one daughter survives to become a mother herself. A further consequence of this declining fertility rate is that the rate of population growth has slowed dramatically. It has fallen to around 0.7% per annum currently, and is expected to fall still further – to around 0.3% per annum by 2050. The great unknown is the level of international migration into South Africa; but predicting future trends in this variable is impossible.

Related to this, but perhaps of greater significance still is the fact that – according to the 2012WPP – the high water mark of the number of births in the population was reached in 2010 (around 1.10 million births per annum). It is expected to be

Table 2 Indicators of inequality in education and income, by Population Group, South Africa, various censuses

		African		Coloured		Indian/Asian		White		National
	Year	Male	Female	Male	Female	Male	Female	Male	Female	
Percentage of adults aged 15 and over with less than 7 years' schooling	1996	40.0	41.0	27.5	27.6	7.9	17.4	1.7	1.9	n/a
	2011	20.9	23.2	16.5	16.7	6.4	11.3	1.9	2.0	
Average annual house-hold income by population group of head of house-hold	2001	R22 522		R51 440		R102 606		R193 820		R48 385
	2011	R60 613		R112 172		R251 541		R365 134		R103 204

Source: Statistics South Africa (2012), Tables 3.24 and 3.26

around 0.89 million by 2050. Again, this reflects the very gradually changing age structure of the South African population, its momentum, and very slowly declining fertility rates – but the policy implications are important. In each and every year from now on, fewer and fewer children will be enrolling in schools. If schooling budgets are not cut, but continue to increase in real terms, then real per capita expenditure per pupil will rise rapidly. In turn, this may precipitate a significant shift in the country's stock of human capital and – even without the rest of the demographic dividend – contribute to creating conditions conducive to faster economic growth. This may lead to rather less dismal increases in human capital than those projected by KC and Lutz. Should this be the case, economic growth (the result that the rhetoric of the demographic dividend seeks) may arise organically, even in countries that have missed the opportunity to seize the demographic dividend.

A second implication, which may well run in the direction counter to the first implication described above, is rather less obvious. The projections produced by the UN Population Division, as well as those produced by KC and Lutz ignore heterogeneity in national populations. The pernicious legacy of apartheid social engineering still looms large in South African society, both spatially as well as socially. Delivery of basic health and education, as well as industrial development opportunities, was far worse outside of the major metropoles that were, under apartheid, designated as 'whites only' areas. Despite extensive investment in service delivery, these spatial discrepancies still remain. Similarly, high quality education and health facilities were reserved for white South Africans under apartheid. The levels of human capital are still fundamentally stratified by race, with consequently massive racial disparities in the income generated and wealth accumulated (Table 2). Despite a substantial narrowing in the racial differentials in these two indicators over time,

white South African adults have – almost without exception – completed primary school education, whereas slightly less than four fifths of African adults have done so. Similarly, households headed by white South Africans had more than six times the income of households headed by African South Africans. But the demography of the country differs fundamentally by population group too: fertility rates for white South Africans are far below two children per woman; HIV prevalence is very low. When the likelihood of future demographic dividends is assessed, the rapid ageing (and their concomitant diminution as a proportion of the national population) and the human capital concentrated among white South Africans surely should be taken into account.

A third implication is that much of the policy agenda associated with the demographic dividend requires labor market and wage flexibility. It is neither clear nor axiomatic that the South African policy environment is conducive to such labor market reforms, which have a clearly political context associated with them.

Even if the demographic dividend is unattainable and the neoliberal agenda not espoused in South Africa, other policies should be considered that might bring greater benefit to South Africa, and to place the country in a position where – demographically – it is capable of making full use of the future economic opportunities that it will be offered. Additional effort should also be expended in reducing child and infant mortality rates (over and above being one of the Millennium Development Goals, keeping children alive represents one of the soundest investments in the country's demographic and economic future); public health policies could be implemented to reduce the burden of disease (communicable, infectious, and diseases of lifestyle) among adults; efforts could be made to improve and reform the wasteful and inefficient primary, secondary, and tertiary education system.

The demographic dividend is likely to prove a mirage in South Africa; demographic momentum means that changes in the overall distribution of the South African population will be slow to materialize. The anticipated 'youth bulge' is unlikely to materialize to any significant degree, and the period of most rapid growth in that bulge is already behind us. Given the lead time required for changes in education policy and practice to have a material impact on the adult lives of current and future learners, the demographic window will be all but shut, even if remedial action were begun today. However, being at the end of a demographic transition may hold and confer economic benefits that can yet be captured.

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Fertility Transitions and Schooling Dividends in Sub-Saharan Africa: The Experience of Vanguard Countries

Parfait M. Eloundou-Enyegue and Noah Hirschl

1 Introduction

The debate on the consequences of Africa's fertility transitions has now reached a turning point where it can shift from speculation to evidence. In the few countries where fertility fell below 3.5 births per woman, the impacts (if any) of these declines should be increasingly visible. Do these vanguard countries show any evidence of a demographic dividend? Conversely, do countries lagging in their demographic transitions also lag economically? Ultimately, how central is demographic change to the recent economic fortunes of African countries?

These questions matter in the debate on the causes and consequences of African fertility transitions. When these transitions began in the 1990s, they were expected to occur uniformly across all ages and socioeconomic groups (Caldwell et al. 1992), but instead they now unfold in a two-tiered pattern that begins among urban middle classes before trickling down to lower socioeconomic (SES) groups (Shapiro and Tambashe 2002; Gandesbery and Giroux 2015). The onset of African transitions also raised the possibility of a first demographic dividend, such as has occurred in Asia (Bloom et al. 2002, 2009). A demographic dividend (DD) would be timely as Africa pursues its ambitious 'Sustainable Development' goals but, unfortunately, studies of DD face two methodological hurdles: one is about internal validity, and the high analytical standards required to establish causation. The other is ecological and external validity, i.e., having results that speak both to national-level concerns and specifically to individual countries. Few methods simultaneously overcome these two hurdles. The resulting quandary – between an academic premium on rig-

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orous design and causal methodology versus a policy preference for country-specific and national-level outcomes – has typically meant a tradeoff in which researchers overcome one hurdle but not the other.

To address this bind, a few studies innovate by integrating micro-level data or elementary processes in estimating aggregate dividends. Such methods include national transfer accounting (Lee and Mason 2011) or simulations mixing age composition data with micro-estimates of demographic effects on economic outcomes (Ashraf et al. 2013; Canning et al. 2015). However, these methods are very data intensive and therefore not widely applicable.

We propose simpler decomposition methods with more modest data requirements. While these methods mostly capture the mechanical components of dividends rather than causal impacts, they present three generic advantages: they permit a broader historical and geographic coverage of national experiences; their focus on the mechanical component of the dividend does in fact fit a strict definition of the dividend; they can be extended to also cover the behavioral aspects of dividends, if data on causal parameters is available (Eloundou-Enyegue and Giroux 2012, 2013).

Additionally, and most important for this chapter, decomposition methods can easily be applied to investigate multiple aspects of demographic dividends beyond GDP growth. In our case, we focus on dividends in the realm of schooling, specifically growth in public spending per pupil. Schooling dividends, we argue, are worthy of interest. Schooling is a recognized driver of economic growth and as such, is well represented in the United Nations' compacts to advance global development (United Nations 2015). Furthermore, schooling and public investments in schooling bear on future fertility as well as inequality among children in Africa (Bledsoe et al. 1999; Lloyd 1994). Finally, growth in spending per pupil – the specific outcome explored here – also depends on gains GDP per capita. In sum, Africa's schooling dividends are expected to have secondary effects on other development outcomes such as economic growth, inequality, and demographic transitions.

The schooling indicator used in this study – public education spending per pupil – can be criticized for being a poor marker of schooling progress (Hanushek 1997). However, part of the inadequacy reflects the multidimensionality of schooling progress, i.e., whether one focuses on quantity versus quality, further recognizing that either dimension comprises several sub-components. Quantity, for instance, covers trends in enrollment, retention, and graduation rates. Quality on the other hand, may include both the investment (returns to schooling) and consumptive aspects of schooling, such as learning or the overall appreciation of the educational experience. Given these many layers, it is hardly surprising that any indicator – including public spending per pupil – would be incomplete. There are, however, two other, more specific, reservations about our indicator. First, even where access to primary education is free, parents (rather than national governments) may bear the costs of books, uniforms, or transportation. Second, whether the budgets officially allocated to education make a difference depend on how efficiently these resources are applied, and many schools are found to succeed against the odds (Christie 2001). Nonetheless, the logic used in this study mirrors the *ceteris paribus* assumption that animates the entire dividend argument. The dividend assumes that *other things being equal*, a lower dependency burden should open greater room for saving and

investment – even as one recognizes that this opportunity can be lost if channeled towards unproductive consumption or debt servicing. In the same manner, we argue that, *everything else being equal (including efficiency)*, more resources per capita give schools a better opportunity to improve outcomes. The rest of the document uses schooling dividends as shorthand for the increase in public spending per pupil, even as we acknowledge the limitations of this indicator.

Using decomposition methods, we examine the magnitude, relative importance and contextual variation of schooling dividends among the vanguard countries of Africa: (1) How large are the dividends observed in these countries? (2) How large are these dividends compared to the influence of other policies or socioeconomic change? (3) Which national circumstances foster a large dividend?

The remainder of the chapter is structured in three sections focused on background (Sect. 2), conceptual/methodological aspects (Sects. 3 and 4) and findings and discussions (Sect. 5). The background discussion covers the drivers and patterns of fertility transitions. The middle section reviews the conceptual framework, methods, and data to estimate the dividend. The final section concludes with tentative answers to the questions raised in this chapter and their implications for the central theme of this book.

2 Selected Countries

This chapter analyzes the experiences of Botswana, Cape Verde, Lesotho, Namibia, Mauritius, South Africa, and Swaziland, seven countries chosen for their early fertility transitions. By the year 2012, these countries had all fallen below a national fertility rate of 3.5 children per woman, in contrast to several West African countries where fertility rates still hovered above 6 children per woman. Underneath their broad similarity, these vanguard countries differ in important ways. Mauritius, for instance, has a much lower fertility rate (1.4) and its transition began in the 1970s. Total fertility rates among other vanguard countries range from 2.4 in South Africa to 3.4 in Swaziland, with most countries (except South Africa) initiating their transition in the mid-1980s. The transition thus began in the midst of an HIV/AIDS crisis that could have precluded capturing any dividend by: (1) raising adult mortality and thereby negating the reduction in age-dependency ratio on which dividends depend; (2) draining resources away from productive investments; and (3) dampening the national commitment to lower fertility. Though the HIV/AIDS epidemic was pervasive, infection rates varied across countries, and so did the trends in child mortality, with a few African countries experiencing surprising reversals at the turn of the century.[1] How these various circumstances affect the dividend merits discussion.

[1] In sub-Saharan Africa, most countries saw relatively small declines in child mortality (less than 20%). Only Gabon and The Gambia achieved over 40% reduction during the last two decades. Countries with only a very modest decline (0–10%) included Burundi, Lesotho, Madagascar, Mauritania, Nigeria, Sierra Leone, and the United Republic of Tanzania. However, some countries experienced an increase in child mortality, including Botswana (16%), Namibia (4%), Niger (1%), Zambia (9%), and Zimbabwe (15%) (World Health Organization 2000).

Along with health crises, much of the region was facing a marked economic downturn in the mid-1980s but again, these crises differed in timing and intensity (Eloundou-Enyegue et al. 2000). Altogether, differences in the experiences of vanguard countries help clarify the circumstances under which DD emerge.

3 Drivers and Patterns of Fertility Decline

To avoid spurious interpretation, a full assessment of demographic dividends must begin with the roots of the fertility transitions themselves: if vanguard countries were already different from lagging countries, the later variation in outcomes could well stem from initial differences, rather than any independent impact of transitions. In other words, the better economic conditions observed among vanguard countries could be cause rather than consequence. Understanding the contexts under which fertility declined also helps investigate which social conditions promote a large dividend.

In theory, people must be "ready, willing and able" to embrace fertility limitation before a large-scale fertility transition begins (Coale 1973). The larger question, however, is how this readiness depends on economic, cultural, and policy forces (Bongaarts and Watkins 1996; Bryant 2007). Economic factors alter the demand for children via the costs and benefits of high fertility. Cultural changes induced by education or globalization do likewise alter the ideals of family size and parental investment in children (Caldwell and Caldwell 1987; Cleland and Wilson 1987; Bongaarts and Watkins 1996). Once fertility preferences change, their actualization further depends on available family planningservices. In sum, economic, cultural, and policy factors combine in complex ways. Even if root causes are hard to disentangle, it is useful to describe the circumstances under which fertility transitions began among vanguard countries. Compared to the rest of the region, these vanguard countries were, on average, more advanced in terms of their GDP per capita, schooling, and urbanization (World Bank 2014).

Beyond the drivers, the patterns of fertility declines deserve attention as well. One issue is homogeneity and the extent to which African fertility transitions occur in lockstep (Caldwell et al. 1992) or, instead, begin among higher SES groups before trickling down (Shapiro and Tambashe 2002). Gandesbery and Giroux (2015) reconcile these two scenarios by suggesting that fertility preferences might have declined homogeneously (consistent with Caldwell's expectation), but the declines in actual fertility did not (consistent with Shapiro and Tambashe 2002). In other words, aspirations change widely, but actual fertility changes faster among higher SES groups, perhaps reflecting greater access to family planning.

Another issue is the possibility of stalled declines, as was possibly the case in Kenya and Ghana. To compare the timing, pace, and steadiness of African fertility transitions, Fig. 1 shows the trends in age structure among vanguard countries as compared to the region's average. Figure 1 clearly shows how age dependency first declined among vanguard countries, compared to the rest of sub-Saharan Africa.

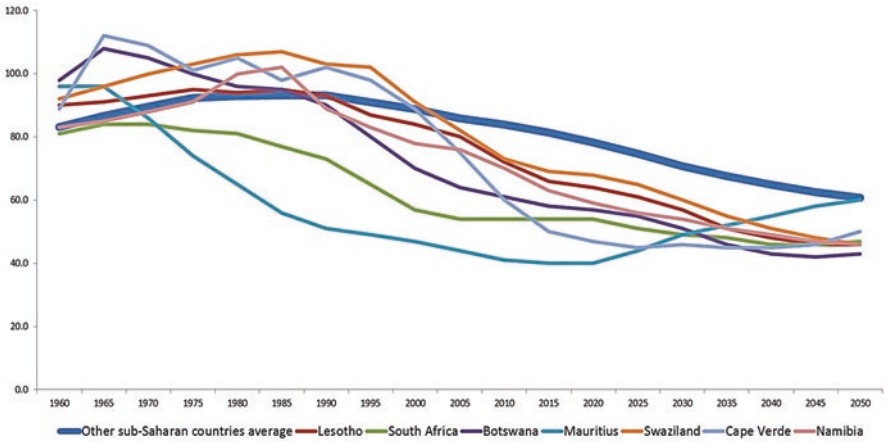

Fig. 1 Trends in age dependency ratios: African Vanguards vs. other sub-Saharan Countries (Source: United Nations 2015)

Indeed, age dependency ratios have begun to inch back up in a few leading countries, most notably Mauritius.

4 Achieving a Demographic Dividend

How is a demographic dividend achieved? The dividend-production process can be described as a five-step sequence involving changes in: (1) fertility, (2) age dependency, (3) *economic* dependency, (4) savings and investment, and (5) positive economic outcomes, including in the realm of schooling and public investments in schooling, as investigated here. By focusing on individual steps, this conceptual framework systematically highlights the many contextual forces shaping the production of a dividend. The first transition (from fertility reduction to lower age dependency) depends on trends in child and adult mortality, while catalysts of the second transition include trends in child labor and adult unemployment; in the third transition, the performance of the national economy and public budget-making processes become paramount; finally, completing the last step depends on the efficiency of sector-specific policies. This five-step process can also be summarized in two key phases, including the *production* of a resource opportunity (steps 1 through 3) and the *transformation* of this opportunity into positive outcomes (steps 4 and 5).

This simple framework supports two complementary analyses to answer this chapter's questions about dividends in the region. The first analysis is to compute 'conversion coefficients' that help track how smoothly various countries progressed through the dividend-production process. The idea in this analysis, which is described in detail elsewhere (Eloundou-Enyegue and Giroux 2013), is to see how change in one step is followed by proportional change in the next. Any step showing

a much less-than-proportional change is viewed as bottleneck in the country's transition. This first analysis thus identifies the step in the process where individual countries stumble. The second analysis used decomposition methods to apportion the changes in national outcomes (specifically schooling) in terms of changes in age structure and other factors. Decomposition is possible for any outcome that can be expressed as a mathematical or statistical function of age structure and other relevant variables. In our case, the outcome of interest (public education spending per pupil) is a function of national GDP, age structure, and share of the national budget allotted to education.[2]

A decomposition analysis thus shows, in accounting terms, the absolute and relative contributions of changes in age structure. In other words, it shows the absolute and relative magnitude of national dividends. Again, the detailed results of our decomposition analyses are given elsewhere (Eloundou-Enyegue and Giroux 2013), and only key findings are excerpted here.

5 Findings

5.1 Are Dividends Automatic?

The answers to this first question considered three complementary criteria, including: (1) whether all the vanguard countries achieve a demographic dividend, (2) conversely, whether all the lagging countries failed to register any sizeable progress, and (3) once a country registered a large decline in fertility, whether the remaining steps in the dividend-production process followed automatically. These three criteria were applied in investigating both schooling and economic dividends.

Looking first at schooling, the study countries fell in four groups, depending on whether they achieved large gains (>$150 per child over the entire period), modest gains (0 to $25 or $25 to roughly $100), or losses, respectively. As this breakdown suggests, there was a gap between the first and the second group. Importantly, the list of countries achieving the largest gains in schooling exactly matched the list of countries at the vanguard of fertility declines (Eloundou-Enyegue and Giroux2013). Yet, a handful of nations (including Mali and Burkina Faso, in the second group) managed to achieve notable gains in schooling without the benefit of a large decline in fertility. Most of the countries lagging in fertility transitions fell in the third category or at the bottom of the second category (Chad and Niger). Indeed, some of

[2] The average schooling resources per pupil (r) depends on the total national resources (G), the share of this budget that goes to education (k), and the size of the school age population (n). Roughly, r = Gk/n. Taking age dependency (p) as the proportion of children compared to the total working age (adult) population (n/N), then r = gk/p where g is (G/N), the national income over the total adult population. The analyses were based on national statistics on fertility rates, age dependency, education budgets, and economic performance (World Bank 2014). The resource commitment to children's education was measured by the share of Gross National Income (GNI) allocated to education. It averaged 4.7% for the whole of SSA in 1990, but declined to 3.8% by 2005.

these countries (Zimbabwe, Côte d'Ivoire, and the Central African Republic) would have registered even steeper declines in spending per pupil in the absence of their (modest) decline in fertility. In short, declines in fertility were consistently associated with gains in spending per pupil, even as some countries achieved some schooling gains despite slow fertility transitions.

Looking next at the dividend-production process, we sought to identify the main stumbling blocks. For all but a few countries, the process was not automatic. Even after achieving some decline in fertility, several countries struggled to convert this decline into economic growth or improved schooling. The most common hurdle was the transition from lower economic dependency to higher savings and investment rates (step 3). This hurdle did not stop the process as much as slow it, resulting in a smaller dividend than would have occurred otherwise. Zimbabwe was one clear case of a country stumbling on this third step, as a result of the country's economic downturn.

5.2 Magnitude of Dividends

Even if fertility declines are systematically associated with improved economic conditions, does the magnitude of these contributions warrant policy attention to dividends as a key ingredient in Africa's efforts to achieve Millennium Development Goals' objectives? To answer this question, we consider both the absolute and relative contributions of age dependency to the region's gains in schooling and economic growth. Looking first at schooling, the average spending per pupil increased by $108.4 between 1990 and 2010, but wide variations were found across countries. The gains exceeded $150 in Botswana ($988), Mauritius ($763), South Africa ($507), Swaziland ($206), and Lesotho ($166). A second rung of ten countries saw smaller but still substantial changes, between $25 and $94. Below, eleven countries saw even smaller (below $25) changes in r values, and the remaining countries (four) saw a decline. The greatest losses in *r* occurred in Zimbabwe (−$160) and Côte d'Ivoire (−$59) (Eloundou-Enyegue and Giroux 2013).

It is useful to examine these contributions in relative terms. Compared to other factors, how dominant is the influence of changing age structure? Decomposition analyses usefully express individual contributions in percentage values. For the region as a whole, the dominant source of gains in spending per pupil was the economic performance of countries (71%). About a quarter (25%) of the gain stemmed from changing age structures, and the rest (5%) from budget choices. Clearly, these gains in schooling were primarily driven by economic progress but the trends in age structure made a substantial contribution. Here also, there are large variations across countries. In the vanguard countries (those experiencing per pupil spending gains over $150 during that period), the contributions of age dependency were all positive and averaged a substantial 42%, ranging from 26% in Lesotho to 70% in South Africa.

Even in countries experiencing a decline in average spending per pupil, age dependency had a positive influence, insofar as it prevented an even steeper decline. In sum, the declining age dependency during this period generally contributed to boost children's public education resources (on a per capita basis), even if its positive effect was at times overshadowed by adverse economic or policy trends. In general, countries with the largest gains in schooling did so with balanced contributions from economic growth, lower age dependency, and budget commitments to education. In countries where spending per pupil declined, economic downturns (e.g., Zimbabwe) or reduced public commitment (e.g., Côte d'Ivoire) were usually the primary factors.

One can also assess the magnitude of dividends by how much they bring African countries in greater convergence with the rest of the world. The result showed that even when African countries nominally improved their levels of spending per pupil, they did usually not gain ground relative to the world average. Only six cases (Botswana, Mauritius, Cape Verde, Swaziland, Lesotho, and Ghana) were an exception to this rule.

5.3 Contextual Dependency

Previous studies of the dividend agree on the importance of contextual dependency. However, beyond a generic conclusion that "the magnitude of the dividend depends on context", few studies clearly point to specific contextual features. These key bottlenecks can be identified by monitoring individual steps in the production of dividends. Over the study period and among all countries initiating a fertility decline, the key obstacle to a large dividend was the conversion of low age dependency into larger savings and investments.. Perhaps because of a backlog of basic needs, debt servicing, or national budget priorities, some of these countries were unable to boost savings and investments. From that perspective, a political commitment to make productive investments during the transition is paramount. One step down the line, countries must also devise effective policies to convert the additional investments, however slim, into positive outcomes.

6 Summary and Conclusions

Researchers can begin to investigate demographic dividends in Africa by focusing on the experience of vanguard countries. The birth rate among these vanguard countries has now fallen below 3.5 children per woman. Given this decline, can one already find clear signs of a dividend? Using historical data and decomposition methods, we examined the contributions of recent (roughly, 1990–2010) demographic changes to the national gains in public spending per pupil. The results for schooling show large improvements in spending per pupil among all vanguard

countries, where spending per pupil increased by anywhere from $166 to nearly $1000 in the period from 1980 to 2008. These gains were much larger than those registered in other nations. While a few countries managed to improve schooling outcomes in spite of slow fertility declines, their gains would likely have been larger under more favorable demographic trends.

Altogether, the recent demographic changes in the region made sizable contributions to schooling improvement. We found a clear demographic impact on socioeconomic trends, but it is equally clear that demographics were not the dominant influence. In explaining the gains in education spending per pupil, the dominant factor was the rate of economic growth. As a final caveat, the dividend is not automatically large. Our step-by-step analysis of the dividend-production process suggests that once a country achieves a sizeable decline in fertility, the most likely stumbling block is the transformation of the resulting low economic dependency into greater savings and investments.

Although our study focuses on the mechanical effects of demographic change, and on schooling outcomes, other studies corroborate the findings highlighted here. For instance, Canning et al. (2015) suggest that the dividends in terms of economic growth may indeed be larger than expected once feedback effects are fully considered. In a related study (Eloundou-Enyegue et al. 2015), we explored the influences of fertility transitions on GDP inequalities between African countries. Results showed that between 1990 and 2010, the GDP inequality between African countries grew by about 18%, with differentiation in age structure accounting for 25% of this economic divergence. Furthermore, countries making the largest contributions to the region's GDP inequality were mostly those at the very vanguard (e.g., South Africa) or at the rear of the fertility transition (e.g., the Democratic Republic of the Congo).

Circling back to the broad questions raised by this book, African fertility transitions do represent a historical opportunity to achieve national development goals, and the signs of a dividend are emerging in vanguard countries. Indeed, our analyses likely underestimate the size of the dividend, given our narrow focus on mechanical influences of age structure and the quantitative aspects of demographic change. Beyond family size and age dependency, African societies are undergoing other, more qualitative, changes in the timing, spacing, and distribution of fertility across classes, as well as the family contexts in which fertility occurs. These additional changes can influence the momentum of population growth, the actual dependency burden, or the levels of schooling inequality among children and, therefore, economic inequality in the next generation.

Our results caution against the Manichean, "gloom-or-bliss" terms in which population debates are occasionally framed. There are three reasons to question such a simple approach. First, a decline in fertility is not universally a necessary condition to short-term growth: over the study period, a few African countries achieved economic progress in spite of slow fertility declines. Second, the magnitude of dividends is contextually variable: we found substantial variation in outcomes among both vanguard and lagging countries, and this variation might be even wider if analysis extends beyond this study's narrow focus on schooling dividends. Third, there

Table 1 Fertility rates by household wealth quintiles in various Vanguard Countries

	Lesotho		Namibia		South Africa	Swaziland
	2004	2009	1992	2006–2007	1998	2006–2007
Lowest	5.2	5.9	6.9	5.1	4.8	5.5
Second	4.5	4.3	7.2	4.3	3.6	4.9
Middle	3.8	3.8	5.9	4.1	2.7	3.9
Fourth	3.4	2.5	4.8	2.8	2.2	3.3
Highest	2	2	3.6	2.4	1.9	2.6

Sources: Demographic and Health Surveys, compiled by the authors

are internal inequalities in the distribution of dividends. Most fertility transitions of the region show a steep SES gradient, with fertility gaps between the top and bottom SESquintiles reaching 2.5 or even 3 children. This gradient remained high even in our vanguard countries where fertility transitions were most advanced (see Table 1). As Table 1 shows, the ratio of fertility for the bottom versus top quintiles were 5.9/2 in Lesotho (2009), 5.1/2.4 in Namibia (2007), 4.8/1.9 in South Africa (1998), and 5.5/2.6 in Swaziland (2006–07). In other words, a 'gloom-or bliss' story obscures the large diversity of situation across and within countries.

These gaps warrant concern about growing economic inequality within countries. When differences in fertility are compounded by differences in income, cultural capital, and social capital, they exacerbate inequality in the resource endowments of children. In turn, inequalities among children sow future economic inequality. As the current generation of children grows up, it is poised to experience vast inequalities in child health, education, and ultimately, economic opportunity. Although these later economic inequalities among young adults stand to attract more public and political attention, it is well to remember that they are being created now. Insofar as extreme economic inequality can be considered a social threat, it is a threat with a long fuse rooted in childhood inequality. African countries can avert these future inequalities, while also fostering an economic dividend, by addressing current inequalities in fertility and early childhood.

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Countries with Fertility Transitions in Progress

Jean-François Kobiané and Moussa Bougma

1 Introduction

In comparison with other developing regions, sub-Saharan Africa (SSA) has not yet completed its demographic transition. To some extent, this situation reflects the specific historical context of the continent, where mortality has rapidly decreased since the end of the 1950s, while in many countries, due to the socio-economic, cultural, and political context, fertility has been taking more time to follow a similar trend. However, this general pattern of fertility in sub-Saharan Africa hides diversities within the continent and even within each country.

This chapter is dedicated to SSA countries where we have seen a continuing decline in fertility over the past decades, and analyzes some socio-economic and contextual factors that have been the driving mechanisms of the fertility decline. Over the past 30 years (1980–2012) as shown in Fig. 1, there has been a continuing decline in fertility in 14 countries in sub-Saharan Africa, and these countries are from different linguistic blocs and located in diverse regions of the continent. For the purpose of this chapter, we have selected five countries, representative of this diversity, in order to highlight the explanatory factors behind the observed trends. These countries are Benin (Francophone) and Ghana (Anglophone) both located in West Africa, Gabon (Francophone) located in Central Africa, Kenya (Anglophone) and Rwanda (Francophone/Anglophone[1]) both located in Eastern Africa. Because the analysis of fertility and its determinants is based on data from Demographic and Health Surveys (DHS), another criteria was that the country had undertaken at least two DHS surveys.

[1] Rwanda, a former protectorate of Belgium, has had French as its official language for a long time, but decided a few years ago to switch to English as its official language.

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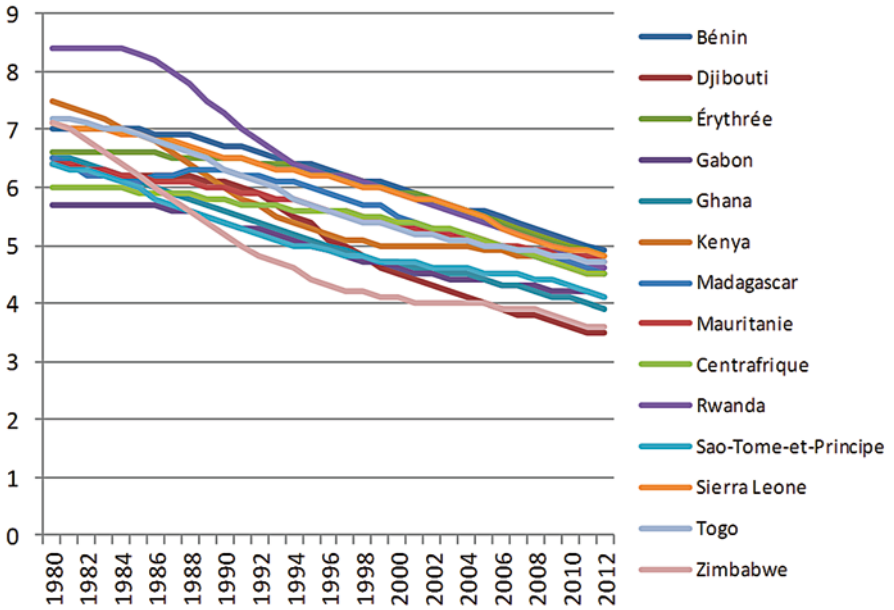

Fig. 1 Total Fertility Rates (TFRs) for 14 Countries in sub-Saharan Africa (Source: United Nations 2015)

The chapter is structured as follows: Section 2 presents the socio-economic context of the countries being studied. In Sect. 3, we present the fertility level and trends. Section 4 examines the trends of some of the intermediate or proximate determinants of fertility as well as some indirect contextual factors such as education. Finally, in Sect. 5 we examine the prospects of the evolution of fertility in the five countries for the next 30 years (2020–2050), using the 2015 UN Population Division revised projections.

2 Socio-economic Context of the Countries Studied

Benin is a French-speaking country located in West Africa that became independent on August 1, 1960. The country entered into a democratization era (with regular presidential elections) on December 11, 1990, with the adoption of a constitution (Institut National de la Statistique et de l'Analyse Économique and ICF International 2013). There were 9,983,884 inhabitants in 2013 according to preliminary results of the last general census of the population and housing (RGPH). Compared with the results of the previous RGPH (2002), the Beninese population has experienced a faster growth over the last 10 years, namely a growth rate of 3.5% in the period from 2002 to 2013, against 3.25% for the period 1992–2002 (Institut National de la

Statistique et de l'Analyse Économique 2013). The country's main economic engine is agriculture, which occupies 47% of the workforce. The main food crops grown are maize, yam, cassava, bean, millet, and sorghum and the largest export products are cotton, peanut, palm kernel, and palm oil. The secondary sector (industry) contributes only 13% to the gross domestic product (GDP), as opposed to 55% for the tertiary sector and 32% for the primary sector (see INSAE 2006, quoted by Institut National de la Statistique et de l'Analyse Économique and ICF International 2013).

To address population issues that were already visible from the RGPH 1992, the Benin government adopted a population policy contained in a document called "Depolipo" (Population Policy Statement) on May 2, 1996, whose objectives are, among others: (i) to ensure a quality education for all Beninese; (ii) to increase life expectancy from 54 years in 1992 to 65 in 2016; and (iii) promote responsible fertility (Institut National de la Statistique et de l'Analyse Économique and ICF International 2013). However, until 2003, literature relating to contraception was still forbidden in Benin by the 1920 French Law, although some family planning activities were conducted in the country by non-governmental organizations. The oldest of these is the Beninese Association for the promotion of the family (ABPF), which has existed since 1970. It was only on March 3, 2003 that the Benin Government adopted a new Act (Act No. 2003-03) on sexual health and reproduction, repealing the 1920 Law. The objective of this new Act is to give everyone the right to be informed and use the method of family planning of their choice (Institut National de la Statistique et de l'Analyse Économique and ICF International 2013).

Ghana is also located in West Africa. It is an English speaking country independent since March 6, 1957, with a constitution in place since July 1st, 1960. In 2010, the total population stood at 24,658,823 inhabitants, with a growth rate between censuses of 2.5% over the period 2000–2010. Compared to previous censuses, the growth rate of the Ghanaian population was almost stable over a long period, as the annual growth rate was 2.4% between 1984 and 2000, and 2.7% between 1970 and 1984 (Ghana Statistical Service 2012). Agriculture, which employs 50% of the population (Ghana Statistical Service 2002) and contributes 34% to the gross domestic product (GDP) (Ghana Statistical Service 2008), remains the most important sector of the country's economic activity. It is followed by the services sector, which accounts for a third of the GDP and the industrial sector, which contributes 26% to the GDP (Ghana Statistical Service 2008).

Ghana adopted a population policy in 1969 whose main objective was to reduce population growth at a rate of 2% per year in 2000. A program called *Ghana National Family Planning Program* (GNFPP) was established for this purpose to provide family planningservices in hospitals and clinics to couples who wanted to limit or space their births. The 1969 national population policy (NPC) was revised in 1994, with the following main objectives: (i) to reduce the average number of children per woman from 5.5 in 1993 to 5.0 in 2000, 4.0 in 2010, and 3.0 in 2020; (ii) to achieve a prevalence rate of modern contraception of 15% in 2000, 28% in 2010 and 50% in 2020; (iii) to reduce the growth rate of the population of about 3% per year to 1.5% by 2020; and (iv) to increase life expectancy from the current level

of 58 to 65 years in 2010 and 70 years in 2020 (Ghana Statistical Service, Ghana Health Service, and ICF Macro 2009).

Gabon is a French speaking country in Central Africa. A former French colony, it became independent on August 17, 1960 and its total population was estimated at 1,500,000 in 2010. One of the particularities of Gabon is the fact that 80% of its population lives in urban areas, with the capital city of Libreville alone containing 40% of the total population (Direction Générale de la Statistique and ICF International 2013). Economically, Gabon is a country with abundant natural resources. It exports-manganese, oil, gas, timber, and other products of the soil and subsoil. With a good macro-economic performance and GDP per capita estimated at 12,249 US dollars in 2011, Gabon is classified as a middle-income country in the top bracket and ranks 3rd in the African ranking. Despite these advantages, however, the incidence of poverty is 33% nationally in Gabon as highlighted in the 2005 survey on poverty (Direction Générale de la Statistique et des Études Économiques 2005).

There is still no institutionalized population policy with well-defined objectives that can be assessed. However, on November 24, 1998 Gabon has signed a draft document with the UNFPA for setting up a national population policy. The basic principles of this population policy are, among others, the increase of the size of the population and promotion of family planning (Direction Générale de la Statistique et des Études Économiques and ORC Macro 2001; Direction Générale de la Statistique and ICF International 2013).

Kenya is an English speaking country located in East Africa. It has been independent since December 12, 1963 and its population stood at 38,610,097 inhabitants in 2009, an increase of 35% compared to the figures enumerated in 1999 (Kenya National Bureau of Statistics 2010). The growth rate of the Kenyan population has accelerated over the last decade; the results of previous censuses indicate that the annual growth rate of the population was 2.9% per year during the 1989–1999 period. Kenya's economy is primarily agricultural with a fairly strong industrial base, but the agricultural sector's contribution to the GDP has declined over time. Indeed, the contribution of agriculture to GDP was over 30% during the period 1964–1979, but decreased to 25% in 2000–2002. In 2007 and 2008, the contribution of the agricultural sector to the GDP was 22% and 23%, respectively. With 45% of exports in 2008, coffee, tea, and horticulture (flowers, fruits, and vegetables) are the main export crops. The manufacturing sector also contributes significantly to the export earnings of the country but its contribution to GDP has been stable over the past decades (10% in 1964–1973 and 11% in 2008) (Kenya National Bureau of Statistics 2009).

In terms of population policy, an association called *Family Planning Association of Keny*a (FPAK) was created in 1957 by individuals, but it was in 1967 that Kenya adopted an explicit population policy. After the second census of 1969 in which the level of fertility was considered very high, the government of Kenya decided to launch a family planning program of 5 years (1975–1979). The specific objectives of this program were to reduce the annual growth rate of the population, from 3.3% in 1975 to 3.0% in 1979 and to improve maternal and childhealth (Kenya National Bureau of Statistics and ICF Macro 2010). However, the family planning component

of the maternal and child health program has had limited success. The results of the 1979 census showed a population growth rate of 3.8% per year, which was higher than the projected growth rate of 3.0%. The national population policy was revised in 1984 and again in 2000, and its objectives were, among others: (i) to minimize the decline in life expectancy at birth for both sexes, from 58 years in 1995 to 53 years in 2010; (ii) to stabilize the population growth rate to 2.1% per year by 2010; (iii) to reduce the average number of births per woman from 5.0 in 1995 to 4.0 in 2000, 3.5 in 2005, and 2.5 in 2010; and (iv) to increase the contraceptive prevalence rate (all methods) from 33% in 1993 to 43% in 2000, 53% in 2005, and 62% in 2010 (Kenya National Bureau of Statistics and ICF Macro 2010).

Located in the Great Lakes region, Rwanda was until recently a French speaking country before becoming an English one. The country became independent on July 1st, 1962 and adopted its constitution on June 10, 1991. It has undergone major political crises, the most tragic one being the Tutsi genocide in 1994 that claimed about million victims (National Institute of Statistics of Rwanda, Ministry of Health, and ICF International 2012). In 2012, the Rwandan population was 10,515,973 inhabitants, of which 83% lived in rural areas. Since the 2002 census, the population increased by 2.4 million, representing an average annual growth rate of 2.6%. Thus, the population growth rate has been accelerated over the last decade, after the decline it had experienced in the 1990s. During this period marked by war and genocide (1991–2002), population annual growth had fallen to 1.2% (National Institute of Statistics of Rwanda 2014). At the economic level, major efforts were made in Rwanda to develop the services sector and stimulate investments in the industrial sector. These efforts bring positive results today, since the services sector contributes more than the agricultural sector to the economy in recent years. In 2010 for example, the services sector's contribution accounted for the largest share of GDP (47%). It was followed by the primary sector (32%) and the secondary sector (15%) (National Institute of Statistics of Rwanda, Ministry of Health, and ICF International 2012).

In terms of population policies, Rwanda first developed a family planning initiative in 1982. This was followed by the adoption of an initial population policy in 1990, with the objectives of curbing population growth and reducing fertility by promoting family planning. In 2003, a second population policy was adopted with a broader objective of improving the quality of life of the population. To create an enabling environment for behavior change (which would result in lower fertility rates), other elements have been included in the population policy such as improving economic growth, ensuring food security, improving education and health, employment of women, and ensuring good governance (National Institute of Statistics of Rwanda, Ministry of Health, and ICF International 2012; Ministère de la santé and Office national de la population 2003).

The socio-economic context presented above reveals that the five countries did not have the same starting point in the adoption and implementation of a population policy, including family planning. In Ghana and Kenya, a population policy was already adopted in the 1960s, along with accurate and revised targets. However, although data were available in Gabon (including census and DHS), there has been

no explicit population policy until now. In addition, the main objectives of these policies or programs, at least in their first iteration, was not the same in all five countries. While Ghana, Kenya, and Rwanda have had anti-natalist prescriptions since the adoption of their first population policy, Gabon on the contrary adhered to a pronatalist policy. Benin has dragged behind because of the pronatalist 1920 French Law, before abolishing it in 2003 with the adoption of a new anti-natalist policy.

It should be stressed that where governmental family planning programs are properly implemented, knowledge and accessibility of contraceptive methods are expanding rapidly and social differences in fertility decline (Riley and Gardner 1997), contributing to a significant decline of fertility at the level of the entire population.

3 Fertility Levels and Trends

The fertility transition involves changes not only in the intensity of fertility, but also in the timing of births. To understand these two types of changes associated with the fertility transition, we use two types of indicators: the total fertility rate (TFR), which measures the level (or intensity) of fertility, and fertility rate per age, which allows us to understand the timing of births. Fertility rates by age are calculated by relating the births from women in each age group to the number of women in the corresponding age group. As for the TFR, it is obtained from the accumulated age-specific fertility rates,, and corresponds to the average number of children that would be born per woman at the end of her reproductive life, if the time (period) fertility rates remained invariable. Both indicators are calculated for the first and last Demographic and Health Surveys (DHS) of the five selected countries. The choice of these two DHS for each country is justified by the fact that the latest DHS allows us to know the level and current fertility calendar. In addition, the comparison of the latest DHS with the oldest allows for the identification of trends in fertility observed over a relatively long period of time in each country. The TFR and women age-specific fertility rate of childbearing age (that is to say aged 15-49) are shown in Table 1. Overall, we see that the current level of fertility remains relatively high in all five countries, the TFR ranging from 4.0 in Ghana (2008) to 4.9 in Benin (2011–2012).

This relatively high fertility is also observed when examining the latest fertility rates per age in each country. Indeed, in the five countries studied, fertility rates per age groups follow the classic pattern observed in general in countries with high fertility: a relatively high early fertility (especially in Gabon where the 15–19 rate reached 114‰ in 2012), which increases rapidly, peaking at 25–29 years (except in Kenya, where the maximum is reached in the 20–24 age group) and, thereafter, decreases steadily to the minimum in the 45–49 age group. However, comparing the results of the most recent with those of the oldest DHS shows that the intensity of fertility has declined significantly, albeit at a rate differing slightly from one country to another: Ghana (1.9% annually), Kenya (1.7% annually), Benin (1.5% annually),

Table 1 Total fertility rate and age-specific fertility rates, by Country and date of DHS survey

Country	DHS date	Total fertility rate	Age-specific fertility rates (‰)						
			15–19	20–24	25–29	30–34	35–39	40–44	45–49
Benin	1996	6.3	123	271	283	260	205	90	31
	2011–2012	4.9	94	230	251	200	126	63	17
Ghana	1988	6.4	124	258	278	248	195	117	60
	2008	4.0	66	176	206	173	118	59	8
Gabon	2000	4.3	144	193	178	176	101	48	11
	2012	4.1	114	170	187	169	116	56	8
Kenya	1989	6.7	152	314	303	255	183	99	35
	2008–2009	4.6	103	238	216	175	118	50	12
Rwanda	1992	6.2	60	227	294	270	214	135	46
	2010	4.6	41	195	248	217	164	98	21

Source: Various DHS

Rwanda[2] (1.4% annually), and Gabon (0.4% annually). Similarly, the timing of fertility has changed noticeably as well. Indeed, the most recent age-specific fertility rates are significantly lower than those observed in the first DHS, suggesting a decline in both early and late fertility in the five countries studied. It should, however, be noted that in Gabon, the rates increased slightly between 2000 and 2012 in the 25–29, 35–39, and 40–44 age groups, from 178‰ to 187‰, from 101‰ to 116‰, and from 48‰ to 56‰, respectively (Table 1). This pattern reflects, to some extent, a more or less stable late fertility in Gabon. The TFR, which was estimated at 4.3 in 2000 in this country, decreased only to 4.1 in 2012, which did not show a significant change in the level of fertility and appears to be coherent with the pronatalist population policy orientation.

4 Evolution of the Determinants of Fertility

The literature points to several factors that may explain the observed changes in fertility within a given population. These factors are generally prioritized in intermediate variables (i.e., socio-economic, environmental, and psychosocial status[3]) and proximate determinants. Among the proximate variables, most empirical studies have shown that marriage, contraception, infertility, and abortion have by far the largest effects on fertility (Bongaarts 1976; Bongaarts and Potter 1983). Since data

[2] The Rwandan context is very particular. According to Westoff (2012), the total fertility rate declined from 6.2 to 5.8 between 1992 and 2000 (due to the disturbances caused by the civil war in the mid-1990s) before rebounding to 6.1 in 2005, and declined again from 6.1 to 4.6 between 2005 and 2010. To a large extent, the Rwanda fertility decline can be attributed to proactive programmatic efforts to expand information and access to contraceptive methods. In addition, health sector reforms, including results-based financing mechanisms, also helped boost contraceptive use.

[3] See the classification test table of Leridon and Toulemon (1997).

on abortion is generally underestimated,[4] we focus here on the three main proximate determinants of fertility (age at first marriage,contraception, and infertility) as well as the level of education of women of childbearing age (an intermediate determinant). The objective in this section is to understand how the level of these variables has evolved in each country during the period of variations in fertility levels, as described in Table 1.

4.1 Age at First Marriage

In Africa, marriage is generally characterized by early first union among women. Comparing the results from the most recent DHS with those of the oldest DHS indicates a significant increase in the median age at first marriage for women aged 25–49 years in all five countries studied (Table 2), suggesting a significant change in recent years. This age increase is somewhat confirmed by data from generations even though the median age at first marriage changes very little from one generation to another, with a rejuvenating trend observed in Benin (Table 2). The apparent contradiction observed in Benin is probably the result of mistakes in the declaration of the age at first marriage, particularly among older women. Thus, although the age at first marriage is not always a clear indication of the beginning of exposure to risk of pregnancy,[5] its postponement in recent years may partly explain the decline in fertility observed in the five countries studied as the increase in age at first marriage reduces the reproductive life period of women.

Table 2 Median age at first marriage among women aged 25–49, by Country, date of DHS survey and age groups

Country	DHS date	Median age at first union					
		25–49	25–29	30–34	35–39	40–44	45–49
Benin	1996	18.4	18.7	18.3	18.4	18.3	17.9
	2011–2012	19.8	19.3	19.5	20.2	20.1	20.8
Ghana	1988	17.5	18.5	18.1	18.1	17.6	18.8
	2008	19.8	21.0	20.0	19.4	19.1	19.1
Gabon	2000	19.7	20.4	20.1	19.4	19.1	18.0
	2012	22.0	22.1	22.4	23.1	21.6	19.6
Kenya	1989	17.5	18.6	17.9	17.9	17.3	18.5
	2008–2009	20.0	20.2	19.9	20.2	20.2	18.9
Rwanda	1992	20.0	20.9	20.2	20.0	19.4	18.7
	2010	21.4	22.3	20.9	20.9	21.4	20.6

Source: Various DHS

[4] In most African countries, induced abortion is still considered a taboo and, in some cases, induced abortion is still forbidden by law.

[5] The age at first sexual intercourse does not necessarily coincide with the age at first marriage.

However, the delay of age at first marriage highlighted in Table 2 may simply be the result of couples who then, by their number of births, catch up with those who married earlier. This phenomenon is also known in the literature under the name of *tempo* effect (Bongaarts and Feeney 2003). Indeed, regardless of the beginning of exposure to risk of pregnancy, the final parity can remain invariable because the same number of births occurring over a longer period of time can also take place over a shorter period of time. Nonetheless, this compensation hypothesis of total births in the remaining reproductive life of the woman is not likely in the five countries studied, as postponing the age at first marriage is not followed by an increase in late fertility, reflecting a shortening of birth intervals. As already indicated, age-specific fertility rates have declined significantly in all age groups, except in Gabon where the rate rose slightly in the 25–29, 35–39, and 40–44 age groups between 2000 and 2012 (Table 1). However, this increase in the age-specific fertility rates does not seem to come from a significant increase in late fertility because the median birth interval in Gabon increased from 33.9 months to 37.6 months between 2000 and 2012 (Direction Générale de la Statistique and ICF International 2013). Therefore, reducing the reproductive life period of women by delaying the age at first union appears to have contributed to the decline in fertility in Ghana, Kenya, Benin, and Rwanda, and, to a lesser extent, in Gabon.

4.2 Contraceptive Use

Despite its complexity, the risk of conception at a given time also depends on the behavior of couples, once one leaves the area of natural fertility. For example, besides birth spacing, using a method of contraception effective at 95% after the birth of the second child greatly reduces the overall fertility of the population from 8 to 3 children (Leridon 2002). Therefore, differences in contraceptive use may explain the differences in the fertility trends between countries. If we consider the prevalence of modern contraceptive use among women in union aged 15-49, we see that the countries studied are not similar. While the prevalence of modern contraception reached 39.4% in 2008–2009 in Kenya and 45.1% in Rwanda in 2010, it was only 7.9% in Benin in 2011–2012 (Table 3). Modern contraceptive prevalence has improved markedly in all the countries studied, although the pace of growth differs from country to country: in terms of annual percentage points of growth, Rwanda is the country where progress was the most significant with 1.79 percentage point increase per year, followed by Kenya with (1.08% point). In Gabon, Ghana, and Benin, the annual percentage point of growth was less than 1, i.e., 0.63, 0.57, and 0.28, respectively. It appears that overall the increase in contraceptive use has compensated for the decrease in the infecundability postpartum period. As countries do not have the same level of contraceptive use at the starting point (first survey considered here), the progress in modern contraceptive prevalence displays another pattern in terms of annual growth rate. Rwanda is still the country with the highest growth (14% annually), followed by Ghana (11% annually), Benin (9%

Table 3 Current use of modern contraception of women in union at the time of the survey (%), by Country, age group, and date of DHS survey

Country	DHS date	Current use of modern contraception							
		Total	15–19	20–24	25–29	30–34	35–39	40–44	45–49
Benin	1996	3.4	2.5	2.6	3.4	3.5	3.0	5.4	4.0
	2011–2012	7.9	4.2	5.7	7.8	7.9	10.0	9.4	7.4
Ghana	1988	5.2	2.3	3.4	4.3	6.9	5.9	9.0	4.2
	2008	16.6	7.6	17.3	14.2	17.3	18.8	19.0	14.8
Gabon	2000	11.8	12.2	12.9	12.7	11.5	11.9	9.8	9.2
	2012	19.4	15.6	23.4	21.7	24.5	17.5	12.8	10.4
Kenya	1989	17.9	6.7	11.8	16.8	22.2	22.9	21.2	17.5
	2008–2009	39.4	19.6	30.4	41.3	48.8	41.2	46.6	32.4
Rwanda	1992	12.9	7.1	7.5	11.1	16.2	15.0	18.8	8.6
	2010	45.1	30.6	42.1	49.8	50.2	51.8	42.1	21.4

Source: Various DHS

annually), Kenya (6% annually), and Gabon (5% annually). Furthermore, this increase in contraceptive practice is observed in all age groups (Table 3). However, the growth rate of contraceptive use of younger women and that of older women are relatively higher in countries where overall contraceptive prevalence has experienced a significant increase (particularly in Ghana and Rwanda). For example, for adolescents aged 15–19, contraceptive prevalence increased by 18% per year in Rwanda and 12% per year in Ghana, while it was only 2% for Gabon. Similarly, among women aged 45–49, contraceptive prevalence increased by 8% per year in Rwanda and 13% per year in Ghana, while again it was only 1% for Gabon. These results confirm, to a certain extent, the decline in fertility and early late fertility observed previously in Table 1.

A result that deserves to be mentioned is the fact that Ghana achieve lower fertility than Kenya (Table 1), despite its much lower use of contraception (Table 3). Abortion could explain this apparent result. In Kenya, abortion is prohibited except to save the life of the woman (and this requires the consent of the spouse), while Ghana has one of Africa's most liberal abortion laws (Boland and Katzive 2008). Moreover, in periods of demographic transition, abortion and contraception are used together, to respond to desire of fertility reduction, and the role of abortion can often appear decisive. According to Singh and Sedgh (1997), although the impact of abortion in fertility transitions is poorly documented in Africa due to the lack of reliable data, it is particularly marked in countries where contraceptive prevalence is low.

4.3 Infertility

Infertility, often called sterility, refers to the physiological inability of a woman to reproduce and is defined as the inability to conceive after several years of exposure to the risk of pregnancy (Rutstein and Shah 2004). In most African societies,

procreation is part of the natural destiny of every individual and infertility is seen as a curse. The infertile couple is indeed prevented from performing an essential part of its social function and a sterile spouse (when it can be identified, or at least the one to whom one attributes sterility automatically) bears more responsibility because she/he brought the other spouse into complicity with this failure (Leridon 2002; Lux 1976; Retel-Laurentin 1980). In this context, couples without children and those who have children without having reached the desired final family size ardently hope to solve their potential fertility problems. Therefore, unlike other proximate variables (age at first marriage, contraception), the decline in infertility in a population participates in the maintenance of high fertility in this population.

However, infertility measurement is problematic because it is difficult to measure the continuous exposure to pregnancy risk over the entire reproductive period in the life of women.[6] In addition, the use of contraception and preferences of couples regarding fertility make objective measurements of infertility more complex because, on the one hand, if couples use contraception, then the absence of live birth or pregnancy is explained; and, on the other hand, the most fertile couples are more likely to use contraception than less fertile couples (Rutstein and Shah 2004). To minimize these measurement problems, we adopt in this study a self-reported measure of infertility by women aged 15–49. In DHS surveys, a question is asked to women about the time elapsed since their last menstrual period. This question is used to calculate the self-reported infertility rates, the numerator consisting of four groups of women: (1) women who have never seen their menstruation; (2) those who have not had their menstruation for 5 years or more[7]; (3) those who are postmenopausal; or (4) those who have had a hysterectomy (Rutstein and Shah 2004). These self-reported infertility rates are presented in Table 4 for the five countries studied. It appears that infertility has fallen in all five countries. This decline is two percentage points per year in Benin, Ghana, Kenya, and Rwanda, and one percentage point per year in Gabon where the rate of infertility observed in 2000 was 10.3%. The decline has been greater in countries where the infertility rate in the first DHS was relatively higher: Benin (27.4%, 1996), Ghana (26.4%, 1988), Kenya (21.9%, 1989), and Rwanda (29.8%, 1992). Moreover, with few exceptions (as in the 45–49 age group in Benin and Ghana, where the infertility rate has increased slightly), this decline in infertility is observed overall in all age groups, and the age structure of the infertility rate was slightly modified between the first and the second DHS (Table 4). Indeed, in the last DHS, the lowest rate was observed for adolescent women (15–19 years old) and the highest for older women (45–49 years old). This occurred in all countries being studies here, except in Rwanda where the lowest and the highest rates were found in the age groups 20–24 and 30–34, respectively. This can be explained by the campaign to promote penicillin in Africa in the 1950s and

[6] A more or less complete measurement of this continuous exposure to risky pregnancy requires data on marital status, abstinence, frequency of sex, fertility preferences, and migration of spouses throughout the reproductive life period considered (Rutstein and Shah 2004).

[7] The five-year period is used to ensure that the absence of procreation is not due to the effects of postpartum amenorrhea.

Table 4 Self-reported infecundity rate (%) by Country, age group of women aged 15–49 years, and date of DHS survey

Country	DHS date	Self-reported infecundity rate							
		Total	15–19	20–24	25–29	30–34	35–39	40–44	45–49
Benin	1996	27.4	17.0	30.2	28.4	33.4	26.6	23.2	39.5
	2011–2012	18.2	10.0	14.8	19.2	17.5	15.1	23.0	45.4
Ghana	1988	26.4	23.4	24.5	32.6	30.0	28.3	19.8	20.2
	2008	13.5	8.1	11.7	16.6	17.0	12.4	9.3	25.5
Gabon	2000	10.3	8.2	9.4	12.2	11.1	9.4	7.9	20.9
	2012	8.9	6.1	9.2	9.3	9.6	7.7	6.3	19.2
Kenya	1989	21.9	18.1	24.7	27.0	25.3	22.1	16.0	12.7
	2008–2009	14.2	11.9	16.0	17.4	16.2	10.9	7.7	17.5
Rwanda	1992	29.8	23.7	23.5	35.3	41.2	35.8	27.3	21.2
	2010	16.8	16.8	12.4	20.8	21.8	18.1	13.1	12.4

Source: Various DHS

the continued improvement of health services, the result being that infertility due to disease is increasingly treated successfully (Retel-Laurentin 1980). This has probably contributed to maintain fertility at a relatively high level in the countries studied.

4.4 Education Level

The effects of the fertility determinants are both material and cultural (Joshi and David 2002). The aim here is not to discuss the influence of education on fertility,[8] but rather to see how the level of education in women of reproductive age has evolved over the period of variations of the observed fertility (Table 1). To this end, Table 5 shows the distribution of women aged 15–49 according to their level of education from the oldest and the latest DHS of each country studied. In addition, the last column of Table 5 shows the literacy rate of women. In fact, in the DHS surveys, in addition to the level of education attainment, respondents who had no education and those who reported having only reached the level of primary education were asked to read a phrase written in an official or national language. Analysis of this question enables the assessment of the degree of accessibility to information for women (literacy rate). Those respondents who have reached at least a secondary education are considered literate.

Results of Table 5 show that the five countries are not at the same level with respect to educational attainment, and these differences may partly explain their fertility differences. For example, the proportion of non-educated women was only

[8] See Joshi and David (2002: 350–355) for an excellent discussion of the different mechanisms of education on fertility behavior.

Table 5 High level of schooling (%) and percentage literate of women aged 15–49, by Country, and date of DHS surveys

Country	DHS date	Highest level of schooling			Percentage literate
		No education	Primary	Secondary or more	
Benin	1996	70.8	19.8	9.4	21.8
	2011–2012	59.5	17.5	23.0	35.1
Ghana	1988	39.7	16.3	44.0	48.3
	2008	21.2	20.1	58.7	62.9
Gabon	2000	5.7	35.6	58.7	85.3
	2012	4.4	21.2	74.3	88.7
Kenya	1989	25.1	54.4	20.4	71.3
	2008–2009	8.9	56.8	34.2	84.9
Rwanda	1992	38.0	54.1	7.9	61.0
	2010	15.5	68.3	16.2	76.9

Source: Various DHS

4.4% in Gabon (2012), against 59.5% in Benin (2011–2012). Also at the same period, the proportion of women with at least secondary level education was 74.3% in Gabon and 23% in Benin. Despite these differences between countries, it is observed that the education of women of childbearing age has improved markedly over time in all the countries studied. For example, the proportion of uneducated women grew at an annual rate ranging from 1.1% in Benin to 3.4% in Kenya, while the proportion of women with at least secondary level education grew at a relatively high annual rate: Benin (9.6%), Rwanda (5.8%), Kenya (3.6%), Gabon (2.2%), and Ghana (1.7%). It is the same for the literacy rate (Table 5). Thus, the substantial improvement of education (formal and informal) of women over time is likely to explain part of the observed fertility trends in recent years in the studied countries.

5 Prospects of Fertility Transitions and Explanatory Factors

To understand the future trends in fertility in the five countries studied in the coming years, we use the UN Population Division projections (United Nations 2015). According to these forecasts, there is a continuous decline in fertility in those countries with a convergence of fertility levels in 2050 (Table 6). Indeed, except for Rwanda where fertility decline is more pronounced, the maximum difference between countries in terms of number of children per woman (TFR) amounted to only 0.5 in 2050 against 0.9 in 2020, irrespective of the projection assumption being used. This suggests a pace of decline more accelerated in the relatively higher fertility countries compared to countries that are already at a lower level of fertility. Moreover, except for Rwanda (low fertility hypothesis), it is clear from Table 6 that until 2050, the fertility of the countries studied will still remain above replacement

Table 6 Total fertility rates by Country and projection assumptions

Country	Hypothesis	Total fertility rate						
		2020	2025	2030	2035	2040	2045	2050
Benin	High fertility	4.8	4.6	4.3	4.1	3.8	3.6	3.5
	Medium fertility	4.5	4.2	3.8	3.6	3.3	3.1	3.0
	Low fertility	4.3	3.8	3.3	3.1	2.8	2.6	2.5
Ghana	High fertility	4.2	4.1	4.0	3.8	3.6	3.5	3.3
	Medium fertility	4.0	3.7	3.5	3.3	3.1	3.0	2.8
	Low fertility	3.7	3.3	3.0	2.8	2.6	2.5	2.3
Gabon	High fertility	3.9	3.8	3.7	3.5	3.3	3.2	3.0
	Medium fertility	3.7	3.4	3.2	3.0	2.8	2.7	2.5
	Low fertility	3.4	3.0	2.7	2.5	2.3	2.2	2.0
Kenya	High fertility	4.4	4.2	4.1	3.8	3.7	3.5	3.4
	Medium fertility	4.1	3.8	3.6	3.3	3.2	3.0	2.9
	Low fertility	3.9	3.4	3.1	2.8	2.7	2.5	2.4
Rwanda	High fertility	3.9	3.7	3.5	3.3	3.0	2.9	2.7
	Medium fertility	3.6	3.3	3.0	2.8	2.5	2.4	2.2
	Low fertility	3.4	2.9	2.5	2.3	2.0	1.9	1.7

Source: United Nations 2015

level whatever the forecast hypothesis, suggesting the coexistence of traditional and modern fertility regimes in the coming decades.

Given the inter-relationships between the multiple factors that influence fertility behavior, it is often very difficult or even impossible to predict the specific effect of each factor on future trends of fertility presented in Table 6. For example, education increases age at first marriage and thus helps reduce reproductive life of women.[9] It also fosters the desire for smaller families, the acceptability of modern contraception, and attendance of health services (Joshi and David 2002). The use of modern health careservices, among other things, increases childsurvival and effectively solves infertility of pathological origin, therefore allowing couples to better control the desired size of their offspring. All these mechanisms that lead to a more or less long-term low fertility in a population are likely to be reinforced over time. Indeed, with the political and social pressure in favor of the schooling of children and young people and the implementation of literacy programs for non-educated people in African countries (UNESCO 2012), improving the educational level (particularly beyond primary) of the population including those of reproductive age women will continue in the coming years. The continued increase in the proportion of women with at least a secondary education (Table 5) is likely to further strengthen the rising age at first marriage and acceptability of modern methods of contraception. Certainly, improving the level of education of women is likely to also increase the

[9] Educated women play a greater role in decision-making on the timing of marriage and choice of spouse. Indeed, it is likely that before getting married they have monetary resources from an extra familial employment and, in some contexts, they are harder to marry than illiterate women (see Jeejebhoy, 1995, quoted by Joshi and David 2002).

potential fecundity, and even the actual fertility in the absence of effective contraception[10] (Joshi and David 2002). But this pro-natalist mechanism of education will likely be reduced by the increasing cost of childbearing and the expansion of family planning programs, which now hold a prominent place in population policies in several African countries.

6 Conclusions

This chapter aimed to analyze the contextual and socioeconomic factors underlying fertility levels and trends in five sub-Saharan countries where fertility transition has begun in recent years. These are Benin (Francophone) and Ghana (Anglophone) located in West Africa, Gabon (French) located in Central Africa, and Kenya (Anglophone) and Rwanda (Francophone/Anglophone) located in Eastern Africa. The analysis was mainly based on the description of the socio-economic context and the use of the data of the first and latest Demographic and Health Survey in each country.

The analysis of the socio-economic context has shown, among other things, that the five countries did not have the same starting point in the adoption and the implementation of a population policy, including family planning. While in Ghana and Kenya a population policy was already adopted in the 1960s with accurate and revised targets as long as data were available, in Gabon there is no explicit population policy so far. In addition, the main objective of these policies or programs in their first format was not the same in all five countries. While Ghana, Kenya, and Rwanda have anti-natalist policies since the adoption of their first population policy, Gabon has a pronatalist population policy. Benin has dragged behind with the 1920 French Law, which was pronatalist, before abolishing it very recently with the adoption of a new anti-natalist Law.

These contextual differences between countries are not without effects on fertility trends and intermediate variables of fertility. Indeed, the analysis of DHS surveys data revealed that the current level of fertility remains relatively high in the five countries studied, the TFR ranging from 4.0 in Ghana (2008) to 4.9 in Benin (2011–2012). However, comparison of the most recent DHS with the oldest DHS shows: (1) a decline in early and late fertility; (2) a delay in the age at first marriage; (3) an increase in modern contraceptive use; (4) a sharp decline in infertility; and (5) a substantial improvement in the level of education of women of childbearing age. The pace of progress of the various indicators differed from one country to another.

[10] An education, even basic, is likely to shorten the duration of breastfeeding because breastfeeding may be incompatible with the type of job sought by women. In addition, educated or literate women are more capable than illiterate women to know and provide their child with food supplements. Similarly, postpartum abstinence decreases with education and the phenomenon is generally attributed to greater intimacy between spouses among educated couples (Joshi and David 2002).

This is due to the differences in the socio-economic context of the countries studied. However, when government family planning programs are properly implemented, knowledge and accessibility of contraceptives are expanding rapidly and social differences in fertility decline. The 2015 United Nations population projections suggest a continuing decline in fertility in the countries studies with convergence in fertility by 2050, underlining the importance of adequate population policies in the coming years. Indeed, in the absence of adequate and strong social policies in the areas of education and health, the expected changes in the age structure prior to the advent of a "demographic window of opportunity" and therefore the demographic dividend itself, will take several decades.

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Countries with Slow and Irregular Fertility Transitions

Gervais Beninguisse and Liliane Manitchoko

1 Introduction

The issue of the demographic dividend in sub-Saharan Africa is at the center of scientific and program concerns regarding the development of the region and its integration into the world economy. Accelerated fertility decline, which brings favorable dependency ratios, is a prerequisite for the demographic dividend to materialize. In effect, the decrease in the number of annual births is accompanied by the reduction of the young dependent population in relation to the working-age population. Furthermore, when the number of workers increase and the number of young dependents decrease, a country reaches a window of opportunity that may accelerate economic growth (Yeakey et al. 2013; Bloom et al. 2002). According to this framework, current demographic changes set in motion and maintained by fertility decline could foster the development prospects of the sub-Saharan continent, by creating suitable conditions for savings, productive investment, and improvement of human capital.

Fertility has generally declined in sub-Saharan Africa. Women in the region now have on average 5.1 children as compared to 6.7 children in 1970 (Gribble and Bremner 2012a). But this fall occurred at different paces according to the countries in a context marked by a very high demand for children and increasing social disparities within the countries (Tabutin and Schoumaker 2001, 2004).

This chapter is focusing on countries within the region that witness a slow and irregular fertility decline, a trend that is not particularly conducive to trigger the demographic changes that are necessary to capture a demographic dividend. The key question is to what extent current fertility trends in these countries can be explained by social change factors, such as female education and the fertility proximate determinants.

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The analysis of this question is based on a case study of seven countries (the choice of these seven countries is justified by the availability of data) using a descriptive method and comparable data from the United Nations Population Division and the Demographic and Health Surveys (DHS) databases. We first describe the fertility trends and factors associated with them in these countries. We then highlight the policy levers necessary for an accelerated fertility decline in order to capture a demographic dividend.

2 Fertility Trends and Associated Factors

2.1 General Trend and Patterns of Evolution

The analysis of the evolution of fertility in the seven countries examined in this chapter, i.e., Cameroon, Comoros, Côte d'Ivoire, Guinea, Mozambique, Senegal, and Tanzania, shows a general declining trend between 1980 and 2015 (Fig. 1). In the 1980s, these countries' total fertility rate (TFR) was between 6.5 and 8 children per woman; but from the year 2000, the TFR is between 4.5 and 6. However, this decline has not been the same in all countries and some special features need to be highlighted. There are three types of countries, highlighting that the fertility transition in these countries has been slow as well as irregular, as follows:

- Countries with a very slow decline (fertility declined on average by one child per woman in 30 years); these countries are Tanzania and Mozambique;
- Countries with a slow decline (fertility declined on average by two children per woman in 30 years); these countries are Senegal and Côte d'Ivoire; and
- Countries in which there are reversals towards an increase (increase followed by a decline); these are Cameroon, Guinea, and Comoros.

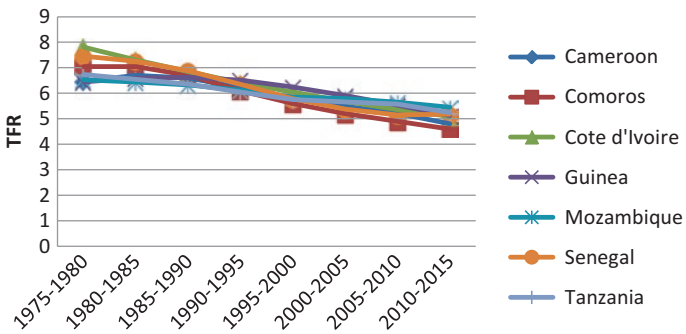

Fig. 1 Evolution of the TFR between 1980 and 2015 in study Countries (Source: United Nations 2015)

2.2 Main Causes of Fertility Trends

In the countries with very slow fertility transition, and for nearly all the observation periods, observed fertility trends, either increasing or declining, are closely linked to the evolution of female educational levels. Results of the decomposition method[1] (Table 1) highlight the predominance of the *performance effect*. This means that observed changes are mainly due to the evolution of fertility behavior inherent to education policies and programs implemented in these countries (schooling, literacy, and information and communication for women's behavioral change). However, an exception is Tanzania, where the fertility decline observed between 2004 and 2010 was mainly due to the change in the distribution of the proportion of women between the different educational categories (the *composition effect*). In Mozambique, on the other hand, changes in educational policies and programs are not yet sufficiently efficient to induce a noticeable fertility decline.

In the countries with slow transition, changes in the distribution of women into the different educational levels constitute the main source of fertility trends observed in Côte d'Ivoire (Table 1). Indeed, the fertility decline occurring in this country resulted essentially from the decrease of the proportion of women with primary school level or less. In Senegal, on the other hand, the main source of fertility trends observed is the evolution of procreation behavior inherent to the education policies and programs implemented.

In the countries with reversals, including Cameroon, Guinea, and Comoros, observed fertility trends, increasing or declining, are closely linked to the evolution of female education inherent to education policies and programs (Table 1). Fertility decline that occurred in Cameroon between 1991 and 1998 was mostly brought about by educated women (primary school level, secondary or more). The fertility increase which occurred between 1998 and 2011 in this country was caused mainly by non-educated women and those with primary school education. It is these social categories that are responsible for the fertility reversals in Guinea, first towards an increase between 1995 and 2005, then towards a decline between 2005 and 2012.

Ultimately, countries that have experienced reversals of fertility (Cameroon, Guinea, and Comoros) also experienced either an increase in fertility of women with no education (low performance of education programs) or reversals of child mortality.

[1] Decomposition is a method of analysis for determining the sources of change of a given phenomenon (here fertility), by breaking down the part that is due to change in the distribution of population between the different social categories (the composition effect) and the part that is due to the change in behavior (the performance effect) (see the Methodological Note at the end of the chapter).

Table 1 Decomposition parameters

Country	Period	Change a-b (ISFb-ISFa)	Simple decomposition		Year	Adjustment parameters			Advanced decomposition		
									Performance		
			% Composition	% Performance		Alpha	Beta	R^2	% Base	% Differentiation	% Error
Cameroon	1991–1998	−0.97	17.12	82.88	1991	6.55	−0.85	66.28	41.10	39.35	2.42
					1998	6.15	−1.25	99.52			
	1998–2004	0.09	−159.17	259.17	2004	6.53	−1.40	92.31	400.42	−175.29	34.04
	2004–2011	0.17	−99.07	199.07	2011	7.00	−1.50	94.94	273.26	−70.58	−3.60
Comoros	1996–2012	−0.50	120.66	−20.66	1996	5.42	−0.85	94.65	−123.13	102.75	−0.28
					2012	6.03	−1.40	97.35			
Cote d'ivoire	1994–1998/1999	−0.12	65.23	34.77	1994	5.90	−1.20	97.96	−313.03	334.60	13.20
					1998/1999	6.27	−1.90	97.74			
	1998/1999–2011/12	−0.20	86.58	13.42	2011/2012	6.07	−1.60	92.31	98.33	−94.10	09.19
Guinea	1999–2005	0.19	−30.58	130.58	1999	5.93	−1.20	99.77	204.72	−41.08	−33.07
					2005	6.32	−1.45	98.09			
	2005–2012	−0.65	37.63	62.37	2012	5.95	−1.35	90.67	56.77	−6.57	12.18

Mozambique	1997–2003	0.34	−23.62	123.62	1997	5.47	−0.80	61.34	315.38	−171.65	−20.11
					2003	6.53	−1.70	94.65			
	2003–2011	0.30	−125.50	225.50	2011	7.13	−1.70	89.66	207.51	0.00	17.99
Senegal	1986–1992/1993	−0.24	23.16	76.84	1986	6.90	−1.60	98.84	83.02	−28.64	22.46
					1992/93	6.70	−1.40	94.23			
	1992/1993–1997	−0.42	27.43	72.57	1997	6.47	−1.60	96.85	55.30	19.91	−2.64
	1997–2005	−0.44	30.31	69.69	2005	6.12	−1.55	98.33	78.88	−5.72	−3.48
	2005–2008/2009	−0.35	21.28	78.72	2008/2009	5.65	−1.25	99.52	134.09	−49.90	−5.48
	2008/2009–2010/2011	0.05	−47.31	147.31	2010/2011	5.85	−1.45	99.64	384.62	−237.31	0.00
Tanzania	1991/1992–1996	−0.57	7.40	92.60	1991/1992	6.82	−1.15	81.47	26.28	58.34	7.98
					1996	6.67	−1.60	92.31			
	1996–1999	−0.23	4.11	95.89	1999	6.57	−1.5	99.41	43.01	−33.35	86.24
	1999–2004/2005	0.25	−41.45	141.45	2004/2005	7.07	−1.8	97.49	197.39	−96.23	40.29
	2004/2005–2010	−0.27	94.24	5.76	2010	7.20	−2.00	97.09	−48.29	67.38	−13.34

Source: Calculations done witch data from DHSs with available information for each country (http://www.statcompiler.com)

2.3 Evolution of Mortality

Analysis of the evolution of infant and child mortality between 1980 and 2015 in countries with very slow fertility transition portrays a general declining trend (Fig. 2). It should be noted that although mortality decline in Mozambique is significant during this period, in the 1980s Mozambique was among countries with very high mortality levels among the countries being examined and it is still one of them in the 2000s. Thus, despite the decline in infant and child mortality, their continued high level in these countries can explain and sustain observed fertility stagnation or very slow decline, because a low mortality level is generally an initiating element of a fertility decline (Vimard et al. 2001).

In countries with a slow fertility transition, there is a mitigating role of under-five mortality. Mortality decline in Côte d'Ivoire is not substantial, which could explain the unsubstantial fertility decline. On the other hand, mortality decline is very substantial in Senegal (Fig. 2). Indeed, it was one of the countries in the study sample with the highest mortality levels in the 1980s, and it had the lowest mortality level in the year 2000 but with a slow fertility transition. Under-five mortality decline in this country, though necessary, was largely insufficient to induce accelerated fertility decline; other factors must therefore be considered.

In the countries with reversals of fertility, particularly Cameroon, under-five mortality levels remain relatively high with poor declines or reversals (Beninguisse et al. 2014).

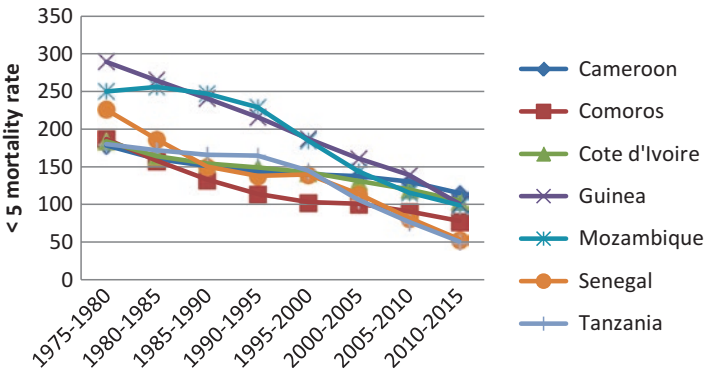

Fig. 2 Evolution of under-five mortality rate between 1980 and 2015 (Source: United Nations 2015)

2.4 Evolution of the Fertility and the Timing of Nuptiality

In the countries with very slow fertility transition, the median age at first birth does not substantially increase and is comprised between 18 and 20 years in the period 1990–2012 (Table 2). However, an analysis of the evolution of the timing of nuptiality reveals a slight increase in age at first marriage in Mozambique from 17 to 19 years between 1990 and 2012. This age is stagnant in the same period, slightly above 18 years in Tanzania (Table 2).

Table 2 Evolution of current use of contraceptive methods, unmet needs in FP, median age at first birth, and median age at first marriage

Country	Survey years	Current use of contraception: any modern method (%)	Need for family planning: Unmet need (%)	Median age at first birth (years)	Median age at first marriage (years)
Cameroon	1991	4.3	22.3	18.6	16.6
	1998	7.1	20.7	19.2	17.7
	2004	12.5	20.5	19.2	17.8
	2011	14.4	23.5	19.7	18.7
Comoros	1996	11.4	35.6	–	19.2
	2012	14.2	32.3	–	–
Côte d'Ivoire	1994	4.3	30.4	18.7	18.3
	1998/1999	7.3	28.9	19.2	19.0
	2011/2012	12.5	27.1	19.6	19.8
Guinea	1999	4.2	24.8	18.7	16.5
	2005	5.7	21.9	19.0	16.3
	2012	4.6	23.7	18.8	17.2
Mozambique	1997	5.1	28.5	19.0	17.2
	2003	20.8	18.9	18.9	17.5
	2011	11.3	28.5	19.2	18.6
Senegal	1986	2.4	–	18.9	16.6
	1992/1993	4.8	28.8	19.4	16.6
	1997	8.1	35.0	–	18.0
	2005	10.3	32.0	–	18.5
	2008/2009	–	–	–	–
	2010/2011	12.1	30.1	–	19.6
Tanzania	1991/1992	6.6	27.8	19.0	18.3
	1996	13.3	26.0	19.3	18.4
	1999	16.9	22.3	19.2	18.4
	2004/2005	20.0	24.3	19.4	18.6
	2010	27.4	22.3	19.5	18.9

Sources: Most recent DHSs with available information for each country (http://www.statcompiler.com)

In the countries with slow fertility transition, the median age at first birth increases slightly while staying between 18 and 20 years in the period 1990–2012 (Table 2). Furthermore, we observe an increase in the median age at first marriage beyond 19 years. This trend is more pronounced in Senegal, where median age at first marriage increased by more than 3 years between 1990 and 2012 (Table 2).

In the countries with reversals of fertility, the median age at first birth is still between 18 and 20 years. Over the period 1990–2012, it witnessed a slight increase in Cameroon and a reversal towards an increase in Guinea (Table 2). Additionally, the median age at first marriage has slightly increased in these two countries. However, with a median age between 16 and 17 years, Guinea has the earliest age at first marriage over the whole 1990–2012 period among the countries being studied (Table 2).

2.5 Evolution of Contraceptive Prevalence and Unmet Need for Family Planning

In the countries with very slow fertility transitions, analysis of trends in contraceptive prevalence between 1990 and 2012 highlights two patterns (Table 2): a large increase in Tanzania and a reversal towards an increase in Mozambique, which could explain the very slow fertility decline. In Tanzania, despite the continuous increase in modern contraceptive prevalence (6.6% in 1992 to 27.4% in 2010, among married women), the level is still relatively too low to induce a significant decline in fertility.

In the countries with slow fertility transition, a slight increase was observed: contraceptive prevalence was very low and varied between 2% and 13% over the whole 1990–2012 period (Table 2).

In the countries with reversals of fertility, an analysis of trends highlights a poor increase and a reversal towards an increase between 1990 and 2012 (Table 2). Also, modern contraceptive prevalence is very low (below 6%) in Guinea over the whole study period. This could sustain the slow and irregular fertility decline. The persistence of low contraceptive prevalence is still associated with relatively high levels of unmet need for family planning (FP) that are missed opportunities for a significant decline in fertility, a necessary step to open the demographic window of opportunity to capture a demographic dividend. Women who do not use modern contraceptives and wish to space or limit their births are generally considered as having unmet need for family planning. In general, the levels remain very high with an average of 27% during the period 2010–2012 and show a fluctuating trend.

The levels are still high in the two countries with very slow fertility transition: roughly one married woman in every three in Mozambique and one in four in Tanzania (Table 2).

Among the seven countries, those with slow fertility transitions also have the highest levels of unmet need for FP over the whole period 1990–2012, even though

the evolution patterns differ: poor decline in Côte d'Ivoire and reversal towards an increase in Senegal.

In the countries with reversal fertility trends, reversals towards an increase in the levels of unmet need for FP are also observed (Table 2), which could explain the irregularity of their fertility transition.

2.6 Family Planning Programs

Millions of women in sub-Saharan Africa are unable to choose the number and spacing period of their births and consequently have more children than they want. Indeed, the case of Cameroon reveals that women have on average one child more than they want and 60% would like to avoid a pregnancy but do not use modern contraception (Vlassoff et al. 2014). This low number of women resorting to contraception leads to very rapid population growth in these countries with its multiple attending consequences. Yet, when women are able to choose when and how often to become pregnant they are likely to have fewer children (Gribble and Bremner 2012a).

Family planning programs are therefore important to address the unmet need for FP and thus contribute to accelerated fertility decline, which by a transition of the population age structure will enable the opening of the demographic window of opportunity and the capturing of a demographic dividend. A recent study in Cameroon (Vlassoff et al. 2014) revealed that meeting half the unmet need for FP would help avoid 187,000 unplanned pregnancies every year. Additionally, investing in contraception to address the unmet need for FP would enable reaping net annual savings of US $5.4 million (2.7 billion FCFA).

There is a need to invest in FP programs to strengthen both the supply and demand for services. This will require "political leadership and the strong commitment of individuals" at all levels of the implementation of FP programs (May 2012: 88).

2.7 Maternal and Child Health

In a large part of sub-Saharan Africa, high rates of infant mortality motivate couples to desire a large family, thus contributing to high fertility. Indeed, high children's mortality leads to the shrinking of the interval between births and the replacement effect (Tabutin 2007). The desire to have many children is likely to change over time: when couples know that an individual child has a better chance of survival, they are likely to want a smaller family (Joshi 2012).

Thus, investing in simple aspects of maternal and child health, which guarantee that children will not die before their fifth birthday is an important means to

accelerate the fertility decline. If child survival improves, the desire for a small family and the demand for contraception will increase (Gribble and Bremner 2012b).

It is therefore necessary to design and implement health programs that supply vaccines, prevent and treat a large number of infections, promote a good diet, and reinforce equity in access to healthcare (through subsidies, free care, and health insurance).

2.8 Female Education and Promotion of Female Employment

The enrollment and maintenance of girls in school up to secondary level or beyond contribute to the increase of age at first marriage and the age at first birth. Furthermore, since women who marry late have a tendency to have fewer children than their counterparts who marry young (Gribble and Bremner 2012a), female education up to secondary level or beyond contributes to fertility decline.

Furthermore, educated women are more predisposed to take on duties other than household chores; this increases the potential and labor for economic development and consequently contributes to the capturing of a demographic dividend. Thus reducing the inequalities between boys and girls is essential for achieving a rapid fertility transition. To achieve this, countries must develop and implement policies and programs that enable girls to attend school and acquire skills and opportunities to compete for a varied range of employment opportunities and better paying jobs.

2.9 Budgetary Allocation in the Health, Education, and Employment Sectors

Considering all the efforts in sectors that contribute to accelerated fertility decline and the capturing of a demographic dividend such as health, education, and employment, policymakers are faced with the challenge of adequately allocating limited budgetary resources in these various sectors (Joshi 2012). For example, the schooling dividend (in terms of gains in schooling resources per child) reaped by few vanguard sub-Saharan African countries[2] was caused not only by demographic change but also by economic performance and continued policy commitment to education, gender discrimination, and women's control of domestic resources (Canning et al. 2015; Eloundou-Enyegue and Giroux 2013).

To be effective, these policies must be implemented within a good governance context, which is conducive to productive investment, promotes social equity, and fights against corruption, a source of resource wastage and depletion.

[2] Botswana, Cape Verde, Ghana, Lesotho, Mauritius, and Swaziland.

3 Date at Which Countries Might Enter the Demographic Window of Opportunity

Entry into the demographic window of opportunity is the first stage inherent in fertility decline that a country must pass through for implemented appropriate policies to be translated into the capturing of a demographic dividend. We consider that a country enters the window of opportunity when the dependency ratio, the total number of persons aged less than 15 and 65 years or above divided by the population aged 15–64, is less than 80% (CARE-IFA 2017). This hypothesis suggests that the proportion of dependents is less than 45% (30% for those less than 15 years and 15% for those aged 65 years or more) and at least 55% for the population aged 15–64 years. We projected fertility trends using the three hypotheses: higher, equal to, and lower than of the United Nations Population Division. On the basis of a dependency ratio of less than 80% and the medium variant of fertility trends (Table 3), countries being studied can hope to enter the demographic window of opportunity at the following dates:

- 2010 for Comoros;
- 2025 for Cameroon, Côte d'Ivoire, and Guinea;
- 2030 for Senegal; and
- 2035 for Mozambique and Tanzania.

Hence the call for appropriate policies discussed in the following section to accelerate fertility decline, enter the demographic window of opportunity, and capture a first demographic dividend.

4 Conclusions

The aim of this chapter was to describe the impact of female education and some fertility determinants on the slow and irregular fertility evolution in seven sub-Saharan African countries and 19 time periods.

The predominance of the effect of education policies and programs on fertility trends stands out clearly in most of the countries studied. The improvement of female educational levels distinguishes itself as a driving force for a noticeable fertility decline. The absence of progress in education or its stagnation is a stumbling block. Stagnation or poor fertility decline in the countries studied is also driven by relatively high levels of unmet need for FP and high mortality, liable to reversals. Hence the importance to reinforce female educational policies and programs, better meet the unmet need for FP, carry on with efforts to improve maternal and child health, and allocate more resources to the health, education, and employment sectors. To be effective, these policies must be implemented within a good governance context, which is conducive to productive investment, promotes social equity, and fights against corruption—a source of resource wastage and depletion. These

Table 3 Dependency ratios obtained using the three hypothesis of fertility trends

Country	Hypothesis	1980	1985	1990	1995	2000	2005	2010	2015	2020	2025	2030	2035
Cameroon	High	93.6	97.3	99.2	98.5	94.8	90.9	87.5	84.3	81.4	78.6	76.4	73.1
Cameroon	Low	93.6	97.3	99.2	98.5	94.8	90.9	87.5	84.3	78.3	71.2	64.0	59.4
Cameroon	***Medium***	***93.6***	***97.3***	***99.2***	***98.5***	***94.8***	***90.9***	***87.5***	***84.3***	***79.9***	***74.9***	***70.2***	***66.3***
Comoros	High	94.4	97.1	98.3	95.0	88.6	82.5	78.6	75.6	74.4	72.9	71.2	68.3
Comoros	Low	94.4	97.1	98.3	95.0	88.6	82.5	78.6	75.6	71.4	65.7	59.1	54.9
Comoros	***Medium***	***94.4***	***97.1***	***98.3***	***95.0***	***88.6***	***82.5***	***78.6***	***75.6***	***72.9***	***69.3***	***65.2***	***61.7***
Cote d'Ivoire	High	92.2	91.8	90.3	86.9	86.2	88.5	87.4	83.5	82.2	82.3	81.9	79.1
Cote d'Ivoire	Low	92.2	91.8	90.3	86.9	86.2	88.5	87.4	83.5	79.2	74.8	69.4	65.2
Cote d'Ivoire	***Medium***	***92.2***	***91.8***	***90.3***	***86.9***	***86.2***	***88.5***	***87.4***	***83.5***	***80.7***	***78.6***	***75.6***	***72.2***
Guinea	High	81.8	86.0	89.6	91.2	91.0	89.5	86.7	83.8	82.3	80.6	78.6	75.0
Guinea	Low	81.8	86.0	89.6	91.2	91.0	89.5	86.7	83.8	79.3	73.4	66.4	61.4
Guinea	***Medium***	***81.8***	***86.0***	***89.6***	***91.2***	***91.0***	***89.5***	***86.7***	***83.8***	***80.8***	***77.0***	***72.5***	***68.3***
Mozambique	High	88.8	92.9	102.2	92.0	92.5	95.1	96.7	94.8	92.2	89.8	87.8	84.2
Mozambique	Low	88.8	92.9	102.2	92.0	92.5	95.1	96.7	94.8	89.1	82.3	75.3	70.3
Mozambique	***Medium***	***88.8***	***92.9***	***102.2***	***92.0***	***92.5***	***95.1***	***96.7***	***94.8***	***90.6***	***86.0***	***81.6***	***77.3***
Senegal	High	97.6	101.2	100.4	96.6	93.4	89.6	87.8	87.6	86.9	84.8	81.1	77.3
Senegal	Low	97.6	101.2	100.4	96.6	93.4	89.6	87.8	87.6	83.8	77.4	68.9	64.0
Senegal	***Medium***	***97.6***	***101.2***	***100.4***	***96.6***	***93.4***	***89.6***	***87.8***	***87.6***	***85.3***	***81.1***	***75.0***	***70.7***
Tanzania	High	96.8	96.3	95.0	93.2	91.6	92.5	93.1	93.8	92.8	90.7	88.2	84.7
Tanzania	Low	96.8	96.3	95.0	93.2	91.6	92.5	93.1	93.8	89.5	82.8	75.1	70.4
Tanzania	***Medium***	***96.8***	***96.3***	***95.0***	***93.2***	***91.6***	***92.5***	***93.1***	***93.8***	***91.2***	***86.7***	***81.6***	***77.6***

Source: United Nations, Department of Economic and Social Affairs, Population Division (2015)

conditions all appear to be necessary for an accelerated fertility decline, the opening of a demographic window of opportunity, and the capturing of a first demographic dividend. These conclusions are in line with those of a previous study on Côte d'Ivoire in which Guengant (2014) highlighted as necessary conditions for capturing the demographic dividend the importance of improving human capital (health and education), the creation of productive employment, and a vigorous policy of FP, which all create a significant demand for contraception.

On the debate over the key policy levers needed to trigger a continuous decline of fertility and mortality, which are necessary conditions to open the demographic window of opportunity, this chapter has shown the inadequacy of an approach based solely on contraception. To be sure, the chapter has highlighted the need to strengthen the FP programs to address unmet need, whose magnitude is persistent. However, the chapter has also demonstrated the need to expand maternal and child health programs to address high under five mortality levels as well as the need to expand education outcomes and employment opportunities for girls/women, whose effects on fertility have been demonstrated.

Appendix

Methodological Note on Decomposition Method

We use the decomposition method to determine the sources of change at the national level of fertility measured by the Total Fertility Rate (TFR). Two decomposition types are used: basic decomposition and advanced decomposition to specify the various sources of change in the TFR.

1 Basic Decomposition

The basic decomposition assumes that the TFR at the national level at time t (Y_t) is a weighted average of TFR of different levels of education (y_{jt}) and the proportion of the female population aged 15 to 49 in each category of the level of instruction j (w_{jt}).

$$Y_t = \sum w_{jt} * y_{jt}$$

As a result, the national change in the TFR can be decomposed into the composition effect (change over time in the distribution of women in different categories of the

level of education) and the performance effect (changes in women's behavior within the various categories of the level of education) as follows:

$$\Delta Y = \sum \bar{y}_j * \Delta w_j + \sum \bar{w}_j * \Delta y_j$$

Total change = composition effect + performance effect.

With $\bar{y}_j = (y_{jt_1} + y_{jt_2})/2$ and $\Delta w_j = (w_{jt_2} - w_{jt_1})$ the same formula is applied for $\bar{w}_j$ and Δw_j.

2 Advanced Decomposition of the Performance Effect

Here, the performance effect is broken down as follows:

$$y_j = \alpha + \beta x_j + \mu_j$$

Where:

- α is the basis performance when x = 0 (x here is the level of education of women).
- β is the increase of the TFR associated with a unit increase in the level of education x
- μ_j is the residual effect of other variables that are not considered in the model.

The total change of the TFR is as follows:

$$\Delta Y = [\sum \bar{y}_j * \Delta w_j] + [\sum \bar{w}_j * \Delta \propto] + [\sum w_j * x\Delta\beta] + [\sum w_j * \Delta\mu_j]$$

A B1 B2 B3

Composition effect *Performance effect*

Thus, the performance effect is broken down into the three following components:

- B1: Basic performance effect. This is the effect of education policies and programs implemented in the country (schooling, literacy, and information and communication for women's behavioral change)
- B2: the effect of the differentiation of the TFR by level of education of women (risk related to level of education)
- B3: the residual effect of other variables not considered.

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Countries with Very Slow or Incipient Fertility Transition

Hamidou Issaka Maga and Jean-Pierre Guengant

1 Introduction

Following the general theory of the demographic transition, fertility has considerably decreased in most countries of the world. According to the recent estimates of the United Nations Population Division, out of a total of 201 countries and territories, 153 had a total fertility rate (TFR) of less than 4 children per woman in 2010–2015, which represent 76% of the documented countries and territories, accounting for 86% of the world population in 2015 (United Nations 2015). Among the remaining 48 countries, 41 (i.e., 20% of the 201 countries and territories), accounting for 12% of the world population, had TFRs between four and less than six children per woman. Finally, seven countries, 3.5% of the 201 countries and territories, account for 2.3% of the world population. These seven countries had TFRs of six or more children per woman. Only Niger had more than seven children per woman (7.6), which constitutes today the highest fertility in the world.

In many African countries fertility rates have decreased significantly since the 1950s. However, there are still high fertility levels in certain countries and areas, especially in sub-Saharan Africa (SSA). Among the SSA 48 sovereign countries, seven countries, representing 18% of the population of the region, still have estimated TFRs higher or equal to six children per woman in 2010–2015. Among these SSA 48 sovereign countries, 32 countries, representing 75% of the region's population, had estimated TFRs between four to less than six children per woman. Only nine SSA countries, representing 9% of the region's population had TFRs below four children per woman.

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The main purpose of this chapter is to analyze the fertility trends in ten sub-Saharan African countries where the fertility transition can be termed as very slow or incipient. These countries: Burkina Faso, Burundi, Chad, the Democratic Republic of the Congo, Mali, Niger, Uganda, Somalia, South Sudan, and Zambia, are located in East, Central, and West Africa. They had in 2010–2015, TFRs above 5 children per woman and high natural population increase rates between 3% and 4% per year (except in South Sudan). They are also characterized by low GDP per capita (less than 1000 current US dollars in 2015, expect for Zambia) (World Bank Group 2016) and low human development (except again for Zambia) (UNDP 2015). Last, they all belong to the category of the Least Developed Countries. Because of their still high fertility and their very young populations, these countries will continue to be confronted with rapid population increases in the decades to come, and they still have a long way to go to reach the demographic window of opportunity linked to the fertility transition and associated with a stabilized number of births and a decrease of the proportion of young dependents.

This chapter also attempts to understand why those countries still have high fertility rates. To this end, we have examined the levels and trends of the main proximate determinants of fertility in these countries, in order to identify the countries where an acceleration of the fertility transition can be envisioned in the near future and the countries where such an acceleration appears less likely. Finally, we discuss the strategies that could be implemented to initiate the fertility transition process in Niger, an atypical country where no fertility decline has been observed over the past 50 years.

2 Methodology

The current chapter relies on internationally recognized data sources and uses the general framework of the fertility transition.

2.1 Data Used and Data Limitations

Two types of interrelated data providing fertility estimates have been used. First, we use the United Nations Population Division data, which combine several sources of data: results of national censuses, demographic surveys, noticeably the Demographic and Health Surveys (DHS), and other surveys and statistics. Second, we use the Demographic and Health Surveys (DHS) data, which rely on a standard internationally accepted methodology allowing comparisons over time and space for a given country and across countries. The DHS data contain detailed information on fertility levels and trends and the corresponding proximate determinants, contrary to census data which are limited to fewer variables. However, it is worth noting that the countries under analysis do not have an equal number of DHS surveys. Two countries,

South Sudan and Somalia, never conducted a DHS survey. Among the remaining eight countries, five have carried out between 4 and 6 DHS surveys (Burkina Faso, Mali, Niger, Uganda, and Zambia) and three (Burundi, Chad, and the Democratic Republic of the Congo) had conducted only two surveys. The time span between the first DHS and the most recent one varies also from about 20 years and more for six countries (Burkina Faso, Burundi Mali, Niger, Uganda, and Zambia), to only 7 years for Chad and the Democratic Republic of the Congo. This constitutes a limitation to some analyses made in this chapter.

2.2 The General Framework of Fertility Determinants

The analyses of fertility trends of this chapter follow the explanatory frameworks proposed by some authors, such as Bongaarts and Freedman.

Bongaarts' framework (1978) deals with the proximate or direct determinants that explain the fertility levels and trends of a country or an area. This framework, to which Stover added some relevant revisions (1998), is still valid for analyzing fertility levels and trends of most countries during their fertility transition.

Freedman's initial framework (1987), explains fertility trends in time and space through three types of determinants:

1. The contextual and socio-economic determinants, including the economic, social, and health policies, the socio-cultural values, the economic, political, and environmental country characteristics, as well as the socio-economic characteristics of individuals;
2. The psycho-social determinants, which deal with individual perceptions and opinions relating to social norms applicable to the family size and the proximate determinants; and
3. Eight proximate determinants, among which only the contraceptive prevalence, the proportion of married women in relation to the age at first marriage, and voluntary or involuntary abortion facilitate the fertility transition.

2.3 Classification of High Fertility Countries with Slow and Incipient Fertility Transitions

Using available data, i.e., the United Nations Population Division data and/or the DHS data, we have selected 10 countries: Burkina Faso, Burundi, Chad, the Democratic Republic of the Congo, Mali, Niger, Uganda, Somalia, South Sudan, and Zambia, where the fertility transition can be considered as very slow or incipient. Among these countries, two different groups have been identified (Fig. 1):

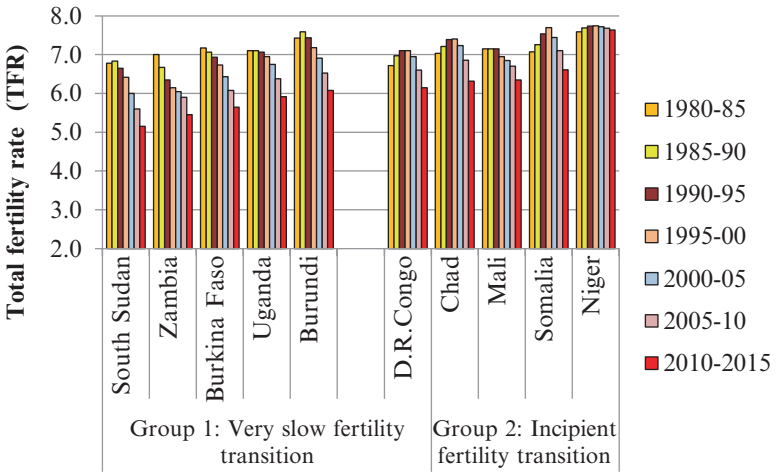

Fig. 1 Total fertility rates (TFR) from 1980–1985 to 2010–2015 in countries with very slow and incipient fertility transitions (Source: United Nations (2015). *World population prospects: The 2015 revision*. New York: Population Division)

1. Group 1: countries with a slow fertility transition, with a TFR decrease between 1980–1985 and 2010–2015 of more than one child. Five countries belong to this group, by increasing order of their TFR for the period 2010–2015: South Sudan, Zambia, Burkina Faso, Uganda, and Burundi. Despite the very slow fertility transition experienced by these countries, available data suggest that an acceleration of the fertility transition can be envisioned for these countries in the near future.
2. Group 2: countries with an incipient fertility transition, namely a decrease of the TFR of less than one child between 1980–1985 and 2010–2015. Five countries belong to this group, by increasing order of their TFR for the period 2010–2015: the Democratic Republic of the Congo (DRC), Chad, Mali, Somalia, and Niger. By contrast with the countries of Group 1, available data suggest that an acceleration of the fertility transition is less likely for these countries in the near future.

Further analysis of the determinants of fertility was not possible for South Sudan and Somalia because no DHS surveys were undertaken in these countries due to civil wars over several years. Therefore, such analyses had to be restricted to the remaining eight countries.

3 Countries with a Slow Fertility Transition

Compared with the countries with an incipient fertility transition, the countries with a very slow fertility transition are characterized by lower percentages of women in union (around 60%, except for Burkina Faso) and higher contraceptive prevalence rates CPRs) for modern methods. As a result, the TFRs given by the last DHS

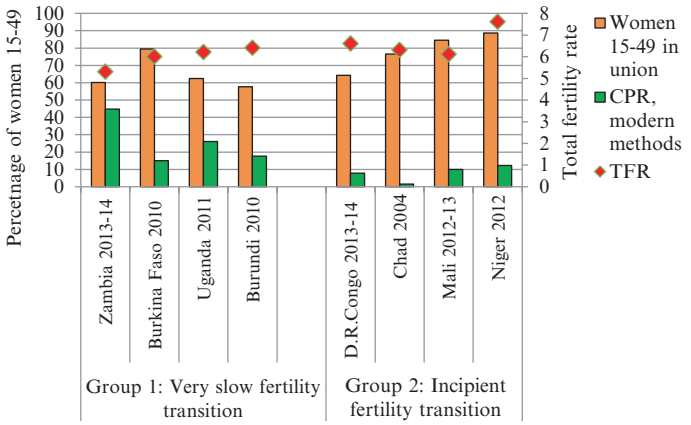

Fig. 2 Percentage of women aged 15–49 years in union, contraceptive prevalence rate (CPR) for modern methods and total fertility rate (TFR) from the most recent DHS surveys in countries with very slow and incipient fertility transitions (Source: The DHS Program, MEASURE DHS and STATcompiler (www.statcompiler.com))

undertaken in the countries of this group are generally lower than the TFRs of the four countries in Group 2 (Fig. 2). In addition, it should be noted that the TFRs given by more recent Malaria Indicator *Surveys (MIS) undertaken in some countries indicate lower fertility levels compared to DHS results: 5.5 children in the 2014 Burkina Faso MIS survey (against 6.0 in the 2010 DHS), 5.7 children in the 2014–2015 Uganda MIS survey (against 6.2 in the 2011 DHS), and 6.1 children in the 2012 Burundi MIS survey (against 6.4 in the 2010 DHS). As the 2013–2014 Zambia DHS gives a TFR of 5.3 children per woman, it can be said that the four countries of this group have already TFRs close to or below 6 children per woman, and that an acceleration of their fertility transition is not unlikely in the near future.*

The CPRs for modern methods in the four countries of this group are quite substantial, ranging from 44.8% for Zambia in 2013–2014 to 15% for Burkina Faso in 2010. In addition, contraceptive prevalence rates (CPRs) for modern methods among women in union have increased to a certain extent during the 20 years period between the *first and the most recent DHS* (between 11 and 36 percentage points for Burkina Faso and Zambia, respectively) (Table 1). The lowering effect on fertility of the increase of contraceptive prevalence has been somewhat reinforced by a decrease in the percentage of women in union (from 3 to 10 percentage points for Zambia and Burundi, respectively), and by an increase of about 1 year (except in Burkina Faso) of the median age at first marriage. Besides, total demand for family planning is relatively high, according to last DHS results (70% in Zambia, 64% in Uganda, and 54% in Burundi), but remains low in Burkina Faso where surprisingly it has decreased between 1993 and 2010 from 50 to 41%. This evolution is linked to a decrease of about one child in the mean ideal number of children among married women, except again in Burkina Faso, where its remains close to 6 children per woman, against about 5 in Zambia and Uganda and 4 in Burundi.

Table 1 Evolution between the first and the most recent DHS survey in countries with very slow and incipient fertility transitions of total fertility rates (TFRs) and some proximate determinants of fertility and other associated variables

Countries and surveys	Total fertility rate 15–49	CPR modern methods, all women (%)	CPR modern methods, women in union (%)	Women 15–49 in union (%)	Median age at first marriage, women 25–49	Total demand for family planning (%)	Mean ideal number of children, currently married women
Group 1: Very slow fertility transition							
Zambia 2013–14	5.3	32.5	44.8	60.1	18.4	70.2	5.1
Zambia 1992	6.5	7.0	8.9	63.1	17.4	45.2	6.2
Burkina Faso 2010	6.0	14.3	15.0	79.4	17.8	40.7	5.8
Burkina Faso 1993	6.5	4.0	4.2	83.8	17.5	49.5	5.9
Uganda 2011	6.2	20.7	26.0	62.5	17.9	64.3	5.1
Uganda 1988–89	7.4	2.7	2.5	67.3	17.0	–	6.8
Burundi 2010	6.4	11.0	17.7	57.7	20.3	54.3	4.3
Burundi 1987	6.9	1.0	1.2	67.2	19.5	–	5.5
Group 2: Incipient fertility transition							
D.R. Congo 2013–14	6.6	8.1	7.8	64.2	18.7	48.1	6.6
D.R. Congo 2007	6.3	6.7	5.8	66.2	18.6	47.6	6.8
Chad 2004	6.3	1.5	1.6	76.6	15.9	31.6	9.2
Chad 1996–97	6.4	1.2	1.2	78.2	15.8	21.6	8.5
Mali 2012–13	6.1	9.6	9.9	84.6	18.0	36.3	6.0
Mali 1987	7.1	1.2	1.3	92.1	15.7	–	6.9
Niger 2012	7.6	11.0	12.2	88.6	15.7	29.9	9.5
Niger 1992	7.0	2.3	2.3	85.5	14.9	23.1	8.5

Source: *The DHS Program, MEASURE DHS and STATcompiler* (www.statcompiler.com)

Obviously, an acceleration of the fertility transition in the four countries examined here will require altogether a further decline in the ideal number of children among women and men, an additional increase in the demand for family planning, and a more rapid increase of the use of modern contraceptive methods than it has been the case in the past. This outcome is not unlikely in the case of Zambia, Uganda, and Burundi, but might be more doubtful in the case of Burkina Faso.

4 Countries with an Incipient Fertility Transition

By contrast to the four countries of Group 1, the countries with an incipient fertility transition are characterized by higher percentages of women in union (from 64% for the Democratic Republic of the Congo to 89% for Niger) and lower contraceptive prevalence rates (CPRs). Therefore, the TFRs given by the last DHS undertaken in the countries of this group are generally higher than the TFRs of the four countries in Group 1, noticeably for the Democratic Republic of the Congo and Niger. It should be noted also that the results of two more recent Multiple Indicator Cluster *Surveys (MICS) indicate for Chad an increase of fertility compared to DHS results: 6.9 children in the 2010 Chad MICS (against 6.3 in the 2004 DHS), and for Mali a TFR quasi identical: 6.0 children in the 2015 Mali MICS survey against 6.1 in the 2012–2013 DHS. Even if the MICS results are not strictly comparable to the DHS results because these surveys do not use exactly the same methodology, these results and the other indicators mentioned above suggest that an acceleration in the near future of the fertility transition for the four countries of Group 2 is less likely than for the countries of Group 1.*

The comparison of the values of the TFRs and some proximate determinants of fertility and other associated variables between the first and the most recent DHS in the countries of this group is limited for the Democratic Republic of the Congo and Chad because of the short number of years (about 7 years) between the two DHS undertaken in these countries. Nevertheless, it should be noted that the CPRs for modern methods among women in union have increased slowly, especially in Mali and Niger during the 20 years period between the *first and the most recent DHS* (less than 10 percentage points). The limited lowering effect on fertility of this slow increase of contraceptive prevalence has not been accompanied by a noticeable decrease in the percentage of women in union (this percentage has even increased in Niger) and by an increase of the median age at first marriage(except in Mali). In addition, the total demand for family planning is low: 48% in the Democratic Republic of the Congo and particularly low, around 30%, in Mali, Chad, and Niger. These indicators are correlated to still high mean ideal numbers of children among married women: 6 children per woman in Mali, 6.6 in the Democratic Republic of the Congo, and about 9 children in Chad and Niger.

To be sure, an acceleration of the fertility transition in the four countries of Group 2 will require an important decline in the ideal number of children among women and men, and a major increase in the demand for family planning, associated with an acceleration of the use of modern contraceptive methods.

5 The Fertility Transition Is More Advanced Among Urban and Educated Women

In all the countries studied here, fertility levels are lower among urban and more educated women than among rural and less educated women. *The comparison of the values of the TFRs by residence and levels of education in the first and the most recent DHS undertaken in these countries allows a better understanding of the* processes that have led to the present fertility differentials.

5.1 Urban Fertility Transition

According to available DHS data, TFRs in urban areas have always been lower than in rural areas (Fig. 3).

According to the most recent DHS, TFRs in urban areas are about 3 children less than in rural areas in three countries of Group 1: Zambia, Burkina Faso, and Uganda. In Burundi and in the four countries of Group 2, the difference between the urban and rural TFRs is less important (between 0.6 child in Chad and 2.5 children in Niger). However, it is interesting to note that these differences have increased rather markedly in Zambia, Burkina Faso, and Uganda, as well as in Niger, whereas in the other countries, the differences have not varied much. This means that the fertility transition has started in all countries in urban areas. In some countries fertility declines have somewhat accelerated in urban areas compared with rural areas, hence the growing differences between urban and rural TFRs. However, in other countries, the diffusion process of fertility declines is now more or less similar in urban and

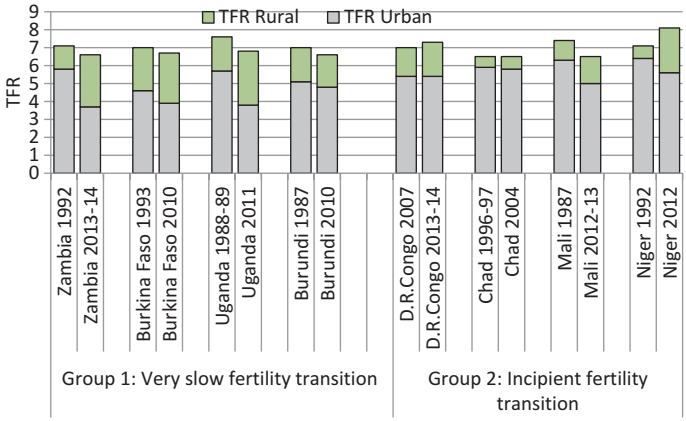

Fig. 3 Evolution of TFRs by residence between the first and the most recent DHS surveys in countries with very slow and incipient fertility transitions (Source: The DHS Program, MEASURE DHS and STATcompiler (www.statcompiler.com))

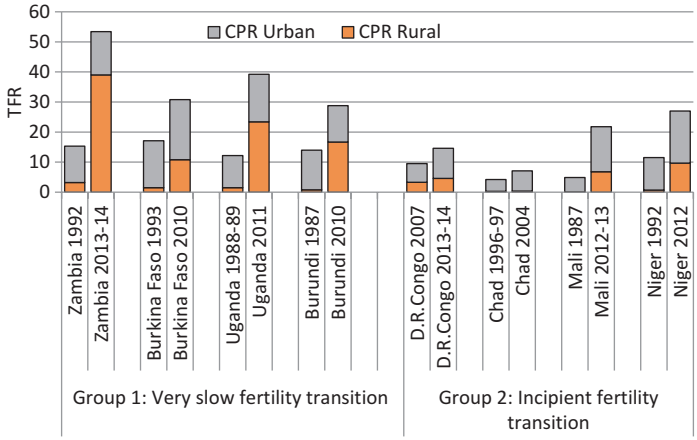

Fig. 4 Evolution of contraceptive prevalence rate (CPRs) for modern methods (%) among women in union by residence between the first and the most recent DHS surveys in countries with very slow and incipient fertility transitions (Source: The DHS Program, MEASURE DHS and STATcompiler (www.statcompiler.com))

rural areas, and the differences between urban and rural TFRs remain more or less the same, and smaller than in the previous situations.

The earlier onset of the fertility transition in urban areas is the result of several factors, including a better access to information and to contraceptive methods as well as better education levels (see below). In fact, according to available DHS data, CPRs for modern methods have always been higher in urban than in rural areas (Fig. 4).

According to the first DHS, the spread of contraceptive use clearly started in urban areas. The CPRs for modern methods registered were around 15% in the countries of Group 1, and between 4% (in Chad) and 12% (in Niger) in countries of Group 2. By contrast, CPRs for modern methods registered in the first surveys in rural areas where insignificant: between 3% (Zambia in 1992 and the Democratic Republic of the Congo in 2007), and less than 1% (in Burundi, Chad, Mali, and Niger).

The most recent DHS surveys indicate the pursuit of the diffusion of contraceptive use in urban areas in all countries, and parallel to that the spread of contraceptive use in rural areas. As a result, in all countries but Burundi, the differences between urban and rural CPRs for modern methods have increased, and the latest urban CPRs in all countries but Chad are about 15–20 percentage points above the rural CPRs. Therefore, the most recent CPRs of modern methods in urban range from roughly 30 to 50% in the countries of Group 1, but stay below 30% in countries of Group 2 (from 7% in Chad in 2004, to 27% in Niger in 2012).

As all countries remain predominantly rural, an acceleration of the fertility transition, especially in countries of Group 2 requires major efforts of information towards rural population and a full national coverage of family planning services.

5.2 *Education: A Key Factor of the Fertility Transition*

Reaching levels of education beyond primary school for both women and men is a key triggering factor of the fertility transition as this has been observed in all countries, including Niger despite its record high TFR (Issaka 1995). Indeed, in the eight countries examined here, the TFRs have always been the lowest among women who have the highest levels of education (Fig. 5).

According to the first DHS, TFRs of women with a secondary level of education varied from 3 children per women (in Burkina Faso in 1993) to 5.7 children (in Burundi in 1987). The most recent DHS surveys give varying TFRs compared with the first TFRs: lower of about one child for Zambia and Burundi, lower of about half a child for Uganda and Chad, more or less the same TFRs for Burkina Faso and Mali, and a recent TFR higher by one child for Niger. Therefore, the last DHS give TFRs of women with a secondary level of education between roughly 4 and 5 children per woman in the countries of Group 1, and from 4 to 6 children in the countries of Group 2. These TFRs are between 2 and 3.5 children less than the TFRs of the women with no education. These results indicate that the effect of education on fertility is real but varies depending on the context, especially on the reproductive and family norms prevailing in each country.

Nevertheless, it should be noted than the TFRs of women with a secondary level of education in all countries, except Burundi, appear to be lower than their urban TFRs. This confirms that advanced education for women has a greater impact on fertility than urbanization, as asserted by some authors, such as Caldwell (1982), who considers the generalization of education to be a strong social determinant

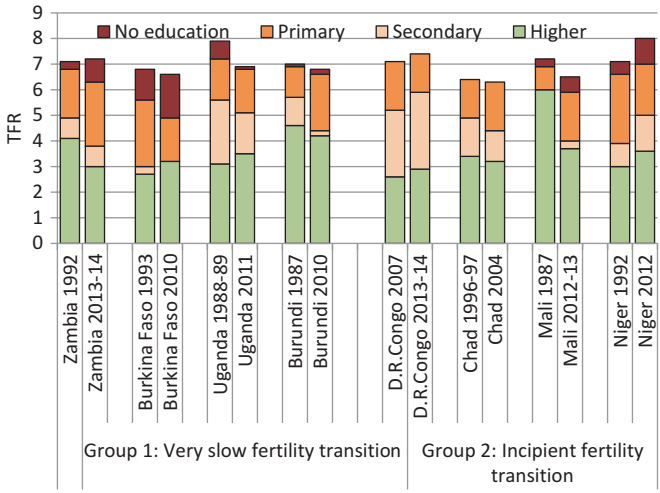

Fig. 5 Evolution of TFRs by levels of education between the first and the most recent DHS surveys in countries with very slow and incipient fertility transitions (Source: The DHS Program, MEASURE DHS and STATcompiler (www.statcompiler.com))

contributing (along with urbanization) to accelerate the speed of the fertility transition in Africa, even in the absence of a significant process of industrialization.

As it could be expected, the lower levels of fertility among educated women are the result of higher CPRs for modern methods (associated with a delayed age at first marriage) (Fig. 6).

The CPRs among the women with secondary or higher (University) levels of education are generally noticeably higher than the CPRs among women with only primary education or no education at all. Use of modern contraceptive methods has increased rather significantly between the first and the most recent DHS, but the most recent CPRs among women with no education or with only primary education remain low, below 30% in the countries of Group 1 (except for Zambia) and below 20% in all countries of Group 2.

Education levels are correlated with fertility and contraceptive use (higher levels of education are linked with lower TFRs and higher CPRs). However, education alone does not seem sufficient to accelerate and ultimately achieve the fertility transition, given the still high fertility levels observed among women with secondary education, i.e., between 3 and 5 children per woman—a result of the still high ideal numbers of children they continue to report in the surveys. Rising education levels, especially among young women, must of course remain a priority, but its impact on lowering fertility will be linked to other factors such as extensive family planning services along with widespread information as well as major improvements in the status of women.

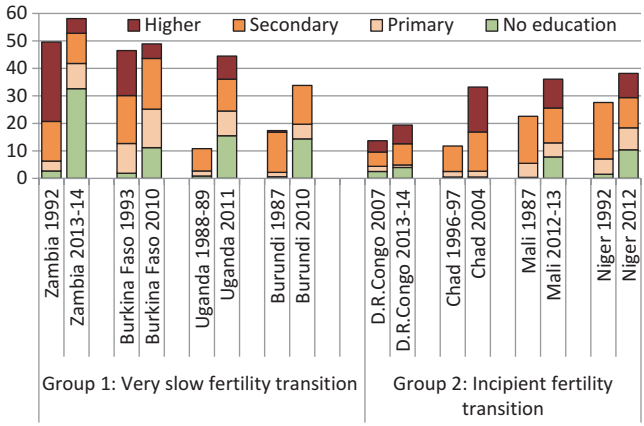

Fig. 6 Evolution of CPRs for modern methods among women in union (%) by levels of education between the first and the most recent DHS in countries with very slow and incipient fertility transitions (Source: The DHS Program, MEASURE DHS and STATcompiler (www.statcompiler.com))

6 When Could the Countries with Very Slow or Incipient Fertility Transitions Benefit from a Demographic Dividend?

Given the still high fertility levels of the eight countries studied, one may wonder when these countries could harness a demographic dividend.

Let us recall that the first condition to be met to possibly benefit from a demographic dividend is to reduce the proportion of dependents (mainly those aged less than 15 years) relative to the proportion of those in the working age population (aged 15–64 years), in order to create what has been called a "demographic window of opportunity".

The opening of the "demographic window of opportunity" begins when the proportion of those in the working age group starts to exceed the proportion of dependents, namely the children and the elderly. This corresponds to a dependency ratio of less than 100 dependents aged less than 15 years and 65 years and more for every 100 "potentially active" people of 15–64 years (this is the most common definition being used). However, the opening of the "demographic window of opportunity" is a continuous process. Therefore, most authors consider that the "demographic window of opportunity" is really opening when those under 15 years represents about 35% of the total population (UNECA 2010), and the dependency ratio is below 75 dependents for every 100 "potentially active" people, as observed in most emerging market economies.

By 2015, according to the estimates of the United Nations Population Division, four countries had dependency ratios slightly below 100 "potentially active" people: three countries of Group 1: Zambia, Burkina Faso, and Burundi, as well as the Democratic Republic of the Congo (and South Sudan and Somalia).). And three countries of Group 2: Mali, Chad, and Niger as well as Uganda had dependency ratios slightly above 100 "potentially active" people, with Niger having the highest dependency ratio, i.e. 113.

Future dependency ratios will depend of the pace of future fertility declines and the corresponding stabilizing impact on the number of births and children in each country. For the eight countries studied here, the United Nations Population Division projected in their 2015 projections (Medium variant) a decline of fertility leading for seven countries to 3.2–3.6 children per woman by 2050, and to 4.7 children for Niger. These assumptions translate into declining dependency ratios below 75 dependents for 100 "potentially active" people by 2035 for Burkina Faso; 2040 for Uganda, Burundi, the Democratic Republic of the Congo, and Chad; 2045 for Zambia and Mali; and 2060 for Niger. Thus, according to these results and the definition adopted, another 20–30 years of fertility decline (45 years for Niger) is likely to be necessary for the countries studied to enter into a "demographic window of opportunity", unless a more rapid fertility decline would happen to shorten this time span.

However, if creating a "demographic window of opportunity" thanks to a fertility decline is a necessary condition to harness a demographic dividend, it is not a suf-

ficient condition. Harnessing a demographic dividend supposes also to have a human capital of a better quality than today, an improved governance, and a large proportion of a rapidly growing labor force employed in more productive and gainful occupations. This represents a daunting challenge for these countries where the largest part of the active population is now working in the informal urban sector and/or in low productive agricultural activities.

7 How to Initiate the Fertility Transition in Niger?

Niger deserves a special attention since according to the estimates of the United Nations Population Division it is the only country in the world to have had a TFR always above 7 children per woman since 1960 and an estimated TFR in 2010–2015 higher than the TFR estimated for 1960–1965 (7.6 children per woman against 7. 3). Thus, Niger is the only country in the world where there has been no sign of fertility decline over the past 50 years.

7.1 Niger Is, and Will Continue to Be, Confronted with Major Demographic Challenges

This constant high fertility was combined with a rapidly decline of child mortality over the past 20 years (the under-five mortality has been divided by three between 1990–1995 and 2010–2015, thanks to the more efficient health programs put into place). This led to an outstanding rate of natural increase of 4% per year in 2010–2015, another world record, which is confirmed by the high annual average rate of growth of 3.9% recorded during the last intercensal period (2001–2012). Because the country experienced a sustained high rate of population growth since its independence, Niger's population increased from about 3.4 million in 1960 to 20 million in 2015—an exceptional six-fold increase.

The Medium variant of the 2015 United Nations population projections for Niger, anticipates a population of 43 million by 2035 and 72 million by 2050. This is a doubling of the population in the next 20 years, and between a tripling and a quadrupling in the next 35 years, despite the projected fertility decline. These projections mean that Niger will continue to cope with major challenges it has already long been confronted to, namely providing food, health, education services, and employment for all, which the country has not really been able to do in the past (May et al. 2004). The difficulties of Niger to fulfill the needs of its population in health, education, and better wellbeing, is reflected by its low human development index. Despite the advances made in health and education, Niger ranked in 2015 188th out of 188 countries documented, and thus had the lowest human develop-

ment index (HDI) of the world (UNDP 2015), as it has often been the case since the first Human Development Report published in 1990.

Sustained high rates of population growth since 1960 have also been a major obstacle for increasing the income of the population given the limited resources base of Niger. According to World Bank Group data, Niger is one of the 10 countries of sub-Saharan Africa to have in 2015 a GDP per capita in real terms inferior (of 37%) of what it was in 1960, because the economic growth was lower than the demographic growth. This has changed since 2005, especially in the 2010–2014 period, thanks to high prices of uranium and oil (exploitation started of the latter in 2011) and to a good performance of the agricultural sector (due to exceptional rainfalls in 2010, 2012, and 2014) (Fig. 7).

However, the highest 5-year average economic growth (of nearly 7% per year) registered since 1960, which occurred in 2010–2014, yielded only an annual average GDP per capita growth of 2.8%, because 60% of the GDP growth was absorbed by the demographic growth. Besides, the economic future of Niger seems less favourable than what is has been in recent years. Prices paid for uranium and oil have plummeted and Niger's economy is not diversified enough to sustain a high continued economic growth in the coming years. Economic growth for 2015 was estimated at 3.6%, less than the demographic growth, yielding a decrease of the GDP per capita of 0.4%. In 2015, the GDP per capita of Niger was estimated at 360 current US dollars (the third lowest of sub-Saharan Africa, after the Central African Republic and Burundi) and to 950 International dollars PPP (purchasing power parity) (the fifth lowest after Liberia, the Democratic Republic of the Congo, the Central African Republic, and Burundi).

Even if the fertility transition accelerates in the coming years, Niger will have to confront aggravated population challenges. Recurrent food crises are likely to get worse because of increasing pressure on more and more limited available land suited for rain-farming, not to mention the negative effects forecasted because of climate change. Given the youthfulness of the population (61% of Nigeriens are

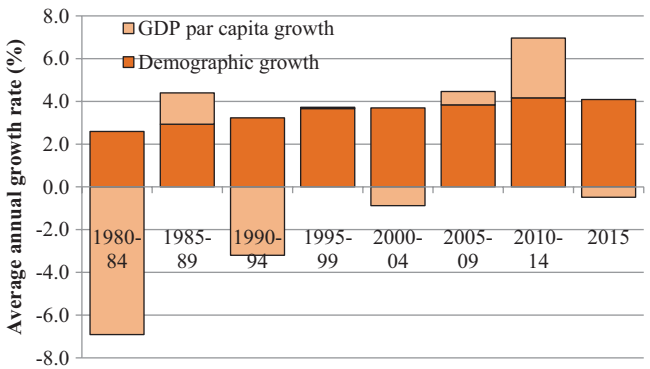

Fig. 7 Trends of GDP per capita and population growth rates from 1980 to 2014 (Source: World Bank Group, World Development Indicators (Last updated: July 8, 2016))

below age 20), the number of youth entering into the labor market will unavoidably double in the next 20 years because all these new entrants are already born. Yet, today at least 90% of the workers occupy poorly paid jobs in the urban informal sector and in (mostly) subsistence agriculture. In this context, it is difficult to envisage that enough "decent" jobs could be created to respond to all the needs. Yet, Nigeriens have proven to be quite resilient to harsh conditions in the past, but it is not at all guaranteed that the new generations will accept no improvement in their living conditions.

At least an acceleration of the fertility transition could help to reduce somewhat the demographic pressures that Niger will be confronted to. This is particularly the case in the area of health services to mothers and children, of education at the pre-primary and primary levels, where a slowdown of the number of births and children would permit some savings that could be used to improve the quality of the services provided, to develop vocational training for young, and to invest more in jobs creation activities.

7.2 The Need for New Population Programs

Niger has already adopted two population policy programs aimed at reducing population growth,, the first one in 1992, the second one in 2007 (Soumana et al. 2005; MP/AS, 2007). But as we have just seen, the population growth of the country has increased instead of decreasing as foreseen.

The 2007 population policy mainly focused on advocacy directed to policy-makers, mass sensitization on family planning and against early marriage, and on population-development issues based on training the stakeholders. In order to reach its objective of reducing population growth through behavioral changes, the 2007 policy aimed at: (a) increasing the contraceptive prevalence for modern methods by at least one percentage point per year between 2007 and 2015 (so as to reach a CPR for modern methods between 15 and 20% by 2015); (b) reducing by one third the percentage of early marriage (before age 20 so that to reduce the percentage of married women aged 15–49 years from 85 to 75% by 2015); and (c) maintaining the mean duration of breastfeeding and postpartum abstinence to a length of 16 months.

None of these targets were reached. According to the last DHS, carried out in 2012, the CPR for modern method (lactational *amenorrhea* or LAM excluded) was only of 8.3% against 5.0% in 2006, which corresponds to a 0.55 percentage point increase per year instead of the one percentage point being planned. The percentage of women aged 15–19 years in union has not decreased, but increased from 59% in 2006 to 61% in 2012, and last but not least, the mean duration of breastfeeding and postpartum abstinence has decreased from 16.4 to 14.7 months.

Yet, an acceleration of the use of modern contraceptive methods is possible. In fact, this is what has been observed in several Asian and North African Muslim countries, thanks in most cases to the appropriate population policies and family planning programs put in place (May 2012). In many countries, outreach and com-

munity based distribution programs directed to rural populations have been key elements for having family planning methods accepted and used by increasing numbers of women.

In Niger, the Nigerien Association for Social Marketing (Animas-Sutura), a non-government organization (NGO) supported by the German Technical Cooperation, has used community-based approaches with success in about 550 villages in three regions out of seven regions plus Niamey (Maradi, Tahoua, and Tillabéri). In the areas of the regions covered by Animas-Sutura, the CPRs for modern methods have increased from 1.5 to 2.0 percentage points per year between 2006 and 2013, and reached between 15 to 20% in 2013, that is three times the CPR found in the rural areas of the country in the 2012 DHS (Guengant and Issaka 2015).

These remarkable results in the context of Niger have been achieved through a combination of community-based strategies involving community leaders (customary and religious leaders) and local stakeholders (health personnel, peer educators, etc.). However, to extend this experience to the overall rural population (80% of the total population) living in some 10,000 villages, represents a real challenge. This will require important and regular investments over several decades and human resources well-prepared to provide quality family planning information and services, in a context where many Islamic leaders rely mostly on breastfeeding and are hostile to family planning, except for spacing reasons. This will require also a strong political commitment to family planning, the implementation of new strategies (e.g., door-to-door sensitization, group discussions at the village level, new messages through local rural radio, etc.) as well as more numerous heath centers. Finally, the renewed strategies to be put in place should focus on the ways to increase the demand for family planning beyond the present low 30%. Unless this is done, the CPR may long remain at a low level and slow down the fertility transition.

8 Conclusions

According to the data used in this chapter, fertility transition is still very slow or incipient in a few African countries.

Among the four countries studied where the fertility transition is slow: Burundi, Burkina Faso, Uganda, and Zambia, a small fertility decline has been observed since the 1980s, thanks to an increase, albeit modest, of the use of modern contraceptive methods and of a small increase of the age at first marriage.. But recent data suggest a continued fertility decline. Therefore, these countries could be on the right track to accelerate their fertility transition in the near future.

In the four countries with an incipient fertility transition, surveys' results suggest that fertility levels have increased in recent years in Niger, the Democratic Republic of the Congo, and Chad, and have remained high in Mali. In all these countries, CPRs for modern methods have not increased rapidly enough to have a significant lowering impact on fertility, therefore an acceleration of their fertility transition in the near future seems less likely.

For the eight countries studied, further analyses reveal that the onset of fertility transition has started among the urban and more educated women, who in all countries have always had the lowest fertility levels and the highest contraceptive prevalence rates (modern methods). However, according to the 2015 United Nations population projections, it remains that another 20–30 years of fertility decline (45 years for Niger) will be necessary for the eight countries studied here to enter into a "demographic window of opportunity", unless a more rapid fertility decline shortens this rather long time span.

They are several possible levers to accelerate the fertility transition in the countries studied. Rising education levels, especially among young women, will have an impact on lowering fertility levels, but only in the medium run. In the short term, it is necessary to intensify information campaign, in the respect of local cultures, on the benefits of family planning, to expand quality reproductive health services as well as to improve the status of women. Last, renewed strategies, using outreach and community based distribution programs have to be put place, especially in rural areas,, in order to increase the acceptance of family planning and the use of modern contraceptive methods among rural women who still constitute the majority of the population of the high fertility countries studied here.

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Demographic Challenges of the Sahel Countries

John F. May, Jean-Pierre Guengant, and Vincent Barras

1 Introduction

Sub-Saharan Africa will be driving global demographic growth in the twenty-first century: from 962 million people in 2015, its population could be comprised of between 1.9 and 2.3 billion people in 2050, depending on the pace of fertility decline (United Nations 2015). However, the region is far from homogenous and the 48 sovereign sub-Saharan countries have experienced very different demographic developments.

Southern Africa has almost completed its demographic transition by passing from high to low levels of mortality and fertility, but it is necessary to note its high prevalence of HIV/AIDS, which has driven increases in mortality and brought major changes in the age structures. The majority of countries in Eastern Africa have begun their transition, but it is not certain that they will be able to complete the process quickly (Guengant and May 2011). By contrast, Western and Middle (or Central) African countries are almost all lagging behind in their transition. In Western Africa, countries still have high fertility levels, above all in the Sahel where, with 7.6 children per woman, Niger has the highest level of fertility in the world (May and Guengant 2014; Population Reference Bureau 2015).

The Sahel (which comes from the Arabic "border") is a semi-arid region, which lies across Northern, Western, Middle, and Eastern Africa, extending from Senegal to Eritrea. It is located between arid Africa and wet Africa, bordered on the North

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by the Sahara Desert and to the South by the savanna regions. As data is only readily available at the national level, this chapter examines the ten countries generally considered as part of the Sahel, namely Burkina Faso, Chad, Eritrea, the Gambia, Guinea-Bissau, Mali, Mauritania, Niger, Senegal, and Sudan. Sudan became independent in 1956; seven countries achieved independence in the 1960s, followed by Guinea-Bissau in 1974 and Eritrea in 1991.

The Sahel region has long attracted the attention of the international development community. Firstly, the region is saddled with multifaceted challenges, including vast expanses of desert, arid soils, erratic rains, low agricultural productivity, and the threat of climate change, which will probably bring negative consequences on food production (higher temperatures would decrease food production, although rains might become more abundant). Secondly and more recently, the region has faced political unrest, separatist movements, and Islamist insurgencies. This political turmoil is illustrated by the emergence of the Al-Qaeda in the Lands of the Islamic Maghreb (AQIM), an Algeria-based Sunni Muslim jihadist group, which was formed in the 1990s and rallied to Al-Qaeda in 2006. Boko Haram, another Sunni Muslim jihadist group that emerged in the North East of Nigeria in 2002, recently extended its attacks on civilians in Chad, Cameroon, and Niger, and also claimed to be part of DAESH (the Islamic State). The Tuareg rebellion as well as incursions of AQIM-supported groups into the North of Mali triggered a French-led military operation in January 2013 (Arsenault 2014). If one considers also the 2014 political transition in Burkina Faso, the chronic instability in Guinea-Bissau, the various coups d'état in Mauritania, and the recurrent clashes between Sudan and South Sudan as well as between Ethiopia and Eritrea, it can be said that insecurity touches almost all Sahel countries today (Michailof 2015).

The tumult in the Sahel region has multiple causes, among which demography plays an important role, although rarely recognized. The region is experiencing exceptional and unprecedented natural demographic growth, leading to a widening gap between population size and available resources. This is a source of social and potential political tensions because the exponential expansion of the population has not been matched by significant human development progress (e.g., education, health, nutrition, governance, etc.). Tremendous development efforts are needed if one wants to avoid further and more dramatic turbulences in this part of Africa. Such efforts also call for strong public policy measures.

2 Geography, Economy, and Security

The ten Sahel countries defined above cover 7.3 million square kilometers. Their total population was estimated to be 138 million people in 2015 (United Nations 2015; see Table 1), against 118.4 million in 2010. Five of these countries (Chad, Mali, Mauritania, Niger, and Sudan – all landlocked, except Mauritania), have a

Table 1 Key demographic and human development indicators for the Sahel countries in 2015

	Burkina Faso	Chad	Eritrea	The Gambia	Guinea-Bissau	Mali	Mauri-tania	Niger	Senegal	Sudan
Population in 2015 (millions)[a]	18.1	14.0	5.2	2.0	1.8	17.6	4.1	19.9	15.1	40.2
Population in mid-2050 (millions)[b]	46.6	37.4	10.4	5.0	3.5	43.6	7.1	68.0	32.3	105.0
Youth literacy rate (% ages 15–24) 2005–2012[c]	39	49	91	69	74	47	56	23.5	66	88
Total fertility rate in 2010–2015[a]	5.7	6.3	4.4	5.8	5.0	6.4	4.7	7.6	5.2	4.5
Total fertility rate in 1970–1975[a]	6.7	6.7	6.6	6.2	6.1	7.2	6.8	7.5	7.4	6.9
Population per square kilometer in 2015[a]	66.2	11.1	51.8	196.7	65.6	14.4	3.9	15.7	78.6	22.8
Urban population (%)[b]	27	22	21	57	49	39	59	22	45	33
Percentage of population <15 in 2015[a]	45.6	47.7	42.8	46.2	40.8	47.5	40.0	50.5	43.8	40.5
Married women between 15 and 49 using modern contraception (%)[b]	18	2	7	8	14	10	10	12	20	12
GDP per capita, PPP (current int. $) in 2013[c]	1684	2089	1196	1661	1407	1642	3043	916	2242	3373

(continued)

Table 1 (continued)

	Burkina Faso	Chad	Eritrea	The Gambia	Guinea-Bissau	Mali	Mauri-tania	Niger	Senegal	Sudan
Decrease of crop production with carbon fertilization in 2080 (%)[d]	13.0	N/A	N/A	N/A	N/A	25.9	N/A	24.2	44.7	49.5
2014 Gender inequality index out of 152 countries[e]	133	150	N/A	139	N/A	148	142	151	119	140
Total unemployment in 2013 (%)[c]	3.1	7.0	7.2	7.0	7.1	8.2	31.0	5.1	10.3	15.2
World Bank Group ease of doing business ranking 2015 out of 189 countries[f]	167	185	189	138	179	146	176	168	161	160

Sources:

[a]United Nations, Department of Economic and Social Affairs, Population Division, World Population Prospects: The 2015 Revision, New York: United Nations, 2015; see http://esa.un.org/unpd/wpp/ (accessed in September 2015)

[b]Population Reference Bureau, *2015 World Population Data Sheet*, Washington, DC: Population Reference Bureau, 2015; see http://www.prb.org/pdf15/2015-world-population-data-sheet_eng.pdf (accessed in September 2015)

[c]World Bank, *World Development Indicators* (last updated: 04/14/2015), Washington, DC: The World Bank, 2015; see http://data.worldbank.org/data-catalog/world-development-indicators (accessed in April 2015)

[d]M. Potts, E. Zulu, M. Wehner, F. Castillo, and C. Henderson, *Crisis in the Sahel: Possible Solutions and the Consequences of Inaction*, Berkeley: University of California, The OASIS Initiative, 2013; see http://nature.berkeley.edu/release/oasis_monograph_final.pdf (accessed in April 2015)

[e]UUNDP, *Human Developments Reports 2014: Country ranking on the Gender Inequality Index out of 152 countries*, New York: United Nations Development Program, 2014; see http://hdr.undp.org/en/data (accessed in April 2015)

[f]World Bank, *Doing Business 2015: Going Beyond Efficiency*, 12th ed., Washington, DC: The World Bank, 2015; see http://www.doingbusiness.org/~/media/GIAWB/Doing%20Business/Documents/Annual-Reports/English/DB15-Chapters/DB15-Report-Overview.pdf (accessed in April 2015)

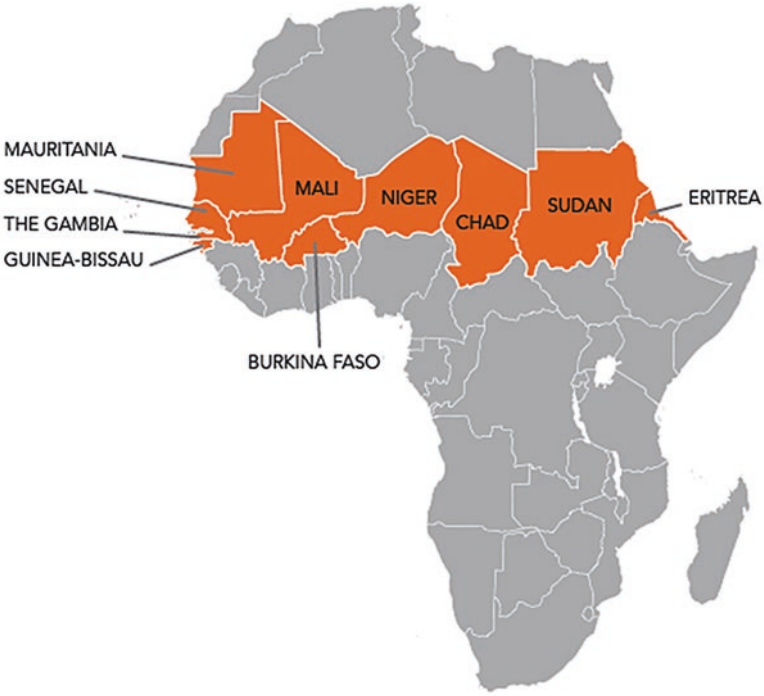

Fig. 1 The Sahel countries (Source: Population Reference Bureau (PRB))

territory of more than a million square kilometers, more than half of which is part of the Sahara desert (Fig. 1).

These five countries, therefore, have low population densities of 22.8 people or less per square kilometer. By contrast, densities of close to 50 people per square kilometer or more are observed in other coastal countries (Guinea-Bissau, Senegal, and Eritrea), as well as in Burkina Faso, also a landlocked country. With 196.7 persons per square kilometer, the Gambia has the highest population density of the Sahel region (United Nations 2015; see Table 1).

In 2013, the gross domestic product (GDP) per capita in Purchasing Power Parity (PPP)) of these ten countries varied, from 900 to 1400 international dollars for Niger, Eritrea, and Guinea-Bissau, which are among the lowest incomes in the world. The GDP was 1600 international dollars for Burkina Faso, the Gambia, and Mali and was comprised of between 2000 and 3400 international dollars for Chad, Senegal, Mauritania, and Sudan (figures which are still low, globally). In the 1970s and 1980s, countries in the Sahel realized modest economic performances following the confluence of several factors: successive droughts triggering crop deficits and nutritional shortages, unfavorable prices for exported products, oil shocks in the 1970s, political instability, and inappropriate economic policies. The adoption of structural adjustment plans in the 1980s was a stop-gap measure. Unfortunately,

these plans considerably reduced the possibility of state interventions in economic and social sectors. In the majority of cases, this triggered decreases in already-low GDPs per capita.

Since 2000, however, several countries have experienced sustained economic growth of between 4% and 6% per year (9% in Chad), thanks to high export prices of oil and minerals. This was the case in Chad, Mauritania, and Sudan, which began producing and exporting petroleum between 1999 and 2006, followed by Niger in 2011. This was also the case in Burkina Faso and Mali, which have benefited from gold exports beginning in the 2000s. Between 1970 and 2013, the total GDP in real terms of the ten Sahel countries has been multiplied, with considerable variations: it was multiplied by a factor of two in Guinea-Bissau and by a factor of seven in Burkina Faso. In half of these countries, however, the revenue per capita in real terms is almost the same in 2013 as it was in 1970, because of rapid population growth. Only one country, Burkina Faso, has seen its GDP per capita more than double (a modest accomplishment compared to the Asian countries). On the other extreme, the GDP per capita in Niger in 2013 was 40% less than what it was in 1970. In the period 2000–2013, the year-on-year growth of GDP per capita (after deducting population growth) was negative in Eritrea, and equal or less than 1% in Guinea-Bissau, the Gambia, Niger, and Senegal, and between 1% and 3% for the other countries, except in Chad where it was 5%. This means that in most countries, population growth – which is still high – has absorbed between 50% and more than 80% of the gains achieved through economic growth (analysis based on World Bank data; see World Bank 2015a).

Since their independence, all the Sahel countries have had military coups, civil unrest, and/or attempts at secession. In matters of democracy, recent improvements offer a somewhat more promising environment for investments, with the exception of Chad, Mali, and Niger. But there is much left to do, as the World Bank *Doing Business Report* of 2014 stresses, which lists indicators for business rules and property rights for 189 countries. The results are disappointing for all Sahel countries (World Bank 2015b). Moreover, many countries no longer have the institutional capacity and financial resources to fulfill their responsibilities as a state and/or to control their full territories. In 2014, five Sahel countries – Eritrea, Guinea-Bissau, Sudan, Mali, and Chad – were listed as "fragile states" (World Bank 2015c). Half of the Sahel countries are thus confronted with worrisome political as well as developmental challenges.

Finally, one should not dismiss the prospect of some Sahelian countries falling into the "Malthusian trap", should the option of massive outmigration to other countries not be readily available. The Malthusian trap is a situation where rapid demographic growth makes a country incapable to feed its population without external help. It occurs when the population exceeds the carrying capacity of the local ecosystem, there is nowhere to migrate to, and there are insufficient exports to exchange for food and other necessities (May 2012).

3 Demographics

For several decades, the ten Sahel countries have experienced particularly high natural growth rates of their populations. From 2010 to 2015, these rates ranged from 2.2% (Sudan and Eritrea) to more than 2.9% per year in the other countries, and even 3.3% and 4.0% in Chad and Niger, respectively.

It is the differential between the mortality decline and the fertility decline that accounts for this population growth. In 2015, the Sahel countries are still experiencing low life expectancies at birth, ranging from 51 years in Chad to 66 years in Senegal. However, the mortality conditions are progressively improving in the region, especially for infants (below age 1) and children (between age 1 and 4). Between 1990 and 2015, mortality for children under 5 years halved or was even reduced by two-thirds. But current under-5 mortality rates are between 50 and 150 per thousand, which is 1 death in 20 and 1 death in every 7 live births or so, respectively. These mortality levels are still unacceptably high and call for the active pursuit of public responses, such as vaccination, nutrition programming and supplementation, and treated mosquito bed nets.

Contrary to what was expected according to the pattern of the demographic transition, the spectacular decline in under-5 mortality that was observed over the past 20 years has not led to a parallel decline in fertility. The average number of children per women (or total fertility rate, TFR) is still very high and is only declining very slowly for the moment; it is even stagnating in some countries. TFRs approaching or surpassing five children per woman indicate that the fertility transition is still far from being completed. With a TFR of 4.4 children per woman between 2010 and 2015 in Eritrea, and TFRs of 4.5 and 4.7 in Sudan and Mauritania respectively, the transition seems more advanced in these countries. But in Burkina Faso, Chad, Mali, and Niger, the fertility transition has not started in earnest: in these countries, TFRs are still about six children per woman or more (7.6 in Niger).

These high levels of fertility are the result of couples' preferences for big families, which largely explains low contraceptive use. Modern contraception is used by only 2% of women in unions in Chad, 18% of women in union in Burkina Faso, and 20% in Senegal. According to data from the Demographic and Health Surveys (DHS) available in eight countries, the average ideal number of children indicated by women aged 15–49 is still high, from a little over five children per woman in Senegal to nine children in Niger and Chad. The ideal number of children indicated by younger, more educated, and wealthier women is a little lower, but is still high. This explains to a large extent the low total demand for contraception (percentage of women who either use or want to use contraception): 30% of married women in Niger, 32% in Chad, 36% in Mali, 41% in Burkina Faso, and 43% in Senegal – this is more or less half of what is observed in many emerging market economies (USAID Measure DHS 2015). Moreover, this total demand for contraception in the Sahel is mainly for birth spacing and not for limiting family size.

The 2015 United Nations projections (Medium variant)) projects TFRs of 2.7–2.9 children per woman in 2050 for Eritrea and Sudan. Even in 2050, Burkina Faso,

Chad, the Gambia, Guinea-Bissau, Mauritania, and Senegal are projected to have TFRs still between 3.0 and 3.5 children per woman. Finally, Mali and Niger are projected to have 3.6 and 4.9 children per woman in 2050, respectively (United Nations 2015). According to the Medium variant scenario, the total population of the Sahel countries will continue to increase rapidly because of current high levels of fertility and the youthfulness of the age structure (two thirds of the population are under the age of 25). In 2050, then, the population of each country will be multiplied by a factor of between 2 and 4. According to the medium fertility variant, the population of the ten Sahel countries could thus reach 340 million in 2050 and close to 700 million in 2100 (United Nations 2015).

Despite the expected decline of fertility levels, the total number of young persons under 20 years will double by 2050 and will then constitute 46% of the total population. This will represent a heavy burden for the potential labor force (persons between 20 and 64 years of age), which will need to provide for the education (at the primary, secondary, and higher levels) for young dependent persons aged 0–19. In 2010, the dependency rate of the Sahel countries varied from about 110 to 160 dependents aged 0–19 per 100 people aged 20–64 years. In 2030, it will be slightly above 90 in Eritrea, Guinea-Bissau, Mauritania, and Sudan, which is double the current rate in East Asian countries, and more than 100 in other countries in the Sahel (164 in Niger). In 2050, the ratios will still be high, ranging from 70 to 100 in the majority of the Sahel countries to 97 in Mali and 129 in Niger.

The challenges associated with high demographic growth in the Sahel countries are thus considerable. These countries must first cope with a doubling, or even a tripling of their active populations, which is a result of high and sustained fertility levels since 1960 and a legacy of the failure to mitigate population growth in the past. These countries must also create the necessary conditions to ensure a better future for subsequent generations. This will require investments in human capital (education and health), but also job creation in the modern sector and taking the informal sector into account for total employment within the economy. So far, it is mostly the informal sector that has absorbed the surplus of labor, which has not found outlets in rural areas and in the modern sector. With the pursuit of urbanization (only the Gambia and Mauritania have more than 50% of the population living in urban areas), the creation of new jobs in the modern sector and in the informal sector will inevitably have to take place in cities. In this context, migration to neighboring countries and northern countries, which is another alternative to unemployment and underemployment, will intensify (OECD 2013). These migrations could be permanent, temporary, seasonal, and legal or illegal, depending on the condition of the respective job markets and restrictions of movements in receiving countries, and could be a potential source of regional and international tensions.

Finally, it is important to stress that if the UN projections of falling fertility are realized, the Sahel countries would be able to reduce their dependency ratios. Certain countries will then be able to open their window of demographic opportunity and, perhaps thereafter, achieve the conditions necessary to capture the benefits of a first demographic dividend. A demographic window of opportunity occurs when falling fertility rates causes a relative increase in the working population and

a decrease in the dependency ratios. But it is important to remember that in addition to demographic changes, obtaining a demographic dividend also requires adequate macro-economic policies as well as a political environment that is both secure and conducive to development (Gribble and Bremner 2012).

4 Food Production, Health Care, and Education

In the ten Sahel countries, the majority of the population practices rain-fed agriculture for subsistence and/or for exportation (notably cotton and peanuts). The returns of the agro-pastoral economy rely largely on the spacing of precipitations during the 3–4 months of the rainy season, between July and October (African monsoon in West Africa), with the exception of cultures located near riverbanks, lakes, or water reservoirs. Historically, the Sahel agricultural systems have been adapted to these climatic constraints and to the food needs of a rapidly increasing population in a context of low soil fertility (which is acidic and sandy) in practicing extensive agriculture, associated with long fallow periods, which was possible thanks to the abundance of available land and low population densities.

In the Sahel zone, which receives an average of 300–500 mm rain yearly (11.8–19.6 in.), raising livestock and cultivation associated with millet predominates, as well as sorghum and peanuts secondarily and sometimes erratically**.** In the Sahel-Sudan zone (500–700 mm rain, or 19.6–27.6 in. annually) subsistence cultivation of cereals predominates: millet and sorghum, along with the cultivation of peanuts and cotton. In both zones, varieties of sorghum and millet with short growing cycles are preferred. Finally, in the Sudan-Sahel (700–900 mm rain, or 27.6–35.4 in.) and Sudan (900–1200 mm rain, or 35.4–47.2 in.), agricultural activities are manifold and varied, and the cultivation of millet and sorghum with long growing cycles coexist and are in competition with maize and cotton. But these zones do not have great importance except in Burkina Faso, Chad, and Mali, as well as in the Gambia and Guinea-Bissau. In all countries with the exception of the last two, the arid and semi-arid Sahara-Sahel regions (100–300 mm rain, or 3.9–11.8 in.) are prominent – even dominant – and no agriculture is possible; only pastoralism is feasible, associated with nomadism. The ecosystems in Sahel countries are thus diverse, and the various zones do not offer the same possibilities for agricultural development (May and Guengant 2014).

Throughout its history, the Sahel has experienced many droughts, associated with serious shortages and famines. These phenomena have become more frequent since 1970, because of the growing irregularities of rainfall. Until recently, traditional agricultural systems have been able to respond to rapid population growth through the expansion of cultivated land, but only by cultivating land that is more and more marginal, and even by eliminating fallow periods that regenerate the soils. This has led to an aggravation of the erosion, an acceleration of the process of desertification and deforestation in many regions, and the exacerbation of recurring conflicts between farmers and herders.

According to the Food and Agricultural Organization (FAO), food production has increased but has lagged behind population growth; in fact, food production per capita has decreased (Bationo et al. 2014). In 2014, there were 20.2 million food insecure people in the region, i.e., 15% of the total population of the ten Sahel countries. It is estimated that five million children under 5 are acutely malnourished and, in 2014, 11.8 million people were targeted for food assistance (OCHA 2014). Moreover, climatologists predict that the soil of the Sahel could warm up between 3 and 5 °C by 2050, and by 8 °C by 2100 (Potts et al. 2013b). Albeit possibly more abundant, rainfall should become more erratic, with more extreme climate events. Food production, which critically depends on rain, risks falling between 13% in Burkina Faso and 49.5% in Sudan. Traditional agricultural systems appear to be no longer sustainable, and new methods to improve agricultural production must be adopted urgently. However, farmers are usually disinclined to adopt new methods, and they often do not have the means to invest in new technologies.

Despite gains realized in education and health since their independence, all countries in the Sahel still have low indices of human development (UNDP 2013). The performance of their health systems declined in the 1980s due to a decrease in resources, but also because of internal unrest in many countries. In 2012, annual health expenditures per capita were less than 50 U.S. dollars in the majority of countries, and they were most often covered (between 25% and 40%) by external aid. The percentage of budgets which governments dedicate specifically to health remains low (around 10% of total expenditures). At least half of total health expenditures are geared at mothers and children (including pre- and post-natal care, labor and delivery, vaccinations, etc.), which is a consequence of high-risk pregnancies and the large number of children under age 5.

In matters of education, primary school attendance is not yet universal in all countries, and the gross rates of enrollment in secondary school remain at a little less than half (between 20% and 40%) of what is observed today in the majority of developing countries. The gross rates of school enrollment at higher levels are also very low (between 2% and 8%). Additionally, teaching quality has deteriorated and the school systems do not appear to be capable of managing the massive influx of students at any level. Therefore, for many young people education will no longer play its traditional role of a social elevator, especially as few jobs are available anyway.

Finally, the status of women in the region still leaves much to be desired, as demonstrated by the ranking of the gender inequality index (UNDP 2014). This mediocre status is attested to, among other examples, by the frequency of marriages of girls younger than 18 years of age, or even younger than 15 years (Potts et al. 2013a). These young married girls also have their first pregnancies too early relative to their development and health status, which often leads to medical problems (e.g., obstetric fistulas) and contributes also to the persistence of high rates of maternal mortality and mortality for children under 5 (Nour 2006).

5 Towards a New Development Agenda

The pressing development challenges in the Sahel (low agricultural productivity, insufficient quality of human development, and security crises) are aggravated by exceptional and unprecedented population growth. To try to arrive at a sustainable development in the region, it seems necessary to act concomitantly on five fronts: improvement of human capital (education and health), increased savings and investments, good governance, job creation, and acceleration of the demographic transition.

The improvement of human capital is a priority shown by governments and donors alike. Yet, the results have been insufficient so far, in large part due to the doubling (every 20 years) of the population in need of education and care. Moreover, the quality of services often leaves much to be desired. While some progress has been made in healthcare, the results are less clear-cut in education. Most children are in primary school today, but many of them leave school without truly mastering reading, writing, and basic arithmetic skills.

The increase in savings and investments in activities with high added value remains low. The Sahel countries are not attractive enough to investors (except for petroleum and minerals). Their internal savings are also insufficient. Their economies remain undiversified and suffer from the hazards of world prices and also from the disproportionate importance of the demographic investments (education and health) that are required.

In many countries, some notable progress has been obtained in matters of governance. But the Sahel countries are still far from displaying a strong legal and institutional environment and stable politics. Transparency still remains an ideal, and democratic processes have also been known to lapse.

Furthermore, the creation of remunerative jobs remains insufficient, with many more new arrivals into the job markets than jobs available. On this subject, the informal sector should be accommodated within development strategies. It is also necessary to reflect on the mechanisms in place for the agricultural sector and rural areas to be able to use more productive labor.

Finally, the acceleration of the demographic transition and above all fertility decline is required as a key measure. Despite good intentions displayed (for example, the preparation and/or revision of national population policies), still too few governments really address the demographic question and devote important resources to it (Guengant and Stührenberg 2013). It will be necessary to reinforce governments' commitment without equivocation and revive the interest of the international community. This, in addition to the traditional multilateral donors, will require the efforts of the various bilateral assistance programs as well as the private foundations.

Among the five fronts reviewed, only the improvement of human capital has received significant attention and major investments, but the returns on investments have not yet been significant. Some efforts have also been focused on governance, but they also remain insufficient. By contrast, the three other levers (savings and investments, job creation, and the acceleration of the demographic transition) thus far have only received limited attention and have registered rather disappointing

results. It seems urgent then to redefine a development agenda with targeted interventions in order to simultaneously implement the five identified levers and unleash the synergies between them.

6 Prospects to Capture a Demographic Dividend

Too often, demographic trends are believed to be out of the realm of public policies. However, if so desired, it is possible to reduce the rate of population growth through adequate public policies, which are well designed, backed by the highest authorities, and implemented with consistency and efficiency (May 2013).

In order for the ten Sahel countries to capture the benefits of a first demographic dividend, they will need to accelerate their demographic transformations, and especially the decline of fertility, which is the *sine qua non* condition to open the demographic window of opportunity. Thereafter, the Sahel countries will need to create the necessary conditions to benefit from a first demographic dividend. This will require an enabling environment, namely to build human capital (education and health) and put into place sound economic policies. All these efforts are predicated by the overall climate to do business and to attract investments, which requires good governance (Gribble and Bremner 2012).

However, prospects for rapid changes on all these fronts are not very promising in the region, at least in the short term. Even more worrisome is the security situation in the Sahel countries, which has recently compounded their formidable development challenges (Michailof 2015). Unless the political situation improves dramatically in the region, or at least does not deteriorate further, it is hard to imagine that the majority of Sahel countries will be able to implement the sound population and socioeconomic policies, not to mention the good governance, that are all needed to open the demographic window of opportunity and capture the benefits of a first demographic dividend.

To conclude, one must convey a sense of urgency as to the need to trigger these demographic and socioeconomic transformations, which are absolutely necessary for the countries to join the league of emerging market economies – a goal pursued by all countries. The fate of many millions of people is at stake, and what happens – or does not happen – in the Sahel will have profound repercussions at both the national, regional, and international levels.

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Part II
Drivers of the Demographic Dividend

The Demographic Dividend: A Potential Surplus Generated by a Demographic Transition

Vincent Turbat

1 Introduction

The concept of the Demographic Dividend (see Lee and Mason 2006, 2015; Canning et al. 2014) is an addition to the long list of studies that aim at assessing the impact of population trends on economic growth. It is now well documented that the concept of DD has been developed on the basis of an ex-post analysis of the rapid growth in four East Asian countries during the period covering the early 1960s to the 1990s. These countries, namely Hong-Kong, Singapore, South Korea, and Taiwan are called "Tigers" or "Dragons".

Just before they experienced what Rostow (1960) called a phase of "take-off" (characterized by an exponential economic growth rate), the Asian Tigers experienced a rapid *demographic transition*. As it is now well-known, a demographic transition begins with a marked decrease in mortality rates, especially the infant (under 1 year) and the child (between 1 and 4 years) mortality rates. This translates into a rapid growth of the general population, and especially the youth part of it.

Then, after a period of variable duration, the total fertility rate starts also to decrease. If the decline is sharp, this translates into a marked reduction of the crude birth rate and therefore of the growth rate of the population. In the case of the Tiger countries, it is worth noting that: (i) the time lag between the reduction in mortality rates and the reduction in fertility rates was quite short (about 10–15 years); and (ii) the rate of decrease in both mortality and fertility rates was rather sharp (more on this later). These two elements, along with the favorable macroeconomic conditions and the choice of the right macroeconomic policies, explain the high impact of the demographic transition on the economy of these countries.

The "baby boom" or "population swell" (Bloom et al. 2003: 30) that results from the period between the decrease in mortality rates and the decrease in population

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growth, due to a decline in fertility rates, will progressively be accompanied by a change in the age structure of the population. And when the "baby boomers" reach the working age (which, so far, is generally defined as being 15–64), the dependency ratio starts also to change.

The dependency ratio is the number of dependents per person of working age. However, from an economic viewpoint, it should be defined as the number of dependents per person actively involved in the economy.[1] The dependents are generally classified into two categories: (1) children, aged 0–14; and (2) seniors, aged 65 and over. Usually, the dependency ratio is calculated according to the following formula:

$$\text{Dependency ratio} = \frac{\text{Number of people aged } 0-14 \textit{ and } 65 \textit{ and} \text{ over}}{\text{Number of people aged } 15-64} * 100$$

We would like to argue that, when calculated according to this formula, this ratio does not capture the actual dependency in most sub-Saharan African countries. First, because the children remain dependents way beyond 15 years of age as demonstrated by the CREFAT.[2] Research done by CREFAT has found that in six West African countries (Burkina Faso, Chad, Côte d'Ivoire, Mali, Mauritania, and Niger) children were starting to generate surplus (Income minus Consumption) at about age 28. CREFAT also found that at age 63 people started to generate a negative surplus. The numerator should thus be modified, as follows: (1) the dependents would comprise the population 0–27 (or Under 28) and 63 and above. This would reflect more accurately the current child dependency burden supported by the labor force.

Second, the unemployed population should be added to the dependents to take into account the fact that, if the labor market cannot absorb the baby boomers, the once "assisted children" are transferred into the category of "assisted jobless", and therefore this does not result in an improved "economic dependency ratio" (as opposed to the "demographic dependency ratio"). In this chapter, we will calculate the "demographic" dependency ratio first with children aged 0–14 (or Under 15), and second with children aged 0–18 (or Under 19). As one can easily guess, the difference is significant (for a discussion of dependency ratios, see also Sanderson and Scherbov 2015).

The "economic dependency ratio" that we suggest for the West African countries should be calculated according to the formula:

$$\text{Economic dependency ratio} = \frac{\text{U}28 + \text{Over}\,63 + \text{Unemployed}\,28-62}{\text{Employed}\,28-62} * 100$$

[1] The dependents should include the youth that are under-age (to legally work), the pensioners, but also the unemployed. Some authors do not take into account the unemployed population. This, in our opinion, is incorrect. In fact, whether indirectly, through taxes and a social security system, or directly (within the family or the ethnic group), the unemployed portion of the population is supported, as are the dependents, by the working population.

[2] Centre de recherches en économie et finance appliquées de Thiès, Senegal.

Now, because the labor market of the Tiger countries had a rather large absorptive capacity, their dependency ratio improved (decreased) rapidly and significantly (see below). This translated into what can be called an "economic surplus" that can be measured as a share of the Gross Domestic Product (GDP). This surplus results from two main elements: (1) the resources freed up by the decrease in the number of dependents per working person (the working population does not have to provide the dependents with as large a share of the Gross National Income (GNI) as before because the dependency ratio decreased); and (2) the increase in GDP generated by the additional labor force.

Again, it should be made clear that this surplus is not generated automatically. In the case of the Tiger countries, the conditions were favorable. First, the baby boomers reaching the working age found a job. Second, there was no instant increase in the "support rate" per dependent (increase in the share of GNI provided by the labor force per dependent). Third, the increase in both the quantity and the quality (or productivity) of the additional labor force was significant. Furthermore, the Tiger countries used this surplus productively, i.e., in investments in both physical (fixed) and human capital. This translated into a sustained and high growth for the whole economy.

Can this process be repeated in the sub-Saharan African countries? To answer this question, we are going to proceed in two steps. In the first, we will develop a theoretical analysis of the Demographic Dividend, with a focus on the conditions for this surplus to be created and then to translate into a sustained and rapid economic growth. In the second step, we will survey the available data for sub-Saharan Africa, and compare it with those from the Tiger countries, to assess whether the current situation could lead to a DD in the near future.

2 Demographic Dividend: Theoretical Analysis

The concept of dividend is generally used in microeconomics. It is understood as a distribution of a company's earning, decided by the Board of Directors, to a class of its shareholders. This dividend is generated by an increase in the profit of the company.

In the case of the Demographic Dividend (DD), we are at macroeconomic level. The concept therefore must be explained as its use is transposed from microeconomics. Looking at the literature about the DD, one cannot help but notice that, in most cases, the concept is not fully explained and, when it is, there are large discrepancies among the definitions provided.

In their seminal paper, Bloom et al. (2003) defined the DD as an "added productivity" resulting from a growing group of people (called a "boom generation") within the working ages due to a decrease in mortality and fertility. By added productivity, they acknowledge the increase of the Labor input in an aggregate production function [in its simplest formulation: $Y = F(K, L)$, where Y is the production, K the fixed capital, and L the labor or human capital].

It might be expected that the increase in labor would then result in an "added production" (or surplus), an output that could be shared and used in the best possible ways to generate growth and development. However, we believe that an aggregate demographic dividend should be calculated through a quantity of output (or outcome) such as an added production (GDP), rather than through an increased rate of output per unit of input (productivity).

For Basu and Basu (2014), the DD is first identified as a change in dependency ratios, which itself is an outcome of falling fertility. It is then described as a demographic bonus, because it is a "gift bestowed upon a population by demographic factors". It is also qualified as a window of opportunity, because the dependency ratio decrease cannot last forever: it will decrease during a certain period of time (which needs to accurately be estimated) that corresponds to less under-aged dependents associated to more working-aged people, before increasing again under the effect of the growth of the 65 and over population. In other words, the DD is identified by the elements that are capable of generating a sustained growth.

In this chapter, we understand the demographic dividend as a *potential economic surplus* resulting from a *window of opportunity* created by the demographic transition. The window of opportunity opens when a country experiences an increase in the working age population associated with an improved dependency ratio (at the point in time where the working age population grows faster than the dependent population, according to the CREFAT). If, and only if, (i) the increase in working age population translates into an increase in labor force; (ii) there is a decrease in the *economic dependency ratio* (including the unemployed population) as well as in the demographic dependency ratio; and (iii) the surplus created is well *utilized* (productively invested), then the process will result in sustained economic growth and development.

The surplus (in the classical economic connotation) is *an amount of resources*, expressed in terms of Gross Domestic Product (GDP), *in excess of what is needed to cover the current needs* – especially the dependents" needs in the case of the DD – and which is available either for investment in both fixed and human capital or additional consumption. This surplus is generated by two elements: (i) the freeing up of resources due to a decrease in the dependency ratio; and (ii) an increase in GDP due to the arrival of the "boom generation" on the labor market.

It is important to note that the "freed up resources" might result in additional GDP at the next period, depending on their utilization, i.e., if these resources are (i) productively used, or (ii) consumed in local products, with the additional consumption triggering additional investments. The increased labor force, on the other hand, translates right away into added growth (i.e., increased GDP).

The surplus can be measured as proposed by the International Monetary Fund (IMF) by "the difference between the GDP per capita without the demographic transition and the GDP per capita with demographic transition" (Drummond et al. 2014: 17). However, it can also be measured by adding, for the whole period corresponding to the window of opportunity, the annual resources (in terms of GNI,

which can easily be translated into GDP[3]) that are freed up by the decrease in the dependency ratio to the annual additional GDP due to the increase in quantity and productivity of the additional labor force resulting from the demographic transition bulge.

On the basis of the demographic transition and macroeconomic indicators, the surplus can prospectively be estimated as demonstrated by the large number of models that have been developed recently. As for any model, results heavily depend upon the (numerous) assumptions that the authors are making.[4] These studies have been made possible by the proliferation of National Transfer Accounts (NTAs) studies[5], which are "providing systematic, comprehensive and coherent methods for the age disaggregation of the major components of national accounts, as well as estimates of private transfers within households". The NTAs help us to understand and analyze the consequences of the demographic transition by estimating the transfers among generations (the "generational dimension" of the economies).

It is also a commonly shared belief that the demographic transition will lead to a "second DD". With the aging of the working population and the perspective of longer retirement periods, the incentives to save and accumulate more assets are stronger than ever. In economic terms, both the marginal and the average propensity to save are increasing. These additional savings, if invested productively, should indeed result in additional growth.

However, this second DD is even less certain than the first one. It depends on a multiplicity of factors that include, among others, economic incentives, behavior change (especially with regard to the preference for the present), pension schemes, interest rates and, most importantly, the global economic conjuncture. Furthermore, if additional savings lead to a decrease in the final demand, there will be lower incentives to invest for the local companies and this despite the probable decrease in interest rates generated by the additional amount of savings.

In the literature on the DD, there is a large consensus on the causes of the population bulge, i.e., the demographic transition. However, several issues remain highly controversial such as: (i) how wide the window of opportunity will be; (ii) how large the surplus will be; and (iii) what end result can be expected in terms of growth and development.

[3] See The System of National Accounts (SNA) of the United Nations: unstats.un.org/unsd/nationalaccount/sna.asp, accessed on June 9, 2016.

[4] See among others: (Moreland et al. 2014; Ashraf et al. 2013: 97–130; Drummond et al. 2014).

[5] Lee, M. *"National Transfer Accounts Project"*; see: http://www.ntaccounts.org, accessed on June 9, 2016.

2.1 The Dependency Ratio Change

As already stated, the demographic transition begins with a fall in mortality rates. This translates into a rapid growth of the population, and especially of the youth (the "boom generation"). Thereafter, fertility rates also start to decrease and this translates into a marked decrease in the growth rate of the population, and especially of the youth. The age structure is changing. This is reflected in the age pyramid, which begins to narrow at the bottom. This dual change in mortality and fertility results in a "population bulge" or "demographic wave" (Bloom et al. 2003: 30), which goes up throughout the pyramid. The size of the bulge will depend on two elements: (i) the speed (rate) of decrease of both mortality and fertility rates; and (ii) the time span between the initial decreasing of mortality rates and the initial decreasing of the fertility rates.

If the fertility rates do not start their decline within a short time after the mortality rates have started theirs, there will be a period in which the country will experience an increase in both the population and the dependency ratio (because less children die before 15). In addition, if the decrease in fertility rates is slow (and this is the case in many sub-Saharan African countries), the dependency ratio will not change significantly enough to free up large resources.

When this bulge or swell reaches the pyramid bars above age 15 (or 19), the working age population is temporarily growing faster than the general population and, under certain conditions (see Box 1), the dependency ratio is starting to decrease, which means that the working age population has to support fewer dependents.

Individually, and again under certain conditions, this could translate into an increase of "net" income. "Net" income should be understood as the income that is not taxed (one way or the other) and is therefore available to the working age population/labor force for either consumption or saving. If the additional consumption benefits the local production (and not the imports) and if the additional savings are used to finance productive investments, one can expect an increase in the economic growth rate.

At a macroeconomic level (country level), the share of the Gross National Income (GNI) that is freed up as a result of the dependency ratio change can be used productively by investing in activities that will generate growth and development for the country. However, if the government uses this freed GNI for purposes that do not generate growth (such as the purchase of weaponry or luxury goods abroad), the window of opportunity created by the demographic transition will be wasted, or at least part of it.

It is important to note that the first element comprising the surplus is "freed up" from the previous situation (higher dependency ratio), when the second is additional: it amounts to the additional Gross Domestic Product (GDP) that results from a quantitative increase in the actual labor force. All else being equal, this amount is strictly proportional to the increase in labor force. However, if part of the current surplus is used to improve the productivity of the labor force, the upcoming surplus

Box 1 Necessary Conditions for Surplus Creation

The first condition relates to the absorptive capacity of the labor market. If the labor market grows more slowly than the population in working age, it is clear that there will be an increasing amount of unemployed population. The latter should be considered "economic dependents" who should be added to the under and over-age dependents. This means that the share of GDP that is going to be actually freed up depends for a large part on the share of the "boom generation" that is going to find a job. The dividend will only be at its maximum if the labor market absorbs the entirety of the bulge. On the other end, it will be equal to zero if none of the "boom generation" is able to find a job.

The second condition relates to the amount of support that is received by each dependent. If the government decides to increase the levy per dependent on each person actually employed, then the amount of GDP freed up will be less than expected. And in the case where the levy increase amounts to the reduction in dependency ratio, the surplus resulting from the freed up resources would be reduced to zero.

will be more than proportional to the quantitative increase in the labor force. For this reason, a government's decision regarding the allocation of the surplus is crucial: it will decide the surplus size as well as the sustainability of the economic growth and development process.

2.2 Size of Surplus

The size of the surplus will depend on many factors that comprise: (i) speed and intensity of demographic transition; (ii) labor market status; and (iii) use of additional resources.

(i) As noted by all specialists, the East Asian demographic transition was fast and took about 65 years (May 2012: 50–52). It took these countries about 50 years to lower the infant mortality rate from 181 per 1000 (1950) to 34 per 1000 (2000) and about 30 years to lower the fertility rate from a high level (six children per woman in 1950) to the replacement level (two children per woman in 2000). It is widely considered as one of the fastest demographic transition in the world to date. This means that the population bulge was soon followed by a decrease in the dependency ratio. In South Korea, the dependency ratio[6] went from 1.18 in 1960 to 0.96 in 1980 and 0.57 in 2000. This resulted in large amount of resources being freed up on a relatively short period that were add-

[6] Calculated with U19 and Over 65.

ing to an increase in GDP due to a growing labor force. In South Korea, the annual GDP growth rate between 1970 and 2000 was estimated at 9.3%.

(ii) A retrospective study of the labor market of the Asian high-performing countries in the takeoff period shows a high absorptive capacity of the labor markets of these countries. During the 1960–1990 period, the population annual growth rate was 1.9% while the labor force annual growth rate was 2.7%. Also, during the 1990–2012 period, the 15–64 South Korean population grew annually by 1.24% while the labor force grew by 1.25%. It seems clear that the greater the difference between the general population growth rate and the labor force growth, the larger the surplus will be.

(iii) The surplus use is the third key element in the size – and the sustainability – of the DD. If the surplus is consumed, there might be an incentive for the suppliers to produce more goods and services to respond to the increase in demand. But this push might be insufficient to put the country on the long-term growth and development path. Now, if the surplus is used to invest in fixed or human capital, this might well result in a long-term growth and development. As the classical economists, and today the neo-Ricardians[7], demonstrated, a surplus should be used in ways that will trigger a virtuous cycle. This might include modernizing the agricultural sector, developing infrastructure, industry, transport, communication, banking and other services as well as investing in health and education. In other words, the right economic and social policies need to be implemented by the governments of the countries experiencing the demographic transition in order to benefit from a large and sustainable DD.

3 Will Sub-Saharan Africa Benefit from a Demographic Dividend in the Upcoming Years?

The four Asian Tigers experienced their demographic transition at about the same period. It is not the case for the 48 sub-Saharan African sovereign countries. Some countries are on the verge of completing their demographic transition while others are still between the decline in mortality rates and the decline in fertility rates. This, in addition to the complexity of the occurrence of the DD, would justify an analysis country per country. However, for reasons of space limit we cannot afford such a detailed analysis in this chapter. We thus assumed that there were sufficient similarities among countries in the main regions (Western, Central & Eastern[8], and Southern Africa) to justify an analysis at this level. But we are fully aware that this analysis does not do justice to some of the Western and Central & Eastern African countries.

[7] See Piero Sraffa, *Production of Commodities by Means of Commodities: Prelude to a Critique of Economic Theory*, Cambridge: Cambridge University Press, 1960.

[8] Both Western and Central Africa regions have few countries; therefore, the two regions were combined in this analysis.

Table 1 South Korea's population aged 0–18, 1960–2010 (data in 1000)

1960	1970	1980	1990	2000	2005	2010
12,634	16,333	16,943	15,474	13,329	12,083	11,298

Source: UN Population Division data

Also, our analysis is focusing mainly on one aspect: the labor market absorptive capacity.

Although we experienced serious difficulties to collect long series of data related to the labor force, we came up with some interesting results: Western and Central & Eastern Africa are not far enough in their demographic transition to start benefitting from the DD soon. Furthermore, they will need to start working on the elements (conditions) that would allow them to fully benefit from this opportunity. For Southern Africa, prospects are much more favorable.

3.1 The Demographic Window of Opportunity

In this paragraph, we are going to focus on the main differences between the Asian and African demographic transition that can be observed at this point in time.

The mortality rates in Asia decreased at a fast and steady rate starting in the late 1960s. This was followed by a decrease in fertility rates that kicked in within 10–15 years. The fertility decreased very fast and impacted the age structure in less than a generation as can be seen in the evolution of the population aged 0–18 (or U19) in South Korea for the years 1960–2010 (see Table 1).

As Drummond and Colleagues (2014: 7) rightly say: "Africa's demographic transition is atypical. Compared to other regions, Africa starts at a much lower base, the transition is longer, and the peak around 2090 is at a somewhat lower level than other regions". Also, Africa did not start its demographic transition until the mid-eighties, or a quarter of century after the Asian Tigers.

When comparing South Korea to the sub-Saharan African regions, it clearly appears that the surplus generated by the demographic transition is going to be much lower in Africa than it has been in South Korea. And if one includes the considerations linked to the surplus use, the DD in Africa could well be a missed opportunity.

In South Korea, the dependency ratio (see Annex 1), calculated with dependents comprising the U15 and 65+ population, decreased sharply from 1960 to 2000 (from 0.8066 to 0.3946), then decreased much more slowly from 2000 to 2010 (from 0.3946 to 0.3759). The same is true with the U19–65+ dependency ratio, although with values that are constantly higher as one could expect: from 1.1799 to 0.5705 and from 0.5705 to 0.5242. As stated earlier, we believe that these values are more representative from the real burden supported by the labor force in terms of dependents than those calculated with a U15/65+ dependency ratio.

In Western Africa, the dependency ratios (U15-65+) continued to increase from 1960 to 1990 (from an average of 0.8065 to 0.9595)[9] and then started to slowly decrease to reach 0.9043 in 2010. However, in countries such as Niger, the dependency ratio is still increasing and reached a peak of 1.1011 in 2010 (see dependency ratios in African countries from 1960 to 2010 in Annex 2). Furthermore, the country profile established by the CREFAT[10] for the six Western African countries cited above shows that the consumption per age increases from 0 to 25 and then decreases steadily. This means that the producers' transfer of resources to dependents is such that it causes them to have a lower available income than when they were dependents. This is a clear economic disincentive as working people are mostly working for others and not for themselves and their close family.

In Central & Eastern Africa, the U15-65+ dependency ratio increased until 1990–0.9766, from 0.9035 in 1960, then went back to its 1960 level in 2010 (i.e., 0.9004).

In Southern Africa, the U15-65+ dependency ratio increased from 1960 to 1980 (from 0.8855 to 0.9618) and then decreased to reach 0.8156 in 2010.

We can formulate two main conclusions from these data: (1) Africa is still far from the U15-65+ dependency ratio of the Tiger countries (0.37) and it is likely that most African countries will never reach such ratio, unless they rapidly act on their high fertility rates, as the aging of the population will soon slow down the decrease of the dependency ratio (before it starts to rise again); and (2) there is a clear hierarchy among the sub-Saharan African regions with regard to the demographic dividend. Southern Africa is ahead of Central & Eastern Africa, while Western Africa comes last.

The demographic window of opportunity, being dependent on the pace of decrease in both mortality and fertility rates, as well as the span of time between the decrease in mortality and the decrease in fertility, it appears that, as it is, the "yearly working population bulge" in Africa, and especially in Western Africa, all other things being equal, is going to be much smaller than it has been in Asia. Failure to speed up the demographic transition will delay and narrow the window of opportunity and thus delay the DD and impact negatively its potential size.

3.2 Labor Market Absorptive Capacity

In this chapter, the labor market absorptive capacity is defined as the *share of the bulge* that the labor market is able to employ. To measure the labor market absorptive capacity, we are using two proxies: (1) the difference between the population growth rate (measured as the natural population increase) and the labor force growth

[9] Calculated by Ms. Samantha Roecker, Georgetown University Research Assistant, based on World Bank and UN data.

[10] CREFAT: Country Profiles for Burkina Faso, Chad, Côte d'Ivoire, Mali, Mauritania and Niger, 2016.

rate on a long-term period (more than 20 years). We assume that all other things remain equal to eliminate the migration phenomenon and, most importantly, the time-delay; (2) the difference between the 15 and 49 population annual growth rate and the labor force annual growth rate.

Data show that the absorptive capacity of most African labor markets is lower than the absorptive capacity of the Asian labor markets of the 1960s and 1970s. This will have a direct effect on the dependency ratio, which is not going to decrease as fast as what has been experienced in the Asian countries (see above). This will limit both the level of GNI that could be freed up and the amount of GDP that could be added. As a result, the surplus of total GDP generated by the demographic window of opportunity should be expected to be much less than what it has been in Asia.

Western Africa has an average rate of natural increase of its population of 2.7%[11] while the annual average increase of its labor force during the past 22 years (1990–2012) has been estimated at 1.272%.[12] However, the annual growth rate of the 15–64 population is only 1.279%, because the mortality rates are still high, and also because of migration (both within and outside Africa). This means that, everything else being equal, the unemployed population has grown by about 0.007 percentage point each year. For the prospect of a DD, it reveals an insufficient absorptive capacity from the labor market as well as an increase in the economic dependency ratio (unemployed population included). Also, because of the continued decline in child mortality, and the probable limitation of the migration flow (as a result of a concerted policy from the African countries with the European Union), the annual growth rate of the 15–64 population is going to increase in the upcoming years and the formal sector labor market will not have the capacity to absorb this bulge, unless strong macroeconomic policies are launched and enforced in the Western African countries.

Central & Eastern Africa has a 2.85% average rate of natural increase of its population, while the annual average increase of its labor force during the period 1990–2012 has been estimated at 1.265%. The annual growth rate of the 15–64 population is 1.295%. This means that the average absorptive capacity of the labor market in Central & Eastern Africa is even lower than what it is in Western Africa. Everything else being equal, the unemployed population is growing annually by about 0.03 percentage point.

Southern Africa has an average rate of natural increase of its population of 1.0% while the annual average increase of its labor force during the period 1990–2012 has been estimated at 1.2647%. The annual growth rate of the 15–64 population during the period 1990–2010 has been 1.267%. This means that Southern Africa has not fully been able to provide jobs to the working age population (annual increase of 0.0023 percentage point).

The main conclusions are that in Africa: (i) the absorptive capacity of the labor market is mostly insufficient; (ii) Central & Eastern Africa has the lowest absorptive capacity among the three regions and the highest natural rate increase of its popula-

[11] Population Reference Bureau data.

[12] Author's calculations from World Bank data.

tion; (iii) the absorptive capacity depends mostly on the quantity of working age population to be incorporated in the labor force, and therefore on the fertility rates. Also, more detailed data are needed to assess the underemployment that heavily impacts the actual dependency rate as well as the low labor productivity.

3.3 Productive Use of the Surplus Generated

As already acknowledged by a large majority of authors, the utilization of the surplus is key for the surplus size as well as the sustainability of the growth process being triggered.

As demonstrated in many studies, the Tiger countries heavily invested in both fixed and human capital. This resulted in a sharp increase in productivity that helped the Tiger countries, together with a policy of low exchange rate of their currencies, to be highly competitive on the international markets, and therefore to drastically increase their exports.

This is the main economic challenge that sub-Saharan Africa is facing today. Will the African countries be willing and/or able to do what the Asian countries did to reform their economies? Will they be able to improve their investment climate[13] and attract foreign investors? As explained by Collier (2007), "traps" plague the "Bottom Billion" countries and prevent them from developing their economies. As long as they will not be able to get out from these traps, there is very little hope that they will be able to invest the amount of resources needed to generate a virtuous cycle of growth.

4 Conclusions

The window of opportunity that might generate a surplus has opened up for many African countries. If the first step has occurred, i.e., the decline in mortality rates, the second, namely the decline in fertility rates, has yet to be significant enough. Many sub-Saharan African countries are still not convinced that a reduction in fertility would be beneficial to their economies. And as long as it is the case, there is very little hope that these countries could benefit from a large and sustainable Demographic Dividend.

For the countries for which the demographic window of opportunity has already opened up, the issue is to put in place and implement the right policies. These include investing in health and education and modernizing the economy. Gross Capital Formation (or Investment) has to grow fast enough to ensure a growth of the

[13] See World Bank, *Doing Business 2016: Measuring Regulatory Quality and Efficiency*. Washington, DC: The World Bank Group, 2015.

labor market that would enable a full employment of the additional 15–64 (or 19–59) population on a yearly basis. They also include a productive use of the surplus generated by the additional labor force and the freeing up of resources consecutive to a decline in the dependency ratio.

The list of problems to be solved is long. It starts with improving the health status of the general population and its levels of literacy. It continues with shifting from an informal sector dominated economy to a formal sector dominated economy and with restructuring the economy (too often reliant on a traditional agricultural sector and on one or two commodities). It ends with establishing good governance. For all involved in development work, this list is well-known. But what is also well-known is the paucity of results that have been obtained so far in sub-Saharan African countries, after years of heavy financing and hard work in these areas.

Annex 1

Dependency ratio (0–14 + 65 and over/15–64) in East Asia

	1960 (%)	1970 (%)	1980 (%)	1990 (%)	2000 (%)	2005 (%)	2010 (%)
Cambodia	93.41	92.78	77.53	90.19	80.57	67.93	58.40
China	77.48	79.28	68.00	54.03	48.07	39.24	36.04
Indonesia	74.78	87.05	79.48	67.28	54.62	53.54	53.47
Japan	55.97	45.25	48.38	43.40	46.64	50.72	56.85
Laos	80.96	82.65	91.91	91.34	89.05	78.96	68.09
Myanmar	78.16	85.42	81.70	72.05	54.96	49.29	45.27
Philippines	100.40	95.90	86.30	78.82	71.65	66.89	63.93
Singapore	82.77	72.83	46.57	37.09	40.43	37.70	35.80
South Korea	80.66	83.31	60.72	44.11	39.46	39.63	37.59
Thailand	86.05	90.87	75.82	53.18	44.40	42.95	39.28
Vietnam	81.66	97.09	86.01	75.80	61.28	50.80	42.92
Hong-Kong	77.70	69.43	45.52	43.24	39.40	35.77	33.40

Source: Author's calculations from World Bank and UN data

Annex 2

U15 + 65 Plus/15–64 dependency ratios in sub-Saharan African countries

	1960 (%)	1970 (%)	1980 (%)	1990 (%)	2000 (%)	2005 (%)	2010 (%)
Benin	77.13	88.22	95.48	97.36	93.57	89.86	86.21
Cameroon	77.34	84.70	93.63	99.24	94.81	90.94	87.47
Chad	81.01	86.54	94.44	102.86	107.53	107.93	105.52
Ghana	87.70	92.67	94.24	87.20	80.01	77.23	73.92
Guinea	72.57	79.11	81.54	89.70	90.34	88.21	85.22
Côte d'Ivoire	78.76	87.21	92.23	89.52	81.80	82.72	81.56
Mali	72.91	78.77	88.05	101.31	98.26	97.47	98.81
Niger	93.79	97.72	98.23	100.57	101.87	106.32	110.11
Nigeria	79.98	83.14	87.80	91.37	86.24	86.20	87.80
Senegal	85.31	88.89	97.52	100.35	93.41	89.62	87.72
Western Africa Region Average	**80.65**	**86.70**	**92.32**	**95.95**	**92.78**	**91.65**	**90.43**
CAR	74.07	80.91	86.55	89.90	86.14	84.58	80.31
DR Congo	86.21	87.67	90.46	93.92	97.15	96.25	93.41
Eritrea	90.64	88.36	91.89	92.87	95.48	83.38	82.25
Ethiopia	85.53	87.56	93.35	97.81	98.65	97.30	91.33
Kenya	100.47	110.55	112.76	106.94	88.68	83.45	82.42
Rwanda	102.98	102.32	101.45	108.29	98.11	87.81	88.60
Somalia	83.68	86.82	88.69	95.54	100.43	102.51	102.10
Sudan	92.73	96.49	99.64	93.81	87.65	86.02	82.47
Tanzania	92.99	95.03	96.68	94.97	91.07	90.93	92.14
Uganda	94.22	97.86	100.18	102.56	108.07	107.68	105.36
Central & Eastern Africa Region Average	**90.35**	**93.36**	**96.16**	**97.66**	**95.14**	**91.99**	**90.04**
Angola	86.62	95.00	96.75	100.25	100.42	100.92	100.91
Botswana	98.48	104.42	96.26	90.37	70.22	63.84	60.69
Lesotho	89.96	93.08	93.78	93.00	84.31	79.50	72.15
Madagascar	85.01	95.69	98.84	92.95	94.07	91.34	86.06
Malawi	94.16	94.54	98.69	94.04	95.58	96.71	96.94
Mozambique	81.94	86.47	88.13	99.19	88.56	92.19	94.47
Namibia	82.98	87.74	100.20	88.80	77.88	75.80	69.84
South Africa	81.19	83.52	80.67	72.80	57.25	54.31	53.70
Zambia	90.54	96.21	100.58	94.91	94.06	97.76	98.27
Zimbabwe	94.61	105.40	107.90	96.36	83.61	82.35	82.54
Southern Africa Region Average	**88.55**	**94.21**	**96.18**	**92.27**	**84.60**	**83.47**	**81.56**

Source: Author's calculations from UN data

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African Fertility Changes

Bruno Schoumaker

1 Introduction

Fertility in sub-Saharan Africa has been the highest in the world for several decades. As of 2010, African women had on average a little less than 5.5 children (United Nations 2015), more than twice the fertility levels in Asia and in Latin America (around 2.3 children), and much higher also than fertility in North Africa (three children). This high fertility has translated into rapid population growth. Between 1960 and 2010, sub-Saharan Africa's population grew by more than 2.5% per year, from 220 million to 840 million people. It is expected to continue growing throughout the twenty-first century. According to the 2015 World Population Prospects (medium variant, 2.18 children in 2100), sub-Saharan Africa's population may reach two billion by 2050, and close to four billion in 2100. However, these projections are very sensitive to fertility assumptions. High fertility projections (2.68 children in 2100) lead to 5.5 billion people in sub-Saharan Africa, while the population would reach 2.8 billion with the low fertility variant (1.69 children in 2100). Changes in age structures would also follow contrasting trajectories, with a faster ageing in the low fertility scenario, and a potentially greater demographic dividend (May and Guengant 2013). In short, Africa's future population and age structures may follow widely varying paths, depending on Africa's fertility changes.

There is indeed considerable uncertainty about sub-Saharan Africa's future fertility. In a few countries, fertility has not started to decline, and may not change in the coming years. In many others, changes have been limited and hesitant, whereas some countries that were well advanced in their fertility transitions have also followed unexpected paths with slowing or stalling fertility transitions. By contrast, a few countries have experienced rapid changes that may offer examples of quick

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transitions for other countries. These diverse experiences result from unequal changes in social, economic, health, and policy environments. They also reflect diverse transformations in the proximate determinants of fertility, such as contraceptive use and marriage patterns. And the changes that have occurred have not affected all social groups in the same way in those countries. These changes are described in this chapter.

2 Data Sources

Until the late 1960s, few reliable fertility data were available in sub-Saharan Africa. The situation has improved considerably since the 1970s (Schoumaker and Tabutin 2004) and fertility is nowadays fairly well documented in most countries. The Demographic and Heath Surveys program has been especially instrumental in collecting data on fertility and its correlates. Since the mid-1980's, more than 120 surveys in over 40 countries have been conducted in sub-Saharan Africa as part of this program. The data covers fertility behavior (birth histories), fertility preferences (ideal number of children), proximate determinants (contraception, marriage, breastfeeding, abstinence), as well as socio-economic characteristics (education, living standard, place of residence, etc.) that may affect fertility behavior. Other surveys (e.g., MICS) and censuses, as well as local demographic surveillance sites, provide additional data on fertility in sub-Saharan African countries; in contrast, civil registration systems are of little use given their low coverage in sub-Saharan Africa.

Despite its increasing availability, data on fertility in sub-Saharan Africa still has limitations. Firstly, its quality is lower overall than in other regions (Pullum 2006; Schoumaker 2014), leading to larger uncertainty in the measurement of fertility levels and trends (Blacker 1994; Schoumaker 2009). Secondly, while fertility is much better documented than other demographic phenomena in sub-Saharan Africa (e.g., adult mortality and migration), some determinants of fertility remain little explored, or confined to local studies. Nevertheless, the existing data is quite rich and of sufficiently good quality to describe major changes in fertility and its correlates.

In this chapter, two main sources are used. United Nations Population Division estimates (United Nations 2015) are used to describe broad changes and patterns of fertility. They cover all the countries of sub-Saharan Africa since the 1950s.[1] Data quality problems have to some extent been corrected in this data, making international comparisons easier. Demographic and Health surveys are used for more detailed information on fertility preferences, proximate determinants, and socio-economic differentials.

[1] The most recent estimates used in this paper refer to the 2005–2009 period. Estimates for the 2010–2014 period are not used as they are less likely to rely on survey and census data collected in this period, and may to a larger extent reflect assumptions about fertility changes.

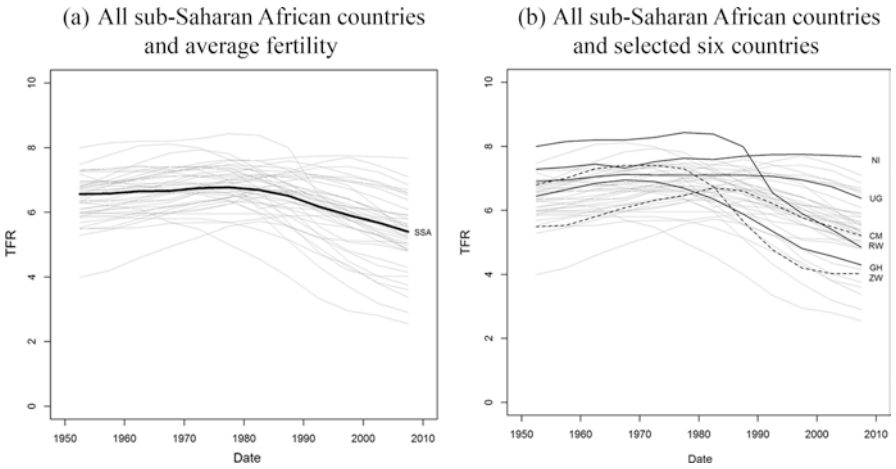

Fig. 1 Trends in total fertility rates in sub-Saharan African Countries (1950–2010) (Source: World Population Prospects (United Nations 2015). *Legend: SSA* Sub-Saharan Africa, *NI* Niger, *UG* Uganda, *CM*Cameroon, *RW* Rwanda, *GH* Ghana, *ZW* Zimbabwe. Forty-two countries are shown. Countries with less than one million inhabitants in 2010 are not shown (Comoros, Djibouti, Seychelles, Sao Tome and Principe, and Cape Verde)

3 Slow and Uncertain Fertility Transitions

Since the 1950s, fertility has only modestly decreased in sub-Saharan Africa (Fig. 1). African women had on average 6.5 children in the 1950s, a level that slightly increased until the early 1980s. Since the late 1980s, fertility has decreased by around 0.5 children per decade, and was a little below 5.5 children in 2005–2010. Fertility decline started much later in sub-Saharan Africa than in other regions of the world, and the pace of fertility decline has also been slower overall (Bongaarts 2013; Bongaarts and Casterline 2013). As discussed later in this chapter, the late and slow overall decline results from a variety of factors, including slow economic progress, low education, high mortality, high demand for children and low investments in family planning programs (Bongaarts 2011).

However, sub-Saharan Africa is heterogeneous, and so are fertility levels and trends. In the 1950s, most countries' fertility was between 5.5 children and 7 children per woman (Fig. 1). The few exceptions either had very high fertility (Rwanda with 8 children, Kenya with 7.5 children), or, by African standards, low fertility (Gabon, four children per woman). Fertility control was at that time very limited and differences across countries were the results of differences among other main proximate determinants of fertility: age at marriage, breastfeeding, post-partum abstinence, and sterility (Bongaarts et al. 1984). In most countries, little change was observed until the late 1980s, and if any change was found, it was rather an increase in fertility, resulting mainly from decreasing sterility (as in Gabon) or decreasing postpartum insusceptibility (Lesthaeghe 2014). A few countries, as South Africa and some small islands (e.g., Mauritius, Seychelles), experienced early fertility declines,

but it was not until the late 1980s that a substantial number of countries entered fertility transition (Bongaarts 2013). Botswana, Zimbabwe, Lesotho, as well as Kenya and Ghana were among the first African countries to experience a substantial fertility decline. According to the World Population Prospects (United Nations 2015), Côte d'Ivoire, Senegal, and Ethiopia also entered fertility transition a little later, and by 2005–2010, the majority of sub-Saharan African countries had experienced at least a slight decline in fertility. As of 2005–2010, fertility had decreased by at least 10%[2] in 35 out of 42 countries. It had decreased by more than 40% in eight countries, most of them located in Southern and Eastern Africa, by 30–40% in six countries, and by 20–30% in ten countries. In another 11 countries, fertility declines were modest, and no decrease was observed in seven countries (Niger, Chad, the Democratic Republic of the Congo, Equatorial Guinea, Somalia, Mali, and Gambia).

4 Heterogeneity in Transitions and Development

Changes in fertility result from a variety of factors, some of which may be very much context-specific. However, levels and changes in fertility at the country-level can be predicted reasonably well from a few aggregate variables: economic development (GDP per capita), education (secondary school enrolment), and mortality (Bryant 2007). The slower declines in African fertility are also consistent with slower development progress compared to other regions (Bongaarts 2013). ***Child mortality*** is one of the most significant correlates of fertility levels, both at the national and sub-national level (Tabutin and Schoumaker 2001). Early fertility declines occurred in countries where child mortality had substantially declined (Caldwell et al. 1992), and countries with currently very high child mortality, such as Niger (Table 1) have experienced little or no fertility changes. These results are consistent with the conventional demographic transition theory. High mortality contributes to high fertility levels to replace deceased children, and to make sure some children will survive to adulthood. As noted by Caldwell and Caldwell (1987), surviving children are especially important for continuing family descents in African societies (Caldwell and Caldwell 1987). Aggregate relationships between ***female education*** and fertility are also quite strong, and mirror the strong relationship between these variables at the individual level (see Sect. 6), as well as the changing costs of children with increasing education, and spillover effects of increasingly educated populations (Kravdal 2002). Finally, the link between ***economic development*** and low fertility is also significant, and again broadly consistent with the fertility transition theory. These socio-economic indicators of course do not account for all variations in fertility levels and changes, leaving room for other explanatory factors. ***Family planning programs*** are one of them. While strong family planning programs may not be sufficient for sustained fertility declines without social and

[2] Compared to its highest fertility level since 1950.

Table 1 Fertility and selected determinants of fertility in six sub-Saharan African countries

Country	Survey	Total fertility rate	Median age at first birth (years)	Teenage pregnancy (%)	Median age at marriage	Modern contraceptive use (%)	Median postpartum non-susceptible period (months)	Mean ideal number of children	Under five mortality (‰)	Urban women with 9+ years of education (% of total)
Cameroon	DHS 2011	5.1	19.7	25.2	18.5	14.4	12.2	5.5	128	26.6
Ghana	DHS 2008	4.0	21.8	13.3	19.8	16.6	12.4	4.3	85	29.2
Niger	DHS 2012	7.6	18.1	40.4	15.7	12.2	14.3	9.2	153	3.8
Rwanda	DHS 2010	4.6	22.9	6.1	21.4	45.1	11.6	3.3	102	3.9
Uganda	DHS 2011	6.2	18.9	23.8	17.9	26.0	11.0	4.8	106	9.9
Zimbabwe	DHS 2010–11	4.1	20.5	23.5	19.7	57.3	12.7	3.8	77	31.1

Source: Demographic and Health Surveys (www.statcompiler.com)

Definitions: *Teenage pregnancy*: percentage of women aged 15–19 who have given birth or were pregnant at the time of the survey. *Median age at first birth*: age at which half of the women aged 25–49 had given birth at least once; *Total fertility rate*: average number of children a woman would have over her reproductive live with observed age-specific fertility rates. Fertility rates are computed for the 3 years preceding the survey. The values of the total fertility rates from DHS may differ from the estimates in the World Population Prospects. *Modern contraceptive use*: percent of married women using a modern method at the time of the survey; *Median postpartum non-susceptible period*: median length (months) of the non-susceptible periods. The non-susceptible period is defined as the longest period of either postpartum amenorrhea or postpartum abstinence; *Median age at first marriage*: age at which half of the women aged 25–49 had married at least once; *Mean ideal number of children*: mean of the ideal number of children reported by women, among women reporting a numerical answer. *Under-five mortality:* proportion of children dying before their fifth birthday (10 years preceding the survey). *Urban women with 9+ year of education*: percentage of women aged 15–49 with at least 9 years of schooling and living in urban areas

economic progress, several examples in sub-Saharan Africa – as in Rwanda – indicate that they have played a role in accelerating transitions. The respective influence of socio-economic development (broadly defined) and family planning programs is not easily disentangled and subject to debate (Bryant 2007); both types of factors are probably at play in fertility changes, but with varying importance across context and periods.

Data from six selected countries further illustrates heterogeneity in fertility levels and trends in sub-Saharan Africa (Fig. 1). ***Niger***, with currently the highest fertility in sub-Saharan Africa (7.6 children), has not experienced any decline; its total fertility rather increased over the last decades. It is also one of the poorest countries in sub-Saharan Africa, with very few educated women and high child mortality (Table 1). As will be shown later, women in Niger also desire large numbers of children, more rarely use modern contraception, and marry early, three factors leading to high fertility. ***Uganda*** has experienced a recent and slight decline (10%) but its fertility remains among the highest in Africa. Its socio-economic characteristics place it in a better position than Niger, but it is clearly less favored than countries such as Zimbabwe and Ghana. As in other countries in Central Africa, fertility in ***Cameroon*** first increased substantially between the 1950s and the 1980s in response to decreasing infertility. From the mid-1980s, Cameroon's fertility decreased in a more or less regular way,[3] by a little over 20% from its maximum level. Zimbabwe, Ghana, and Rwanda are three examples of substantial fertility declines, by more than 30% in Ghana and in Rwanda, by 40% in Zimbabwe. ***Zimbabwe*** was among the pioneering countries in fertility transitions in Africa, and its decline between the early 1980s and the late 1990s was impressive (1.5 children per decade). It was also one the few African countries with fairly high levels of social and economic development, and early family planning programs. The decrease in fertility has since then slowed down substantially, as in other countries such as Kenya (Westoff and Cross 2006).[4] In Zimbabwe, as in Kenya (Westoff and Cross 2006), the slowdown has been accompanied by stalls in contraceptive use and in fertility preferences. Overall, a lack of investment in family planning programs, increases in child mortality and slowdowns in economic and social development have been mentioned as factors for explaining such stalls in Africa, but their causes are not entirely clear (Schoumaker 2009; Shapiro and Gebreselassie 2008; Westoff and Cross 2006). ***Rwanda****'s* decline has also been rapid, and, as shown later, it results from impressive changes in contraceptive use and fertility preferences. The recent strong commitment of the government to family planning programs in Rwanda has probably strongly contributed to these changes (Bongaarts 2013; Lesthaeghe 2014), in addition to increases in education and living standards (Bundervoet 2014). ***Ghana***'s decline has been more regular, and its lower fertility level compared to the other countries is also consistent with its better socio-economic situation. While Ghana was also thought to have

[3] Trends in Cameroon, as in Ghana, differ according to the source of data. Uncorrected estimates from DHS suggest that fertility decline in Cameroon stalled in the late 1990s, a trend that corrected estimates from the United Nations Population Division do not show.

[4] According to the 2015 World Population Prospects, fertility decline has resumed in Kenya.

experienced a stall in the late 1990s (Bongaarts 2008; Shapiro and Gebreselassie 2008), reexamination of fertility trends in DHS (Machiyama 2010; Schoumaker 2014) as well as UN data suggest the stall was spurious.[5]

5 Changing Proximate Determinants and Fertility Preferences

Socio-economic factors influence fertility levels and trends through a limited numbers of proximate determinants, i.e., biological and behavioral factors that directly affect fertility. Four groups of proximate factors have had a substantial influence on fertility in sub-Saharan Africa: postpartum non-susceptibility, pathological infertility, fertility control (through contraceptive use and abortion), and marriage patterns.

Early analyses of the proximate determinants of fertility in sub-Saharan Africa showed that the ***postpartum non-susceptible period*** – combining the effects of lactational amenorrhea and postpartum abstinence – was a major inhibiting factor of fertility (Bongaarts et al. 1984), and also key to understanding variations of fertility across countries.[6] These practices of sexual abstinence and breastfeeding have evolved as ways to protect childrens' and mothers' health (Cohen 1993; Jolly and Gribble 1993), and are not deliberate ways of controlling fertility. Yet they lead to long birth intervals and exert a powerful check on fertility. Urbanization, education, and other socio-economic changes have to some extent eroded these practices, and in most countries, the length of the non-susceptible period has decreased (Fig. 2), leading to fertility increases or partly offsetting the effects of contraception (Lesthaeghe 2014). However, the non-susceptible period is still relatively long in most countries, with durations clustered around 10–15 months (Fig. 2, Table 1), and its fertility-inhibiting effect remains substantial.[7]

Pathological infertility[8] is also used to account for large variations across countries, and was very common in Central African countries, such as Gabon and Cameroon, but also in other parts of Africa (Frank 1983). Pathological infertility is now much less widespread than it used to be. For instance, the percentage of childless women at ages 45–49 (an indicator of overall infertility) in Gabon was above

[5] The fertility estimates in the 1998 Ghana DHS appear to have been underestimated for various reasons, leading to an apparent stall between the late 1990s and the early 2000s. Reconstructed trends based on combining data from successive surveys suggest there was no stall (Machiyama 2010; Schoumaker 2014).

[6] For instance, Kenya's high fertility in the 1970s (around eight children per woman) was partly due to relatively shorter postpartum non-susceptible periods compared to other countries (Bongaarts et al. 1984).

[7] The fertility inhibiting effect of the non-susceptible period of length is estimated as $1-20/(18.5+i)$ (Jolly and Gribble 1993). A duration of 12 months corresponds roughly to a 35% reduction in fertility.

[8] Gonorrhea was thought to be the major cause of infertility in these regions (Frank 1983).

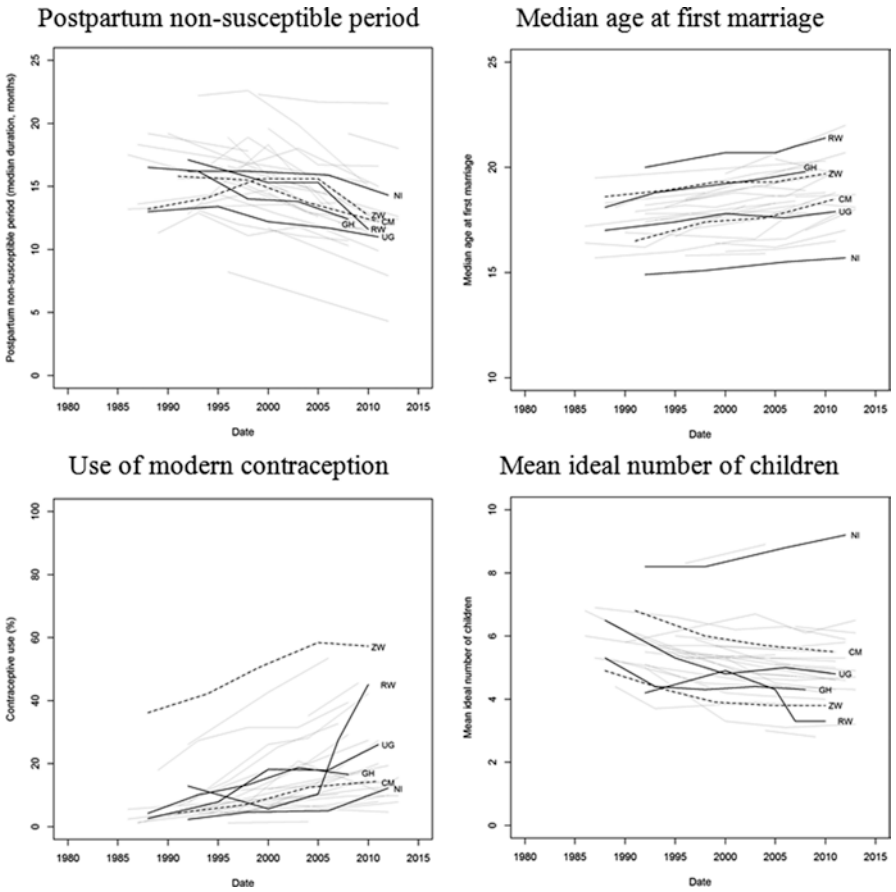

Fig. 2 Trends in non-susceptible period, age at first marriage, contraceptive use, and ideal number of children in 33 countries (Source: Demographic and Health Surveys (www.statcompiler.com). 125 surveys in 33 countries. *Legend: CM* Cameroon, *GH* Ghana, *NI* Niger, *RW* Rwanda, *UG* Uganda, *ZW* Zimbabwe. Definitions: see (Table 1))

30% in the late 1970s (Frank 1983); it had declined to 7% in the 2000 DHS, and was below 3% in the latest DHS (2012). Decreasing infertility also contributed to fertility increases in the most affected countries. For instance, the total fertility rate in Gabon increased from around four children in the 1950s to more than 5.5 in the early 1980s.

Changes in marriage patterns have somewhat contributed to fertility declines, but overall ***increases in age at marriage*** have been modest, and are in no way comparable to changes found in North Africa (Schoumaker and Tabutin 2004). Overall, the effects of changes in marriage on fertility have been limited in most countries (Shapiro and Gebreselassie 2013). Since the 1980s, average increases have been less than 1 year per decade in the large majority of sub-Saharan countries (Fig. 2).

As a result, African women still marry young: the median age at first marriage among women aged 25–49 is below 20 years in most sub-Saharan African countries (four countries out of five), and is very early in a few countries, as in Niger (less than 16 years, (Table 1, Fig. 2). Exceptions (age at marriage over 20) are found in Southern Africa (South Africa, Namibia, Botswana), in Rwanda, Burundi, Gabon and Congo Brazzaville. But premarital fertility has also long been frequent in some African countries (Jolly and Gribble 1993), and has emerged in others (Garenne and Zwang 2006) so that later marriage does not necessarily translate into delayed childbearing and lower fertility (Cohen 1993). Childbearing indeed still starts early in most sub-Saharan African countries; teenage pregnancies remain also quite common in sub-Saharan Africa (Table 1). Frequent remarriage after divorce and widowhood also contribute to women spending a large portion of their reproductive lives in union. Frequent polygyny,. Frequent polygyny,[9] by facilitating marriage and remarriage, also contributes to increasing women's time in union and their fertility (Caldwell and Caldwell 1987).

In most countries of the developing world, contraception has been a major proximate determinant of fertility changes. In sub-Saharan African, ***contraceptive use*** has also gained some ground in recent years, but the uptake has been slow (Lesthaeghe 2014; May and Guengant 2013). Until the early 1980s, the use of modern contraceptive methods was very low (below 5%) in most sub-Saharan African countries. By the late 1980s, Zimbabwe and Botswana, two pioneering countries in the fertility transition, already had contraceptive prevalence (modern methods) above 30%. Kenya was close to 20%, but most African countries were well below 10%. Contraceptive use started increasing in a larger set of countries in the late 1990s (Fig. 2). By 2005–2010, modern methods were used by more than 30% of married women in eight countries (out of 34 countries with data available after 2000), and as many as 57% of married women in Zimbabwe were using a contraceptive method (Table 1). But in seven countries, contraceptive use was still below 10%. These changes in contraceptive use are partly correlated to socio-economic progress, but also to the strength of family planning programs, that may be independent from economic and social development (Cleland et al. 2011). Overall, hormonal methods (pill, implants, and especially injections) and condoms are the most frequent modern methods.[10] These methods are mainly used for spacing or postponing births, but demand for stopping methods (IUD, sterilization) may increase (Lesthaeghe 2014).

Trends in contraceptive use are of course correlated to fertility changes in sub-Saharan Africa. For instance, Rwanda's contraceptive prevalence (modern methods) rocketed, from 10% in 2005 to 45% 5 years later (Fig. 2), and fertility declined also rapidly (Fig. 1). In contrast, Zimbabwe's trend in contraceptive use stalled, mirror-

[9] Between 30% and 50% of married women are in polygynous union in many Western and Central African countries; polygyny is less widespread in Eastern and Southern Africa, but still a significant phenomenon.

[10] Traditional methods, such as periodic abstinence and withdrawal, are also used by substantial numbers of women in some countries (e.g., Congo, Gabon, Cameroon).

ing the slowdown in fertility decline. Yet, the correlation between contraceptive use and total fertility in the most recent Demographic and Health Surveys *is not very strong* (−0.51, n = 33), indicating that other factors are at play. For instance, Ghana and Zimbabwe have roughly the same levels of fertility (around four children), but strikingly different levels of contraceptive use (17% in Ghana, 57% in Zimbabwe (Table 1); Niger and Cameroon show very close levels of contraceptive use (12% and 14%, Table 1), but fertility is 2.5 children higher in Niger than in Cameroon. Several factors may account for these differences. In part they may be due to measurement errors in fertility and contraceptive use, and in part to differences in contraceptive mix and efficacy across methods. These differences may also reflect the role of other proximate determinants, and especially of the use of abortion to control fertility and the high unmet need for contraception (Lesthaeghe 2014).

Collecting good quality data on ***induced abortion*** is challenging, and such data is not common in sub-Saharan Africa (N'Bouke et al. 2012; Westoff 2008). The data from a few countries and indirect estimates suggest that induced abortionabortion is far from negligible, especially among urban youth (N'Bouke et al. 2012; Guillaume 2003). According to indirect estimates (Westoff 2008), women experience between 1 and 1.5 abortions in their reproductive lives (total abortion rate) in 10 of the 11 sub-Saharan African countries of Westoff's study.[11] In the 2012 DHS in Gabon, one woman out of four reported having experienced an abortion during her reproductive life. Several studies in African cities also show that total abortion rates increased (N'Bouke et al. 2012; Guillaume 2003), contributing to fertility declines. Abortion, often conducted in poor conditions, results among other factors from the lack of access to contraception and disapproval of sexuality outside marriage (N'Bouke et al. 2012).

The high fertility and low contraceptive use in sub-Saharan Africa partly reflect an unmet need for family planning, but also a ***high demand for children,*** higher overall than in other regions (Bongaarts and Casterline 2013). In the most recent DHS, the mean ideal number of children is above four children in three quarters of the countries (Fig. 2), and reaches nine children in Niger and Chad. The distinctively high fertility preferences in sub-Saharan Africa are related to a variety of factors, including the benefits of children in rural Africa as well as religious and cultural factors that make high fertility "economically and socially rewarding" (Caldwell and Caldwell 1987, p. 410). Uncertainty in most spheres of life in sub-Saharan Africa is also conducive to maintaining preferences for high fertility (Moultrie and Timaeus 2014). Even though preferences have decreased in most countries (Fig. 2), changes have been slow overall (Bongaarts 2011), maintaining fertility at high levels. Rwanda is an exception: fertility preferences have declined rapidly since the early 2000s, as a result of both declining preferences across

[11] Sub-Saharan countries in the study are Cameroon, Ghana, Kenya, Niger, Nigeria, Senegal, South Africa, Tanzania, Uganda, Zambia, and Zimbabwe. Zimbabwe is the only country with a total abortion rate well below one child.

cohorts and *within* cohorts (Schoumaker 2015), suggesting that the strong family planning program in Rwanda influenced fertility preferences (Bongaarts 2011). Contraceptive use also drastically increased in Rwanda, and the unmet need declined (Lesthaeghe 2014), leading to a rapid decline in fertility. In other contexts, however, decreasing preferences usually lead to increases in the unmet need for contraception, and fertility declines lags behind declining preferences.

6 Urban and Educated Women First

Changes do not occur at the same pace in all social groups and even in countries with very high fertility, some groups are well advanced in the fertility transition. Urban educated women, usually with higher living standards, systematically have lower fertility than their rural, less educated, and poorer counterparts (Bongaarts 2010), or than the intermediate 'floating group' (Rossier et al. 2015). Higher costs of children, related to investments in the education of children and higher opportunity costs of women's employment, the decreasing importance of social norms favoring high fertility, lower child mortality and greater access to contraception, all contribute to the lower fertility of the better educated and urban women. Changes in marriages have also had a substantial effect on fertility declines in urban areas in around a third of African countries (Shapiro and Gebreselassie 2013).

Data from the most recent DHS conducted in sub-Saharan Africa shows that fertility among *urban women with at least 9 years of education* (approximately lower secondary) is between two and four children in the large majority of countries (Fig. 3); it is slightly over four in only one country (DR Congo), and below three children in more than half of the countries. In other words, urban women with at least lower secondary education have entered the fertility transition in *all* the countries with available data. Fertility has even reached levels close or below replacement levels among this group in a few countries (e.g., Ethiopia and Côte d'Ivoire). And even in countries with very high fertility, such as Niger and Uganda, these women have less than four children. In all these countries, urban educated women also desire fewer children, marry later, and are more likely to use modern methods of contraception than their rural and less educated counterparts (results not shown).

In contrast, fertility among rural women with less than 9 years of schooling is higher than five children in most countries, and greater than six in two-thirds of them. Women with low levels of education living in rural areas are clearly lagging behind in the fertility transition. And since they usually represent a large share of the women,[12] they weigh heavily on the overall trends. In a few countries, however,[13]

[12] In more than half of the countries, they represent the majority of women (up to 80% in Niger); in contrast, the share of urban educated women is greater than 20% in only ten countries (as in Cameroon, Ghana, and Zimbabwe, see Table 1).

[13] Rwanda, Zimbabwe, Lesotho, Namibia, Swaziland and to a lesser extent Ghana and Kenya.

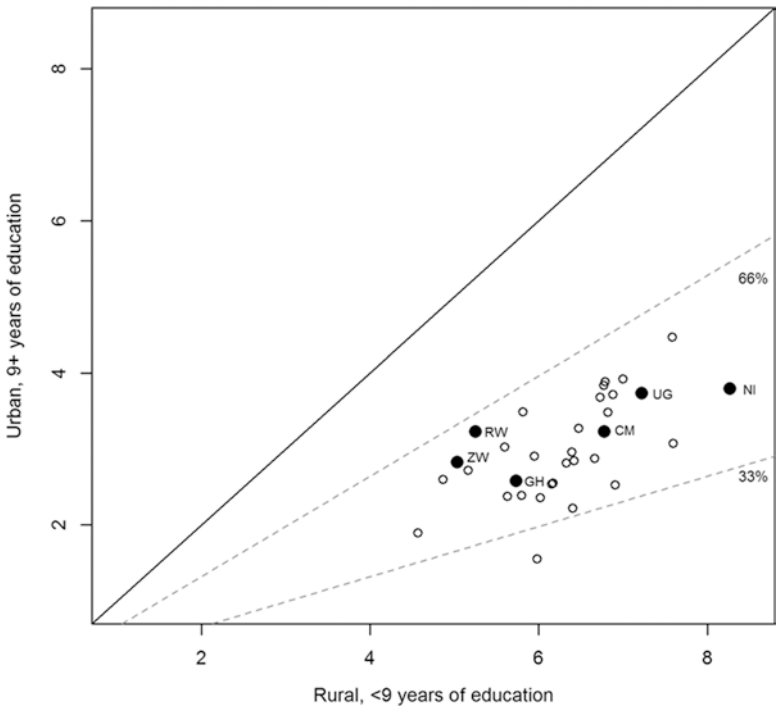

Fig. 3 Comparison of total fertility of urban women with 9 years and over of schooling and rural women with less than 9 years of schooling. (Source: Demographic and Health Surveys. Author's computations from individual recode data files of the most recent surveys in 33 countries. Most surveys were conducted after the year 2000. *Legend: CM* Cameroon, *GH* Ghana, *NI* Niger, *RW* Rwanda, *UG* Uganda, *ZW* Zimbabwe. For definitions, see Table 1)

fertility has been decreasing even among the least favored groups. These changes, albeit slight, have mainly occurred in countries where family planning programs have been more developed than elsewhere in sub-Saharan Africa. The urban educated are clearly the first to control their fertility, but in some circumstances, fertility control can also reach the least favored strata of the population.

7 Conclusions

African fertility transition has started in most sub-Saharan African countries, but declines have remained modest in many of them. Slow social and economic development, low investments in family planning programs, and overall uncertainties in people's lives have not been conducive to rapid declines. Slow increases in contraceptive use have also been partly offset by eroding postpartum abstinence and breastfeeding, and large families are still valued.

However, in all countries, educated and urban women are well advanced in their fertility transition, showing that no country is immune to fertility transition (Lesthaeghe 2014). Rapid declines in a few countries are also illustration of the fact that African transitions need not necessarily be slow. Rapid changes may follow in other countries in the coming years, but the overall impression of African fertility transitions is that of a great uncertainty. Reversals in fertility trends in a few countries show that African countries may follow unexpected trajectories. Moultrie et al. (2012) have also argued that postponement of births is a major driver of fertility changes in sub-Saharan Africa. This strategy of postponing births, rather than stopping fertility, may be a rational response to uncertainties in women's lives in most sub-Saharan Africa (Moultrie and Timaeus 2014). It may also be a sign that fertility changes in sub-Saharan Africa are more fragile than elsewhere, and as a result less predictable. Further economic and social development, decreases in child mortality, provision of family planningservices, but also changing norms and preferences for high fertility, may lead to sustained and rapid fertility changes. The strength and the speed of these changes can have a tremendous impact on the future of Africa's population.

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Access to Family Planning and Women's Health

Ndola Prata

1 Introduction

Access to family planning is considered one of the drives of fertility decline. With contraception and abortion being among the key proximate determinants of fertility, this chapter discusses the role of access to family planning as an important public health intervention to increase contraceptive use, decrease fertility, and improve women's reproductive health. Abortion rates in the context of fertility decline are debated as well, as unsafe abortion contributes significantly to the morbidity and mortality of girls and women of reproductive age. The provision of family planning services as well as the removal of barriers to access to these services are also discussed in the context of supply and demand strategies in family planning programs. We argue that family planning programs affect women's reproductive health indicators and constitute an important strategy in accelerating the fertility transition. This transition is necessary within high fertility countries in sub-Saharan Africa (SSA), in order to open a demographic window of opportunity that will allow countries to benefit from a first demographic dividend (DD).

2 Women's Reproductive Health and Mortality

Sub-Saharan Africa has witnessed a decline in fertility from 6.5 children per woman in 1950–1955 to 5.4 in 2005–2010. This decline appears to be much slower than in other regions with similar high fertility in the 1960s. In addition, there are huge variations among countries regarding the pace of the decline. There are countries in

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Southern Africa with total fertility rates (TFR) rates of less than 3; countries such as Gabon and Zimbabwe have a TFR between 3 and 4; Kenya and Ethiopia have a TFR between 4 and 5; Nigeria and Tanzania have a TFR between 5 and 6; finally, countries such as Angola and Niger have very high fertility rates exceeding 6 children per woman and even 7 in the case of Niger. Data from Demographic and Health Surveys (DHS) also show that within countries, differences in TFR are noteworthy. Women from the poorest socio-economic groups, those in rural areas and those with no or little education are the ones with the highest TFR, present the lowest rates of modern contraceptive use, and have the highest percentage of women with unmet need for family planning.

The persistent high fertility in the region contributes to poor women's health indicators. High fertility is associated with high maternal mortality due to poor spacing of the pregnancies and incremental risk of dying with each pregnancy. Worldwide, maternal mortality has been declining, and the same is happening in sub-Saharan Africa. However, the region shows a decline at a much slower pace than other regions of the world and still exhibits the highest maternal mortality ratios (MMR) in the world. Between 1990 and 2013, the MMR in sub-Saharan Africa decreased from 456.3 maternal death per 100,000 live births to 353 in central SSA; 150 to 279 in southern SSA; 480 to 468 in western SSA; and from 511 to 387 in the eastern part of SSA. However, the number of maternal deaths and the life time risk of dying has declined only modestly because the number of women has risen and the number of births per woman has fallen only slightly. Moreover, major variations exist between countries. For example, South Sudan has an MMR of 956 maternal deaths per 100,000 live births (Kassebaum et al. 2014).

On the quality and accuracy of MMR estimates, we can briefly say that the more recent estimates differ significantly in the total number of maternal deaths from previous estimates, especially those published by the United Nations. It is a fact that maternal deaths are poorly recorded in resource poor settings, thus depending on the methodology employed and various data sources, estimates of global, regional, and country level MMR may differ. The current estimates use robust statistical methods including the Cause of Death Ensemble model to analyze 7065 site-years and estimate the number of maternal deaths from all causes in 188 countries between 1990 and 2013. Cause-specific mortality and the fraction of deaths aggravated by pregnancy were made using systematic reviews of vital registration data among other sources, while country estimates for the same period were developed using Bayesian meta-regression. One of the most important differences between the recent estimates and the United Nations' seems to be related to the WHO estimates of reproductive-age mortality and also the fraction of reproductive-age mortality due to maternal causes. Furthermore, the United Nations MMR estimates predict levels of adult mortality in West Africa on the basis of child mortality, while the more recent estimates make use of survey and census data from the region in the Global Burden of Disease analysis. While a definitive conclusion on the quality of MMR data is beyond the scope of this chapter, it is important to note that the more recent estimates employ a more comprehensive and refined methodology using all available data sources, probably yielding more accurate estimates.

2.1 The Burden of Unsafe Abortion

Over 22 million unsafe abortions take place in developing countries (Ahman and Shah 2011). The 2013 Global Burden of Disease Study revealed that unsafe abortion is the second leading single cause of maternal death globally after hemorrhage (Kassebaum et al. 2014). In 2010, the mortality ratio from unsafe abortion was estimated at 40 per 100,000 live births, ranging from 10 in Asia to 80 in Africa (Ahman and Shah 2011). Singh (2006) estimate that around five million unsafe abortion seekers develop some form of disability requiring medical care. The incidence of severe acute maternal morbidity is estimated to be six times higher than mortality ratios, 15 times higher for severe complications and 100 times higher for any complication, making unsafe abortion a large contributor to maternal morbidity and disability (Adler et al. 2012). Even though the number of deaths from unsafe abortion decreased globally from 49,970 in 1990 to 43,684 in 2013, in sub-Saharan Africa, the same period saw a 40% increase in abortion-related deaths, from 18,400 to 26,000 (Kassebaum et al. 2014).

2.2 Status of Women and Policies to Improve Maternal Health

There is evidence that changes in fertility aspirations reflect changes in social and cultural norms. Gender inequality plays a role in fertility behavior. In sub-Saharan Africa couples tend to differ in their fertility aspirations, with men showing desired for higher fertility and larger families. Thus, empowering women to freely participate in decision making is crucial to achieve lower fertility and as a result help to improve maternal health. A review of studies investigating the relationship between women's empowerment and fertility indicators found positive association with lower fertility, longer birth intervals, and lower rates of unintended pregnancy (Upadhyay et al. 2014). Strong political will in the region and stakeholders' involvement are key strategies in the development and implementation of policies and actions that empower women and increase access to family planning. Women and couples would then be able to make informed decisions and as a result fertility decline could be accelerated. Such acceleration is crucial in bringing about changes in the age structure of the population, creating what is known as the demographic window of opportunity. By creating this important demographic opportunity countries are primed to benefit from the DD, grow economically, and citizens could benefit from improvements in economic conditions.

A review of countries assessing global progress and potentially effective policy responses to reduce maternal mortality illustrates that effective policies include: (i) innovative financing measures, (ii) investment in human resources both in terms of strengthening pre-service education and emphasizing in-service training for healthcare providers, (iii) strengthening obstetric care by enhancing infrastructure and upgrading equipment, as well as improving quality of services, and iv) investing in the broader determinants of maternal mortality, particularly family planning and

women's education and socioeconomic empowerment (Mbizvo and Say 2012). Countries with persistent high MMR in sub-Saharan Africa encounter many challenges for implementation of these strategies ranging from a lack of political will to the prevalence of inaccurate data for decision making and limited financial resources and health care workforce (Prata et al. 2010).

3 Family Planning Programs, Contraception, and Fertility

Family planning programs are recognized as important contributors to increases in contraceptive use. In about 40 years of organized national family planning programs in developing countries, contraceptive use increased from 10 to 60% resulting in fertility declines of about half compared to the period before the implementation of family planning programs (Cleland et al. 2006). Increases in contraceptive use contribute significantly to declines in fertility, as contraception is one of the key proximate determinants of fertility. In addition, contraception relates to abortion rates, another important proximate determinant of fertility decline. This combined effect on birth rates has the potential to reduce maternal mortality by 32% in high birth rates countries, in addition to a 10% reduction in child mortality (Cleland et al. 2006), demonstrating the potential impact that family planning programs can have on women's health.

A recent analysis of trends in contraceptive need and use in developing countries shows that in SSA between 2003 and 2012, 49 million more women of reproductive age (15–49 years) were reported, mostly resulting from population growth (Darroch and Singh 2013). This increase resulted in an additional 25 million women wanting to avoid pregnancy. However, the number of women using modern contraceptive methods has not increased substantially during this same period. In 2012, an estimated 36 million women were using modern methods, an increase from 20 million in 2003. However, only 40% of women in 2012 who wanted to avoid pregnancy were using modern contraceptive methods compared to 32% in 2003 (Table 1). Consequently, it is not surprising that the unmet need for modern methods in this region continues to grow (53 million women in 2012 compared to 43 million women in 2003).

Table 1 Trends in selected family planning indicators use in sub-Saharan Africa, 2003, 2008, and 2012

	2003	2008	2012
Number women 15–49 years (millions)	164	195	213
Number women wanting to avoid pregnancy (millions)	64	78	89
% wanting to avoid pregnancy	39%	40%	42%
Number using modern methods (millions)	20	28	36
% wanting to avoid pregnancy using modern methods	32%	35%	40%
Number with unmet need for modern methods (millions)	43	51	53
% wanting to avoid pregnancy with unmet need for modern methods	68%	65%	60%

Source: Table assembled by author using data from Darroch and Singh (2013, Tables 2.3 & 5)

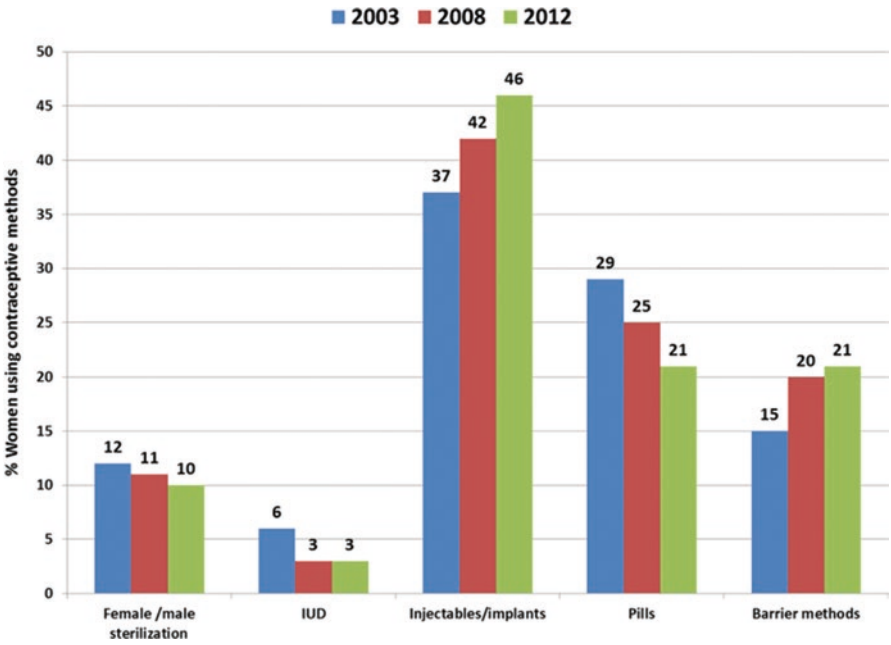

Fig. 1 Percent distribution of women using modern contraceptives in sub-Saharan Africa, by type of method in 2003, 2008 and 2012 (Source: Figure assembled by author using data from Darroch and Singh (2013, Table 4))

Most women using modern contraceptives in sub-Saharan Africa continue to rely on re-supply methods such as injectables, pills, and condoms (Fig. 1). Injectable contraceptives have been the fastest growing modern method in SSA, especially in rural areas where this is the preferred method, and the longest acting method available to rural women that have been benefiting from a growing number of community-based distribution programs, making this method available closer to women.

3.1 Relationship Between Contraception, Fertility, and Abortion

Throughout the world, women control their fertility with contraception and abortion and sub-Saharan Africa is no different. Thus, understanding the relationship between contraception and abortion is vital to recognizing the possible impact on women's health especially during fertility decline and in societies where abortion is highly restricted – as it is the case of the vast majority of the countries in sub-Saharan Africa.

It is expected that when fertility is not changing (i.e., kept constant), increases in contraceptive use will result in decreases in abortion rates. In contrast, when fertility

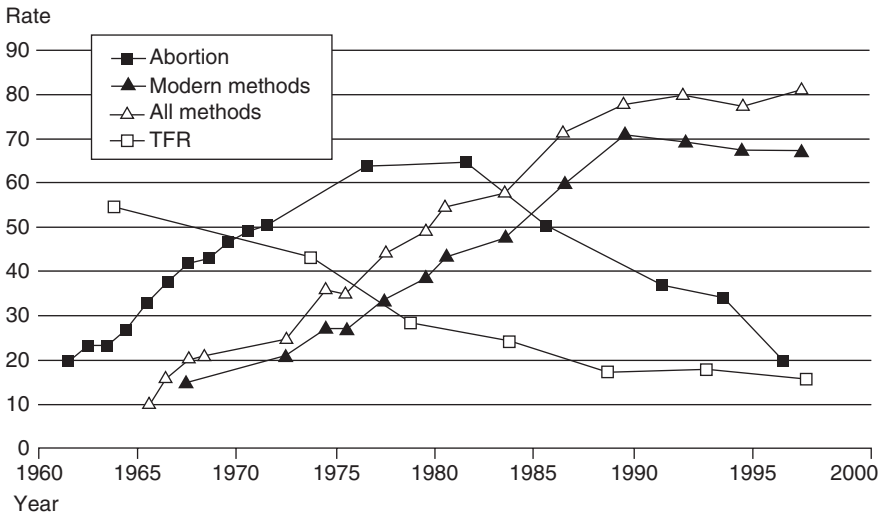

Fig. 2 Relationship between fertility, contraception and abortion. Korea, 1960–2000 (Source: Marston and Cleland 2003)

is declining both abortion and contraceptive rates can rise initially until a threshold is reached. At that point, a high contraceptive prevalence is expected to prevent most of the unintended pregnancies, thus decreasing the need for abortion (Marston and Cleland 2003). In addition, the method mix in the situation of high contraceptive prevalence rates reflects a distribution with a large percentage of women using very effective long acting methods commensurate with achieved desired family size. The Korean example (Fig. 2) can help us appreciate the role of abortion during fertility transition. As can be seen in Fig. 2, Korea's initial stage of fertility decline was accompanied by both increases in contraceptive and abortion rates for more than 15 years (1960 to late 1980s). The difference in this case was that Korea had safe abortion available to women, and the country did not experience a negative impact on women's health as a result of this trend.

A similar pattern can be observed in sub-Saharan Africa. Abortion rates are very high in all sub-regions except in the Southern region where modern contraceptive use is much higher. In the remaining sub-regions of SSA where fertility has for the most part started to decline, many countries show indication of contraceptive use rising but most likely not fast enough to respond to the demand for services. Thus, a rise in abortion rates should be expected, and can partially explain the rise in abortion mortality observed by Kassebaum et al. (2014). Abortion is highly restricted in most SSA countries, so many women resort to unsafe abortion. Evidence shows that women who have undergone unsafe abortion are at higher risk of repeat abortions (Prata et al. 2010). Studies also show that more than half of women receiving post-abortion care following an unsafe induced abortion had never used contraception prior to the abortion.

3.2 Confronting Abortion During Fertility Decline

It is imperative to confront abortion during fertility decline in sub-Saharan Africa. Morbidity and mortality due to unsafe abortion constitutes a major women's health issue that can be addressed with existing evidence from policies and programs. However, this public health issue has been neglected. In 2013, a WHO independent Expert Review group on information and accountability for women's and children's health concluded that there has been *"a pervasive neglect of safe abortion"* in reproductive health. Since the 1994 International Conference on Population and Development (ICPD) declaration that "*in all cases, women should have access to quality services for the management of complications arising from abortion",* unsafe abortion-related mortality has remained high. In most countries, despite changes in laws that allow or expand legal provisions under which abortion is permitted, service provision is still hindered by limited awareness and interpretation of existing and/or new laws by health providers and women and their families (Shah et al. 2014). Moreover, differential access to safe abortion care illustrates the wide economic and social equity gaps. Young, poor, rural women are at a much greater risk of unsafe abortion than their more wealthy counterparts living in urban areas, regardless of the existing laws and degrees of restrictions. These issues make it all the more urgent that strong policies and protocols to manage unsafe abortion while accelerating women's access to family planning methods in SSA are imperative.

The issue of safe abortion is clearly a pressing one for women's health and mortality. In an examination of 140 public health professionals and researchers surveyed for a 2014 study on research priorities for maternal and perinatal health, five of the top 20 research questions focused on abortion. These included among others areas for increasing awareness and uptake of post-abortion contraception, integrating abortion services into existing family planning services and implementing task-shifting for post-abortion care (Souza et al. 2014). With a new global focus on family planning expected to greatly increase the numbers of women using contraception, it is likely that abortion rates will rise in sub-Saharan Africa.

Firstly, while most country laws restrict abortion, provision of post-abortion care to women experiencing unsafe abortion (and who have a legal right to this care) will become increasingly important. In these countries, the provision of comprehensive post-abortion care (PAC) services that include uterine evacuation, family planning counseling, and contraceptive method provision is vital. In this respect, task shifting of PAC services to mid-level providers has the potential to increase access to care for women, especially in rural areas where a delay of several hours in seeking services can make the difference between life and death. Secondly, within the framework of existing abortion laws, positive actions can be taken to increase access, including raising awareness of the provisions in abortion laws that permit a woman to have a legal safe abortion (e.g., in cases of rape, women's health condition, incest, force marriage, fetal malformation, among others), informing the public where services can be obtained, recruiting and training providers, and implementing task shifting of services to mid-level providers (Guttmacher Institute 2012).

Thirdly, abortion laws should include a provision that allows safe abortion in the event of contraceptive method failure.

Although the majority of unintended pregnancies still result from non-use of contraceptives, there will still be a significant number of women that experience contraceptive failure of modern and traditional methods. In an analysis of 19 developing countries, Cleland and Ali (2004) estimated that contraceptive failure contributes to around 15% of the unintended pregnancies and 12% of the induced abortions (Cleland and Ali 2004). Even though the provision of safe abortion services will continue to be restricted in many developing countries, it is important to recognize that increasing abortion rates are an inevitable consequence of a rapid change in demand for family planning services. As a consequence, unsafe abortion will remain a major women's health issue. However, every country can and must do something to address unsafe abortion. Technologies are available to provide services at all levels of health facilities, including in rural areas. Policies and protocols can be implemented to increase access, and legal reforms are possible to expand the provisions under which abortions can legally be conducted. While donors and countries are committed to programs to increase contraceptive use, what is missing is equal attention to the inevitable public health problem of unsafe abortion (Tietze and Bongaarts 1975). With the formulation of the new Sustainable Development Goals (SDGs), unsafe abortion must be high on the reproductive health agenda to ensure that the basic human right of access to these services for all women enshrined in the ICPD is upheld globally, in order to confront a solvable public health catastrophe.

4 Contraceptive Method Mix and Unintended Pregnancies

During the demographic transition, the impact and need of family planning programs can also be demonstrated by assessing trends in the incidence of unintended pregnancy. An estimated 80 million unintended pregnancies occur every year in developing countries, and about 50% of them end in abortions (Sedgh et al. 2014).

While overall contraceptive use has been increasing in sub-Saharan Africa (Population Reference Bureau 2014), it is important to note that leading causes of unintended pregnancies are closely related to the contraceptive method mix. In sub-Saharan Africa, long acting reversible methods such as IUDs and non-reversible methods for both men and women continue to be very low and have not shown from 2003 to 2012 an upward trend (see Fig. 1). Women continue to rely on re-supply methods. Although these methods are relatively more available, they have higher user failure rates and higher discontinuation rates. Some of the reasons for discontinuation have also been associated with the supply side of the re-supply methods. Commodity stock outs, poor quality of services (e.g., poor counseling on side effects), and overall difficulties in gaining access to family planning services are among the reasons associated with method discontinuation. Although research suggests that non-use of contraception is the main factor contributing to unintended births, a 15% contribution in addition to an estimated 10% contribution to abortion

could mostly be prevented with highly effective family planning methods (Cleland and Ali 2004).

The potential for long-acting reversible contraceptive (LARC) methods to decrease unintended pregnancies was well described in a 2008 editorial by Speidel and colleagues (Speidel et al. 2008). LARC methods are highly effective, highly cost-effective from a programmatic perspective, and are suitable for almost all women who want them. In addition, they usually present a relatively high client satisfaction rate. For example, sub-populations such as postpartum and post-abortion women are excellent candidates for LARC, in addition to women without access or not wanting to resort to permanent methods. Furthermore, adolescents and young adults that are sexually active and know they do not want to have a child in the next 3–5 years are equally likely candidates. However, as can be seen in Fig. 1, the use of IUDs in sub-Saharan Africa declined slightly from 2003 to 2012.

Many factors have been associated with barriers to LARC methods affecting both supply and demand side barriers: providers lack information, are misinformed, and lack training; family planning programs commodity procurement emphasizes re-supply of shorter-acting methods; clients' lack of knowledge, misinformation, and fear of how future fertility might be affected. In summary, limited or non-existent realistic access to LARC methods prevail in sub-Saharan Africa.

4.1 Supply and Demand for Family Planning Services

In the past, the role of family planning programs and demand side factors rationalized by the number of women who wished to stop childbearing have been questioned, especially in SSA where lack of progress in fertility reduction was observed. Debates emerged and the value of family planning programs were questioned in what seemed to be understood as a lack of demand for services due to slow changes in the desire for smaller families. Demand for children was understood to be high in SSA due to many social, cultural, and economic reasons in addition to prevailingly high infant and child mortality rates. Generally, there was a view that the fertility transition was largely the consequence of changing parental demand for children as a result of changes in the economic costs and benefits of raising children. These views have been challenged with an alternative explanation that fertility transitions can be driven by the level of knowledge and access to contraceptive methods. In fact, even in Latin America, countries that have completed the fertility transition continue to improve efficiency in the supply of family planning services in order to generate and meet future demand for services. Although changes in the desire for fewer children are necessary, it is known today that the drivers of these changes include an understanding of how to enact fertility control and how realistic this is. For many women in SSA, numerous barriers to fertility regulation exist, and the majority of these are considered to be supply side barriers.

Barriers to family planning are defined by Campbell et al. (2006) as "*the constraining factors standing between women and the realistic availability of the*

technologies and correct information they need in order to decide whether and when to have a child" (Campbell et al. 2006). These barriers include four key groups of issues, namely correct knowledge about contraceptive methods, fear of social disapproval, fear of side effects and health concerns including future fertility, and women's perception of their husband's opposition (Cleland et al. 2006). Supply and demand side interventions can address these barriers through the design of culturally and socially appropriate family planning programs. It is important to note that some of these barriers can be perceived by women as insurmountable, resulting in many with an unmet need for family planning reporting that they do not desire to use family planning methods.

The interplay between demand and supply side strategies is extremely important. Current evidence suggests that strategies do exist to successfully generate demand for services, including for LARC, and among all types of sub-populations of potential users. There is also evidence that the supply/availability of quality services and preferred contraceptive method can increase demand. Women tend to listen to their friends and family for recommendations about methods and providers. In the same way, these networks when uninformed can be a source of rumor spreading, myths, and misconceptions about family planning methods making it more difficult for women to adopt family planning. Hence, the removal of barriers to fertility regulation is at the forefront of the timing and pace of fertility decline. Demand generation strategies need to be implemented, including campaigns that address social barriers. However, a growing demand for services can only be met with a significant increase in resources and improvements in the quality of services and supplies. In addition, the ability to have contraceptive choice – women can choose their preferred method and that choice can change according to the reproductive stage of each woman – is key to success. Nevertheless, many family planning programs in sub-Saharan Africa are focusing on a few of the existing modern methods, decisions mostly driven by the programs' capacity to offer methods, cost-effectiveness, and to some extent the donor community. While pragmatism can be seen as an important feature in program implementation in resource poor settings, it is important to consider the implications of limiting choice as a barrier to contraceptive adoption in the case of SSA, one that is imposed by the supply side. The reality is that family planning is not a free market-based economy where prices for goods and services are set freely by the forces of supply and demand, allowing them to reach equilibrium without intervention by policy and programs. In addition, there is limited knowledge about the application of behavioral economics to fertility decision making.

A review of the behavioral economics in reproductive health prepared by the Center for Effective Global Action at the University of California, Berkeley, concluded that few of the behavior economic tools in public health and policy interventions have been tested in the context of reproductive health. The review proposes four unique opportunities where evidence of biases in reproductive decision-making suggest compatibility with the toolkit developed by psychologists and economists. These opportunities are: (i) correcting false beliefs, (ii) changing norms, (iii) making family planning easy to access, and (iv) motivating service providers. While some of the behavioral economic tools are novel to reproductive

health and more specifically to family planning, the opportunities identified in the review for the application of behavioral economics have been recognized by the family planning community and in many places strategies have been put in place to address those opportunities. However, it is important to note that reproductive decision making involves unique matters. These include gender inequality, the ability to make reproductive decisions, age difference between partners, coercion, disease risk perception, and perception of economic risks by going against the socially expected outcome such as preference for large families, to name a few. Many of these issues have limited roles in other areas of health that have benefited from behavior economics principles. Thus, the appropriate application of behavioral economics in fertility decision making including family planning use is still a major gap in knowledge that could be used for programmatic planning.

In summary, contraceptive practice can influence the pace of fertility decline in SSA making it a critical step in creating the demographic window of opportunity, so that changes in the age structure of the population can be quickly achieved. However, demand for contraceptives will be greatly influenced by supply. Because the use of a preferred contraceptive method can be associated with a higher likelihood of method continuation, especially in re-supply methods, ensuring that demand for a preferred method is satisfied is important. However, this will require significant shifts in policies and programs so that women have "real contraceptive choice" and not just opportunities to use certain methods that are available at a certain point in time. Moreover, to accelerate contraceptive use in SSA innovation in service delivery will be required. New approaches to serve the poor in rural areas and/or exploring synergies from combining old approaches including better use of the private sector are needed.

5 Conclusions

Family planning provides women with a fundamental human right – the ability to control their own fertility. By doing so, it empowers women, improves women's reproductive health and maternal mortality while decreasing child mortality and poverty. The consequent declines in fertility will also create the demographic window of opportunity that can in turn allow countries to benefit from a first demographic dividend. Thus, access to family planning is an important driver of the DD. At an individual and family level, the benefits from the DD can improve work opportunities for women; improve health and education; and provide better gender equality and higher incomes and savings. In SSA, fertility remains high, contraceptive use remains low, the unmet need for family planning keeps growing and the population continues to grow rapidly. Thus, a much slower fertility transition can be expected. However, actions can be taken to accelerate fertility decline through empowering women and creating realistic access to information and contraceptive methods. What the region needs is strong leadership and a political will to allocate resources, remove barriers to access, and implement existing family planning policies by considering them part of the country's development agenda.

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Manpower, Education, Skills and Jobs in Sub-Saharan Africa: Past Trends and Future Outlook

Nicholas Eberstadt

1 Introduction

For all the obvious caveats that must attend large generalizations about postwar demographic and economic developments, two overarching facts concerning the role of sub-Saharan Africa (or SSA) in the world are both critically important and incontestable. First: for the half-century and more since 1960, the tempo of population growth has been faster for the sub-Sahara than for any other major region on earth. Second: over those same years the pace of economic performance or material advance has been more halting, and indeed disappointing, than in any of the world's other major regions.

By the reckoning of the United Nations Population Division (UNPD), the population of the sub-Sahara rose roughly 3.8-fold between 1960 and 2010, an average 2.7% per annum (as against an average of 1.6% per annum for the rest of the world over that same period), thereby expanding from just over 7–12% of humanity in two generations.[1] However over those same years, according to estimates from the World Bank, GDP per capita for sub-Saharan Africa rose by about 45% – as against roughly 150% for the world as a whole.[2] Consequently, despite this extraordinary

The author wishes to thank Mr. Alex Coblin of AEI for his superb research assistance, and Ms. Grace Finley of the University of Virginia for her additional, highly valued contributions to this study. The usual caveats of course apply.

[1] United Nations Population Division (2015a). World Population Prospects. http://esa.un.org/unpd/wpp/. Accessed 26 July 2016.

[2] World Bank (2015). World Development Indicators. http://data.worldbank.org/data-catalog/world-development-indicators. Accessed 2 October 2015. Data are for real GDP per capita in 2005 dollars (non-PPP). SSA's estimated performance for this period, incidentally, includes the upswing in growth that has been recorded since roughly the year 2000: for the four decades 1960–2000, the World Bank estimates total per capita growth in the region to have averaged a meager 12%.

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surge of population, sub-Saharan Africa accounted for a markedly smaller share of world output in 2010 than it had 50 years earlier. The late Angus Maddison, for example, estimated that the sub-Saharan region contributed 2.7% of global product (PPP adjusted) in 1960, but less than 2.2% in 2008, the year of his last global update.[3] Such broad estimates suggest that per capita productivity in the sub-Saharan region is on average far lower today than for any other region of the earth—and that postwar improvements in productivity for SSA have been decidedly slower and more limited than for the rest of the human population.

The outlook for productivity in sub-Saharan manpower promises to become an increasingly weighty question for humanity in the decades immediately ahead. This is so, quite simply, because sub-Saharan Africa is on course to comprise a progressively larger portion of the world's working-age population. Manpower productivity in the sub-Sahara will thus not only largely define the economic prospects for the region's own residents, it stands increasingly to account for the denominator upon which global averages for per capita productivity are based, and to shape the scope of productivity-enhancing opportunities for the rest of the world from economic interaction with Africa. The more productive the sub-Sahara is, the better off the rest of the world can expect to be. Conversely: a disappointing future performance by SSA, in addition to its local implications, will threaten to compromise global alleviation of absolute poverty, and could of itself force an increase in world income inequality.[4]

This chapter offers both a retrospective and a prospective view on SSA manpower, education and productivity. Firstly, we review patterns of working age manpower growth over the postwar era for the sub-Sahara, as well as indications of the changing local and regional trends in adult educational attainment. Secondly, we place SSA's educational performance in international perspective, and examine the influence that educational attainment and other key factors seem to have exerted on per capita productivity, both in SSA and the rest of the world. Finally, we venture to examine the outlook for SSA manpower, education and productivity in the decades immediately ahead.

2 Data Sources: Availability and Reliability

It is safe to say that researchers and policymakers today have at hand a more extensive, detailed and reliable storehouse of data on demographic, social and economic conditions in the sub-Sahara than at any previous point in history. That said, this storehouse is more limited, irregular and problematic for SSA than for any other

[3] Maddison, A. (2008). Historical Statistics on World Population, GDP, and Per Capita GDP, 1-2008 AD. http://www.ggdc.net/maddison/oriindex.htm. Accessed 2 October 2015.

[4] Cf. Sala-i-Martin, X. (2007). Global Inequality Fades as the Global Economy Grows. In *2007 Index of Economic Freedom* (pp. 15–25) Washington: Heritage Foundation and Wall Street Journal. In Sala-i-Martin's words from 2007: "unless the incomes of these African citizens begin to grow, and grow rapidly, world income inequality will start to rise again in a few years' time". (p. 24)

major region of the contemporary world. This should not come as a surprise. Accurate in-depth socio-economic data is a handmaiden of modern economic development, a process which to date has made less progress in SSA than any other large area. Weaknesses in coverage and quality have been exacerbated by the great political diversity of the region and also by its evident political fragility for so much of the post-colonial era.[5] (Ironically, recent improvements in statistical capabilities in the sub-Saharan region may have seemed to challenge the credibility of official demographic, social and economic data by exposing or highlighting inconsistencies, gaps and differences in state figures that heretofore simply would never have come to light.[6])

It is telling that the most recent (2013) edition of the *UN Demographic Yearbook* should render the evaluation that there is not yet a single state in continental SSA in which vital statistics coverage is near complete (i.e. civil registration of 90% or more of annual births and deaths).[7] Even so: nearly every mainland SSA state has conducted one or more censuses in the last two global rounds of census collection.[8] Among the 43 states on the continental mainland that the UN defines as being sub-Saharan, a total of 95 population censuses have been taken over the last three global rounds. Additional demographic and social information has been methodically accumulated from the Demographic and Health Surveys (DHS)) which have been

[5] That fragility has an impact on the very classification of the boundaries of the sub-Saharan African region. Depending on how one counts, SSA currently encompasses 51 or 52 separate territories and administrative authorities. The UN currently maintains there are 51 sub-Saharan states and territories, of which 48 are considered sovereign countries (excluding Mayotte, Réunion and Saint Helena). [C.f. United Nations Statistics Division (2013). Composition of macro geographical (continental) regions, geographical sub-regions, and selected economic and other groupings. http://unstats.un.org/unsd/methods/m49/m49regin.htm. Accessed 2 October 2015.] Note that UNPD and Wittgenstein Centre, following current UN geographic taxonomy, tally 51 SSA states and territories, whereas the US Census Bureau and the World Bank tally 52. The discrepancy turns on the status of currently-constituted Sudan (i.e., with boundaries reflecting the 2011 secession of South Sudan) which is treated as an SSA state in some data-bases but not in others (in the United Nations taxonomy, Sudan is listed in Northern Africa and South Sudan in Eastern Africa). Where practicable we try to include Sudan in this study. Thus we use the UNPD or Wittgenstein Centre's reported SSA aggregates "as is", but include Sudan within SSA in our own subsidiary data analyses. Ultimately, of course, adding or omitting Sudan has little effect on aggregate regional trends for SSA.

[6] Sandefur, J., Glassman, A. (2015). The Political Economy of Bad Data: Evidence from African Survey and Administrative Statistics. The Journal of Development Studies, 51(2), 116–132.

[7] United Nations Population Division (2015b). Demographic Yearbook 2013 (Table 4). http://unstats.un.org/unsd/demographic/products/dyb/dyb2013/Table04.pdf. Accessed 2 October 2015. By this assessment, five "sub-Saharan" countries have achieved completeness or near-completeness in their vital registration systems: Cabo Verde, Mauritius, Reunion, Sainte Helene, and Seychelles. But all of these are islands, sub-Saharan in the sense of being nearer to SSA than to any other large landmass, and in total accounting for less than one third of 1% of the population for the region as the UN defines it geographically.

[8] United Nations Statistics Division (2015). 2010 World Population and Housing Census Programme. http://unstats.un.org/unsd/demographic/sources/census/censusdates.htm#AFRICA. Accessed 2 October 2015.

undertaken throughout SSA since 1984.[9] This data permits us to approximate region-wide and national trends in manpower development with some confidence, and to reconstruct trends in adult educational attainment as well (albeit with more gaps and a lesser measure of confidence). Corresponding improvements in economic data collection and national accounts systems provide evidence on levels and trends of productivity throughout much (though not all) of SSA over the past two generations as well.

In this chapter we will rely heavily upon demographic data from the United Nations Population Division (while checking UNPD estimates and projections against those of the US Census Bureau,[10] the other leading global authority that publishes data on worldwide demographic conditions). For estimates and projections concerning adult educational attainment, we use two sources: the Barro-Lee database,[11] and the corresponding work of the Austria-based Wittgenstein Centre for Demography and Human Capital[12]; for the most part, these efforts offer consonant and complementary apertures on the gradual deepening of educational attainment in SSA and the rest of the world over the postwar era. As for measures of economic productivity, we will utilize long-term regional and national-level estimates of per capita output (GDP) from two of the main sources of such global calculations today: the World Bank's World Development Indicators data-files, and the heroic work of the late economic historian Angus Maddison.

Readers will recognize that such blunt (some would say crude) macro-indicators cannot hope to bring to the table some of the richness and nuance that a microeconomic analysis of SSA labor markets might promise – especially as relates to the interplay between education, skills, jobs and income. Nevertheless, our "bird's eye" approach arguably has its uses for a summary chapter – and data limitations still basically preclude any comprehensive assessment of postwar SSA labor market dynamics from a micro-perspective.[13]

[9] Vaessen, M., Thiam, M., Le, T. (2005). The Demographic and Health Surveys. In Household Sample Surveys in Developing and Transition Countries (pp. 495–522). New York: United Nations; USAID (2015). The Demographics and Health Survey. http://www.dhsprogram.com/Where-We-Work/Country-List.cfm.; and the predecessor World Fertility Surveys and Contraceptive Surveys from the 1970s and early 1980s.

[10] US Census Bureau (2015). International Data Base. http://www.census.gov/population/international/data/idb/informationGateway.php. Accessed 2 October 2015.

[11] Barro. R., Lee, J., (2010). A new Data Set of Educational Attainment in the World. Journal of Development Economics, 104, 184–198. Available at: http://www.barrolee.com.

[12] Wittgenstein Centre for Demography and Global Human Capital (2015). Wittgenstein Centre Data Explorer Version 1.2. http://www.wittgensteincentre.org/dataexplorer. Accessed 2 October 2015.

[13] Labor market data for SSA is still so limited and fragmentary that a 2013 World Bank study titled "Urban Labor Markets in Sub-Saharan Africa" referred to its regional overview of employment, unemployment and working conditions as consisting of "stylized facts". Cf. De Vreyer, P. and Roubaud, F. eds.(2013) Urban Labor Markets in Sub-Saharan Africa, Washington D.C.: World Bank, p. 37.

3 Broad Postwar Trends in Sub-Saharan Manpower Growth: 1960–2010

As a rule it is much easier to track manpower availability than manpower utilization. This is especially true for societies where subsistence production and other varieties of household-centered economic activity account for any appreciable proportion of a population's remunerative work effort. Table 1 presents an overview of estimated manpower availability in SSA for the period 1960–2010, using the conventional (and arbitrary, though not entirely unreasonable[14]) definition that classifies the 15–64 group for both males and females as the "economically active ages" (see Table 1).

Table 1 Population and manpower indicators for Sub-Saharan Africa

	1960	1985	2010	2035 (projected)
Total SSA population (millions)	221	427	840	1565
% of World population	7.3	8.8	12.1	17.7
SSA 15–64 population (millions)	120	220	447	918
% of Wold 15–64 population	6.9	7.5	9.8	16.2
SSA 15–64 population as % of total SSA population	54	52	53	59
		1960–1985	1985–2010	2010–2035 (projected)
Average per annum growth rate SSA total population (%)	–	2.67	2.74	2.52
TotaSSA growth as % of total world growth	–	11.2	19.9	38.0
Average SSA 15–64 per annum growth rate (%)	–	2.46	2.88	2.92
SSA 15–64 population gowth as % of global 15–64 growth	–	8.5	14.0	41.9
Average per annum global population growth rate excluding SSA (%)	–	1.85	1.28	0.71
Average per annum global 15–64 growth rate excluding SSA (%)	–	2.05	1.68	0.59

Source: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, World Population Prospects: The 2015 Revision, http://esa.un.org/unpd/wpp/index.htm, accessed on July 29, 2015

[14] Generally speaking, however, this convention is more problematic for the world's least developed societies, where child labor and toil for the elderly are familiar if not commonplace. According to its 2001 population census, for example, 53% of men and women over the age of 65 and nearly 38% of boys and girls 10–14 years of age were part of the country's labor force. International Labour Organization. ILOSTAT Database. http://www.ilo.org/ilostat/faces/oracle/webcenter/portalapp/pagehierarchy/Page137.jspx?_adf.ctrl-state=9g11glacl_328&clean=true&_afrLoop=2184281783750021&clean=true. Accessed 2 October 2015.

By UNPD estimates and projections, sub-Saharan aggregate manpower surged from 120 million in 1960 to almost 450 million in 2010 – a leap of more than 270% over that half century, very close to the scale of overall population growth for the region during those same years. We can regard this as an unprecedented event in the sense that no other large region of the world has ever recorded a similar pace in manpower growth over a comparable time period and generated more or less entirely by natural increase.

Several implications of the trends outlined in Table 1 deserve mention. First, the tempo of manpower growth for SSA as a whole significantly *accelerated* between the quarter century 1960–1985 and the 1985–2010 quarter century: from 2.5% per annum to 2.9% per annum. This at first may seem surprising, considering the UNPD's estimate that total fertility rates in the sub-Sahara remained more or less unchanged (around 6.6–6.7 births per woman) between the early 1950s and the late 1980s – i.e., the years when almost all of the new inductees into the manpower pools in Table 1 were being born.[15] The explanation is not net immigration – UNPD estimates that net *out*migration from SSA during those years amounted to about 6 million – but instead substantial improvements in survival chances, the HIV pandemic and all else notwithstanding.

Secondly, the pace of manpower growth for SSA is increasingly and dramatically diverging from that for the rest of the world. While the SSA's tempo of manpower growth has been on the upswing, the overall tempo elsewhere has been sharply slowing. This is an inescapable consequence of the divergence in net reproductive rates between SSA and the rest of the planet over the past several generations. In the early 1950s, by the UNPD's reckoning, SSA's net reproduction rate was roughly 10% higher than the average for the rest of the world. By the early 1980s, it was over two-thirds higher. Today (2010/2015) it is thought to be more than twice as high (with SSA's NRR estimated at just over 2 while the NRR for the rest of the planet is estimated to be just below replacement): thus portending even greater divergence in manpower trends in the coming decades.

Thirdly, as a consequence of the aforementioned demographic divergence, SSA is coming to account for an increasing fraction of global manpower – and its marginal share of global manpower growth is inflecting upward.

Fourthly, because SSA's population structure is very youthful and its pace of manpower growth and total population growth have roughly matched one another over the postwar era, the share of working-age population to total population was a relatively low 54% of total population in 1960 and actually dropped very slightly thereafter. Consequently, none of the salutary properties some have ascribed to the "demographic dividend" could as yet be expected to come into play.

Given the extraordinary diversity of the populations of the sub-Sahara, and the many dozens of states presiding over these peoples, it is not feasible here to describe

[15] SSA's teenage manpower in 2010 was born in the 1990–1995 period, at which time UNPD estimates the region's TFR had declined to about 6.2 – a fact that further underscores our point about the role of mortality improvements in the acceleration of SSA manpower growth.

national or sub-national manpower composition or growth over these two generations in any detail; a few large generalizations will have to suffice instead.

First: there seems to have been surprisingly little correspondence in manpower growth for the countries in question from one generation to the next. This is indicated by basic measures of statistical association for SSA countries' manpower growth between 1960/1985 and 1985/2010. The coefficient of determination (i.e. R-squared) for the inter-generational correlation in proportional manpower growth for the SSA countries was just 6%. In addition, Spearman's *rho* for the ordinal rankings in manpower growth was just +0.15 (and not meaningfully different from zero in terms of its statistical significance). Both of these statistics indicate that information about the pace of manpower growth or its growth ranking in the first period provides essentially no information for the second period.

Second: the pace of manpower growth was substantially more homogeneous among SSA countries in 1985/2010 than it had been in the 1960/85 period. In the earlier generation, the coefficient of variation for proportional manpower growth for the countries of the sub-Sahara was 28%; a generation later it was 15%, just over half as high. Even as the region's overall tempo of manpower growth was accelerating, the dispersion in national manpower growth tempos for the countries within the region was appreciably diminishing.

Third – and related to the first two points: the role of migration changed over time with respect to inter-country manpower growth differentials in the post-colonial sub-Sahara. Although overall net migration from SSA to other regions has been rather small in relation to overall population growth (amounting to just 2% for 1960–1985, and well under 1% for 1985–2010), net migration movements in quite a number of sub-Saharan countries had a major impact on population change. In the 1960–1985 period, by the estimates of UNPD, 19 SSA states experienced population increases or decreases of 10% or more due to net migration; in 1985–2010, the same was true for 13 SSA states. But there was essentially no correlation at all (R-squared under 2%) between the proportional magnitude of net migration for these countries during these two periods, so migrations may have made for big swings in SSA rankings for manpower growth.[16] We may observe that the role of net migration in total postwar SSA population change – and by extension, perhaps in population change for working age groups as well – tends to be more consequential for smaller countries. In the postwar era, SSA migration has reflected both "pull" and "push" – the latter all too often resulting from political crises.

Fourth: given the tremendous differences in population size among contemporary (2015) sub-Saharan states – from Nigeria's projected 180-million plus level to Saint-Helene's fewer than 8000 souls—most of SSA's manpower growth between 1960 and 2010 accrued to a relatively small number of countries. For both 1960–1985 and 1985–2010, UNPD estimates that just over half of the SSA's manpower growth was accounted for by just half a dozen countries: Nigeria, Ethiopia,

[16] We must couch this as a surmise since neither the UNPD nor US Census Bureau offer estimates for net migration of working-age populations per se; their net migration estimates are only for total population.

Democratic Republic of the Congo, South Africa, Kenya and Tanzania. In both periods, the "top 10" countries accounted for about two thirds of all SSA manpower increase (9 of the top 10 countries for the two periods being the same).

Fifth, and not least significant: sub-Saharan Africa is comprised today mainly by inhabitants of what the UN designates as "least developed countries".[17] In 1960, by UNPD reckoning, about three fifths of SSA's 15–64 population was from current LDCs; by 2010, the share was very slightly higher. About three fifths of sub-Saharan manpower growth over the past half century also accrued from places currently classified by the UN as "least developed." The UN describes LDCs as "the poorest and weakest sector of the international community…characterized by weak human and institutional capacities, low and unequally distributed income and…often… governance crisis, political instability and, in some cases, internal and external conflicts."[18] Since the categorization of a country as an LDC is always *ex post facto*—i.e., determined by its past record of socioeconomic performance rather than its future outlook—the simple fact that so much of the SSA population is LDC already tells us a great deal about the state of education, skills and jobs in the sub-Sahara today.

4 Postwar Trends in Estimated Adult Educational Attainment: SSA in International Perspective

Census returns and DHS surveys permit the UNPD and the US Census Bureau to offer a fairly comprehensive set of postwar estimates and projections for sub-Saharan Africa's changing regional and national population structures. However, these same sources offer distinctly more limited data for mapping corresponding changes in educational profiles within the region. The Barro-Lee project, for example, reconstructs patterns of educational attainment for the 1960–2010 period for 146 countries worldwide – but for just 33 of 52 possible sub-Saharan countries, omitting inter alia Nigeria and Ethiopia, SSA's two most populous states. The Wittgenstein Centre project dares to offer somewhat greater coverage for the sub-Sahara – providing historical numbers for 41 of what it counts as the region's 51 countries, including both Ethiopia and Nigeria: but its time series does not commence until the year 1970. Intrinsically important as these gaps in coverage may be in their own right, we may also suspect that they might bias reported regional estimates for SSA upward, insofar as places with poorer educational performance may also tend to be non-reporters or partial reporters of local educational attainment.

[17] With 33 out of SSA's 51 states being currently counted as LDCs (or alternatively 34 out of 52, depending on whether current-day Sudan is included in SSA).

[18] United Nations Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and the Small Island Developing States (2015). About LDCs. http://unohrlls.org/about-ldcs/. Accessed 2 October 2015.

For a conspectus of postwar educational progress for SSA manpower in a global perspective, we can turn to Table 3, which presents findings from the Barro-Lee project (see Table 3). This table offers long run (1950–2010) trends in years of schooling by sex for 111 countries accounting for roughly 90% of the world's working-age population as of 2010. Note however that only 24 countries from SSA are included; this roster accounts for just over half of SSA's estimated 2010 working-age population.

There are many different criteria one may utilize for parsing the patterns of performance reflected in Table 3. By virtually any criterion one cares to select, however, sub-Saharan Africa's educational progress looks to be distressingly poor in comparison with other major regions of the world. To go by these numbers, the 1950–2010 period was an era of extraordinary worldwide educational expansion – but sub-Saharan Africa looks to have been the planet's most conspicuous regional underachiever.

Between 1950 and 2010, by Barro-Lee's reckoning, mean years of schooling (MYS) for working-age men and women in SSA increased by roughly 4.2 years, to an average of 5.5 years. Though this may possibly sound heartening – out of context – it happens to be the weakest increment for any large region in the world for the decades under consideration. The countries in the Asia-Pacific grouping, for example, registered an estimated MYS increase of 5.7 years for its working-age adults. And the oft-troubled MENA region (Middle East-North Africa) reportedly gained 6.5 MYS in working-age adult education. SSA's comparatively weak improvements in mean years of schooling for working-age adults hold for men and women alike. Although this was not the case back in 1950, as of 2010 SSA has by far the lowest estimated level of working-age adult educational attainment of any large geographic region of the world.

Trends in the proportion of the working-age adult population with no schooling at all paint a similarly gloomy picture for sub-Saharan Africa. Table 2 suggests that in 2010 nearly one third of working-age adults in SSA – over a quarter of the men, and about three in eight women – had no schooling at all. When contrasted with results for SSA in 1950, this can be described as considerable progress – but when compared with any other region of the world, SSA's gains look unmistakably modest, and for both sexes. As a consequence of its unsteady advances over this 60 year epoch, SSA today has a much higher proportion of completely unschooled adult men and women than any other large region of the world – higher indeed than MENA, which according to the Barro-Lee project had an even poorer educational profile in 1950. Recall as well that SSA's region-wide progress in Table 3 could possibly be overstated due to coverage or non-reporting bias.

While SSA's average level of educational attainment nowadays (2010) is low, the inter-country disparities within the region are extremely high. By the Barro-Lee project's reckoning, MYS for the 15+ population in sub-Saharan countries in 2010 ranged from a low of 1.9 years (Niger) to a high of 9.7 years (South Africa): a high-to-low ratio of over 5:1, with a coefficient of variation of 40%. (The corresponding Wittgenstein Centre SSA numbers for 2010 range from 1.1 to 9.2 – for a high-to-low ratio of over 8:1, with a coefficient of variation of 48%.) We will address the

Table 2 Top 20 Sub-Saharan Africa countries growth in labor force (15–64) (absolute changes rounded to nearest tenth of a million)

1960–1985			1985–2010			2010–2035 (projected)		
	Absolute change (mil)	Proportion of SSA growth (%)		Absolute change (mil)	Proportion of SSA growth (%)		Absolute change (mil)	Proportion of SSA growth (%)
Nigeria	18.7	17.8	Nigeria	41.2	17.3	Nigeria	84.6	17.3
South Africa	9.0	8.6	Ethiopia	25.0	10.5	Ethiopia	50.4	10.3
Ethiopia	8.8	8.4	DRC	17.8	7.5	DRC	43.7	8.9
DRC	7.4	7.1	South Africa	14.4	6.1	Tanzania	29.8	6.1
Tanzania	5.9	5.6	Kenya	12.8	5.4	Uganda	23.8	4.9
Kenya	5.2	5.0	Tanzania	12.5	5.3	Kenya	22.3	4.6
Sudan	4.7	4.5	Sudan	11.1	4.7	Sudan	18.4	3.8
Uganda	3.8	3.6	Uganda	8.8	3.7	Angola	14.2	2.9
Côte d'Ivoire	3.4	3.2	Ghana	7.3	3.1	Mozambique	14.1	2.9
Ghana	3.1	3.0	Madagascar	6.2	2.6	Niger	13.5	2.8
Mozambique	2.7	2.5	Cameroon	5.7	2.4	Madagascar	12.6	2.6
Zimbabwe	2.4	2.3	Angola	5.6	2.4	Ghana	11.2	2.3
Madagascar	2.4	2.3	Mozambique	5.6	2.3	Cameroon	11.0	2.2
Cameroon	2.2	2.1	Côte d'Ivoire	5.4	2.3	Malawi	10.1	2.1
Angola	2.1	2.0	Niger	4.3	1.8	Côte d'Ivoire	10.1	2.1
Zambia	1.9	1.8	Burkina Faso	4.1	1.7	Mali	9.8	2.0
Niger	1.7	1.6	Malawi	3.9	1.6	Burkina Faso	9.7	2.0
Malawi	1.7	1.6	Senegal	3.7	1.6	Zambia	9.3	1.9
Somalia	1.7	1.6	Mali	3.6	1.5	South Africa	8.9	1.8
Rwanda	1.5	1.4	Zambia	3.5	1.5	Senegal	8.2	1.7

Source: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, World Population Prospects: The 2015 Revision

Table 3 Estimated educational attainment of adult populations 15–64 years of age in 111 countries: 1950 vs. 2010 (Barro-Lee estimates)

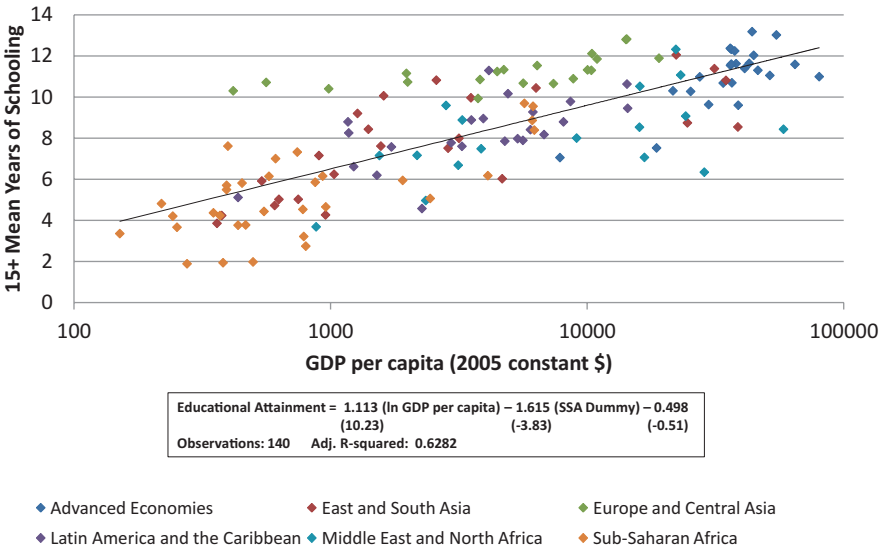
	15–64 population (Millions)			% no schooling			Mean years schooling		
	Female	Male	Total	Female	Male	Total	Female	Male	Total
World (111)									
1950	693	695	1388	52.8	43.1	47.9	2.86	3.5	3.18
2010	1994	2042	4035	17	8.8	12.9	7.92	8.73	8.33
Advanced (24)									
1950	195	184	380	10.1	8	9.1	6.4	6.79	6.58
2010	324	326	651	1.5	0.9	1.2	11.94	11.94	11.94
Developing (87)									
1950	497	511	1008	69.6	55.7	62.6	1.48	2.32	1.9
2010	1669	1715	3385	20.1	10.4	15.1	7.14	8.12	7.64
Asia/the Pacific (17)									
1950	340	368	708	80.1	61.3	70.3	0.92	1.97	1.47
2010	1162	1217	2379	21.3	9.7	15.4	6.75	8.01	7.4
Eastern Europe (8)									
1950	65	51	116	16.6	9.5	13.5	4.17	5.13	4.58
2010	89	84	172	0.5	0.5	0.5	11.91	11.75	11.84
Latin America/the Caribbean (25)									
1950	46	46	92	49.2	41.4	45.3	2.51	2.94	2.73
2010	196	190	386	6	5.3	5.6	8.73	8.62	8.68
Middle East/North Africa (13)									
1950	21	21	42	94.9	85.9	90.4	0.29	0.85	0.58
2010	106	108	213	29.4	16.5	22.9	6.93	7.92	7.43
Sub-Saharan Africa (24)									
1950	25	24	49	83.7	69.6	76.8	1.02	1.69	1.35
2010	118	117	235	37.6	26.5	32	4.95	6.03	5.5

Source: Barro, Robert, and Jong-Wha Lee. "A New Data Set of Educational Attainment in the World, 1950–2010." (Journal of Development Economics, 2010)

question of SSA's distribution of individual educational attainment later. For now we may simply observe that low levels of schooling in conjunction with high measures of dispersion for this same attainment can only contribute to poverty and inequality in the territories so characterized.

Sub-Saharan Africa's poor long-term record in promoting education demands explanation. It may perhaps be regarded as a political outcome to the extent that it is related to the severe and often recurrent bouts of instability witnessed in so many sub-Saharan locales in the post-colonial era. Civil war, violent upheaval, chaos, government breakdown and even what have been called "failed states" have been all too familiar features of the sub-Saharan landscape over the past half century and more – and these are hardly propitious conditions for building, maintaining and expanding educational systems.

While we cannot precisely quantify the impact of such political factors on schooling outcomes for working-age Africans today, we can demonstrate that there



Source: Robert Barro and Jong-WhaLee, "A new Data set of Educational Attainment in the World, 1950-2010" *Journal of Development Economics*, vol 104, pp.184-198, available at http://www.barrolee.com; World Bank, World Development Indicators, "GDP per capita (constant 2005 $)," available at http://databank.worldbank.org/data/views/variableselection/selectvariables.aspx?source=world-development-indicators accessed on December 12, 2014.

Fig. 1 GDB per capita v. total mean years of schooling (15+), 2010 (Barro-Lee estimates)

has been a peculiar and severe "SSA factor" that has worked very much to their educational disadvantage.

We illustrate the problem in Fig. 1. This simple scatterplot shows the worldwide relationship between Barro-Lee estimated mean years of schooling for the 15+ population in 2010 on the one hand and GDP per capita on the other across 140 countries. As is readily apparent, the SSA group of states consistently "underperforms" in this graphic. Put another way: despite the region's highly problematic economic record over the past two generations, SSA countries have managed to "purchase" even fewer years of adult education than one would expect on the basis of their income levels alone. Indeed, in this simple regression, introducing a dummy variable to capture the "SSA effect" suggests that simply being a sub-Saharan country has the predicted effect of lowering MYS in 2010 by about 1.6 years, all else being equal.

A slightly more sophisticated analysis of SSA performance with respect to educational attainment for its working-age populations today would examine MYS for the working-age (15–64) group, rather than the 15+ group, and would also take account of an initial MYS, say 1960, for a country's working-age population. If we run this somewhat more carefully specified regression, using Barro-Lee data for educational attainment and World Bank estimates for real GDP per capita, our findings are considerably more robust. The model predicts four fifths of the 2010 differences between the 139 countries for which we have data, and all of the predictors are highly meaningful in terms of statistical significance. The variable for measuring the "SSA factor" now estimates a slightly smaller effect for being a sub-Saharan country—but at negative 1.2 years, it is powerful and highly adverse. (Disaggregating

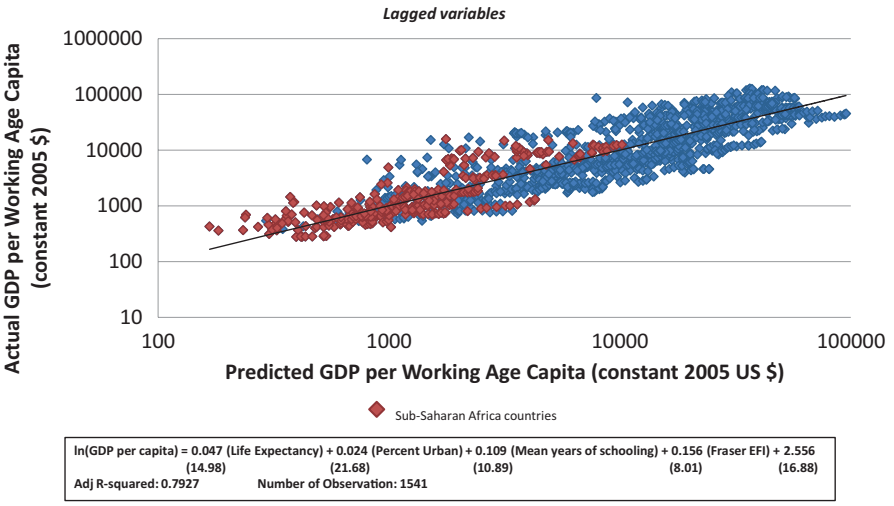
these results by sex reveals that this adverse SSA effect holds for both SSA men and SSA women as well.) In other words: even after taking into account SSA countries' typically very low initial levels of educational attainment for working-age population, and their generally dismal record of long-term economic growth, educational advancement as measured by working-age mean years of schooling was *still* substantially lower than would have been predicted.

The implications of the SSA's postwar failure to keep up with the tempo of educational expansion in the rest of the world are profound and far-reaching. Given the direct causal relationship between education and productive potential, diminished adult educational attainment clearly placed constraints upon both economic growth and poverty reduction throughout the sub-Sahara. Faltering educational progress – especially among girls and young women – may also have had indirect, long-term, intergenerational consequences. The strong and general negative correlation between educational attainment and fertility levels is by now a familiar, worldwide finding within the social sciences. While that relationship is subtle and complex in practice – for instance, some populations with quite limited female education have undergone dramatic fertility declines in recent decades – few would contest the underlying influence at work. Without attempting rigorous quantification here, it would seem fairly safe to suggest that weak educational progress over the past two generations has been an important factor in the tremendous growth of the pool of relatively poorly educated SSA manpower over the past generation – and for the generation ahead.

5 Explaining Postwar Manpower Productivity Patterns in SSA and the World: The Contribution of Education and Other Factors

We have discussed the dimensions of the region-wide failure in SSA educational progress over the past several generations, as well as some of the potential factors contributing to the region's generally poor performance in enhancing educational attainment. We now turn to the economic consequences of this lagging educational performance. We do so in this section by exploring worldwide patterns of postwar productivity growth, and considering what those patterns tell us about the SSA region's generally grim economic record in the post-colonial era and the factors accounting for it. While tracing the relationship between manpower, educational attainment, and output does not tell us anything directly about jobs and skills – two of the assigned themes for this chapter – it may cast some indirect light on these quantities nonetheless.

In Fig. 2 we present a simple econometric model for predicting real GDP per member of the working-age population – i.e., general manpower productivity – around the world for the 1970–2010 period (see Fig. 2). It utilizes measures of human resources and "business climate" ("institutions and policies" in the current



Source: GDP and Life Expectancy: World Bank, World Development Indicators, available at http://data.worldbank.org (2014). *World Urbanization Prospects: The 2014 Revision*, available at: http://esa.un.org/unpd/wup/CD-ROM/Default.aspx, accessed August 15, 2014. Education: Author's calculations derived from Robert Barro and Jong-WhaLee, "A New Data Set of Educational Attainment in the World, 1950-2010," *Journal of Development Economics*, vol 104, (April 2010): 184-198. Available at: http://www.barrolee.com/ Accessed August 15, 2014. Economic Freedom Index: Fraser Institute, Economic Freedom Network, available at: http://www.freetheworld.com/, accessed September 15, 2014.

Fig. 2 Predicting Global GDP per working -age capita with life expectancy urbanization, education (15–64), and Fraser EFI: 1970–2010

literature) in any given time period to predict general manpower productivity 5 years later on. The model turns out to be both powerful and robust: it manages to account for about four fifths of postwar differences in general manpower productivity between countries, and within countries over time, and each independent variable in it is highly significant in the statistical sense of the term.

In this model, each additional year of life expectancy at birth leads to a gain of nearly 5% in general manpower productivity 5 years hence, and each additional percentage point in a country's urbanization ratio conduces a jump in productivity of nearly two and a half percent. After controlling for health and urbanization, each additional mean year of schooling for the 15–64 population is associated with almost a 12% boost in productivity. And perhaps not surprisingly, a country's institutions and policies exert tremendous influence on productivity: each step upward on the Fraser Institute's 0–10 scale "Index of Economic Freedom" increases subsequent output per member of a country's working-age population group by nearly 17%.

Three points about the results in Fig. 2 deserve special mention. First: simple as it may be, this "human resources and 'business environment'" model does a very good job of predicting general manpower productivity in sub-Saharan Africa (the highlighted red data-points in the scatterplot), as well as in the rest of the world.[19] To go by Fig. 2, the sub-Sahara is not a "special case": to the contrary, SSA man-

[19] Given the complexity and untidiness of the real world, and the inescapable "noise problem" in some of these data series, we may deem it striking that *any* four-variable model should be capable of so much predictive power for general worldwide productivity levels, achieving as it does an R-squared of nearly 80%.

power productivity looks to be well explained by the more general "story of modern economic development" offered in this graphic.

Second: for all the dependence of many SSA economies on particular commodities and natural resources – and for all the importance in SSA of "enclave enclaves," "conflict minerals," "the resource curse," etc. in the region's political economy – our parsimonious model can explain an immense share of productivity differences between countries in terms of human resources, leaving the question of natural resources out of the discussion altogether.

Third, our model cannot tell us about productivity per *worker* – we would need detailed and accurate data (currently lacking) on SSA and global employment patterns for that – but because it reflects general productivity levels for the population of working ages, it has a bearing on our understanding of the potentialities of the "demographic dividend" theory. Our background research for Fig. 2 did not reveal any special influence on general manpower productivity from such conventional demographic variables as fertility levels and rates of population growth. Any "demographic dividend" would therefore look in our analysis to work directly through the shift in the ratio of working-age population to the rest of society (as opposed to second or higher order effects therefrom). But such shifts could have big consequences on their own. With rapid fertility decline, the share of a high-fertility society's population in the working age groups can rise by 10 percentage points in a single generation (as was the case in South Korea, for example, where that share rose from 55% to 66% between 1960 and 1985). All other things being equal, an ROK-magnitude shift in population structure would imply an increase in per capita output of over 20%, averaging 0.7% per annum over a 25 year period.

Our simple model for explaining postwar global manpower productivity patterns permits us to decompose the components of the predicted gaps separating SSA performance from average global levels.

Our model predicts that general manpower productivity in SSA would be about one fifth of the overall global level for 2010.[20] Some of this huge productivity gap is explained by the region's business climate. In the Fraser Institute's "Economic Freedom Index", which we use in this model to measure the quality of institutions and policies, sub-Sahara's ratings on the whole are dismal. For the period in question, Fraser Institute scores for SSA are far lower than for any other region of the world: the 36 SSA countries under consideration occupied 24 of the bottom 40 rankings in this 141 country survey. If the SSA were just to reach the average worldwide "business climate" score in this survey – a level reflected in, say, the score for the unexacting example of Moldova – predicted productivity levels in the region would have been far higher than those actually achieved.

But it is striking that our model indicates the overwhelming majority of the productivity gap separating SSA from the world today is explained by disparities in

[20] The World Bank WDI database places the actual SSA level of general manpower productivity at about one sixth of global level – quite close to our model's prediction. Angus Maddison's PPP-adjusted estimates place the general manpower productivity differential between SSA and the rest of the world at about 5:1 for 2008.

human resources. Almost a quarter of the gap is explained by under-urbanization. Nearly half of the gap is explained by the region's low level of life expectancy. And just under a fifth of the gap is explained by low levels of educational attainment.

Our model suggests SSA productivity levels would have been nearly 40% higher in 2010 if the region had achieved global averages for years of schooling for its adult populations. But the model does not explore interactive effects – if it did, the role of education in explaining depressed SSA manpower productivity today might be even larger. All around the world, for example, education plays a major independent role in lowering mortality,[21] which in turn further contributes to productivity improvements. In SSA, however, education seems to have made a more limited region-wide contribution to improving life expectancy than elsewhere. Enhanced understanding of this dynamic might possibly suggest that the education factor accounts for an even greater share of SSA's productivity gap than our simple model indicates.[22]

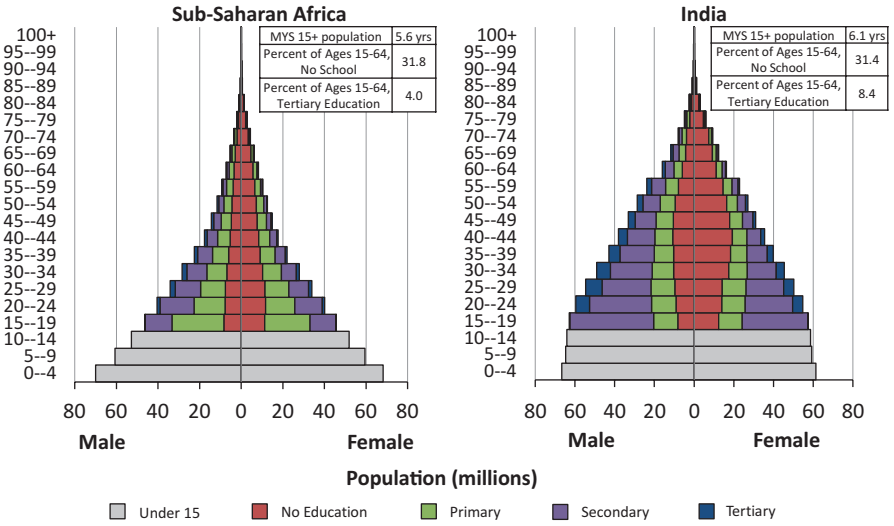
6 Sub-Saharan Manpower and Productivity: Development in the Indian Mirror

If we are looking for international comparators by which to assess modern SSA's performance in manpower and productivity development, the most instructive might perhaps be the state of India. India's population is enormous, and the ethnicities, languages and religions it encompasses are diverse. India's population, like Africa's, increased very rapidly from 1960 to 2010: Indian working age manpower more than tripled over this half century, averaging 2.2% growth per annum. Educational progress in India, moreover, began from a very low starting point and expanded relatively slowly over the post-colonial era, as in SSA. In fact, India's adult educational profile looks remarkably similar to the sub-Sahara's. Figure 3 illustrates these similarities for the year 2010, using estimates from the Wittgenstein Centre.

Although SSA's 2010 working-age population is somewhat more youthful than India's, and India's MYS for the 15+ is estimated to be a bit higher, the estimated proportion of working-age population with no education is almost identical (just under one third). If we look a little closer, we can of course notice differences. For the young (ages 20–39) manpower group, for instance, sub-Saharan Africa appears to have achieved more progress than India between 1970 and 2010 in extending rudimentary schooling to those completely outside the educational system, whereas

[21] Gakidou, E., Cowling, K., Lozano, R., Murray, C. (2010). Increased educational attainment and its effect on child mortality in 175 countries between 1970 and 2009: a systematic analysis. The Lancet, 376(9745), 959–974.

[22] A fuller, more complete model that addressed the "endogeneity question" might also attribute longer term contributions to human resource development to a country's institutional and policy environment, for example.



Source: Wittgenstein Centre for Demography and Global Human Capital, (2014). Wittgenstein Centre Data Explorer Version 1.1. Available at: www.wittgensteincentre.org/dataexplorer, accessed on July 23, 2015.

Fig. 3 Educational profiles in 2010 (Wittgenstein Center estimates)

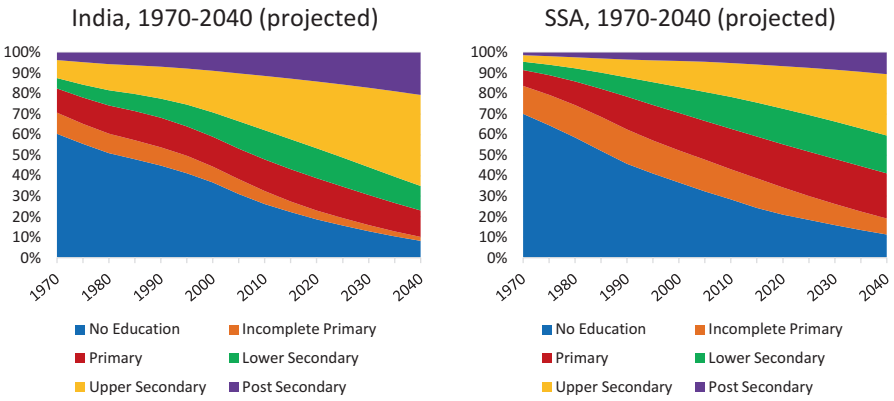
India seems to have done more to augment secondary and tertiary education (see Fig. 4). But in all, it is the likeness of these patterns that attracts comment.

The big difference in manpower development between India and SSA concerns productivity growth. Where the WDI database estimates that real per capita GDP growth averaged just 0.7% per annum in SSA between 1960 and 2010, it estimates the annual pace in India was 3.0%. After adjusting for changes in population structure, India's estimated annual tempo of output growth per person of working age was still four times as high as SSA's for 1960–2010 (2.8% vs. 0.7%).[23]

Obviously India stands as an existence proof that a very large population with approximately sub-Sahara's educational profile, and very rapid long term manpower growth, can achieve higher levels of general manpower productivity, and much greater rates of long-term productivity growth, than were witnessed in SSA itself. Of course the key question here is: why?

It should be immediately apparent that the education and other human resource factors can only account for a small fraction of the long term SSA-India productivity gap. Between 1960 and 2010, by Barro-Lee estimates, mean years of schooling for working age men and woman did rise somewhat more in India than in SSA: but not by much more than a year. It is true that health improvements were much more substantial in India than in SSA for the period under consideration—India's gains in life expectancy at birth over that half century were over a decade greater, in fact. But

[23] By Angus Maddison PPP-adjusted estimates, per capita GDP growth for 1960–2008 was 3.0% for India and 0.8% for SSA – and general manpower productivity growth averaged 2.8% and 0.8%, respectively.



Source: Derived from Wittgenstein Centre for Demography and Global Human Capital (2015). Wittgenstein Centre Data Explorer Version 1.2. available at http://witt.null2.net/shiny/wittgensteincentredataexplorer/, accessed on June 9, 2015.

Fig. 4 Educational profile of youth labor force (20–39) populations: India vs. Sub-Saharan Africa, 1970–2040 (Wittgenstein Centre estimates and projections)

on the other hand urbanization (which tends to stimulate productivity, as we have seen) was much faster in SSA: over those same years the sub-Sahara's urbanization ratio rose almost 10 percentage points more than did India's. When these three partially offsetting factors are taken together, our simple econometric model in Fig. 2 predicts a net swing in general manpower productivity growth of about 0.8% per year in India's favor. While that would help explain a portion of the India-SSA productivity gap, it would leave the great majority of that gap – and a long term residual in productivity growth of about 1.3% a year – still demanding explanation.

But a big clue to understanding that residual may come from, of all places, poverty statistics. World Bank estimates for the percentage of population living in absolute poverty suggest that poverty reduction has been much more rapid in India than in SSA in recent decades, and that the risk of living on less than $1.25 per day was only half as great in India as in the sub-Sahara for the most recent years for which such numbers were calculated (24% vs. 47% for 2011).[24] Given the host of uncertainties and possible errors entailed in such grand calculations, we are probably best served regarding those findings as "stylized facts" rather than precise estimates – but we can draw meaningful inferences even from such stylized facts. For one thing, they suggest that India has been much more successful in recent decades than SSA in generating the sorts of employment opportunities which lift households out of absolute poverty. And this in turn points to the possibility that differences in "business climates" – or if one prefers, in institutions and policy regimens – may have played a critical role in such employment differentials (and in general productivity differentials as well).

We lack the data necessary for our simple econometric model to generate a predicted contribution of "business climate" to the SSA-India general working age

[24] World Bank (2015). World Development Indicators. http://data.worldbank.org/data-catalog/world-development-indicators. Accessed 2 October 2015.

productivity differentials for 1960 to 2010. So instead, it may suffice to underscore the obvious: namely, that the longstanding presence of a stable, accountable, relatively transparent, and (at least in recent decades) economically pragmatic polity in one of these places – and not in the other – may help to explain some (and perhaps much) of the residual long term differences in productivity growth that cannot be explained in terms of education, urbanization, and health.

7 The Outlook for the Coming Generation

Looking to the generation ahead (which we define as the 2010–2035 period), SSA is on track to remain the world's fastest growing population, its least healthy region, and its least educated large geographic region as well. But current projections suggest that it is also poised for an appreciable improvement in adult education and other human resource measures. All these prospective trends have powerful implications for the manpower and productivity outlook for the region, and for the world as a whole.

Although both the "medium variant" demographic projections by UNPD and the US Census Bureau single projection series both envision fertility decline in SSA for 2010–2035,[25] manpower growth for the sub-Saharan region is nonetheless projected to continue at a very rapid tempo, and possibly to accelerate very slightly (thanks arithmetically to population momentum and mortality improvements). The UNPD projects the working age group in SSA would more than double between 2010 and 2035, to almost 920 million (see Table 1). By those numbers, the absolute increment in SSA manpower over this still-unfolding generation would approach half a billion persons (471 million), and would exceed almost by half (44%) the total increase in SSA manpower from the previous two generations combined.

SSA's share of global manpower is also on track to increase sharply – an inescapable consequence of the continuing high rate of demographic growth for the sub-Sahara in conjunction with a very steep deceleration for the rest of the world.[26] In the 50 years between 1960 and 2010, SSA's share of worldwide working age manpower rose by 3 percentage points; in the 25 years between 2010 and 2035 it is projected to jump by over 6 percentage points. By 2035, under medium variant UNPD projections, the sub-Sahara would account for almost one sixth of world manpower.

No less important: SSA is poised to account for the lion's share of world manpower growth over the decades immediately ahead. Two generations ago, SSA contributed

[25] Between 2010 and 2035, medium variant UNPD projections put SSA's prospective fertility decline at just under 30% (from a TFR of about 5.3 to about 3.7); the US Census Bureau envisions a decline of somewhat over 30% (from a TFR of 5.1 to about 3.5). Note that the Wittgenstein Centre envisions somewhat greater fertility declines for SSA, to a TFR of about 3.3 around 2035, on what it envisions as the impact of increased education on fertility throughout the region.

[26] In the 2010–2035 generation, UNPD projects the pace of manpower growth for SSA to be nearly 5 times as rapid as for the rest of the world: 2.9% per annum vs. 0.6% per annum. The US Census Bureau's projections are similar: 2.8 per annum for SSA and 0.5 per annum for the rest of the world, implying that manpower growth would be over five times faster in the former than the latter.

less than a tenth of global manpower growth. In the 1985–2010 generation, it contributed just over one seventh of global manpower growth. In the generation currently unfolding, it stands to contribute over two fifths (42%) of all global manpower growth. In particular, we should note the sharp increase in worldwide manpower growth that stands to be accruing to the sub-Saharan region's current roster of least developed countries. From 1960–1985, the SSA LDC share of global manpower growth was about 5%, and for 1985–2010, about 9%. For 2010–2035, it is projected to be nearly 30%.

Although sub-Saharan Africa's overall tempo of manpower growth is not projected to change appreciably in the generation now unfolding, some anticipated changes in patterns and composition are worth mentioning. While most of SSA's manpower growth is projected to come from a small proportion of the region's states, the "top 10" share for 2010–2035 would be slightly smaller than for 1985–2010 (64.5% vs. 66.2%) and the share of manpower growth emanating from currently-designated least developed countries would be appreciably greater (70% vs. 63%[27]). Furthermore, the tempo of current growth now promises to be a somewhat better predictor of future manpower growth within SSA than it was in the past. The intergenerational Spearman's rank coefficient rises from an insignificant 0.15 over the past two generations to a highly significant 0.41 for the generation just concluded and the one currently unfolding. (The R-squared for intergenerational manpower growth also rises to 20%, a weak but now discernable relationship, and statistically significant.) With an impending projected increase in the coefficient of variation among these sub-Sahara countries (from 15 to 19%), somewhat greater variations in manpower growth among SSA states are thus projected for the years immediately ahead.[28]

While the future is by definition uncertain, the uncertainties in manpower projections for 2010–2035 are very substantially reduced by the simple but powerful fact that so much of tomorrow's working age population is already alive and enumerated today. Projecting future educational attainment for working age populations necessarily entails a much larger measure of conjecture: for here one must make additional assumptions about just how enrollment trajectories will be improved (or whether in some cases improvements can be sustained) in the future. The uncertainties clouding such assumptions may be greatest precisely where educational systems are weakest – which would include most of the SSA region. To make matters worse, educational projections for SSA are bedeviled by the discordance between officially claimed and actual enrollment ratios which has recently been revealed for a number of sub-Saharan states.[29]

If we compare Barro-Lee and Wittgenstein Centre projections for adult educational profiles for 2035, we can get a sense of just how serious these uncertainties

[27] Sudan included.

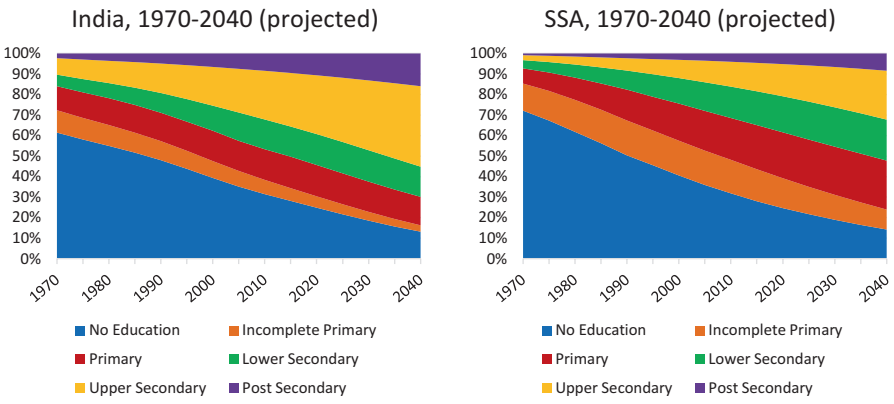
[28] On the whole, migration is projected to play less of a role in manpower change in the coming generation for SSA than it did in the recent past: but then again demographic projections are particularly weak when it comes to migratory flows.

[29] Sandefur, J., Glassman, A. (2015). The Political Economy of Bad Data: Evidence from African Survey and Administrative Statistics. *The Journal of Development Studies*, 51(2), 116–132.

are for the sub-Saharan region.[30] Although both series project improvements between 2010 and 2035 in MYS for the working age population of every single SSA country they cover, there is scant agreement between the two series on just how much progress any given sub-Saharan country might achieve by 2035. In fact, the R-squared for Barro-Lee and Wittgenstein Centre 2035 estimates for MYS 15–64 for the 30 SSA countries both datasets cover is a hardly confidence-inspiring 29%. With these nontrivial caveats in mind, we can consider the numbers the Wittgenstein Centre offers for SSA educational profiles for 2010–2035.[31]

In these projections, although SSA would still be the world's least schooled geographic region in 2035, continuing regional improvements are anticipated; in fact, the Wittgenstein Centre posits some convergence toward global averages. Its medium variant ("SSP2") projections place MYS for the 15+ population in the sub-Sahara in 2010 at 5.6 years – on track to reach an envisioned 7.7 years in 2035. By those same Wittgenstein Centre numbers, the gap between global and SSA averages in mean years of schooling for the 15+ population would be about two and a half years in 2010 and just under 2 years in 2035; the gender gap in adult MYS would also narrow. In this vision of the future, India and SSA would continue to follow similar educational trajectories, albeit with slightly greater progress for India (Fig. 5).

Needless to say this presumed upswing in adult and working age educational attainment for sub-Saharan Africa would augur well in many ways, not least for the productive potential of SSA manpower. Increasing educational attainment, furthermore, would have the quite predictable additional consequence of reducing the inequality in the national and regional distributions of years of adult schooling: all

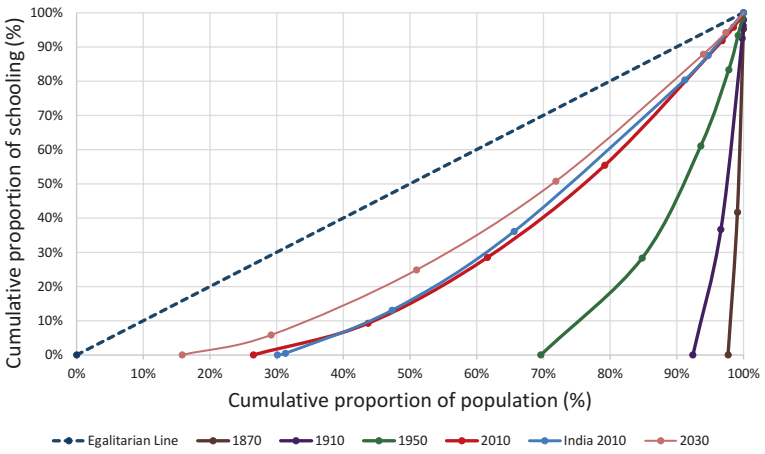


Source: Derived from Wittgenstein Centre for Demography and Global Human Capital (2015). Wittgenstein Centre Data Explorer Version 1.2. available at http://witt.null2.net/shiny/wittgensteincentredataexplorer/, accessed on June 9, 2015.

Fig. 5 India v. Sub-Saharan Africa educational profile of working age (15–64) populations: (Wittgenstein Center estimates and projections)

[30] Cf. Barro, R., Lee, J. (2015) *Education Matters: Global Gains from the 19th to the 21st Century* , New York: Oxford University Press; Lutz,W., Butz, W. and KC, S., eds. (2014), *World Population and Human Capital In The Twenty-First Century*. New York: Oxford University Press.

[31] Wittgenstein Centre Data Explorer Version 1.2.



Source: Barro, Robert, and Jong-WhaLee. "Human Capital in the Long Run." (Economics Department, Korea University, 2015), available at http://barrolee.com/data/Human%20Lee%2020150224.pdf; Thomas, Vinod, Yan Want, and Xibo Fan. "Measuring Education Inequality: Gini Coefficients of Education." (Policy Research Working Papers, 1999), available at http://down.cenet.org.cn/upfile/41/2005117141431157.pdf.

Fig. 6 Sub-Saharan Africa (15–64): education equality by year (Barro-Lee estimates)

other things being equal, this should constitute a "pro-poor" social improvement (Fig. 6).

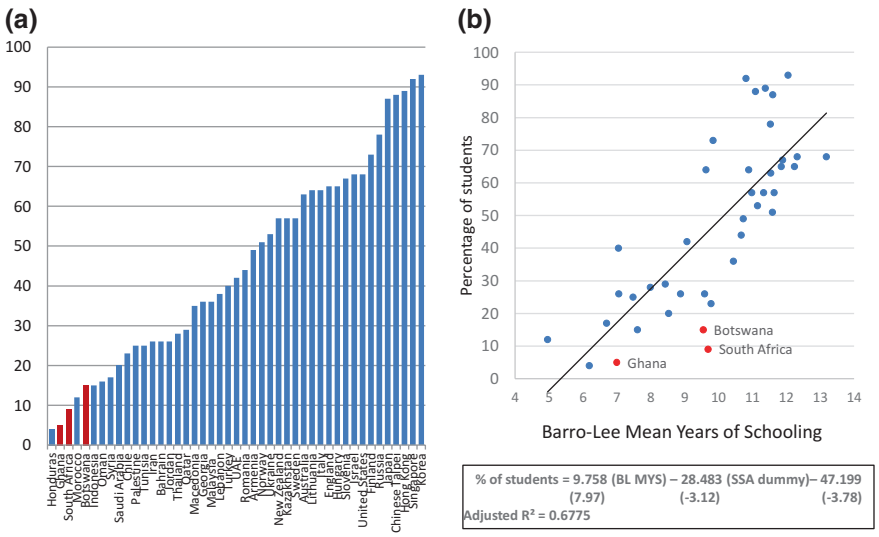
Along with this, if they do come to pass, other projected changes in SSA human resources would also hold promise for SSA manpower productivity. For 2010–2035, the UNPD currently envisions a major jump in life expectancy and urbanization ratios. Ordinarily, such an augmentation of human resources would be said to portend substantial improvements in general manpower productivity.[32]

Against the background of past performance, SSA's current presumed outlook for education progress may appear rather positive. And so indeed it may turn out to be. But a note of caution is surely in order here.

It is entirely possible, to begin with, that prospective advances for SSA in education and other factors are being overestimated today. Even if these projections prove entirely accurate, SSA's ability to capitalize upon improvements in human resource potential would appear far from assured.

For one thing, we must note the ominous possibility that the quality of education may be significantly – and perhaps systematically – worse in SSA than in the other regions of the world. Given the paucity of standardized international testing data for students of different ages, we should perhaps as yet regard this only as a possibility – available evidence may not be sufficient to establish it as a general fact. But the possibility is presented in Fig. 7.

[32] Moreover, the pace of per capita productivity improvements for SSA could further improve thanks to changes in population structure. Working age manpower stands to increase its share of total sub-Saharan population between 2010 and 2035 (from 53 to 59% in the UNPD projections, or 54–60% in the US Census Bureau outlook). While such a rise in the share of working age groups may not bring to mind an East Asia style "demographic dividend", it could nevertheless add to average per capita productivity growth for the population as a whole for decades ahead.



Note: TIMMS test data for Botswana, South Africa, and Honduras are based off Ninth Grade Participants. MYS data for England is based on the United Kingdom.
Source: Ina V.S. Mullis, Michael O. Martin, Pierre Foy, *TIMSS 2011 International Results in Mathematics*, "Exhibit 2.19" (Chestnut Hill, MA: TIMSS & PIRLS International Study Center, 2012), available at http://timssandpirls.bc.edu/timss2011/downloads/T11_IR_Mathematics_FullBook.pdf, accessed on March 16, 2015. MYS data: Barro, Robert and Jong-Wha Lee, April 2010, "A New Data Set of Educational Attainment in the World, 1950-2010." *Journal of Development Economics*, vol 104, pp.184-198. Available at: http://www.barrolee.com/ , accessed July 31, 2015

Fig. 7 (**a**) Percentage of students reaching International Math standards (8th Grade, intermediate): 2011. (**b**) Percentage of students reaching International Math students reaching International Math standards (8th Grade, intermediate, 2011) vs. barro-Lee Mean Years of Schooling for 15+ Population (2010)

It shows TIMMS (Trends in International Mathematics and Science Study) testing results in mathematics for 8th graders from 45 countries in the year 2011. Only three sub-Saharan countries are included – Ghana, South Africa, and Botswana – but these are countries with what would generally be regarded as some of the region's very strongest school systems. Yet the results look little short of disastrous. These SSA countries occupy three of the five lowest country rankings for 2011: and for the top performer of the three, Botswana, barely 15% of students reached the "intermediate" standard for math achievement. The picture for testing results for science is much the same. And the SSA states' performance is even poorer than it appears at first glance, for the tested pupils from Botswana and South Africa were 9th graders, not 8th graders, because these were deemed to be countries "where eighth grade students would find the TIMMS assessments too difficult" (p. 5).[33]

There are a number of structural problems that may contribute to the low quality of schooling in sub-Saharan Africa: among these, the prevalence of extreme poverty among pupils; the low levels of per capita income from which to finance education; and the intrinsically more rudimentary nature of schooling per se in societies where average educational attainment is low to begin with. But such structural disadvantages do not seem to account for these exceptionally poor SSA testing results. After controlling for per capita GDP, for example, the SSA countries are still outliers—

[33] Mullis, I., Martin, M., Foy, P. (2012) *TIMSS 2011 International Results in Mathematics*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center.

they still test far lower in math than would otherwise be expected. Even starker results are obtained when we control for mean years of schooling, where the SSA countries lag by 28 percentage points below the achievement levels predicted on the basis of their societies' mean years of adult schooling. That is the equivalent of subtracting an extra 3 years from a society's adult level of MYS.

To repeat: the three SSA countries in Fig. 7 are likely among the region's top performers with respect to educational quality. Hard empirical evidence on the quality of education in the rest of the region are still surprisingly limited and episodic, but such soundings as can be found are sobering if not positively distressing.

According to a 2014 World Bank study on youth employment in sub-Saharan Africa, for example,

- In several countries, a very large proportion of primary school students are illiterate. For example, more than 80% of Malian third-graders and more than 70% of Ugandan third-graders cannot read a single word.
- Household surveys that measure numeracy and literacy are consistent with these troubling results. In Tanzania, for example, a 2011 assessment of children's abilities revealed that 70% of students complete standard two without meeting the numeracy standards of that level... Assessments in Kenya and Uganda revealed similar shortfalls in students' cognitive skills.
- A study from Guinea-Bissau that mapped performance in basic literacy and numeracy by children's ages…shows that only half of 8-year-olds recognize single digits, while less than half of 9-year-olds recognize letters of the alphabet. Literacy and numeracy performance improves only very slowly with age. An average 16-year-old still cannot read a paragraph and cannot subtract a single-digit number from a two-digit number. These low learning trajectories are widespread: 351 schools were visited as part of the Guinea-Bissau study, but in only 6 of them could an average student read a paragraph. In none of the schools could an average student multiply or divide.[34]

The authors of the study on educational outcomes in Guinea-Bissau describe their findings as "surprisingly dire": "[O]ur survey", they conclude, "suggests nearly the entire generation of children in rural villages is growing up illiterate and innumerate".[35]

Our education metrics in this chapter have focused on the easily quantified variable of years of schooling per person, rather than the no less vital but very much more difficult to quantify variable of quality of education imparted.[36] Figure 7 raises

[34] Filmer, D., Fox F. (2014) Youth Employment in Sub-Saharan Africa. Washington DC: World Bank. Pp 76, 78.

[35] Boone, P. et al. (2013). The surprisingly dire situation of children's education in rural West Africa: Results from the CREO study in Guinea-Bissau (Comprehensive Review of Educational Outcomes. *NBER Working Paper* no. 18971. http://www.nber.org/papers/w18971. Accessed 2 October 2015.

[36] For more background on the performance of school systems in low-income countries, see Pritchett, L. (2013). *The rebirth of Education: Schooling Ain't Learning.* Washington DC: Center for Global Development.

the disturbing possibility that educational systems in sub-Saharan Africa may be transmitting rather less skills to the workers of tomorrow than we would have assumed by the sheer amount of school years reported (additional, albeit less systematic and standardized, evidence would appear to corroborate that possibility.) If the aforementioned 2014 World Bank study is correct in asserting "Africa's schools are not effectively imparting basic numeracy or literacy skills, nor are they imparting other cognitive skills such as problem solving or critical analysis",[37] then prospects for productivity improvements over the coming generation may be more compromised than conventional educational attainment projections would seem to indicate at face value.

The second, and even greater, imponderable is: the outlook for governance in SSA in the years ahead. Institutions and policies matter greatly to the productivity of human resources. As we have already seen: even with relatively mediocre metrics on a global scale for governance, as per the case of India, long-term productivity progress can be fairly dramatic, including for poorly educated manpower.[38] There would seem to be great potential for "catch up growth" in SSA via "unlocking the value of human resources" with improved institutions and policies. But whether this potential will be grasped remains to be seen – for there is no reliable method by which to predict the future quality of governance in SSA, or for that matter anywhere else.

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[37] Youth Unemployment in sub-Saharan Africa, p. 79.

[38] Among these metrics of governance: personal physical security, political stability and social order, rule of law, property rights, governmental corruption, and economic and social policies.

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Marriage Patterns and the Demographic Dividend

Dominique Meekers and Anastasia J. Gage

1 Introduction

Countries which completed their demographic transition all experienced drastic changes in their age distribution, with the baby boom generations creating a bulge that gradually moved up in the age distribution. When they reached their prime reproductive ages, their offspring created another baby boom that also affected the age distribution. In sub-Saharan Africa, this bulge in the age distribution started relatively recently (Bloom et al. 2003). When these bulge generations reach working age, a large share of the population will be of working age. This change, combined with favorable social and economic policies and conditions, can create opportunities for economic growth, which are called the demographic dividend. The extent to which Africa will experience an age distribution favorable for economic growth depends largely on countries' ability to rapidly reduce fertility (Bloom et al. 2013).

The age structure changes which cause an increase in the working-age population also affect marriage patterns. Because men tend to marry later than women, when marriage cohorts are growing in size the cohort of marriageable women is larger than that of marriageable men, creating an excess of women – or marriage squeeze – which worsens the position of women (Bhaskar 2013). Most sub-Saharan African countries are currently in this situation. And the larger the age gap at marriage – which is caused largely by individual preferences and cultural norms – the larger the excess supply of women. However, after a sustained fertility decline the situation will eventually reverse. The size of the marriage cohorts will decrease, which creates a relative excess of marriageable men and improves women's position.

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The aim of this chapter is to highlight that for countries to realize their potential for a demographic dividend, they need to implement and enforce programs and policies that offer girls the right to marriage choice, educational advancement, and sexual and reproductive choice. To that effect, we examine how changes in marriage patterns and women's status may facilitate or impede the prospects of a demographic dividend. We discuss marriage patterns and trends, the role of polygyny and women's status, and policies and programs aimed at changing and/or improving marriage and family patterns and women's empowerment.

2 Marriage, Family Patterns, and the Demographic Dividend

It is widely recognized that fertility decline is a necessary, though insufficient step in achieving a demographic dividend (Gribble and Bremner 2012) and that marriage or being in union is one of the proximate determinants of fertility. When formal unions provide the context for socially sanctioned childbearing, changes in age at first marriage may result in corresponding changes in age at first birth. This may affect overall fertility levels, which in the long run could change the age structure of the population.

Changes in marriage patterns can affect the length of exposure to the risk of pregnancy, which directly affects fertility. Without changes in contraceptive use, the extent to which changes in age at first marriage affect fertility depends on the levels of premarital childbearing. When premarital childbearing is common, increasing age at marriage may not have much impact on fertility. Nevertheless, delaying age at first marriage is integral for advancing female educational attainment and increasing the quality of the workforce.

Figure 1 provides a conceptual framework of the key role marriage plays in the demographic dividend. The links between marriage timing, educational attainment, and fertility are well established. Girls with higher levels of schooling tend to marry later, and in some countries girls may be withdrawn from school to be married.

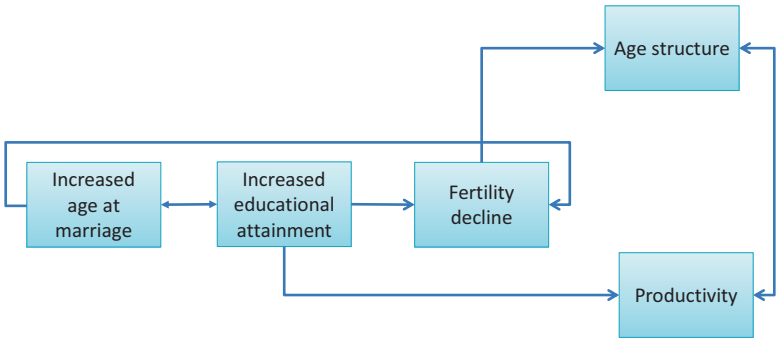

Fig. 1 Conceptual framework of the role of marriage in the demographic dividend

Likewise, in some countries girls who become pregnant are expelled from school and may be discouraged from returning to school after giving birth. However, early pregnancy and marriage are usually not the main reason for female school dropouts. In fact, early pregnancy and marriage are estimated to account for only one fifth of all school dropouts among African schoolgirls (Kuépié et al. 2015; Lloyd and Mensch 2008). In most cases, premature school dropouts result from the fact that little value is placed on secondary education for females and that there are few employment opportunities for educated females. The 2013 Nigeria Demographic and Health Survey (DHS) showed that women aged 25–49 years who received secondary or higher education married on average 7.4 years later than uneducated women. The median age at marriage was 15.5 for uneducated women, 18.0 for women with primary education, and 22.9 for those with secondary or higher education.

Much of sub-Saharan Africa is characterized by gender differences in marriage timing and by traditional values which contribute to extreme gender disparities in educational attainment. Sustained economic growth requires access to education for both boys and girls; for girls, secondary education is crucial in delaying marriage and first birth (Gribble and Bremner 2012). Secondary education of both sexes is also crucial for changing social norms related to childbearing and women's status. With increased age at marriage, individuals stay in school longer, which increases the likelihood of them entering the workforce. Better educated workers tend to be more productive (Bloom et al. 2003). In addition, delayed marriage and increased education implies more women enter the workforce, provided the labor market can absorb the additional workers. The link between delayed marriage and workforce productivity is therefore indirect.

In countries with youthful populations, fertility and population momentum drive future population growth. The fertility component of population growth will double the population between 2010 and 2100 (Andreev et al. 2013). The population momentum can be offset by delaying marriage and first births, which can reduce the number of births occurring in future years, regardless of the average number of births that women have over their lifetime.

Countries with a high prevalence of child marriage have higher total fertility rates (Fig. 2). When premarital childbearing is frowned upon, delaying marriage can lower fertility rates among young women (Andreev et al. 2013). In African countries with the lowest ages at marriage and highest fertility rates, future population growth can be slowed by 15–20% by delaying marriage and childbearing for five years, provided that childbearing occurs within marriage (Bruce and Chong 2009). However, since premarital and out-of-wedlock childbearing are common in much of sub-Saharan Africa, an increase in the female age at first marriage may not lead to a shorter reproductive age span. In other words, the effect of increases in female age at marriage on fertility may be partially offset by increased premarital childbearing (Garenne 2014; Lesthaeghe et al. 1989). Because of the complexities of African unions, which include alternative living arrangements such as informal cohabitation, premarital and out-of-wedlock childbearing are common. Consequently, at the

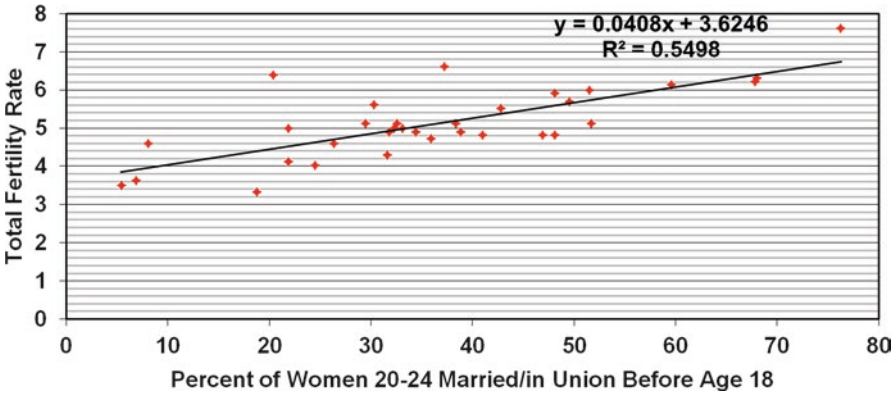

Fig. 2 Association between the child marriage prevalence rate among women 20–24 years of age and the total fertility rate, sub-Saharan Africa, 2004–2014 (Source: Demographic and Health Surveys and Multiple Indicator Cluster Surveys)

aggregate level the effect of the observed changes in marriage patterns on fertility levels is negligible (Garenne 2014).

Countries with high rates of child marriage typically have high adolescent birth rates. Although higher female education tends to be associated with lower levels of adolescent childbearing, in countries such as Cape Verde, Kenya, and Namibia the adolescent birth rate is high despite low out-of-school rates for girls (United Nations 2013a). In general, high adolescent childbearing is associated with lower contraceptive use and a higher unmet demand for family planning. In sub-Saharan Africa, contraceptive use among girls aged 15–19 who were married or in union was only 16% in 2000–2010 (United NationsPopulation Fund 2012). In general, contraceptive use in sub-Saharan Africa is low, a fact which has been attributed to pronatalist cultural norms and a denial of women's access to sexual and reproductive health information and services, limiting reproductive choice.

As long as the age at marriage and modern contraceptive use rates are low, high fertility will hamper sustained economic growth, particularly in countries like the Central African Republic, Chad, Guinea, and Niger where 20–30% of women aged 20–24 were married or in union before age 15. Furthermore, in countries with high ages at marriage, high levels of premarital childbearing, and low out-of-school rates for girls (e.g., Namibia and Swaziland), delaying age at marriage will have little impact on fertility decline and the demographic dividend. Rather, expanding access to information and services to prevent unwanted pregnancy can help women fulfill their right to determine their sexual and reproductive goals.

3 Data and Methods

3.1 Data Sources

Our analysis uses two main data sources: the 2012 revision of the United Nations World Marriage Data (United Nations 2013b) and the DHS StatCompiler (ICF International 2015). Our analysis is limited to countries that had at least one data point for the period between 1980 and 1999 and at least one data point from 2000 onward (N = 32).

3.2 Indicators

Our indicator of female and male age at first marriage is the Singulate Mean Age at First Marriage (SMAM), which estimates the average number of years of single life among those who marry before age 50 (Hajnal 1953). The gender difference in age at first marriage is calculated as the difference between the male and the female SMAM. A large gender difference in the SMAM may indicate a lower status for women, and is often associated with a higher prevalence of polygyny (Lesthaeghe et al. 1989). Our indicators of the prevalence of adolescent marriage are the percentage of single females aged 15–19 and the percentage of single males aged 20–24. The prevalence of polygyny is estimated using the percentage of married women who report being in a polygynous union.

3.3 Methods

To analyze trends in marriage indicators, we compare data from the period 1980–1999 with data from 2000 onward. For each country, we selected the earliest available data point for the period from 1980 to 1999 and the most recent data point for the period from 2000 onward. For each indicator, the results are presented in a scatterplot, with data for 1980–1999 on the horizontal axis and data for the period from 2000 onward on the vertical axis. Thus for each country, the 1980–1999 and the 2000+ value of the indicator is shown as a single data point. Each scatterplot also shows the y = x line, which means no change in the indicator was observed between the two time periods. Countries located above the y = x line experienced an increase in the indicator; countries located below the line experienced a decrease. The larger the distance of each data point (country) to the y = x line, the more the indicator changed over time.

4 Results

4.1 Trends in Age at First Marriage

In the 1960s, marriage in sub-Saharan Africa was nearly universal. By the 1970–1980s the timing of first marriage varied across countries, and age at marriage was increasing (Lesthaeghe et al. 1989; van de Walle 1993). Initially, increases in female age at first marriage were often accompanied by corresponding increases in the male age at first marriage. Thus the gender gap in age at first marriage persisted. Recent cohort analyses of trends in age at marriage revealed more complex patterns. The median female age at first marriage increased substantially in Southern Africa, and to a lesser extent in Eastern and Central Africa and in some countries in Western Africa (Garenne 2014). However, some countries had limited or no changes in the median female age at marriage. Furthermore, some countries which previously experienced increases in female age at marriage now experienced either stagnating age at marriage or even a decrease in age at marriage. Reversals in female age at marriage occurred in Congo, Côte d'Ivoire, Madagascar and Mali.

Figures 3a and 3b show trends in the female and male SMAM, respectively. The female age at first marriage ranged from 15.6 in Sao Tome and Principe to 30.3 in

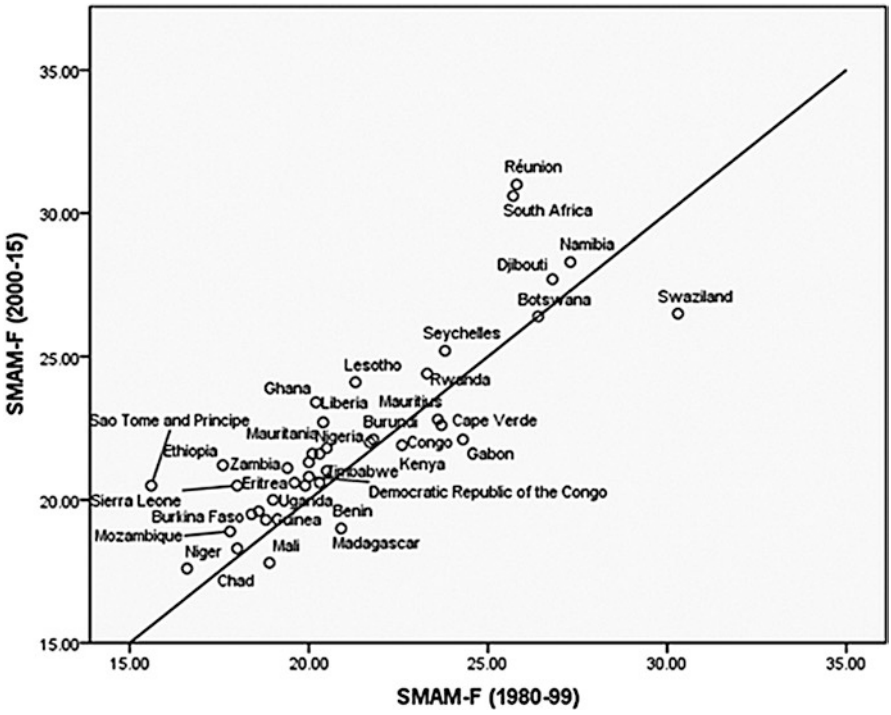

Fig. 3a Trends in the female singulate mean age at first marriage (1980–1999 vs. 2000–2015)

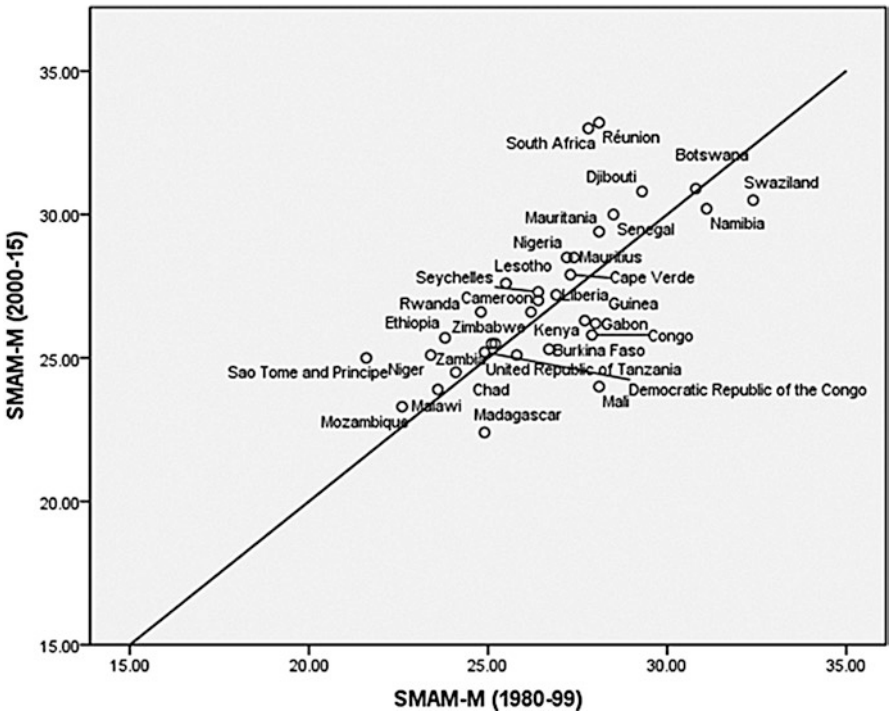

Fig. 3b Trends in the male singulate mean age at first marriage (1980–1999 vs. 2000–2015)

Swaziland for the period from 1980 to 1999. For the period from 2000 onward, the range was from 17.6 in Niger to 31.0 in Réunion. The female age at first marriage increased in many countries, while it remained constant, or even declined in some others. The largest decline in female age at first marriage was 3.8 years (Swaziland), while the largest increase was 5.2 years (Réunion).

Countries with Increases in Female Age at First Marriage Between 1980–1999 and the period starting with the year 2000, increases in the female age at first marriage of 3 or more years occurred in Ethiopia (17.6 years to 21.2), Ghana (20.2 to 23.4), Réunion (25.8 to 31.0), Sao Tome and Principe (15.6 to 20.5), and South Africa (25.7 to 30.6). Increases of at least one year but less than three years occurred in Cameroon (20.0 to 21.3), Eritrea (19.6 to 20.6), Malawi (18.6 to 19.6), Mauritania (20.5 to 21.8), Mozambique (17.8 to 18.9), Namibia (27.3 to 28.3), Niger (16.6 to 17.6), Rwanda (23.3 to 24.4), Senegal (20.1 to 21.6), the Seychelles (23.8 to 25.2), Sierra Leone (18.0 to 20.5), Uganda (19.0 to 20.0), Burkina Faso (18.4 to 19.5), and Zambia (19.4 to 21.1).

Countries with Decreases in Female Age at First Marriage Female age at first marriage decreased notably in five countries. Decreases of at least one year occurred in Liberia (from 20.9 years to 19.0), Mali (18.9 to 17.8), and Mauritius (23.7 to

22.6), while decreases of two or more years took place in Gabon (24.3 to 22.1) and Swaziland (30.3 to 26.5).

Typology of Patterns of Female Age at First Marriage Based on the most recent estimate of the female age at first marriage and the trend in female age at first marriage, we can classify countries into several fairly distinct groups:

- Countries that currently have a high female age at first marriage (at least 25.0, which is roughly one standard deviation above the mean). This group includes several countries in southern Africa (Botswana, Namibia, South Africa, Swaziland), as well as Djibouti, Réunion, and the Seychelles in Eastern Africa. These countries already had a high female age at first marriage in the 1980s and 90s, and most experienced further increases in the female age at first marriage. The only exceptions are Botswana, where there has been no change, and Swaziland, which experienced a substantial decline in the female age at first marriage.
- Countries with a low female age at first marriage (below 19.0), which include Chad, Mali, Niger, and Mozambique.
- Countries with an average female age at marriage, which nonetheless experienced increases of at least one year. This group includes several countries in Western Africa (Burkina Faso, Ghana, Liberia, Mauritania, Nigeria, Senegal, and Sierra Leone), and Eastern Africa (Eritrea, Ethiopia, Malawi, Rwanda, Uganda, and Zambia), as well as Cameroon, Sao Tome and Principe, and Lesotho.
- Countries with an average female at marriage, which nonetheless remained fairly constant or declined. This group includes several countries in Eastern Africa (Burundi, Kenya, Madagascar, Mauritius, Tanzania, and Zimbabwe), Guinea and Cape Verde in Western Africa, and Congo, the Democratic Republic of the Congo, and Gabon in Middle Africa.

As anticipated, males tend to marry later than females (see Fig. 3b). For the period from 1980 to 1999, the male age at first marriage ranged from 21.6 (Sao Tome and Principe) to 32.4 (Swaziland); for the more recent period, it ranged from 22.4 (Madagascar) to 33.2 (Réunion).

Countries with Increases in Male Age at First Marriage As was the case for females, the male age at first marriage increased in several countries. Increases of at least 3 years occurred in Réunion (28.1 to 33.2 years of age), Sao Tome and Principe (21.6 to 25.0), and South Africa (27.8 to 33.0). Increases in the male age at first marriage of between 1 and 3 years took place in Ethiopia (23.8 to 25.7), Djibouti (29.3 to 30.8), Lesotho (25.5 to 27.6), Mauritania (28.1 to 29.4), Mauritius (27.4 to 28.5), Niger (23.4 to 25.1), Nigeria (27.2 to 28.5), Rwanda (24.8 to 26.6), and Senegal (28.5 to 30.0).

Countries with Decreases in Male Age at First Marriage In a few countries the mean age at first marriage for males decreased. Mali is the only country that experienced a decrease of over three years (28.1 to 24.0), but several countries observed decreases ranging from one to three years, including Congo (27.9 to 25.8), Gabon

(28.0 to 26.2), Guinea (27.7 to 26.3), Madagascar (24.9 to 22.4), Swaziland (32.4 to 30.5), and Burkina Faso (26.7 to 25.3).

Typology of Patterns of Male Age at First Marriage Based on the most recent estimate of the male age at first marriage and the trend in male age at first marriage, we can identify the following groups of countries:

- Countries that currently have a high male age at first marriage (at least 28.0). This group includes Botswana, Namibia, South Africa, and Swaziland in Southern Africa, Nigeria, Mauritania, and Senegal in Western Africa, and Djibouti, Mauritius, and Réunion in Eastern Africa. Most of these countries experienced substantial increases in the male age at first marriage. However, Botswana experienced no change, while Namibia and Swaziland experienced declines.
- Countries with a very low male age at first marriage (<24). This group includes Madagascar, where the male age at first marriage declined, and Malawi and Mozambique, where it increased slightly.
- Countries with an average male age at first marriage (>=24 and <28) which experienced increases of at least one year. In Ethiopia, Lesotho, Niger, Rwanda, and Sao Tome and Principe the male age at first marriage increased by 1.7 to 3.4 years.
- Countries with an average male age at first marriage which changed little or declined. This group includes several countries in Middle Africa (Cameroon, Chad, Congo, the Democratic Republic of the Congo and Gabon), Western Africa (Cape Verde, Guinea, Liberia, and Mali), and Eastern Africa (Kenya, the Seychelles, Tanzania, Zambia, and Zimbabwe). Five countries (Congo, Gabon, Guinea, Mali, and Burkina Faso) experienced a decline in the male age at first marriage of between 1.4 and 4.1 years.

4.2 Trends in the Gender Difference in Age at First Marriage

Large gender differences in the SMAM are associated with higher levels of polygyny (Lesthaeghe et al. 1989:255). Figure 4 shows trends in the difference in male and female Singulate Mean Age at First Marriage. The average gender difference in age at first marriage decreased from 5.4 years in 1980–1999 to 4.7 from 2000 onward.

In countries located near the x = y line, the gender difference in age at first marriage did not change much between the period 1980–1999 and the period since 2000. For example, in Senegal and Mauritania men typically marry at least seven years later than women and this pattern has persisted over time. By contrast, in South Africa and Réunion men typically marry only about 2 years later than women.

Countries That Experienced Increases in the Gender Difference in Age at First Marriage In countries located above the y = x line the gender gap in age at first marriage increased. In Mauritius the difference in age at first marriage between men

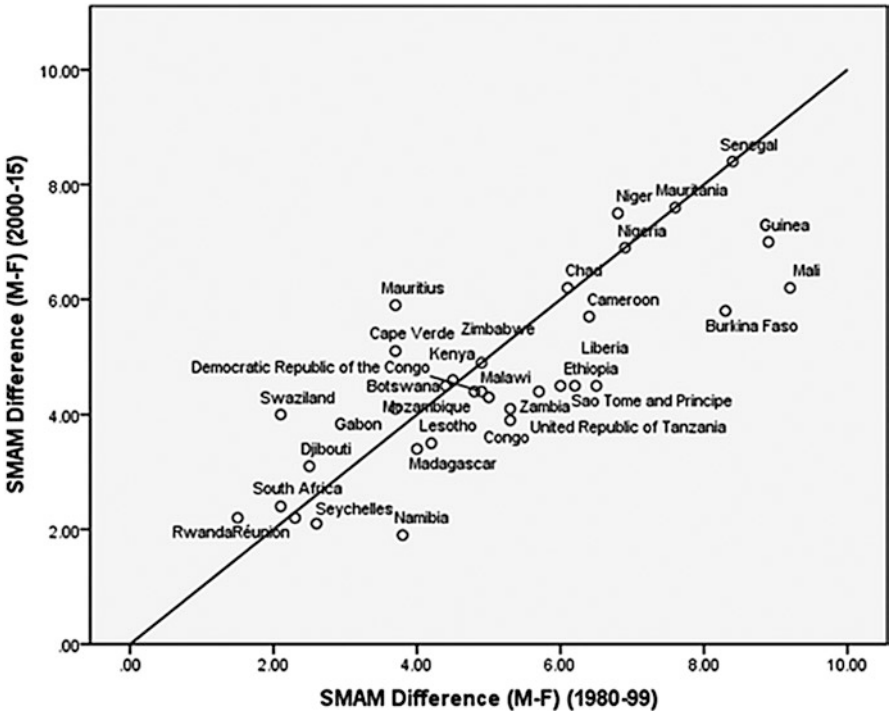

Fig. 4 Trends in the gender difference in the singulate mean age at first marriage (1980–1999 vs. 2000–2015)

and women increased from 3.7 years during the period 1980–1999 to 5.9 years for the period from 2000 onward. Substantial increases in the gender gap in age at first marriage also occurred in Swaziland (from 2.1 to 4.0 years) and Cape Verde (3.7 to 5.1 years). In Cape Verde, the gap widened due to an increase of 1.1 years in the age at first marriage for men and a similar decline in the age at first marriage for women. In Swaziland, the decline in the age at first marriage from 1980–1999 to 2000–2015 was larger for women (3.8 years) than for men (1.9 years).

Countries that Experienced Decreases in the Gender Difference in Age at First Marriage In many countries the gender gap in age at first marriage decreased substantially, as indicated by the countries located below the y = x line. The gender gap in age at first marriage decreased two or more years in Mali (9.2 to 6.2 years), Burkina Faso (8.3 to 5.8 years), and Liberia (6.5 to 4.5 years). Decreases of between 1 and 2 years are observed in Namibia (3.8 to 1.9 years), Zambia (5.7 to 4.4 years), Congo (5.3 to 3.9 years), Tanzania (5.3 to 4.1 years), Ethiopia (6.2 to 4.5 years), Sao Tome and Principe (6.0 to 4.5 years), and Guinea (8.9 to 7.0 years). In Namibia and Guinea, the gender gap in age at first marriage decreased due to a decline in the age at marriage among men of 0.9 and 1.4 years, respectively) and an increase in the age at marriage among women (1.0 and 0.5 years, respectively). In Ethiopia, age at

marriage increased among both sexes, but the increase was much larger among women (3.6 versus 1.9 years).

Based on the data in Fig. 4, we can classify the countries as follows:

- Countries with a gender gap in age at first marriage of less than three years. This group includes Réunion, Rwanda, and the Seychelles in Eastern Africa and Namibia and South Africa in Southern Africa. The gender gap in age at first marriage changed little in these countries, except for Namibia, where it decreased substantially.
- Countries with a gender gap in age at first marriage of at least six years. This group includes several countries in Western Africa (Guinea, Mali, Mauritania, Niger, Nigeria, and Senegal), as well as Chad and South Sudan. In most of these countries the gender gap in age at first marriage changed little, with the exception of Guinea and Mali, where the gap decreased.
- Countries with a gender gap in age at first marriage of 3–6 years, and where the gap decreased. This group includes Congo, Ethiopia, Liberia, Sao Tome and Principe, Tanzania, Burkina Faso, and Zambia.
- Countries with a gender gap in age at first marriage of 3–6 years, and where the gap has changed little or has increased. This pattern can be observed in the remaining countries. This group includes three countries where the gender gap increased by over one year (Cape Verde, Mauritius, and Swaziland).

4.3 Child Marriage

In 2010, there were 44 countries in Africa where the minimum legal age at marriage for women without parental consent or approval by a pertinent authority was 18 years or higher. In six countries (Chad, the Democratic Republic of the Congo, Egypt, Guinea, Togo, and Zimbabwe), the legal minimum age at marriage for women was below 18 years and in 35 countries, girls younger than 18 could marry with parental consent/approval by pertinent authority. By comparison, the minimum legal age at marriage for men without parental consent or approval by pertinent authority was 18 years or higher in 52 countries. Only Zambia and Sudan allowed the marriage of boys younger than 15 with parental consent (United Nations 2011).

Data from two consecutive household surveys (DHS and MICS) for the period from 2000 to 2011 suggest that little progress has been made in preventing child marriage in African countries. In only eight countries did child marriage decline by ten percentage points or more (Ethiopia, Lesotho, Liberia, Rwanda, Sierra Leone, Togo, Uganda, Tanzania, and Zimbabwe). Benin and Cameroon had declines in urban areas only, whereas Congo and Zimbabwe had declines in rural areas only. However, some countries where child marriage is common lack data on trends in child marriage (United Nations Population Fund 2012).

4.4 Trends in Polygyny

Data from the 1960s to 1980s showed that polygyny levels varied widely across Africa, but that they remained stable in most countries (Lesthaeghe et al. 1989). Figure 5 shows trends in the percentage of currently married women who report having at least one co-wife. Before 2000, 31.6% of married women were in a polygynous union. For recent surveys, the percentage of married women in polygynous unions had declined to 21.8%.

The largest declines in the percentage of married women in polygynous unions occurred in Togo (52.3% to 32.3%), Namibia (24.2% to 5.9%), Senegal (46.5% to 34.5%), Cameroon (38.2% to 25.4%), Benin (49.4% to 34.8%), Ghana (32.6% to 18.6%), Kenya (23.4% to 13.3%) and Mali (45.0% to 34.8%). Declines were smaller in other countries. Polygyny did not decline in Eritrea (an increase from 6.9% to 9.3%), Niger, and Chad (constant at 36% and 39%, respectively).

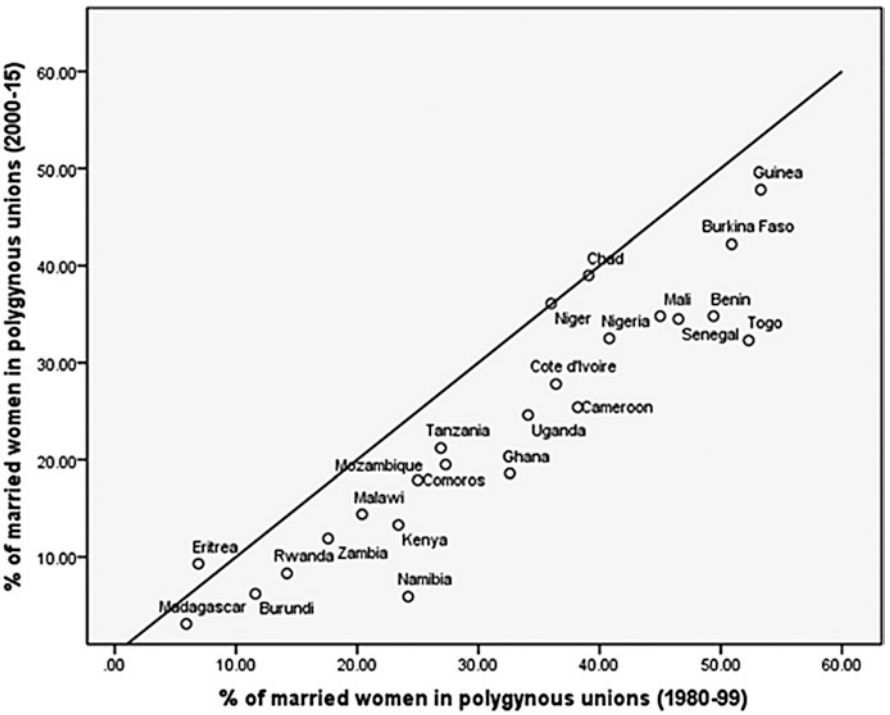

Fig. 5 Trends in the percentage of married females who report being in a polygynous union (1980–1999 vs. 2000–2015)

5 Implications for Policies and Programs

Existing political and cultural barriers to girls' rights to marriage choice, educational advancement, and sexual and reproductive choice may hamper sub-Saharan Africa's potential for a demographic dividend to be realized. Therefore, programs and policies must be implemented to enable both married and unmarried girls to have access to sexual and reproductive health information and programs, to identify and understand their options to delay or limit childbearing, and to receive the support of their husbands, family members, and communities (United Nations Population Fund 2012). The fertility transition typically proceeds faster in settings which exhibit greater gender equality (Eastwood and Lipton 2011).

A country's marriage pattern and stage in the fertility transition determines the kinds of programs and policies it can implement to improve marriage and family patterns and the status of women. A systematic analysis of policies and programs identified five promising policy and programmatic approaches to address child marriage (Maholtra et al. 2011). In countries with high rates of child marriage, high adolescent birth rates, and low levels of satisfied demand for contraceptive use, integrated multi-pronged approaches across sectors are most likely to succeed (Amin 2011).

1. *Enact and enforce laws to prevent early marriage*: this approach includes a combination of legal reform and outreach to promote cultural, systemic, and behavioral change regarding early marriage. Particular attention should be given to bringing customary marriage laws in line with international human rights standards to protect girls from child marriage, increasing community awareness of existing laws, and strengthening birth and marriage registration systems to support the enforcement of child marriage laws (United Nations Population Fund 2012). Although child marriage accounts for only a fraction of school dropouts, the enforcement of child marriage laws can help reduce secondary school dropouts for girls. It is essential that age 18 be enforced as the minimum legal age of marriage for both sexes.
2. *Empower girls by building their skills and enhancing their social assets:* these programs include life skills training to help girls develop livelihoods, and to better communicate, negotiate, and make decisions which directly affect their lives. They also provide safe spaces for girls to interact with peers and mentors, and assess alternatives to marriage (Muethengi and Erulker 2010); and they empower young girls to make autonomous decisions.
3. *Improve girls' completion of secondary education*: education is positively associated with men's and women's career aspirations and employment in skilled jobs. Secondary school education is also associated with ideational and social norm change, particularly with regards to the timing of marriage and childbearing. Therefore, this approach may require enacting laws to mandate schooling for longer periods, to enable youth to delay marriage and first birth and pursue a career (United Nations Economic Commission for Africa 2013).

4. *Enhance the economic situation of girls and their families*: since poverty is one of the causes of early marriage, some programs offer incentives (loans, scholarships, subsidies, and conditional cash transfers) to encourage families to postpone the marriage and prolong the education of their daughters. Employment opportunities generated through vocational training and microfinance schemes can be viable alternatives to child marriage marriage and may reduce pressure to marry girls off early (Maholtra et al. 2011; United Nations Population Fund 2012).
5. *Mobilize communities to transform social norms that undervalue girls*: since families and community members often decide when and whom a girl will marry, programs can work with parents and community stakeholders (e.g., village chiefs and religious leaders, etc.) to make delayed marriage the social norm. Social norm interventions around child marriage have often included community dialogue, mass media messages about the harmful consequences of child marriage, the rights of the girl child and alternatives to child marriage, and interventions involving men and boys (United Nations Population Fund 2012). These interventions have been more successful when integrated with the approaches described above.

To address the diversity in marriage patterns and trends within countries, policymakers and program managers should identify subgroups with low age at marriage and determine whether they also have low levels of education, low status of women, and low levels of satisfied demand for family planning. Subgroups exhibiting multiple levels of vulnerability should be prioritized to receive an integrated set of multi-sectoral interventions (United Nations Population Fund 2012). In countries where age at marriage and levels of premarital and unwanted fertility are high, programs might want to focus on improving the quality of schooling, teaching comprehensive sexual education, providing health services (sexual and reproductive health, maternal health, family planning and HIV/AIDS), and implementing poverty reduction strategies such as life skills, vocational training, and livelihood programs. They should aim at targeting the most vulnerable and marginalized girls. Overall, a zero-tolerance policy towards child marriage should be combined with greater investment in family planning and other reproductive health services, better health care, good governance, and job creation, to help bring about a demographic dividend.

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Mortality, Health, and Aging in Sub-Saharan Africa

Bruno Masquelier and Almamy Malick Kanté

1 Introduction

The demographic dividend that sub-Saharan Africa (SSA) may reap in the future will largely depend on trends in mortality and health. Improved health raises labour productivity and encourages foreign direct investments. It also induces positive behavioural changes such as higher rates of savings and higher school enrollment. By contrast, low survival prospects are holding back development. Some authors even argue that the high adult mortality rates explain Africa's economic stagnation (Lorentzen et al. 2008). Premature adult mortality shortens time horizons and encourages behaviors associated with short-term benefits but long-term costs. For example, a study found that farm households in Kenya sold assets such as small animals and farm equipment to mitigate the shock caused by the death of a working-age man (Yamano and Jayne 2004). Adult mortality has other indirect effects, including a reduction in levels of support for the elderly (Kautz et al. 2010), and threats to the well-being and development of children (Beegle et al. 2010).

Another channel whereby mortality and health impact upon the demographic dividend is through changes in the age structure of the population. Mortality decline has been firmly established as the main driver of fertility reduction, in both the theoretical framework of the demographic transition and in numerous empirical analyses. Because mortality and fertility declines are asynchronous, they generate population growth and shifts in the age structure. In the early stages of their transition, populations typically grow *younger*, since progress in the fight against infectious diseases and conditions of early childhood is more rapid than against

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diseases affecting adults. The growth in the number of young people is later offset by fertility declines, and populations begin to age. In SSA, some countries are yet to begin their fertility transition (e.g., Niger, Mali, and Somalia), while in others, the transition has only recently begun and has progressed at a slow pace (e.g., Malawi). The total fertility rate is still above 3.5 children per woman in all countries except in the small island countries, in Djibouti, and in Southern Africa. Protracted economic development and a strong cultural emphasis on the extended family are among the main obstacles to the fertility transition in Africa (Shapiro 2015). In this context, the population in SSA will continue to grow for many years, leaving the region with the youngest population in the world in the coming decades. Most SSA countries are only experiencing a moderate population aging. In absolute terms, however, the region will have to face sharp increases in the number of adults aged 60 and above. From 46,5 million in 2015, this population is projected to grow to 161 million in 2050 (United Nations 2015). Yet it remains difficult to make reasonable assumptions as to future trends in adult and old-age mortality, when even the current estimates are very tenuous.

Overall, demographers remain ill-equipped to document changes in mortality, health, and aging in the region, in part because vital registration systems fail to provide full national coverage in most SSA countries. In this context, a wide variety of alternative data sources are used to derive mortality and cause-of-death statistics: censuses, surveys, cohort studies from small geographical areas, death records from urban areas, areas, etc. This chapter provides a cursory overview of these different data sources, and goes on to present trends in mortality among children and adults, using survey reports on the survival of close relatives. The chapter then describes major changes in the leading causes of death and highlights specific characteristics of the process of demographic aging in SSA.

2 Data Sources on Mortality, Health, and Aging

SSA is repeatedly cited as the region where uncertainties around levels and trends in mortality are the greatest. The most optimistic could argue that this picture is changing. In the context of the post-2015 agenda, there is a growing political momentum around Civil Registration and Vital Statistics (CRVS) systems. The need to accurately register deaths with a cause certified by a medical practitioner is being recognized more widely. This momentum has yet to translate into real changes in countries, however. At present, apart from South Africa and some islands, often less than 50% of deaths are reported to registration offices[1]. Often a smaller proportion is registered with a cause certified by a medical practitioner. When death certificates are required to obtain a burial permit, some large cities and capitals are able to

[1] See the estimates of the coverage of birth and death registration developed by the United Nations Statistics Division, available at: http://unstats.un.org/unsd/demographic/CRVS/CR_coverage.htm, accessed June, 30, 2015.

achieve a more complete death registration. In Senegal, for instance, only 30% of deaths are registered nationwide, but this proportion reaches 88% in Dakar, according to the 2013 census. In other cities, including Harare (Dlodlo et al. 2011), Bamako (Fargues and Nassour 1988), and Antananarivo (Masquelier et al. 2014b), local death registers are a relatively untapped source of data. They could be used more extensively as stepping stones for strengthening CRVS systems. Despite this, it is unlikely that registration data will become the main source of mortality measurements by cause at the national level in the foreseeable future.

In the interim, surveys and censuses will remain key data sources for mortality estimation. In particular, birth and sibling histories collected in the Demographic and Health Surveys (DHS) and UNICEF's MICS surveys are widely used. Full birth histories are an exhaustive enumeration of all children of the women interviewed, giving for each the sex, date of birth, survival status, and current age or age at death. Sibling histories collect the same information for the brothers and sisters of the respondent, hence providing the equivalent of the birth history of the mother. Deriving mortality rates from retrospective survey data remains challenging because of selection issues (families with high mortality will be underrepresented in the sample) and various reporting errors (omissions of deaths, errors on the ages at death or the timing of deaths, etc.) (Masquelier 2014). These problems are also pervasive when estimating mortality from census reports on the survival of children, parents, or household members (Moultrie et al. 2013). By contrast, demographic data of a very high quality is collected in Health and Demographic Surveillance Systems (HDSS) operating in over 20 small geographic areas in SSA (Ye et al. 2012). At the initiation of an HDSS, an initial census is conducted and this marks the start of the continuous follow-up of an open cohort. New individuals can enter the population by birth or in-migration, and members can exit by out-migration or death. On each study round, interviewers review the composition of all households, checking the lists of people who were present in the households at the last visit and collecting data about vital events since the last round. These sites are predominantly rural and they cover populations varying from 8000 inhabitants (Mlomp, Senegal) to more than 230,000 inhabitants (KEMRI/CDC – Kisumu, Kenya). HDSS are particularly useful to fill the dearth of data on the underlying diseases that contribute most directly to deaths in SSA. The enumerated populations are not representative of the entire population, however. To obtain a more comprehensive picture, a few countries (Mozambique, Zambia, etc.) have conducted post-census mortality surveys to follow up on reported household deaths and ascertain causes of death at the national level.[2]

Both HDSS and post-census mortality surveys document cause-of-death patterns through *verbal autopsies*. Verbal autopsies are interviews among relatives and caretakers of the deceased to collect data on circumstances and symptoms preceding the death through a structured questionnaire. Interviews among relatives by trained physicians were first introduced in surveys conducted in the 1950s and 1960s in

[2] See "Mortality in Mozambique: results from a 2007–2008 Post-Census Mortality Survey", available at: http://www.cpc.unc.edu/measure/publications/tr-11-83, accessed June, 30, 2015.

Asia (Punjab) and Africa (The Gambia and Senegal) (Garenne and Fauveau 2006). There has been a flurry of methodological advances in this field in recent years, in part because procedures for interviewing and assigning causes of deaths in HDSS have been standardized, and probable causes of death are increasingly ascertained based on statistical models (Leitao et al. 2013).

To respond to the growing need for reliable mortality statistics, complex demographic and epidemiological models have also been devised by the United Nations and academic institutions. Among others, the *Global Burden of Disease* (GBD) study team assembled a large array of data sources, including surveys, censuses, HDSS data and death registers to quantify the loss of health from disease and injuries. Their work provides the most comprehensive view of epidemiological changes since 1990 but it has also generated considerable debate, in part because of staggering discrepancies with mortality estimates developed by UN, WHO or other academic groups. For example, when comparing GBD estimates with those of the Maternal and Child Epidemiology Estimation group (MCEE) and the WHO for 2013, the relative difference in the number of post-neonatal deaths among children due to malaria, meningitis, AIDS, and measles are 20% or larger (Liu et al. 2015). Such variations provide compelling examples of the need for a more systematic collection of primary data on causes of death.

A major challenge in these epidemiological models consists in reconciling discrepant values of all-cause mortality to obtain a "mortality envelope" (that is, an estimate of the total number of deaths by age and sex). In the GBD Study, individual estimates of each disease and injuries are squeezed to fit into this envelope. Figure 1 illustrates the difficulties involved with the case of Sierra Leone, one of the countries facing the highest mortality rates worldwide, even before the epidemic of the Ebola Virus Disease in 2014. The left-hand plot present trends in under-five mortality rate ($_5q_0$, also denoted as U5MR), that is, the probability that a newborn will die

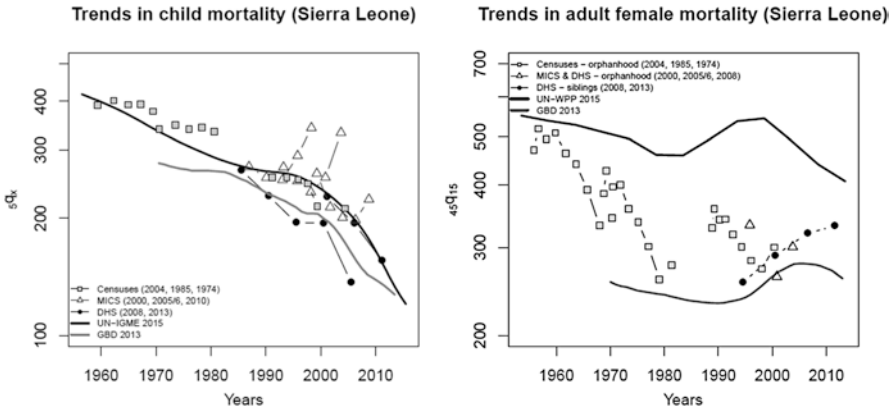

Fig. 1 Trends in under-five mortality (both sexes) and female mortality between the ages 15 and 60 according to various surveys and censuses, UN WPP and IGME 2015 and GBD 2013 estimates for Sierra Leone. *Sources*: Various censuses and surveys, UN-IGME 2015 and GBD 2013

before reaching age 5 under the current mortality regime. The right-hand plot presents trends in ${}_{45}q_{15}$, the probability that an adult (here a female) aged 15 will die before reaching her sixtieth birthday (again when facing the mortality rates prevailing during the year under consideration). For child mortality, indirect estimates are obtained from census or survey reports as to the number of children born and surviving. They generate a relatively steady trend, except for estimates based on younger mothers, which is common. They are higher than direct estimates derived from the birth histories collected in the last DHS. For adult mortality, estimates based on orphanhood data are also quite regular. Combined with mortality rates derived from DHS sibling histories, they suggest a gradual decline in mortality between 1960 and the late 1990s, possibly followed by a recent reversal. To varying degrees, these statistics are incorporated in the modelling exercises carried out by the UN and the GBD study team. Yet for both age groups, GBD estimates fall far lower than UN estimates, probably because they give more weight to direct estimates from birth and sibling histories collected in the last DHS. Discrepancies in ${}_{45}q_{15}$ are larger than among children, reflecting the weak consensus on strengths and limitations of the different data sources on adult survival.

To date, there have been few efforts to use surveys or censuses to estimate old-age mortality in SSA. Estimates developed by the UN or GBD are currently inferred from model age patterns anchored to child and adult mortality, and there is little, if any, empirical data involved for the elderly. Bendavid et al. (2011) estimated old-age mortality from data on recent household deaths and suggested that mortality above age 60 could be lower than in UN estimates. But survey and census estimates obtained for the elderly are of doubtful accuracy, owing to omissions of deaths and age misreporting. This is problematic because an increasing share of deaths is taking place at older ages. In 2005–2010, 24% of deaths occurred above age 60 in SSA, and this proportion will rise to 51% in 2050–2055 (United Nations 2015). There is more evidence about the health of the elderly, especially as regards functional status, self-reported health, and basic epidemiological risk factors (hypertension, etc.). Data collected in HDSS sites as part of the *WHO Study on global AGEing and adult health (SAGE)* has contributed to expand the evidence base in this area (Kowal et al. 2010).

3 Trends in Mortality Among Adults and Children

This section draws on birth and sibling histories collected in DHS to present recent mortality trends. We pooled surveys together within each country and used a generalized additive model to smooth mortality rates. We also adjusted mortality rates upwards to account for the underreporting of deceased children and siblings, based on a comparison of mortality rates obtained from successive surveys for a fixed reference period. Further details on the methodology are provided elsewhere (Masquelier et al. 2014a). Figures 2 and 3 present trends in the probabilities ${}_5q_0$ for both sexes and ${}_{45}q_{15}$ for females, and emphasize some country trajectories. From 1970 to 1990, there was a large gradient in mortality from north-west to south-east.

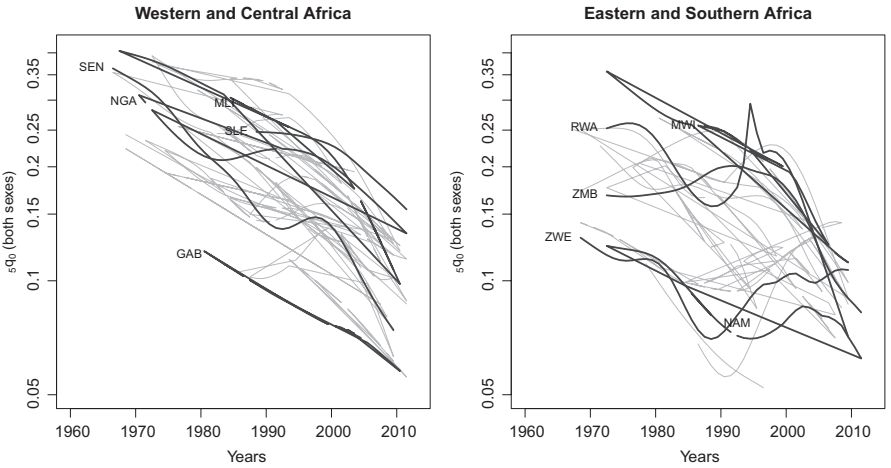

Fig. 2 Trends in under-five mortality for both sexes estimated from birth histories collected in 125 DHS. *Sources*: DHS data (authors' calculations). Countries highlighted in dark grey are GAB: Gabon, MLI: Mali, MWI: Malawi, NAM: Namibia, NGA: Nigeria, RWA: Rwanda, SEN: Senegal, SLE: Sierra Leone, ZMB: Zambia, ZWE: Zimbabwe

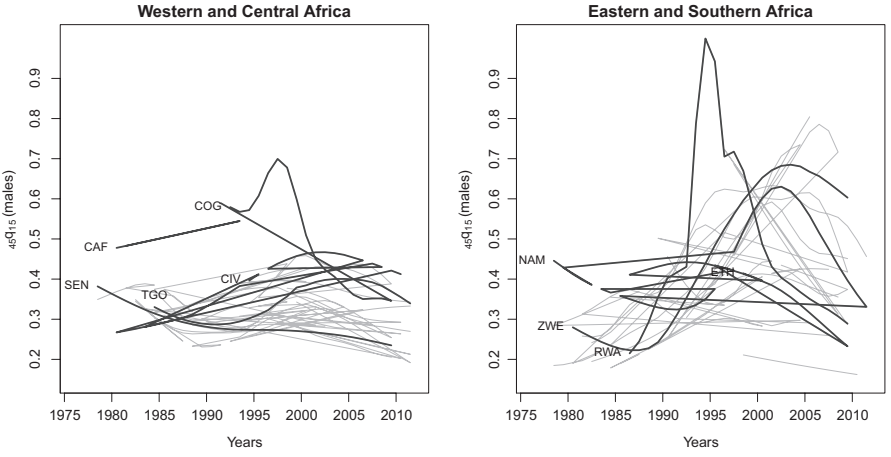

Fig. 3 Trends in female mortality between the ages 15 and 60 estimated from sibling histories collected in 89 DHS. Note: DHS sibling histories (authors' calculations). Countries highlighted in dark grey are CAF: Central African Republic, CIV: Côte d'Ivoire, COG: Congo, ETH: Ethiopia, NAM: Namibia, RWA: Rwanda, SEN: Senegal, TGO: Togo, ZWE: Zimbabwe

In 1980, the U5MRs in Mali, Niger, and Guinea were about three times higher than in Zimbabwe, Namibia, and South Africa. Under-five mortality rates decreased during this period in almost all countries covered by DHS, but at various paces. The annual rate of reduction (ARR) was two to three times larger in Southern Africa than it was in other regions. It was estimated at 2.9% in Southern Africa, compared

with 1.3% in Western Africa, 1.2% in Central Africa, and only 0.9% in Eastern Africa (these estimates are from the United Nations 2015). The rate of progress greatly diminished in the 1990s, and DHS birth histories suggest that 15 countries saw periods of temporary *increases* in child mortality. These stalls stood in stark contrast with the fourth Goal set by the United Nations Millennium Declaration, which established a reduction of two-thirds in U5MR between 1990 and 2015, corresponding to an annual rate of decline of 4.4%. Because of the limited progress in the 1990s, few countries in sub-Saharan Africa achieved MDG-4 by 2015. The slowdowns or reversals of child mortality mortality were clearly related to the HIV/AIDS epidemic, but other factors also played a role. Several countries went through periods of conflicts, including Liberia, Rwanda, Somalia, Congo-Brazzaville, and D.R. Congo. The 1990s were also characterized by stalls in immunization rates, after substantial improvements in the 1980s. For example, the vaccination coverage for diphtheria, pertussis, and tetanus (DTP3) increased from 29 to 56% between 1985 and 1990 in the region, hovered around 50% in the late 1990s and early 2000s, before rising again to reach 74% in 2013.[3] An additional negative factor was the spread of chloroquine resistance in the malaria parasite which resulted in increases in malaria-related mortality (Trape 2001).

More encouraging was the rapid acceleration of progress in the 2000s, especially after the peak of the HIV epidemic in 2005. Countries such as Liberia, Rwanda, Ethiopia, and Madagascar have made significant strides in reducing their under-five mortality in the last decade. Globally, there has been a convergence of U5MRs, with half of the countries in the region now experiencing U5MRs between 60 and 120%. Geographical contrasts persist, however; Western Africa still faces the highest levels of child mortality in the world, especially Sierra Leone, Guinea-Bissau, Mali, Chad, and Burkina Faso.

Over the last four decades, adult mortality has followed trajectories that have been largely disconnected from trends in child mortality. From the early 1980s to the 2000s, the probability ${}_{45}q_{15}$ increased by as much as two- to threefold in Zambia, Malawi, and Uganda, and to a lesser extent in Kenya and Tanzania. Ethiopia is among the few exceptions apparent in DHS where adult and child mortality evolved in tandem; the country cut its premature adult mortality by half between 1990 and 2010. Rwanda also succeeded in dramatically reducing its adult mortality after the 1994 genocide. Compared with Eastern Africa, HIV incidence peaked later and at a higher rate in Southern Africa (e.g., at 6% in Zimbabwe in 1993, compared with 2.6% in Zambia in 1986[4]). This is reflected in mortality estimates. For all countries in the region covered by recent DHS, the probability ${}_{45}q_{15}$ for males went above 60%. Adult mortality rates have started to decline again, and in countries such as Uganda, Zambia, Tanzania, and Namibia, this took place before the scaling-up of antiretroviral therapy (ART) in 2005. Mortality declines have since accelerated and generalized, but about a dozen countries have not yet recovered the levels of adult mortality they had in the 1980s. In Southern Africa in particular, the UN Population

[3] http://data.unicef.org/child-health/immunization, accessed June, 30, 2015.

[4] Estimates obtained from EPP/Spectrum version 5.29.

Division projects that the probability ${}_{45}q_{15}$ for both sexes combined will remain higher than the level observed in 1980 until at least 2035 (United Nations 2015). The high risk of mortality among adults in their most productive years limits the region's potential for fully realizing its demographic dividend.

Mortality increases due to AIDS were more moderate in Western and Central Africa, except for the Ivory Coast where HIV prevalence peaked at 7.5% (in 1997) and the probability ${}_{45}q_{15}$ reached 0.45 in 2002 among males. Even if they faced smaller HIV epidemics, few countries in Western and Central Africa experienced sustained improvements in adult survival. The Congo (Brazzaville) went through a period of political turmoil around 1997 and this is visible in sibling histories. There has been virtually no change in adult mortality rates in Niger since 1990, and DHS data is suggestive of temporary mortality increases in Burkina Faso, Benin, Cameroon, Sierra Leone, and Togo. It is tempting to associate these unfavorable trends with the economic crises witnessed by many countries, but there is limited evidence to support this claim. In addition, trends derived from DHS sibling histories should always be interpreted with caution due to problems of data quality (Masquelier et al. 2014a).

4 Changes in Cause-of-Death Patterns in Sub-Saharan Africa

Mortality trends are important markers of health progress, but information on the underlying diseases are required to guide policies and programs. There have been major changes in the relative share of causes of death in SSA, as the region has followed a worldwide trend and initiated its *epidemiological transition*. This transition corresponds to a long-term shift from a regime of high mortality, dominated by communicable diseases, maternal disorders, and nutritional deficiencies, to a regime of low mortality where deaths are mainly due to non-communicable diseases (NCDs). It is closely linked to the aging of populations but also supported by changes in lifestyles (e.g., decreasing exercise and increasing tobacco use).

The transition in SSA has not been as regular and predictable as in other regions. It began after the diffusion of antibiotics in the 1940s, followed by modern vaccines a few decades later. As indicated in the mortality trends presented above, it has progressed at a much slower pace than in other developing countries. For example, life expectancy at birth was similar in SSA and India in 1950–1955 (36 years), but it had only reached 57 years in 2010–2015, lagging 10 years behind India (United Nations 2015). In more developed countries, the transition was triggered by better nutrition and rises in living standards, while the mortality decline has been largely dependent on anti-microbial medicine in SSA. This raises concerns in the context of the development of drug-resistance. The shift from communicable to non-communicable diseases is not definite either, as illustrated by the outbreak of the Ebola Virus Disease in 2014. Instead of a gradual shift from communicable to non-communicable diseases, SSA now faces a "double burden of disease" (Agyei-Mensah and de Graft

Aikins 2010). This double burden is typical of urban areas, where the wealthy and more educated face a rise in chronic diseases, while the urban poor bear the persistent risk of life-threatening infections, especially in slums (Rossier et al. 2014).

The transition underway in SSA is reflected in cause-specific estimates from the *Global Burden of Disease 2013 Study*. Figures 4a, b present tree-map diagrams displaying the percentage of the total number of deaths due to a specific cause, focusing on females and the years 1990–2013.[5] Overall, non-communicable diseases caused

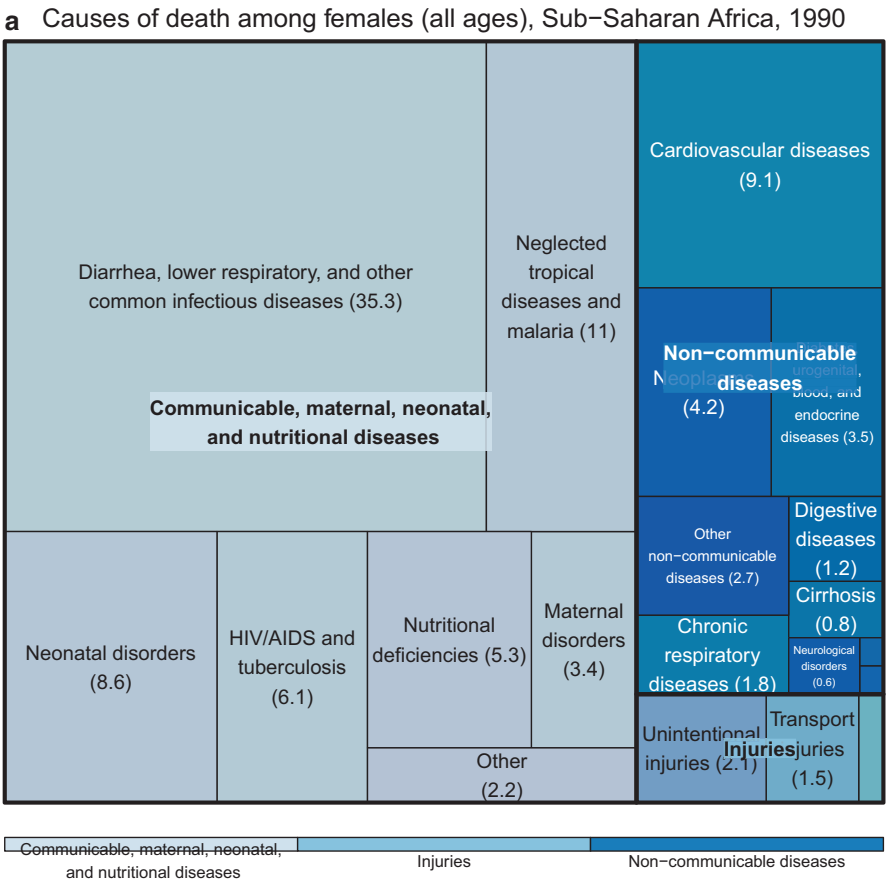

Fig. 4 (**a**, **b**) Percentages of the total number of female deaths due to a specific cause in sub-Saharan Africa, 1990 and 2013, as estimated by the GBD 2013 Study. *Source*: GBD collaborators, Global, regional, and national age-sex specific all-cause and cause-specific mortality for 240 causes of death, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013, *The Lancet*, Volume 385(9963), 117–171, 2015

[5] These diagrams were created based on estimates from GBD 2013, available online at http://ghdx.healthdata.org/, accessed June, 30, 2015. More detailed online versions of this visualization tool are available at http://vizhub.healthdata.org/gbd-compare, accessed June, 30, 2015.

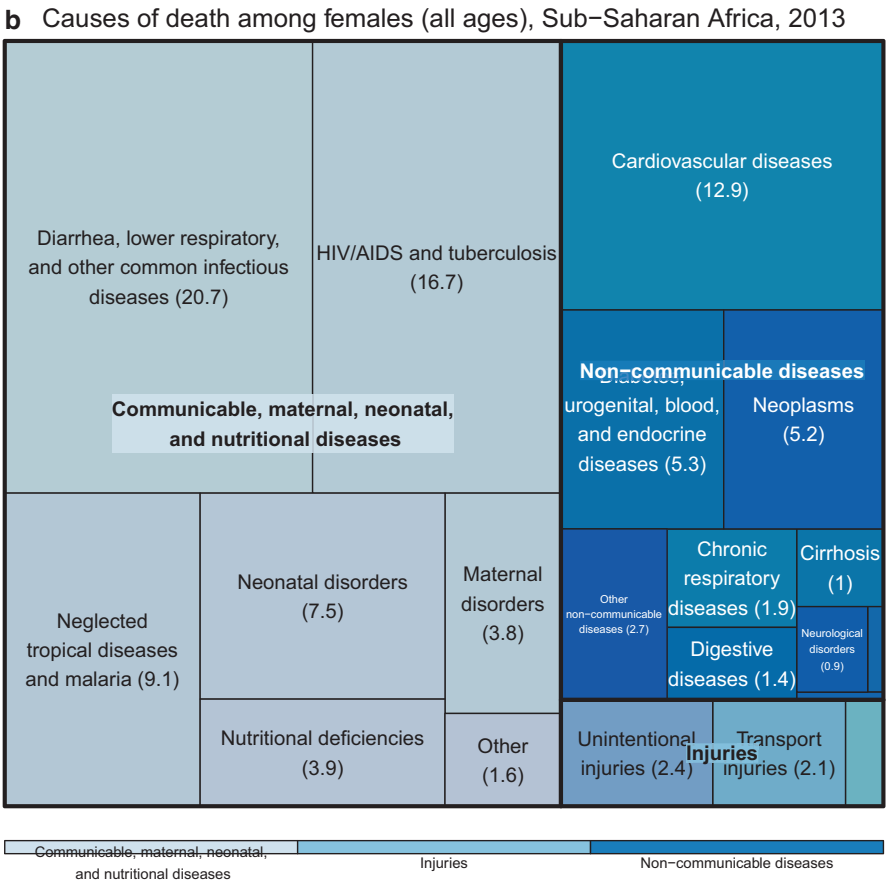

Fig. 4 (continued)

24% of female deaths in 1990, and this proportion rose to 32% in 2013. Several studies have showed that age-standardized death rates from NCDs can be higher in SSA countries than in high-income countries countries (Dalal et al. 2011). Among NCDs, the leading causes of deaths were cardiovascular diseases (13% of all deaths in 2013), diabetes, urogenital, blood and endocrine diseases (5%) and neoplasms (5%).

From 1990 to 2013, the proportion of female deaths caused by communicable, maternal, neonatal, and nutritional diseases declined from 72 to 63%. This drop was largely due to a reduction in diarrhea, lower respiratory infections, and other common infectious diseases, whose proportion decreased from 35 to 21%. Measles, formerly a major killer, accounted for less than 1% of deaths in 2013. The share of deaths due to nutritional deficiencies was also reduced from 5.3 to 3.9%. Efforts to improve sanitation, increase access to safe water and extend immunization coverage, all helped to drive down mortality from infectious diseases. Changes in the

management of childhood conditions may have helped too. In particular, the *Integrated Management of Childhood Illness* (IMCI) was launched by the WHO in 1996 to assess children based on a limited number of selected signs and symptoms using a syndromic approach, rather than based on a precise diagnosis targeting a single disease category. In Tanzania for example, the IMCI program had a significant impact on child mortality (Armstrong Schellenberg et al. 2004). Later on, the *Integrated Community Case Management* (iCCM) programs adapted the IMCI with a stronger focus on training lay community health workers to reach populations with limited access to facility-based services. The iCCM approach targets pneumonia, diarrhea, malaria (some programs also add acute malnutrition). It is expected to produce an immediate impact on child mortality mortality if implemented in optimal conditions, which include the constant availability of essential medicines, regular supportive supervision of staff and functional referral system. However, a multi-country evaluation of the iCCM showed that the programs were associated with a significant acceleration of the decline in child mortality in Ghana only (Amouzou et al. 2014). The effectiveness of the iCCM strategy is yet to be demonstrated.

According to GBD estimates, the number of malaria-related deaths increased from 1990 to 2004, to reach 1.03 million deaths annually, and then declined by about 30% to account for 8.5% of all deaths in 2013. Since 2005, most SSA countries have scaled-up successful interventions, particularly insecticide-treated mosquito nets (ITNs), indoor residual spraying (IRS) and intermittent preventive treatment during pregnancy (IPTp). Burkina Faso, for instance, recorded a jump in ITNs ownership by households from 5% in the 2003 DHS to 57% 7 years later in the 2010 DHS. When incorporated into national programs, the malaria prevention coverage has a significant health impact, likely more than a 20% decrease in all-cause childhood mortality (Steketee and Campbell 2010).

Deaths due to AIDS and tuberculosis also peaked in the mid-2000s, in 2006, according to GBD 2013. At that time, HIV/AIDS and TB caused 1.6 million deaths annually in SSA. We have presented earlier the impact of the epidemic on trends in mortality among adults and children. In 2000, only a few countries had effective interventions including prevention of mother-to-child transmission (PMTCT) and antiretroviral therapy (ART). Since 2005, PMTCT and ART services have expanded enormously, and this has driven down mortality rates.

5 Population Aging and the Health of the Elderly

The rapid decline in child mortality in SAA, combined with a modest fertility reduction, makes the African population younger than it was two or three generations ago. In 31 countries, the median age (the age that divides the population in two equal parts) was lower in 2015 than it was in 1950 (United Nations 2015). In 2015, it was estimated at 18.3 for the region as a whole, and ranged between 14.8 in Niger and 35.2 in Mauritius. Also omnipresent in discussions related to the demographic dividend are the dependency ratios. They started to decline mostly in the 1980s, but

they peaked only after 1990 in 18 countries and they are still rising in Niger. The percentage of the population aged 60 and above is another key statistic to describe the process of demographic aging. It was estimated at 4.8% in 2015, and it is projected to grow fairly slowly to reach 7.6% in 2050. The aging of the region is nonetheless a real and serious demographic dynamic, which has direct bearing on the demographic dividend. First of all, one should keep in mind the great diversity in the demography of African nations, which means that the elderly already account for an important share of the population in specific countries (e.g., 7.7% in South Africa in 2015 and 7.3% in Gabon). Secondly, the relatively slow shifting in the age structures masks a rapid growth of the elderly population *in absolute numbers*. Nigeria and Ethiopia already rank among the top 30 countries in the world in the size of their population aged 60 and above. According to the United Nations (2015), this number will increase fourfold in the next 40 years in the whole region. This growth is more rapid than in the developed world and it will present a number of challenges to families, policymakers, and healthcare providers, especially when considering the lack of social security systems and the widespread poverty. As pension systems cover only a small fraction of the population, adults are compelled to work at later ages. They also need to turn to the extended family as a source of financial and social support, for instance when they face health problems impeding access to income-generating activities. However, the size and composition of this extended family is changing. While the total fertility in SSA was as high as 6.7 children per woman in 1980, it is now around 5 children and should decline even further in the coming decades. The nature of the social support provided by the family could also change, in response to globalization, democratization, and rises in educational levels. Research indicates that the authority of the elderly in the political, residential or marriage spheres is decreasing, and this could weaken the traditional obligations of caring for elders and be detrimental to their health and well-being (National Research Council 2006).

In this context, probably the largest share of research on aging in sub-Saharan Africa has focused on living arrangements. The focus is often put on countries with generalized HIV epidemics, where the upsurge of working-age adult mortality deprived many families of their main caregivers and put kinship networks under considerable pressure. The literature suggests that larger proportions of older adults are now living alone or in "skipped generation households", comprising solely dependent children and elders (Kautz et al. 2010). As the numbers of AIDS orphans continue to grow, grandparents face increased childcare responsibilities (Beegle et al. 2010). Irrespective of the scale of the HIV epidemic, current research also underscores large gender differences in living arrangements. Older women are more likely to be found either in extended households or alone, whereas men are more likely to be found in nuclear households (Zimmer and Dayton 2005). A majority of older men are married while many more women are widowed. This is because since women tend to marry older men, they are less likely to remarry than widowers and they typically live longer than men. The aging of SSA countries is thus associated with heightened vulnerability of older women.

Another stream of research has focused on the health of the elderly. Once they reach 60 years, adults in SSA can expect to live 16 additional years on average, which is only slightly less than in Southern Asia or South-Eastern Asia (respectively 17.9 and 18.4 years) (United Nations 2015). Yet there is accumulating evidence that the elderly suffer from a higher burden of disability in SSA. According to GBD 2013 estimates, the number of years lived with disabilities per 100,000 inhabitants aged 50 and above is larger in SSA than in Southern Asia or South-Eastern Asia.[6] Musculoskeletal disorders (including osteoarthritis or low back and neck pain), sense organ diseases (such as hearing loss and eye disorders), depression, and chronic obstructive pulmonary disease are among the main causes of disabilities. A series of population-based surveys conducted among older people in Africa confirm these patterns (Aboderin and Beard 2015). This large burden of disability can be traced to the lack of access to health services and to a lifetime exposure to harsh economic conditions.

6 Conclusions

Over the last 40 years, the overall health status of populations in sub-Saharan Africa has undergone substantial transformations. Remarkable progress has been achieved in reducing premature deaths, especially from diarrhea, lower respiratory infections, and vaccine-preventable diseases such as measles. Most of the leading causes of death are still associated with communicable diseases, maternal disorders, and nutritional deficiencies, but the burden of these diseases is slowly decreasing. Consequently, about 60% of new-born children can now expect to survive to age 60, compared to just over 40% in 1970 (United Nations 2015). However, most of the mortality decline has been concentrated among children. There have been limited reductions in adult mortality, except for countries now recovering from the HIV/AIDS epidemic. In addition, progress has been much more erratic than in other regions for both adult and child mortality. The 1990s and early 2000s were a period of slowdowns and severe setbacks, caused by ravaging conflicts, the HIV/AIDS epidemic, and the re-emergence of other infectious diseases such as malaria and tuberculosis. Since 2005, most countries are back on track to reduce mortality, with a particularly impressive acceleration of progress in child survival. However, due to mediocre living conditions, low levels of health development, and a growing risk of antimicrobial resistance, African countries are not immune to new epidemics. Recently, the unprecedented outbreak of the Ebola Virus Disease in Western Africa has demonstrated how precarious health transitions can be in the region. Additional resources need to be devoted to strengthening health systems to sustain long-term mortality declines and contribute to the demographic dividend.

After decades of efforts focused on the fight against infectious diseases, countries are not well prepared for another growing challenge; the unfolding epidemic of

[6] See http://vizhub.healthdata.org/gbd-compare, accessed June, 30, 2015, for the latest estimates.

NCDs. The international community has also failed to take stock of this gradual change. In 2012, less than 1% of development assistance for health (DAH) was devoted to NCDs in sub-Saharan Africa, compared to 21% for maternal, newborn and child health health and 47% for HIV/AIDS.[7] The new Sustainable Development Goals (SDGs) will bring stronger attention to NCDs. One of the SDG targets is to reduce by one third premature mortality from non-communicable diseases by 2030. The probability of dying of cardiovascular disease, cancer, diabetes, or chronic respiratory disease between ages 30 and 70 is the proposed indicator to monitor progress on this target. In addition to commitment from donors and governments, better monitoring systems will be required to track progress in this area and make informed decisions about how to spend limited human and financial resources. Effective systems are in place to monitor trends in malaria, tuberculosis and AIDS mortality, but the current health information and statistical systems in SSA are inadequate to document the rising burden of NCDs. More generally, the historical focus on maternal and child health has been associated with a complete lack of interest in mortality and morbidity among adult aged 60 and above. The significant uncertainty surrounding mortality levels and trends in the elderly mean that any projections of the future demographic dividend should be interpreted with great caution.

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Acute and Chronic Health Challenges in Sub-Saharan Africa: An Unfinished Agenda

Thomas Zeltner, Farhad Riahi, and Jonas Huber

1 Introduction

Before the turn of the millennium the co-existence of acute and chronic diseases in one and the same region was by some researchers (Murray and Lopez 1996) and the World Health Organization (WHO 1999) coined "the double burden of disease". The concept of a double burden of disease finds its root, implicitly or explicitly, in ideas outlined as far back as 1971 by A.R. Omran. According to this theory, health and disease patterns change over time in societies. Like individuals, societies are thought to have a "life cycle". In young societies infectious diseases, nutritional deficiencies and maternal, newborn and childhealth problems prevail. When societies grow up accidents and violence-related diseases as well as NCDs become more prevalent. In aging societies, finally, NCDs predominate (Omran 1971). The growing burden of NCDs was thought to be a consequence of demographic transition and the double burden of disease was considered a phenomenon of societies in transition which were hit by the emerging epidemic of NCDs, while still struggling with an "unfinished agenda of infectious diseases" (WHO 1999).

The same line of thinking made it logical to separate the two entities of diseases when putting together a package of health goals for the Millennium Development Goals (MDGs, adopted in 2000). The MDGs focus on the "unfinished agenda" and concentrate on the fight against HIV/AIDS and other infectious diseases and on improving maternal and child health. There is no link made to NCDs, although

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some researchers such as Stuckler et al. (2010) warned that the MDGs might not be reached without addressing NCDs as cofactors for communicable diseases.

The same logic of division continued to dominate the debate when the world began to address the NCD epidemic. In 2005, the World Health Organization acknowledged in its report "Preventing chronic diseases: a vital investment" that NCDs are not primarily and exclusively a problem of the older and richer countries, but are even more so for the developing world. New research data had shown for instance that some 80% of all cardiovascular disease related deaths occur in low and middle-income countries (WHO 2005).

In 2011, the United Nations General Assembly (UNGASS), in its political declaration on the prevention and control of NCDs, committed all governments to fight the epidemic of NCDs. This declaration also acknowledged that NCDs hit developing countries particularly hard (UNGASS 2012). In 2013 the World Health Assembly adopted the "WHO Global Action Plan for the Prevention and Control of NCDs 2013–2020". By doing so, they confirmed and reinforced the concept of a double agenda.

Overall, the concept of a "double burden of disease" is a success story. It has unleashed an unprecedented global response to address the unfinished agenda of infectious diseases, particularly in Africa. It has brought governments, international organizations, the private sector, NGOs and philanthropic organizations together. It was instrumental in launching the Global Alliance for Vaccines and Immunization GAVI (2000), the Global Fund to fight AIDS, Tuberculosis and Malaria GFATM (2002) and for the inclusion of the fight against the major infectious diseases in the Millennium Development Goals Agenda. Finally, the concept mobilized civil society and political leaders in 2011 to adopt a global target of a 25% relative reduction in overall mortality from cardiovascular disease, cancer, diabetes or chronicrespiratory diseases by 2025.

In his 2012 Science Perspective paper, I.C. Bygbjerg rightly points to three possible and unintended side effects of this double approach (Bygbjerg 2012):

- It does not take into account the growing scientific evidence of links between infectious diseases (particularly TB and HIV) and NCDs (particularly diabetes, cancer and chronic obstructive lung diseases) or the importance of improved maternal and childhealth in the prevention of NCDs.
- It creates a competition in resource allocation between the two areas: *"At a time of global financial crises and shrinking health budgets, there is a threat that the battle against common and future health problems, both communicable and non-communicable, may become a fight for funds to control either health problem, rather than a fight against the double burdenof disease."*
- It blurs the fact that a comprehensive "double burden of disease" policy requires integrated control strategies that have to begin in the primary health care sector and need a multidimensional approach.

The dual approach in addressing the burden of two disease groups was, however, necessary for political reasons. The HIV/AIDS crisis of the end of the 20th century and the high burden of communicable diseases in low and middle-income countries made it imperative to address the challenge of infectious diseases as a high priority. A delay would not

have been understood and could have jeopardized the willingness of low-income countries to cooperate with high-income countries in the area of newly emerging and re-emerging infectious diseases, such as SARS, or pandemics of different strains of the influenza virus. It might also have affected their willingness to collaborate with the WHO and its Global Outbreak Alert and Response Network, established in 2000.

The challenge for Governments and particularly for Ministries of Health in SSA, is how to address the two burdens of disease in tandem. Internationally they have to negotiate with organizations active in one or the other field. On the national and subnational level they have to come up with public health responses that take into account the need of their populations for an integrated control strategy.

2 Changing Patterns of Diseases and Mortality in Sub-Saharan Africa

2.1 The Development of the Burden of Disease and of Mortality in SSA Between 1990 and 2010

The publication of the World Bank *Disease and Mortality in sub-Saharan sub-Saharan Africa* (Jamison et al. 2006) and the 2013 report of the Institute of Health Metrics on the Global Burden of Disease (sub-Saharan Africa regional edition, IHME 2013) give a comprehensive report of the actual burden of diseases in the region. The overall findings were:

1. Non-communicable diseases and disability caused a greater share of health loss in 2010 compared to 1990 in most regions of the world. At the same time the leading causes of disability-adjusted life years (DALYs) in SSA have changed little over the past 20 years. There is, however, evidence for progress made in SSA in the reductions in mortality from malaria, HIV/AIDS, and in maternal conditions.
2. Remarkable declines in health loss from diarrheal diseases, lower respiratory infections, and measles have been achieved. Despite this progress, many of these conditions still top many countries' health burdens and account for a large portion of childhood death and illness. Malaria and HIV/AIDS continue to drive substantial health loss throughout the region, and do so at rates higher than those two decades earlier; it appears, however, that the total health burdens caused by these diseases peaked between 2000 and 2005 for most countries.
3. While most countries in SSA still face large health burdens due to communicable, neonatal, maternal, and nutritional conditions, many have also experienced an increasing disease burden due to injuries and non-communicable diseases from 1990 to 2010. These dual burdens of communicable and non-communicable diseases are largely found among the lower- and upper-middle-income countries, but even low-income countries are now seeing ailments such as stroke among their top 10 drivers of premature death and disability. Road injuries have become an increasingly dominant cause of health loss in the region, with many countries,

including Ghana, Kenya, and Nigeria, documenting at least twice the health burden caused by road injuries in 2010 than in 1990.

4. War and conflict affected many countries in SSA in 1990, accounting for a substantial amount of health loss in countries such as Ethiopia and Liberia; by 2010, these causes were no longer primary drivers of premature death and disability.
5. Overall, a number of risk factors, including suboptimal breastfeeding, vitamin deficiencies, childhood underweight, and others associated with under-nutrition, have declined throughout SSA. This has likely contributed to the regional progress in reducing health loss caused by several childhood conditions. However, risk factors associated with growing burdens of chronic diseases, such as high body mass index and physical inactivity, have become important threats to public health in many countries in the region (Fig. 1).

The leading 15 risk factors are ranked from top to bottom in order of the number of DALYs they contributed in 2010. Bars going right show the percentage by which risk factors have increased since 1990. Bars going left show the percentage by which risk factors have decreased. Pointed arrows indicate causes that have increased by a greater amount than shown on the x-axis.

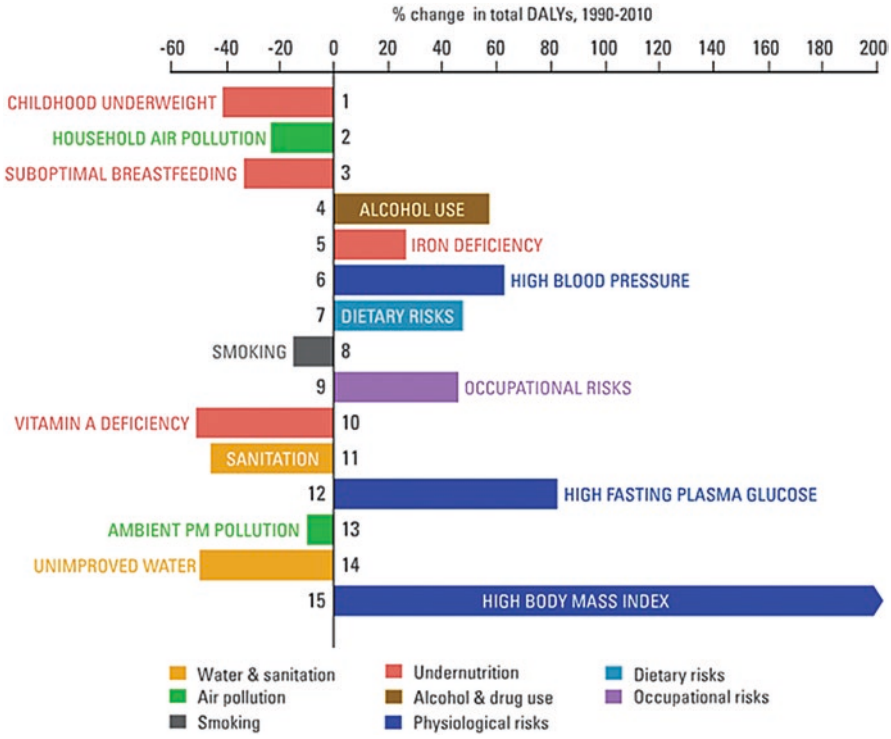

Fig. 1 Shifts in ranking of DALYs in SSA for top 15 risk factors, 1990–2010 (Source: IHME, Human Development Network, The World Bank. The Global Burden of Disease: Generating Evidence, Guiding Policy — Sub-Saharan Africa, Regional Edition. Seattle, WA: IHME, 2013)

2.2 Projection of the Burden of Disease and the Mortality in SSA Until 2030

Shona Dalal et al. (2011) reviewed the literature for SSA and summarized the data of the WHO and of the International Agency for Research on Cancer. Based on this review, the authors predict that the burden of NCDs such as cardiovascular diseases, diabetes mellitus type 2, and cancer will grow in SSA. There is, however, a substantial amount of uncertainty because there are few community-based studies that examine the NCDs prevalence, incidence, and risk factors and allow for a projection. Furthermore the prevalence of NCDs and risk factors varies considerably between countries, urban/rural locations, and other sub-populations. The prevalence of stroke ranged from 0.07 to 0.3%, diabetes mellitus from 0 to 16%, hypertension from 6 to 48%, obesity from 0.4 to 43%, and current smoking from 0.4 to 71%. Hypertension prevalence was consistently similar among men and women, whereas women were more frequently obese and men were more frequently current smokers. The authors therefore call for more research in Africa to provide evidence for NCDs prevention and treatment in SSA.

Based on their analyses the authors summarize the estimated proportion of age-standardized mortality rates for communicable and non-communicable diseases, injuries as well as for maternal, perinatal, and nutritional causes between 2002 and 2030 as shown in Fig. 2.

3 Challenges/Solutions

Sub-Saharan Africa faces the challenge of building and strengthening health systems that address its dual burden of disease effectively, equitably and sustainably. In doing so, it must recognize its pioneering role, as there are no equivalent models to learn from. While many countries have effectively solved their infectious disease challenges, and while there are more and more (but still sub-scale) examples of managing NCDs well in resource-limited settings, no country can be held up as a role model for success in tackling the challenges facing SSA.

The problem is two-fold. Firstly, the types of policies and delivery systems that work for infectious diseases are often different from those that work for chronic conditions. Secondly, even if these systems were both available, integrating them into a coherent, unified health system is a very difficult task. This becomes clearer as we look at specific challenges and examples of progress:

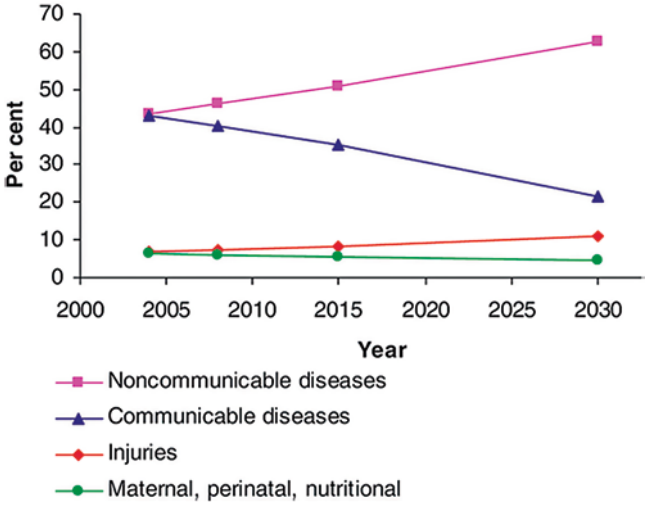

Fig. 2 Estimated proportions of age-standardized mortality rates by cause in SSA (Source: WHO. Global Burden of Disease. Projections of mortality and burden of disease, 2002–2030. SSA mortality estimates were standardized to the WHO World Standard Population)

3.1 Leadership and Policy Challenges

The challenge of getting the dual burden of disease onto an already crowded global health and development agenda has already been raised above. This challenge is further complicated by some differences between infectious diseases and chronic ones: (1) for most infectious diseases, there is a relatively high consensus on the technical interventions and on appropriate policies and delivery systems; for most chronic diseases, the technical consensus is mostly there, but not yet accompanied by broad agreement on policy and delivery options. Efforts such as the WHO's NCD "best buys" (WHO 2011a) represent a good path forward. (2) For most infectious diseases, the time lapse between starting interventions and seeing improvements in mortality and morbidity is low – months or years; for most chronic diseases, it is high – years to decades. National leaders will need to define success, progress, and interim milestones in ways that ensure implementation and support through multiple political cycles. (3) Most infectious disease programs are administered by the public sector, with limited private sector involvement; much of chronic disease care in SSA is delivered and insured by the private and non-profit sectors. National leaders will have to determine the role and extent of the different sectors and of public-private partnerships, to maximize population health benefits and equity of access.

3.2 Infrastructure and Input Challenges

The challenge is in expanding the healthcare infrastructure in SSA beyond that which is required for managing infectious diseases, to also being able to support prevention, diagnosis, treatment, and palliation of a broad range of chronic conditions. Furthermore, this expansion must be affordable, sustainable, and adaptable for the future. There are many examples of possible solutions to these challenges, many of which are being developed and implemented in SSA, for example:

- *Physical infrastructure*: it is far more cost-effective to manage chronic conditions in outpatient and near-home settings than it is to build more acute-care facilities. Mobile technology is making it increasingly feasible and cost-effective for care to be delivered by front-line healthcare workers in the community, and even by patients themselves. The WHO and International Telecommunications Union (ITU) Health Initiative are bringing together governments and private sector partners to develop, pilot, and scale up successful mobile-based tools and applications for the prevention and treatment of chronic diseases (WHO 2012).
- *Medical equipment*: the equipment required for the diagnosis and treatment of many chronic conditions conditions (e.g., CT scanners, MRI scanners, cardiac pacemakers) has historically been priced beyond what most health systems in sub-Saharan Africa could afford. This situation is changing, both as manufacturers from other countries such as India and China enter the market, and as the main Western manufacturers (e.g., Medtronic, GE, Siemens) recognize the need and opportunity for "frugal innovation", expand R&D activities in developing countries, and develop products which are not only considerably cheaper, but also technologically advanced and adapted for use in local settings (Economist 2011).
- *Medicines*: many chronic conditions conditions (and indeed many infectious diseases) can today be managed well with relatively affordable generic medicines. However, in much of Africa, there are still major barriers to access, caused by inefficient supply chains and by complex national regulations that are not yet harmonized with each other. These issues have been recently evaluated and a set of recommendations developed in Galambos and Sturchio (2013).

3.3 Financial Resourcing and Sustainability Challenges

The financial resources dedicated to the health sector in SSA (public and private, preventative and curative) have been and still are very low. They are in the same order of magnitude as in India, but represent only 2% of what is spent on health per capita in the OECD countries. In 2005 health expenditures per capita were at low US$ 59.7 in sub-Saharan African countries, compared to US$ 709.1 worldwide (8.33%). Till 2012 they have grown to US$ 96.2, representing a growth rate of 61.1% (Fig. 3).

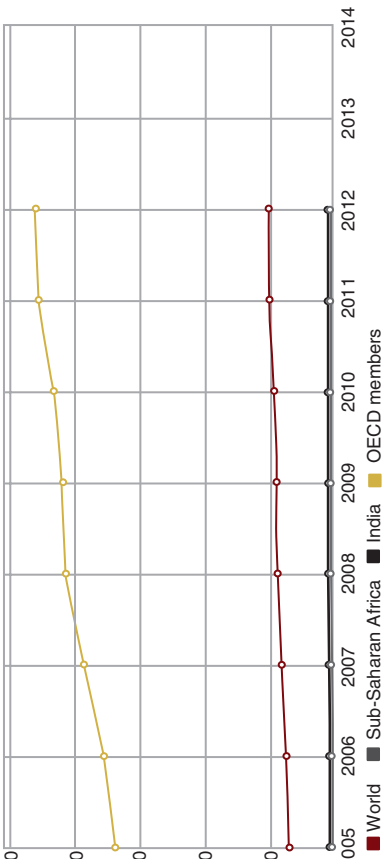

Fig. 3 Health expenditure per Capita (current US$) (Source: World Health Organization National Health Account database, World Development Indicators) (See http://apps.who.int/nha/database (accessed 25 June 2016) for the most recent updates)

Total health expenditure is the sum of public and private health expenditures as a ratio of total population. It covers the provision of health services (preventive and curative), family planning activities, nutrition activities, and emergency aid designated for health but does not include provision of water and sanitation. Data is in current U.S. dollars.

Data of 2013 show that 44% comes from public sources. In about half of African countries, 40% or more of the total health expenditure is constituted of household out of pocket payments, which is the most regressive way of funding health care. The reliance on this payment mechanism creates financial barriers to access to health services and puts people at the risk of impoverishment (WHO 2013).

The funding of the health sector is lagging behind the promises made by the African Union countries in 2001.

In that year, 53 of the African Union countries, during a meeting in Abuja, Nigeria, pledged to increase government funding for health to at least 15% and urged donor countries to scale up support. Ten years later only one African country had reached this target. Overall, 26 have increased the proportion of government expenditures allocated to health and 11 have reduced it since 2001. In the other 9, there was no obvious trend up or down (WHO 2011b). At the same time a substantive number of African countries continue to significantly depend upon external (international) sources to finance their health sector (World Bank data 2012, see Table 1).

A major challenge is the long "payback time" of many chronic diseases. Investments in primary prevention pay back financially in decades, investments in secondary prevention in years. It is possible to develop lower-cost, high-quality delivery systems to meet this challenge, and indeed this is already happening in many countries, in particular India. The Naryana Cardiac Clinics for example, established in 2001, have become Asia's largest cardiac care center with hospitals and outpatient facilities in 17 cities in India. Their focus on high volumes, high throughput, and "lean" processes has allowed them to deliver more affordable cardiac surgery at a fraction of the cost in the West with outcomes that are global best practice: their mortality rate of 2% and hospital-acquired infection rate of 2.8% per 1000 intensive care unit days are comparable with the best hospitals in the world. This focus, along with a tiered pricing model, allows them to serve all income levels and not turn anyone away because of his or her inability to pay (see case study, Reform UK 2014). Naturally economic sustainability can also be helped by focusing more on diseases that primarily affect working-age and income-earning populations (e.g., diabetes rather than dementia), but policy-makers must also address the issues of equity across generations and socioeconomic classes.

3.4 Prevention and Health Promotion

While prevention is almost always seen as superior to treatment, SSA faces some real challenges in this area. As shown by the figures above, the burden of chronic disease is already high and many people already need care, not just prevention. In

Table 1 External sources as a share of total health expenditures for African Countries (2001, 2005, 2010)

Year	Less than 20%	20–40%	Over 40%
2001	South Africa, Botswana, Mauritius, Swaziland, Gabon, DRC, Namibia, Congo Seychelles, Côte d'Ivoire, Cameroon, Sierra Leone, Nigeria, Lesotho, Togo, Angola, Guinea, Burkina Faso, Zambia, Kenya, Liberia, Cape Verde, Central African Republic, Senegal, Burundi, Benin, Ghana, Mali, Tanzania, Mauritania, Gambia	Ethiopia, Guinea-Bissau, ComorosMozambique, Chad, Niger, Uganda, Madagascar, Eritrea, Rwanda	Sao Tome and Principe, Malawi
	(31 Countries)	**(10 Countries)**	**(2 Countries)**
2005	South Africa, Mauritius, Gabon, Seychelles, Swaziland, Nigeria Botswana, Côte d'Ivoire, Cameroon, Guinea, Angola, Congo, Sierra LeoneCentral African Republic, Guinea-Bissau, Mali, Chad, Namibia, Lesotho, Senegal Mauritania, Cape Verde, DRC, Togo	Benin, Kenya, Ghana, Comoros, Uganda, Sao Tome and Principe, Burundi, Niger, Tanzania, Burkina Faso, Ethiopia, Madagascar	Zambia, Liberia, Mozambique, Gambia Rwanda, Malawi, Eritrea
	(24 Countries)	**(12 Countries)**	**(7 Countries)**
2010	Mauritius, South Africa, Gabon, Angola, Congo, Seychelles, Chad Madagascar, Nigeria, Côte d'Ivoire, Mauritania, Guinea, Cape Verde, Cameroon, Central African Republic, Togo Ghana, Swaziland, Botswana, Senegal, Namibia, Comoros, Lesotho	Sierra Leone, Sao Tome and Principe, Burkina Faso, Guinea-Bissau, Mozambique, Uganda, Mali, Niger DRC, Benin, Kenya Eritrea, Zambia, Ethiopia	Gambia, Burundi, Rwanda, Tanzania, Liberia, Malawi
	(23 Countries)	**(14 Countries)**	**(6 Countries)**

Source: World Health Organization. Regional Office for Africa, State of health financing in the African Region, January 2013

addition, prevention and health promotion for metabolic and cardiovascular conditions depend to a large extent on individual and population behavior modification, and the interventions that support these are complex and often require coordination across multiple government agencies. For example:

- Developing integrated transport and urban design policies that favor activity and exercise;
- Developing food supply and nutrition policies that support healthy eating;
- Determining the balance of individual freedom and business freedom vs. population health priorities.

Perhaps the biggest opportunity is in tobacco control. Smoking rates are relatively low in SSA, and if governments can keep citizens from starting to smoke, the health

and economic payoff will be huge. The WHO's Framework Convention for Tobacco Control and associated guidelines for tobacco control are relevant here, as is the experience of countries that have successfully reduced tobacco use, such as Brazil.

Box 1: Country Example: Ghana

Ghana, like many other low and middle income countries, has gone through a transition in which the major cause of death has shifted away from predominantly communicable diseases to a combination of communicable and non-communicable diseases (NCDs). The WHO (2014) estimates that 42% of all deaths in Ghana can be accounted to NCDs. In 2012 NCDs killed roughly 84,000 people. The leading cause for NCD death is cardiovascular diseases, which account for 18% of all death or 37,800 persons. However, contrary to widespread beliefs, not only older generations are affected. The probability of dying between the exact ages of 30 and 70 from any cardiovascular disease, cancer, diabetes, or chronic respiratory diseases amounts to 20% (WHO 2014). The increase in the NCD burden is on the one hand related to the achievement of population ageing and on the other hand to modifiable risk factors of which many are linked to rapid urbanization and unhealthy lifestyles. Ghana's NCD burden is expected to further increase due to the continued development of the aforementioned factors.

In August 2012 the Ministry of Health published the "National Policy for the Prevention and Control of Chronic Non-Communicable Diseases in Ghana". This policy defines the broad path which Ghana wants to follow in order to prevent and control NCDs. In line with the WHO, the country's NCD policy focuses on cardiovascular diseases, diabetes, cancers, and chronic respiratory diseases (Ghana Ministry of Health 2012). These four NCDs share risk factors and therefore allow for a coordinated approach. To tackle these four NCDs the policy defines five strategic areas, namely: primary prevention, early detection and clinical care, strengthening of the health system, research and development, and the surveillance of NCDs and their respective risk factors.

One of the most recent and most prominent initiatives launched was the "Ghana Access and Affordability Program" (GAAP). The GAAP is a public/private partnership which aims to provide safe and affordable medicine for the treatment of NCDs. Ghana is one of three countries that have been selected to pilot this program (Ghana News Agency 2014).

The national policy outlines an ambitious strategic plan. First steps into the right direction have already been taken and measures have been implemented. Nevertheless, Ghana is still showing deficits in certain areas, for example the failure to put a NCD surveillance and monitoring system in place (WHO 2014). Such a system would allow the country to report results against the nine global NCD targets defined by the WHO. Furthermore, it would provide higher transparency to the decision makers and other countries keen to learn from Ghana's experiences.

4 Outlook

4.1 The International Framework

Four global frameworks will impact upon the development of the health agenda of the sub-Saharan African Countries:

1. The Millennium Development Goals (MDGs) 2000–2015, adopted at the Millennium Summit of the United Nations in 2000;
2. Report of the UN High Level Panel to strengthen national and international systems to prevent and manage future health crises such as the Ebola crisis (2015);
3. The WHO Global Action Plan for the Prevention and Control of NCDs 2013–2020, adopted by the World Health Assembly in 2013;
4. The Sustainable Development Goals, proposed to replace the MDGs and adopted by the United Nations in September 2015.

The MDGs and the "Ebola-Report" will continue to influence national and regional responses to infectious diseases, particularly to Malaria, TB and HIV/AIDs, as well as to health crises caused by infectious diseases.

The latest report on the achievement of the MDGs concludes that the lives of an estimated three million children under age five were saved from malaria due to coordinated interventions in sub-Saharan Africa between 2000 and 2012. The report says that SSA is on its way to halting the spread of and reversing the incidence of tuberculosis. The incidence of new HIV cases in the region fell by more than half between 2001 and 2012. SSA has the second highest rate of access to treatment for HIV/AIDS, with 63 per cent of people living with HIV receiving antiretroviral therapy in 2012. However, sub-Saharan Africa remains most severely affected by HIV. Seventy percent of the estimated number of new infections in 2012–1.6 million cases – occurred in the region.

Most importantly, the MDGs have had a major impact on the social determinants of health in SSA. From 1981 to 1999, extreme poverty in sub-Saharan Africa rose from 52% of the population to 58%. But since the launch of the MDGs, it has declined sharply, to 48% in 2008. Much of this was likely driven by MDG-backed investments in healthier and better-educated work forces in the region (McArthur 2013). Finally, the report concluded that the SSA region will not meet most of its goals by their 2015 target date.

The countries of the African Union decided therefore in 2014 on a Common African Position (CAP) on the Post-2015 Development Agenda (African Union 2014). Concerning the health agenda they committed themselves to continue their efforts *"in reducing the incidence of communicable diseases, non-communicable diseases (e.g. mental health) and emerging diseases; ending the epidemics of HIV and AIDS, tuberculosis and malaria; reducing malnutrition; and improving hygiene and sanitation. This can be achieved by: ensuring universal and equitable access to quality healthcare, including access to comprehensive sexual reproductive health and reproductive rights(e.g. family planning), improving health systems and health*

financing and medical infrastructure, the local manufacturing of health equipment (e.g. commitment to the Abuja Declaration); and setting up monitoring and evaluation, and quality assurance systems."

The Millennium Development Goals have mobilized governments and the business sector to donate tens of billions of US$. Not so the WHO Global Action Plan for the Prevention and Control of NCDs 2013–2020. It is a non-binding set of recommendations to the member states of the WHO aiming to reduce the number of premature deaths from NCDs by 25% by 2025 through nine voluntary global targets. The nine targets focus in part on addressing factors such as tobacco use, harmful use of alcohol, unhealthy diet, and physical inactivity that increase people's risk of developing these diseases. The plan offers a menu of "best buy" or cost-effective, high-impact interventions for meeting the nine voluntary global targets. These include banning all forms of tobacco and alcohol advertising, replacing trans fats with polyunsaturated fats, promoting and protecting breastfeeding, and preventing cervical cancer through screening.

Given the non-compulsory nature of the action plan, special efforts are needed to raise awareness on the NCDs and scale up efforts to address NCDs in the different countries. Supranational coalitions, such as the East African NCD Alliance Post-2015 Initiative, have been formed to convince governments and civil society of the urgent need for action locally and internationally (The East Africa NCD Alliance Initiative, 2014). They also advocate for the inclusion of a health specific target in the Agenda of the Sustainable Development Goals.

4.2 Integrated Approaches to Address the Double Burden of Disease

By now, many SSA countries have recognized NCDs as a national health and development priority and have started formulating national NCD plans (see Box 1, Country Example Ghana). A particular problem remains often unresolved, however: namely how to gear up to the challenge of non-communicable diseases in a way that avoids creating new vertical programs in competition for scarce resources.

Much focus has been given in the past years to identify the most cost-effective intervention for a specific disease and multi-sectoral approaches have not yet been developed. Marquez and Farrington (Marquez and Farrington, 2012) have proposed a 3-line approach to overcome silo thinking and acting within SSA countries:

(a) Capitalize on the links between communicable and non-communicable diseases and the underlying social conditions. People diagnosed with HIV/AIDS can be screened for hypertension and diabetes; immunization programs can be expanded to include not only vaccine preventable diseases, but also HPV vaccines to protect against cervical cancer;

(b) Focus on common care needs rather than disease categories. Care models for HIV/AIDS and tuberculosis can be extended and adapted to chronic conditions and comorbidities. Projects to integrate and improve quality of care for chronic conditions such as HIV, hypertension, and diabetes are already underway in Uganda, Tanzania, and South Africa.
(c) Capitalize on existing resources and capabilities. The case has been made for reshaping primary healthcare as part of a continuum of care involving coordinated primary, secondary, and tertiary care as well as the community with patients at the center.

International support is still too often disease specific and will continue to be so. Countries therefore have to negotiate collaborations between "silos" and integrate the different international support chains nationally.

A final challenge to be addressed is how to engage with the private sector entities without getting trapped in major conflicts of interest. In the 1980s, multi-sectoral collaboration for health meant creating productive working relationships with sectors such as education, housing, nutrition, water supply and sanitation, and particularly meant productive collaboration with other governmental sectors. Today and in the years to come multi-sectoral collaboration consists of offering people the opportunity to adopt a healthy lifestyle and live in an environment preventing them from developing NCDs. This approach could go against the interests of whole business sectors. The WHO has developed guidelines and strategies on how to engage with private sector entities that should allow for a transparent and productive collaboration, which would reduce the risk of a conflict of interest. The reality check of how well they will function in the context of SSA countries is, however, still outstanding.

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New and Re-Emerging Infectious Diseases in Sub-Saharan Africa

Alan Whiteside and Nick Zebryk

1 Introduction

The great Roman philosopher Pliny the Elder famously wrote *ex Africa semper aliquid novi* [always something new out of Africa]. This quote referred to the variety of wildlife and the seemingly infinite abundance of natural resources which amazed the Romans. However, the quote could be equally applied to the proliferation and spread of infectious diseases. The two most serious epidemics of recent times emerged from African tropical forests, namely AIDS and Ebola. Every region of the world has to deal with the threat and impact of disease, but Africa has been disproportionately impacted.

Infectious diseases play a critical role with respect to demographic trends in sub-Saharan Africa. Higher mortality rates for the working-age population can create scenarios where dependency ratios are adversely impacted. In order for the continent to move forward and claim a demographic dividend, it is crucial that the impact of infectious diseases is understood and addressed.

The demographic dividend is defined by the United Nations Population Fund (UNFPA) as "the economic growth potential that can result from shifts in a population's age structure, mainly when the share of the working-age population (15–64) is larger than the non-working-age share of the population (14 and younger, and 65 and older)" (UNFPA 2015). We argue that this was under threat in parts of Africa due to the AIDS epidemic, which primarily killed young adults. Malaria mortality is found more among children while TB is closely related to AIDS. Treatment for AIDS and TB has been a game changer, and with the proper drugs people can expect to live close to normal lives. However, while demographic impacts can be prevented or at least delayed, it is at a price.

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This chapter looks specifically at three existing diseases: malaria, AIDS, and tuberculosis and one new one Ebola. It addresses also the likelihood of new diseases emerging.

2 Global Health and Africa

In the past half century, the global health landscape has changed markedly for the better and will continue to do so. People are living longer, healthier lives, and indicators of infant, child, and maternal mortality show steady improvement. In their call for the new Sustainable Health Goal[1] to have measurable targets, Norheim and colleagues noted: 'Throughout the world, except in countries where the effects of HIV or political disturbances predominated, mortality decreased substantially from 1970–2010, particularly in childhood' (Norheim et al. 2015).

Sub-Saharan Africa is the region with the youngest and most rapidly growing population (IHME 2010). The United Nations Children's Fund (UNICEF) estimates that within 35 years, one in every four people will be African—in 1950 only nine in 100 were. By 2050, around 41% of the world's births, 40% of under-fives, and 37% of children under 18 will be African (You et al. 2014). The growth of the youthful population threatens to outpace economic development, placing a strain on institutional capacities and the delivery of social services. On the other hand, it means that there is an opportunity for a demographic dividend, as discussed elsewhere in this book. Additionally, and for some time, Africa will not see the same burden of non-communicable diseases (NCDs), resulting from an aging population, as the rest of the world is facing.

Despite these gains, the continent faces serious challenges from infectious diseases. This is put into context in Table 1, which shows the changing Burden of Disease data globally and for sub-Saharan Africa (SSA), from 1990 to 2013. Globally the main cause of loss of disability-adjusted life years (DALYs) is heart disease, which is an NCD. If we were to look at developed countries (not shown), their major burden comes from NCDs, in particular heart disease, stroke, and other lifestyle related illnesses. These are increasing in importance but only sickle cell disease makes it into the top ten ranking in SSA (stroke is number 19 and heart disease number 17 in the 2013 ranking).

[1] The Sustainable Development Goals (SDGs) will replace the Millennium Development Goals that ran from 2000 to 2015.

Table 1 Global disability-adjusted life years (DALYs)[a], top 10 causes global and Sub-Saharan Africa

	Global			Sub-Saharan Africa		
Rank	1990	2013	% change	1990	2013	% change
1	Lower respiratory infections	Ischemic heart disease	30	Diarrheal disease	**Malaria**	−7
2	Diarrheal disease	Lower respiratory infections	−44	Lower respiratory infections	**HIV/AIDS**	483
3	Neonatal preterm birth	Diarrheal disease	−58	**Malaria**	Lower respiratory infections	−22
4	Ischemic heart disease	Low Back Pain	63	Measles	Diarrheal disease	−48
5	Neonatal encephalopathy	COPD	21	Protein-energy malnutrition	Neonatal preterm birth	−6
6	**Tuberculosis**	Neonatal preterm birth	−47	Neonatal preterm birth	Protein-energy malnutrition	−22
7	**Malaria**	**Malaria**	1	Neonatal encephalopathy	Neonatal encephalopathy	−3
8	COPD	Hemorrhagic stroke	22	**Tuberculosis**	**Tuberculosis**	−8
9	Hemorrhagic stroke	**HIV/AIDS**	370	Neonatal sepsis	Neonatal sepsis	30
10	Iron-deficiency anemia	Neonatal encephalopathy	−22	Other neonatal	Sickle cell	40

Source: IHME (2016)

[a]DALYs stand for disability-adjusted life years and are a metric for quantifying the burden of disease from mortality and morbidity. One DALY can be thought of as one lost year of healthy life

3 Communicable Diseases

Malaria and AIDS are the communicable diseases that head the latest DALY table for SSA. TB has remained consistently at number eight on the African ranking. These diseases spread most easily where there are weak health systems and poor infrastructure. However, all can be brought under control. Interventions such as spraying and (often impregnated) bed nets reduce the incidence of malaria. The development and distribution of anti-retroviral therapy means symptomatic AIDS illness can be suppressed. TB can be cured (WHO 2010). The game changer for all these diseases would be the development of effective (or for TB, more effective) vaccines (PATH 2015).

Lower respiratory infections and diarrheal disease account for significant health loss in SSA, although their relative disease burdens are lower than 20 years ago. The expected improvement in living conditions and wealth will reduce incidence of diarrhea (e.g., clean water and hygiene) and respiratory infections (e.g., not using wood, coal, or paraffin for cooking and having better ventilated housing – the ventilation will also cut transmission of TB). Improvements in access to health care will reduce infant, child, and maternal mortality. Deaths from measles have fallen out of the top ten diseases. The 2015 Bill and Melinda Gates' Foundation letter reflected the optimistic view that polio would be eradicated in Africa in 2015 (this seems to be the case in 2016), and Guinea worm, elephantiasis, river blindness, and blinding trachoma will be controlled and eliminated (Gates and Gates 2015).

3.1 Malaria

Malaria is vector-borne disease caused by *plasmodium* parasites, transmitted to humans through the bites of infected female *anopheles* mosquitoes. The WHO estimates that 3.2 billion people in 96 countries are at risk of malaria infection (1.2 billion are at high risk). In 2013, over 198 million cases of malaria occurred globally, leading to approximately 584,000 deaths. The disease occurs disproportionately in Africa as Fig. 1 shows. The continent accounts for 90% of deaths, of which 78% are children under the age of 5 (WHO 2014b). Within endemic countries, the poorest and most marginalized communities are those most severely impacted by malaria, and are least likely to have access to services for prevention, diagnosis, and treatment.

The likelihood of transmission depends on factors related to the parasite, the vector (mosquito), the human host, and the environment. Mosquitoes breed in standing water and so transmission patterns are highly dependent on climate, particularly rainfall patterns, temperature, and humidity. The African vector species has shown a particularly long lifespan and higher tendency towards biting humans, a reason why the disease is rampant throughout the continent. People who move into areas

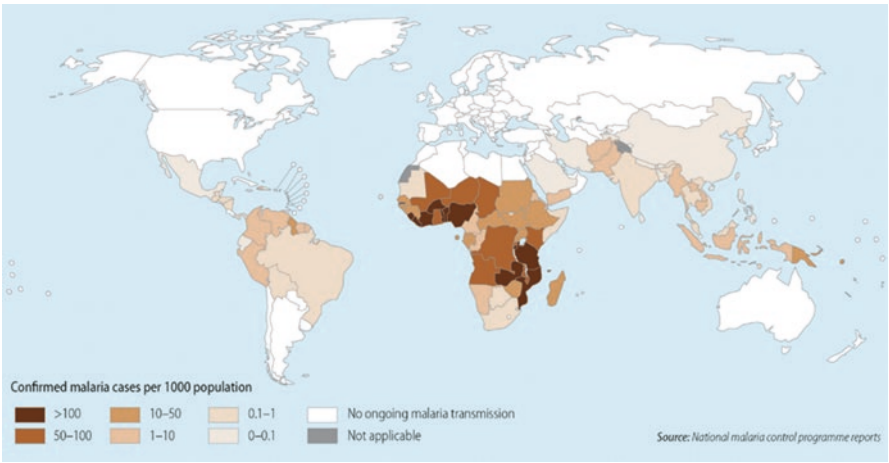

Fig. 1 Countries with ongoing malaria transmission 2014 (Source: WHO 2014b)

with high malarial transmission include migrant workers and refugees; infants and children are particularly susceptible as their immunity is low.

Unlike some other infectious diseases there are highly efficient and cost-effective interventions available. The main ones are vector control and protection. This involves managing the environment to reduce the places in which mosquitoes can breed, and using indoor residual spraying (IRS) and insecticide-treated mosquito nets (ITNs). The WHO estimates that ITNs reduce the incidence of malaria by over 50% (similar results have been documented via the use of IRS, however randomized trial data is limited) (WHO 2014b). Current treatments for malaria are effective and therefore good case management, accurate diagnosis, and the treatment of infections are crucial. The fact that malaria is still so serious in Africa is an indictment of poor health systems and a lack of political will.

The international community has implemented a strong, coordinated response to the malaria epidemic, highlighted by the creation of the Roll Back Malaria (RBM) partnership launched in 1998 by the WHO, UNICEF, UNDP, and the World Bank. The RBM Partnership, hosted by the WHO in Geneva, is a global framework of more than 500 partners. The WHO is planning a strategy for 2016–2030 with the aim of "a world free of malaria" (WHO 2014b). The Gates Letter predicts: 'We won't be able to completely eradicate malaria by 2030, but we will have all the tools we need to do so. These will include a vaccine that prevents people being infected with malaria… In 15 years; we'll be poised to send malaria the way of smallpox and polio' (Gates and Gates 2015).

3.2 HIV and AIDS

The human immunodeficiency virus (HIV) is a retrovirus that destroys the cells of the immune system. As the infection progresses, the immune system becomes weaker and the person is susceptible to opportunistic infections. Incidents of illness increase in frequency, duration, and severity. This can take 10–15 years, during which time the person is infected and can transmit HIV. The most advanced stage of HIV infection is acquired immunodeficiency syndrome (AIDS). If the individual is not put on treatment they will die.

The first cases were identified in 1981 among gay men in the United States. HIV was isolated and recognized as the cause of AIDS in French laboratories in 1983. The virus originated in non-human primates in Africa and was transferred to humans in the early twentieth century. The HIV-1 strain of the virus was transmitted from chimpanzees in Central Africa, while at around the same time the less virulent HIV-2 strain crossed the species barrier from sooty mangabey monkeys in West Africa. The mode of transmission is unknown. Speculation is that either hunters or people butchering the animals were first infected.

Spread occurred beyond the primary cases. HIV moved slowly out from initial infections in a core area until it reached populations where conditions were ripe for rapid transmission. This, in Western societies, was among relatively affluent gay men and intravenous drug users. In sub-Saharan Africa, it occurred in unstable central African regions, particularly the border between Uganda and Tanzania.

HIV is most efficiently transmitted through the transfusion of infected blood, but blood and blood products are now screened. The sharing of contaminated needles is the second most effective route of transmission. This can happen in health care settings (nosocomial infections), but is most common among injecting drug users. Simple measures of sterilization can reduce this, as well as providing clean needles in clinics and hospitals and to addicts.

Being HIV positive reduces the chance of a woman falling pregnant (by about 30%), carrying the fetus to term, and delivering (Chen and Walker 2010). HIV infected women experience higher maternal mortality. Even if a woman is on treatment, she is less likely to conceive, or complete the pregnancy, and still faces a higher (albeit reduced) risk of death. An infected mother can pass HIV to her child during pregnancy, childbirth, and breastfeeding. Use of anti- retroviral drugs reduces this risk from about 30% to less than 5%. The current advice is that HIV positive pregnant women remain on treatment for the rest of their lives. Infected children fail to thrive and, in the absence of treatment, most die before their fifth birthdays. Even if children are not infected, infant and child mortality rates are slightly higher among those born to infected mothers.

Globally, over 36.9 million people are living with HIV and 1.2 million die annually (UNAIDS 2015). The worst affected continent is Africa, but it is not a homogeneous epidemic. In much of North and West Africa, prevalence levels among adults (aged 15–49) are low (below 2%) and the disease is concentrated among specific populations. Many Southern African countries are experiencing hyper-endemics

Table 2 AIDS and key indicators for selected African countries

Country	HIV revalence	Life expectancy					Infant mortality rate		
	2014	1995	2000	2005	2010	2013	1995	2005	2015
Botswana	25.2	56.2	48.7	54.6	63.4	64.4	48.9	44.8	34.8
Ethiopia	1.2	49.3	51.9	56.2	61.3	63.4	105.6	69.6	41.4
Kenya	5.3	54.5	50.8	53.5	58.7	61.0	71.9	54.3	35.5
Lesotho	23.4	56.8	47.2	43.7	47.5	49.3	76.6	88.1	69.2
Malawi	10.0	43.5	44.1	48.3	56.8	61.5	121.9	70.7	43.4
Mozambique	10.6	45.9	48.7	50.6	53.2	54.6	143.4	90.4	56.7
Nigeria	3.2	46.1	46.6	48.7	51.3	52.4	123.4	96.6	69.4
Rwanda	2.8	31.6	48.2	54.8	61.4	63.4	129.6	70.2	31.1
South Africa	18.9	61.4	55.8	51.6	54.4	56.7	48.2	51.5	33.6
Swaziland	27.7	56.4	48.7	45.9	48.3	48.9	68.7	83.0	44.5
Tanzania	5.3	48.7	50.5	55.6	61.6	64.3	95.8	58.7	35.2
Uganda	7.3	43.8	46.4	51.8	55.8	57.8	101.0	67.6	37.7
Zambia	12.4	42.0	43.5	49.4	56.4	59.2	107.8	68.7	43.3
Zimbabwe	16.7	50.2	41.7	41.8	49.6	55.6	60.1	61.0	46.6

Source: World Bank (2015)

where prevalence levels are above 15% and have remained at this level for long periods.

The AIDS epidemic in the worst affected countries has an impact on mortality levels, labor force participation and employment, food security, and life expectancy (AVERT 2014a). The effect of the disease on key indicators is shown in Table 2.

AIDS can be effectively controlled via the use of antiretroviral therapy (ART). ART consists of the combination of antiretroviral (ARV) drugs to suppress the progression of the virus. ART is effective in reducing viral load and hence prolonging life, reducing mortality rates, and increasing birth rates.

Scientific advances mean ART can be taken as one pill, once a day and different combinations are available if a patient develops resistance to some drugs. The cost of ART has plummeted dramatically, falling, at its lowest level, to US$115 per person per year in 2013 for first-line ART therapy (AVERT 2014b). The numbers on treatment rose and at the end of 2015, it was between 14.9 and 15.8 million globally. The challenge is to reduce new infections and get people on treatment, and both are happening. Provided people can access treatment and are adherent, the burden of AIDS will continue to decrease. People on treatment are much less infectious, and so the number of new cases falls and treatment becomes prevention.

Improvements in ART quality and availability mean people infected with HIV can now live almost normal lives. This also means that the number of people living with HIV is going to increase. One of the most crucial ways of combatting the epidemic will be to maintain a reduction in the number of new infections. In this sense, we are on the right track as new infections have fallen by 35% since 2000, from 3.1 million people in 2000 to 2 million in 2014 (UNAIDS 2015).

Unfortunately, many African countries are dependent on donor funding to provide treatment and related services. This means that the sustainability of treatment is threatened. An analysis by Resch, Ryckman, and Hecht looking at 12 African countries found under their 'maximum effort scenario', across the countries "total average annual government expenditure on AIDS would increase by 2·5 times, reaching $5·1 billion, which is sufficient to cover 64% of total AIDS financial needs' and "although upper-middle-income countries, such as Botswana, Namibia, and South Africa, would become financially self-reliant, lower-income countries, such as Mozambique and Ethiopia, would remain heavily dependent on donor funds" (Resch et al. 2015).

3.3 Tuberculosis

Tuberculosis (TB) is an infectious bacterial disease commonly affecting the lungs. Coughing, sneezing or spitting can help facilitate the transfer of *mycobacterium tuberculosis* from person to person. It no longer appears in the list of the top ten causes of Global DALYs, largely because it is so linked to AIDS. TB is an AIDS related opportunistic infection and may not be recorded separately. In 2013, nine million people developed TB and over 1.5 million died, of which 300,000 were HIV+ (WHO 2014c). TB accounts for 25% of all HIV-related deaths.

The WHO estimates that about one-third of the world's population has latent TB. These people have the TB bacteria, but are not ill, and do not infect others. On average the lifetime risk of an infected person falling ill with TB is around 10%, however this number is significantly higher for certain groups. HIV+ people are over 26% more likely to develop TB (WHO 2014d). Children and people in low- and lower-middle income countries face a heightened risk of falling ill. Africa has the greatest proportion of new TB cases with 280 falling ill per 100,000 in 2013. In North America, the rate is only 3–4 people per 100,000 annually (WHO 2014d; World Bank 2015).

TB is treatable and curable, generally with four antimicrobial drugs over a 6 month period. Over 30 million lives were saved through effective diagnosis and treatment between 2000 and 2013. Without proper supervision and technical support, adherence to the treatment can be difficult. There is also a growing concern about multidrug-resistant tuberculosis (MDR-TB), i.e., bacteria that do not respond to the most common, first-line drugs. This may be caused by ineffective treatment, either via incorrect use or low quality TB drugs and non-adherence to treatment. MDR-TB is more complex to treat, with lower cure rates, and the costs are 100 times greater than normal TB (WHO 2014e).

Preventing TB involves inoculation and public health interventions. Currently, the only available vaccine *bacillus Calmette-Guérin* (BCG) reduces the risk of getting infected by 20% and the risk of infection turning into disease by nearly 60%. It is given to children in much of the resource-poor world, but is no longer routinely used in the rich world. Intense efforts to develop new vaccines are underway. TB is

closely linked to poverty, crowding, and lack of properly ventilated accommodation. This means that public health and development interventions are critical.

Further research and development for new TB drugs is essential. Other areas for research include improving adherence to the drug regimen, which will address the danger of MDR-TB, and better diagnostics. However, the majority of global funding for TB is put into drug production and preventative vaccines, making new cures difficult to come by (Moran et al. 2013). Internationally, the Global Fund to Fight AIDS, Tuberculosis, and Malaria, provides over 80% of all support to fight TB. This has created a concern about financial dependence.

4 Emerging Diseases

One of the goals of this chapter is to speculate on the likely burden of disease up to 2050. Obviously, we cannot know what new diseases may emerge. However, we envisage that they will be zoonotic, crossing the species barrier from vertebrate animals to humans, as seen with new strains of influenza, severe acute respiratory syndrome (SARS)[2] or Middle East respiratory syndrome (MERS)[3]. Zoonoses are of concern because they are often unrecognized and may have increased virulence in human populations (Quammen 2012). The host reservoir may be difficult to identify, monitor, and control, making the prediction and prevention of outbreaks problematic. Globalization and global travel facilitate the rapid spread of such diseases.

Africa is a likely source of new diseases, and it is probable that most new illnesses will be viral hemorrhagic fevers (VHFs). Rapid economic development and population growth result in exploitation of formerly untouched natural resources and increasing contact between humans and wildlife. The potential for emergence of new diseases is increased. Subsequent urbanization, mobility, and increased human proximity create ideal conditions for diseases to spread widely and rapidly.

The key global health response must be to contain outbreaks locally and then regionally. This was well illustrated by the reaction to the 2014 Ebola epidemic. The first stage was to understand the disease: transmission and epidemiology. The second stage was to put in place the public health measures needed to stop transmission. While new diseases will emerge, experience and scientific advances, especially with AIDS and Ebola, mean that we can expect that they will be contained relatively quickly. It is unlikely that new emerging diseases will have a significant impact on African population dynamics although there are serious economic and social consequences. Compared to HIV, new epidemics may be quick to spread, but they can also be quick to control.

[2] SARS is a viral respiratory disease of zoonotic origin caused by the SARS coronavirus (SARS-CoV). Between November 2002 and July 2003, it originated in the livestock markets of southern China, causing about 8000 deaths.

[3] MERS is viral respiratory illness first reported in Saudi Arabia in 2012. It is also zoonotic and, as with Ebola, fruit bats were believed to be the reservoir.

The emergence of the 2015 Zika virus epidemic in Brazil took the global community by surprise, and is another example of the risks of a zoonotic disease. Zika was first identified in Uganda in 1947 in rhesus monkeys through a monitoring network of sylvatic yellow fever. It was subsequently identified in humans in Uganda and the United Republic of Tanzania in 1952.

It is spread to people through the bite of an infected *Aedes* mosquito. The symptoms of the virus include mild fever, skin rashes, conjunctivitis, muscle and joint pain, and malaise or headache, lasting for 2–7 days. These relatively minor symptoms make it hard to determine exactly how many people have been infected with the virus. Despite the fact that Zika itself is very rarely fatal, there has been growing concern that the virus can cause serious birth defects, primarily microcephaly. Brazilian health authorities also observed an increase in Guillain-Barré syndrome, which coincided with Zika virus infections in the general public. These concerns culminated in the WHO declaring, in February 2016, Zika "a Public Health Emergency of International Concern" (WHO 2016). This swift response may have been prompted by the failures of the WHO in responding to the 2014 Ebola outbreak.

4.1 Ebola

The first recorded outbreak of the acute and deadly infectious disease caused by the Ebola virus was in Southern Sudan in June 1976, where 284 people were infected, and over 50% died. A few months later, there was a second occurrence in Zaire (today the Democratic Republic of the Congo). This time, almost 90% of the 318 infected persons died. During this outbreak, Ebola was identified as a hemorrhagic fever. The disease was named after a river in the Northern area of DRC (CDC 2014). Over the next 30 years, there were sporadic, isolated outbreaks of Ebola in a number of Central African countries. All were either contained, or petered out.

Ebola is a zoonotic infection. The animal reservoir is believed to be bats. The incubation period in humans is 2–21 days. People are not infectious until they develop symptoms. Initial indications include fever, fatigue, muscle pain, headache, and a sore throat, followed by vomiting, diarrhea, rash, organ failure, and internal and external bleeding. Victims remain infectious even after death, as their blood and body fluids still contain the virus. Human-to-human transmission occurs via direct contact with contaminated fluids (WHO 2014a).

In March 2014, cases of Ebola were reported from the West African country of Guinea. Within a few days, Sierra Leone and Liberia notified the WHO that they too were seeing patients. Shortly after, for the first time, Ebola was seen in a major urban area, Conakry, the capital of Guinea. By June 2014, there had been 337 deaths, making this outbreak the worst recorded, and the death toll continued to rise. By April 2016, just over 11,000 people had died (CDC 2016). Isolated cases occurred in a number of developed countries including the United States, Spain, and the United Kingdom. Almost all were health care workers returning (or evacuated) from epidemic areas.

At the time of writing, there is a sense that the current Ebola epidemic has been brought under control. On March 29, 2016, the WHO Emergency Committee on Ebola announced that, in their view, the Ebola situation in West Africa no longer constituted a Public Health Emergency of International Concern and that the Temporary Recommendations adopted in response should be terminated. However, there are still sporadic cases.

Ebola caught the attention of the global press and resulted in a massive mobilization, including support from the international community. It is not demographically significant, however, because the numbers of casualties are too small. Nonetheless, it has been extremely costly. A WHO document estimated that the sum of US$1536 million was needed to stop the outbreak, treat infected people, ensure essential services, preserve stability, and prevent outbreaks in countries as yet unaffected (WHO 2015a). As of May 2015, only US$482 million had been mobilized.

5 Mortality, Morbidity, and Socio-economic Impacts

There is much reason to be optimistic when looking at health prospects in SSA. To be sure, there are challenges but overall the burden of disease has decreased significantly. Norheim et al. note: "Except where HIV or war or other major political disturbances predominate, health and longevity are better now than they were 20, 40, or more years ago, and still improving …; a cost effective way to reduce premature death in many countries is to continue reducing child and maternal mortality, tuberculosis, HIV and malaria, partly because programs for these reductions that took years to establish are already in place and death rates are decreasing" (Norheim et al. 2015).

When AIDS first appeared there were dire predictions of hugely increased mortality, population declines, and possible socio-economic collapse. Demographers grappled with the implications and ran models to assess what might happen (Whiteside 1998). There was evidence of falling life expectancy and birth rates, changing population structures, and growing numbers of orphans. Rates of infection tended to be higher in urban areas, especially in the informal settlements or slums. What was and remains baffling is how little notice was taken of potential demographic impacts (Smith and Whiteside 2010; Whiteside 2006; de Waal 2006).

As policies and programs were put in place to combat the AIDS epidemic, the urgency seemed to diminish. However, innovative work by the RUSH Foundation is sounding warning bells (Collier et al. 2015; Atun et al. 2015; RUSH 2014). These studies looked at the moral and fiscal implications of ART and the concept of long term debt. It remains to be seen what action will be taken.

Ebola has been an additional wake-up call, but it seems that many of the previous arguments are being rehashed. An example is the issue of orphans – a major concern in the AIDS epidemic, but one where there was little action. Evans and Popova noted: "Every child who loses a parent experiences a tragedy. But many non-orphan children are experiencing significant income shocks due to the Ebola crisis, and

income differences can dwarf the differences between orphans and non-orphans. Thus, while it will be crucial to be mindful of the needs of orphans, broader attention to the needs of children in the wake of the Ebola crisis will be just as important for the long-term health and welfare of the affected countries" (Evans and Popova 2015). Still, there is no sign of action being taken.

As is reflected in other chapters in this book, sub-Saharan Africa faces unique challenges. While the region has made overall progress in reducing mortality and the burden of disease, different countries show increased instances of death within particular age groups and sexes. For example, between 1992 and 2012, Mozambique saw mortality rates among women aged 15 to 60 rising from 378 per 1000 people to 475 per 1000 people (World Bank 2014).

Much of the success is the result of the international rollout and commitment to immunization and prevention. As a result of immunization and other health care improvements (i.e., access to clean water, improved sanitation and hygiene, and educational programs), the number of deaths of children under the age of 5 fell from 9.6 million in 2000 to 7.6 million in 2010 (WHO 2012). The key will be to move toward what The Lancet describes as a health convergence where health in the poor countries gradually improves until it is similar to that in the wealthy world (Jamison et al. 2013).

6 Funding for Health

The key question is how the control of epidemics will be funded. Health funding is different in each country with a mixture of domestic resources; private financing, including insurance and out-of-pocket payments; and donor funding.

The diseases are expensive – Roll Back Malaria estimates that Africa needed US$2.2 billion in 2015 (Roll Back Malaria 2015). In 2013, global funding for the HIV and AIDS response was an estimated US$19.1 billion in low and middle-income countries. The need was, however, an estimated US$22–24 billion (AVERT 2015). The funding gap for TB is estimated at US$930 million in Africa (WHO 2015b). As mentioned, the price tag for the current Ebola outbreak was estimated at US$1536 million. Resources slated for Ebola is being reallocated to fight the Zika virus.

Money was raised rapidly from the international community for HIV and AIDS. In 2001, Kofi Annan, Secretary General of the United Nations, called for spending on HIV/AIDS to be increased tenfold in developing countries, and the Global Fund for AIDS, TB and Malaria (GFATM) was established. In 2003, President George W. Bush pledged US$15 billion toward the Presidential Emergency Program for AIDS Relief (PEPFAR), and WHO launched the "3 × 5" campaign to have three million people on treatment by 2005 (Whiteside and Lee 2005). The problem is that the existence of external resources means in many countries the bulk of epidemic funding comes from international sources, therefore creating an unhealthy situation of dependency.

Slow economic growth and the resulting fiscal cutbacks have left many sectors at a loss for funding. In spite of this, however, development assistance for health

(DAH) rose from 2012 to 2013 by 3.9%. We predict that DAH will remain steady or decline. There has been a push for countries in the developing world to increase their domestic funding for health. The Abuja Declaration in 2001 was an agreement by the Heads of State of African Union countries to increase government spending for health to at least 15% of their annual budget. However, only three countries have achieved their Abuja Declaration commitments thus far.

There are initiatives to increase domestic funding for health, including improving the efficiency of existing spending. The move to universal health coverage (UHC) will be significant. Malaria, HIV and AIDS, tuberculosis, and Ebola will require continuing international support in some countries. AIDS is too expensive to treat from domestic resources alone in some settings, and the withdrawal of international financing would mean people would die. However, the one constant with infectious diseases is that they can be prevented, and prevention costs less than cure. Africa's infectious disease burden can be managed.

7 Conclusions

Sub-Saharan Africa has a young and rapidly growing population. The region has seen significant health gains over the past 30 years. However, challenges still remain as a result of infectious diseases.

This chapter looked at a number of infectious diseases in Africa. Malaria, Tuberculosis, HIV and AIDS, and Ebola all may jeopardize efforts to capture a demographic dividend. High mortality and morbidity decrease the likelihood of a demographic dividend occurring, as dependency ratios worsen. As a result, increased focus must be placed on ways in which the diseases can be effectively combatted and mitigated. This includes finding sustainable funding from both domestic and international sources.

Demographic dividends can occur in Africa provided AIDS is treated. The other diseases are mainly felt in human misery rather than macroeconomic terms. Perhaps this should provide reason enough to intervene.

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Internal Migration, Urbanization and Slums in Sub-Saharan Africa

Blessing Mberu, Donatien Béguy, and Alex C. Ezeh

1 Introduction

Africa's migration system has been identified as dynamic and extremely complex and as other social processes, it is related to the complex multifaceted interactions and interconnections of structure, agency and consciousness (Adepoju 2008; Baker and Aina 1995). Despite increasing focus on the challenges of emigration and immigration within and across the continent, internal migration within countries is the dominant process in the spatial redistribution of the populations in the region. Research in sub-Saharan Africa (SSA) has identified all four conventional internal migration streams (rural-urban, rural, rural-rural, urban-rural, urban-rural and urban-urban)) and these have intensified since political independence across the region. In terms of the relative importance of the four conventional migration processes, available evidence identified the quantitative dominance of rural-rural migration in the region, which is linked to most people living in rural areas, the modernizing of rural economies and the economic opportunities rural areas present for employment in its modern developed nodes (UNDESA 2014; Oucho 1998). However, rural–urban movements, whether for circulation, temporary sojourns in towns, or permanent urban residence, have been seen as the most significant form of internal movement in SSA following its implications for long-term spatial population redistribution and the rapid and unmanageable growth of urban agglomerates (Chen et al. 1998; Oucho 1998; Oucho and Gould 1993; Zlotnik 1994). Further, persistent rural-urban migration in the context of declining economic performance of most African countries have been linked to the emergence of a new face of poverty, with a significant proportion of the urban population living below the poverty line in over-crowded slums and sprawling shanty towns around major cities in the region (UN-Habitat 2003, 2008, 2010).

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In this chapter, we present theoretical and empirical data on internal migration processes, urbanization and the growth of slums in SSA. The subsequent sections are presented in three sub-sections: the push-pull factors for rural-urban migration in the region; rapid urbanization and the emergence of Africa's mega-cities; and the emergence of slums, the challenge of data in the study of slums, and a case study of the slums of Nairobi, Kenya.

2 Push-Pull Factors for Internal Migration in Sub-Saharan Africa

Explanations of the determinants of internal migration invoke different sociological, economic, geographical, and regional science theories, primarily due to the multi-disciplinary nature of the subject. For SSA, there is a generalized conceptual model including exogenous, contextual and independent variables, which have been identified as major determinants of rural-urban migration in the region (Oucho 1998; 2006). These factors are discussed under the following sub-headings.

2.1 Historical, Economic and Political Context

Historically, the foundation laid by the colonial powers and maintained by multinational corporations in many African countries, ensured that investments in industry, commerce, administration, social amenities, post-primary educational and financial institutions, heavily concentrated in towns to the neglect of rural areas, are maintained. Urban areas continue to be 'islands of privilege' despite the sustained post-independence economic downturn experienced in many countries (Bocquier 2003, 2005; Cohen 2004). Objective indices of welfare confirm that real wages are higher in cities; that urban schools and health care are better than their rural counterparts; and those seeking enhanced social mobility continue to seek for such opportunities in cities (Lowry 1990). In fact, the increasing urbanization of poverty in the region (UN-Habitat 2003; APHRC 2002) is primarily linked to push factors in rural areas that continue to push people to urban destinations in search of a better life (Ezra 2001). There is considerable evidence to suggest that migration in the region is an intrinsic dimension of economic and social development, reflecting the rational decisions of millions of migrants to seek new opportunities away from local restrictive environments, especially from rural to urban destinations (Kessides 2006; Montgomery et al. 2003; White et al. 2008).

2.2 Regional and Community Contexts

Conditions operating below the national level – at regional and community levels have been identified as important determinants of rural-urban migration. These variables include regional and local labor markets, transport systems, community social amenities and institutional structures. Though there is a paucity of data at the community level in the region, available evidence suggests that migrants' linkages and networks have pervasive influence on rural-urban migration in the region. Social networks thrive partly at the household level and partly at the community level, with members of communities often pooling resources under Hometown Improvement Unions and Social Welfare Associations. Associations. This not only facilitates migrant to non-migrant linkages, and the development of areas of origin, but also enhances the migration of community members to particular destinations. Gugler and Flanagan (1978) confirmed that in West Africa, established social networks of some ethnic groups in urban areas and the prospect of superior income earning opportunities have encouraged out-migration for members of such groups. In the same token, Smith (2004) identified kinship networks, above all other factors, as the thread that links particular rural and urban communities in southeastern Nigeria, providing individuals and communities with access to resources and opportunities connected to the state and the wider economy.

2.3 Economic Factors

The most widely understood reason for migration is economic and in SSA, there is general consensus that improvement in economic circumstances is the primary motivation for internal migration (Adepoju 1977). There is wide consensus in the literature that people are attracted to cities because they generally offer more choices (such as good quality housing), opportunities (such as employment) and better services (such as education and health care) to the residents. We also find evidence that people move usually to primate cities as they tend to have more manufacturing and service industries with higher chances for employment opportunities compared to smaller towns. A study in South Africa found that the majority of migrants justified their migration on their need for employment (CoRMSA 2009). Similarly, a study in five Southern African countries, Botswana, Lesotho, Mozambique, Namibia and Zimbabwe, found employment or job search as the most cited reason by 29% of migrants, while 25% cited trade related reasons (McDonald 2000).

African migration is fundamentally a family affair, rather than an individual activity, and the sending of remittances by migrants is identified as one of the strongest and most pervasive phenomena in Africa's migration systems (Adepoju 1995). Arhinful (2001) and Andersson (2001) supported the perspective that migration in Africa is part of the livelihood and survival strategy for non-migrant rural families. Consequently, a juxtaposition of the neoclassical economic models (Harris and

Todaro 1970) and the center-periphery model of capitalist penetration (Wallestein 1974), with its resultant uneven investment and economic development patterns, can theoretically explain why economic factors are significant determinants of rural-urban migration in Africa. It is important to point out gender differences on the role of economic factors for migration, with males more likely to migrate for economic reasons, and females for family reasons (Zulu et al. 2006; Asfar 1998).

2.4 Demographic Factors

High rates of population growth yield a youthful population who are better educated, adventurous and therefore highly mobile. Rapid population growth may itself sustain rural-urban migration through the continual replacement of young age cohorts. In places like Eastern Nigeria, Rwanda, Burundi and Central Kenya, extremely high population density and competition over resources generate a high propensity of rural-urban migration (NISER 1997; Oucho 1998). With rural population density of approximately 400 persons per sq.km, the manifestations of extreme population pressure on farmland and fuel wood resources in southeastern Nigeria include reduced fallow periods, permanent cultivation around settlements, the cultivation of marginal lands, soil impoverishment and soil erosion (NISER 1997). This partly explains why the region continues to be a major source of rural-urban migrants in Nigeria.

Researchers have consistently characterized rural-urban migrants as predominantly single, educated, young and often students seeking better educational opportunities, which are disproportionately located in urban areas. Human capital theories have not only identified the life cycle advantage for young people to move but also emphasized the role of education, where individuals with more schooling are expected to have greater returns in moving and hence have higher migration rates (Mberu 2005).

On the role of gender in rural-urban migration, Baker and Aina (1995) underscored the increasing importance of the rural-urban migration of females in SSA countries. Findings in Ethiopia confirm the dominance of women in rural-urban migration flows. Beside the high percentage of migrants moving due to the transfer of a family member, there are considerable flows for reasons related to the celebration of marriage, following patrilineal descent and patrilocal residential arrangements. Also women characterized by marriage instability, i.e. widows, the divorced and the separated, contribute significantly to internal mobility in the region. This is linked to stigma and social isolation which force such women out of rural places of origin into nearby towns (Casacchio et al. 2001). Researchers have suggested that the nature of female migration would appear to evolve naturally from the structure of employment opportunities available in each of the destination areas for women (Martine 1975; Ajakaiye and Adeyeye 2001; Chattopadhyay et al. 2006). For many decades during the colonial period and for some time afterwards, the male-dominant

migration in sub-Saharan Africa was sustained by biased employment opportunities, the type of work available and an inequitable provision of education. In recent decades however, following increased access to higher education and skills training, higher female labor participation rates and more employment opportunities for women, female migration has become a significant phenomenon involving both autonomous and associational migrants (Adepoju 2008; IOM 2000; Zlotnik 2003). The role of literacy on female migration is consistent with the role of literacy status and educational attainment for rural-urban mobility in countries in the region across all population groups. Evidence available on Ethiopia shows that more than half (51%) of migrants are literate, whereas the national literacy rate in 1999 was about 29% (Casacchio et al. 2001). A survey conducted in Burundi, Ghana, Kenya, Mali, Nigeria, Senegal, Togo and Uganda has found education, marital status, age, ethnicity and number of births to be determinates of rural out-migration (Brockerhoff and Eu 1993).

2.5 Socio-Cultural Factors

These are non-economic determinants of migration, prominent among which include positive perceptions of urban destinations gained from earlier migrants and the presence of friends and relatives in urban areas. Social-cultural networks can provide information on migration opportunities, facilitate finding employment, and support migrants while looking for work. Evidence from different parts of the continent underscores the role of migrant networks in migration of kin and how cultural obligations are evoked to sustain them (Andersson 2001; Chukwuezi 2001; Smith 2004). There is also an increasing network across boundaries, which ensures that family members migrate to specific urban destinations in pursuit of better livelihoods (Pavanello et al. 2010). In Kenya for instance, some Somali refugees have relatives or connections already living in Nairobi, and use these networks to find work and accommodation, especially in the Eastleigh area of the city (Pavanello et al. 2010). Furthermore, remittances are an important means to serve kinship ties, which entail mutual obligations (Mberu 2006).

2.6 Environmental Factors

Drought, floods, famine, soil erosion and other critical hazards continue to push people out of their places of origin to other areas. In SSA, rural dwellers are more likely to be victims of famine and environmental hazards and so migrate to urban areas. This is linked to the fact that agriculture is the primary source of sustenance for people living in rural areas and is the first victim of environmental stress. Desertification has considerably expanded Africa's arid zones, affecting some 300

million people and now covering almost half of the continent (Adepoju 2007). Grote and Warner (2010) found that environmental degradation, desertification and deforestation, along with natural disasters such as floods and droughts, are all factors which result in migration as a coping strategy for households. By crippling agricultural production, fishing or herding, drought affects millions of families who have to leave their homes to look for greener pastures elsewhere (Kioko 2013). According to Marchiori et al. (2010), climate variation has been responsible for the displacement of 2.55 million people over the period of 1960–2000 in SSA. The problem has led to rural-urban migration as well as a shift from agricultural to non-agricultural sectors. It has therefore been a determining factor for urbanization on the continent (Barrios et al. 2006).

2.7 Poor Management of Natural Resources (Poor Governance)

Despite the challenges of the natural environment, poor governance broadly defined have been identified as a key push factor of rural-urban migration across many countries in SSA. In parts of Ghana, male heads of households left in search of work and the push factors include the construction of the Akosombo Dam, which blocked the Volta River, inhibiting the river's flow with detrimental effects on farmers and fishermen, who had relied on the Volta River for their livelihoods. In areas around Lake Chad prone to desertification, the lack of infrastructure to improve irrigation practices on a broader scale exacerbated the shrinkage of the lake and the water crisis in Niger, Northern Nigeria, Cameroon and Chad. Ethiopia's land tenure system has undergone many political upheavals, since the 1974 revolution that unseated Emperor Haile Selassie, through the 17-year military dictatorship and ethnic federal government that followed. The combination of government policy-related displacements and lack of opportunity in Ethiopia's rural areas is linked to rural-urban migration, which has led to a population increase in urban areas that outstrips urban infrastructure development, resulting in proliferation of urban slums. Despite the low level of economic development, population movement in Ethiopia is substantial and resulted from the accumulated impact of famines, and government environmental management policies (Kiros and White 2004). In addition, the country has been undergoing a major transformation from a centrally planned to a market-oriented economy since the current government came to power in 1991. Under such transformations, internal migration tends to play an increasing role both demographically and economically (Kiros and White 2004). Urban growth was especially reported in the northern half of Ethiopia, where most of the major towns are located.

3 Rapid Urbanization and the Emergence of Mega-Cities in Sub-Saharan Africa

3.1 Rapid Urbanization in Sub-Saharan Africa

Migration and urbanization are two major inter-linked demographic features of the twenty-first century world (White 2012). Since 2007, more than 50% of the world's population has been urban. In 1950, 30% of the world's population was urban, and this proportion increased to 54% in 2014 and is estimated to increase to 66% by 2050 (UNDESA 2014). Continuing population growth and urbanization are projected to add 2.5 billion people to the world's urban population by 2050, with nearly 90% of the increase concentrated in Asia and Africa (UNDESA 2014). Despite being the least urbanized region in the world, sub-Saharan Africa at 1.5% urban growth per annum in 2014, is the fastest urbanizing region in the world and the share of its urban population is projected to increase from the current 37% to 55% by 2050 (UNDESA 2014). Figure 1 summarizes the percentage urban in the world and SSA regions at three points: 1990, 2014 and 2050.

Migration from rural to urban areas has historically played a key role in the rapid growth of cities and, together with the reclassification of rural localities into urban centers, it continues to be an important component of city growth. However, natural increase (the difference between births and deaths), can contribute significantly to urban growth, particularly in countries where fertility levels remain high. Today, natural increase makes a larger contribution to urban population growth than internal migration and reclassification in the majority of developing countries (United Nations Development Programme 2009). Africa's rapid urban population growth has been mostly linked to high natural increase, which accounts for about 75% of its urban growth, with rural-urban migration accounting for 25% of growth (Chen et al. 1998). The majority of countries whose total fertility rates (TFR) are higher than 5 are situated in the sub-Saharan Africa region and policymakers in the region often

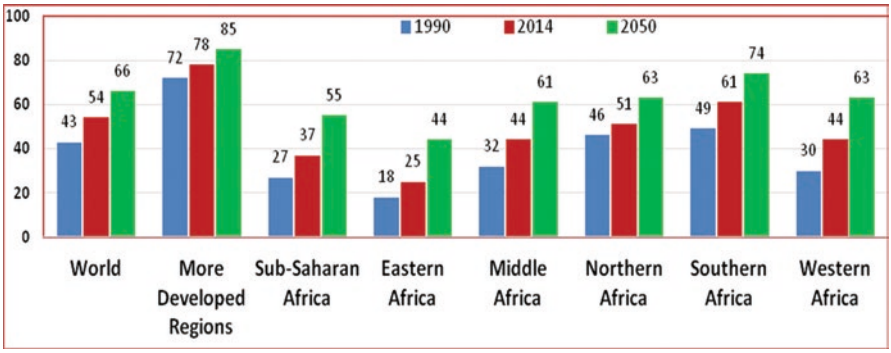

Fig. 1 Percentage urban in world and SSA regions 1990, 2014 and 2050 (Source: World urbanization prospects: The 2014 revision)

attempt to retard urban growth by only discouraging migration, under-appreciating the central contribution made to growth by natural increase (White et al. 2008).

3.2 The Emergence of Mega-Cities in Sub-Saharan Africa

According to the United Nations Economic and Social Council (2014) estimates, close to half of the world's urban dwellers reside in relatively small settlements of less than 500,000 inhabitants, while only around one in eight live in the 28 megacities with more than 10 million inhabitants. Historically, most of the world's largest urban agglomerations were found in the more developed regions, but today's large cities are concentrated in the global South, with the fastest growing urban agglomerations being medium-sized cities and cities with less than 1 million inhabitants located in Asia and Africa (ibid). In 1960, Johannesburg was the only city in sub-Saharan Africa with a population of over a million; however, by 1970, there were four: Cape Town, Johannesburg, Kinshasa and Lagos. By 2010, there were 33 African cities with populations of over one million, including: Addis Ababa (Ethiopia), Nairobi (Kenya), Khartoum (Sudan), Luanda (Angola), Harare (Zimbabwe) and Dakar (Senegal).

Megacities are notable for their size and concentration of economic activity, but are home to only about one in eight of the world's urban dwellers. In 1990, there were ten cities with more than ten million inhabitants, which were home to 153 million people, representing less than 7% of the global urban population, but by 2014, the number of megacities has nearly tripled to 28, with a population of 453 million, accounting for 12% of the world's urban dwellers (UNDESA 2014). Most megacities and large cities are located in the global South, especially China which has six megacities and ten cities with populations of between five and ten million in 2014, and estimated to add one more megacity and six more large cities by 2030. Indian cities of Ahmadabad, Bangalore, Chennai and Hyderabad with populations of five to ten million inhabitants in 2014 are projected to become megacities in the coming years, bringing a total of seven megacities projected for the country by 2030. In Africa, Cairo, Kinshasa and Lagos were the only megacities in 2014, but Dar-es-Salaam, Johannesburg and Luanda are projected to surpass the ten million mark and achieve the megacity status. The number of large cities with populations between five and ten million in Africa is also expected to increase, from three in 2014 to twelve in 2030 (UNDESA 2014).

One in five urban dwellers worldwide lives in a medium-sized city with one million to five million inhabitants. The global population living in medium-sized cities nearly doubled between 1990 and 2014, and is expected to increase by another 36% between 2014 and 2030, growing from 827 million to 1.1 billion. In Africa, Addis Ababa, the largest city in Ethiopia, falls under this category of cities. The number of people living in cities of between 500,000 and one million inhabitants is expected to grow at a similar pace, increasing from 363 million in 2014 to 509 million in 2030, but continuing to hold only around 10% of the global urban population.

In 2014, close to one half of the world's urban population lives in settlements with fewer than 500,000 inhabitants and by 2030 these small cities and towns are estimated to be home to around 45% of global urban dwellers and will constitute more than half of Africa's urban dwellers (UNDESA 2014). In SSA, the majority of urban people (57%) live in towns or cities with fewer than half a million residents and only 6% of the region's urban population live in cities of five million or more (United Nations 2006). This is important because smaller localities generally have less infrastructure and may exhibit levels of human capital, fertility, health and child survival closer to those of the surrounding rural areas (Montgomery et al. 2003).

As the world continues to urbanize, experts suggest that sustainable development challenges will be increasingly concentrated in cities, particularly in the lower-middle-income countries where the pace of urbanization is fastest. Integrated policies to improve the lives of both urban and rural dwellers are needed, including investments in data systems to address data gaps, where census data has not been collected or reported in decades.

4 The Emergence of Slums, the Data Challenge, and the Case of Nairobi Slums, Kenya

4.1 The Emergence of Slums in Sub-Saharan Africa

The process of urbanization historically has been associated with important economic and social transformations. In terms of economic output, urban areas represent a much larger share of gross domestic product (GDP) than their share of the population and the very concentration of such activity in cities may lead to more efficient markets and hence promote development, both in urban and rural areas (Kessides 2006).

Notwithstanding, cities concentrate risks and hazards for health, further exacerbated by the inability of countries to provide basic social infrastructure and amenities and economic opportunities (WHO 2010). In particular, the model of a strong direct association between urbanization, economic growth and social development has recently come under question for SSA and rural–urban migration and urban natural increase have been linked to the expansion of urban poverty (Mabogunje 2007).

Among global city dwellers today, almost 900 million people live in areas considered slums and in SSA in 2013, about 62% of the urban population lived in slums or slum-like conditions (UN-Habitat 2010, 2013; UNDESA 2012). According to the UN-HABITAT (2006), a slum household is characterized by lack one or more of the following: durable housing of a permanent nature that protects against extreme climate conditions; sufficient living space which means not more than three people sharing the same room; easy access to safe water in sufficient amounts at an affordable price; access to adequate sanitation in the form of a private or public toilet

shared by a reasonable number of people; and security of tenure that prevents forced evictions.

With over 80% of the region's slum households having one or two shelter deprivations, and approximately one-fifth of them lacking more than three of these needs, SSA's slums are ranked among the most deprived and this is compounded by insufficient living space for families and inadequate makeshift housing (UN-Habitat 2006). Urban shanty towns attract particular attention because they are such readily visible manifestations of disadvantage and the environmental health conditions that many poor urban residents face has undermined the urban advantage in mortality reduction in the region (Mabogunje 2007). Physical proximity to urban social and infrastructure services does not guarantee their actual utilization by or affordability for poor urban residents (Kessides 2006) and child mortality rates are higher among the urban poor than among the rural population in several countries (Garenne 2006).

The overall growth of slums has been linked to the inability of cities to promote the level and type of economic growth that would hasten the reduction of poverty in SSA (UN Habitat 2003, 2008, and 2010). The various structural problems, including high levels of national debt and consequent structural adjustment policies, have placed uneven economic burdens on urban populations (Roberts 2006). Other contextual features in SSA linked to the growth of slums include exposure to broader pressures of global competition, limited outlets for external migration, and loss of the productive workforce and of family security due to HIV/AIDS (Kessides 2006). Moreover, issues of governance, particularly the discrepancy between the urban promise and concrete reality, have been linked to a lack of vision, foresight and a participatory approach to planning which involves the poor in finding solution to their problems (Kessides 2006; UNFPA 2007).

4.2 The Data Challenge to the Study of Urbanization and Slums in Sub-Saharan Africa

The foregoing unintended consequences of rapid urbanization in the SSA region have posed major intricate policy challenges in relation to scarce livelihood opportunities for the poor, exposure to pernicious health conditions, and low access to social services. However, the inadequacy of the data has generally been identified as a primary hindrance to discussion of migration and urbanization, as well as their associated challenges in the region. Despite increasingly regular censuses across Africa, long intercensal intervals and a lack of specific questions on change of residence, both particularly impair knowledge of migration flows in countries affected by significant economic, social or political shocks.

The lack of data at local levels across African cities has been severally identified. Researchers have documented how global and national indicators generally lack aggregation at local levels, and how national and citywide averages blur sub-group inequities within urban areas. In particular, national level indicators cannot help

answer a number of questions critical to the specific health and livelihood issues of the most vulnerable of urban dwellers, whose indicators will drive national indicators in the coming years (WHO 2010). Urban health programming is practically done at local levels by local governments, yet available evidence points to a lack of the urban health statistics needed by implementing agencies and local governments to measure progress and identify interventions that work or otherwise (Satterthwaite 2014).

4.3 Slums and Urbanization of Poverty: The Case of Nairobi, Kenya

Kenya typifies SSA's urban crisis, with a significant proportion of its urban population living in informal settlements. Nairobi, the capital city's population was estimated to have grown at about 5% per year between 1969 and 1999 (Government of Kenya 2000). The city's population grew from 2.1 million in the 1999 census to 3.1 million in the 2009 census. Estimates show that between 1990 and 2007, the proportion of urban population living in slum areas in Kenya remained at approximately 55%, but the situation is more extreme in Nairobi where between 60 and 70% of residents are estimated to be living in slums or slum-like conditions (UN-Habitat 2003, 2008, 2010). Figure 2 summarizes the incidence of slums across Nairobi city. These slums are characterized by limited access to water and sanitation, poor housing conditions, limited employment opportunities, and near absence of the public sector, all of which is linked to an appreciable deterioration of key urban health and social indicators, as well as significant disadvantages with respect to morbidity, access to health services, mortality, and risky sexual practices relative to other population sub-groups, including rural residents (APHRC 2002; APHRC 2014;

Fig. 2 Map of Nairobi showing slum incidence (Source: www.kibera.org.uk (as presented in APHRC 2014))

Fotso et al. 2008; Garennee 2006; Kabiru et al. 2010; Kyobutungi et al. 2008; Ziraba et al. 2009; Zulu et al. 2002).

The Nairobi case is only typical of the increasing urbanization of poverty observed in most metropolitan centers in the region (Brockerhoff and Brennan 1998; World Bank 2000). Consequently, there has been increasing concern regarding the sustainability of urban living in the region, especially for the most vulnerable urban poor. In fact, the commonly assumed urban advantage has been challenged in many low and middle income countries, raising intricate social policy challenges around resilience and viability of life in cities in many countries (Mberu et al. 2014; Fotso et al. 2009).

The increasing global attention on the economic and health challenges of the most deprived in cities (UN-Habitat 2010) in the last decade and half, was epitomized by the adoption in 2000, of Millennium Development Goal (MDG) 7, (Target 7D) that aims to improve the lives of at least 100 million slum dwellers by 2020 (United Nations 2000). The target has been characterized as imprecise, not evidence based, nor framed to allow rigorous confirmation of achievement (Cohen 2014). Moreover, the target is unjustifiably low as the existing slum population by 2003 was estimated to already be about 900 million persons (UN Habitat 2003). In Kenya, however, the push to achieve the MDGs has been linked to significant investments in policy and program interventions by the Government of Kenya and its development partners in the last decade. Slum-focused projects undertaken by municipal and national level governments include slum upgrading, cash transfers to the elderly, free primary education, and a reproductive health voucher scheme (APHRC 2014). One key question arising from these investments relates to whether they improved health and socioeconomic outcomes for the urban poor? Answering such questions requires appropriate data at the local levels, but due to the limited coverage of slum residents in nationally-representative sample surveys, existing national estimates do not sufficiently answer these questions as it relates to the urban poor, who constitute the majority of city dwellers (APHRC 2014). To provide answers to these questions, the African Population and Health Research Center, conducted the Nairobi Cross-sectional Slum Surveys in 2000 (NCSS 1) and 2012 (NCSS 2). The NCSS 1 was a pioneer in providing valid estimates on health and demographic indicators among the Nairobi slum dwellers, while the NCSS 2 provides an updated demographic and health profile of the residents of Nairobi's informal settlements, taking stock of the changes that had taken place and identifying current challenges faced by the urban poor in access and use of health, education and other social services since 2000 (APHRC 2014).

Generally, the NCCS 2012 results highlight marked improvements in environmental, health and educational indicators among slum dwellers. Notwithstanding, improvements were not uniform across slums and sub-groups, with overall disadvantages of slum relative to non-slum dwellers persisting over the 2000–2012 observation period (APHRC 2014).

The widespread adoption of a free primary education policy by the Government of Kenya since 2003 and specific focus on expanding school access to the urban poor in slum areas through non-formal schools has improved enrolment numbers across the country and specifically among Nairobi slum dwellers. Figure 3 showed increase

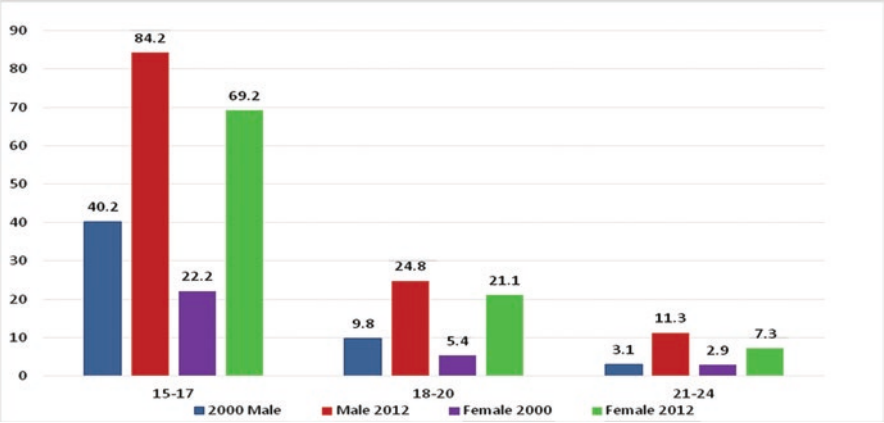

Fig. 3 Increased school participation among slum youth aged 15–24, 2000–2012 (Source: APHRC 2014)

in school participation among young people living in slums between 2000 and 2012. However, while school participation among male and female youth are similarly moving in a positive direction, there remained an appreciable level of gender gap across all age groups, with huge female disadvantage especially among those aged 15–17 years old. This may reflect the hindrances young women face in transition to higher education occasioned by challenges related to early marriage, early childbearing and associated poverty. What also came out clearly was the persistent educational disadvantage of slum dwellers relative to the whole city (APHRC 2014).

One key concern central to the livelihood outcomes of slum dwellers is related to unemployment. The examination of employment data summarized in Table 1 shows that overall levels of unemployment among women increased from 41% in 2000 to 52% in 2012. For men, 17% were not working at all in 2012. Moreover, unemployment was higher for women aged 20–24 at 62% compared to 22% among young men of the same age. It is important to underscore that most employment opportunities available to slum dwellers are jobs on the fringes with little or no job security. Among employed women, only 14% were in formal employment, while a whopping 86% were employed in the informal sector in their own business, as casual workers or in urban agriculture, among others. For men, 18% were in formal employment - formal salaried, while 82% were in informal employment-formal casual, informal salaried-gardeners, own business, casual workers and urban agriculture (APHRC 2014).

Beyond limited opportunities, other challenges identified among Nairobi slum residents include garbage/sewer disposal and insecurity. In 2012, while 14% of Nairobi slum residents identified a lack of garbage/sewer disposal services, 13% of them identified insecurity as major concerns (APHRC 2014). The challenge of garbage/sewer disposal is consistent with evidence that in cities throughout Africa, rapid population growth as well as an expansion of service and manufacturing

Table 1 Proportion of the unemployed among slum dwellers in Nairobi by age, NCSS 2012, NCSS 2000

Background characteristics	Females		Males	
	Not currently working	No. of cases	Not currently working	No. of cases
Age				
15–19	83.9	590	75.1	234
20–24	61.6	1027	22.2	425
25–29	46.6	1043	6.8	560
30–34	38.7	543	4.3	366
35–39	29.5	351	5.9	285
40–44	23.1	198	5.8	169
45–49	31.2	140	4.5	104
NCSS 2012 Total	51.7	3892	16.6	2143
NCSS 2000 Total	40.6	3256	NA	NA

Source: Nairobi Cross-Sectional Slums Surveys (NCSS) 2000 and 2012

sectors have led to an increase in the amount of solid waste produced in cities throughout Africa, which have not been matched with efficient solid waste management systems (UN-Habitat 2010). In particular, refuse that is collected is improperly disposed of on open dump sites or landfills, frequently situated in close proximity to informal settlements (UN-Habitat 2010). In terms of insecurity, the concern is consistent with increases in insecurity-related mortality among slum residents in the last ten years. Data on the causes of death from the Nairobi Urban Health and Demographic Surveillance System (NUHDSS) for two slums in Nairobi between 2003 and 2012, identified a two-fold increase in death due to injuries for men from 17% in 2003 to 34% in 2012, 58% of which are linked to assaults (Mberu et al. 2015).

In conclusion, while urbanization is expected to bring about prosperity in African cities, it has, on the contrary, been accompanied by growing inequities between the rich and the poor, increasing slum populations and concentration of health risks and hazards in the continent. This situation has challenged the urban advantage that commonly assumes that urban dwellers fare better than their rural counterparts in terms of economic and health conditions. With the absolute number of slum dwellers projected to grow, sustained investments in improving the lives of urban dwellers, particularly the most vulnerable, are critical to meeting national development goals across African cities. Beyond slum focused interventions, broader policy and program investments covering internal migration, as well as challenges related to the region's rapid urbanization process, calls for profound interventions across the region.

Finally, the overall search for pathways to address migration, urbanization and urban health and livelihood inequities, will require huge and deliberate investments in research and data systems at local levels, especially in monitoring and evaluation of interventions and in determining what works in improving the well-being of the urban poor. Existing data sets fail to account for pockets of deprivation in urban

areas. Tracking urban policies requires that countries establish data systems that disaggregate health, education, social indicators in urban areas by key socio-economic factors such as wealth, area of residence, gender, ethnicity and other relevant criteria. This should be part of SSA countries efforts to reposition their cities as drivers of development.

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Internal and International Migration

Nikola Sander and Elin Charles-Edwards

1 Introduction

The surge of African migrants and asylum seekers attempting the risky voyage across the Mediterranean in 2014 and early 2015 has brought international migration to the front pages of newspapers, fuelling public anxiety about a looming European migration crisis caused by large uncontrolled inflows from sub-Saharan Africa. Future population growth is often associated with an imminent increase in emigration from the African continent to the Western world. How the European Union should respond to the rising influx and whether to relax or restrict immigration are hotly debated issues, but, unfortunately, political rhetoric and populist media dominate at the expense of fact-based discussions. In the countries of origin in sub-Saharan Africa, debates tend to focus on ways of reducing the emigration of skilled Africans to Western countries and on how to combat human trafficking and smuggling. Although the scientific community is well-equipped to inform public and political debates on migration, little attention has been paid to establishing a comprehensive picture of migration flows within and away from sub-Saharan Africa. Research on migration around the globe and variations across countries has been hindered by a lack of comparable statistics on internal and international migration flows. The dearth of understanding regarding where people move in the world has inhibited research on the links between the demographic transition and

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migration.. Hence, the existing literature on the demographic dividend has been rather cautious about grappling with the complexities of migration.

This chapter summarizes the available evidence on the patterns and trends in internal and international migration in sub-Saharan Africa over the period 1990–2010. We take advantage of two newly available datasets on internal and international migration around the globe, allowing us to compare these migration flows across the region and place them in a global context (Abel and Sander 2014; Bell et al. 2014). The forces which shape migration are summarized in the next section, followed by a discussion of the available data on internal and international movements. Thereafter, there are two sections which provide analyses of spatial patterns of migration in sub-Saharan Africa in a global context. Firstly, key trends occurring in global international migration flows are presented together with relationships between within-sub-Saharan African movements and levels of economic development. Secondly, patterns of internal migration are examined for selected countries in the region, followed by a discussion of links between internal and international migration. By way of conclusion, we provide an outlook on the future of migration in sub-Saharan Africa and its potential impact on future population change in the coming decades.

2 Why People Move

Migration as a means by which people aim to improve their financial and social wellbeing is not a new phenomenon. In fact, the migratory paths of our ancestors can be traced as far back as 200,000 years[1]. The reasons why people move are often complex and typically involve a mixture of motives related to income, family, housing, and education. The determinants of migration have traditionally been studied with reference to Lee's push-pull migration model (Lee 1966). Based largely on the determinants of migration that have been observed in the developed world, the push-pull model suggests that uneven processes of development are at the core of factors that explain migration flows between regions as well as between countries. According to Lee (1966), wage differentials are a key determinant of migration, although people living in the poorest countries are usually not the most likely to migrate due to a lack of resources necessary to realize a move. The notion that (economic) opportunities at the destination and deficiencies at the origin trigger migration is admittedly a rather simplified view of the migration decision-making process, as it overlooks a number of non-economic factors that play an important role in shaping migration in sub-Saharan Africa, most notably violent conflict, environmental change, and the demographic transition.

Violent conflict is associated with vast population displacements out of conflict zones, often into neighboring countries, and thus causes a shock to the migration system that is extremely difficult to foresee. The United Nations High Commissioner for Refugees (UNHCR) estimated that by the end of 2013 there were 51.2 million

[1] See the Genographic Project available at: https://genographic.nationalgeographic.com (accessed 25 June 2016).

people 'of concern', which included 33.3 million internally displaced persons, 16.7 million refugees, and 1.2 million asylum seekers[2]. As reliable data on the spatial patterns and trends in internally displaced persons is extremely sparse, the focus of this chapter is on internal and international movements of legal migrants and refugees, although internal displacement in many conflict situations is far more common than migration captured by national statistics. Nevertheless, the analyses presented here highlight the refugee movements triggered by the numerous conflicts seen in Central and East Africa in the Republic of the Congo, Rwanda, Burundi, Uganda, South Sudan, and Sudan since 1990. In addition, the economic collapse in Zimbabwe caused substantial emigration to South Africa. Outside Africa, the violent conflicts in Iraq and Afghanistan are also noteworthy.

The ways in which environmental change shapes migration are complex and closely linked with socio-economic, cultural,, and political factors determining migration decisions. For example, drought-stricken populations may be constrained in their mobility due to the associated lack of capital (e.g., livestock, harvest), which is necessary to realize a move further afield. The combination of factors affecting migration makes it extremely difficult to identify the causal relationship between environmental change and human mobility. Nevertheless, a general pattern has emerged of short-distance migration in response to slow-onset environmental change being more common than longer distance movement triggered by sudden environmental disasters, such as tsunamis and hurricanes (Stojanov 2008).

The level and direction of migration is also shaped by demographic factors, most prominently the size of a population, its growth rate, and age structure (e.g., Preston et al. 1989). The combination of strong population growth and a young age structure releases an abundant labor supply. Regional and cross-national variation in labor supply and labor demand often act as drivers of both domestic and international labor migration. As current patterns of labor migration from South to West Asia demonstrate, movements tend to originate in countries experiencing strong population growth and target destinations with rising labor demand. Will future population growth in sub-Saharan Africa result in equally large movements towards the oil-rich Gulf countries and traditional destination countries in the developed world?

Predicting the likely future trajectory of migration flows to, from, and within sub-Saharan Africa is difficult given the scarcity of data on migration and the dearth of research on the topic. It is unlikely that the trajectory of sub-Saharan Africa will closely follow that of many Asian countries, given the profound differences in socio-demographic characteristics between populations, most notably rates of literacy and educational attainment. Hence, it is unclear whether a growing young adult population that exerts pressure on domestic education systems and labor markets will trigger substantial migration flows from countries south of the Sahara to more developed, rapidly aging countries.

[2] UNHCR Mid-Year Trends, 2014.

3 Migration and the Demographic Dividend

When considering the role of the demographic dividend in shaping migration trends, one may speculate that a growing labor force may be associated with higher volumes of movement within sub-Saharan Africa, rather than increased emigration to more developed countries. In this scenario, regions or countries that have more effective policies in place to ensure the adequate provision of services and incentives for economic growth are successful in attracting labor migrants from neighboring countries with less favorable conditions. A key question underlying this scenario that has not yet been adequately addressed in the literature is whether the trend of migration streams going up the income ladder, which is observed across the more developed world, also holds in sub-Saharan Africa. Provided that income differentials trigger migration, developing countries might be able to reap fiscal and economic benefits from their sizable young adult populations and perhaps even transition from a migrant sending to a receiving nation by placing emphasis on solid political institutions, expansion in education, and strong economic growth. This chapter aims to shed some light on the effects of cross-national variation of gross national income on migration trends in sub-Saharan Africa.

The demographic dividend not only shapes migration trends, but in turn it is also shaped by migration. Important in this context is the selectivity of migration by age, with young adults being the most mobile age group. The dividend begins with change in the population structure, which is commonly attributed to falling fertility. At the same time, the relative size of the working age population and the number of children per adult of working age can also be influenced by migration among younger adults. In the oil-rich Gulf countries, for example, immigration has led to an increase in the relative size of the working age population, whereas in Nepal the working age population has shrunk substantially due to emigration. At the subnational level, similar effects are caused by migration flows up the urban hierarchy. Around the globe, internal migration tends to result in a growing labor force in cities and a shrinking labor force in rural areas The movements of young adults, especially if they leave their children behind, can significantly alter the demographic prerequisites needed to capture a demographic dividend.

Besides the tendency to select younger adults, migration is also selective of more highly educated individuals. Rising education levels within a country's population are commonly attributed to rising investments in children, as falling fertility lowers the number of children each couple has to support through education. But the second demographic dividend, which results in the higher economic productivity of a working age population, can also be shaped directly by high-skilled immigration. Highly-educated people tend to exhibit a greater propensity to move up the urban hierarchy towards metropolitan centers rich in job opportunities, and are more likely to move over long distances than their less educated peers. Therefore, highly-skilled migration has the potential to affect not only the first demographic dividend through alterations in national and regional population age structures, but also the second demographic dividend through shifts in the education level of populations.

Migration makes it much more difficult to establish how accelerated growth in a country's economy can be achieved. Besides strategic investments in health, education, and good governance, managing migration effectively through adequate policy development will be crucial for countries in sub-Saharan Africa. Such policies should facilitate both the flow of unskilled labor between neighboring countries, and circular migration of skilled labor between origin countries and destinations in North America, Europe, and Australia. International circular migration programs can be an effective means for reducing a labor surplus while at the same time reducing the risk of losing human capital to brain drain (Hugo 2013). However, the science-based development of circular migration policies has long been hindered by a lack of comparable data on migration flows and migrant characteristics at regional and global scales, a topic to which this chapter now turns.

4 Data on Migration in Sub-Saharan Africa

In contrast to other components of demographic change, comparative statistics on migration have long been absent from national and international statistical collections (Bell et al. 2014). This is rapidly changing, with the emergence of new estimates of international migration stocks (UNPD 2013) and more recently, estimates of international migration flows between 196 countries (Abel and Sander 2014). The IMAGE project (Comparing Internal Migration Around the Globe) has sought to advance comparative statistics on internal migration by conducting an inventory of data collection practices and developing a suite of methods and metrics for the purpose of cross-national comparison (see e.g., Bell et al. 2014, 2015). Notwithstanding, there remain severe impediments to cross-country comparisons due to differences in data collection instruments, the types of migration data collected, and the spatial and temporal framework employed. This is more marked for the analysis of internal migration than international moves, which have benefitted from significant recent advances in data collection and estimation procedures (see for example Abel and Sander 2014).

Globally, three main instruments are conventionally used to collect migration data: population and housing censuses; population registers and administrative data sets; and surveys. Population censuses are the most common source of data, with 142 of 193 UN member states collecting some form of internal migration data in the 2000 Census Round (Bell et al. 2014). The number of countries collecting data on the size of their immigrant population is broadly similar. Data from population registers and administrative sources is used in at least 50 countries around the globe, however, these collections are largely limited to Europe and Asia. Surveys are much more common, but vary widely with respect to sample size and coverage, severely limiting their utility for migration analysis. Compared with other parts of the world, data on migration in sub-Saharan Africa is relatively scant. Of the 48 UN member states, 28 collected internal migration data via a census in the 2000 Census Round, 36 collected internal migration data via a survey, while no countries employed a population register or administrative data set (Bell et al. 2015).

The questions and criteria used to capture migration within censuses, registers, and surveys vary widely around the globe, further complicating regional or global comparisons. The most common form of migration data collected by population censuses is place of birth, with 26 African countries collecting these data in the 2000 Census Round. This question provides information on the number (or stock) of internal migrants currently living outside their region of birth, as well as the size of a country's immigrant population. Lifetime data is usually collected on a relatively coarse spatial scale, limiting its utility for the analysis of spatial patterns. A more serious limitation of this data is the lack of information regarding the timing of moves, making it difficult to identify changes in migration intensity and patterns over time. Census questions on recent migration do allow temporal shifts in the intensity and pattern of migration to be more readily explored. These questions take a number of forms. Most common in sub-Saharan Africa are questions asking respondents about their place of previous residence at some time in the past, commonly one or 5 years ago (16 countries in SSA). Data on the duration of current residence is also frequently collected (15 countries) and, when coupled with information on place of previous residence (11 countries), can be used to explore internal migration patterns and estimate recent immigrant stock. Despite the growing availability of census data, differences in the spatial and temporal frames used to collect migration data severely constrain cross-national comparisons and the quantification of international movements around the globe. This is further impacted by a lack of data availability, with collection not always guaranteeing the dissemination of migration data. For this study, census data is used to explore the spatial patterns of internal migration for a small sample of countries.

Surveys present an alternative to census data for countries in sub-Saharan Africa. The Demographic and Health Survey, conducted by USAID, has collected data on duration of current residence across a number of survey waves. While this data provides next to no information on the spatial pattern of moves and is limited to women aged 15–49, its strength lies in the standard approach to collecting data on internal migration, capturing a broadly comparable measure of internal migration intensity to be calculated with a sample of 35 countries. Together, this data provides some limited insight into the intensity of internal migration across the region. To explore the intensity and pattern of international migration in the region, we draw on bilateral flow estimates developed by Abel and Sander (2014).

5 Spatial Patterns of International Migration

This section draws on new estimates of bilateral migration flows covering the period 1990–2010 (Abel and Sander 2014). To quantify international migration flows, an indirect estimation methodology was developed to determine the number of movements required to meet changes over time observed in migrant stock data published by the United Nations. The estimates capture the number of migrants who changed their country of residence over 5-year periods, thereby omitting most seasonal and circular types of movements. The estimates include refugee movements that were

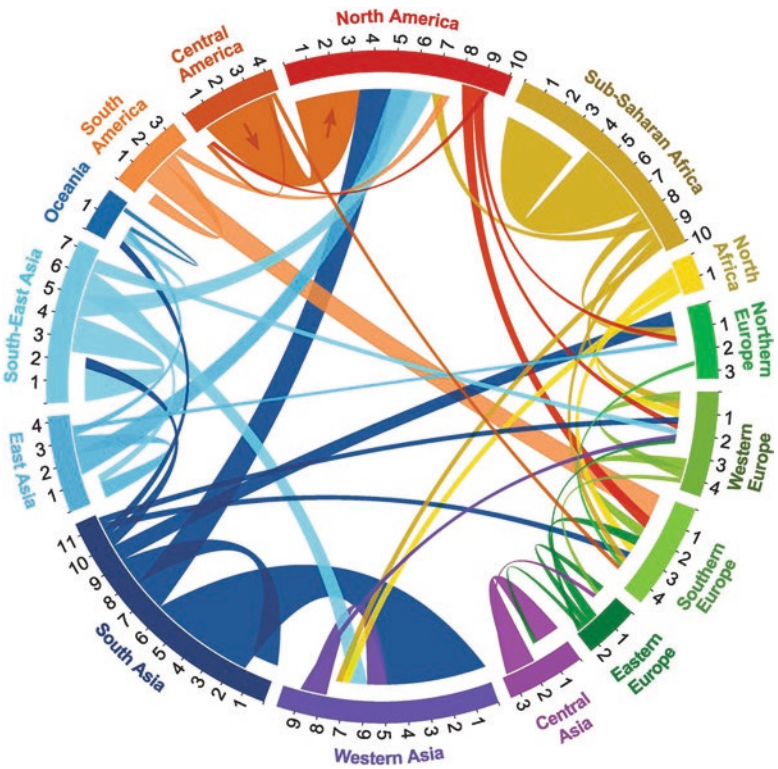

Fig. 1 International migration flows between 15 world regions in 2005–2010. Note: How to read the graphic: world regions are arranged in a circular layout, with each world region assigned a distinctive color. The band width denotes the size of the migration flow and assumes the color of the origin region. The direction of the flow is also indicated by a greater separation of the band from the outer circle at the destination region. The numbers outside the circle indicate the total migration in and out of a region in millions
(Source: Abel and Sander 2014. Quantifying Global International Migration Flows. *Science*, 343 (6178): 1520–22)

registered by the UNHCR but fail to take into account undocumented migration, nor do they cover recent migrant streams triggered by the violent conflicts in Syria, Libya, and Yemen.

The data enables us to provide a much more comprehensive overview of the geography of migration and the position of sub-Saharan Africa within the global system of flows than has been possible to date. Figure 1 shows the relative size and direction of migration streams between 15 world regions over the 5-year period 2005–2010. By focusing on flows in excess of 140,000 people, we can highlight the global flow of people between world regions, which are represented by the segments of the circle, in just one visualization. Neighboring world regions are arranged close to one another around the circle and the size of each migration flow flow is represented by the width of the links between the regions. The color of each flow is identical to the color of the origin region, following the idea that migrants take their characteristics

with them when moving to another country. The direction of the flow is shown also by a gap between the flow and the circle segment at the destination. For example, one of the largest migration flows around the globe was the orange flow from Central America (orange, located at about 11 o'clock in Fig. 1) to North America (red, located at about 12 o'clock). The numbers on the outside of the segment for North America indicate that the volume of the flow was about 3 million people.

The visualization shows that most migrants move over short distances within the same region or between neighboring regions, and relatively few move between continents. North America, Europe, and the oil-rich Gulf countries in Western Asia are the destinations of flows that come from furthest afield (most of which go through the centre of the circular graphic). Sub-Saharan Africa recorded movements of about 10 million migrants. The largest flow (3.7 million) was within the region, whereas 2.2 million people moved to Europe and North America. The flow within sub-Saharan Africa was therefore larger in volume than the stream from Central to North America (3.2 million), but smaller than the flow from South to Western Asia (4.9 million).

At the global scale, the intensity of international migration was estimated to be stable at about 0.6% of world population moving over 5-year periods since 1995. In 1990–1995, the violent conflicts in Eastern Africa and Afghanistan, as well as the fall of the Iron Curtain, triggered stronger movements (0.7%). The system-wide intensity of international migration within sub-Saharan Africa was above the global average in 1990–1995 (7.7 million moves, or 1.5% of the population) but declined to 3.7 million (or 0.5% of the population) in 2005–2010. The total net loss of population through migration to countries outside the region was 1.8 million (or 0.24% of population) in 2005–2010.

A closer look at the patterns of international migration within sub-Saharan Africa reveals three separate systems of flows in Western, Eastern, and Southern Africa with very little movement between these systems (see Fig. 2). In contrast to the global pattern of movement with many longer-distance flows between continents that go through the center of the circle in Fig. 1, migration in sub-Saharan Africa occurs almost exclusively between neighboring countries. The largest flows in the region from Zimbabwe to South Africa, from Tanzania to Burundi and from Uganda to South Sudan were triggered by political instability and violence rather than purely economic considerations, highlighting the region's vulnerability to shocks that fundamentally alter the migration system. Although few people move directly from the poorest to the richest countries, the global pattern of migration flows flows is characterized by movements from lower to higher income countries. This pattern of flows up the income ladder is much less clear in sub-Saharan Africa. Movements occur from lower to higher income countries, such as from Mozambique and Malawi to South Africa, but also in the reverse direction, such as from Côte d'Ivoire and Guinea to Liberia and from Sudan to Chad. It appears that economic factors (such as income levels and unemployment rates) play a less important role in the migration decision-making compared to other world regions, and that geographic proximity, violent conflict, and political instability play a major role in shaping migration patterns. Thus far, we have found surprisingly little evidence for the trend of migration streams going up the income ladder to hold in sub-Saharan Africa.

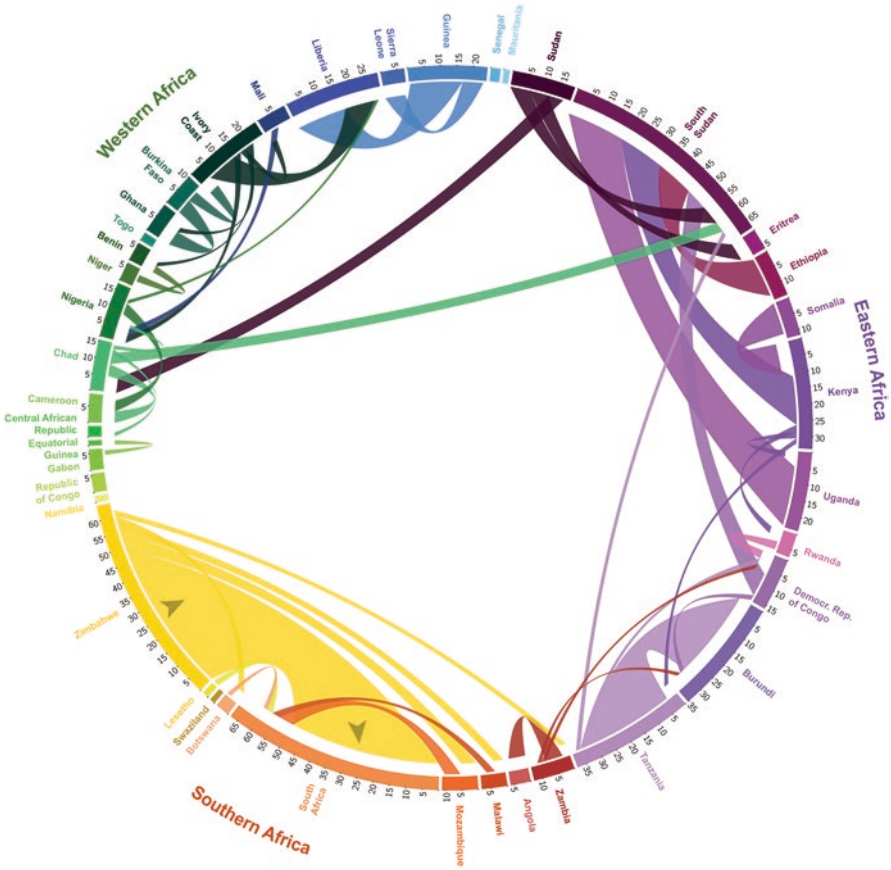

Fig. 2 Net migration flows between countries in sub-Saharan Africa in 2005–2010. Note: Countries with very small volumes of movement were omitted. Similar to Fig. 1, countries are arranged in a circular layout, with each country assigned a distinctive color. The band width denotes the size of the migration flow and assumes the color of the origin region. The numbers outside the circle indicate the total migration in and out of a region in 10,000 people

International migration has become an increasingly important component of national population growth, especially in low-fertility countries across North America, Asia, and Europe. Figure 3 suggests that for most countries in sub-Saharan Africa, the impact of migration on population size is much more modest. The majority of countries that recorded net migration gains or losses in excess of 5% sent or received people from other countries within the region. Senegal, Somalia, and Malawi are the only countries that experienced a noticeable net loss of migrants to countries outside of sub-Saharan Africa, providing little support for the notion of mass skilled emigration causing a 'brain drain'. Triggered by the violent conflicts in Eastern Africa, the intensity of movements was substantially higher in the period 1990–1995 than in 2005–2010, in which only Somalia, South Sudan and Lesotho recorded noticeable net migration gains from within the region.

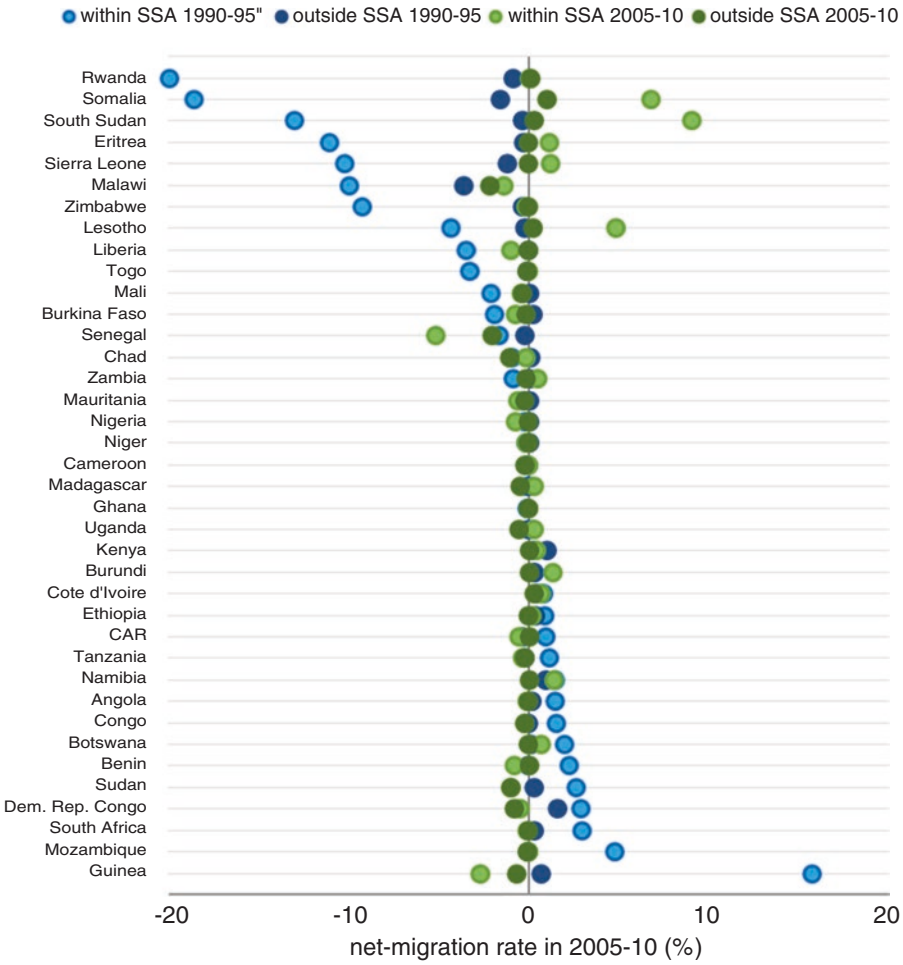

Fig. 3 Net migration rates rates for countries in sub-Saharan Africa in 1990–2010 and 2005–2010. Note: A distinction is made between net migration gains/losses with other countries in SSA, and gains/losses with countries outside SSA

In summary, the spatial patterns of international migration in sub-Saharan Africa are different from those observed in other world regions. Migration occurs over relatively short distances, chiefly between neighboring countries, and appears to be triggered largely by non-economic factors that, in the case of violent conflict and political instability, are very difficult to predict. Although migration does not resemble the patterns observed elsewhere, its impact on national population size and age structure has been more subtle than in many developed countries, with the exception of refugee movements in Eastern Africa. The findings suggest that international migration may only play a minor role in alleviating or intensifying labor market imbalances created by a large cohort of young adults.

6 Internal Migration in Sub-Saharan Africa

The existing literature on the demographic dividend has paid little attention to within-country variations, although it is well established that cities tend to lead the demographic transition compared to poorer rural areas (Williamson 2013). This neglect is somewhat surprising, given the key role that internal migration plays in shaping the distribution of population within countries. Evidence suggests that there is significant heterogeneity in the intensity, spatial pattern, and impact of internal migration around the globe. Results from the IMAGE project which draw on census data indicate significant regional variability in internal migration intensities across Africa, with pockets of both high and low mobility (Bell et al. 2015). The geographic coverage of this analysis is relatively limited, due to a lack of detailed census data.

The Demographic and Health Survey provides an alternative source of internal migration data. It benefits from a much wider geographic coverage compared with census data, as well as consistent migration questions across countries, but is limited to women aged 15–49. Figure 4 shows estimates of migration intensities over a 5 year interval for 34 countries across sub-Saharan Africa[3]. Estimates range from a low 6.6% in the island state of Comoros, i.e., 6.6% of women aged 15–49 changed their place of residence in the 5 years prior to the survey, to a high of 39.8% in Zambia. Three broad clusters of countries with high migration intensities can be identified: a West African group centred on Côte d'Ivoire, Gabon, and Liberia; an East African group, with high intensities in Kenya and Uganda; and a Southern African group, echoing the regional groupings in international migration described earlier. Lower internal migration intensities are observed throughout Central Africa and parts of the Sahel – the latter may reflect high levels of temporary mobility. There is likely a gender dimension to these patterns, with the mobility of women not necessarily representative of the mobility in the population as a whole. Differences are likely to be greatest in countries with the lowest levels of gender equality.

In the developing world, rural to urban migration is often viewed as the primary form of internal migration. In point of fact, migration flows are rarely unidirectional, with counter-flows from urban to rural regions, flows between urban centers, and between rural localities all typically a part of wider migration systems. An understanding of migration across different levels of the settlement hierarchy is useful for a number of reasons. It provides an insight into the pace and drivers of urbanization. It can indicate the degree of inequality within national space economies, and it provides insights into the spatial patterns of development. Cross-national comparison of migration patterns across the settlement hierarchy is impeded by both the lack of spatially referenced migration data, and a lack of standard definitions for urban and rural areas which vary widely between countries. Following Rees and Kupiszewski (1999) and Rees et al. (2015), we adopt population density

[3] Estimates are derived from the question on duration of residence. Data is drawn from the most recently available DHS data.

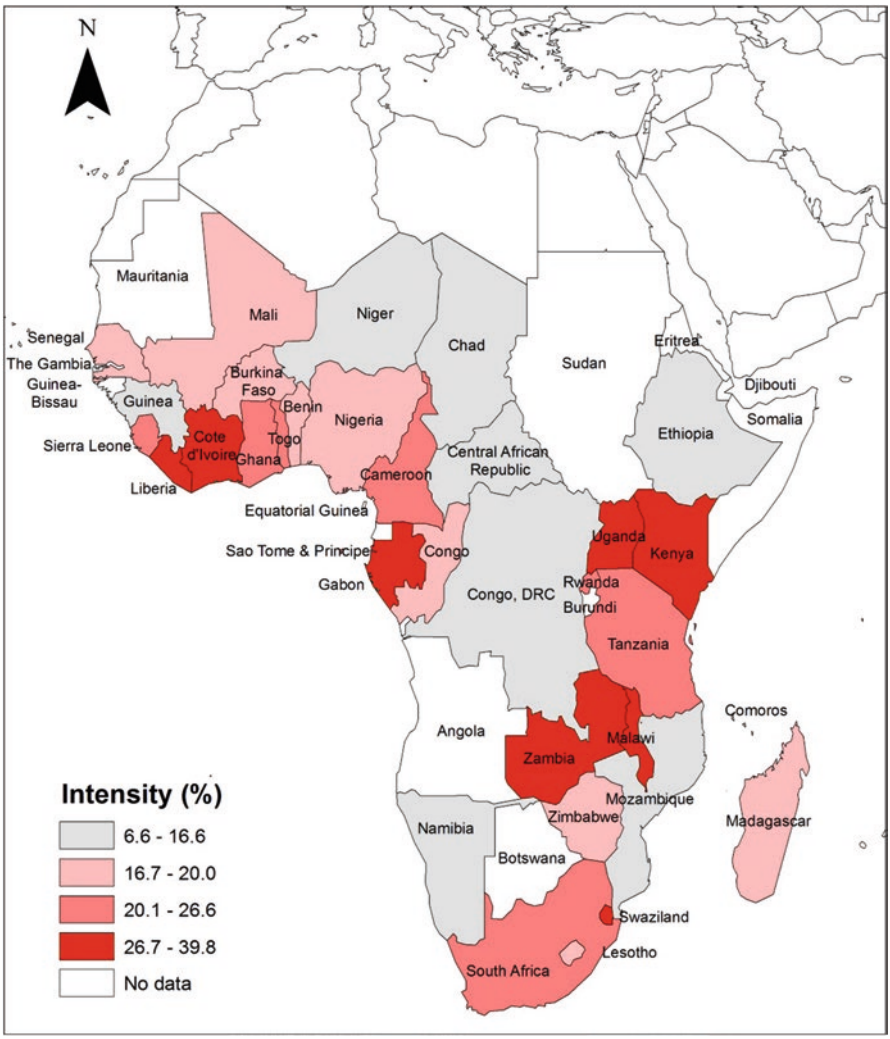

Fig. 4 Intensities of internal migration over a 5 year interval for 34 countries across sub-Saharan Africa
(Source: DHS data)

as a proxy for the degree of urbanization of regions within countries. For each country, regions are grouped into four density quartiles, with the top quartile the most densely populated (i.e., most urban) and the bottom quartile the least (i.e., most rural). Flows between region types can be examined to see whether the largest flows are from low density to high density regions (i.e. rural-urban migration), between regions in the same density band (i.e., inter-urban or inter-rural flows) or from high density to lower density regions (i.e., counter urbanization). Figure 5 shows inter-regional migration flows classified by density band for five countries: Burkina Faso,

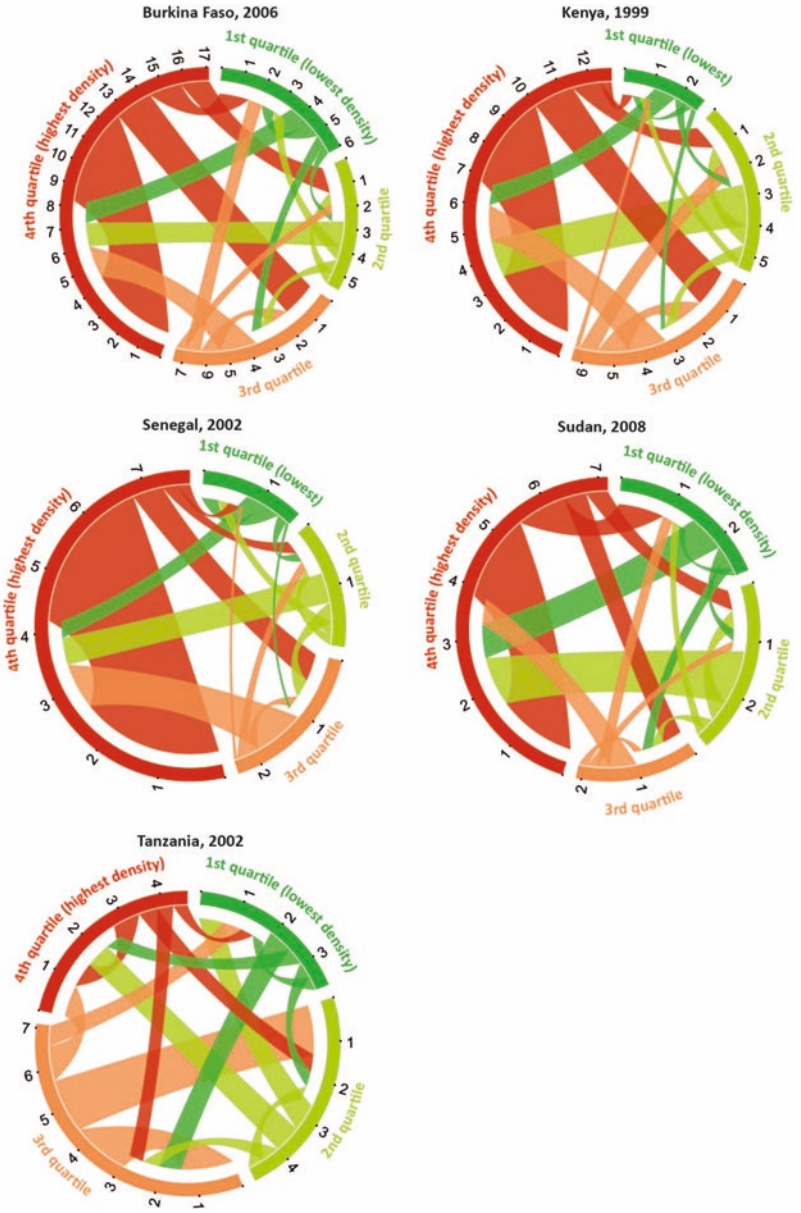

Fig. 5 Internal migration flows between quartiles of regions' population density for five selected countries. Note the scale: Burkina Faso in 10,000s; Kenya, Senegal, Sudan and Tanzania in 100,000s

Kenya, Senegal, Sudan (includes both Sudan and South Sudan), and Tanzania. In Burkina Faso, Kenya, Senegal, and Sudan the largest single flow is between regions in the top density bands, suggesting significant inter- and intra-city exchange. There is also evidence of significant rural to urban flows in each of these four countries, but these are partly offset by counter-streams from high to low density regions. The migration system of Tanzania stands apart from other countries, in that it is dominated by flows down the urban hierarchy, particularly from regions belonging to the third quartile to regions in the second quartile. Flows into the highest density regions are also offset to a large degree by flows back down the settlement hierarchy.

In summary, there is significant cross-national variation in the intensity of internal migration across sub-Saharan Africa, with pockets of high internal migration echoing clusters of countries with similar patterns of international migration, suggesting an association between these types of mobility. The limited evidence presented on the spatial distribution of migration flows across the urban hierarchy, confirms the importance of rural-to-urban flows in many sub-Saharan African countries. These are accompanied by strong inter-urban and urban-rural exchanges, suggesting a diverse range of spatial strategies and individual motives for migration that seem to go well beyond economic factors.

7 Linking Internal and International Migration

International and internal migration are typically viewed as two separate demographic components, although they are clearly intertwined at the individual level, because migrant trajectories often involve a sequence of internal and international moves. Conventional wisdom suggests that internal migration from rural to urban areas acts as a stepping stone for international migration; and that large cities serve as gateways for international immigrants, causing the displacement and replacement of the host population. Neither of these important links has been rigorously studied (King and Skeldon 2010), largely because of the dearth of longitudinal migration data that allows migrants to be traced across national borders. Hence, existing evidence on the relationship between internal and international migration is mostly based on a small number of national surveys.

As a first step towards the development of a better understanding of the links between internal and international migration, we compare the intensities of the two types of movement for 30 countries in sub-Saharan Africa that DHS data was available for, and that had a population above 1.5 million people in 2010. The intensities in per cent of the population are paired and depicted in a scatterplot in Fig. 6 along with an indication of the gross national income (GNI) (GNI) of each country. Green shading indicates above-median intensities of internal migration and net gains through international migration, whereas grey shading indicates below-median intensities of internal migration and net international losses. Darker shading corresponds to above-median GNI levels, whereas lighter shading suggests below-median income levels. Focusing first on the scatterplot in Fig. 6, the overall picture

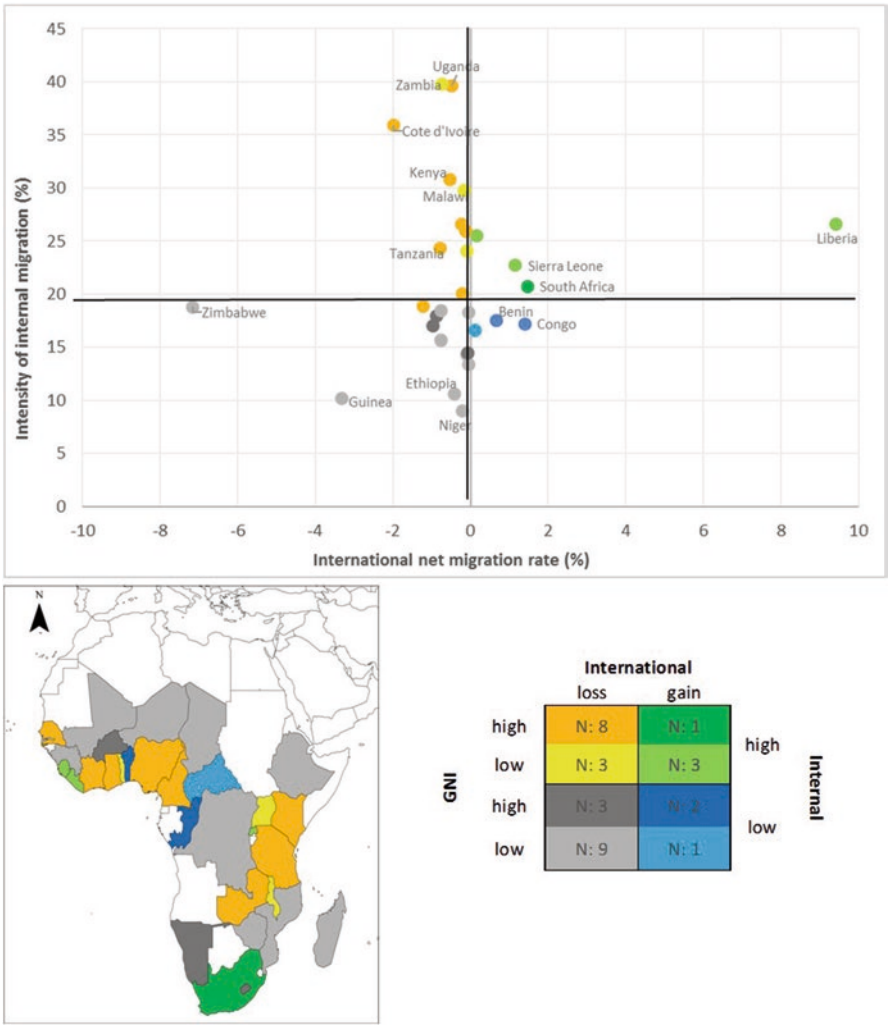

Fig. 6 Linking internal migration, international migration, and gross national income (GNI): A simple typology of countries in sub-Saharan Africa. Note: Internal migration intensities calculated using DHS data; international migration intensities calculated using estimates by Abel and Sander (2014) and UN WPP 2014 population data. Data on GNI for the period 2005–2010 sourced from the World Bank

is one of little or no systematic relationship between internal and international migration. High levels of internal migration (predominantly from rural to urban areas) do not coincide with high levels of international migration, with the exception of Liberia. There does not appear to be a clear relationship between income levels and intensities of migration. Some countries with lower income levels experience high internal migration intensities coupled with negligible intensities of

international migration (e.g., Zambia), while some countries with higher income levels have low internal and higher international migration intensities (e.g., South Africa).

The spatial representation of the typology of countries shown in the map in Fig. 6, however, echoes the three clusters of countries described earlier and underlines the importance of the regionalization of migration within sub-Saharan Africa. The West African group includes a diverse set of countries with regards to their pairings of migration intensities and income levels. The East African group is dominated by countries with negative international net migration and high intensities of internal migration, whereas the Southern African group includes the only country with high international migration gains, high internal migration intensities, and higher income levels (i.e. South Africa). These findings, however, should be interpreted with caution, given the limited data quality discussed earlier.

8 Conclusions

This chapter has provided a summary of the existing evidence on patterns and trends in internal and international migration in sub-Saharan Africa. Our aim has been to fill the gap in the literature created by the absence of adequate studies which examine the relationship between migration and countries' ability to reap the benefits of the demographic dividend. A key obstacle to a better understanding of this relationship is the limited availability of reliable migration data. While the United Nations has made some progress in promoting a unified standard for collecting statistics on migration, national legal frameworks and the divergent interests of nation states limit the degree of alterations which national statistical institutes are willing to implement so as to improve cross-national consistency. In response to the limitations of secondary data sources, the scientific community has focused on the development of harmonization and estimation methodologies as well as the exploitation of new alternative data sources, such as mobile phone data (Abel and Sander 2014; Raymer et al. 2013; Wesolowski et al. 2013; Bell et al. 2015). The collection of adequate data and the promotion of open access to census and register data should be a top priority in sub-Saharan Africa and beyond.

Projecting the likely future trajectory of migration in sub-Saharan Africa and its impact on population size and age structure is inherently difficult, especially in the context of African migration being largely triggered by shocks to the system, such as violent conflict and political regime changes. These difficulties are reflected in the United Nations opting for the simple but unrealistic assumption of net-international migration rates converging to zero by the year 2050. Even fewer studies have been devoted towards projecting sub-national populations within countries south of the Sahara, owing partly to the lack of adequate data. Another source of uncertainty in population projections for sub-Saharan Africa is the speed of expansion of education. A commensurate expansion in education and the growth of a more skilled workforce could lead to higher levels of internal migration as individuals

seek to maximize their economic potential, but, unless domestic job markets are sufficiently attractive, it could also result in an increase in emigration from Africa to the more developed world.

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Part III
Development Challenges

Economic Growth and Public and Private Investments

Vincent Turbat

1 Introduction

Easterly and Levine (1997) began their World Bank report on Africa by stating: "Africa's economic history since 1960 fits the classical definition of tragedy: potential unfulfilled with disastrous consequences. In the 1960s, a leading development textbook ranked Africa's growth potential ahead of East Asia's, and the World Bank's chief economist listed seven African countries that" clearly have the potential to reach or surpass "a 7% growth rate. Yet these hopes went awry. Much of Africa has suffered negative per capita growth since 1960, and the seven promising countries identified by the World Bank's chief economist were among those with negative growth".

Twenty years later, the 2015 Regional Economic Report[1] from the IMF for sub-Saharan Africa states: "sub-Saharan Africa's economyeconomy is set to register another year of solid growth, although the expansion will be at the lower end of the range registered in recent years, mainly reflecting the severe impact of the sharp decline in oil prices on the region's oil exporters".

In this chapter, we are going to identify the main factors that enabled most sub-Saharan African countries to shift from a negative to a positive growth, and assess whether this growth path is sustainable.

[1] IMF. *Regional Economic Outlook: sub-Saharan Africa, Navigating Headwinds,* Washington, DC: International Monetary Fund, World Economic and Financial Surveys, April 2015.

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2 The Growth Determinants

"Fast, sustained growth does not happen spontaneously. It requires long-term commitment by a country's political leaders, a commitment pursued with patience, perseverance, and pragmatism"[2]. The Commission on Growth and Development (2008) lists "five striking points of resemblance" among all highly successful countries:

- *Openness to the global economy*. During their periods of fast growth, all the successful economies made the most of the global economy. They did so in at least two ways: firstly, they imported ideas, technology, and know-how from the rest of the world—a world that had become more open and more tightly integrated since the end of World War II. Secondly, they exploited global demand, which provided an almost infinite market for their goods. In sum, successful economies "all imported what the rest of world knew, and exported what it wanted." The unsuccessful countries did the opposite.
- *Macroeconomic stability*. The second stylized fact of high-growth countries is their maintenance of stable macroeconomic environments. During their most successful periods, the countries avoided the kind of unpredictability in fiscal and monetary policies that damage private sector investment.
- *High saving and investment rates.* Another characteristic of high-growth countries is their willingness to forgo current consumption in pursuit of higher levels of incomes in the future. High saving rates were matched by high investment rates. The fact that countries such as Singapore or Malaysia adopted mandatory saving schemes have led some researchers to stress the importance of deliberate saving policies as the main cause for these high saving and investment rates (Montiel and Serven 2008). In fact, the main explanation may be the ability of these countries to produce large economic surplus and to generate rates of return on investments that were high enough to provide strong incentives to save. In the 1970s, Southeast Asia and Latin America had similar savings rates. Twenty years later, the Asian rate was about 20 percentage points higher.
- *Market allocation*. The Growth Commission Report notes that the twentieth century saw many experiments with alternatives to a market system. They all failed to help developing countries achieve sustained growth. While successful countries may differ in the intensity and strength of their property rights systems, they all adopted a well-functioning market mechanism that provided adequate price signals, transparent decision-making and good incentives. Their governments also did not resist the market forces in the reallocation of capital and labor from sector to sector, industry to industry.
- *Leadership and governance.* Sustained growth that can help overcome poverty is typically a multi-decade process, which only takes place in a stable and functional investment environment. It requires political leadership and effective, pragmatic and sometimes activist governments.

[2] *Growth Commission Report*, Washington, DC: The World Bank Group, 2008.

The Growth Commission Report also identifies a series of "bad ideas" to be avoided by policy-makers in their search for growth. The non-exhaustive but lengthy list includes: subsidizing energy, except for very limited subsidies targeted at highly vulnerable sections of the population; dealing with joblessness by relying on the civil service as an "employer of last resort"; reducing fiscal deficits by cutting expenditure on infrastructure investment (or other public spending, which yields large social returns in the long run); providing open-ended protection of specific sectors, industries, firms, and jobs from competition; imposing price controls to stem inflation; banning exports for long periods of time to keep domestic prices low for consumers at the expense of producers; resisting urbanization and as a consequence underinvesting in urban infrastructure; ignoring environmental issues in the early stages of growth on the grounds that they are an "unaffordable luxury"; measuring educational progress solely by the construction of school infrastructure or even by higher enrollments, instead of focusing on the extent of learning and quality of education; underpaying civil servants; having a poor regulation of the banking system combined with excessive direct control and interference; and allowing the exchange rate to appreciate excessively before the economy is ready for the transition towards higher-productivity industry.

Economic development is therefore a dynamic process marked with externalities and requiring coordination. While the market is a necessary basic mechanism for effective resource allocation at each given stage of development, governments must play a proactive and facilitating role in order for an economy to move from one stage to another.

In sum, the new structural economic framework is three-pronged: it includes an understanding of a country's comparative advantage defined as the evolving potential of its endowment structure; reliance on the market as the optimal resource allocation mechanism at any given stage of development; and the recognition of a facilitating role of the state in the process of industrial upgrading. This framework helps explain the economic performance of the most successful developing countries.

3 The Tragedy Period

During the period 1960–2000, sub-Saharan Africa was the poorest region in the world and its growth was the slowest of any region in the world. On average, real per capita GDP did not grow in sub-Saharan Africa during this period (0.56% for the period 1960–2000, according to Ndulu and O'Connell (1999, 2005), and −1.1% between 1985 and 1995 according to the World Bank; see Table 1), while, in East Asia and the Pacific, per capita GDP growth was over 5% and Latin America grew at almost 2% per year.

Easterly and Levine, through an econometric analysis, found that poor growth in Africa is strongly associated with several structural as well as conjunctural features such as: (1) low schooling; (2) political instability; (3) under-developed financial

Table 1 Average annual per capita growth rates, 1960–2000

	1960–1969	1970–1979	1980–1989	1990–1999
SSA	2.0	0.7	−1.0	−0.5
East Asia and the Pacific	1.3	4.4	6.1	7.1
Latin America and the Caribbean	2.4	3.1	−0.8	1.5

Source: World Bank, *World Development Indicators*

systems; (4) a distorted foreign exchange market; (5) high government deficits; (6) low infrastructure; (7) ethnic fractionalization; and (8) spillovers (or contagion) from neighbors.

Non-African growth consistently outpaced African growth after 1960, with the result that sub-Saharan real incomes fell by over 35% relative to incomes in other developing regions and by nearly half relative to industrial countries. Human development gaps widened over time rather than narrowing, and Africa's cumulative progress was insufficient, by 2000, to reach the levels of human development, which the rest of the developing world had already attained by 1960 (Ndulu et al. 2007). At the turn of the Millennium, nearly half of the sub-Saharan African population fell below an income poverty line of $1.50 per day (PPP--adjusted), up from 35% in 1970. How could this be explained?

The first type of explanation includes the conventional growth determinants such as investment rates, human capital, and population growth… However, these variables do not explain the full story. This is why numerous models have been developed over the past few decades to try to better explain the differential between SSA countries and fast-growing East Asian countries.

For example, capital formation as a percentage of GDP has been lower in Africa than in other developing regions, while population growth rates have tended to be systematically higher. However, Devarajan et al. (2001) found that, even though investment rates are lower in Africa than in other developing regions, low investment is not the main constraint. They argue that the productivity of investment is very low in Africa when compared to other countries. The solution would then be to increase the investments'investments' productivity.

Human capital productivity is almost lower in sub-Saharan Africa than anywhere else. This might not improve any time soon, as secondary school enrollment rates have been low during the whole period. Furthermore, the average quality of education remains very low in most SSA countries.

Factors that matter for growth—for example, macroeconomic stability, trade openness, and strong institutions—take on greater importance in the face of rapidly growing populations and increasing shares of working age population. Some policies, however, become relatively more important in the context of the demographic transition. Investments in human capital, including healthcare and education, are critical in the early phases to speed up the transition, improve the productivity of the workforce, and increase the size of the potential dividend. Policies that promote flexible labor markets, facilitate the development of labor-intensive sectors that can compete globally, and liberalize trade are necessary to increase employment

opportunities. Similarly, furthering financial sector development to effectively channel savings into investment can increase employment and growth.

Garner (2006) states that the focus of most SSA growth analyses of the period 1960–2000 can be regrouped into two main categories. In the first category, governance issues are considered the main reason as to why SSA experienced such a slow growth. In the second category, geography is considered to be the main issue.

Governance includes political and economic institutions as well as the policies implemented, both at a micro and macro level (such as price controls, budget, trade, de/regulation, etc.).

Geography is viewed as including the country's natural factors that impact upon its ability to extract, manufacture, transport, and trade goods and services. The list comprises, among others: natural resources, soil quality, climate, direct access to oceans/rivers, distances between producers and markets, and environment. However, governance is not fully independent of geography, as the latter can influence the former.

There is a wide consensus in academic and policy circles that good governance is a prerequisite to sustained growth and economic development. Starting with North (1990) and Shleifer and Vishny (1993), many researchers have argued that the economic performance of nations can be severely hampered by malfunctioning government institutions that reduce incentives and opportunities to invest and innovate. Yet, good governance is difficult to define rigorously and in a way that commands universal acceptance (see Chapter "Governance, Transparency, and the Rule of Law" in this volume). Good governance generally "relates to political and institutional processes and outcomes that are deemed necessary to achieve the goals of development […] the process whereby public institutions conduct public affairs, manage public resources and guarantee the realization of human rights in a manner essentially free of abuse and corruption, and with due regard for the rule of law" (United Nations 2007: 1).

The World Bank (1997) has defined good governance as "predictable, open and enlightened policy-making; a bureaucracy imbued with professional ethos; an executive arm of government accountable for its actions; and a strong civil society participating in public affairs; and all behaving under the rule of law".

By selecting variables such as school attainment, political stability, level of development of financial systems, government budget balance (deficit/surplus), and level of development of infrastructure, Easterly and Levine (1997) are focusing on governance. With these variables they were able to explain about two-fifths of the growth differential between SSA countries and fast-growing East-Asian countries. Their demonstration includes four steps:

(i) Economic growth is strongly linked to the following variables: political stability, government budget, financial systems, infrastructure, and school attainment. According to their calculations, these variables account for about two-fifths of the growth differential between countries in SSA and fast-growing countries in East Asia.

(ii) SSA suffers from chronic political instability, large government deficits, large black market exchange rate, poorly developed financial systems, inadequate infrastructure, and low school attainment. This would explain the low growth level reached by SSA during that period.
(iii) Higher levels of ethnic diversity in SSA are linked to poor policies, poor education, political instability, and inadequate infrastructure. The reason is that ethnic diversity encourages the adoption of growth-reducing policies (such as financial repression and overvalued exchange rates) that foster rent-seeking behavior and makes it more difficult to form a consensus for growth-promoting public goods.
(iv) They also demonstrate that high levels of ethnic diversity are linked to high fertility.

They conclude that ethnic diversity increases polarization and thereby impedes agreement about the provision of public goods and therefore, the extraordinarily high levels of ethnic diversity in SSA significantly contribute to Africa's tragedy.

The size of the informal sector is also mainly a governance issue. Both the ILO and the IMF estimate the formal sector employment (percentage of working age population employed formally, i.e., subject to national labor legislation, income taxation, and social protection)) in SSA to be between 10 and 25%, which means that the informal sector comprises up to 90% of all non-agricultural employment in SSA. Although it is hard to generalize the employment conditions in the informal sector, they most often result in low wages and poor social security coverage and are associated with increasing poverty. Some of the characteristic features of informal employment are a lack of protection in the event of non-payment of wages, compulsory overtime or extra shifts, lay-offs without notice or compensation, unsafe working conditions and the absence of social benefits such as pensions, sick pay and health insurance. Women, migrants and other vulnerable groups of workers who are excluded from other opportunities have little choice but to take informal low-quality jobs. Furthermore, there is a huge loss for the state budget as the enterprises from the informal economy do not pay the amount of taxes that they should pay otherwise. As a result, the growth-generating public expenditures in infrastructure, education or health, are insufficient, and the budget deficit widens.

However, the impact of a large informal sector on the country's growth is not so clear according to Sparks and Barnett (2010), who try to answer the question that has been asked over the past 20 years or so: "should the informal sector really be seen as a marginalized, "survival" sector, which mops up excess or entrenched workers, or as a vibrant, entrepreneurial part of the economy which can stimulate economic growth and job creation?" (African Union 2008). Not only do they argue that it is a vibrant part of the economy, but they believe that if the aim is to create jobs and reduce poverty, the informal sector must be included in the debate and governments should find ways to encourage its growth. At the same time, they also need to decide how to strengthen the formal sector and extend benefits to those in the informal sector, while removing barriers to the formal sector to allow more to participate.

From a health viewpoint, and taking into consideration that a large informal sector prevents the implementation of a comprehensive risk-sharing scheme, the growth impact is negative. As argued by Lorentzen et al. (2005), a high adult mortality rate can reduce investment and growth by shortening time horizons. More broadly, it is clear that a less healthy workforce will have a lower productivity than a healthier one.

Bloom and Sachs (1998) stress the importance of geography while analyzing growth in sub-Saharan Africa. Many African countries are landlocked, with limited access to ports for international trade, have poor quality soil, and must cope with a difficult environment of communicable diseases. Sachs and Warner (1997) find that, in addition to a lack of trade openness, the landlocked nature of many countries, a high natural resource dependency, and an adverse disease environment help account for the continent's slow growth. However, Collier (2007) demonstrates that being landlocked is not an issue in itself if the neighbors are "good". It is only when the neighbors are "bad" that being landlocked can become one of the four poverty traps, which are: (i) experiencing frequent conflicts; (ii) an economy depending on a few natural resources; (iii) being landlocked with bad neighbors; and (iv) bad governance.

Africa is relatively well endowed with natural resources and with respect to growth an abundance of natural resources can be a curse rather than a blessing (see Chapter "The Role of Natural Resources" in this volume). This can occur because of the well-known "Dutch disease" of an overvalued exchange rate that discourages domestic industry, or because the rents from these resources engender corruption and civil strife. Sachs and Warner (1997) find that countries with abundant natural resources tend to grow on average more slowly than resource scarce countries. For example in Africa, the Democratic Republic of the Congo has enormous mineral resources, including diamonds, copper, and zinc, but has been among the world's worst growth performers.

The IMF (2003) did not find any clear-cut common geographical pattern of growth performance. In this 2003 study, each regional subgrouping experienced large cross-country variance in growth rates. For instance, the 13 countries of the CFA franc zone were equally distributed around the median growth rate.

4 The Hope Period

The period 1990–2003 saw, for all but a few sub-Saharan countries, a slight increase in the real per capita GDP growth (see Table 2). Rates were predominantly under 1% during the period 1990–1997; they reached 1% in 1997–2001 and 1.6% in 2003.

Table 2 Real per capita growth rate (in percent)

	1997–2001	2001	2002	2003
SSA	1.3	1.3	1.1	1.6
SSA, excluding Nigeria and South Africa	2.1	2.1	1.2	0.9

Source: IMF 2003

Table 3 Real per capita growth rate

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014p	2015p
SSA	5.2	4.2	4.6	5.5	3.9	1.7	4.5	2.7	1.9	2.6	2.6	3.3
Median	2.3	2.7	2.8	3.6	2.7	0.7	3.1	2.5	2.4	2.4	2.7	3.0
Nigeria and South Africa ex-cluded	3.8	3.9	4.0	5.4	3.7	0.8	3.7	3.3	2.6	3.6	2.7	3.5
Oil ex-porting	9.9	5.5	6.2	7.6	5.9	4.5	6.1	1.9	0.9	2.9	3.2	4.1
Oil im-porting	2.4	3.4	3.6	4.0	2.6	0.4	3.3	3.3	2.7	2.4	2.1	2.7

Source: IMF Data, p for projections

The period 2004–2015 saw the sub-Saharan average growth rate surpass 4% (see Table 3). However, there were significant discrepancies between the oil exporting and oil importing countries. The latter had a much lower growth rate, reaching up to a 1.6 percentage point difference.

Average per capita real income growth, which was negative in the period 1992–1996, turned positive—albeit at modest levels—in the subsequent period. This welcome reversal partly explains the progress that has been made by some countries in respect to poverty reduction and social wellbeing. Over the same sub-periods, the average rate of inflation was brought down to less than half of the earlier level and is approaching single digits, in large part as a result of improvements in monetary and fiscal management.

The mid-1990s ushered in two decades of strong and sustained growth in the region, with both sound macroeconomic policies and and favorable external conditions playing a role. Indeed, trade has been a powerful engine for growth, but far less for labor productivity gains. With the global environment becoming less supportive, it will be key for the region to build on the growing trade ties of the past 20 years to better leverage its comparative advantages, participate in global value chains, and support structural transformation in the process.

An important part of the changing landscape of the last 5 years is the beginning of a political transition in Africa, with significant movements towards democratization and political liberalization. This transition, although partial and fragile, serves as the backdrop to any discussion of the political economy of development in the region. The last 5 years have also seen noticeable progress on certain key items of macroeconomic reform such as exchange rates and price control, but with fragility in other key areas such as fiscal balance. There has been relatively less progress overall on the deeper, structural elements of the development agenda, but with very interesting country examples in specific sectors.

SSA's growth resilience was primarily attributable to a number of domestic factors such as the soundness of macroeconomic and structural policies, but also external factors such as external aid. Countries that are pursuing prudent macroeconomic policies and implementing wide-ranging structural reforms, including improving

the quality of their institutions and ensuring peace and security, tend to perform better than others. Also, all low-income countries countries that were able to sustain compounded GDP growth rates of 5% or more during 1997–2001 (Mozambique, Rwanda, Uganda, Benin, the Gambia, Cape Verde, and Senegal) have been implementing IMF–supported macroeconomic and structural policies.

By contrast, countries in conflict and/or countries with a weak track record of policy implementation such as Sierra Leone, the Democratic Republic of the Congo, Guinea- Bissau, and Zimbabwe, have generally performed poorly.

The IMF 2003 report also found that the quality of public investment programs (i.e., the good management of public resources) has been critical for economic growth. In SSA, individual countries' growth performance seems poorly correlated with the amount of public investments. For instance, during 1997–2001, with similar public investment-to-GDP ratios (11%), Ghana was able to sustain a positive growth rate of 4.3% while Guinea-Bissau recorded a negative growth rate of 1%. Conversely, Burkina Faso and Tanzania were both able to sustain growth rates of 4.3% during the period, notwithstanding their very different levels of public investments (14.4% and 4% of GDP, respectively). However, while quality tends to matter more than quantity in the area of public investment, countries with very low public investment ratios (i.e., below 5% of GDP) have in general not been able to sustain high growth rates (this is the case of the Democratic Republic of the Congo, South Africa, Togo, Côte d'Ivoire, Sierra Leone, and Zimbabwe).

Given sustainable poverty reduction as the overarching objective, African and global experience suggests that equitable and environmentally sustainable growth, accompanied by broad-based investment in human development and infrastructure, would form the basic elements of a development agenda. For growth, macroeconomic stability is necessary, as are agricultural development and private sector development.

5 Should One Fear a Downturn?

The main question is whether the recent performance from most sub-Saharan countries can be sustained. As showed above, growth has been driven by a combination of external resources (including international aid, debt relief, and commodity windfalls) and the removal of some of the worst policy distortions of the past. Furthermore, domestic productivity has been given a boost by an increase in demand for services (mostly) and more efficient use of resources. However, productivity gains have yet to come.

In other words, the underlying problem is the weakness of these economies' structural transformation. For example, East Asian countries grew rapidly by replicating (as suggested by Rostow) what the advanced countries did following the Industrial Revolution: (i) they turned their farmers into manufacturing workers; (ii) they diversified their economies; and (iii) they exported a range of increasingly sophisticated goods. Meanwhile, one can observe that very little of this process is

taking place in Africa. As researchers at the African Center for Economic Transformation in Accra, Ghana, put it, the continent is "growing rapidly, transforming slowly" (Rodrik 2013).

The central challenge in Africa is to accelerate growth significantly beyond present trends. This requires, in the first instance, that domestic policies be strengthened through sustaining and deepening macroeconomic policies, improving political and economic governance, enhancing domestic institutions and infrastructure, and pursuing key structural reforms, especially those promoting financial intermediation and the private sector. In addition, faster growth in Africa will require a strengthened and integrated framework of support through enhanced debt relief, increased trade and market access, aid, and private capital flows.

Highlights for the continent include the progress that has been made in a number of countries in the realm of good governance (fighting corruption, the manipulation of elections, and human rights abuses) and in pursuing prudent macroeconomic and pro-reform policies. In these countries, the basis of a virtuous circle of improved domestic saving and investment, increased external assistance and sustained higher economic growth, has been established. These countries do not yet, unfortunately, constitute a critical mass to drive the entire region on a generalized path of higher growth and poverty reduction.

Less optimistic areas include the fact that many sub-Saharan African countries continue to experience weak policies and public sector inefficiencies. While a number of countries, mostly oil exporters, have temporarily benefited from improved terms of trade, many other countries continue to be adversely affected by depressed commodity prices and trade barriers in developed countries. Furthermore, the HIV/AIDs pandemic, the Ebola epidemic and other endemic diseases, together with recurrent exogenous shocks such as severe droughts and the impact of climate change, continue to cloud the regional outlook.

In spite of an incipient recovery since the end of the 1990s, with per capita income growth rates outpacing those of rich countries for the first time in many years, leading observers in the development and policy community are advocating a "big push" to help the region escape poverty and regain the lost ground vis-à-vis the rest of the developing world (e.g., Collier 2007). These calls for action propose a variety of remedial policy agendas, but virtually all of them list infrastructure development among the top priorities.

The region has experienced a formidable expansion of its trade flows over the last 20 years, helping to propel its growth engine. A strong demand for commodities has undeniably played a role in supporting the increase in trade, in particular with the emerging market economies, but this is far from being the entire story, as even non-oil commodity exporters have managed to diversify their export structure, and begun to integrate into value chains.

However, even after accounting for lower levels of income and economic size, generally longer distances and a larger number of landlocked countries, trade flows emanating from sub-Saharan Africa are still significantly smaller than in the rest of the world. Likewise, the region still has some way to go to better integrate into global value chains—a process that has been associated in other regions with higher

growth over time—although there is substantial heterogeneity across countries. Where progress was registered, manufacturing, agriculture and agribusiness, tourism, and transport all showed the largest potential for deeper integration. To leverage this potential, findings emphasize the need to fill the infrastructure gap, lower tariff and non-tariff barriers, and improve the business climate and access to credit.

Furthermore, the current global environment—a slowing China, anemic growth in Europe, faltering commodity prices, and the risks of global financial volatility as some advanced economies normalize monetary policy conditions—will become more challenging than in the recent past. This environment provides a unique opportunity to refocus policies on economic diversification and on fostering structural transformation. Further and better integration into global trade can provide such an opportunity. Despite the strong growth in trade flows, sub-Saharan Africa still trades below its potential, both in terms of total flows and of positioning in global value chains. Some countries have started to leverage their comparative advantages, either in agriculture and agribusiness, or, in some cases, in manufacturing. But more broadly, much more could be done to arrest the gradual deindustrialization in the region.

Addressing the barriers to trade could therefore unlock untapped productivity gains, bringing with it more jobs, higher income levels, more diversified economies, and eventually more sustainable growth. Supporting the development of regional trade flows would also better shelter the region from exogenous external shocks. Insufficient infrastructure comes out as one of the most important impediments to trade flows. But lower tariffs, better access to credit for the private sector, a more conducive business climate as well as efforts to improve education outcomes are all found to support more intense trade flows and a better insertion into global value chains. These are levers over which the authorities have control, and on which they have started to work. The efforts should be sustained and even accelerated to leverage the region's remarkable assets, including sound macroeconomic policies, improving economic institutions, and a young and growing workforce.

Does what you export matter? This is the question posed by Lederman and Maloney (2012), and their answer is as follows: "A large literature answers affirmatively to the first question and suggests the characteristics that distinguish desirable exports. Some schools of thought are best known by their colorful metaphors. For example, natural resources are a "curse"; "high-tech" goods promote the "knowledge economy"; a "product space" made up of "trees" (goods) from which "monkeys" (entrepreneurs) can more easily jump to other trees fosters growth. More prosaically, but no less controversially, goods which are intensive in unskilled labor are thought to promote "pro-poor" or "shared growth," whereas those which are skilled-labor intensive are thought to generate positive externalities for society as a whole. Concerns about macroeconomic stability have led to a focus on the overall composition of the *export basket* of the sub-Saharan countries".

At this point in time, the sub-Saharan export basket is still too dominated by natural resources and does not comprise enough goods intensive in skilled labor and high-tech goods. In fact, Sub-Saharan Africa is less industrialized today than

in the 1980s. A clear shift needs to take place for the economy to continue growing at least at the rates reached during the last decade.

On the bright side, one can note that sub-Saharan Africa is starting to experience new trends in investment sources such as: domestic savings, foreign direct investment, remittances and development assistance. Domestic savings peaked at 25% of the GDP in 2006, but fell back at 19.22% of the GDP in 2015 (which is still better than the 13.28% of 1998) (IMF 2015). According to UNCTAD, the stock of FDI into the transport, storage and communications industries grew more than four-fold between 2001 and 2012, from $8 billion to $34 billion[3]. Remittances sent to sub-Saharan Africa have increased by 2.2% in 2014. Their growth is expected to slow down to 0.9% in 2015, and then bounce back to grow by as much as 3.8% in 2016 and 2017[4]. If these new trends continue to develop at a rapid pace, sub-Saharan countries would be able to invest on a larger scale and sustain the nascent growth that triggered the renewed hope of reaping the benefits of a Demographic Dividend.

6 Conclusions

To reap a dividend from the demographic transition, sub-Saharan Africa will need to create jobs at a hitherto unprecedented rate for a long period of time (about 18 million per year until 2035). Otherwise, the "economic" dependency rate (including the unemployed population) will deteriorate and the demographic transition will translate into a loss rather than a dividend.

This will require policies that favor investments in human capital, tackle the infrastructure deficit, ensure greater labor market flexibility, and support production in labor-intensive sectors. It will also require sub-Saharan Africa to become more integrated into the global economy.economy. Lastly, it will require a mobilization of domestic savings, which would result from the demographic transition, to spur productive investments.

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Governance, Transparency, and the Rule of Law

Anna Zuber, Christian Blickenstorfer, and Hans Groth

1 Introduction

Countries undergoing rapid demographic transition will eventually enter a demographic window of opportunity once the share of dependent persons (in this stage mainly children) decreases due to a reduction in the fertility rate. In the best case scenario, a lower dependency ratio frees public and private resources while at the same time increasing productivity and tax revenues, due to the rising proportion of the population actively participating in the workforce. For a certain period of time, this specific demographic structure can substantially boost the economy of a country and build a momentum for its overall development. Rising per capita income due to increased productivity during this transition period constitutes a so-called demographic divided (DD). The economic benefits of a DD, however, do not materialize automatically. In order to take advantage of this demographic window of opportunity, a favorable political and economic environment is crucial. In particular, the following three elements are key when it comes to capturing a DD (Fig. 1).

Job Creation In order for the growing working-age population to contribute effectively to productivity and economic growth a successful integration into the workforce is required. If not successfully achieved, the demographic transition will merely lead to an increase in youth unemployment, which can be a threat to stability and a drag on the economic development of a country. Furthermore, because of the high risk of brain-drain, public investment in a solid education system can become futile when suitable jobs are lacking, depriving the country of one of its most valuable resources. Therefore, a stable macroeconomic environment (i.e., low inflation) encouraging savings and a healthy financial sector providing access to credit, is crucial to facilitate the necessary private investment, which leads to the creation of

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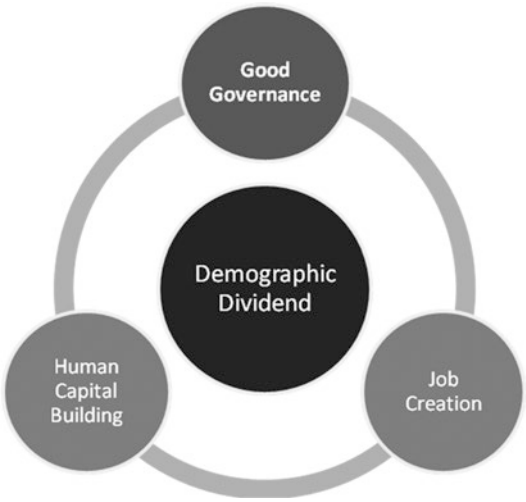

Fig. 1 Enhancing factors for reaping a demographic dividend (Source: The authors)

new jobs (see chapter "Economic Growth and Public & Private Investments" of this volume).

Human Capital Building The ability of the labor market to absorb a high number of new entrants also heavily depends on the skills of the job-seeking persons. Therefore, the scope and quality of education provided by the state will have a major impact on the country's ability to reap a DD. Furthermore, a well-educated working population will provide higher per capita productivity and therefore most likely increase the size of the potential DD. And last but not least, a well-developed health care system is needed to make sure that potential productivity losses due to health problems are reduced.

Good Governance While not as obvious as the first two factors, the quality of the public sector is likewise a key element when it comes to seizing the opportunities inherent to the demographic window of opportunity. On the one hand, providing access to *high-quality education* and *affordable health care* is an integral part of the public service and is therefore under governmental control. If these sectors are poorly managed, or if the necessary resources do not reach the rightful beneficiaries, the benefits of the DD can be substantially reduced due to a lack in human capital formation. More generally, if the public resources freed through a decreasing fertility rate are not used productively, then this fraction of the DD will not manifest in terms of growth or rising per capita income. On the other hand, *political stability*, *low levels of corruption*, and *the rule of law* compose important prerequisites for business to flourish. Even more importantly, these key elements of Good Governance are decisive for attracting foreign direct investments. If, however, the political environment is perceived to be unstable or corrupt, then the stream of foreign capital will most likely take different roads and the much-needed jobs will be created somewhere else where the political and economic environment is more favorable (Javorcik and Wei 2009).

In this chapter we discuss the importance of governance and transparency, or the lack thereof, for the prospects of capturing a DD in sub-Saharan Africa (SSA). After defining the core concepts of Good Governance, the current status of the region is analyzed by applying some of the most popular instruments for measuring the quality of political institutions and the prevalence of corruption. The last section evaluates these results in the light of the region's attempt to reap a DD and identifies existing opportunities and major challenges.

2 What Constitutes Good Governance?

Good Governance is a concept that has come into regular use in political science, public administration and, more particularly, international development literature (Doornbos 2001). Nonetheless, the terms 'governance' and 'Good Governance' are often used quite vaguely and different meanings are attributed to them in different contexts (Weiss 2000). In its broadest sense, Good Governance is about *good decision-making practice* and the implementation of these decisions. The concept is commonly applied to political institutions (e.g., governments) but can equally be used to describe decision-making processes within private institutions, such as corporations ('Good Corporate Governance') and/or non-governmental organizations.

Since governance is mostly about the 'how' and not the 'what' of decision-making, the elements used to describe Good Governance usually target the *process* of how governments manage public affairs and resources, and not the *content* of their decision. The specific procedural requirements that have to be met differ, depending on the underlying reference framework.

An important contribution towards a clarification of the concept of Good Governance can be found in resolution 2000/64 by the former Commission on Human Rights of the United Nations. In this paper, the Commission identifies five key elements of Good Governance, namely transparency, accountability, responsibility, participation, and responsiveness (to the needs of the people).

Transparency describes the level of disclosure of a decision-making process. Full transparency requires that both the decision-making rationale and the decisions resulting from it are made public and that this information is easily accessible to those who might be affected by it. Therefore, freedom of the press is an integral part of the transparency requirement. Transparent procedures work against corruption and serve as a prerequisite for the monitoring and evaluation of government (or management) performance.

Accountability describes the degree to which the population (or other stakeholders) can participate in the monitoring of the entity in power and take effective measures if they disapprove of their performance (e.g., depose a ruling government). Although transparency and accountability are interdependent concepts, they should be understood as mutually reinforcing. Together they enable citizens to participate in the decision-making process and hold those in charge to account for the decisions taken (T/A Initiative n. d.).

Responsibility, unlike the other elements, is rather undertheorized in the context of Good Governance. Following the meaning of responsibility as it is used in the debate about Corporate Social Responsibility (CSR), it describes the requirement for an agent to take into account the effects of his actions on different stakeholders according to a normative standard, for example human rights (OHCHR n. d.). It is therefore closely linked to the requirement to govern in a manner that is responsive to the needs (and rights) of the people.

Participation describes the requirement to involve citizens in public policy-making. Besides standard means of democratic participation, such as elections and referenda, participatory elements in political decision-making can take various forms reaching from opinion polls over stakeholder consultation to advocacy boards and petition rights. Participation also presupposes certain rights being protected, such as the rights to freedom of expression, assembly, and association (Caddy 2001).

Responsiveness describes the extent to which decision-makers take the needs of the people (present and future generations) into account. Strictly speaking, this element exceeds to a certain extent the focus on mere procedural consideration by putting the common good first. According to this claim, decisions should serve the needs of the community as a whole and not promote the interest of particular groups or individuals. Usually this notion presupposes a focus on welfare and sustainable human development.[1]

A widely used benchmark, which further elaborates on the aforementioned elements, is the UN-ESCAP framework for Good Governance. This framework identifies eight major aspects of Good Governance, adding the important dimensions of *efficiency* and the *rule of law* to the list. Even more clearly, this list of desiderata is not bound anymore to purely procedural requirements, but rather demands a pro-poor and pro-minorities view when making political decisions:

> «*Good governance has 8 major characteristics. It is participatory, consensus oriented, accountable, transparent, responsive, effective and efficient, equitable and inclusive and follows the rule of law. It assures that corruption is minimized, the views of minorities are taken into account and that the voices of the most vulnerable in society are heard in decision-making. It is also responsive to the present and future needs of society*.»[2]

There is a certain risk here to fill the notion of Good Governance with all kinds of different political desiderata and by this dilute the meaning of this important concept. It is not the aim of this chapter, however, to develop a more rigorous definition of Good Governance, but rather to shed some light on where the sub-Saharan region stands in terms of transparent and accountable governance as it is evaluated by the most common indicators, which are based on varying definitions of Good

[1] Good Governance Guide (2012); see http://www.goodgovernance.org.au/about-good-governance/what-is-good-governance, accessed 1 January 2016.

[2] The Global Development Research Center, (n. d.); see http://www.gdrc.org/u-gov/escap-governance.htm, accessed 1 January 2016.

Governance.[3] In the next section, we present a series of selected indicators and their underlying methodology.

3 Measuring the Quality of Political Institutions

When discussing the influence of Good Governance on various other factors, such as development or economic growth, the question of how to properly operationalize the quality of governance is essential (Besançon 2003). Resnick and Birner (2006) therefore correctly point out that: "[t]*he definitional ambiguity surrounding the notion of governance is particularly challenging when trying to measure governance. Governance-related donor and research initiatives have been accompanied by a surge in indicatorsthat aim to measure governance*." To complicate things even more, the questionable quality of available data for some countries limits the validity of any assessment tool to a certain degree.

Measuring the quality of political institutions is, however, not primarily of scientific interest. Development organizations, international donors, and United Nations institutions, such as the International Monetary Fund (IMF), place "*great emphasis on good governance when providing policy advice, financial support, and technical assistance.*"[4] Good Governance has become a decisive criterion for the eligibility of countries for donor support (Doornbos 2001). To ensure a most efficient use of their funds, international organizations, such as the World Bank Group or the IMF, rely on pre-composed governance indicators to assess the quality of the public sector in a given country. Three commonly used assessment instruments with different scopes will be discussed below. The *Worldwide Governance Indicators* (WGI) by the World Bank Group corresponds best to the definition of Good Governance presented above. A broader view on governance is taken by the *Country Policy and Institutional Assessment* (CPIA) tools and the *Ibrahim Index of African Governance (IIAG)*, which focuses exclusively on African countries.

3.1 Worldwide Governance Indicators (WGI)

Developed and run by the World Bank Group, the *Worldwide Governance Indicators* (WGI) project provides data from 215 economies over the period 1996 to the present day, and is issued annually.[5] The focus of the WGI project lies on three main dimensions of governance: *"(1) the process by which governmentsare selected,*

[3] For an excellent discussion of different conceptual and normative accounts of corruption see Velasquez (2012).

[4] See http://www.imf.org/external/np/gov/guide/eng/index.htm, accessed 1 January 2016.

[5] See http://info.worldbank.org/governance/wgi/index.aspx#home, accessed 1 January 2016. Before 2002, it was issued every 2 years.

Table 1 Worldwide governance indicators (WGI) by the World Bank Group

Category	Content
Voice and Accountability	Voice and Accountability captures perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media
Political Stability and Absence of Violence/Terrorism	Political Stability and Absence of Violence/Terrorism measures perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism
Government Effectiveness	Government Effectiveness captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies
Regulatory Quality	Regulatory Quality captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development
Rule of Law	Rule of Law captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence
Control of Corruption	Control of Corruption captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests

Source: http://info.worldbank.org/governance/wgi/index.aspx, accessed 1 January 2016

monitored, and replaced; (2) the capacity of government to effectively formulateand implement sound policies, and (3) the respect of the citizens and the state for the institutions that govern the economic and social interactions among them."[6] The indicator covers a total of six categories of Good Governance, as listed in Table 1.

Data from different sources is used to compose the results for each of the six components.[7] Countries are ranked on a scale from 1 to 100 in each category, according to their relative performance (percentile rank). Country specific results as well as regional and income group averages can be accessed online and traced back to 1996.

3.2 Country Policy and Institutional Assessment (CPIA)

Complementary to the WGI effort, the World Bank Group also provides a tool for *Country Policy and Institutional Assessment* (CPIA) with a broader scope. This data set covers 95 economies over the period 2005 to present and is updated annually.

[6] See http://info.worldbank.org/governance/wgi/index.aspx#faq-1, accessed 1 January 2016.

[7] See http://info.worldbank.org/governance/wgi/index.aspx#faq-5 , accessed 1 January 2016.

Table 2 Country policy and institutional assessment by the World Bank Group

Category	Criteria
(A) Economic Management	1. Monetary and Exchange Rate Policies
	2. Fiscal Policy
	3. Debt Policy and Management
(B) Structural Policies	4. Trade
	5. Financial Sector
	6. Business Regulatory Environment
(C) Policies for Social Inclusion and Equity	7. Gender Equality
	8. Equity of Public Resource Use
	9. Building Human Resources
	10. Social Protection and Labor
	11. Policies and Institutions for Environmental Sustainability
(D) Public Sector Management and Institutions	12. Property Rights and Rule-based Governance
	13. Quality of Budgetary and Financial Management
	14. Efficiency of Revenue Mobilization
	15. Quality of Public Administration
	16. Transparency, Accountability, and Corruption in the Public Sector

Source: http://documents.worldbank.org/curated/en/550331468188659453/CPIA-2014-criteria, accessed 1 January 2016

Countries are rated on a scale from 1 (low performance) to 6 (high performance) on the basis of quantitative and qualitative information. In its current form, the CPIA contains 16 criteria which are grouped in four areas: economic management, structural policies, policies for social inclusion and equity, and public sector management and institutions.[8] The criteria assessed in the last category (D) are closest to the traditional understanding of Good Governance. The full list of components is provided in Table 2.

The aim of the CPIA tool is to assess the quality of governance in terms of "*how conducive that framework is to fostering poverty reduction, sustainable growth, and the effective use of development assistance*."[9] Based on the results from the CPIA, the World Bank Group also issues a special report discussing the quality of public policy and institutions in Africa.[10]

[8] See http://data.worldbank.org/data-catalog/CPIA, accessed 1 January 2016.

[9] See http://documents.worldbank.org/curated/en/550331468188659453/CPIA-2014-criteria, accessed 1 January 2016.

[10] See http://datatopics.worldbank.org/cpia, accessed 1 January 2016.

3.2.1 CPIA by the African Development Bank

The African Development Bank (AfDB) annually issues its own CPIA ranking, covering 40 African countries over the period from 2000 to present. The methodology is similar to the CPIA report by the World Bank Group, however, the AfDB survey includes 18 criteria grouped into 5 categories.[11] The rating scale ranges from 1 (very weak for 2 or more years) to 6 (very strong for 3 or more years), and can be accessed online.[12]

3.3 Ibrahim Index of African Governance (IIAG)

The concept of governance used by the *Ibrahim Index of African Governance* (IIAG) is again broader than the one underlying the WGI, but its scope is restricted to African countries only. The Mo Ibrahim Foundation (MIF), founded by the Sudanese businessman Mohammed Ibrahim,[13] defines governance as "*the provision of the political, social and economic goods that a citizen has the right to expect from his or her state, and that a state has the responsibility to deliver to its citizens*."[14] Established in 2007, the IIAG is based on four key areas containing 14 sub-categories and a total of 95 different indicators, each weighted equally. It is therefore the most comprehensive tool for governance assessment in Africa, using 34 external sources for its annual evaluation. The 2014 Index covers 52 African countries, and scores range from 0 to 100 (Table 3).[15]

The aim of the IIAG is to provide a "*framework for citizens, governments, institutions and the private sector to accurately assess the delivery of public goods and services, and policy outcomes, across the continent*."[16] The index is intended to facilitate the evaluation of government performance as well as to serve as a decision-making instrument for civil servants.

[11] See https://cpia.afdb.org/documents/public/cpia2014-questionnaire-en.pdf, accessed 1 January 2016.

[12] See https://cpia.afdb.org, accessed 1 January 2016.

[13] Mo Ibrahim is the founder of the cell phone company *Celtel International,* as well as *Satya Capital Limited*, a private equity fund focused on Africa.

[14] See http://www.moibrahimfoundation.org/iiag, accessed 1 January 2016.

[15] See IIAG 2014.

[16] See IIAG 2014.

Table 3 Ibrahim Index of African Governance

Category	Sub-category
Safety and Rule of Law	Rule of Law
	Accountability
	Personal Safety
	National Security
Participation and Human Rights	Participation
	Rights
	Gender
Sustainable Economic Opportunity	Public Management
	Business Environment
	Infrastructure
	Rural Sector
Human Development	Welfare
	Education
	Health

Source: http://mo.ibrahim.foundation/iiag/methodology, accessed 1 January 2016

4 SSA's Standing in Terms of Transparency and Governance

This section summarizes the results of the governance indicators presented above for sub-Saharan Africa. Whenever necessary, regional or country specific information is given. The results will be discussed following the order of indicators presented in Sect. 3.

4.1 Worldwide Governance Indicators (WGI) Results for SSA

According to the WGIs, the overall quality of governance in SSA, relative to other regions, has not substantially improved over the last 10 years (2003–2013). For certain dimensions, such as *Government Effectiveness*, *Rule of Law*, and *Control of Corruption*, the 2013 results even fall behind the levels achieved in 2003. However, this can also result from a stronger performance of other regions and does not necessarily indicate an absolute deterioration of governance quality in SSA.[17] On an aggregate level, the region ranks in the bottom third of all countries assessed by the WGIs with percentile ranks ranging from 27 (Government Effectiveness) to 34 (Political Stability) in 2013 (Fig. 2).

On a country level, the differences between the best and worst performing SSA countries are substantial. Therefore, the following sub-sections will discuss selected results on a country basis for each category of the WGIs (individual scores are displayed in brackets).

[17] In addition, for statistical reasons (normal distribution curve), a given change in scores at different levels of the ranking is not comparable in absolute numbers.

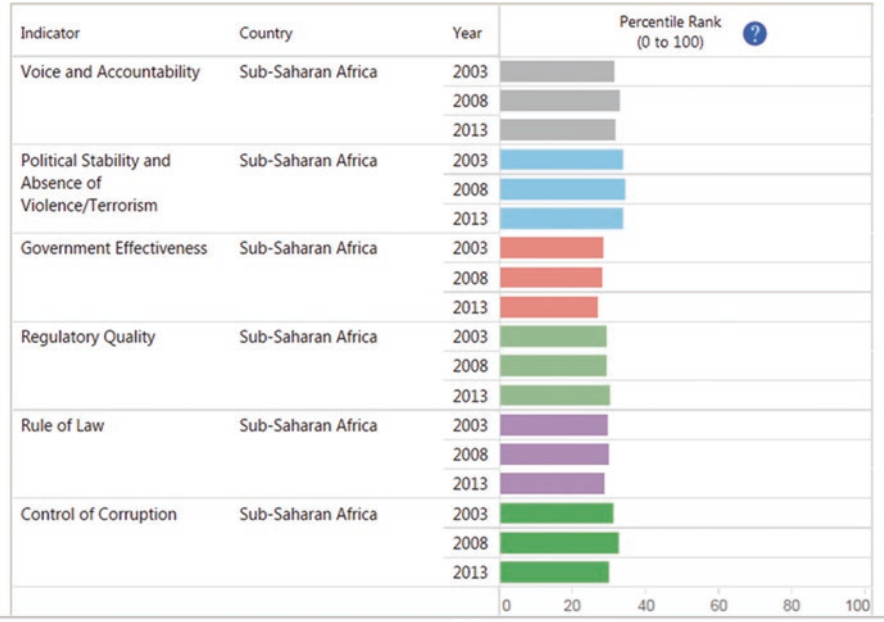

Fig. 2 WGI Results for SSA (Source: Interactive WGI database, http://info.worldbank.org/governance/wgi/index.aspx#reports, accessed 1 January 2016)

4.1.1 Voice and Accountability

Among the countries in SSA that score highest on voice and accountability are, not surprisingly, Cape Verde (74), South Africa (65), Botswana (63), Namibia (59), and Lesotho (53). However, Ghana (61), Benin (55), and Senegal (50) also score in the upper half of all countries assessed by the WGIs in 2013. Substantial improvements over the period 2003–2013 can be observed for Zambia (38–45), Malawi (36 to 42), Liberia (8 to 33), and Côte d'Ivoire (14 to 27). Unfortunately, there are also countries which show a considerable deterioration in voice and accountability, mostly due to increased political instability (see sub-Sect. 4.1.2). Among them are Madagascar (48 to 27), Mali (59 to 38), and The Gambia (38 to 14). Somalia (0) and Eritrea (1) score the lowest, followed by Sudan (3).

4.1.2 Political Stability and Absence of Violence/Terrorism

The second indicator shows similar results but with an even higher spread. The most stable and peaceful countries in the region are Botswana (85), Namibia (77), the Seychelles (73), Cape Verde (71), Gabon (59), and Lesotho (58). Missing in this list is South Africa (44), which does not reach the median score due to its high crime rate. Several countries in SSA substantially improved their security situation over the last

10 years (2003–2013), for instance Zambia (49 to 61), Rwanda (16 to 44), Tanzania (21 to 41), Sierra Leone (18 to 41), Liberia (2 to 31), the Republic of the Congo (15 to 30), and Uganda (6 to 20). Increasing instability and/or violence over the same period was registered in Madagascar (65 to 23), Mozambique (51 to 37), Burkina Faso (43 to 22), Niger (42 to 10) and, most dramatically, Mali (52 to 7), facing an armed conflict in the Northern part of its territory in 2012/13. The lowest scores for 2013 are attributed to Sudan (3) and Nigeria (4), which represents their struggle with civil war and violent militia such as the Islamic extremist group Boko Haram in Nigeria.

4.1.3 Government Effectiveness

The third indicator is again dominated by the southern African countries, although the results are not as good as those concerning stability. The highest scores are achieved by South Africa (67), followed by Botswana (63) and the Seychelles (63), Namibia (60), Cape Verde (58), Rwanda (55), and Ghana (51). Results are pretty stable over time (2003–2013) for most countries, with a remarkable increase for Rwanda (25 to 55) and Ethiopia (19 to 36), although for Ethiopia the 2013 score meant a decrease from its all times high (42) in 2007/2008 and 2010. Severe deterioration in Government Effectiveness could be witnessed for Guinea (23 to 9) and Eritrea (15 to 3). Eritrea at the same time belongs to the lowest performers, together with Sudan (3), the Democratic Republic of the Congo (1), the Central African Republic (1), and Somalia (0).

4.1.4 Regulatory Quality

Government Effectiveness and Regulatory Quality are two highly interlinked indicators, which is why comparable results could be expected. This is true for Botswana (73), South Africa (64), Ghana (56), Namibia (54), and Rwanda (53). The Seychelles, however, only scores 44, only slightly outperformed by Cape Verde with a percentile rank of 48. A remarkable score of 47 is achieved by Burkina Faso. There are several countries which improved their Regulatory Quality over the time period 2003 to 2013, such as Liberia (3 to 21), Sierra Leone (13 to 27), Burundi (12 to 22), Rwanda (22 to 53), Ghana (45 to 56), and Nigeria (10 to 25). Decreasing quality in regulation was observed for Gabon (49 to 31), Guinea-Bissau (19 to 9), and Madagascar (44 to 28). Again at the bottom of the ranking are Somalia (1) and Eritrea (1), together with Zimbabwe (2), South Sudan (5), and the Democratic Republic of the Congo (5).

4.1.5 Rule of Law

Concerning the Rule of Law, the highest scores were achieved by Botswana (68), Cape Verde (65), Namibia (60), South Africa (58), Ghana (57), the Seychelles (55), Rwanda (51), and Malawi (50). A series of countries in SSA saw a positive

evolution of their scores between 2003 and 2013, although sometimes on a very low level. Examples are Liberia (1 to 19), Côte d'Ivoire (6 to 19), Burundi (5 to 15), Rwanda (22 to 51), Uganda (35 to 44), Ethiopia (25 to 33), and Swaziland (27 to 42). A decrease was attested to Eritrea (37 to 5), The Gambia (58 to 35), Madagascar (46 to 20), and Mali (52 to 27). For this indicator, the lowest performing countries are Somalia (0), the Central African Republic (1), Zimbabwe (2), Guinea-Bissau (2), the Democratic Republic of the Congo (3), and South Sudan (4).

4.1.6 Control of Corruption

When it comes to the Control of Corruption, the southern African countries and the islands are again leading, with quite respectable results, such as for Botswana (79), Cape Verde (75), the Seychelles (68), Namibia (65), and Lesotho (64). Especially remarkable is the result for Rwanda with a score of 72, which makes it the second best result of all countries in SSA. Furthermore, Ghana (56), South Africa (55), and Senegal (50) achieved scores in the upper 50%. Unfortunately, there is not much improvement over time, with the exception of Liberia (8 to 29), Niger (12 to 35), and Côte d'Ivoire (from 10 in 2008 to 23 in 2013). Decreasing scores were witnessed for Burkina Faso (57 to 33), Eritrea (56–23), The Gambia (46 to 24 to 27), and Madagascar (58 to 27). The following countries scored lowest for this indicator in 2013: Sudan (1), Burundi (3), Zimbabwe (3), Angola (5), Guinea-Bissau (5), Chad (6), and the Democratic Republic of the Congo (6).

4.2 Country Policy and Institutional Assessment (CPIA)

Given the high number of indicators used in the CPIA, we will confine our analysis to the results for cluster D, *Public Sector Management and Institutions*, with a special focus on the sub-category *Transparency, Accountability, and Corruption in the Public Sector*. Since many of the best performing countries, such as South Africa, Namibia, and Botswana, are not included in this data set, the overall results can be expected to be lower compared to the other tools discussed. On an aggregate level, SSA countries eligible for assistance by the International Development Association (IDA) scored a 3 on a scale from 1 to 6 with no relevant change over the last 10 years (2005–2014). However, as has been shown in the last sub-section, such aggregated results are often of limited value due to the huge discrepancies between individual countries. Therefore, country level results need to be analyzed to get a more complete picture of the state of public sector management in SSA.

4.2.1 Public Sector Management and Institutions

The highest score across the CPIA cluster *Public Sector Management and Institutions* in 2014 was achieved by Cape Verde (4), followed by Senegal and Rwanda (3.6), Burkina Faso and Ethiopia (3.5), Ghana, Kenya, and Tanzania (3.4). On the other end of the scale, we can find South Sudan (1.9), followed by Sudan, the Central African Republic, and Guinea-Bissau with 2.2 each. Across the five sub-categories contained in this cluster, the highest improvements over the last 10 years could be witnessed in Zimbabwe (2.1 to 2.7) and Côte d'Ivoire (3.5 to 3.1), although on a rather low level. The most severe decreases in scores can be observed for Madagascar (3.4 to 2.6) and Mali (3.6 to 3).

4.2.2 Transparency, Accountability, and Corruption in the Public Sector

The scores on the sub-category on *Transparency, Accountability and Corruption* for 2014 range from 1.5 in Zimbabwe and Sudan to 4.5 in Cape Verde. The majority of countries achieve scores of between 2 and 3. However, there is a cluster of countries, situated primarily in West Africa, which perform relatively well: Senegal, Ghana, Benin, and Burkina Faso, all of which scored a 3.5 in 2014. This result could only be attained by Rwanda, which increased its score from 3 to 3.5 over the last 10 years. Even bigger improvements over the same time period could be observed for Côte d'Ivoire (2 to 3), whereas Madagascar and Uganda witnessed a serious decrease in their ratings by one point, from 3.5 to 2.5 and 3 to 2, respectively. In total, only six countries could improve their scores over the last 10 years, whereas for eleven countries the 2014 results were below those achieved in 2005. These country level results support the conclusion that no major progress could be observed over the last 10 years, except for Côte d'Ivoire.

4.3 Ibrahim Index of African Governance (IIAG)

The average score of the SSA countries according to the 2014 IIAG is 51.5, with a huge spread between the highest and lowest scores, Mauritius (81.7) and Somalia (8.6). Sudan and South Sudan were not included in the 2013 ranking (Fig. 3).

The top 10 ranking reads very similarly to the result of the WGIs, with Cape Verde (76.6), Botswana (76.2), South Africa (73.3), the Seychelles (73.2), and Namibia (70.3) at the top, followed by Ghana (68.2), Senegal (64.3), and Lesotho (62.3). In the following sub-sections, the four clusters of the IIAG will be discussed on a country basis.[18]

[18] See IIAG 2014 for detailed results.

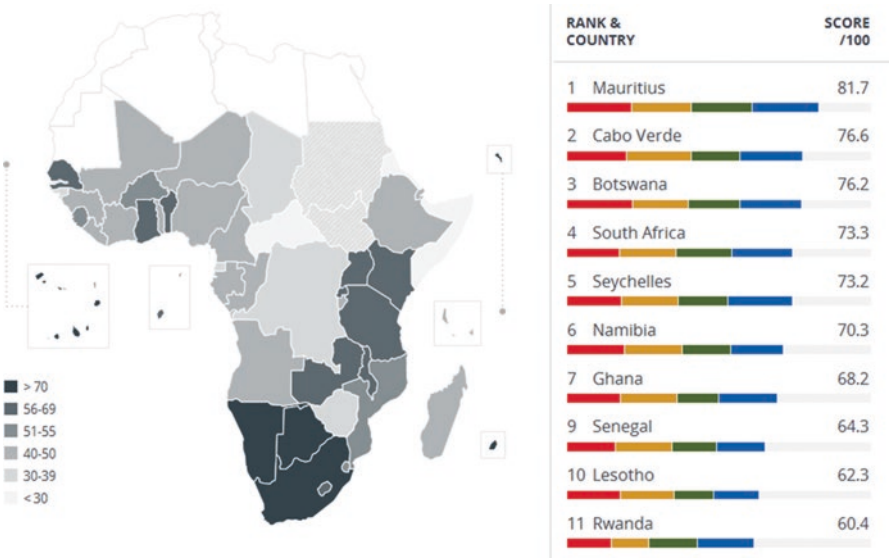

Fig. 3 IIAG Results for SSA (Source: IIAG 2014 Data Portal, http://iiag.online, accessed 1 January 2016)

4.3.1 Safety and Rule of Law

According to the IIAG report, this cluster "*measures the extent to which all individuals are protected from both internal and external threats to the peace, and the existence of a robust legal system and transparent, effective and accessible institutions, within all branches of the state*."[19]

The scores range from 85.3 for Botswana to 5.9 in Somalia. The top 10 ranks are mostly occupied by southern African countries and the islands with remarkable results for Ghana (69.9 points, rank 6) and Zambia (65.1 points, rank 10). The biggest improvements in Safety and the Rule of Law over the last 5 years were achieved by Côte d'Ivoire (31.6 to 41.6), Guinea (36.5 to 46.5), Sierra Leone (49 to 58.5), Niger (49.5 to 56), and Senegal (58.4 to 63.5). The largest deteriorations could be observed in the Central African Republic (26.5–12), Guinea-Bissau (42.3 to 30.5), and Mali (58 to 48.6). The bottom ranks are again hold by Somalia (5.9), the Central African Republic (12.0), the Democratic Republic of the Congo (23.7), Guinea-Bissau (30.5), and Eritrea (31.0).

[19] IIAG 2014: 10.

4.3.2 Participation and Human Rights

This category assesses the relationship between government and citizens. It captures "*both the extent to which individuals can participate in, and take ownership of, the political process and the state's achievement in guaranteeing the political and social rights of all citizens.*"[20]

The best performing country in SSA in terms of *Participation and Human Rights* is Cape Verde with a score of 83.5, followed by Mauritius (77) and Namibia (75). Furthermore, Senegal (6th) and Ghana (7th) rank in the top ten with 73.7 and 73.6 points, respectively. Very similar to the results for *Safety and the Rule of Law*, the greatest improvements over the last 5 years can be witnessed in Côte d'Ivoire (29.7–43.9), Niger (41.3–55), and Guinea (31.4–43.2). Decreasing scores are observed for Mali (60.4–45.9), Guinea-Bissau (40.3–30.1), the Central African Republic (35.6–28.2), and The Gambia (43.4–36.4). The lowest scores for *Participation and Human Rights* are made by the Central African Republic (28.2), Chad (28.1), Equatorial Guinea (25.9), Eritrea (22.8), and Somalia (10.7).

4.3.3 Sustainable Economic Opportunity

In this category, it is assessed "*whether the state provides the conditions necessary for the pursuit of economic opportunities that contribute to a prosperous and equitable society*."[21] The aim of this cluster is to measure the quality of economic policies and the provision of a sustainable economic environment that is conducive to investment and the operation of businesses.

The highest country score for *Sustainable Economic Opportunity* in 2013 was achieved by Mauritius with 79.7 points, followed by South Africa (71.9) and Botswana (65.9). Rwanda ranks 6th with a remarkable score of 63.4 points. Positive developments over the past 5 years could be witnessed in the Democratic Republic of the Congo (27 to 34.8), Rwanda (57.1 to 63.4), and the Seychelles (58.4 to 63.6). By contrast, the economic environment has become less favorable in Madagascar (49.7 to 44.1) and Burkina Faso (55.5 to 51). Finally, the following countries can be found at the bottom of the ranking: Guinea-Bissau (25.7), the Central African Republic (24.8), Zimbabwe (23.5), Eritrea (21.9), and Somalia (3.5).

4.3.4 Human Development

"This category evaluates the success of the state in securing the well-being of all of its citizens. It measures the extent to which the government provides citizens with social protection, comprehensive education and a healthy life."[22]

[20] IIAG 2014: 14.

[21] IIAG 2014: 18.

[22] IIAG 2014: 22.

Again, there are no big changes in the top five ranking, with Mauritius (85.6) taking the lead, followed by the Seychelles (84.4), Cape Verde (81.6), Botswana (80.4), and South Africa (78.8). A remarkable result was achieved by Ghana with a score of 75.5 points. With 24 out of 52 African countries achieving their best scores in the category *Human Development* in 2013, this cluster shows the most progress and also the best average score across all countries (58.7). Zimbabwe (43.3 to 53.9), Togo (46.9 to 54.6), and Rwanda (64.4 to 72.1) substantially improved their scores over the past 5 years. However, there are also countries which had to face a setback in 2013, for instance Madagascar (53.3 to 48.6) and Eritrea (47.9 to 43.5). Compared to the other three clusters, even the bottom scores are higher, with Somalia (14.1) scoring lowest, followed by the Central African Republic (34.3), Chad (37.1), and Eritrea (43.5).

5 Challenges and Opportunities Concerning a Demographic Dividend in Sub-Saharan Africa

The demographic structure of a country, most importantly the ratio of the working (i.e., productive) to the non-working (i.e., dependent) population, can function either as a catalyst or a drag on its economic development. In countries with high dependency ratios, the economic income is generated by a relatively small group of people and has to be shared with a relatively large group of dependents. Per capita income, private savings, and tax revenues tend to be low, which subsequently inhibits private and public investment in infrastructure and the economy. High levels of corruption further distract these scarce resources away from the public realm into private pockets, leaving the state with no means with which to provide the public services necessary for building up human capital through education and a well-developed health care system. Improving the quality of public institutions can provide an exit to this downside spiral.

Political institutions play a dual role regarding the capturing of a demographic dividend. On the one hand, the demographic transition can be accelerated if accompanied by effective population interventions, making it more likely for a demographic window of opportunity to occur in the first place. On the other hand, the realization (and magnitude) of a DD will heavily depend on the ability of: a) the economy to create new jobs and absorb the increasing number of young people entering the job market; and b) the capability of the educational sector to ensure that the increased workforce is properly equipped to match the needs of the expanding economy. Both factors are, for their part, dependent on a favorable policy environment. It should be stressed that effective population policies require a mid- to long-term perspective and a strong commitment by the government towards family planning. Likewise, investments in human capital will not immediately translate into economic benefits, and therefore are easily neglected if the focus of the government lies primarily on increasing short-term revenues. This is why the quality of

governance, especially concerning the dimensions stability, accountability, and control of corruption, is crucial when thinking about preconditions favoring a DD.

In reality, however, the systemic interactions are far more complex and only a weak link between Good Governance and development could be established in empirical studies on SSA (Resnick and Birner 2006). These results might reflect the fact that investments in human capital do not generate immediate returns and that even a solid public sector is not sufficient to sustain economic development if investments in the private sector remain weak.

Nonetheless, from a governance perspective there are several countries in SSA where achieved improvements in the quality of their public institutions might increase the chances to benefit from a DD. The majority of countries which scored best on the different dimensions of Good Governance (e.g., Mauritius, Cape Verde, the Seychelles, Botswana, Namibia, South Africa, and Lesotho) are also the most advanced ones in their demographic transition (see chapter "Fertility Transitions and Schooling Dividends in Sub-Saharan Africa: The Experience of Vanguard Countries" in this volume). These countries are most likely to benefit from a DD in the near future,[23] although the effect of governance is difficult to isolate (Resnick and Birner 2006). Interesting cases, with still high fertility levels but relatively high or increasing quality of the public sector, are Rwanda, Zambia, Ghana, and Senegal. These countries show a favorable political environment for an economically successful demographic transition, but it remains open as to whether they will eventually be able to take advantage of it. Alarming situations were observed in the Central African Republic, the Democratic Republic of the Congo, Eritrea, and Somalia as well as, to a certain extent, in Chad, Guinea-Bissau, Sudan, South Sudan, and Zimbabwe. Without a substantial improvement in the governance of their public sectors, these countries will not be able to exit the vicious circle of mismanagement and poverty.

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[23] For South Africa, the window of opportunity is already closing (see chapter "A Case of Almost Complete Demographic Transition: South Africa" in this volume).

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The Role of Natural Resources

Daniel J. Mabrey

1 Introduction

More than 25 countries possess bountiful oil, gas, and mineral deposits in sub-Saharan Africa (SSA), making Africa home to more resource-rich states than any other region in the world. This includes almost 30% of the world's known reserves of minerals, and 7.6% of the world's proven oil and natural gas reserves (British Petroleum 2015). SSA has the largest deposits of cobalt, diamonds, platinum, and uranium reserves in the world. These numbers are even more impressive given that Africa is underexplored compared to the rest of the world (African Natural Resources Center 2015).

According to the African Natural Resources Center (2015) at the African Development Bank, minerals account for an average of 70% of total African exports and about 28% of Gross Domestic Product (GDP). For some countries in SSA, natural resources provide nearly all fiscal revenues to the government. The African Development Bank estimates that natural resources will contribute more than US$30 bn per year in government revenues through to 2035. As Africa continues its development through the twenty-first century, it is clear that natural resource development will play an important role.

The Africa Progress Panel (2013: 8) perfectly identified the opportunities of developing natural resources in SSA:

> *Effective and equitable stewardship of Africa's natural resource wealth could transform the region. Apart from building manufacturing industries,, the development of natural resources could provide the revenues needed for investment in smallholder agriculture, food security, employment, health and education. Governments have a responsibility to future as well as present generations to harness natural resource wealth. Sub-Saharan Africa entered the 21st century with a population of 670 million. By 2025 the region will be home to 1.2*

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billion – a figure that will rise to 2 billion by mid-century. The demography matters. Equipped with skills and opportunities, Africa's youthful population could become a powerful – and positive – force for change. Denied a chance to realize their potential, children born today will become a lost generation. Well-managed resource wealth has the potential to lift millions of Africans out of poverty over the next decade, while giving hope to future generations.

This chapter will examine the role of natural resources in the economy, development, and demography of countries in SSA. We will start with a framework which allows us to organize how we discuss and analyze countries according to the abundance of their natural resources. Then we will review how natural resources affect a country's exports and economic growth. We will examine how natural resources can be a blessing for some countries, but a curse for others, with the human development outcomes of resource-rich countries generally underperforming resource-scarce countries. We will present some new data about which countries in Africa might develop new hydrocarbon reserves by 2050 and become resource-rich countries in their own right. We will also attempt to answer the question of whether natural resource development can help a country capture its demographic dividend by analyzing the current case of Uganda. Finally, the chapter will conclude with a discussion of natural resource revenue management practices which are relevant to a SSA policymaker planning for an upcoming demographic transition that will change the population age structure.

2 Natural Resource-Driven Economies in SSA

While SSA's natural resource wealth is significant, the endowment of these resources varies widely from country to country. When discussing natural resource-driven economic growth in SSA, it is useful to organize the countries according to the contribution which natural resources make to the national economy. The first such classification was completed by the International Monetary Fund (IMF) in 2010, resulting in 20 SSA countries designated at "resource-rich" developing countries. The general criteria for receiving this designation included: (a) they must be either a low-income country or a lower-middle income country, (b) they must have either natural resource revenue or exports which are at least 20% of total fiscal revenues and exports, respectively, over 2006–2010, (c) both Gabon and Equatorial Guinea were included because of their membership in the Economic Community of Central African States (CEMAC) monetary union (International Monetary Fund 2012). A further review of economic data in 2014 revealed that an additional seven SSA countries should be designated as resource-rich developing countries (IBIS 2014). These designations do not distinguish between the type of natural resource; whether renewable (such as timber or fish), minerals (such as gold or diamonds), or hydrocarbons (such as oil or natural gas).

In this chapter, we will classify SSA countries as either Oil-Exporting, Mineral-Exporting, or as resource-scarce. In this scheme, Oil- and Mineral-Exporting

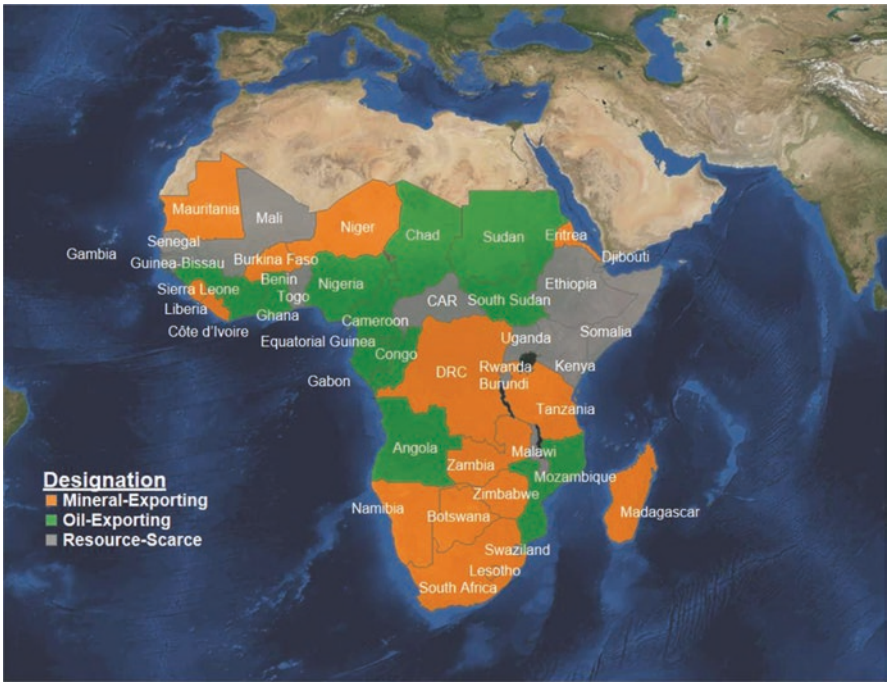

Fig. 1 Map of SSA countries by natural resource designation

countries will have earned at least 20% of total export revenues from natural resources in 2014. Resource-scarce countries will have oil and mineral exports contributing less than 20% of total export revenues in 2014. We identify 13 SSA countries as being Oil-Exporting, 16 countries as being Mineral-Exporting, and 15 as resource-scarce. We do not take into account any planned or future natural resource development in classifying countries, although later we will identify those SSA countries that could develop significant natural resources in the future. Figure 1 is a map showing the designations of each SSA country based on an analysis of 2014 export statistics. These designations allow us to better understand the impact of natural resource exports on economic growth, and provide the context for how natural resources can be a blessing or a curse for a developing country.

3 Exports and Economic Growth from Natural Resources

Resource-rich countries in SSA tend to be highly dependent on resource exports for both foreign exchange and fiscal revenues, with Oil-Exporting countries being significantly more dependent on resource exports than Mineral-Exporting countries. According to the IMF, the share of fuels in total exports from Oil-Exporting

countries in SSA has increased by nearly 12 percentage points since 1990, to almost 90%. From 2000 to 2014, resource-rich countries outperformed other countries in SSA, reflecting the global commodity price boom and subsequent growth surge (International Monetary Fund 2012). This strong economic performance drove increases in average per capita income for most of the resource-rich developing countries. Oil-Exporting countries benefited more during this period than Mineral-Exporting countries due to the higher rents for hydrocarbon commodities. For example, Angola saw per capita incomes double and Equatorial Guinea saw per capita incomes triple between 2000 and 2011 (Africa Progress Panel 2013). Table 1 below shows the export distribution and natural resource designation for each SSA country, based on an analysis of 2014 export data from the International Trade Centre (2015).

Beyond fiscal revenues from exports, resource-rich countries in SSA also receive significant Foreign Direct Investment (FDI)) for developing natural resources. These FDI flows usually provide a boost to the economy through additional domestic investment and employment. The criticism of FDI is that these investments do not create sustainable economic development because of absorptive capacity constraints. This means that only a percentage of the total amount invested is actually captured by domestic firms and workers. When countries have low absorptive capacity, foreign companies and expatriate workers receive most of the investments and when the project is over, the host country is left without any sustainable economic activity. As we will discuss later, the technical nature of natural resource development projects prevents resource-scarce countries from meaningfully participating in these activities at the outset, when most of the FDI occurs.

FDI to SSA expanded by a factor of 30 since 1995, which was 7.5 times faster than high-income countries countries and ten times faster than global GDP (World Bank 2014a). Nearly all of this FDI went to resource-rich countries in SSA due to the extended commodities boom and the capital-intensive nature of extractive industries. Research by Farole and Winkler (2014) found that SSA countries were not able to use that investment to create links between foreign investors and local economies, especially in the value-added area of creating domestic supply chains. As they noted, generating spillovers from FDI is not easy, particularly for small economies with limited existing capacity, and the responsibility for developing domestic firms and industries is left to governments through investment in education and human capital. Without these links and spillovers, economic development from resource projects in Oil– and Mineral-exporting countries will be limited to rent capture mechanisms of FDI, which is ultimately unsustainable.

There is a wide-ranging literature on whether developing natural resources can lead to sustainable economic development. On the one hand, Norway has been able to develop its natural resources and invest the revenues in education and growth, making it one of the most prosperous countries in the world. On the other hand, Nigeria stands out as an example of how oil revenues did not significantly improve the country's overall welfare. Even Organization of Petroleum Exporting Countries (OPEC)) in the Middle East saw their GDP per capita decrease by 1.3% each year from 1965 to 1998 despite oil production increasing from about 8 m barrels of oil

Table 1 SSA countries natural resource designation

Country	Designation	Primary export product 2014 (with% of total exports)[a]	# of products totaling >75% of exports
Angola	Oil-exporting	Crude petroleum (98.3)	1
Benin	Resource-scarce	Cotton (31.8)	7
Botswana	Mineral-exporting	Diamonds (85.5)	1
Burkina Faso	Mineral-exporting	Gold (51.4)	3
Burundi	Resource-scarce	Coffee (46)	5
Cameroon	Oil-exporting	Crude petroleum (56.3)	3
Central African Republic	Resource-scarce	Wood (84.2)	1
Chad	Oil-exporting	Crude petroleum (97.3)	1
Congo	Oil-exporting	Crude petroleum (61.9)	2
Congo, Dem. Rep.	Mineral-exporting	Copper (34.9)	3
Côte d'Ivoire	Oil-exporting	Cocoa Beans (35.6)	6
Djibouti	Resource-scarce	Other commodities (32.9)	7
Equatorial Guinea	Oil-exporting	Crude petroleum (94.3)	1
Eritrea	Mineral-exporting	Ores (97.2)	1
Ethiopia	Resource-scarce	Petroleum, not crude (19)	5
Gabon	Oil-exporting	Crude petroleum (90.2)	1
Ghana	Oil-exporting	Crude petroleum (33.9)	3
Guinea	Oil-exporting	Crude petroleum (41.9)	2
Guinea-Bissau	Resource-scarce	Edible fruit and nuts (67.9)	2
Kenya	Resource-scarce	Coffee (18.8)	15
Lesotho	Mineral-Exporting	Diamonds (40.5)	3
Liberia	Mineral-exporting	Ores (40.4)	3
Madagascar	Mineral-exporting	Nickel (27.2)	8
Malawi	Resource-scarce	Tobacco (42.2)	6
Mali	Resource-scarce	Cotton (39.1)	5
Mauritania	Mineral-exporting	Ores (50)	2
Mozambique	Oil-exporting	Petroleum gases (30)	5
Namibia	Mineral-exporting	Diamonds (26.7)	6
Niger	Mineral-exporting	Ores (45.6)	2
Nigeria	Oil-exporting	Crude petroleum (96.6)	1
Rwanda	Mineral-exporting	Ores (31)	6

(continued)

Table 1 (continued)

Country	Designation	Primary export product 2014 (with% of total exports)[a]	# of products totaling >75% of exports
Senegal	Resource-scarce	Petroleum, not crude (16.4)	12
Sierra Leone	Mineral-exporting	Ores (84.5)	1
Somalia	Resource-scarce	Live animals (56.4)	2
South Africa	Mineral-exporting	Precious stones and metals (15.5)	11
Sudan (North + South)	Oil-exporting	Crude petroleum (87.5)	1
Swaziland	Resource-scarce	Essential oils (22.4)	8
Tanzania	Mineral-exporting	Gold (23.9)	10
The Gambia	Resource-scarce	Filaments (60.5)	4
Togo	Resource-scarce	Cotton (13.1)	11
Uganda	Resource-scarce	Coffee (22)	15
Zambia	Mineral-exporting	Copper (74.4)	2
Zimbabwe	Mineral-exporting	Precious atones and metals (29.5)	4

Source: International Trade Centre – Trade Map
[a]Note: As measured in 2014 Exported Value in USD

per day in 1965 to about 22 m barrels of oil per day in 1998. With this mixed performance, should natural resources be considered a blessing or a curse to developing countries?

4 Natural Resources as a Blessing

The argument for developing natural resource is clear and simple. Countries with mineral and hydrocarbon resources can earn significant economic rents that their governments can invest and/or spend to improve public welfare and create intergenerational wealth. With proper management, resource revenues can enhance development that leads to sustainable economic growth. This can be achieved through productive public investment and expanding human capital in a country. In the best case, investments from resource revenues could create links between the energy sector and the larger economy, generating positive spillovers to other sectors and increasing employment. In Low Income Countries (LIC),), where annual per capita incomes average USD 626 (World Bank 2014b), resource revenues can be used to alleviate poverty, which leads to positive human development outcomes.

We can consider the case of Botswana, a Mineral-Exporting country that was one of the poorest in Africa when it gained independence in 1966, with GDP per capita

of about US$70. In 2014, Botswana's GDP per capita was US$7,240, fueled largely by the discovery and development of diamonds. Botswana has been one of the fastest growing economies in the world, governed by a mature democracy with free and fair elections and strong institutions. Revenues from diamonds are invested in education at one of the highest rates in the world, at around 9% of GDP (World Bank 2014a). According to analysis by the African Development Bank (Meijia and Castel 2012), Botswana was able achieve these outcomes through a three-pronged approach that involved: (a) pursuing economic diversification, (b) separating expenditure from revenues and employing expenditure smoothing mechanisms, and (c) investing surplus revenues for the use of future generations. Botswana's management of natural resources certainly serves as a model for other SSA countries with significant amounts of minerals and hydrocarbons and hydrocarbons.

5 Natural Resources as a Curse

If Botswana is the case study for natural resources as a blessing, then Sierra Leone might be its counterpoint. Sierra Leone is a Mineral-Exporting country whose diamonds were discovered in 1935. The country gained its independence from Britain in 1961 when its GDP per capita was around US$150. Sierra Leone's GDP per capita in 2014 was around US$775 (World Bank 2014b) and it is among the poorest countries in the world despite diamonds accounting for nearly 30% of export value since 2002 (International Trade Centre 2015). Since independence, Sierra Leone has suffered large-scale illicit diamond trading, endemic corruption, and a decade-long civil war fueled and prolonged by diamond mining (Maconachie and Binns 2007). Sierra Leone's civil war, which began when rebels from Liberia crossed the border to conduct operations in diamond-rich South Eastern Sierra Leone, would eventually spill over the region and contribute to Liberia's Second Civil War from 1999 to 2003. We can summarize Sierra Leone's natural resource experience as one of: (a) negative growth impacts, (b) the prevalence of poverty, (c) increased social conflict, (d) poor governance/weak democratic institutions, and (e) negative regional impacts of resource projects.

Many resource-rich countries that develop natural resources, especially in SSA, have experiences more similar to Sierra Leone than to Botswana. Indeed, when compared to resource-scarce countries, resource-rich countries tend to have a worse growth performance, less openness, lower quality governance institutions, and less income per capita. The empirical foundation for these findings can be found in the work of Sachs and Warner (1995, revised 1997 & 2001). Taken together, the negative economic performance of resource-rich countries coupled with the political economy issues of corruption, rent-seeking behavior, bad governance, and conflict, suggest that natural resources are more of a curse than a blessing. Richard Auty (2004) observed this in his research and coined the phrase "resource curse" to describe these negative impacts. Since then, the phrase has become commonplace.

The literature on the resource curse is dominated by economic analysis of the negative growth impacts of resource-rich countries. Stevens' (2015) review of the economic literature on this topic neatly summarized nearly 30 years of scholarship on the macroeconomic performance of resource-rich countries. In short, a large number of studies have supported the theory of a negative link between natural resource development and GDP growth, although these studies looked at the full spectrum of resources, both renewable and non-renewable. More recent work has challenged this theory on the grounds that the methods used to measure resource abundance and the econometric techniques used to test the hypotheses are insufficient. Notwithstanding recent contrary findings, the available evidence points to demonstrable negative growth impacts for countries that have developed their natural resources.

Related to negative growth impacts is the macroeconomic concept of the Dutch Disease in resource-rich developing countries. Dutch Disease is said to occur when a country develops natural resources, the export of which causes a real appreciation of the exchange rate and causes a contraction in the non-natural resource tradable sector. In the Netherlands in the 1970s, the discovery of gas led to a decline in manufacturing that adversely affected economic growth, hence the name Dutch Disease. This economic condition has been observed, with varying levels of impact, in nearly every country that has developed natural resources. In SSA, where most countries do not have an industrial base or any significant manufacturing sector, Dutch Disease effects can be more severe because the all-important agriculture sector usually declines.

Another example of negative economic growth impacts occurs when governments begin to receive natural resource revenue windfalls and become over-dependent on these revenues. This usually occurs when commodity prices are high. This over-dependence exposes government fiscal policiespolicies to the boom-bust commodity cycles, in effect leading to budget surpluses when commodity prices are high and deficits when prices are low. Research by the IMF confirms this pattern and found that fiscal behavior in developing oil-producing countries suggests that government expenditure, consumption, investment, non-oil revenue, and non-oil primary balances are strongly pro-cyclical (Erbil 2011). Ultimately, pro-cyclical fiscal policiespolicies lead to inefficient and unproductive investment of resource revenues, which stifles economic growth.

The political economy literature on the resource curse generally focuses on dysfunctional state rent-seeking behavior, large public sectors, unsustainable budgetary practices, and civil conflict and war. Again, Stevens (2015) ably reviewed the political economy literature on social conflict and the resource curse. He found strong evidence that natural resource development is associated with increased social conflict. Possible reasons for this include: (a) resource revenues are significant enough to fight over, so that they can be looted, (b) natural resource projects can alienate local communities, and (c) conflict exacerbates poverty and resources that could be used to alleviate poverty are often diverted to fighting. However, recent research does not appear to support the claim that the resource curse degrades governance or democratic institutions.

The case of Equatorial Guinea illustrates the resource curse well. It is a small Oil-Exporting country with a population of around 800,000. According to the IMF, GDP per capita has averaged more than US$30,000 since 2008, making it the only high income country in SSA. However, 75% of the population of Equatorial Guinea lives on less than US$700 per year (Lawson-Remer and Greenstein 2012). Equatorial Guinea is often labeled repressive and autocratic by international organizationsorganizations and led by a strongman president who has been in power since 1979. The country has the worst score of all African countries on the World Bank's Control of Corruption Index. Oil rents as a share of GDP is 47%, which exposes Equatorial Guinea's fiscal policiespolicies to swings in commodity prices. In their 2015 end of mission Press Release, the International Monetary Fund (2015) concluded:

> *The growth outlook poses very significant challenges with prospects dominated by falling oil production volumes and very weak prices, given that hydrocarbons account for around 80 percent of the economy.. With limited fiscal buffers to cushion the drop in government revenues,, fiscal retrenchment will be unavoidable, and will contribute to an economic contraction of 9.5 percent in 2015. Growth is expected to decline over the medium term. The gradual decline in oil output will likely continue in coming years, but may potentially be somewhat mitigated by the introduction of new extraction technologies and ongoing exploration.*

Many SSA countries are expecting to discover and develop natural resources to meet their national development plans over the next 20–35 years. For some countries, this will be their first experience extracting and monetizing natural resources. For others, there will be new opportunities to learn from (or repeat) past mistakes.

6 Prospects Up to 2050

This book is focused on Africa's potential to achieve a demographic dividend through to 2050 and as we have argued in this chapter, natural resource development will be a key driver of wealth and welfare in SSA countries. We think it is useful to present estimates of potential natural resources for each SSA country through to 2050, although it is strictly limited to oil and natural gas, as research for this chapter did not identify any estimates of future mineral resources. This data on future hydrocarbon resources was provided by Rystad Energy, an independent oil and gas consulting firm based in Norway.

A total of 26 countries are estimated to have hydrocarbon resources, including six that are currently resource-scarce countries (Ethiopia, Kenya, Senegal, Somalia, Somaliland, and Uganda). Four countries that are currently Mineral-Exporting countries will likely become Oil-Exporting countries, if these estimated resources are developed (Madagascar, Mauritania, Mozambique, and Tanzania). Figure 2 presents the estimated total remaining reserves by SSA country.

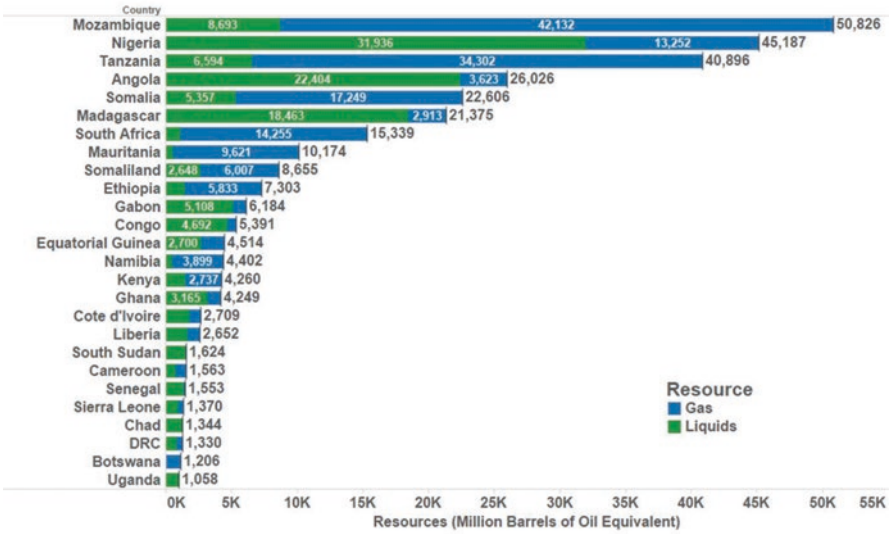

Fig. 2 Estimated total remaining reserves by country (These estimates include unconventional resources, such as shale gas, and resources that have not been discovered yet. Only SSA countries with >1b barrels of oil equivalent are shown here)
(Source: Rystad Energy UCube)

7 Capturing a Potential Demographic Dividend

The demographic dividend is the potential growth in a country's economy as the working-age population grows when mortality and fertility rates decline. This change in the population age structure is known as the demographic transition. A smaller share of children in the population enables greater investments in health care,, education, and nutrition which can lead to changes in labor productivity. It is assumed that to capture a demographic dividend,, a country experiencing the demographic transition will need policies in place to support productive employment and boost per capita income. A number of SSA countries are expected to undergo the demographic transition by 2050, raising the potential for opening the demographic window of opportunity and thereafter capturing a first demographic dividend, increasing economic growth and improving societal welfare.

As we have discussed earlier, natural resource development and hydrocarbon reserves in particular, with their significant foreign direct investment (FDI)) flows, have the potential to improve welfare through the efficient and productive investment of resource revenues. Could natural resource development and the proper management of resource revenues help a country capture a demographic dividend?? The answer is yes, but this is highly dependent on the timing of a country's demographic transition, the amount of recoverable resources, the development profile for

extracting and producing the resources, and the economic growth policies for investing resource revenues.

We can illustrate this with the case of Uganda, which is currently a resource-scarce country that has made capturing a demographic dividend a part of its national development plan, as spelled out in Uganda's Vision 2040. Uganda has never meaningfully developed hydrocarbon or mineral resources before and its economy is primarily based on agriculture. As discussed above, Uganda is one of SSA's countries that will develop natural resources in the next 35 years. As of 2015, Uganda has discovered 6.5 bn barrels of oil, of which 1.4 bn barrels are recoverable with existing technology. Uganda is expecting to begin producing oil in 2020. Assuming an average oil price of US$75 with a 30 year development profile and 100% export of crude produced, under the most efficient and productive fiscal policypolicy scenarios Uganda can expect to see a welfare increase of US$602,723,000 per year or US$17.27 per person per year in 2012 US dollars (KAPSARC 2015). In aggregate over the production life of the resources this is a significant amount of money. However, it is clear that managing oil revenues efficiently will not yield the investments required to drive the changes in labor productivity that could support the outcomes of the demographic transition. Uganda will need to adopt economic growth policies which optimize investments in the energy sector to create links to other economic sectors and create positive spillovers, such as increasing the efficiency and productivity of agriculture.

In every country, an oil sector is capital intensive and does not necessarily create jobs on the same scale as labor-intensive manufacturing and services sectors. Hydrocarbon and mineral projects usually require a flurry of investment and employment to explore and develop the resources over a short period of time. Then these projects have long production plateaus, which recover the initial investment while employing small amounts of workers. According to public estimates from Total, the French oil operator with exploration and production rights in Uganda, the planned development profile will require a peak level of 13,000 direct jobs (during the construction phase) and a sustained workforce of 3,000 direct jobs at crude production plateau. The company Total estimates that oil and gas activity in Uganda has the potential to generate 100,000–150,000 indirect and induced jobs, although 80% of these jobs will be short-term for the peak construction phase and will have to be transferred to other economic sectors and/or to neighboring countries to remain sustainable (Hamman 2014). The peak construction phase ends about 7 years into Uganda's development profile, and the development of Uganda's oil fields began in 2012. Unless Uganda is already well into its demographic transition, it is unlikely that direct, indirect, and induced employment in the oil sector will lead to significant changes in labor productivity.

International Oil Companies and the associated service companies operating in Uganda will require highly skilled technicians to operate sophisticated equipment. Uganda, like most resource-scarce SSA countries, does not have the human capital to meaningfully participate in the energy sector from the start. Uganda has been investing in education and human capital development programs since 2011 to educate and train Ugandans to work in the oil sector. This includes both individual

workers and Small and Medium Size Enterprises (SMEs). Many of the highly skilled jobs in the oil sector require at least 4 years of education, training, and mentorship. It is therefore unlikely that there will be a significant number of Ugandan workers or firms participating in the highly-skilled technical jobs during the construction phase of development (where 80% of the employment is required). To maximize national benefit from these human capital investments, investments, Uganda needs to enable these skilled workers and/or the most innovative and adaptive SMEs to transfer to other economic sectors and make those sectors more efficient and productive. Over time, these links should create positive economic spillovers which could lead to new capabilities for manufacturing and/or a more productive agriculture sector.

While the size of Uganda's recoverable oil resources and the timing of the field development do not appear to line up with a demographic transition, proper management of the oil revenues combined with human capital development and proper incentives could create the links to accelerate economic growth. Careful planning and the implementation of Uganda's oil sector could create policies which support productive employment, boost per capita income, and will allow Uganda to capture a first demographic dividend later this century. Lest we forget, all this must be done while struggling with the economic and political issues of the resource curse that Uganda will inevitably encounter. If Uganda can navigate those issues successfully, it could become the first SSA Oil-Exporting country to realize a natural resource blessing.

Uganda's case is illustrative of the complexity involved in leveraging natural resources to help capture a demographic dividend. Each SSA country that is planning on developing natural resources to spur economic growth will grapple with similar issues.

8 Natural Resource Management as a Driver of Wealth and Welfare

Nearly all observers of resource-rich developing countries identify natural resource revenue management as the most important driver of wealth and welfare. To that end, there are numerous guides, roadmaps, NGO-supported activities, and training courses with best practices on managing revenues from oil, gas, and minerals. For instance, the Extractive Industries Transparency Initiative (EITI), the Natural Resource Governance Institute, the World Bank, and the International Monetary Fund (IMF) regularly publish materials and offer support to resource-rich developing countries. Elbadawi and Mohammed (2015) reviewed all the natural resource revenue management literature and provide a thorough review of the natural resource revenues management best practices. We will present and summarize those which are most relevant to avoiding the resource curse and using natural resources to capture a demographic dividend.

8.1 Ensure Inter-generational Transfers

A country seeking to prepare for a demographic transition needs to invest wisely in healthcare, education, and nutrition so that these investments are ongoing and guaranteed for future generations. This is usually done through some offshore investment fund or sovereign wealth fund that receives a predetermined percentage of natural resource revenues and invests them for long term growth. The use of a sovereign wealth fund has three different purposes: (i) to create inter-generational transfers which include saving money to be spent for future generations or investing in health, education, or infrastructure, (ii) to prevent the boom-bust investment cycle driven by volatility in commodity prices, and (iii) to sterilize the symptoms of Dutch Disease.

8.2 Build Domestic Assets with Domestic Investment

Paul Collier et al. (2010) termed this as "investing to invest" and suggested that resource-rich developing countries should prioritize domestic investment to eliminate bottlenecks and improve the absorptive capacity of the country to implement investment projects. Generally this means investing in necessary infrastructure and upgrading human capital to benefit both present and future generations. This is more than just investing for its own sake; the goal of this strategy should be to maximize the domestic value of every dollar invested. When done properly these types of investments have been shown to spur economic growth and can also increase non-resource revenues (Daniel et al. 2013).

8.3 Make Public Spending Efficient

For SSA countries seeking to capture a demographic dividend, fiscal planning and public investment will be required to prepare for the demographic transition when it occurs. Countries using natural resource revenues for public investment should avoid wasteful spending through subsidies that can distort the economy. Such spending detracts from the available funds for developing future generations through education, nutrition, and healthcare. For example, the resource-rich economies of all the Gulf Cooperation Council (GCC) (GCC) countries (Saudi Arabia, Qatar, United Arab Emirates, Bahrain, Kuwait, and Oman) have been adversely affected by their long-term reliance on petroleum subsidies. The United Arab Emirates (UAE) (UAE) and Qatar took steps in 2015 to end their petroleum subsidies, and Saudi Arabia is said to be studying the issue. In Saudi Arabia the issue is more dire as the country spends around US$86 bn a year on petroleum subsidies (roughly 13.2 % of GDP) compared to spending US$56 bn on education (Kerr 2015).

8.4 Understand the Expectations of Resource-Producing Regions and Distribute Proceeds Accordingly

Oftentimes in SSA, natural resources are discovered in the most impoverished, underdeveloped regions of a country. The population that lives where the resources were discovered will inevitably make claims on the resources, revenues from the resources, and on human capital development opportunities to participate in the oil, gas, or mineral sector. Understanding their expectations and responding appropriately can prevent instability or civil strife that ultimately will delay or imperil a project.

The resource-driven conflict in Nigeria's Niger Delta provides a good case for understanding how the distribution of oil proceeds can foment instability. The Niger Delta is an area of approximately 70,000 km^2 (about 7.6% of Nigeria's land mass) with a population of about 30 m people (about 17.3% of Nigeria's population). With 48 oil fields and 93 natural gas fields, the region holds 93% of the countries recoverable reserves, estimated at 34.5 billion barrels of oil and 94 trillion cubic feet of gas (Allen 2012). Local perceptions about unequal distribution of proceeds from the sale of Niger Delta-produced oil and gas have fueled separatism, sabotage, theft, and illicit trafficking for more than two decades. This started in the 1990s with the creation of the Movement for the Survival of Ogoni People (MOSOP) and slowly evolved into a coordinated pan-Delta armed resistance that is now an alliance called the Movement for the Emancipation of the Niger Delta (Obi 2010). Until the Niger Delta Amnesty Program was launched in mid-2009, the Nigerian federal government and the international oil companies working in the Niger Delta had ignored the expectations of these local communities in favor of an increased security presence, to the detriment of all.

8.5 Build State Institutions to Prevent Conflict and Secessionist Movements

Civil society organizations in SSA usually inherit the role of observing and sometimes exposing government revenue management practices. When civil society organizations are strong and independent, they can usually act as the interlocutor between the government and the public providing education about natural resource development and government policies. The level of accountability and oversight of the government which these organizations provide can be effective in preventing conflict and secessionism.

Beyond the Niger Delta example discussed above, insurgency and secessionist movements have emerged in many resource-rich developing countries including Sierra Leone, Sudan, South Sudan, Sao Tome and Principe, The Democratic Republic of the Congo, Liberia, Algeria, Chad, and Niger. In most of these countries, the roles

of civil society organizations to oversee and foster debate about the extractive industries have been limited through government repression, censorship and conflict.

8.6 Promote Diversification of Production and Exports

As discussed above, the economic literature on the resource curse shows the challenges of being overly dependent on natural resources. In SSA, agriculture will be the most significant employer of citizens, so economic diversification and the promotion of renewable exports from agriculture should be protected when a country decides to develop its natural sources. As presented in the Uganda example above, most countries will not be able to capture a demographic dividend through resource revenues alone. Natural resource development will only contribute to a demographic dividend if it can create sustainable links to the wider economy, in order to generate inclusive growth that leads to meaningful increases in income per capita.

9 Conclusions

The role of natural resources in shaping SSA's development through the twenty-first century is clear. By 2050, more than 75% of SSA countries will be considered resource-rich developing countries. Many of these countries have linked the successful extraction and monetization of natural resources to their national development plans. However, as we have discussed previously, success is not guaranteed.

The challenges of natural resource-driven development are manifold and complex. Rents from developing natural resources and royalties from their export generate tremendous fiscal revenue for governments … Managing those revenues to create inclusive economic growth requires strong political institutions, competent technocrats, and a vibrant civil society to oversee the sector and communicate what resource revenues can mean for a country's development. In the absence of good revenue management, macroeconomic impacts of resource revenues that include price volatility and the related commodity boom-bust cycles, Dutch Disease effects, negative economic growth impacts, and over-dependence on natural resource revenues can pull a country down the resource curse path. In the worst case, these negative impacts can push countries toward instability and conflict, and even failed states.

The good news is that SSA countries are no longer struggling to develop their natural resources alone. There is significant expertise, support, and programmatic assistance provided by international organizations like the World Bank and the International Monetary Fund. Non-governmental organizations like the Africa Progress Panel, the Extractive Industries Transparency Initiative, and the Natural Resources Governance Institute are active in many SSA countries with capacity building programs for government officials. Finally, international donor

organizations such as the Norwegian Agency for Development Cooperation, the Department for International Development (UK), and the German *Gesellschaft für Internationale Zusammenarbeit* (GIZ) are providing expert assistance, research, and funding to educate policymakers, the private sector, civil society groups, and the general public about hydrocarbon and mineral value chains and ways to participate in these sectors.

If SSA countries are to capture their demographic dividend through the development of natural resources, then governments will need to successfully navigate the revenue management issues and prioritize investments from natural resource revenues into health care,,, education, and nutrition. The timing and magnitude of natural resource discoveries will determine the extent to which a country's energy sector will be able to create the necessary jobs for the demographic transition. The impact of these jobs will be modest, however, due to the capital-intensive (as opposed to labor-intensive) nature of energy projects. Countries seeking to leverage their nascent energy sector to spur economic development need to be focused on human capital development to create forward and backward links which can achieve positive economic spillovers. Perhaps armed with knowledge of the resource curse and with the assistance of international organizations and donors, we will be able to count more SSA countries that have turned their resources into blessings.

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Population, Food Security, and Climate Change: Africa's Challenges

Jason Bremner

1 Introduction

One the key development challenges of sub-Saharan Africa (SSA) is food security. Despite the fact that agriculture accounts for 60% of employment in the region, SSA imports about 30% of its needs for staple foods. Under-nutrition and poor nutrition are more prevalent in SSA than in other parts of the world. Yields per hectare in SSA have not improved in the past 30 years. Most sub-Saharan farms are tiny in size and ill-equipped for innovation. Last but not least, the poor status of women is not conducive to help increase the agricultural production.

Turning to climatic conditions, nearly all farming in SSA is rain fed and thus vulnerable to increasingly erratic rainfall as well as more frequent drought. In addition, yields in the tropics will be particularly vulnerable to temperature rises, which are likely to be brought about by climate change. Therefore, the doubling of population in the coming few decades will put huge pressure on agricultural production in SSA.

Against this backdrop, however, SSA countries have made rather great progress in reducing poverty over the last 20 years. Rapid economic growth has happened across the continent, although economic growth appears to have slowed down quite considerably in the most recent years. Yet despite such progress, nearly 220 million people in sub-Saharan Africa, or almost one in every four, lacks adequate food for a healthy and productive life (FAO, IFAD, and WFP 2015). Many more remain vulnerable to food insecurity, as seen in 2008 and 2011 when rising food prices and severe drought pushed record numbers of people into poverty and hunger (FAO, IFAD, and WFP 2012). In many countries, particularly in the Sahel and the Horn of Africa, recurrent cycles of crisis have existed for decades. Now, however, the pros-

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pects of more frequent drought due to climate change combined with continued rapid population growth in SSA have renewed concerns about future food security.

At the same time, however, many leaders in Africa are talking excitedly about the possibility of a first demographic dividend, which would bring an accelerated economic growth. Today's large youth population and recent declines in fertility in several African countries have produced a sense of optimism across much of SSA about the demographic future. On the contrary, others in the development community view the population growth in combination with climate change and declining agriculture as a future humanitarian disaster (Potts et al. 2013). They urge global leaders to reexamine long-debated questions concerning how the world will meet its growing demand for food, particularly in the Sahel, and advocate for immediate action.

This chapter examines trends in population growth and links with food security and climate change in SSA and assesses their potential effect on the prospects for capturing a first demographic dividend. Evidence presented in the chapter suggests that the same investments that are critical for opening a window of opportunity for a demographic dividend – empowering women, educating girls, and improving access to voluntary family planning – are also critical for fulfilling future food needs and building resilience to mitigate the impact of climate change.

2 Population and Food Security Trends in Sub-Saharan Africa

Food security exists when all people at all times have both physical and economic access to sufficient food to meet their dietary needs for a productive and healthy life. Achieving food security requires that sufficient quantities of appropriate foods are consistently available, that individuals have adequate incomes or other resources to purchase or barter for food, that food is properly processed and stored, that individuals have sound knowledge of nutrition and childcare which they put to good use, and that they have adequate health and sanitation services to ensure that they do not become malnourished due to repeated illness (USAID1992). Achieving food security in sub-Saharan Africa, however, remains a great challenge.

At the top of the list of Millennium Development Goals (MDGs) was the goal of eradicating extreme poverty and hunger. More than 60 countries in the world made great progress toward achieving the MDG hunger target 1.C, which was to halve, between 1990 and 2015, the proportion of people who suffer from hunger (although the MDGs were adopted in 2000, many of the MDG indicators used a 1990 baseline figure). Progress toward this hunger target was measured as the percentage of undernourished people and the percentage of children under-5 years old who were moderately or severely underweight for their age. Between 1990 and 2015, the prevalence of undernourished individuals in SSA declined from 33.2% to 23.2%, and the prev-

alence of underweight children decreased from 28.5% to 21.1%. However, in terms of absolute numbers, there has actually been an increase in the number of undernourished from 175 million in 1990 to 220 million in 2015. Thus, today there are 45 million more undernourished people in SSA than there were in 1990 (FAO, IFAD, and WFP 2015). Similarly, there are more children who are underweight in SSA today than in 1990, largely due to high fertility, population growth, and the fact that the region now has approximately 50% more children than it did in 1990 (United Nations 2015).

The projected population growth in SSA will make the goal of eradicating hunger more challenging as the amount of food needed to adequately feed sub-Saharan Africa's people in the future is expected to increase greatly. The United Nations develops low, medium, and high population projections for every country and region in the world based on different future fertility patterns. The UN's medium projection is based on the assumption that fertility rates in developing countries will do what they did in developed countries – decline to approximately two children per woman on average or less by 2100. For SSA, the medium projection assumes that fertility will decline from about five children today to three children on average in 2050, and that sub-Saharan Africa's population will grow from 960 million today to over two billion in 2050, even as couples choose smaller families (United Nations 2015).

Based on this growth in population as well as changes in diet requiring more grain for animals, experts estimate that by 2050 future food needs in Africa will grow three to four times beyond current production levels (Searchinger et al. 2013). Unfortunately, most estimates only look at the UN's medium projections and do not take into account variability and other estimates. A rapid decrease in fertility in line with the UN assumptions, however, is far from certain. Over the last decade the UN's population projections for many of the least developed countries in Western and Central Africa, particularly in the Sahel, have regularly been revised upward due to slower than expected declines in fertility (United Nations 2015). As population projections are revised upward, estimates of future food needs must also be increased.

3 The Impact of Climate Change on Food Security

The Sahel region of Africa is among the most chronically vulnerable in the world due to many factors, including poverty, population growth, and the harsh and variable climate. Spanning across the African continent, with the Sahara Desert to the North and the savanna to the South, the Sahel covers an area of over 1.1 million square miles. The Sahel has experienced increasing climate variability over the last 50 years, and between 1970 and 1993 there were 20 years of severe drought across the region. As a result, the people of the Sahel region are increasingly food insecure. The combination of low rainfall, environmental degradation, insufficient agricultural investment, and civil conflict, has led to significant decreases in agricultural

production (Oxfam 2012). In 2011, low food stocks and high food prices pushed over 18 million people into food insecurity (USAID 2012a,b).

The future prospects for agriculture in the Sahel are not bright. Climate models predict that by 2050 the Sahel will be between 3 and 5 °C warmer than it is today, and extreme weather events, particularly severe drought, will be even more common. The length of the growing period across most of the Sahel is expected to decline by more than 20%, resulting in declines in agricultural and livestock productivity (Thornton et al. 2006). In a region where the majority of the population depends on agriculture for their livelihood and where the population is expected to more than double, these models suggest continued challenges to food security and recurrent needs for both humanitarian food assistance as well as efforts to build resilience to withstand future drought.

The recent drought in the Horn of Africa is perhaps a harbinger of what is to come for the Sahel. In 2011, the combination of severe drought and protracted conflict plunged 13.3 million people into crisis in the Horn of Africa. In Somalia, the drought led to a food security crisis, killing an estimated 258,000 people and resulting in a great exodus from the most affected areas, leaving 1.1 million people internally displaced and another 1 million Somali refugees crossing into other countries. While Somalia has received nearly US$1 billion each year since 2011, mostly in emergency funds, conflict and lack of governance have meant that very little humanitarian assistance has gone toward investments in social sectors such as public health, education, and agriculture, which could help to improve long-term food security (Development Initiatives 2012). The result is that people in Somalia at the onset of the drought were already vulnerable to disaster (Slim 2012). Elsewhere in the Horn of Africa, Ethiopia and Kenya were also severely affected by the drought and famine of 2011, but were better able to respond and cope with the crisis. Both Ethiopia and Kenya are among the largest recipients of Official Development Assistance (ODA) from international donors, much of which is spent on social and health programs aimed at addressing the root causes of vulnerability.

The Sahel has seen comparatively little investment in the health and welfare of people, nor in the agricultural systems required to support one of the fastest growing populations in the world. Estimates put the current population at almost 140 million in 2015, more than three times the population in 1950. Projections suggest the population will more than double by 2050, and there will be over 340 million people living in the Sahel (May et al. 2017). This rapidly growing population in tandem with the changing climate in an already arid region means that a far greater number of people will be exposed to more frequent droughts and famine (Potts et al. 2013).

There is a growing recognition of the importance of including population and family planning needs in efforts to improve food security and resilience. In September 2012, the OASIS Conference brought together a multidisciplinary group of experts from Africa and North America, to discuss projections of global warming and rapid population growth in the Sahel and to begin building an evidence base to enable decision-makers at a national, regional, and global level to invest in preventing catastrophe in the region. All participants agreed that these immediate needs require investment of resources in girls and young women, enabling women to

manage their childbearing through family planning within a human rights framework (Potts et al. 2013).

In addition to the increased food demands that come with more people, population growth also puts additional pressure on the natural resources that are the basis of rural livelihoods in the Sahel. A greater number of households has meant an increasing demand for croplands and grazing lands, straining existing land tenure systems as croplands expand into grazing areas and grazing lands are shared among more animals and additional users (Ickowicz et al. 2012). In addition, population growth in combination with agricultural expansion and urbanization will strain already limited water sources in the region (Smith et al. 2014; Niang et al. 2014). As a result, experts are predicting that, despite low population density,, the Sahel will be unable both to adapt to predicted changes in climate and to accommodate the expected population growth, and may see a large outmigration of people as has happened during past crises (UNEP 2011).

The rapid population growth of the Sahel is a result of persistently high fertility, which is in large part related to the poor health and low social status of women. Low levels of school enrollment for girls, early marriage, unintended pregnancy, unmet need for family planning, and a persistent desire for large families all contribute to high fertility. Of the ten countries in the world with the highest total fertility rate, or average number of births per woman, four are in the Sahel – Niger (7.6), Chad (6.6), Mali (6.1), and Burkina Faso (6) (Population Reference Bureau2015).

While education and literacy rates are low overall in the Sahel compared to the rest of Africa and the world, they are especially low for women. The overwhelming majority of women are poor and illiterate with little power in their households or communities. In Niger, for example, only 11% of girls enroll in secondary school, and half of women are married before their 16th birthday. Among married women, contraceptive use is very low in the Sahel region. Only 1.6% of married women in Chad and 8% of married women in Mauritania use modern contraceptives. As a comparison, fertility in Ethiopia and Kenya has declined to an average of four births per woman, and modern contraceptive use among married women is 40% and 53%, respectively.

High fertility and the desire for a large family are in part related to the high infant and child mortality rates of the past. Infant mortality rates over the last two decades, however, have declined remarkably throughout the Sahel. In Mali and Niger, for example, the number of children who die before their first birthday has been halved since just 1990. As a result, more children are surviving and life expectancy is increasing. However, the declines in desiredfamily size and fertility, which have accompanied this transition in much of the rest of the world have not occurred yet in the Sahel.

The resulting rapid population growth can make it difficult for communities and governments to keep pace with current social sector needs, such as building schools and health clinics. It can impede the ability to invest the additional resources required to create jobs for the expanding labor force, in order to capture a demographic dividend or to invest in agriculture. These investments, however, are necessary to build resilience to recurrent crises, and adapt to the expected climate changes

in the region. For example, in Niger, where the population is growing by almost 4% per year, more than one million additional children are born each year, and 52% of the total population is under the age of 15 (Population Reference Bureau2015). Niger's population is likely to double from about 19 million people today to almost 40 million people just 20 years from now. This growth will require a great investment in schools, health clinics, and job creation for youth, all of which will compete with the resources that Niger also needs to invest in adapting agricultural systems, ensuring food security, building resilience to withstand future crises, and addressing the national and regional security issues.

4 Improving Agriculture, Nutrition, and Resilience and the Role of Improving the Status of Women

Almost two of every three people in sub-Saharan Africa live in a rural area and most rely principally on small-scale agriculture for their livelihood. Improving agriculture on small farms is critical to reducing food insecurity. Experts agree that over the short to medium term, improving the prospects of African agriculture will depend heavily on strategies to improve the yields of existing farms. These strategies will include closing yield gaps between what farmers are currently producing and what they could produce by introducing better seeds, improving soil and water management loss through soil conservation and dryland agroforestry strategies, and increase and improve the use of fertilizers (Searchinger et al. 2013). All of these will require increased agricultural research, building the capacity of farmers, as well as the extension of capital markets so that small farmers can invest in their lands and the inputs needed (FAO 2009). Improved yields, however, will have to be accompanied by efforts to reduce crop loss and waste by increasing the infrastructure for storage, transport, and markets. Additionally, African farmers will need the financial infrastructure to smooth the adverse effects of price and weather fluctuations, including saving vehicles and insurance as well commodity exchanges (Zimmerman and Haase 2017).

Women will play a key role since they perform *half* of all agricultural labor in the region and contribute an even greater amount in many countries. There is consistent and compelling evidence to suggest that when the status of women is improved, agricultural productivity increases, poverty is reduced, and nutrition improves (FAO 2011). Any attempt to improve women's prospects in agriculture, however, faces many obstacles. Women often lack the land, access to credit, and agricultural extension services needed to boost production (FAO 2011). Furthermore, they face special burdens related to their traditional roles of childbearing, caring for the family, and fetching water and firewood.

Roughly four in every five farms in Africa are less than two hectares, and while the region is becoming more urban, the rural population is still expected to grow by more than 150 million people over the next 40 years (United Nations 2015).

Most countries in the region will experience rural population growth, and farms will likely get smaller as farmers subdivide agricultural land among their children. In the Democratic Republic of the Congo, the rural population almost doubled from 1970 to 1990, and the average farm size declined from 1.5 to 0.5 ha (Nagayets 2005). There is evidence that declining farm size is making it more difficult for farmers to grow enough food to have a secure livelihood and feed their families. In a national survey in Kenya, the majority of farmers reported that their land's production was not sufficient to support their families, and two out of three felt that there was not enough available land for their children to stay on the farm and in the community (ICF Macro 2015). Women face even greater land constraints than men and are less likely to own land, and less likely to have access to rented land. Moreover, the land which they do have access to is often of poorer quality and in smaller plots. Improving women's access to land will improve agricultural productivity in the region (Quisumbing and Pandelfelli 2009).

Agricultural yields in SSA remain low compared to other developing regions. Agricultural inputs and the techniques and technologies needed to boost production are lagging far behind the rest of the developing world (Morris et al. 2007). Though efforts are underway to improve farmers' access to and use of organic and inorganic fertilizers, they remain prohibitively expensive for most small farmers (Rosegrant et al. 2005). Women, for a variety of reasons including greater poverty, lower levels of education, and lack of credit, are much less likely to use purchased inputs such as fertilizers and improved seeds or to have access to mechanical tools and equipment. In many countries, women are only half as likely as men to use fertilizers, contributing to low agricultural yields on their plots (FAO 2011).

Women also face unique gender-related constraints that may limit the labor they are able to put into their farms (Peterman et al. 2011). They are usually responsible for domestic work such as collecting water and firewood and preparing meals for the household. In addition, pregnancy, breastfeeding, and childcare may limit women's mobility and the time they are able to spend laboring on their farms (Peterman et al. 2011). Poor access to reproductive health information and services often leads to adolescent pregnancies, girls dropping out of school, and frequent pregnancies – all of which have negative effects on women's health and economic opportunities. Low levels of schooling, poor health, and compromised nutritional status constrain poor rural women in their multiple roles as agricultural producers, workers, mothers, and caregivers (Quisumbing and Pandelfelli 2009).

The complex development challenges women, families, and their communities face requires multi-sector investments in women's agriculture, education, and health. Integrated approaches to addressing these challenges will improve prospects for women, increase food production, and improve the well-being of households. Scientists from diverse fields are studying resilience to better understand different responses to crises. Research suggests that women are critical for building resilience and should be at the center of resilience programming (Mercy Corps 2013).

Largely unexplored in the research on resilience, however, is the role that improving health might play in contributing to the resilience of women, their families,

and communities. To increase resilience, households and communities need to have both adaptive capacity – the ability to quickly and effectively respond to new circumstances – and the ability to reduce vulnerability and the risk of shocks. There are many different ways to increase adaptive capacity and reduce vulnerability and risk. Though enabling women and couples to determine whether, when, and how often to have children is a recognized "best buy" for development (Kohler and Behrman 2014), few have proposed that it should be part of development strategies focused on building resilience or improving nutrition and food security.

The use of family planning can reduce unintended pregnancies and allow for healthier timing and spacing of pregnancies. Forty percent of the 213 million pregnancies that occurred worldwide in 2012 were unintended. Fifty percent of these 85 million unintended pregnancies ended in abortion and 38% ended in an unplanned birth (Sedgh et al. 2014). Research has proven that avoiding unintended and closely spaced pregnancies results in better health and less morbidity and mortality for both mothers and their children (Rutstein 2008). It has also been shown that there are social and economic consequences as women recover from unintended pregnancies and particularly unsafe abortions. They are prevented from fulfilling other responsibilities such as making a living, attending school, and caring for their families. Furthermore, the loss of a mother due to death during childbirth or because of an unsafe abortion can quickly plunge a household into crisis (Singh 2010).

Evidence from Bangladesh suggests that women who have consistently had better access to strong family planning programs are more likely to work outside the home in the labor force, and their households have accumulated greater wealth (Joshi and Schultz 2007). Having multiple sources of income and financial assets are important factors that resilience experts recognize as critical for helping households better prepare for and respond to changing circumstances as crises occur (Mercy Corps 2013).

Family planning may also have a long-term impact on adaptive capacity, because family planning programs can result in higher educational attainment for women and thus brighter future prospects (Angeles et al. 2005). Avoiding early marriage, early pregnancy, and the high fertility which often results from starting childbearing early, has both immediate and long-term social and health benefits (Lloyd 2009). Women with low levels of education are more vulnerable to drought, displacement, food insecurity, and other crises. Better education levels, particularly of women, are recognized as a critical factor in reducing risk and building the adaptive capacity of households and communities (Lutz et al. 2014). Women who have better access to education and health programs are also more likely to participate in household decision-making, and evidence from food security, livelihood, and environment programs suggests that empowered women are more likely to make wise choices regarding diversification of livelihoods, nutrition, and food security (Naik and Smith 2015).

Beyond the individual and household benefits, some food security experts have also called for improved access to family planning in combination with girls' education as a means of reducing fertility, slowing population growth, and slowing the

increase of food demand (Smith and Smith 2015; Searchinger et al. 2013). All this contributes to slower growth in food needs, as well as resilience at the community, regional, and national levels.

5 Conclusions: Food Security, Climate Change, and the Demographic Dividend

Today, nearly a quarter of the sub-Saharan Africa population lacks adequate food for a healthy and productive life. Rapid population growth combined with the poor performance of the agricultural sector is renewing concerns about a major food security crisis in the continent. Moreover, the poor status of women is not conducive to increase agriculture productivity. Last but not least, food production will probably worsen with the effects of climate change, including the more frequent occurrence of droughts and food security crises.

Reducing hunger in SSA will depend on investments in improving agricultural productivity as well as improving the status of women. These efforts will improve agriculture, improve the lives of women, who are likely to continue doing a large share of agriculture work, and in the long term will affect agriculture and probably the size of the future population. Healthier and fewer families also result in long-term savings to the social sector, as the smaller population would place less demand on education, health, and other services, including agricultural extension (Health Policy Initiative 2009). These investments, as discussed in other chapters of this book, would put countries on a path toward capturing a first demographic dividend.

The growth in future food needs will mean that large investments are necessary to improve agricultural productivity but are also needed to improve the health and well-being of a large percentage of the agricultural workforce. These investments are important in order for households to develop resilient agricultural livelihoods. However, at this stage there is little evidence to suggest that agriculture will be a driving force of the job growth needed to capture a demographic dividend.

All this presents SSA countries with a major challenge – can they adequately invest in economic sectors that will stimulate job growth to obtain a demographic dividend, while also adequately investing in agriculture to ensure future food security? Studies of the subject have thus far simply asked which sectors were critical for investment in order to attain a demographic dividend. They have not yet looked at how these investments might have to compete with investments in agriculture and resilience building that are critical for improving food security in the context of population growth and climate change, but might not per se contribute to a demographic dividend.

Clearly, however, programs that improve the status of women, help girls complete their education, and provide access to health services that let them decide the timing, spacing, and desired number of pregnancies, benefit both improved agriculture

and progress toward capturing a demographic dividend. Governments must therefore prioritize these investments as a critical step toward future food security and a path to capture a first demographic dividend, while researchers must continue to study the role that the agricultural sector will play in either contributing to, or perhaps drawing resources away from, the investments needed to capture a demographic dividend.

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The Development of Organized Commodity Exchanges in Africa: An Economic Analysis

Heinz Zimmermann and Marco Haase

1 Introduction

Commodities are a major engine of the sub-Saharan economic growth, and a substantial part of Africa's population makes their living from agricultural production without having market access. It is therefore important to explore ways to organize commodity (spot and futures) exchanges in Africa in order to improve the market access of small farmers and to stabilize their income from price fluctuations. There are substantial indirect effects from the development of organized commodity exchanges: improving infrastructure and food security. The previous chapter in this book by Jason Bremner highlights the many dimensions of food security on a continent where food needs will grow three to four times above current levels by 2050.

But food safety cannot be accomplished by just accelerating production. Eleni Gabre-Madhin, one founder of the Ethiopia's Commodity Exchange, noticed that problems in the supply chain make Ethiopia poor and food insecure.[1] For example, in 1984 a shortage of grain in the north of Ethiopia claimed million lives in the big famine, but at the same time there was a surplus of grain in the Western part where prices collapsed. The same happened in 2002 when price collapsed almost to zero due to a bumper harvest, and only 6 months later Ethiopia required emergency food aid for 14 million people because of the lack of incentives to store the surplus. The crucial role of commodity exchanges for the development of an efficient and orderly food-marketing and distribution system has not been recognized over many decades. This is surprising since the Chicago Board of Trade was established under similar conditions in 1848 and is regarded as a major contributor to the economic success of the U.S. (CBOT 1936).

[1] See Everitt (2012).

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We argue that the implementation of standardized commodity exchanges makes it ultimately necessary to improve countries' basic andfinancial infrastructure. Commodity exchanges thereby ameliorate production, trading, and distribution of commodities for the society at large. This has positive side effects on the physical access of corporations, co-operatives, and individuals to food, and thus helps to improve food security. However, based on historical experience, we also discuss several limitations and risks if excessive steps are undertaken in the launch of (futures) exchanges. Failure is often paired with damage in public support and imposes long-term economic costs on society.

2 From Price Stabilization Programs to Market-Based Risk Management

For more than half a century, international trading in selected commodities was regulated between the governments of producing and consuming (mostly less developed and developed) countries by International Commodity Agreements (ICAs), which occasionally contained interventionist and protectionist elements aimed at stabilizing or maintaining acceptable commodity prices – such as export controls, buffer stock, and price-band schemes, or import tariffs and quotas.[2] At the national level, these arrangements were – and still are – supplemented by revenue management programs, e.g., stabilization funds, which are set up to immunize public revenues and expenditures against commodity pricevolatility. In Africa, specifically, marketing boards provided a wide range of services which helped producers to access markets and to stabilize income. Compensatory financing mechanisms at the international level (such as the Compensatory and Contingency Financing Facility, CCFF, or the European Commission Compensatory Finance Scheme to Stabilize Export Earnings, STABEX) were established to substitute countries' insufficient reserves or global borrowing capacity in their national stabilization policies.

At the international level, as noted by Gilbert (2011), stabilization policies became more politicized in 1964 when existing ICAs came under control of the newly founded United Nations Conference on Trade and Development (UNCTAD), which also stimulated the extension of existing programs. Among the objectives, as stated in its Resolution 93(IV) released in 1976, was the establishment of a common funding facility (the Common Fund for Commodities, CFC) for financing buffer stocks in order to reduce price volatilities, and the stabilization of commodity prices at levels remunerative to producers. These objectives were applicable to ten major commodities.

Brown (1980) and Gilbert (1987) among others provide an early, critical, and overall pessimistic view about the politics and hence the impact of these programs. Without reviewing the details, the arrangements failed to sustain during the global recession in the 1980s, when prices of major commodities declined (e.g., tin, coffee,

[2] Gilbert (2011) report six ICAs containing interventionist clauses, related to cocoa, coffee, natural rubber, sugar, tin, and wheat.

cocoa, sugar), public budgets tightened, and an emerging attitude against multilateralism in international economic relations could be observed (UNCTAD 2003: 33). The stabilization mechanisms were designed to compensate for temporary shocks in commodity prices or export shortfalls, but were unable (and could realistically never have been intended) to mitigate secular price trends or their economic consequences.

The disillusion about the traditional stabilization schemes moved the discussion towards the question about the feasibility and welfare aspects of market-based financial instruments, notably contracts traded on commodity futures exchanges. Long before, McKinnon (1967) already pointed out that "[t]he commodity-price-stabilization literature implicitly assumes that the word "price" refers to the spot price and entirely ignores the continuum of future prices. This [...] has meant that numerous interventions by governmental authorities in commodity markets have been confined to the manipulation of spot prices." He demonstrates that direct manipulation of spot prices "is likely to be a very inefficient and unnecessarily costly method of achieving governmental policy goals: in particular, the stabilization of producer incomes" (p. 844). In an important paper, Gilbert (1985) analyzes this claim in more detail and finds that commodity futures markets provide a more effective and welfare-improving way for dealing with price volatility than pure buffer-stock mechanisms. This conclusion, however, is only valid under restrictive assumptions: competitive markets, unbiased futures prices, and in particular the absence of frictions and costs in using futures markets. The last point is particularly critical since it assumes that LDC (Less Developed Countries) producers have full access to commodity credit in order to meet the margin requirement of futures exchanges. This is a strong limitation, as discussed below.

The shift from governmental price stabilization policies to market-based solutions was first explicitly addressed in a report by the World Bank (1994): it highlights the failure of traditional stabilization schemes and concludes that "*market-based risk management instruments […] offer a promising alternative to traditional stabilization scheme*" (p. 4). It marks the move away from aggregate policies to the decisions of individual economic units (e.g., sectors, firms, cooperatives, households), from the manipulation of prices to the smoothing of adverse price effects on earnings, costs, and profits.

Is this a feasible strategy for LDCs? We argue in the subsequent sections that futures markets provide an economically efficient alternative for stabilizing commodity related income. While this is true in principle, it overlooks the practical difficulties in implementing these markets in less developed financial systems. It is thus not surprising that commodity futures markets have not been widely developed in LDCs (in Africa) – with a few exceptions for specific commodities and countries. We argue that the establishment of functioning commodity (spot) exchanges – not necessarily futures markets[3] – should be regarded as the primary step in the development of market – based risk management solutions. While a futures exchange

[3] We simplify the discussion to "spot" and "futures" markets and ignore alternative bilateral contracts like forward, swap, and others.

certainly represents the ultimate goal of this process, a successful development of such a sophisticated market structure ultimately requires intermediate steps which are aimed at improving the technological, financial, and legal infrastructure of a country. Nevertheless, the plan of such an exchange may accelerate this process.

3 Economic Benefits of Commodity Futures Exchanges

Before addressing the role of futures, it might be useful to point out the differences between non-organized and organized commodityspot markets. Non-organized commodity spot markets (also called "cash" markets) are characterized by the trading of physical commodities at a specific location, where the terms of an agreement are bilaterally negotiated between purchaser and seller, and delivery and payment takes place immediately. Trading is typically spread over a wide range of places.

In contrast, centralized spot exchanges are organized and highly formalized trading places: the commodity contracts are standardized in terms of quantity, quality, and delivery places; the legal counterparty of each transaction is the exchange, respectively, the clearing house of the exchange who guaranties the fulfillment of the contract; finally, exchanges are governed by an auto-regulatory structure with a set of transparent rules and regulations.

Established exchanges have extended their spot contracts through the inclusion of contracts with a delivery in the future. These contracts are commonly designated as "futures" and are daily settled through the margin accounts maintained by the clearing house. In contrast to spot markets where the pricing and exchange of the commodity occurs in the present, futures contracts are settled at a specific future date (the maturity of the contract), either as physical delivery or in cash, but the price of the transaction (the futures price) is still determined at the present.

3.1 Futures Exchanges: Economic Aspects

The benefit of organized commodity futures exchanges has long been recognized by economists and regulators alike. The most prominent writers include Gray (1966), Working (1970), Peck (1985), and Telser (1981). While the economic function of commodity futures is traditionally seen in the insurance against price risk for commercial hedgers, supplied by speculators, others see the benefit of commodity futures related to:

- **market organization** (e.g., central counterparty, market integrity, and contract enforcement, standardization, anonymity): this is most clearly analyzed by Telser (1981).
- **price information**: by consolidating the transactions of a wide range of market participants with heterogeneous trading motives and expectations, futures prices

aggregate information and accelerate the price discovery process. Danthine (1978) has shown that futures prices replace individual price expectations in optimal production decisions and stabilize commodity price formation.

In addition, exchanges provide extensive measurement and grading services to the cash commodity market as a prerequisite for futures trading. Such systems are intended to reduce trading costs of heterogeneous commodities and decentralized delivery places. An exchange also provides market information beyond prices. Such information includes statistics about production and consumption, imports and exports, visible supply, warehouse stocks, or trader statistics.

Moreover, exchanges provide legal safety: for example, they establish arbitration processes in order to overcome disputes about deliverable quality, and implement a variety of governance mechanisms for increasing the probability of contractual performance, including the enforcement of contracts. Of course, exchanges are subject to financial market supervision and have to comply with public and penal law.

3.2 Storage and Futures

A particularly important aspect for stabilization function of futures markets comes from their informational role in the intertemporal allocation of inventories. Tomek and Gray (1970) have shown that futures markets exhibit the highest level of development when the commodities are storable and inventories are carried continuously, as for example in the case of grain, soybean, or cotton. Under these conditions, the term structure of futures prices provides the relevant information for improving inventory and production decisions. The breadth of the futures market and the guidance of futures prices both have stabilizing effects: the improved opportunities to buy commodity surplus in the harvest season and sell it forward after the season stabilizes the inter-seasonal price volatility or price range. The adverse effects of CME's (Chicago Mercantile Exchange's)suspension of the onion futures market in the mid-1950s is a revealing case to consider (see Gray 1963).

This case illustrates the two important functions of futures markets in providing marked based food security: firstly, lower post-harvest prices release the burden of food expenditures over a year. Secondly, since warehouse operators are able to hedge their price risk, they carry more commodities into the next season, and thereby reduce the probability of substantial food shortages occurring due to crop failures.

However, the informational role of futures markets in stabilizing inventory is deteriorated if the commodity is only partly storable (such as potatoes) or not storable at all; this was analysed by Leuthold (1974) for live beef cattle.

3.3 Futures Markets Versus Price Stabilization

Overall, futures markets play an essential role in absorbing the consequences of commodity price variability, for producers, cooperatives, elevators, warehouses, financial intermediaries, exporters, and (possibly) consumers.[4] However, they provide no protection against declining secular price trends which may result from structural or global oversupply. An insufficient price level jeopardizes the secure existence of farmers and may call for long-run stabilization programs. General reservations regarding the ability and use of futures markets for long term price stabilization have been expressed by Dana and Gilbert (2009); they regard futures markets as useful for hedging price risk within a crop year, but question their role for dealing with the intra-annual price level risk which affects farmers' long term investment decisions, and thus the structure and welfare of the farming sector. Even Telser (1981) concludes that in this situation, government price support programs are superior to exchanges, since they ensure perfect price stability, though at the cost of growing inventories. Notice, however, that this is only true if a lower price limit is maintained; an upper price bound can only be defended as long as government stocks are not exhausted or the underlying commodity can be imported at any quantity. Moreover, as noticed by Telser (1981), price stabilization forces the government to choose a wrong price compared to the free market price, which implies a misallocation of scarce resources. In contrast, exchanges help to stabilize prices around the equilibrium price. Finally, and most important, government price stabilization programs are unlikely to co-exist with market-based solutions. They ultimately drive out speculators, and consequently, liquidity from the market. This makes price manipulation more likely. As noted by Telser and Highbotham (1977), "price variability affects the benefit of having an organized market" (p. 998). Hence, price stabilization programs, even oriented at longer time horizons, are difficult to reconcile with market-based solutions.

3.4 The Benefit of Futures Exchanges

To sum up, the benefit of commodity futures exchanges is mainly twofold: firstly, it supports and improves the nations' trading in physical commodities, and secondly, it provides useful price information to the society – not only to those who are currently trading in the market. Moreover, they create and enforce property rights and governing mechanism to facilitate the contractual relationships between market participants. Finally, organized exchanges stabilize prizes around market equilibrium levels and avoid misallocations of scarce resources at the cost of higher price

[4] The exposures to agricultural price risk for the various agents in the supply chain in LDCs are described by Dana and Gilbert (2009).

variability compared to governmental price support programs. However, the waste of resources by ignoring basic supply and demand relations must not be ignored.

3.5 The Costs of Futures Exchanges

The benefits of futures come at a substantial cost: futures exchanges are complex, expensive, and risky in their setup and operation. This is particularly true for commodity futures, where the physical nature of the underlying commodities and the heterogeneity of market participants challenge the design of optimal contracts and an adequate market structure. Many futures markets failed because of inappropriate contracts, insufficient liquidity, and market manipulation, and thereby lost public and political support. In addition, a futures exchange requires an ample infrastructure (technological, information, education) as well as a reliable regulatory framework. These are challenging tasks which can only be implemented in a process of well-defined successive steps.

It has been suggested that LDCs should use existing, international futures exchanges (e.g., Leuthold 1994) to circumvent the costs and difficulties of establishing local exchanges. In the light of the preceding discussion we do not think that this is a constructive or feasible option. Apart from difficulties related to capital controls or exchange rate risk, prices at international exchanges may not be representative for local producers and consumers. This is because the price discovery process is ultimately related to the physical deliverability of commodities, which puts severe limitations on the global use of commodity markets.

4 Commodity Exchanges in Africa: Experience and Prospects

4.1 The Development from 1990 to 2004

After the market liberalization in the late 1980s, five countries established agricultural commodity exchanges, but only South Africa attracted sizeable trade volumes to run a profitable exchange: SAFEX started in 1988 with cash-settled beef and potatoes futures, and both failed.[5] The first successful contract was launched 1996 on the country's staple crop white maize, with a robust delivery system, using transferable silo receipts, and trading both spot and futures. Options were introduced in 1998 on maize and wheat. There were no applicable laws and regulations. The exchange operated as a self-regulatory organization.

[5] See Rashid et al. (2010) for details.

Zambia established the second exchange in Africa in 1994, the Zambia Agricultural Commodity Exchange (ZAMACE). The relative success of the exchange inspired other provinces to create two other exchanges, the Kapiri Commodity Exchange and the Eastern Agricultural Commodity Exchange. All three were closed due to unpredictable government interventions.

Zimbabwe established the ZIMACE based on standardized warehouse receipts. The ZIMACE was quite active until 2001 but was subsequently suspended when the government gave the state-owned Grain Marketing Board a monopoly on the trading of maize and wheat. Moreover, there was poor market information, no clearinghouse, no payment guarantee on contracts, and other frictions (see AfDB 2014: 92).

The **Kenyan** Agricultural Commodity Exchange (KCAE) and the Uganda Commodity Exchange (UCE) were launched in 1997 and 1998, respectively. KACE installed a physical trading platform, but was not successful: commodities were not graded or standardized and thus failed to attract large volumes; there was no capacity to provide complementary service such as storage or market information; there was no access to credit facilities for traders and stockholders, along with many other reasons.

In **Uganda**, although the government covered operation costs, the exchange faced problems with the quality and quantity verification system; again, there was no system to guarantee payment and no dispute settlement procedures. In 2006, a warehouse receipt system with focus on maize and beans was introduced, which switched to an electronic platform in 2008. Further steps towards an organized market were that UCE started to secure buyers and sellers against counterparty risk; it built a network connecting seven decentralized warehouses; and three banks started to provide credit against warehouse receipts.

4.2 The Development Since 2004

There are currently about a dozen commodity exchanges operating in Africa, but only three exchanges have achieved sizeable trading volumes. Commodity futures are traded only at the South African Futures Exchange (SAFEX), namely on maize, wheat, sunflower seeds, and soya beans.

The agricultural commodity exchanges in Zambia and Malawi trade contracts mainly on wheat and maize, and to a lesser extent on soya, fertilizer, cement, maize barn, cottonseed, and kidney beans.

Ethiopia's Commodity Exchange (ECX) was established in 2008 and deserves special attention: although one of the poorest nations of the world, the country hosts one of Africa's most developed exchanges. The clearing house acts as third party guarantor of all transactions and is guaranteeing the quality, quantity, payment, and delivery of trades. Thereby, clearing and settlement with partner banks is executed on the "next day payment after trade" standard. About 12 % of exchange members represent 2.4 million small farmers. The exchange started with a single commodity (coffee) and a single warehouse in 2008, with a trading volume

representing some 10 million USD. Today, the exchange trades five commodities (apart from coffee: sesame, navy beans, maize, and wheat), hosts 17 delivery centers and is connected to 57 warehouses, and the trading volume represents more than 1 billion USD.

But the currently most ambitious project is the launch of MCX Africa[6] under the auspices of the Indian billionaire Jignesh Shah, which is planned to be domiciled at the Botswana International Financial Services Centre (IFSC). The project plans to operate a Pan-African commodity and derivatives exchange across all of Africa's 53 countries. The specific plans include: "[…] a spot platform enabling the efficient delivery and procurement of a range of African commodities. Another solution they plan to bring will be a futures exchange that brings price discovery, risk management, and investment opportunities directly to the African user" (Mmegi online, March 13, 2015).

5 Success and Failure of Futures Exchanges

Failures of exchanges are not a typically African phenomena. In order to analyze the causes of these failures, it might be useful to review the findings of a couple of studies which address the factors determining the success and failure of futures contracts, respectively, futures exchanges from many parts of the world.

Notice first that failure of exchanges can impose long-run costs on society. A prominent case to learn from is the Berlin Produce Exchange, where forward contracts on most major commodities were severely restricted or even forbidden by the German Exchange Act of 1896, largely driven by the negative public attitude towards commodity speculation. The consequence was not only that the Berlin exchange "formerly one of the most influential markets of Europe […] dropped to the rank of a small provincial market" (see Jacks 2007: 354), but also that the experience and culture of trading commodity price risk disappeared for almost a century in continental Europe. It paved the way to bureaucratic and expensive agricultural subsidy programs which are still effective today.

The Berlin case demonstrates that political support as well as the general public perception of market-based risk transfer mechanisms are essential preconditions for establishing organized commodity exchanges. Apart from these general conditions, individual futures contracts are also exposed to unpredictable success and failure. In the US, from the hundreds of commodity futures contracts launched over the decades, probably less than a third have survived; this estimate can be inferred from the study by Carlton (1984) covering 11 US exchanges from 1960 to 1981.

Apparently, exchanges can only be innovative if they have a basket of successful contracts for absorbing the risk of failure of new contracts. The factors leading to success or failure can be either commodity or contract specific. The classic study of Gray (1966) emphases that contracts should benefit buyers and sellers, hedgers and

[6] MCX stands for Multi Commodity Exchange.

speculators alike. Similar arguments can be found in Black (1986) who moreover stresses the risk of market manipulation if contracts do no attract sufficient liquidity.

Black (1986) also stresses the homogeneity and storability of the underlying commodity, and the emergence of a broad cash market. The last factor is empirically supported by Brorsen and Fofana (2001) who conclude that an "active cash market is found to be necessary for futures contract success since this variable alone perfectly predicts whether or not a commodity has a futures market" (p.129). We consider this the key element in the development of futures exchanges in LDCs.

An industrial organization perspective by Pirrong (2000) suggests that the competitive position of an exchange determines its efficiency and hence its success. Efficient rules and governance structures are adopted by exchanges the more competition they face, while monopolies have an incentive to self-protect and impose entry barriers. This leads to a less-than optimal number of market participants which might impair market liquidity.

These concerns must be taken seriously in establishing new exchanges: Pirrong (1995b) argues that exchange members are likely to ignore the effects of manipulation and have a low incentive to adopt efficient measures against it. He therefore considers self-regulation as an inefficient means to control manipulation and argues in favour of the coercive power of federal law. Manipulation is a well-analysed topic in the law and economics literature of futures markets. Easterbrook (1986) argues that traders anticipate losses from manipulation and will not enter the market if the expected benefit from trading is less than the expected costs of being a victim of manipulation. Under such conditions people will shift from futures trading to using bilateral forward contracts or even to bilateral trade in the spot market.

A broader economic perspective is taken by Rashid et al. (2010) arguing that exchanges have failed in some African countries because their government suppressed the establishment of exchanges by interventions, whereas in other countries exchanges have failed due to adverse local conditions which put excessive private costs on the operation of an exchange or its participants. Adverse conditions arise from: inadequate infrastructure in the physical market (e.g., related to transportation or warehousing) or in information technology; an inadequate legal structure for enforcing contracts; or an underdeveloped financial system with insufficient credit facilities to operate a clearing house. Exchanges also fail if the trading volume is too low to spread the fixed costs.

An overall conclusion is that public policy must be an integral part of building commodities exchanges: governments should support building infrastructure, prevent manipulation, enhance the enforcement of contracts, and support the emergence of intermediaries acting between farmers and the exchange and help to bridge the various "gaps" between the traded (standardized) contracts and the physical commodities (e.g., quality standards, quantities, delivery locations).

6 Steps Towards the Implementation of Commodity Futures Exchanges

We learn from historical and international experience that modern commodity futures exchanges grew out of a continuing process of improvements in a nation's:

1. Commodity spot market
2. Warehouse system
3. Technological and basic infrastructure
4. Banking and credit market
5. Legal and regulatory framework

A key insight from studies analyzing the success and failure of futures exchanges is that an active cash market is the single most important explanatory factor in the success of futures trading. In terms of commodities, it implies that the ultimate first step towards development of an organized futures market is the development of a liquid commodity (spot) exchange. This involves several steps.

6.1 Standard Contracts

Many of the difficulties arise from the physical nature of the underlying commodities and their unique characteristics (heterogeneity, limited storability, transportation, and handling costs) and from the multiplicity of parties involved in commodity trading.

Commodities are not standardized financial securities by their physical nature, and farmers or cooperatives are not specialized stock brokers! Nevertheless, a futures market requires a basic standardization on the underlying spot markets, in particular with respect to: (a) the traded commodities, and (b) the trading infrastructure. Both aspects are related, and lead to the emergence of trading in standardized contracts. Standardization implies that only a small number of all actual commodities, and qualities are traded. The key success factor of an organized exchange is liquidity, and liquidity is impaired if trading is spread over too many contracts, commodities and qualities. Liquidity not only improves the price discovery process, but directly determines the cost of trading, i.e., the spread between bid and ask quotes. Working (1953) observed that traders prefer a "poor hedge that is cheap to a more nearly perfect hedge this is relatively expensive" (p. 341). This insight applies to any organized commodity exchange. In spot markets, it creates strong incentives to trade homogeneous goods, in particular with respect to quality, as "benchmarks" in the trading and pricing of non-standard commodities and qualities.

The design of a small set of optimal commodity contracts is more an art than a science. The most important step involves the standardization of quality and grading, i.e., defining the deliverable grades of commodities. This in turn requires the implementation of reliable measurement systems, for example weighting and

grading. Such a system should reflect national grades and standards, recognize the country specific infrastructure, support intermediaries such as local warehouse operators in fulfilling their task in measurement and grading, and recognize the need of banks to use warehouse receipts as collateral. The historical experience from establishing exchanges in the US, as well as more recently in emerging and developing economies, teaches us that this requires the development of a warehouse (and also a warehouse receipt) system, which is designed to comply with the local needs of the major market participants.

As a side remark, it might be interesting to notice that the development of sophisticated weighting and grading systems was historically not advanced by futures exchanges to facilitate futures trading; according to Pirrong (1995a), they rather "intended the system to improve the efficiency of the cash grain trade" , and the potential for futures trading was only recognized thereafter. Innovation often starts at the cash market!

6.2 Central Counterparty

With respect to trading infrastructure, the major challenge in enhancing market liquidity is to ensure reliable, solvent, and competent counterparties to handle the transactions. The seller of the commodity has to deliver to the right place in the right quantity, in the right condition at the right time, and the buyer must inspect the delivered commodities immediately and pay the seller. A key function of an organized commodity exchange is to facilitate and ensure this process. The goods are traded anonymously by agents, where the trading rules are defined and enforced by the exchange. Moreover, the exchange itself steps in as the counterparty with respect to the physical transaction: the original contract is replaced by two contracts with the exchange, respectively (if it exists) a clearinghouse. Briefly, the most important benefit of an organized exchange is that it "facilitates trade among strangers" (Telser and Highbotham 1977).

As a consequence, an organized exchange which trades highly fungible commodities attracts a wide range of potential market participants; theoretical and empirical studies demonstrate that the resulting price information is superior to "personalized" markets where the trades and transactions rely on the characteristics of individual participants and goods. Most important, not only those who are actively trading on the exchange benefit from superior price information, but the economic system as a whole.

6.3 Certification

The trading of standard contracts is a key aspect of liquid commodity exchanges. As noted by Telser and Highbotham (1977), these need not be futures contracts. In the case of developing economies, the issuance of tradable, certified warehouse receipts is the most obvious alternative. Warehouse receipts entitle its owner to delivery of a specific amount of a commodity and quality grade at a specific warehouse location. They are typically issued by regulated warehouses and are subject to securities regulation. Warehouse receipts not only make it possible to easily transfer ownership of commodities without physical transaction, but they are also used as collateral in the margining or borrowing process. The role of these instruments in developing African commodity exchanges is described in Mohammed and Issah (2014) and AfDB (2014).

6.4 Infrastructure

Infrastructure includes information technologies as well as a reliable system of transportation and distribution. The infrastructure itself is precondition to the existence of a commodity exchange, because the delivery location is predefined in a contract and access must be guaranteed. Since most exchanges trade storable commodities, the country needs sufficient and adequate warehouse capacity, including the connection between the warehouses and delivery locations. The weak infrastructure in many developing countries is a major restriction for developing functioning commodity exchanges.

6.5 Daily C&S and the Credit Market

The final stage in the development of organized commodity exchanges are futures markets. The distinguishing features of a futures exchange are not only the maturity range of traded contracts and the flexibility in delivery (cash or physical), but in particular the daily clearing and settlement (C&S) through a clearing house. This requires a developed payment and banking system with expanded credit facilities for maintaining the daily cash and collateral requirements (margins). Telser and Highbotham (1977) compare the societal benefits of "financialization" of commodity trading through futures markets to the use of money compared to barter, while Gilbert (1985) considers this as the major obstacle for implementing futures exchanges in developing countries.[7]

[7] For example, in South Africa only 20 % of farmers use SAFEX, and most of them use options due to the more attractive margin requirements; others prefer forward contracts with intermediaries who transfer their price risk to SAFEX.

6.6 Homogenization of Produce and Local Delivery

A consequence is that even where an organized commodity exchanges operates successfully, it is impossible that all commodities benefit in the same way: contracts only survive if the benefit exceeds the costs. For producers, an exchange thus generates strong incentives to adjust production towards deliverable commodities, which means:

(a) A concentration on a small number of goods and
(b) More homogeneous products in terms of quality.

This might be controversial, because (a) implies less diversification and (b) increases production costs due to higher quality standards. Of course, if the produced quality of a commodity cannot be delivered against a futures contract, futures prices may not be representative for the produced goods and the futures contract provides an imperfect hedge, reflected in a less-than-perfect correlation between the variation of futures and cash commodity prices, called "basis risk". Even more important than differences in quality are high transportation costs, or even disruptions, in transferring goods quickly between the cash market and the delivery location, which causes local cash prices to be disconnected from futures prices at the delivery location. If basis risk is excessive, hedging quality is poor and the futures contracts will not be used for hedging purposes. This reduces market liquidity for futures contracts and decreases the informativeness of the price system.[8] The same mechanism puts severe limitations in using global exchanges if international delivery is not feasible for local producers. Trade restrictions like export or import bans, taxes, quality standards as well as insufficient infrastructure are the major drivers for basis risk in an international context.

Domestic exchanges mostly do a better job for hedging purposes if contracts are based on domestically consumed commodities with local product specification and delivery. The success depends on whether the domestic contract attracts sufficient liquidity.

7 Summary and Conclusions

The economic benefits of developing organized commodity exchanges – not necessarily futures markets – for the development of Africa's economies are manifold and can be summarized as follows:

1. Organized exchanges provide safety in transactions, delivery, and payment, ideally if the exchange or a clearinghouse steps in as central counterparty. The rules and regulation of exchanges provide legal certainty and replace individualized contracts.

[8] Morgan et al. (1999) provide a detailed discussion of these issues.

2. Exchanges define standard contracts, which provide standardization and standards with respect to grading and quality: this creates incentives for farmers to meet exchange standards, which homogenizes product quality – but most likely at higher production cost.
3. Exchanges provide price transparency and other market related information: farmers learn very quickly how to use price information to improve their position in negotiations.
4. Exchanges make the commodity sector bankable: exchange-based price information can be used to value collateral, which serve as a basis for bank lending and the development of credit markets.

The development of commodity exchanges should be seen in the broader trend of Africa's population towards urbanization. Current estimates predict that half of Africa's population will live in cities in 2025, compared to one third now. Africa is currently a net importer of the food commodities consumed in cities. Thus, a big challenge of agricultural policy in Africa will be in covering an increasing portion of urban food demand by local production. This also defines the opportunity of Africa's commodity exchanges, namely to improve the process of national and regional commodity trading. In this regard, organized commodity exchanges help to improve food security in the emerging African economies, a major challenge for the next generation as discussed by Bremner (2017) in this book.

We do not think that the ultimate priority of Africa's food policy should be in the development of futures markets. Based on the experience and the history of commodity trading, this might be an excessive step for most countries. The development of organized and to a certain extent standardized spot markets paired with steps towards improving the basic andfinancial infrastructure seems to be a more promising way.

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Part IV
Assembling Sub-Saharan Africa's Jigsaw

Is Rapid Fertility Decline Possible? Lessons from Asia and Emerging Countries

Feng Wang

1 Introduction

Comparing demographic changes in Africa and Asia is a daunting exercise, to put it mildly. Entering the second decade of the twentieth century, most Asian countries are already well into the demographic transition from high to low death and birth rates, with the region's population growth rate dropping from 1.94% in 1950–1955 to 1.15 in 2005–2010, a decline of over 40%. Fertility level, measured by the total fertility rate (TFR), (TFR), declined from 5.83 to 2.25 during the same time period, a drop of more than 50%. The continent's lowest fertility area, East Asia, now has an average fertility level of 1.61, which is already among the lowest in the world (UNPD 2013).

The contrast between Asia and Africa in demography could not be starker. During the same period as Asia recorded its historical decline in population growth rate, Africa's annual rate of population growth actually increased, from 2.13% to 2.5%. At such a rate, the African population can be expected to double in size every 28 years. Such an increase in population growth rate in Africa, however, is not due to an increase in fertility. Rather it is due to improvements in health and declining mortality, as the region's fertility level, while still high at close to five children per woman (TFR in 2005–2010 was 4.88), has already shown an appreciable decline, from 6.6 in 1950 to 1955.

As a result of these diverse demographic trajectories, Africa and Asia (especially East Asia) stand out as the two extremes of the world's fertility landscape. Today, ten of the world's highest fertility countries are all in Africa. These African countries are also the ones where fertility has not declined much since 1970. In contrast,

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three of the world's five lowest fertility societies are in Asia: Taiwan, the Republic of Korea, and Singapore, where the total fertility level in 2013 was at 1.2 or even lower. Since 1970, these three Asian societies also saw the fertility level in their respective locales drop from nearly two-thirds to almost three-quarters, from 4.5 to 1.2 in the case of the Republic of Korea (Population Reference Bureau 2014).

Just as the demographic profiles of the two continents diverged during the last half-century, their economic fortunes also changed, in an even more dramatic way. In the three decades between 1981 and 2011, per capita income level in sub-Saharan Africa rose from 897 to 2363 (World Bank 2014, current US dollars), an increase of 2.63 times. In the most developed region of Asia, East Asia and Pacific, income level rose from 1370 to 10,356, by 7.56 times. In 30 years, difference in standards of living between these two regions, as measured by current U.S. dollars and reported by the World Bank, shot up from 53% higher in East Asia and Pacific in 1981 to 438% in 2011.

There are numerous plausible explanations behind such a vast divergence in standards of living: they range from history, culture, natural and human endowment, to political institutions, governance, stability, and policy choices. But one factor is indisputably clear. This is the role of demographics in the development of these two continents, or at least the two regions in these two continents. In Africa, the demographic transition started late and has been slow, whereas in much of Asia especially East Asia, it has long since been completed. In the process of the demographic transition, improved health, declined fertility level, and the historically favorable population age structure formed the condition of what is known as the demographic dividend in East Asia, while such a dividend is yet to be realized in much of Africa. To some, while the potential for reaping the demographic dividend is huge in Africa, institutional challenges may elude some of the countries to benefit from this historical opportunity (Mason 2001; Bloom et al. 2007; Wang and Mason 2008; Eastwood and Lipton 2011).

Such stark contrasts in demographics as well as in economic growth, however, should not discourage one from making an attempt to examine the underlying factors that have contributed to Asia's demographic and economic transformations, and to make observations on what lessons, if any, Asia can offer to Africa. After all, half a century ago, Africa and Asia displayed demographic landscapes with more significant similarities than differences: total fertility rates were 6.6 in Africa versus 5.8 in Asia (5.6 in East Asia), and mortality under age 5 was 30.9% versus 23.7% respectively (18.9% in East Asia).

To make comparisons, and especially to draw lessons from Asia's demographic transition, I will begin in the following with a brief examination of the classic explanations of fertility decline, in order to establish a basic understanding of the conditions necessary for further fertility decline in Africa. I will then consider some unique forces of fertility decline in Asia, especially in East Asia, to discuss their implications for Africa. The last section of the chapter will shift the focus to variations within Africa, and anticipate changes that are likely to occur based on both the lessons from Asia and from different regions within Africa.

2 Classic Theories of Fertility Decline

During the era of global population explosion, and with an urgent worldwide interest in bringing down fertility, theories of fertility decline also mushroomed. In the second half of the twentieth century, especially during the period from the 1970s to the early 1990s, a copious literature emerged in the academic disciplines of demography, sociology, anthropology, economics, and political science. The rising prominence of the whole academic discipline of population studies, in fact, centered around finding answers to lowering fertility. Explanations of fertility variations ranged from institutional analysis (Davis and Blake 1956), economic analysis under a demand-supply framework (Becker 1960; Bulatao and Lee 1983; Easterlin 1975; Easterlin and Crimmins 1985), culture (Lesthaeghe 1983; Lesthaeghe and Surkyn 1988), economic modernization, intergenerational wealth flow (Caldwell 1982), ideational change (Cleland and Wilson 1987), to women's status in the society (Mason and Taj 1987).

Beginning in the 1970s, a number of worldwide data collection and analysis efforts were launched with the same purpose of understanding fertility decline. These projects include the Princeton Project on European Fertility (Coale and Watkins 1986), the World Fertility Survey (WFS), and the Demographic and Health Surveys (DHS). Together, these and other studies (e.g., Tsuya et al. 2010) have gathered detailed information on human fertility and underlying factors associated with fertility change in much of the world from the eighteenth to the twenty-first century.

All these theories, together with the data and analyses benefiting from one or more of these theoretical orientations, still left much to be desired. Specifically, while each theory contained its own merit and helped us to understand fertility variation in one locale, one time period, and from a particular perspective, they did not lead to a uniform and satisfactory story for understanding human fertility variation and change. Such a deficiency is most apparent when it comes to understanding the demographic change, especially fertility in decline in Africa, as will be made clear later in this chapter.

In a classic synthesis presented as the Presidential Address to the Population Association of America, Karen O. Mason made the following observation about the inadequacy of existing theories of fertility decline, exposing four errors in the thinking on fertility change (Mason 1997). These four errors were: (1) assuming that all transitions have the same cause, (2) ignoring mortality as a precondition of fertility decline, (3) assuming that the regulation of fertility is fundamentally different in pre-transitional and post-transitional populations, and (4) focusing on a decadal time scale. Mason further offered a more holistic model of explaining fertility transitions, and proposed an "interactive approach to fertility transitions." As an illustration, Mason used Western Europe, East Asia, and sub-Saharan Africa as three separate cases of different fertility transitions.

East Asia and sub-Saharan Africa differ both in pre-transitional conditions and in factors likely to induce the onset of fertility transition (Mason 1997). In contrast to

East Asia, where an acceptable number of surviving children in the pre-transitional era was moderate and gender stratification was strong, in sub-Saharan Africa the acceptable number of surviving children was or is large, and gender stratification varies from one society to another. In addition, in contrast to East Asia where a wider range of post-natal controls were available, including migration, infanticide, adoption, and childmarriage, in sub-Saharan Africa the common post-natal controls are fostering, adoption, and migration. As a result of these and other differences between the two regions, the factors that are likely to induce fertility transitions may also differ. In the case of East Asia, the key factors include mortality decline, exposure to Western lifestyle via mass media, industrialization, industrializationindustrialization and the rise of mass education, and the creation of family planning programs. In sub-Saharan Africa, the key factors include mortality decline, the erosion of traditional kin obligations, and the creation of family planning programs (Mason 1997: 451).

3 What Laid the Foundation for Fertility Transitions in (East) Asia?

Among the numerous factors that could potentially explain the differences in fertility transitions in Africa and Asia, there are four that serve as major explanations of the Asian model: improved health, expansion of education, improved economic opportunities, and strong family planning programs.

3.1 Improving Health and Reducing Infant Mortality

Other than the difference in the acceptable number of surviving children prior to fertility transitions, which is larger in sub-Saharan Africa than in Asia, mortality decline is clearly a pre-condition of fertility decline. The earlier and faster mortality decline in Asia, especially in East Asia, laid the foundation for a much faster fertility transition in Asia.

The comparison in the trajectories of fertility and mortality changes in the last half-century between the two regions reveal the importance of mortality decline in Asia's fertility transition. Though initial fertility levels in Africa and Asia differed, as shown in Fig. 1, they both stayed unchanged for some years at pretransitional levels. Rapid fertility decline began in the early 1970s for Asia as a whole, whereas for Africa, it lagged for about two decades, in the mid-1980s to early 1990s. At the start of the fertility transitions in Asia, especially East Asia, a key mortality measure, infantmortality rate, was already substantially lower than in Africa. The infant mortality level was by all means quite high by modern standards in Asia, including East Asia, in 1950–1955, at 146 per thousand and 116 per thousand respectively.

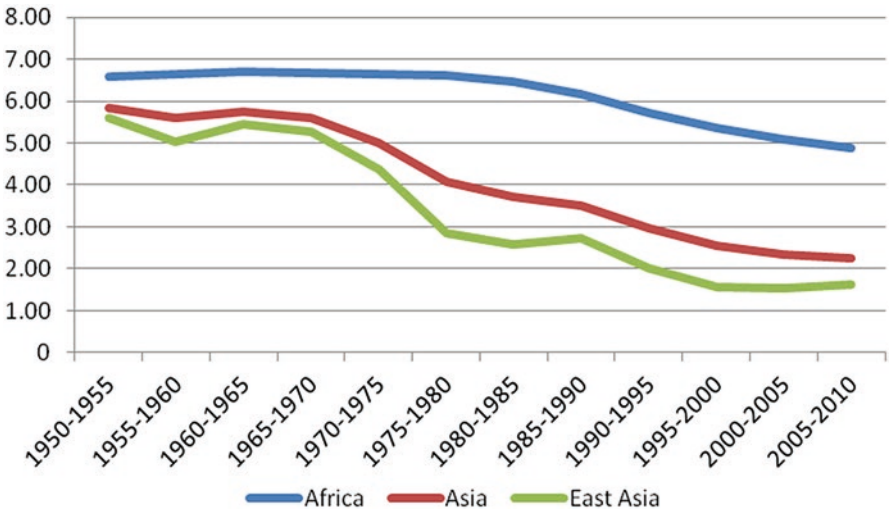

Fig. 1 Trends in fertility (total fertility rate): Africa and Asia, 1950–2010 (Source: UNPD 2013)

But it was much lower than the level in Africa as a whole, at 187 per thousand, or almost 20%. By the time rapid fertility decline started to take roots in Asia, in the late 1960s and early 1970s, infant mortality in Asia as a whole already dropped to the level of below 100 per thousand, and in East Asia, to only around 50 per thousand. Mortality decline, as represented by decline in infant mortality, clearly served as a pre-condition for Asia's fertility transitions (Fig. 2).

Judging from Asia's experience, substantial fertility would not start until infant mortality drops to below the level of 100 per thousand, which is what happened in Asia by the 1960s, and what happened in Africa in the late 1980s and the early 1990s. For fertility to decline further, continued and major improvement in health, especially in infant and maternal health is the first priority.

3.2 Expanding Mass Education

In much of Asia, especially East Asia, massive expansions in educational opportunities were catalyzed by a strong cultural tradition emphasizing education and a state-led developmental strategy that prioritized education and health. East Asia's early expansion of education is shown in Table 1. By 1970, the earliest date comparable educational data available from the World Bank shows that the primary schoolenrollment ratio was already over 100% in both East Asia and Pacific region in general and in the developing portion of the region. For both the sub-Saharan region as a whole and in the developing portion of the region (by the World Bank's standards) the primary school education enrollment ratio did not go above 80% until in the twenty-first century. Similar if not larger gaps persist at higher levels of education.

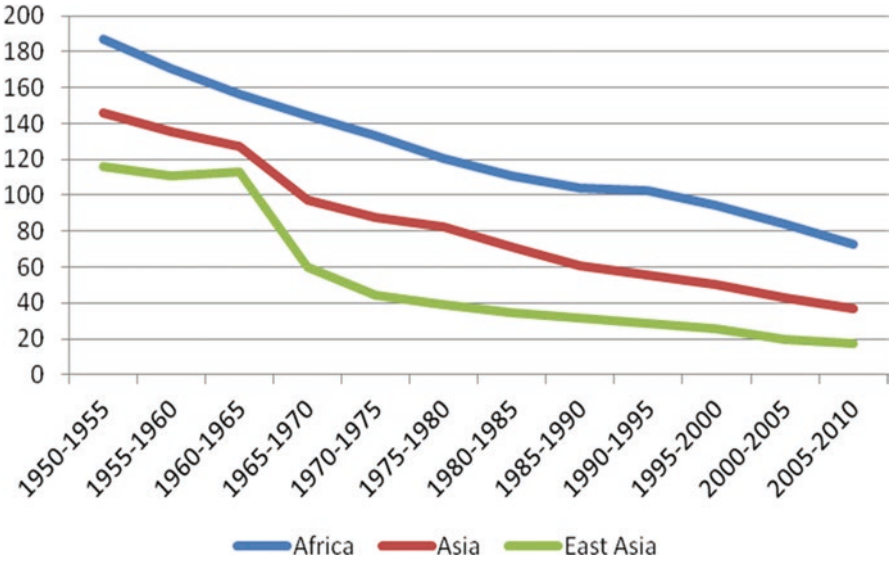

Fig. 2 Trends in infant mortality (per thousand), Africa and Asia, 1950–2010 (Source: UNPD 2013)

All secondary enrollment ratios passed 50% in East Asia by the mid 1990s, with a level of twice that in the sub-Saharan region. By 2010, the ratio in East Asia reached 80%, still twice that of the sub-Saharan region (Table 1). At the highest level of education, while a gap between the two regions was present as far back as the 1970s, the difference became larger over time, with East Asia at a level three times or more of that in Africa beginning in the 1990s.

The links between increased educational attainment and reduced fertility levels have long been established. Schooling serves not just to prepare a more knowledgeable and hence more productive labor force, but also plays an extremely important role in improving health. More educated mothers are especially important, as their children are shown to have better health, and also more likely to be in schools.

3.3 Expanding Economic Opportunities

Getting children and young people to schools alone will not necessarily lead to lower fertility. Education plays many beneficial roles for the population and the society, including more knowledge of health, the potential for higher labor productivity, increased civic participation, and the ability to innovate. But to turn increased educational opportunities into concrete health, economic, and social benefits, there need to be the right institutional contexts to allow individuals to realize the potential from their education.

Table 1 Education by level, East Asia and Sub-Saharan Africa, 1970–2010, gross enrollment ratios

	1970	1975	1980	1985	1990	1995	2000	2005	2010
Primary									
East Asia and Pacific (all income levels)	102.11	112.38	110.49	115.06	118.51	106.77	104.56	111.35	117.57
East Asia and Pacific (developing only)	101.92	113.49	111.19	116.56	120.09	107.12	104.81	112.20	118.92
Sub-Saharan Africa (all income levels)	52.02	59.42	75.57	76.72	71.58	74.73	81.59	93.41	98.91
Sub-Saharan Africa (developing only)	51.99	59.39	75.54	76.67	71.54	74.69	81.58	93.40	98.92
Lower secondary									
East Asia and Pacific (all income levels)	–	–	–	–	–	72.15	75.36	85.73	94.43
East Asia and Pacific (developing only)	–	–	–	–	–	69.28	73.44	84.69	93.77
Sub-Saharan Africa (all income levels)	12.94	14.52	18.51	23.92	23.13	24.15	32.08	32.08	39.92
Sub-Saharan Africa (developing only)	12.94	14.52	18.52	23.93	23.13	24.14	26.15	32.09	39.93
All secondary									
East Asia and Pacific (all income levels)	33.56	46.12	45.23	39.29	44.28	54.77	60.65	66.01	80.43
East Asia and Pacific (developing only)	27.37	41.39	41.21	34.21	39.11	50.10	57.29	63.52	78.67

(continued)

Table 1 (continued)

	1970	1975	1980	1985	1990	1995	2000	2005	2010
Sub-Saharan Africa (all income levels)	–	–	–	–	–	–	44.38	51.51	–
Sub-Saharan Africa (developing only)	12.94	14.52	18.52	23.93	23.13	24.14	26.15	32.09	39.93
Tertiary									
East Asia and Pacific (all income levels)	2.96	3.56	5.09	6.73	7.31	10.29	15.48	22.66	27.32
East Asia and Pacific (developing only)	1.21	1.60	2.93	4.58	5.07	6.93	11.45	19.24	24.31
Sub-Saharan Africa (all income levels)	1.40	1.61	2.21	2.68	3.21	3.79	4.39	5.97	7.77
Sub-Saharan Africa (developing only)	1.40	1.60	2.12	2.68	3.21	3.80	4.39	5.97	7.77

Source: World Bank (2014). World Development Indicators. http://data.worldbank.org/indicator

Many Asian countries, most notably East Asian countries, have followed a state-led developmental strategy that focused on the one hand on the creation of a healthy and well-educated labor force, and on the other, on an export-oriented economic strategy that utilized their educated and relatively cheap labor to their competitive advantage. Such a strategy helped Japan in the 1960s to the 1980s, South Korea from the 1970s to the 1990s, and China from the 1990s and the 2000s. Between the mid-1950s to the 1970s, real GDP per capita quadrupled every 10–15 years in Japan. Beginning in the mid-1960s, South Korea's per capita real GDP also quadrupled every 10–15 years until the mid-1990s. Between 1985 and 2000, real GDP per capita quadrupled in China as well (Tsuya et al. 2009).

In all three societies, both men and women are able to enjoy the economic opportunities. In Japan, for instance, until the economic slowdown in the 1990s, the share of college graduates getting regular employment increased steadily, from below 45% to 81% for females, from 64% to 81% for males between 1950 and 1990 (Tsuya 2015; Table 5.2). Labor force participation rate during the same period remained extremely high for males beyond college education age, almost at 100%, and even in a society where gender ideology supported women to be housewives, labor force participation reached about 50% (Tsuya 2015; Table 5.3). In China and

South Korea, labor force participation among the young is equally high if not higher than in Japan.

By contrast unemployment, especially youth unemployment in Africa still ranks among the highest and remains a serious concern for many countries. The unemployment rate in East Asia in the aftermath of the global financial crisis edged up from 3.8 to 4.5 between 2007 and 2013, and remained low at around 4% in South Asia. In Africa, by comparison, unemployment rate is much higher, at around 7.5% for sub-Saharan Africa, 12% in North Africa, and as high as 25% in South Africa (ILO 2014: 19). Even with the healthy economic growth rate, sub-Saharan Africa has a youth unemployment rate of around 12%, in contrast to East Asia's 9–10% (ILO 2014).

The feedback loop between economic opportunities and educational attainment is a virtuous one. An improved educational level within a population serves as an essential factor for economic growth and income increase. Increased returns to education in turn offer more incentive, and also possibilities, for families to invest more in the education of their children. When widespread unemployment, especially youth unemployment, persists, this virtuous loop is broken. When investment in education brings little or no return, families are discouraged from investing more in their children's education.

3.4 Government Family Planning Programs

Government sponsored and organized family planning programs have played an important role in providing contraceptive services during the process of fertility transition in Asia. From very early on, policy-makers in many Asian countries recognized the need to organize and to support family planning programs that offered contraceptive services. As far back as in the mid 1970s, among the selected Asian countries listed in Table 2, almost all had government policies to lower fertility. China in this UN assembled database was listed as "raise," but that was only a rhetorical response which the Chinese government provided at the time based on their ideological needs (Wang et al. 2012). The fact was that China's government sponsored birth control campaign was well under way, with the slogan of "later (marriage), longer (birth intervals), and fewer (births)." By 1975, IUD insertions, female sterilizations, and induced abortions had all reached historical highs and were at 270%, 217%, and 130% of the levels in 1971 (Whyte et al. 2015). In Malaysia, the other country on the list in 1976 that did not have a formal government policy of lowering fertility, the government considered the fertility level in the country as "too high," and provided direct support to contraceptive services (United Nations 2014).

For two decades, until the mid 1990s, there was a sharp contrast between Africa and Asia in government policies toward lowering fertility. As shown in Table 2, until 1996, only a minority of the selected African countries had a government policy of lowering fertility. In Asia, with the exception of Japan, where fertility had already reached to below the replacement level in the mid 1970s, almost all other countries

Table 2 Government policy on fertility selected African and Asian Countries

Country year	1976	1986	1996	2007	2013
Africa					
Angola	NI	L	L	L	L
Botswana		NI	NI	M	L
Burundi	L	L	L	M	M
Cameroon	NI	L	L	L	L
Central Africa Republic	NI	NI	L	L	NI
Chad	NI	NI	NI	NI	L
Congo	NI	NI	NI	NI	L
Democratic Republic of the Congo	NI	NI	L	L	L
Ethiopia	NI	NI	NI	NI	L
Gabon	NI	NI	L	L	L
Gambia	R	R	R	R	R
Ghana	NI	L	L	L	L
Kenya	L	L	L	L	L
Malawi	L	L	L	L	L
Mali	NI	NI	L	L	L
Morocco	NI	M	L	L	L
Mozambique	L	L	L	L	L
Nigeria	M	NI	L	L	L
Somalia	NI	L	L	L	L
South Africa	NI	NI	NI	NI	NI
Sudan	L	L	L	M	M
Sudan (including Sudan)					L
Uganda	NI	NI	L	L	
United Republic of Tanzania	L	L	L	L	L
Zambia	NI	NI	L	L	L
Zimbabwe	NI	NI	L	L	L
Lower fertility	**6/27**	**11/27**	**20/27**	**18/20**	**22/27**
Asia					
Bangladesh	L	L	L	L	L
Cambodia	R	R	L	L	L
China	L	L	L	M	M
India	L	L	L	L	L
Indonesia	L	L	L	L	L
Iran (Islamic Republic of)	L	NI	L	L	R
Japan	NI	NI	NI	R	R
Malaysia	L	M	L	NI	M
Nepal	L	L	L	L	L
Pakistan	L	L	L	L	L
Philippines	L	L	L	L	L
Republic of Korea	L	L	NI	R	R
Sri Lanka	L	L	L	M	M

(continued)

Table 2 (continued)

Country year	1976	1986	1996	2007	2013
Thailand	L	L	L	M	R
Viet Nam	L	L	L	L	M
Lower fertility	**113/15**	**11/15**	**13/15**	**9/15**	**7/15**

Source: United Nations, World Population Policies Database. http://esa.un.org/poppolicy/about_database.aspx
NI No intervention, *L* Lower, *M* Maintain, *R* Raise

had a government policy aimed at lowering fertility. It was not until well into the twenty-first century, by which time many countries in Asia had experienced extended periods of below replacement fertility, that some Asian governments began to shift their fertility policies to non-intervention or to raise fertility. Also after the mid-1990s, the majority of African countries listed in Table 2 had shifted to policies that were aimed at lowering fertility.

Government family planning programs clearly played a crucial role in meeting the needs of the population for birth control, and in facilitating the fertility transitions in Asia. The most noticeable fertility decline for both Asia as a whole and for East Asia took place after the mid-1960s. Similarly, in Africa, the most noticeable fertility decline region-wide took place after the mid-1980s, when government policies started to shift toward lowering fertility (Fig. 1).

A brief note is needed here to clarify a potential misconception about one unique birth control program in East Asia, which is China's one-child policy. Policy. With China's dramatic economic growth and its extreme birth control program co-existing for the last three decades, it is sometimes tempting to make a causal link between the two, mistakenly believing that an excessive birth control policy is desirable or even needed for birth control and for economic growth. Such a belief is totally misplaced, as most of China's fertility transition took place prior to the one-child policy, policy, as the policy bears with it long-run and irreparable harms to its population, and as other Asia countries from South Korea to Thailand and more recently to Iran also had rapid fertility transitions in the absence of such a harmful policy (Wang et al. 2012).

Outside East Asia, the success of fertility decline in countries like Bangladesh offers further encouraging examples of achieving fertility decline in the absence of coercive birth control programs and within the context of low levels of economic development and even with a relatively high level of infant and child mortality. Over four decades ago, in 1970, infant mortality in Bangladesh was at a high level of 175 per thousand, and a fertility level of seven children per woman (Population Reference Bureau 2014). By the mid 1990s, while infant mortality was halved to 82 per thousand, still relatively high and at a level that is comparable to many African countries today, fertility was more than halved, to 3.3 children per woman, much below the level in most African countries today (Caldwell et al. 1999). These demographic changes took place while Bangladesh still had a low-income level (per capita income in 1997 was only $270), and was predominantly rural, with a very high

share of the population who are Muslim (Caldwell et al. 1999). By the second decade of this century, Bangladesh had completed its demographic transition: with an infant mortality rate mortality rate of 33 per thousand and a total fertility rate of 2.2. Similar changes have also taken place in India, Nepal, and to a lesser degree, Pakistan (Population Reference Bureau 2014). In the case of the Bangladesh success story, family planning played a very crucial role, but that role, as argued by some scholars, was only as large as there was a demand in the society, a demand generated by a transformed economic structure, urbanization, educational expansion, and rising aspirations (Caldwell et al. 1999).

4 Paths to Fertility Decline in Africa

Culturally and politically, Africa and Asia are even more different from one another than the divergences in their respective demographic profiles and legacies would suggest. What led to the rapid fertility transitions in Asia, while also essential for further fertility decline in Africa, cannot be simply transplanted to the continent of Africa. The Asian, especially East Asian experiences, originate from their unique cultural and political traditions and were embedded in the specific historical contexts. To speculate on the relevance of Asian experiences to Africa's fertility transitions, one needs to first pay close attention to the specific cultural and institutional differences between the two regions (Caldwell and Caldwell 1987; McNicoll 2011).

Scholars have identified two distinctive patterns between Africa and Asia relevant to fertility transitions. The first is an observation that African populations had a pre-transition feature of relatively long birth intervals. Such long birth intervals have served as a mechanism for enhancing child survival survival and have been achieved by postpartum abstinence, normally for up to 3 years. In addition, pre-transition fertility is further curtailed by sexual abstinence when a mother reaches the status of grandmother (Caldwell et al. 1992; Moultrie et al. 2012). Such a pre-transition pattern is distinctively different from fertility transitions in historical Europe and contemporary Asia and argues for an "African exceptionalism" (Caldwell and Caldwell 1987; Caldwell et al. 1992; Bledsoe et al. 1998; Moultrie et al. 2012). In both the West and in much of Asia, fertility transition is featured by the so-called parity-specific control, namely stopping childbearing at earlier ages when a desired number of births has been reached (Coale and Trussell 1974; Coale and Watkins 1986). The implications of this first feature of the African pre-transition are that transitions in these societies could well follow the tradition of long birth intervals, with fertility reduction occurring in ages, by further lengthening birth intervals (Caldwell et al. 1992; Bledsoe et al. 1998).

The second well-documented feature of African fertility is the desire for large family sizes. In comparison to populations in other regions of the world and at similar fertility levels, African survey respondents generally report a desired number of children that is higher (Caldwell and Caldwell 1987; Bongaarts and Casterline 2012). High fertility, within the context of high infant and child mortality, was

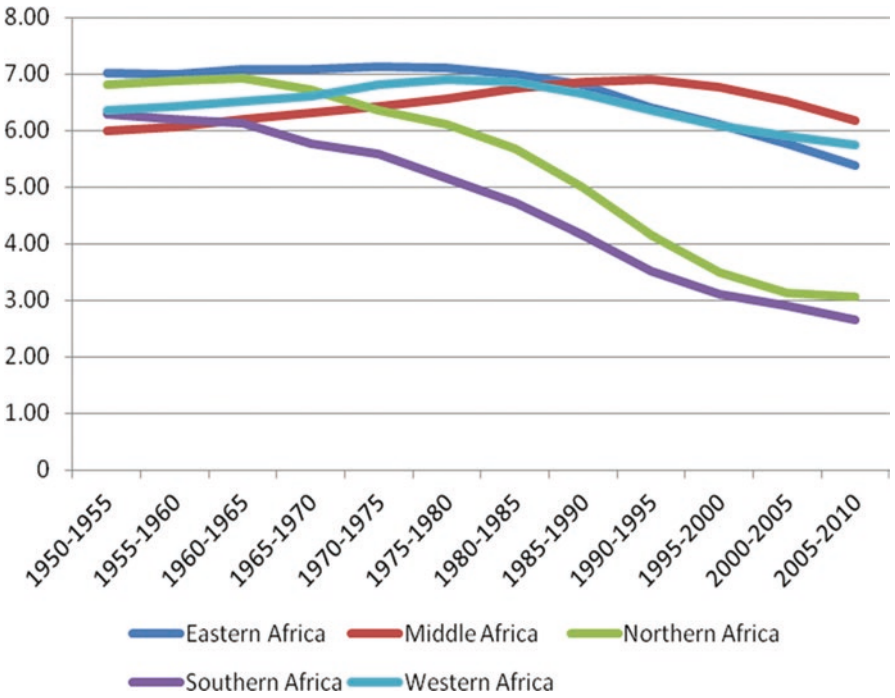

Fig. 3 Fertility trends in Africa, by Region, 1950–2010 (Source: UNPD 2013)

needed to ensure the number of surviving children, which in turn is driven by a strong cultural or even religious tradition of generational succession, centered on ancestors and hence a fear of childless (Caldwell and Caldwell 1987).[1]

Recent research based on survey data, however, offers support for the second but not the first "African exceptionalism" argument. While the pace of fertility decline (beginning in the late 1980s) in Africa is much slower than that in Asia and Latin America in the 1970s, the pattern of decline resembles rather than differs from Asian and Latin American fertility transitions. In Africa, as in Asia and Latin America, fertility decline is found to be more rapid among women of older age groups (Bongaarts and Casterline 2012). The same study, nevertheless, does confirm the second feature of the African fertility regime, namely a desire for a higher number of children found among the African population than in Asia and Latin America.

As the African fertility transition unfolds, clues to the future fertility transition can be found in the vast regional variations within the African continent as well. In two parts of Africa, Northern and Southern Africa, fertility already declined rather

[1] In these circumstances, high fertility (and a considerable number of surviving children) is associated with joy, the right life, divine approval, and approbation by both living and dead ancestors. Conversely, low fertility is only too easily interpreted as evidence of sin and disapproval. (Caldwell and Caldwell 1987: 416)

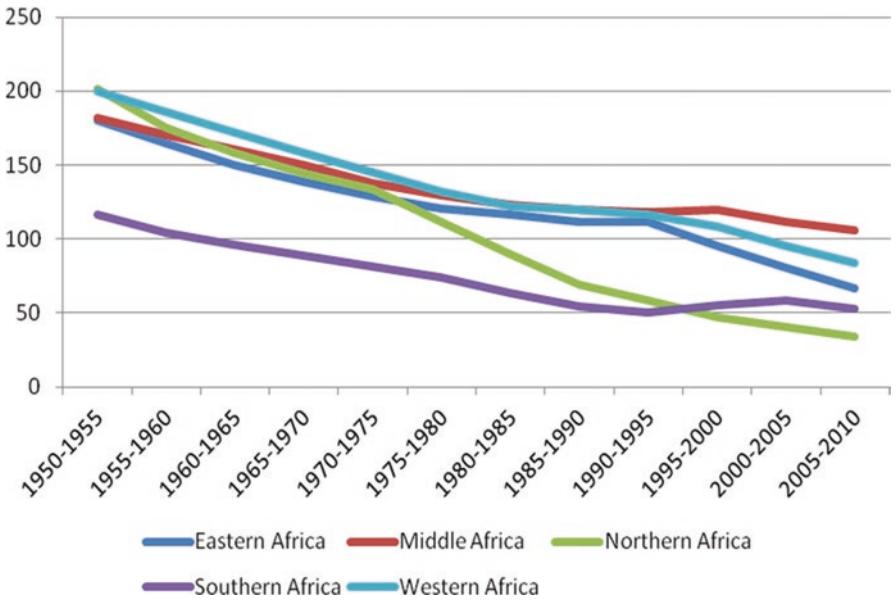

Fig. 4 Infant mortality in Africa, by Region, 1950–2010 (Source: UNPD 2013)

rapidly in the last three, and especially in the last two decades (Fig. 3). It is also in these two African regions that infant mortality has either declined early (Southern Africa) or declined most rapidly (Eastern Africa, Fig. 4). In both regions, as observed in Asia, rapid and sustained fertility decline began after the infantmortality rate dropped to below the 100 per thousand threshold. For Southern Africa, this occurred in the early 1960s and for Northern Africa,Africa, after the late 1970s. The recent rapid fertility decline in one African country, Rwanda, similarly followed an extremely rapid drop in childmortality. As child mortality dropped from 196 per thousand in 2000 to 152 in 2005, and further to 76 in 2010, total fertility dropped from 6.1 to 4.6 between 2005 and 2010 (Westoff 2012). The answer to the question of whether rapid fertility decline is possible in Africa can therefore be found within Africa, namely that it can happen, but not without drastic improvement in health, especially infant and maternal health.

Many countries in Africa continue to face serious challenges in health improvement. For the continent as a whole it was only near the end of the twentieth century that infant mortality dropped to the level of below 100 per thousand. In sub-Saharan Africa, infectious diseases continue to be prevalent, with the three main killers, malaria, HIV/AIDS, and TB, still not successfully under control. Malaria and HIV alone make up 30–40% of the roughly ten million deaths occurring annually in sub-Saharan Africa. By 2005, it was estimated that 70% of the world's new infections

and 80% of AIDS deaths were in sub-Saharan Africa (Bongaarts and Casterline 2012). Such high levels of mortality naturally inject uncertainty in life and are not conducive to fertility decline.

Reducing mortality, especially infant and child mortality, is a necessary but not a sufficient condition for fertility transition. As is shown in the case of Asia, reduced infant mortality can narrow the gap between the number of children born and surviving, hence facilitating a reduction in fertility. To reduce the reliance on children as sources of economic, social, and political security, alternative institutions need to be established and developed, and opportunities for economic and social mobility need to be made available. Such institutional conditions include easy and equitable access to education, employment and economic opportunities, and open channels of social mobility. It also requires effective family planning programs that can help meet the need for birth control.

Cultural and political legacies therefore play a crucial role in determining further fertility transition in Africa. Building such extra-familial institutions represents a greater challenge in Africa than in Asia, as many Asian societies, especially societies in East Asia, are ethnically and culturally more homogenous than African countries. The importance of such differences is well highlighted in a comparative analysis of two cases in their demographic transitions: Indonesia in Asia and Nigeria in Africa. These two societies vary greatly in their institutional legacies, ranging from family and household system, gender relation, land rights, legal system to local government. These differences affect a number of factors underlying fertility transition, such as human capital deepening, family nuclearization and economic autonomy, role of the community, belief systems, and governance (McNicoll 2011)

Fertility transition in Africa has already begun. As shown in parts of Africa, rapid fertility decline is by all means possible. Rapid decline in fertility in more African countries, nevertheless, depends on a set of conditions. While fertility transitions in different parts of the world and in different historical periods were driven by many factors, both the general theories of fertility transitions and the experiences of Asia, especially East Asia's experiences converge on one pre-condition, which is mortality decline or drastic improvement in survival. Such a pre-condition is by no means sufficient, as shown in the experiences of Asia and other parts of the world as well, but it is well in line with the widely observed African cultural tradition of generational succession and relatively high number of desired children. Reducing infant and childmortality can lead directly to increased childsurvival and facilitate generational succession. Reduced mortality and fertility, in turn, can free up resources wasted under high death and birth rates, and result in a virtuous circle of healthy population, rising productivity, prosperous economy, and vibrant society. With substantial improvement in health already made, and with a healthier and young Africa posed as a major engine for global economic growtheconomic growth in the twenty-first century, rapid fertility decline is not just on the horizon, but a certain reality in the coming decades.

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Demographic Dividend Models

Scott Moreland and Elizabeth Leahy Madsen

1 Introduction

The contribution of demographic change to economic growth in the East Asian "Tiger" states was first quantified 15 years ago (Bloom and Williamson 1998; Bloom et al. 2003). Since then, these potential benefits have captured the attention of policymakers in many high-fertility countries, creating an opening for targeted policy strategies to realize a dividend while also improving individual health, education, and well-being. However, the dividend is a complex concept often described in the public policy arena in optimistic and fairly general terms, without the specific recommendations or qualifying conditions that decisionmakers need to take effective action. Meanwhile, the research community has spent decades mired in debate over whether, in simplified terms, fertility decline is a cause or effect of economic growth or whether demographic change impacts economic growth at all.

Modeling offers several advantages for both research and policy strategy-setting related to the demographic dividend. Dynamic simulation models offer the ability to apply country-specific data and generate multiple scenarios comparing the effects of different policy decisions. Among scholars, as noted by Ashraf et al. (2013), modeling may disentangle the longstanding fertility-economic debate, by moving beyond causally ambiguous econometric analysis of cross-national data to a technique which is able to delineate the direct effects of various interacting factors upon one another.

There is a long history of using models to explore the long-term effects of population growth on economic development. Notable among these is the Coale-Hoover

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model applied to India (Coale and Hoover 1958). This influential model posited that economic growth is driven primarily from capital investment which is, in turn, influenced by population. The model's main conclusion is that rapid population growth can impede economic growth because the larger number of children in a high population growth country will divert expenditures away from savings and productive capital investment. The model was one of the earliest to recognize the effects of not just population size but age structure on development. As Coale and Hoover note, "[a] more rapid increase in the number of consumers (*mostly children*) [emphasis added] is the ultimate cause of the slower rise in total output with the higher population trend" (285). While the Coale-Hoover model was criticized for its simplicity, the basic premise that savings and investment are influenced by population growth is imbedded in models developed more than 50 years later.

Another influential model is the Futures Group's RAPID model (Abel 2000) which uses a simple economic growth calculation combined with a population projection to calculate the future path of per capita income. The model also identifies a series of resource requirements (e.g. water) for sectors such as education, health and infrastructure. The model has been used successfully as an advocacy tool for reduced population growth for decades.

In the late 1970s the International Labor Organization developed a series of models called "Bachue" that were applied to Kenya and the Philippines (Rodgers et al. 1978; Anker and Knowles 1983). A smaller, more general "international" model was also built using cross-national data and a more simplified structure (Moreland 1984). These were complex economic-demographic simulation models with endogenous links between population and economic sectors. The Bachue models are notable for modeling the effects of population on income distribution and employment.

Recently, several models have been developed to look more specifically at the potential demographic dividend in countries where the necessary demographic conditions are not yet in place. For example, Ashraf's simulation model (Ashraf et al. 2013) looks at the effect of reductions in fertility on output per capita. The model includes the effects of education, the size and age structure of the population, capital accumulation, parental time for child-rearing, and fixed natural resources. It is parameterized using a combination of microeconomic estimates, data on demographics and natural resource income in developing countries, and elements of quantitative macroeconomic theory.

Also, Bloom (Bloom et al. 2010) applied a model to Nigeria which was empirically established from cross-country economic growth equations. The model uses a Barro and Sala-i-Martin income per worker growth model (Barro and Sala-i-Martin. 2004) to formulate an estimable equation by relating income per worker growth to income per capita growth and working-age population growth.

More recently, an econometric model has been developed at the International Monetary Fund (Drummond et al. 2014) which estimates the potential size of the dividend for sub-Saharan Africa. The model is empirically estimated similarly to Bloom et al. (2010) but uses improved statistical techniques to include fixed effects and country-specific estimates. The model also emphasized the role of human capital in explaining regional differences in the magnitude of the demographic dividend.

The model was used to determine how the economic benefits of the dividend vary based on the pace and scale of the demographic transition and to explore if there are any minimum income and education levels required to attain the demographic dividend. The model finds results similar to those of Bloom et al. (2010) for the effects of changes in the working age population on real per capita GDP growth in sub-Saharan Africa.

Lastly, the present authors' own model ("*DemDiv*") was developed with funding from the U.S. Agency for International Development (USAID)-supported Health Policy Project and applied in several countries in Africa and Asia (Health Policy Project 2014). The model is divided into a demographic model and an economic model with links between the two. More details on this model and the results of applying it in two countries are provided below.

2 Facilitating a Demographic Dividend

It is important to separate the window of opportunity that is created by the *demographic transition* from the realization of the potential economic benefits of the *demographic dividend*. Two interacting but distinct sets of factors are required to achieve a demographic dividend.[1] They can be organized to align with the name itself: The first set of factors—the demographic—is related to population change, and the second set is the human capital and economic factors that transform demographic change into an economic dividend. While some economic benefits are likely to accrue from improvements in either set of factors alone, a true demographic dividend is the increased, or incremental, economic growth spurred by the two sets interacting with each other.

A common misconception about the demographic dividend is that fertility decline and the resulting age structure changes will *automatically* induce economic benefits. Obviously, a smaller population, all else equal, will lead to an increase in per capita income simply because the denominator is smaller: The same size income divided among fewer people raises income per capita. But the concept of the demographic dividend involves changes not only in the size of the population but also in the age structure, which can reduce the dependency burden, potentially freeing up resources for investment which can lead to increased production. However, translating this *demographic* opportunity into an *economic* dividend requires concomitant improvements in both physical and human capital and a favorable macroeconomic environment as prerequisites for the achievement of a full first demographic dividend.

A recent IMF report (Drummond et al. 2014) which examined data on the share of the working age population and GDP per capita in Asia and Latin America illus-

[1] Unless otherwise noted, this chapter addresses the first demographic dividend, which is driven by decreases in fertility rates and an increased proportion of working-age adults in the population age structure.

trates that a demographic dividend is not automatically brought on by demographic change. Both regions experienced similar demographic change between 1965 and 2010, as the share of the working age population grew by more than 20%. However, in Asia GDP per capita increased seven times over the 45-year period (with some regional disparities) while it only doubled in Latin America. As noted in the report, "Asia's more favorable economic outcomes have been attributed to a stronger focus on human (education and health) and physical capital, higher labor participation rates, and an initial emphasis on labor intensive export-led growth…. In contrast, a weak policy environment and an inability to attract investment on a sufficient scale are considered as two factors that have hindered Latin America's ability to benefit from a demographic dividend" (Drummond et al. 2014, p. 9).

There are multiple mechanisms by which demographic changes can create an economic dividend. As delineated by Ashraf et al. (2013), these include the *dependency* effect of a lower dependency ratio increasing per capita incomes; the *life-cycle savings* effect of a larger working population increasing savingssavings and investment; the *experience* effect of increased productivity among an older, more experienced workforce; and the *life-cycle labor supply* effect of higher labor force participation rates among older workers. In addition to these age structure-driven effects, the authors describe several other economic benefits of population change more broadly, relating to the care of and investments in children, economies of scale, diminished pressure on fixed resources, and a lower capital-to-labor ratio ("capital shallowing"). Modeling these mechanisms and the relationships between them is a relatively recent endeavor and one open to multiple approaches.

2.1 Modeling the Demographic Dividend: The DemDiv *Model*

To illustrate a model designed to guide policy strategy-setting in the context of a possible demographic dividend, we examine the *DemDiv* model, developed by the Futures Group under the Health Policy Project. *DemDiv* addresses the complexity of the demographic dividend by linking age structure with social and economic development, enabling policymakers to quantify the changes that would be required to successfully achieve a demographic dividend. It does so by allowing the user to design multiple scenarios to show how the combined power of multi-sector policy investments can generate a demographic dividend not possible under the status quo.

The *DemDiv* model is designed to be empirically robust and offer broad utility in policy decision making. The objectives for creating the model were twofold. First, it is intended to meet gaps in existing research by offering a clear, replicable and readily trainable evidence-based tool for in-country use to quantify the potential demographic dividend in high-fertility contexts. Second, it aims to generate policymakers' support for investments in the multi-sector policies required to achieve those benefits.

In order to accurately describe and project the demographic dividend, the model is not limited to either population or economic inputs, but addresses the interplay

between them, as affected by other social and development variables. In addition to being comprehensive in scope, it is based on a foundation of empirical and statistical research.

Conceptually, the *DemDiv* model follows in the tradition of simulation modeling employed by Coale and Hoover (1958) and, more recently, Ashraf et al. (2013). In developing *DemDiv*, the authors also drew on an existing econometric model to forecast the demographic dividend by Bloom et al. (2010), which was presented with results from Nigeria. Its authors developed a cross-national regression to project change in GDP per capita based on age structure, trade openness, institutional quality, life expectancy, and geographic location.

The *DemDiv* model uses a statistical approach, including multiple linear regressions in a two-part model projecting demographic and economic changes. The demographic component projects fertility, life expectancy at birth, at birth, child mortality, and population size and age structure, including the dependency ratio. These demographic calculations feed into the economic model, which consists of equations describing capital formation, employment growth, and total factor productivity as a function of age structure and other social and economic variables. The two-part model components interact over the projection period to describe the combined effects of changes in both sub-models, ultimately projecting GDP and GDP per capita.

When applied to a specific country, users can input different scenarios based on their specific goals for the policy variables. Users can choose to design multiple scenarios to see the effects of different policies by manipulating the following variables:

- Contraceptive prevalence rate (CPR) (CPR)
- Postpartum insusceptibility
- Sterility
- Education
- Public institutional quality
- Labor market flexibility
- Financial market efficiency
- Imports
- Information and communication technologies (ICT) infrastructure

The main economic and demographic outputs of the model are shown in Table 1.

Table 1 Core outputs of the *DemDiv* model

Demographic	Economic
Population by age and sex	Labor force by age and sex
Dependency ratio	Employment
Fertility rate	Investment (new capital formation)
Life expectancy at birth	GDP
Infant, child and maternal mortality	GDP per capita
	GDP growth rate

2.2 Demographic Factors

The basic demographic change required to precipitate a demographic dividend is a shift to a greater proportion of working-age adults within the population age structure. What matters is not the absolute size or proportion of the working-age population alone, but relative to the two age groups composed of economic consumers, one younger and one older. These dependent cohorts rely on the income generated by working adults—economic producers—for their support.

These age structural differences are reflected in the dependency ratio. The average ratio for developed regions is 51 dependents per 100 working-age adults, with dependents evenly split between children and older adults (World Population Prospects: The 2012 Revision; see United Nations 2013)). This means that there are two working-age adults to support each dependent person. The dependency ratio for less developed regions is almost the same at 52, but with a much younger age composition of 43 child dependents for every 100 of older ages. Sub-Saharan Africa, the region of focus for this chapter, has a very different demographic picture, with a dependency ratio of 85, of whom nearly all are children.

2.2.1 Fertility Rates

Changes to the dependency ratio are driven by declines in fertility rates. As fertility rates fall, the proportion of children within the population also falls, and the proportional size of the potential labor force rises as cohorts born during the previous periods of high fertility rates reach working age. For a few decades, the age structure is characterized by a bulge, in which the working-age population is larger than the dependent cohorts older *and* younger.

Therefore, the fertility rate is the first key indicator in modeling the dividend. Projected fertility rates can either be taken from a secondary source, such as the United Nations Population Division's biannual *World Population Prospects* (United Nations 2013), or modeled endogenously.

Models that adopt fertility rates from secondary sources, such as Ashraf et al. (2013) and Bloom et al. (2010), implicitly accept the assumptions of those sources. In the case of the United Nations Population Division's medium fertility variant, this means accepting that all countries are converging toward replacement fertility, with only the pace varying somewhat. In some of the high-fertility countries where interest in the demographic dividend has been most pronounced, such as Nigeria, these assumptions are extremely ambitious when contrasted to recent trends, a caveat that should be noted when results from such models are disseminated.

Because the *DemDiv* model is intended to highlight the specific actions and investments that decision-makers should make to capture a dividend, it models fertility rates endogenously. In *DemDiv*, the total fertility rate is an output of several policy inputs, which are in turn derived from the Bongaarts proximate determinants framework (1978, 1984). Four of the proximate determinants are included in the

model: the indices for contraception (Cc), postpartum insusceptibility (Ci), sterility (Cs), and marriage (Cm). Future levels of the first three—contraception, insusceptibility, and sterility—are treated exogenously by the model and input directly by the user. Due to the model's policy purposes, the fourth determinant, the marriage index, is calculated by the model as a function of girls' education. To capture the bi-directional relationship between fertility and education, the percentage of women married/in union is modeled as a function of expected years of education among girls, while the fertility rate calculated by the model in turn influences mean years of education among women.

2.2.2 Working-Age Population

Although the working-age population is most commonly defined as those between 15 and 64, there is no universal threshold for this group. Entry and exit from the workforce is often gradual, and the ages at which individuals make those transitions vary across societies. In advanced economies, many young adults postpone entry into the workforce until they are well into their twenties in favor of accumulating education, yet their lifetime earnings often outstrip those who begin working earlier, but with less training and fewer credentials (Carnevale et al. 2011).

Similarly, not all adults in developed economies become economically dependent at age 65, especially in countries without generous social security provisions. More than 30% of adults ages 65–69 are economically active in both Japan and the United States (LABORSTA 2010). Regardless of retirement age, in many countries older adults rely more heavily on their own savings for support than on younger family members or state-provided benefits (Mason and Lee 2011). These accumulated savings can in turn provide the investment for a second demographic dividend, potentially larger than the first (Mason 2005).

DemDiv defines the working-age population as all adults 15 and over, in effect not accounting for retirement, but allows the user to set an average labor force participation rate for this population that is held constant over the course of the projection period.

2.3 Dividend Factors

While demographic change opens the window of opportunity, achieving a dividend requires favorable conditions across a range of human capital, governance, infrastructure and economic factors. As described above, all else equal, the age structure change driven by lower fertility rates will increase per capita incomes simply because the denominator in income per capita decreases. However, a true demographic dividend results when demographic change combines with these other structural factors to increase economic growth faster than it otherwise would have.

Quantifying the interplay of these population and economic factors is the primary objective of demographic dividend modeling.

2.3.1 Human Capital and Education

One of the channels by which demographic change can engender an increase in per capita income is through the effects of reduced fertility on education. With lower fertility, women can remain in school longer and this leads to an increase in human capital. These effects are incorporated into several models, including Ashraf et al. (2013), *DemDiv,* and Drummond et al. (2014).

The experience of the East Asian Tigers demonstrated that a true demographic dividend is linked to economic development, including the shift away from "factor-driven" economies toward "efficiency-driven" and, ultimately, "innovation-driven" economies. The workforce requirements for these types of economies are quite different. Factor-driven economies often rely on agriculture or informal business activity, which have relatively low productivity for the economy as a whole, to provide a large share of employment and individual incomes. For example, in Ghana, 46% of working men and 38% of working women are employed in agriculture, but the sector only contributes 30% of GDP (World Development Indicators; see World Bank 2015).

Generally, as economies achieve higher levels of development, the shift away from agriculture towards manufacturing and service industries requires higher-skilled workers. Although university degrees may not be necessary, secondary education is a prerequisite for many manufacturing jobs and most in the service industry. Between 1965 and 1990, the supposed period of the demographic dividend in South Korea, average completed education among adults increased from 4 to 9 years (Barro-Lee Educational Attainment Dataset; see Barro and Lee 2014).

To address the time lag between attainment of education and its application via work, education can be modeled in two time dimensions. The *DemDiv* model uses sex-disaggregated mean years of education, measured as the average number of years of education attained among adults ages 25 and over, and expected years of education, also known as "school life expectancy," which applies to children entering primary school. Mean years can be considered to reflect the human capital of the current labor force, while expected years projects the human capital of the future labor force.

In the *DemDiv* model, education is integrated into both the demographic and economic sub-models. Female education is both an input and an output of fertility, as described above. In addition, education affects the economy via the productivity of the workforce, based on a Mincerian (Mincer 1974) function of the returns to education, and is an input into the calculation of the model's initial value of total factor productivity (TFP), a measure of how efficiently capital and labor inputs are used. *DemDiv* does not address quality of education, or its relevance to the labor market, although these are both important qualifying factors.

2.3.2 Economic Environment

It is clear that the full potential of a demographic dividend cannot be realized through population change and human capital alone. While human capital is fairly clearly linked to higher levels of education and health, the potential economic policies required to facilitate a dividend are numerous and diverse. Several demographic dividend simulation models, including *DemDiv* and Ashraf et al. (2013), organize these factors around variations of a Cobb-Douglas production function, which models economic output as a function of productivity, capital, and labor. The returns to labor are often estimated at roughly twice those to capital. The Ashraf et al. model incorporates a fixed supply of land as an additional factor input.

In *DemDiv*, economic policy variables are drawn from the World Economic Forum's Global Competitiveness Index (GCI). (World Economic Forum 2014). This annually-updated database scores countries on more than 100 individual indicators, aggregated into 12 pillars of varying importance for factor-, efficiency-, and innovation-driven economies. There is a strong relationship between countries' overall GCI score and TFP.

In designing *DemDiv*, three individual GCI indicators—public institutions, trade openness, and information and communications technology (ICT)) use—were tested for their effect on TFP. Multivariate linear regression showed that these three indicators are significant in predicting TFP, with ICT use having the largest effect size and lowest uncertainty level. The ICT variable measures internet use, connectivity, and bandwidth, as well as mobile phone subscriptions. Ease of access to these communications methods directly affects the amount and quality of information available to producers and consumers and therefore their productivity.

Economic factors shape other components of the demographic dividend as well. For example, the *DemDiv* model incorporates the GCI measure of labor market flexibility into its employment equation. Even with a large and growing working-age population, issues such as hiring and firing practices, flexibility in wages, and labor-employer relations can help or hinder employment generation. Similarly, the investment equation in *DemDiv* includes the GCI indicator of financial market efficiency, which addresses access to financial services, loans, and venture capital. Regardless of the size of the economy or labor force, individuals and firms are unlikely to create new businesses or expand existing ones unless they can do so easily, securely, and without excessive costs.

Ashraf et al.'s (2013) model also has a productivity function. One version incorporates foreign direct investment in the capital function but otherwise, capital is only a function of individual (worker) savings rates and depreciation. The human capital function incorporates some of the same factors as those in DemDiv as well as some additional ones, including workforce size, age- and sex-specific labor force participation rates, returns to schooling and returns to experience, for the population 15–64.

The Bloom et al. (2010) model uses a single equation multivariate regression that relates income per capita to the difference in working-age and total population growth, trade openness, institutional quality, secondary schooling, life expectancy,

and geography (tropical/landlocked), using different techniques to correct for bias and reverse causality.

3 Results of Demographic Dividend Simulation Models

Ashraf et al. (2013) found a 5.6% increase in GDP per capita in Nigeria over a 20 year period, modeling the World Population Prospects low fertility variant compared to the medium fertility variant. By 50 years, the projected income effect had doubled, equating to an incremental effect of 0.225 percentage points per year. The authors decompose the effects of the various interactions between population and economic growth built into their model, finding that over a 50 year period the most significant is the dependency or mechanical effect, followed by capital "shallowing," reduced competition for fixed resources, and increased human capital through education.

The simpler approach utilized by Bloom et al. (2010) found a higher demographic dividend for Nigeria. GDP per capita could be 12% higher in just 10 years and 29% higher over 20 years, due to the demographic factors of fertility decline and life expectancy increases increases alone. Adding in institutional improvementsimprovements only slightly increased the demographic effects. They found no effect from increased educational attainment, but attributed that to simultaneity between education, life expectancy and population growth.

The model used in the IMF study (Drummond et al. 2014) confirms the findings of the econometric model of Bloom et al. (2010) that both the initial proportion of the working-age population and its change over time increase the per capita income growth rate. The model finds that on average a 1% change in the working age population increases real per capita GDP growth in sub-Saharan Africa by 0.5 percentage points, with the range varying depending on the region. The strongest economic effects, which were contingent on human capital, were found from large and rapidly growing "bulges" in the working-age population.

3.1 Illustrative Examples of Demographic Dividend Policy Simulations with the DemDiv Model

This section illustrates the results of applying the *DemDiv* model in Kenya and Uganda.

3.1.1 Kenya

The *DemDiv* model was piloted in Kenya in 2014 under the leadership of the National Council on Population and Development. Four scenarios were developed over the period from 2010 to 2050 (for comparability with those from Uganda, results presented here are to 2040). The Base Case scenario held all indicators constant at their 2010 levels and projected no changes in the economic, education or family planning (FP) variables. The Economic-only scenario projected improvements in the five economic indicators—labor market flexibility, ICT, financial market efficiency, public institutions, and imports—to match the current levels of Malaysia and Italy, which were selected as benchmark countries by stakeholders involved in the model development. The Economic + Education scenario added improvements in education variables to those of the Economic-only scenario. Finally, the Combined scenario retained the assumptions of the Economic + Education scenario and raised use of contraception to 65% by 2040, in line with national development goals.

The model results demonstrate that the Combined scenario would provide the greatest benefits to Kenya. Fertility would fall from over 4–2.6 children per woman, and life expectancy for education would reach the tertiary level for both males and females. Investment per capita would increase more than seven times from the baseline level, and would be about 50% higher by 2040 in the Combined scenario compared to the Economic + Education scenario. Similarly, the employment gap, under an assumption of full labor force participation, would be smaller in absolute terms in 2040 under the Combined scenario than in 2010, despite growth in the size of the working-age population, and would be more than 20% lower than in the Economic-only scenario.

While all three scenarios apart from the Base Case would result in significant improvements in GDP per capita, the addition of each of the two social sectors incrementally raises projected GDP per capita above the levels of the Economic-only scenario. Investing solely in economic policies produces a more than five-fold increase in GDP per capita by 2040, while integrating education improvements boosts incomes nearly seven times over the 2010 baseline. Adding in FP investments on top of those in the education and economic sectors creates a demographic dividend of over US $1,000 per person through higher levels of capital formation and the effect of a smaller population (Fig. 1).

3.1.2 Uganda

In 2014, Uganda's National Planning Authority led an application of the *DemDiv* model to explore policy options for the country to achieve a demographic dividend in the context of its long-term development plan, Vision 2040. Three policy scenarios were designed drawing on the average FP, education, and economic indicators for a small group of upper-middle-income countries countries that served as benchmarks for Uganda's development in Vision 2040.

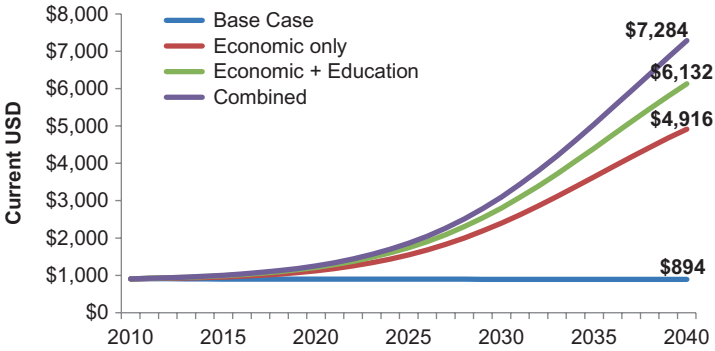

Fig. 1 GDP per capita modeled under three Scenarios for Kenya with *DemDiv* (Source: Authors' calculations using DemDiv model)

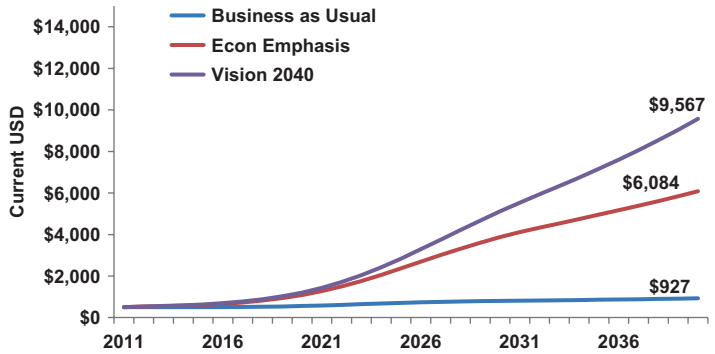

Fig. 2 GDP per capita modeled under three scenarios for Uganda with *DemDiv* (Source: Authors' calculations using the DemDiv model)

The baseline scenario, termed Business as Usual in the Uganda application, modeled slow progress in the expansion of contraceptive use, educational attainment and economic reforms, in line with recent trends. In this scenario, Uganda reaches just 30% of the current education and economic indicators of its benchmark countries by 2040, and contraceptive use increases at less than one percentage point per year. In the Economic Emphasis scenario, Uganda achieves improvements in the five economic indicators that approximate the current averages of the benchmark countries, but education and FP indicators are held to the same levels as in the Business as Usual scenario. Finally, in the Vision 2040 scenario, the investments of the Economic Emphasis scenario are combined with rapid improvements in the FP and education sectors. By increasing contraceptive prevalence to 67%, Uganda attains a fertility rate of two children per woman by 2040 and also fully achieves the current education levels of its benchmark countries.

As in Kenya, the model results (Fig. 2) show the greatest benefits from the simultaneous emphasis on education, family planning, and economic reform investments

as projected in the Vision 2040 scenario. In particular, Uganda would attain the target level of GDP per capita, $9,500, established in the Vision 2040 plan. Investment per capita would be two-thirds higher under the Vision 2040 scenario than the Economic Emphasis scenario, and the employment gap, holding labor force participation constant at the 2010 rate, would be 19% lower.

While the Economic Emphasis scenario would provide significantly higher growth in GDP and GDP per capita than the Business as Usual scenario, the social sector investments of the Vision 2040 scenario would raise GDP per capita more than an additional 50%, generating a demographic dividend of $3,500 per person, as seen in Fig. 2. This demographic dividend appears larger than that of Kenya because of the scenario design in the Uganda application, which combines all social sector investments (education and family planning) into a single scenario rather than projecting their impacts individually. In Kenya, the difference in the end year per capita GDP between the economic-only and combined scenarios is around $2,300.

3.2 Policy Impacts of Demographic Dividend Modeling

The intended purpose and audience of *DemDiv* differ from other models. Rather than researchers and academics, *DemDiv* was designed to be applied by country government agencies and to be readily understood by and useful to national-level policymakers. These goals are evident in the outcomes of the model's first applications. In July 2014, President Yoweri Museveni of Uganda signed a report on the demographic dividend that incorporated results from the *DemDiv* model. The report emphasized that the demographic dividend is not automatic and emphasized five key policy priorities: health, education, labor and economics, governance, and a favorable population age structure. President Museveni made several statements underscoring the interrelated nature of these policy investments as he launched the report, which was subsequently presented to Uganda's Cabinet and will be incorporated into the forthcoming Second National Development Plan. In Kenya, the Economic Secretary of the Ministry of Planning and Devolution stated that the policies delineated by the *DemDiv* model will help the government identify new approaches to addressing population issues.

The applications of the *DemDiv* model to date confirm that the use of country-specific data and, especially, scenarios developed and validated by local stakeholders, are key to promoting national ownership of the results and associated policy recommendations. With the support of high-level political leaders and with dissemination led by national planning agencies, these model results are more likely to directly inform future policies in these countries, as their governments aim to achieve a demographic dividend.

4 Conclusion

Models are only one approach to study the potential economic dividend from demographic change. Those referenced in this chapter are not meant to be predictive but rather to suggest, on balance, how countries' economies may progress under alternative demographic and socio-economic scenarios. The only way to really validate these models is to apply them to the historical record of a country. This is problematic because of the lack of appropriate datasets that date back 40 or 50 years. Confidence in using such models must derive, therefore, from the underlying logic of their structures and the research evidence underpinning the individual relationships that are modeled.

Each model by design is limited in the variables it tracks and the relationships included. For example, *DemDiv* has a single-sector economic model so cannot account for migration, differences between rural and urban economies, or between the manufacturing, services and agriculture sectors. Other models are limited in their treatment of population change as exogenous. The selection of which model to use depends on an acceptance of their limitations and on suitability for the ultimate policy or research objective.

Of course most countries are already trying to engender broad-based economic growth through development strategies, apart from the potential added benefits of a demographic dividend. However, many policymakers are engaging in rhetoric regarding the dividend without a complete understanding of the diverse policy investments that will be required to achieve it. The economic policy variables included in the demographic dividend models discussed here point to the key areas that were found to be statistically important and that can potentially operate together with the demographic transition to create a sort of multiplier effect on GDP.

The best use of demographic dividend models such as *DemDiv* is to show how changes in the size and age structure of the population brought on, for example, by strengthened family planning programs, can complement economic and education policies and can boost income per capita over what would otherwise be the case. Hence the starting point is economic and education policies and then family planning, rather than the other way around.

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The Roles of Governments, the Private Sector, and the International Community

Jotham Musinguzi

1 Introduction

Although the first demographic dividend (DD) is not automatic, sub-Saharan African (SSA) countries should aspire to harness it. The first DD, which is sometimes called the demographic "bonus", refers to the potential favourable interplay between a country's economic growth and the transformation in its population's age structure resulting from the demographic transition. As mortality and fertility decrease, there is a limited window of opportunity for sub-Saharan African (SSA) countries and their development partners to put in place responsive socio-economic policies that would help to harness a first DD. Moreover, the adoption of such responsive socio-economic policies needs to be timely.

According to Ashford (2007), reaping the DD appears to depend on several factors, namely strong public health systems that improve infant and child survival and health in general; the widespread availability and social acceptability of family planning; rapid and steady declines in childbearing; improvements in educational enrollment and quality; and stable economic conditions conducive to growth and job creation. Bloom et al. (2003) insist that a demographic dividend requires distinguishable changes in the population age structure, improved labor productivity, and economic growth over time. Last but not least, Guengant and May (2013) as well as May (forthcoming) do stress that governments and their development partners must also implement proactive and bold policies to trigger a rapid fertility decline.

The SSA countries are at different stages of their demographic transition and face various challenges and opportunities. There are two major trends in fertility transition in SSA. On the one hand, there are countries where the fertility transition is either very slow (e.g., Angola, Burkina Faso, Burundi, Central African Republic, Niger, Somalia, South Sudan, and Uganda) or slow (e.g., Benin, Cameroon,

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Mozambique, Senegal, Tanzania, and Zambia). On the other hand, some African countries are experiencing fertility transitions that are either well in progress (e.g., Djibouti, Ethiopia, Eritrea, Ghana, Kenya, Malawi, Rwanda, Swaziland, and Zimbabwe) or close to completion (e.g., Botswana, Lesotho, Mauritius, Namibia, Seychelles, South Africa, and Cape Verde).

Typically, countries in their very early stages of the demographic transition are overburdened by high mortality, high fertility, high dependency ratios, and a very youthful population. Their policies need to address the issue of high fertility, which needs to be curbed. By contrast, countries at a more advanced phase of their transition have started to experience population ageing. Their policies need to respond to these types of challenges, including social security and health systems that address different epidemiological profiles and burdens of disease (Bloom et al. 2000a, b, c).

Although demographers tend to agree that SSA will experience a fertility transition, there is no consensus regarding the reasons underpinning continued high fertility rates, what might be the best interventions to curb high fertility levels, and the probable timing of the future fertility decline. As Bloom and Sachs (1998: 25) have noted, "Africa's demographic uniqueness [over the past half century] … is *not* in the *level* of fertility but in the *persistence* of such a high level of fertility in the face of mortality declines". High fertility has been the major factor of Africa's sluggish demographic transition and a major cause of its rapid population growth. Compared with other developing regions in 1960, SSA started with a slightly higher total fertility rate of 6.7 children per woman. By the mid-1990s, dramatic reductions had occurred elsewhere—to 3.0 children per woman in Latin America, 3.8 in South Central Asia, and 2.2 in East Asia. During that period, all three regions saw a concomitant surge in contraceptive use. The percentage of married women aged 15–49 using contraception rose from aroundaround 13% to 80% in East Asia, from 7% to 40% in South Asia, and from 14% to 67% in Latin America (Bloom et al. 2000a, b, c). Virtually all these countries, except those of South Central Asia, achieved their contraceptive revolution (when at least 70% of couples use a modern method of contraception).

By contrast, the figures of contraceptive use for sub-Saharan Africa over that time period are much less impressive, rising from around 5% to just 18% (Goliber 1997), with fertility falling only from 6.7 to 5.9 children per woman (United Nations 2001). While some countries—in particular those of southern Africa (Namibia, Botswana, South Africa, and Zimbabwe) and Kenya—have achieved significant fertility reductions, the majority of sub-Saharan African countries still have very high fertility rates (Goliber 1997). There are various reasons for this continued high fertility. In particular, with limited financial infrastructure in rural areas offering little incentive or means to save, children are still viewed as insurance for old age (Bloom et al. 2002).

As African countries want to enhance their prospect of harnessing a first demographic dividend, they need to ensure a faster fertility decline. In fact, the chances of harnessing the demographic dividend depend on how substantive the fertility decline will be (Bloom et al. 2013). As fertility declines, the smaller share of children in the population enables greater investments per child, particularly for

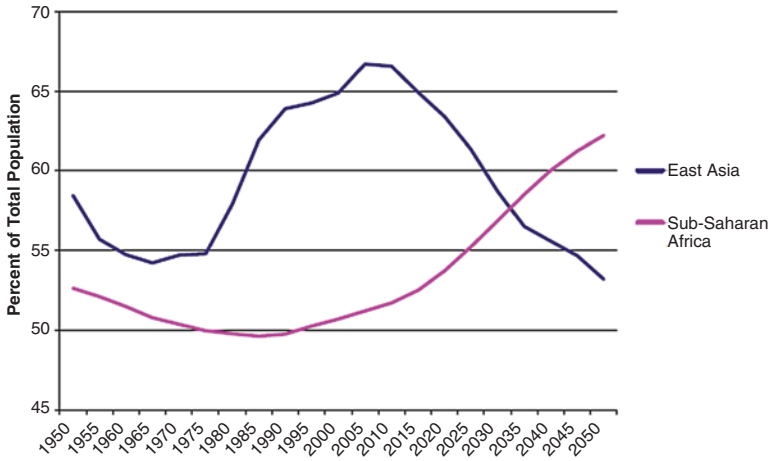

Fig. 1 Working age population (ages 15–59) as a percentage of total population in East Asia and Sub-Saharan Africa, 1950–2050 (Source: Ross 2004)

education, health care, and nutrition. The decline in fertility provides a window of opportunity to invest more in education leading to improved human capital. If appropriate policies are in place to support productive employment and jobs, the larger working-age cohorts can produce more on a per-person basis than in the past, thus boosting per capita income. If these workers save and invest, this can lead to economic growth. This is what happened with the East Asia "Tigers" including South Korea and Singapore, a situation vastly different from what is currently happening in sub-Saharan Africa.

Figure 1 illustrates the vast differences between continents in terms of their working age populations from 1950 to 2050. Beginning in 1950, East Asian countries moved quickly through falling fertility rates that resulted in a change in the percentage of their populations in the working age group. Their dividend opportunity rose quickly during the next 50 years. It is peaking just now and will fade steadily as their population age. Their window of opportunity is beginning to close (United Nations 2001).

Sub-Saharan Africa, on the other hand, is just now starting to enter its demographic window of opportunity, under the assumption of declining fertility rates over the next several decades. If those fertility declines come to pass, and if the governments involved take policy actions that are discussed in this chapter, i.e., those adopted in East Asia, the first demographic dividend may become real rather than potential.

Lee and Mason (2013) estimate that an accelerated fertility decline in selected sub-Saharan African countries can increase per capita income from 2010 to 2040 by a cumulative total of 30–32% in Ghana and Ethiopia and that constant fertility will reduce income growth by 1.1% in Nigeria and Mozambique (Lee and Mason 2013).

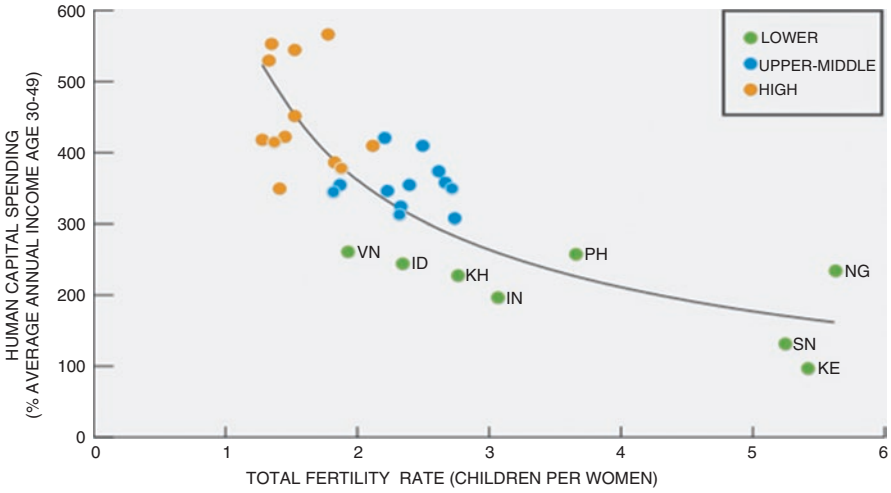

Fig. 2 Trade-off between human capital spending and fertility (Source: Lee and Mason 2013)

Dramani and Ndiaye (2012) estimate the demographic dividend for Senegal to be a 0.75 percentage point increase of economic growth around 2025.

As Fig. 2 of the trade-off between human capital spending and fertility shows, low fertility enhances a country's ability to invest in its human capital. Where fertility rates are five or more births per woman, as is the case in many sub-Saharan countries, the percent of average annual income invested per child to improve human capital is the lowest. Research also shows that building up the quality of human capital with early schooling, health, and employment investments can provide robust payoffs for a sustained period of time (Lee and Mason 2012).

Whereas population change is not the only major factor that needs to be taken into account to achieve socio-economic development, SSA countries should factor into their development plans the potential positive interplay between changing population age structures and socio-economic development (Soucat and Ncube 2014). It is also important that sub-Saharan governments put in place interventions to curb high fertility levels and foster human capital (e.g., health, education, and gender equality). In addition, sub-Saharan governments will need to partner strategically with the private sector and the international community (i.e., donor agencies and NGOs) in order to enhance the policies needed to capture a first DD.

2 The Role of Governments

The demographic transition influences family structures, the status of women and children, and the way people work. Therefore, embracing and understanding demographic challenges and their implications should be a top policy priority.

Specifically, governments will need to prioritize four main policy areas, namely decrease high fertility levels, improve health outcomes, strengthen education and gender equality, and boost economic growth and enhance good governance.

In addition, as it will be discussed in the last two sections of this chapter, governments should work with the private sector and other partners like donors and non-governmental organizations (NGOs) in order to implement the policies that are needed to capture the benefits of a first demographic dividend.

2.1 Fertility Decline

Traditionally, sub-Saharan African societies have always favored pronatalist values. In doing so, communities compensated for very high infant and child mortality levels. Moreover, these cultural attitudes fulfilled the widespread desire to enhance the wealth of communities as well as security in old age through numerous surviving children. Last but not least, high fertility levels addressed the need to secure a large pool of labor for agricultural production.

Governments and policymakers in the region have consistently been wary to flag the issue of high fertility and, in doing so, to antagonize their constituencies. As a consequence, few sub-Saharan governments have launched broad based family planning programs with the view of reducing high fertility levels. Malawi, Ethiopia, and Rwanda are recent exceptions to the general pattern (May forthcoming).

However, the advent in SSA of policy discussions on the DD has brought back to the fore the issue of high fertility levels. Still, governments and policymakers have not always seen clearly the linkages between rapid fertility declines and the opening of the demographic window of opportunity to capture a first DD. This is in sharp contrast with what happened in the emerging market economies, which all have reached fertility levels of three children per woman or less and have completed their contraceptive revolution.

To accelerate the fertility transition, sub-Saharan governments will need to coordinate and ensure access to a whole range of family planning methods and increase age at first marriage. In addition, programs will need to focus on vulnerable populations and hard-to-reach areas and expand the supply and provision of long-acting and permanent methods (LAPMs) of family planning.

In addition to enhanced efforts in the supply of family planning services, programs to reduce high fertility levels will also require proactive interventions to foster the demand for smaller family size. This will entail interventions in the areas of health, female education, gender equality, skills development, and job creation.

At this juncture, it appears that the first step for sub-Saharan governments would be to comprehend the importance and the urgency of rapid fertility reductions. However, the politics for family planning policies and programs in the region are not conducive for such a paradigm shift to take place rapidly. This situation has been made worse by changes of priorities among the international donor community.

In particular, the fight against the HIV/AIDS epidemic has diverted attention and resources from the much needed expansion of family planning programs (May forthcoming).

2.2 Health Systems

Improvements in public health are at the heart of the demographic transition. Better sanitation, expanded immunization programs, greater access to antibiotics, and better birth spacing as well as birth limiting initiate the decline in mortality that leads to the decline in fertility. It should be noted that the last two of these outcomes are linked to increased access to family planning services.

The health story does not end there, however. In recent years, evidence is mounting that health is also a key determinant of economic performance, counter to the frequently made assumption that causation runs only from wealth to health (Bloom et al. 2003). The Commission on Macroeconomics and Health, which was convened by the World Health Organization (WHO), has found also substantial evidence showing that the improved health of a population contributes to higher economic growth and poverty alleviation (World Health Organization 2001; see also Bloom et al. 2000a, b, c).

If a country is to accelerate its demographic transition (in particular its fertility transition) and take advantage of a first DD, five health policies should be prioritized:

- First, ensuring that infants and children receive effective medical care is of paramount importance, as a high degree of certainty about an infant's and a child's survivalinfant's and a child's survival is vital to the triggering of the fertility transition. Such certainty precludes the need to have more offspring and means that investments in education are concentrated in fewer children.
- Second, the health of women is critical for two main reasons. Women's access to reproductive health services is important for achieving desired family size. Women are also essential conduits of knowledge about health: a healthier woman will likely improve the health of her family, especially of her children.
- Third, children need to have adequate support for their health needs in order to ensure they maximize their opportunities in the education system, where poor health often contributes to educational under-achievement (Ruger et al. 2001).
- Fourth, as the baby-boom generation enters the workforce, a proportion of the prosperity they generate will have to be channeled back into policies that improve health systems. This is not an area where the market will necessarily suffice, as market failures in the public health area are common, and the institutions and technologies that support health must instead be generated through efforts by the state, the civil society, and families (Easterlin 2001).
- Fifth, policies to improve health systems can prove a powerful weapon against social exclusion, which lessens and/or eliminates the contribution that certain groups make to the development of a society.

In the health sector, governments should put in place policies and programs that accelerate a reduction of infant and child mortality. Such programs include immunization against childhood diseases, better nutrition, and management of childhood infections and treatment of tropical diseases (e.g., malaria). In addition, increased and sustained investment in family planning is crucial. The importance of governments prioritizing increased access to family planning services cannot be overemphasized. As mentioned, child survival programs and access to family planning are mutually re-enforcing. Moreover, family planning programs brings also positive economic returns (see Bulatao 1998; Bongaarts and Sinding 2011).

Evidence suggests also that better health facilitates improve economic production. Moreover, poor health is an important cause of losses in household income (Bloom et al. 2002). All this stresses the importance of policies to promote health in order to capture a first DD, as exemplified by the Asian situation (Bloom et al. 2000a, b, c). Some examples include: ensuring that infants and children receive good medical care; protecting women's reproductive health (and enhancing their health knowledge, since they play a central role in the health of their families); stressing the health of children and teenagers to improve educational performance; and focusing especially on low-income groups.

When parents see that their children are surviving and thriving, they recognize the need for smaller families and are willing to spend more of their resources on their children's health and education. Investments in child survival survival play a key role in initiating and sustaining lower levels of fertility; as infant and child deaths decrease, the desire for a smaller family and demand for family planning both increase (Joshi 2012). In many countries in SSA, couples still desire large families, in part because of high inequality in improvements in child survival. survival. While many SSA countries have made great improvements in child survival over the last few decades, much more needs to be done.

It is noteworthy that whereas childhood mortality (both infant and under-five mortality) is gradually declining in SSA, neonatal mortality has remained high and continues to undermine, quite significantly, the child survival efforts of SSA countries (in some African countries, neonatal deaths contribute almost half to the infant mortality).

2.3 Education and Gender Equality

Many SSA countries have very youthful populations. This means that African governments need to prioritize the development needs of the under 15. With 45% of its population under the age of 15, the Sahel region faces particular challenges in meeting the development needs of its youth, which will continue to rapidly grow in size (Mason and Lee 2007; see also chapter "Demographic Challenges of the Sahel Countries" in this volume). Policies and investments are needed in the short term to enable the smooth transition of this young segment of the population into productive adulthood (Mason 2007).

In the education sector, governments need to ensure equity and quality including at primary, post-primary, secondary, and tertiary levels. Moreover, education and skills should match the labor market requirements of the country. The education system should also ensure equal enrolment of both boys and girls and their retention in the school system with the goal of eliminating school drop-outs. This will ensure that women and girls will find equal opportunities in the formal employment sector. Policies and programs should address also the various barriers to youth employment.

African governments need to design gender sensitive policies and implement them. Gender discrimination in schooling and employment opportunities hurts economic growth. Concern has been raised that countries that ignore the female half of their population will not realize their demographic dividends (Desai 2010). On the other hand, if African policymakers could urgently place much more emphasis on educating and empowering African girls, who ultimately represent one of the continent's most important source of economic and social progress, they could expect their countries to reap corollary rewards. Dollar and Gatti (1999) find that a 1% increase in the percentage of females with secondary schooling can increase per capita income growth by 0.3 percentage points. Educated mothers not only raise more highly educated children but they contribute to the labor supply and household income by participating themselves in the labor force (Schultz 2002). Experiencing a complete fertility transition from 6.5 to 2.5 births per woman can increase a female's lifetime work years by 18%, or 8 out of 45 total years (Schultz 1995). One study estimates the return on investment from meeting two-thirds of the need for contraception in Kenya to be a 51% increase in per capita income between 2005 and 2050 (Bloom et al. 2013). Government investments in women's human capital will increase per capita income, and shifting from high to low fertility will add work years to female labor supply, raise household incomes, and increase tax revenues (Reich 2000).

2.4 Economic Policies and Governance

Governments need to institute economic policies that lower the cost of doing business and encourage the private sector to thrive. In addition, governments should adopt flexible labor laws and policies that attract both domestic and direct foreign investments, measures that will enhance job creation. Furthermore, it is the responsibility of governments to ensure a favorable climate that promotes the necessary investments in infrastructure, energy, transport, and telecommunication, among others.

Governments in sub-Saharan Africa should continue to exploit ways of regional integration to enhance trade, free movement of people and goods in order to spur economic growth and benefit from economies of scale as well as enhanced job creation. In this regard, SSA governments should pro-actively and vigorously promote regional trading blocs, all aiming at creating a free trade area, like the Common

Market for Eastern and Southern Africa (COMESA), the East African Community (EAC), the Economic Commission of West African States (ECOWAS), the Inter-Governmental Authority on Development (IGAD), and the Africa Free Trade Zone (AFTZ).

However, absorbing the baby-boom generation into productive employment is more than just a matter of labor market flexibility. Any expanding economic enterprise (from small to large business) needs capital. Investment can come from savings—by governments, business, or private individuals—or from overseas development assistance and/or foreign direct investment. Private household savings are one of the most powerful ways of financing growth, as the East Asian experience has shown. Individual savings are, in turn, dependent on demography and longevity. People save at different points in their lives, and they save for different purposes, most notably, their retirement[1]. Encouraging private savings and efficiently allocating them to investments will require reform of macroeconomic policy and financial institutions. Governance affects how much a country saves and whether those savings are productively invested. Latin America provides an example of a region where savings have been low, while East Asia's much higher savings rates contributed substantially to its socio-economic development. The demographic transition can encourage people to save—but only if saving seems relatively safe and reasonably profitable. In order to promote savings, governments must attempt to provide price stability, as incentives to save are higher in environments with low inflation, and they must encourage competition, transparency, and efficiency in financial institutions.

Good governance is part and parcel of efforts to harness the demographic dividend. Sub-Saharan African governments need to continue strengthening good governance, efficiency, and accountability in the deliverance of public services at all levels. Many African countries are endowed with natural resources (e.g., oil, minerals). These need to be exploited in a very transparent manner, which is currently not the case.

3 The Role of the Private Sector

3.1 Job Creation

A key factor that must be present for a country to benefit from a first demographic dividend is the ability to create jobs for the growing workforce. Although governments have the primary responsibility of putting in place enabling policies for the economy, health, education, and job creation, it is the private sector that actually creates by far the majority of the jobs.

[1] Savings and investments are particularly important for capturing a second demographic dividend.

In this regard, the private sector becomes the driving force behind jobs creation by investing in various sectors of the economy (e.g., agriculture, infrastructure, communication and transport, energy, tourism, etc.) and taking advantage of the enabling policies that governments put in place. This is especially true where good governance, transparency, and accountability exist, as well as where governments have reduced the cost of doing business. The private sector involved in extractive industry (e.g., oil and minerals) in sub-Saharan Africa needs to be more transparent than it has hitherto been and contribute to the elimination of the rampant corruption menace. The benefits of this industry need to reach citizens instead of benefiting only a few people who are well connected in government. The private sector should contribute to a fundamental change in good governance in SSA if the continent is to increase its chance of capturing a first DD.

3.2 Public-Private Partnerships

Public–private partnerships are needed in many areas of social policy, as governments alone will be unable to cope with pressing demographic challenges, and markets alone will leave some areas unattended. Such partnerships provide innovative ways for the public and private sectors to share costs and administrative duties associated with the provision of social services. In the developed world, it is interesting to note how governments are under pressure to act in a more businesslike fashion, while businesses (especially large corporations) are facing increasing demands to accept more corporate social responsibility. While governments must become more efficient trustees of taxpayers' money, business needs to explore the effects on its bottom line of a whole range of factors—from better-educated workers to improved environmental performance (Bloom et al. 2000a, b, c; Reich 2000).

The private sector can be very instrumental in all sectors of the economy, including education and health. As several companies in sub-Saharan Africa and Thailand have shown, the private sector can play a useful role in HIV/AIDS efforts, bringing its corporate skills to ease the burden on health systems (Bloom et al. 2001).

Non-medical interventions are aimed at working more broadly to strengthen health systems. Priorities include the need to develop better data for decision making and to use this data to set priorities. In addition, there is a need to develop a new role that emphasizes facilitation, sponsorship of innovation, finance, and supervisory capabilities, beyond the traditional emphasis on services delivery. Partnerships between the public sector, the civil society, and the private sector have the potential to be fruitful, but these partnerships need leadership if they are to develop.

4 The Role of the International Community

The international community (e.g., donors, NGOs, etc.) will also play a critical role in the efforts of SSA countries to harness a first demographic dividend.

4.1 Donors

Donors (multilateral and bilateral) have helped and continue to assist sub-Saharan African countries by providing badly needed resources (financial and technical) to complement national resources. For a long time to come, many sub-Saharan countries will continue to rely on external donors to balance their national budgets. Donors' contributions to African countries in harnessing a first DD will continue to be crucial in terms of supporting countries' development scenarios, sharing knowledge, experiences, and best practices as well as innovations.

Donors' support can facilitate progress in the health sector in particular, by establishing a climate that encourages the research, development, and roll-out of contraceptive services. Donors can also help promote family planning delivery standards, provide training at all levels, and help evaluate the comparative effectiveness—or ineffectiveness—of national programs (Bloom et al. 2013). Last but not least, donors can foster the political dialogue to help build a consensus about the need for effective population policies and by supporting governments as they develop their national policies and programs.

Donors should continue to support data availability, research, and knowledge sharing (through South-South as well as North-South modalities) to assist sub-Saharan countries in their endeavor to harness the DD. Different countries of Africa and its regions (e.g., the Sahel) have different levels of need and this will require careful mapping out in order to provide the appropriate financial and technical assistance tailored to the actual country's requirements. The first DD is not automatic and the challenges of harnessing it are complex in nature. To address them, expertise and long-term investments are needed. In this regard, donors should support and promote a wider understanding and appreciation of the dynamic challenges and opportunities of the DD at global, regional, national, and sub-national levels.

4.2 Non-Governmental Organizations (NGOs)

Many non-governmental organizations (NGOs) have provided financial and technical assistance to sub-Saharan countries. In particular, international and regional NGOs have been active in the health sector, including the delivery of family planning services. For example, social marketing, i.e., resorting to marketing techniques to boost the use of specific products, has been used successfully not only to expand

contraceptive coverage but also to mitigate the HIV/AIDS epidemic through the provision of condoms.

In addition to their participation in various roles, such as the provision of social services (in particular, in the education and health sectors), NGOs have a unique role to play in that they can enhance good governance and hold governments accountable. The NGOs should use their comparative advantage to speak out as activists and advocates. They should ensure that African governments and the private sector eliminate corrupt tendencies, especially in the extractive industry and in the delivery of public services.

NGOs, civil society and donors' support can help facilitate institutional change and encourage new forms of behavior and new practices. These are also vital for ensuring proper financing, especially in the critical phase, where pilot programs are necessary because governments have not provided such services. However, it is necessary to encourage governments and insist that they finance, expand, and scale-up promising initiatives and programs piloted and/or started up by NGOs and donors.

With respect to family planning programs specifically, the Bill and Melinda Gates Foundation launched at the Family Planning London Summit of 2012 the Family Planning 2020 Initiative, which is an ambitious program to boost contraceptive use among 69 focus countries. Of these 69 countries, 39 are in sub-Saharan Africa (see www.familyplanning2020.org, accessed on June 25, 2016). There is also a renewed interest in family planning in West Africa under the auspices of the Ouagadougou Partnership, which was launched in 2011 (May forthcoming).

5 Conclusions

The potential for a first demographic dividend in sub-Saharan in sub-Saharan Africa, though not automatic, is very much worth aspiring to by all African countries. It is also true that favorable policies take time to establish and take effect. Investments in education, health, and jobs creation are vital, as are policies that favor the fertility decline in order to open the demographic window of opportunity. Sub-Saharan governments, the private sector, and the international organizations should embrace the capturing of a first DD as a key priority.

Today's large youth populations can turn into a powerful workforce, driving a nation's economic growth, but leaders must invest in the right policies and programs toward achieving that goal. Lessons learned from nations who have reaped the rewards of the demographic dividend are clear—the benefits are possible, but only when the young dependent population grows smaller and key investments are made in health, education, economic policy, and governance. While each country is unique, the demographic dividend suggests an opportunity for the youth to accelerate economic growth in SSA. Failure to act on these issues could have a damaging effect on future prospects, as unemployment rises, the social fabric crumbles, and rising numbers of old people begin to overwhelm available resources. Embracing

and understanding demographic challenges must therefore be a priority for all governments.

To deliver on this tall order, SSA governments will need to address the issue of high fertility, to invest in human capital including female education and gender equality, and to enact and implement a set of proactive policies. In order to do so, they will have to establish strong partnerships with the private sector as well as muster the technical and financial support of the community of donors and NGOs.

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Conflicts and the Demographic Transition: Economic Opportunity or Disaster?

Siri Aas Rustad, Gudrun Østby, and Henrik Urdal

1 Introduction

An eventual strong fertility decline in sub-Saharan Africa (SSA) could pave the way for a demographic transition[1] on the continent that would open a demographic window of opportunity. Having contributed strongly to the economic miracles of the Asian 'Tiger Economies', demographic transitions elsewhere have illustrated that mere opportunities may not necessarily translate into 'demographic bonuses', or 'dividends', rather their realization depend on the political and economic climate. The demographic dividend is made possible by a large increase in the working age population (15–64 years) coinciding with slower growth in the population below 15 years, and its demonstrable existence refutes earlier beliefs that population growth had a general, negative effect on per capita economic growth. It also challenges claims from the 'resource scarcity' school that high population growth could spur violent conflict over scarce renewable resources. However, it has been suggested that the demographic transition and increasing relative youth proportions are neither 'good' nor 'bad' in themselves, and that under unfavorable political and economic conditions, 'youth bulges'[2] may be a curse, rather than a blessing, increasing the risk of armed conflict. This chapter will explore these two scenarios, and

[1] The demographic transition is a stylized presentation of the change from high fertility and mortality societies with poorly developed health institutions, to low mortality and eventually low fertility regimes. As the fertility decline will only happen after child mortality has dropped significantly, the transition period is associated with strong population growth before people adjust fertility behavior to the new, lower mortality level.

[2] 'Youth bulges' are measured as cohorts aged 15–24 as a share of the total adult (15+) population.

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how different factors, such as education, ethnic distribution, migration, and urbanization, can affect how demographic change impacts the risk of conflict.

Highlighting the tension between the optimistic prospect of a demographic dividend and the more pessimistic potential for conflict, this chapter begins by reviewing the main concerns related to conflict and population growth in the conflict literature, and shows general conflict trends, discussing how these relate to the demographic transition. In the extension of this argument, we further consider how demographic shifts can affect violent conflict, and finally we explore the factors which determine whether youth bulges become a blessing or a curse.

2 Conflict and Population Growth

Despite a growing interest in the links between environmental conditions, population dynamics, and the security trajectories of states, systematic, quantitative research on the demographic aspects of conflict has been surprisingly scarce (Brunborg et al. 2006). In fact, over the last few years, only a very limited number of articles have addressed how demographic shifts influence large-scale violence both within and between states (Goldstone et al. 2012).

In the 'resource scarcity' literature, high population growth and density are seen as primary drivers of scarcity in renewable resources such as arable land, fresh water, forests, and fisheries. Arguably, such scarcities may trigger armed conflict over resource access (Homer-Dixon and Blitt 1998).

However, the State Failure Task Force Report (Esty et al. 1998) found that soil degradation, deforestation, and limitations of freshwater supply had no effect upon the risk of state failure. Cross-national correlations of population pressure and internal conflict were examined more thoroughly in a global study by Urdal (2005). The results of this study indicated that national-level aggregate population growth and scarcity of fertile land are not strongly related to armed conflict.

Three sub-national studies were later conducted to investigate whether the null-findings were simply a result of too high a level of aggregation, possibly missing local conflicts driven by population pressure-resource dynamics (Raleigh and Urdal 2007; Urdal 2008; Østby et al. 2011). In total, the sub-national studies generally provide more support for the population pressure, scarcity, and conflict nexus than the global studies. This highlights the potential importance of local processes in population-renewable resource dynamics. The sub-national studies also reveal that population pressure may have different effects on different types of political violence, and that the violence potential may be conditioned by other factors, such as inter-group dynamics.

3 Conflict and the Demographic Transition

Going beyond the broad category of aggregate population growth and density, conflict and demography also have a second dimension: the age distribution of the population and its transition.

When the working age population (15–64) is increasing relative to the dependent population, i.e., those below and above working age, it is generally associated with positive economic growth (Kelley and Schmidt 2001). The rapid growth in East Asia since 1975 has partly been attributed to this effect, often referred to as the demographic dividend. Africa has experienced the first phase of the demographic transition, with declining mortality, and as fertility rates are slowly starting to decline, the African continent is moving towards a demographic window of opportunity. While most African countries are still far away from seeing the ratio of more than two 'producers' per 'consumer' which the Asian Tigers experienced at the peak of their transitions, dependency ratios have started to decline on the continent, resulting in an increasing relative number of young people in the workforce (i.e., the working-age population (Fig. 1).

Previous research has shown that countries associated with slow economic growth have a higher risk of experiencing conflict (Hegre and Sambanis 2006),

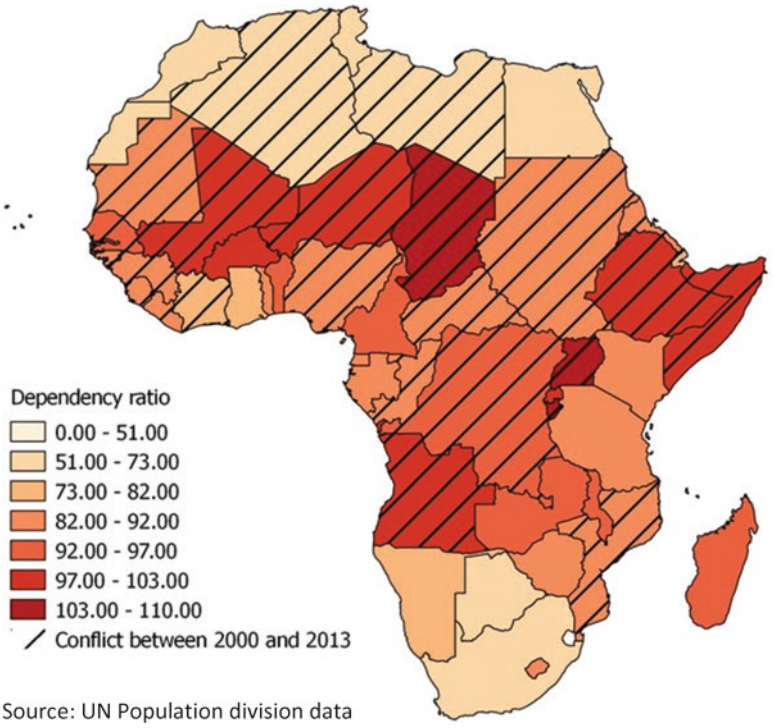

Fig. 1 Level of dependency and conflict experience since 2000

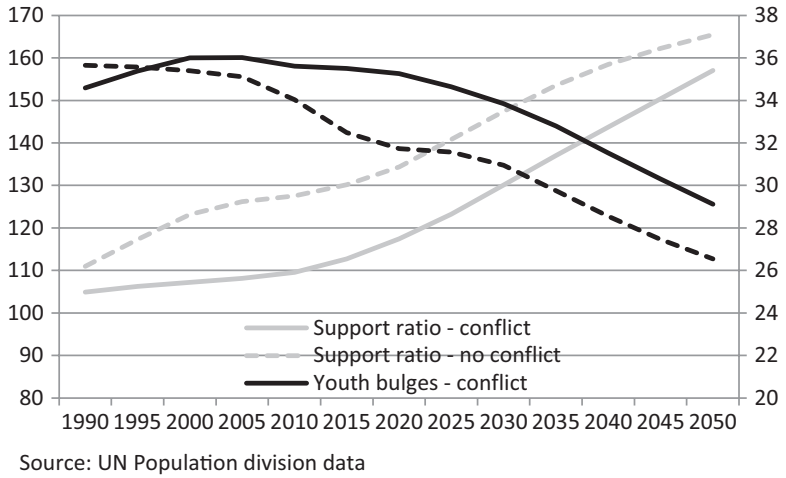

Fig. 2 Youth bulge and support ratio in SSA between 1990 and 2050

hence a rapid economic growth should be conflict mitigating. This yields the hypothesis that an increase in the working population should decrease the risk of conflict. To explore this hypothesis we will now consider the ways in which these variables relate to each other.

The map in Fig. 1 shows the African countries with armed conflict between 2000 and 2013, and the ratio between the working age population (15–64) and the non-working population (0–14 and 64+)[3]. The darker the color, the higher is the share of dependency. While the map does not show a perfect overlap, we can clearly see a trend, in that almost all countries with a high dependency ratio have experienced conflict, while fewer of those with a low dependency rate have.

Further, in Fig. 2 we see how the demographic transition has developed since 1990 and is likely to develop up until 2050. We have split the countries into those which have had conflict sometime between 1990 and 2013 (solid line) and those that have not experienced conflict. The graph shows the development of the youth bulge (black lines) and the support ratio[4] (grey line). We can observe two important points from this figure. First of all, in general the window of opportunity for a demographic dividend is not likely to emerge until 2030, when the supply ratio reaches 150. However, when we look at the conflict countries we see that this might come as late as 2045. Secondly, we see that the decrease in youth bulges is much slower in conflict countries than in non-conflict countries.

[3] Calculated as (0–14and 65+)/(15–64) by the UN Population Division based on data from 2000. The UN supply data for every fifth year from 1950 to 2010, the years in-between have been interpolated and extrapolated.

[4] The support ratio measures the balance between the potential labor force population and young- and old-age dependents. It is defined as the number of people aged 15–64 years per 100 people aged 0–14 and 65+.

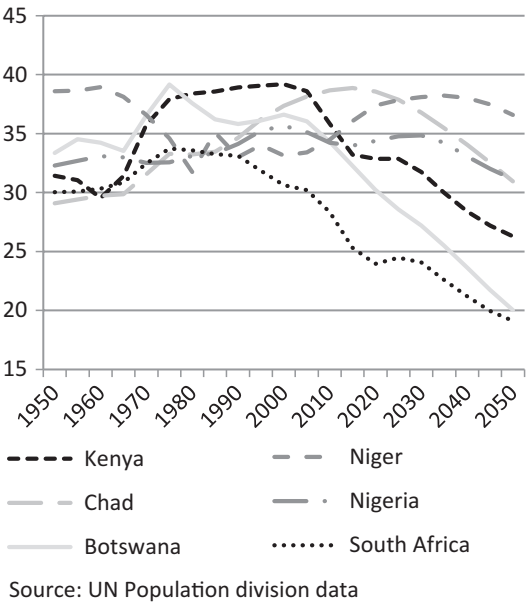

Fig. 3 Youth bulges in six African countries 1950–2050

To further underscore the large variation in the demographic transition that countries in SSA are experiencing we look at the development of youth bulges in six countries (Fig. 3).

This figure shows that Botswana and South Africa have already experienced the top of the youth bulge and the share of the young population is decreasing. On the other hand, countries like Chad and Niger are still experiencing a growth in the young population. This graph indicates that we cannot talk of a uniformed demographic transition in SSA.

In a number of current and recent major conflict countries, including Burundi, the Democratic Republic of the Congo, Mali, Nigeria, Somalia, South Sudan, Sudan, and Uganda, youth bulges are still high. In these countries around 30% of the population above the age of 15 is in the age group 15–24. While support ratios are on the rise in all of the countries, gradually opening up for a demographic dividend, changes are slow. In particular Mali, Somalia, and Uganda will have large youth bulges for decades to come. In the absence of expanded economic opportunities, the young age structures will continue to represent a structural condition that could fuel further dissatisfaction, instability, and violent conflict.

It has been pointed out that whether a country is able to harvest the fruits of an increase in the working population depends upon the conditions under which the growth is taking place: are there sufficiently developed education and health systems? Is there a growing job market to consume the increase in working population? Is the government stable and corruption low?

In countries where these factors are in place, an increase in the youth population – the so called *youth bulge* – is likely to be an asset. However, in countries where the

conditional factors are not conducive to growth, an increase in the youth population could be a curse rather than a blessing. In the following section we will discuss how the effect of an increase in the youth population could increase the risk of conflict, and dampen the opportunity which the demographic dividend represents.

4 Youth Bulges

It has been argued that countries and areas undergoing age-structure transitions, resulting in very youthful populations, are increasingly susceptible to political violence. Young people often play a prominent role in political violence, and the existence of a 'youth bulge' has historically been associated with times of political crisis (Goldstone 2001). Furthermore, youth bulges have become a focus of current political upheavals in the Arab world, including the most recent revolutions in Tunisia and Egypt, as well as for recruitment to international terrorist networks. Conditions that provide youth bulges with the necessary motives and opportunities for armed conflict are discussed below, starting from what we may call the opportunity and the motive perspectives.

The opportunity literature has its roots in economic theory and focuses on structural conditions that provide opportunities for a rebel group to wage war against a government (Collier 2000). These are conditions that provide the rebel group with the financial means to fight, or factors that reduce the cost of rebellion, such as unusually low recruitment costs for rebel soldiers. Paul Collier has suggested that relatively large youth cohorts may be a factor that reduces recruitment costs through the abundant supply of rebel labor with low opportunity cost, increasing the risk of armed conflict (Collier 2000: 94). According to the opportunity perspective, rebellion is feasible only when the potential gain from joining is so high and the expected costs so low that rebel recruits will favor joining over alternative income-earning opportunities. The motive-oriented tradition has its origins in relative deprivation theory and tends to see the eruption of political violence as a rational means to redress economic or political grievances (Gurr 1970). Motives for committing political violence can be economic – for instance poverty, economic recession or inequality – or political – such as a lack of democracy, the absence of minority representation or self-governance. Most of the literature on youth bulges and political violence arguably falls into this tradition. It focuses on how large youth cohorts may be aggrieved by institutional crowding in the labor market or educational system, a lack of political openness, and crowding in urban centers. This paves the way for political violence (Goldstone 2001).

A number of relevant contextual factors have been suggested to affect the relationship between large youth cohorts and conflict. Firstly, the mere existence of an extraordinarily large pool of youth is a factor that lowers the cost of recruitment, since the opportunity cost for a young person is generally low (Collier 2000: 94). Additionally, research within the field of economic demography suggests that the alternative cost of individuals belonging to larger youth cohorts is generally lower

compared to members of smaller cohorts. This is called the cohort-size effect. Not only do youth bulges provide an unusually high supply of individuals with low opportunity cost, but an individual belonging to a relatively large youth cohort generally also has a lower opportunity cost relative to a young person born into a smaller cohort. The influence of the size of youth cohorts on unemployment is also emphasized in the motive-oriented literature on civil violence (Goldstone 2001). If the labor market cannot absorb a sudden surplus of young job-seekers, a large pool of unemployed youths will generate strong frustration.

Secondly, for large youth cohorts, the economic climate at the time they enter into the labor market is particularly crucial. Large youth cohorts are likely be rendered particularly susceptible to lower income opportunities when economic conditions generally deteriorate, reducing the income they forego by signing up as a rebel. Similarly, the motive-oriented literature posits that youth belonging to large cohorts will be especially vulnerable to unemployment if their entry into the labor force coincides with periods of serious economic decline. Such coincidences may generate despair among young people that moves them towards the use of violence.

Thirdly, when large youth groups aspiring to political positions are excluded from participation in the political process, they may engage in violent conflict behavior in an attempt to force democratic reform (Goldstone 2001).

Finally, it has been suggested that if youths are abundant in relatively compact geographical locations, like urban areas, this may increase the likelihood that grievances caused by crowding in the labor market or educational institutions arise (Goldstone 2001). The young often constitute a disproportionately large part of rural-to-urban migrants, hence strong urbanization may be expected to lead to an extraordinary crowding of youths in urban centers, potentially increasing the risk of political violence.

Two highly influential civil war studies, Fearon and Laitin (2003) and Collier and Hoeffler (2004), found no effect of youth bulges on the risk of civil war outbreak. However, both studies used a flawed measure of youth bulges, dividing those aged 15–24 years by the total population, including all cohorts under the age of 15 years in the denominator. Such a definition is highly problematic both theoretically and empirically. These studies also use a relatively high battle deaths threshold and thus only include major civil wars.

In a cross-national time-series study of the 1950–2000 period, Urdal found that the presence of youth bulges increased the risk of conflict outbreak significantly (Urdal 2006). In a background paper for the World Development Report 2011 Fearon (2010) finds less robust support for the youth bulge hypothesis when using the same operationalization of youth bulge as Urdal (2006). However, the discrepancies in findings between these two studies may be due to differences in sample and model setup.

Assessing possible interaction effects, Urdal (2006) finds that the conflict risk associated with youth bulges does not seem to increase when youth bulges coincide with long-term per capita economic decline, expansions in higher education or strong urban growth. However, the results suggest that the effect of youth bulges is

greater in the most autocratic regimes as well as in the most democratic states. It could indicate that youth bulges provide greater opportunities in autocracies and greater motives in democracies.

Finally, the study on India reported above (Urdal 2008) also included age structure measures. Generally, the results supported the findings from the global study. A young age structure was the only demographic factor in that study to be statistically associated with increased risks of all three forms of political violence. However, Urdal and Hoelscher (2012) find no effect of a young urban age structure for urban violent and non-violent social disorder.

As the impact of demographic shifts depends on how they are managed, we will in the following look at five different factors conditioning the effect of demographic change on conflict.

4.1 Education

According to the opportunity perspective, increasing education increases the income-earning opportunities of an individual, assuming a negative relationship between education and rebel recruitment. It has been suggested that when countries respond to large youth cohorts by expanding opportunities for higher education, this may produce a much larger group of highly educated youths than can be accommodated in the normal economy.

In systematizing different theoretical contributions linking education to conflict it can be useful to distinguish between arguments relating to the levels, expansion, and inequality. The first type of argument presented in the literature pertains to levels of education (usually in terms of enrolment or attainment) or government investment in education. Most of these propositions share the premise that higher levels of education foster peace. There are at least three different explanations provided for this relationship: (1) Increased government spending in education can reduce people's grievances, both directly and indirectly through spurring economic development and social equality. (2) Increased education opportunities simply make it less attractive for young people to enlist as soldiers rather than pursuing a civilian career. (3) Higher education attainment may promote a 'culture of peace' that encourages political participation and channels conflicts of interest through peaceful political institutions. Hence, education could be the factor that opens up the window of opportunity to harvest the demographic dividend (Østby and Urdal 2014).

On the other hand, raising the expectations among large youth groups and failing to deliver employment opportunities for them afterwards could carry a risk of radicalizing and mobilizing an increasingly competent youth population. When countries respond to large youth bulges by expanding access to higher education, they may produce a much larger group of highly educated young people than the labor market is able to absorb. Prevailing unemployment among highly educated youths may cause frustration and grievances that could in turn motivate political violence.

Hence the demographic dividend is also dependent on an active job market and business environment (Østby and Urdal 2014).

Finally, there is the potential challenge that inequalities of educational opportunities between individuals and groups could breed grievances and cause conflict. It has been argued that inequalities that follow group boundaries, such as religion or ethnicity, are particularly conflict-conducive, even more than inequality between individuals. Schooling policies might be used by governments to discriminate against certain minority groups, and this could enhance group grievances among disfavored groups and cause them to mobilize against the state to alter the status quo.

4.2 Health and Fertility

While during conflicts, the most obvious victims are the direct casualties, major losses of life and negative health effects also stem from the indirect consequences of armed conflict. Conflicts weaken societies' capacity to handle morbidity and mortality (Foege 2000), and have detrimental health effects through hampering food production and displacing populations (Bundervoet et al. 2009). Women are more vulnerable to indirect health consequences of conflict, and poor maternal and reproductive health (MRH) is likely to be a key contributor (Ghobarah et al. 2003).

A growing body of research suggests that there are significant challenges to improve maternal health post-conflict (see e.g. Urdal and Chi 2013). In a study of 42 African countries, O'Hare and Southall (2007) found that Maternal Mortality Ratios (MMRs) were 45% higher in post-conflict countries than in non-conflict countries. Determinants which directly influence maternal health outcomes include the general health status of the woman; her reproductive status; her access to (and quality of) reproductive health services; and her health care behavior (including her use of health services). Armed conflict may influence these determinants directly or indirectly through socioeconomic, political, and cultural factors, such as poverty, destroyed infrastructure, and reduced access to education. For a country to facilitate the demographic dividend it is crucial to have a well-functioning health care system which provides key MRH services.

The potential impact of armed conflict on fertility is an aspect of considerable relevance to the likelihood of an African demographic bonus. One of the features of the demographic transition is that the fertility rate drops, leading to a drop in the dependency burden. As a consequence, more families can afford to send their children to school, and future youth bulges are reduced. However, while we see declining dependency ratio across sub-Saharan Africa, some countries are still facing very high fertility rates. Guha-Sapir and D'Aoust (2010) argue that the lower availability of Maternal and Reproductive Health Services causes high child mortality, which prevents birth rates from declining. This scenario is typical for conflict settings, and Urdal and Chi (2013) find evidence for such dynamics in a study of country-aggregated fertility rates and armed conflict. In poor countries high-intensity armed conflict is

associated with higher fertility levels. This suggests that conflicted and post-conflict countries often experience a delayed fertility transition and greater challenges in reducing their fertility levels.

4.3 Differential Ethnic Growth

While the larger share of the literature focuses on the growth in the size of the population, it is also important to look at where and how the growth is occurring. How, if at all, do changes in the relative proportions of ethnic groups within a state affect the risk of civil war? In theory, this could work in two ways. On the one hand, waning majorities might launch a preventive war, either by passing legislation designed to prevent a rising minority from gaining influence commensurate with its increasing numbers, or by outright assault. On the other hand, a rising minority might demand redistribution, again ranging from increased access to various political and economic goods, or even outright independence (Toft 2007).

Indeed a number of prominent studies of ethnic conflict have suggested that when ethnic groups grow at different rates, this may lead to fears of an altered political balance, which in turn might cause political instability and violent conflict (Toft 2007). There is ample anecdotal evidence for such a relationship. The civil war in Lebanon, for example, has largely been attributed to a shift in the delicate ethnic balance in that state. Further, in the early 1990s, radical Serb leaders were agitating for the secession of 'Serbian' areas in Bosnia-Herzegovina by instigating popular fears that Serbs would soon be outnumbered by a growing Muslim population aiming for the establishment of a Shari'a state. Situations of differential growth may be aggravated by differential developments in age structures, potentially leading to economic and social development in areas and among groups with favorable age structures, and slower development among groups with larger youth bulges and higher dependency burdens.

4.4 Migration

Yet another part of the demography-conflict literature has explored the role of population movements. Most of this literature, as well as popular discussion, treat migration and refugee flows as a consequence of conflict rather than a potential cause. Some scholars, however, have noted that migration, and refugee migration in particular, can spur the spread of conflict both between and within states (see for example Lischer 2005).

Existing work suggests that environmentally induced migration can lead to conflict in receiving areas due to competition for scarce resources and economic opportunities, ethnic tensions when migrants are from different ethnic groups, and the exacerbation of socioeconomic 'fault lines' (Raleigh et al. 2008).

Similarly, Salehyan and Gleditsch (2006) point to spill-over effects, in the sense that mass refugee migration might spur tensions in neighboring or receiving states by imposing an economic burden and causing political instability. In particular, they argue that refugees can lead to the spread of violence through the expansion of rebel social networks both at home and in their host countries, and by posing negative externalities for receiving areas, such as negatively affecting economic conditions or changing the demographic profile of receiving areas. Based on a statistical analysis of refugees from neighboring countries and civil war onset during the period 1951–2001, they find that countries that experience an influx of refugees from neighboring states are significantly more likely to experience wars themselves.

4.5 Urbanization

For the first time in history, the majority of the world population now lives in cities. Global urbanization continues at a rapid pace, and the world's urban population is projected to increase by more than three billion people between 2010 and 2050. Some of this increase will be the result of high urban reproduction rates and reclassification of rural land into urban areas, but a significant portion of future urbanization will be caused by rural-to-urban migration. While urban populations generally enjoy a higher quality of life, many cities in the developing world have large slums with populations that are largely excluded from access to resources, jobs, and public services. In the environmental security literature, great rural resource scarcity, causing rural to urban migration, is seen as an important source of violent conflict.

Only a handful of statistical studies explore if and how changes in the size and composition of the urban population affect national security. One exception is Cincotta et al. (2003), who conduct bivariate comparisons which show that countries undergoing rapid urban growth are significantly more likely to experience civil conflict. In Urdal's (2005) global, multivariate study described earlier he uses the same data on urban population growth and civil conflict as Cincotta et al. (2003). He finds that urban population growth is not associated with civil conflict for the entire period covered by the study (1950–2000), and that urban population growth is actually negatively associated with civil conflict onset when only looking at the post-conflict period (1990–2000). In a recent contribution to the literature, Buhaug and Urdal (2013) highlight several issues implying that a rejection of a causal relationship between urbanization and political violence may be premature. Most importantly, they argue that the previous research conducts empirical analysis at too high a level of aggregation (i.e., the country-level), whereas most arguments link population pressure to local violence. In order to remedy this problem, Buhaug and Urdal use city-level data on population growth and political violence, drawing on the newly developed Urban Social Disorder data (Urdal and Hoelscher 2012) which covers 55 major cities in Africa and Asia. However, their results show that population growth in cities and urban disorder are at best causally unrelated (some models even indicate a reversed relationship). Buhaug and Urdal (2013) explain their

findings by noting the comparably higher living standards in urban centers, and the fact that population concentration tend to be vital for the development of industry and trade.

Buhaug and Urdal do not distinguish between city-level in-migration and natural population growth. A study by Østby (2016) however, drawing on household surveys, provides new city-level indicators of in-migration, poverty, and inequality for 34 cities in Africa and Asia during the period 1986–2006. This data is linked with the dataset on Urban Social Disorder (Urdal and Hoelscher 2012). The results suggest that it is not the actual movement of rural people into the cities that creates social upheaval. Rather, overall poor and unequal educational opportunities as well as socioeconomic marginalization of rural-urban migrants are found to spur increased levels of lethal urban political violence.

5 Conclusions

As with any other type of resource, the potential gain in the demographic transition lies in the way it is managed. A country with a large young population, where there are opportunities for education and the health care system is sufficient, where the job market is growing and businesses are thriving, has a much better chance of harvesting the demographic dividend. Unfortunately, these factors have been difficult to achieve in many African countries, particularly in war-torn and post-conflict countries where the infrastructure, health systems, schools, and economy have been worn down with years of conflict.

Institutional quality is the key to harvesting the fruits of the demographic dividend. For example, research suggests that institutional quality is decisive in the transformation of natural riches into economic development. A study by Halvor Mehlum, Karl Moene, and Ragnar Torvik, shows that in countries with higher institutional quality, the adverse effect of natural resources on economic growth is weaker; moreover, in countries with the healthiest institutions, the adverse effect does not occur at all (Mehlum et al. 2006). It could be assumed, therefore, that we would see a similar effect relating to a demographic shift. In post-conflict situations, the ability to ensure maternal health, education, and job opportunities depends to a large extent upon the quality and capacity of governance. Thus, many of the approaches described in this chapter depend on a post-conflict institutional framework that is at least partly functional. Since robust local and national institutions are crucial, institutional reform should be a peacebuilding priority.

For this reason, the management of large young cohorts in Africa could be a make or break issue for many countries. For those that successfully take advantage of the opportunity to establish economic growth, this could be the way out of conflict and poverty. However, for others who are not able to manage this transition, or for those which are experiencing large migration and urbanization and where the *youth bulge* effect is much more visible, they might sink deeper into the conflict trap.

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Conclusions

Hans Groth and John F. May

This academic volume provides new insights and experts' views into one of the greatest demographic challenges and its potential geopolitical implications in the twenty-first century, namely the current and prospective population dynamics of the African continent.

The analyses presented in the first section of the book, *Sub-Saharan Africa's Population: Country and Regional Case Studies*, highlight the demographic challenges of the 48 sovereign countries of sub-Saharan Africa (SSA), especially the slow decrease of their high fertility levels. The total fertility rate for the entire SSA region has decreased from 6.7 children per woman on average in 1970 to only 5.0 children in 2015–a decline of less than 0.4 children per decade, a slow pace compared to the fertility transitions in other parts of the world. This first section examined the implications of these trends for the prospects to open a demographic window of opportunity and, thereafter, to capture a first demographic dividend (DD). The concept of the DD refers to the accelerated economic growth resulting from the changes in the age structure of the population. However, without the right policies and expanded access of the youth to employment, this potential bonus can rapidly turn out into a major challenge.

SSA countries are extremely different from each other as well as very diverse internally. The analysis explained why they are all at different stages of their demographic and, especially, their fertility transitions. Across sub-Saharan Africa, the total fertility rate varies from 7.6 children per woman in Niger to 2.6 in South Africa (fertility is lower in several small island-countries lying outside continental Africa).

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However, 62% of the SSA population still lives in countries where women give birth to five or more children on average. Among the 21 countries of the world with such high levels of fertility, only two, Afghanistan and Timor-Leste, are not located in SSA. As a whole, SSA is still very far away from achieving the women's health improvements in terms of information and access to services as well as the contraceptive revolution (when at least 70% of couples use a modern method of contraception) that are needed to usher a regime of low fertility. From the perspective of sustainable development for a nation in the twenty-first century, this should be a fertility level of three children per woman or less. Such lower levels of fertility are a necessary condition to balance the ratios of young dependents relative to the working age population, which is the *sine qua non* condition to capture a first DD.

Among the three largest countries of SSA, only Ethiopia appears to be on the way of reducing significantly its high fertility levels, and has already achieved an impressive decrease in fertility of three children per woman between 1990 and 2015. In these 25 years, fertility decreased on a national level from 7.2 to 4.1 children per woman, which is a sharp decline of 1.24 children per decade (this is three times the average fertility decline for SSA as a whole between 1970 and 2015). However, there are large urban/rural differentials in Ethiopia, like in many other SSA countries. Nigeria, the most populous country in SSA, and the Democratic Republic of the Congo still experience very high levels of fertility of 5.5 and 6.6 children per woman, respectively. But there are also promising developments: South Africa, an economic heavy-weight in SSA, has seen its fertility rates decline steadily from 6.1 children per woman in 1960–1965 to 2.4 in 2010–2015 (a decline of 0.7 children per decade over a period of 50 years). However, the catastrophe of the HIV/AIDS epidemic has precluded South Africa's prospects of capturing a demographic dividend. Still, the most problematic situations with nearly no fertility reductions at all are to be found in the Sahel region. The Sahel countries have the highest fertility rates in SSA (e.g., 7.6 children per woman on average in Niger), and their human capital prospects are bleak. These countries are also threatened by insecurity and social disruption, and it should be mentioned that the challenge of climate change is not even taken into account in these pessimistic forecasts.

Turning to the *Drivers of the Demographic Dividend*, which are covered in the second component of this book, a chapter on the demographic dividend in Asia and sub-Saharan Africa raised some key questions, in particular how to calculate the number of dependent children and how to define the active workers because many adults are either unemployed or underemployed. As the chapter demonstrated, more pragmatic and detailed definitions of some key parameters of the DD are needed, especially those pertaining to the numbers of active adults and their young dependents.

With respect to fertility, which is the key driver of demographic change, the analyses presented in this book demonstrate again the huge diversity of situations. However, some fertility determinants are open to policy interventions. Therefore, broader and unrestricted access to family planning, the provision of women's health services, and the patterns of early marriage (marriage before age 18) will all need much more attention.

The prospects for health and life expectancy improvements in SSA appear promising, although some regions of the continent are affected by re-emerging and/or new infectious diseases such as HIV/AIDS, malaria, and tuberculosis. More recently, the outbreak of Ebola affected several coastal countries of Western Africa. The emergence of the Zika virus in Brazil in 2015 is another potential threat. Some countries are also facing a dual burden of disease, caused by the concomitant plight of both infectious and non-communicable diseases (chronic health conditions). Moreover, there is a third burden on the horizon: sooner or later, all SSA countries will need to tackle the issue of population aging. The United Nations project that the median age of the sub-Saharan population should increase from 18.3 years in 2015 to 34.2 years in 2100.

Sub-Saharan Africans are also very mobile. This is captured in the analysis of internal and international migration patterns, with a focus on the time period 1990–2010. Africans mostly migrate from rural areas to cities, but also across neighboring countries as well as throughout the continent. Despite their broad coverage in the Western media, African migration flows to Europe remain still at modest levels although this situation will probably change in the coming decades. Rapid urbanization and the emergence of slums (in the largest cities) are also major challenges that are linked in several ways to the capturing of a first demographic dividend.

The greatest challenges of all, however, appear to be those linked to manpower, education, skills, and employment. The International Monetary Fund (IMF) has estimated that 18 million new jobs are needed in SSA every year. In other words, SSA needs to create *every year* as many jobs as there are inhabitants today in Burkina Faso. Over the next 25 years, this amounts to a staggering total of 450 million new jobs. Unless the youth finds meaningful and decent employment, sub-Saharan societies are at great risk of facing an African version of the Arab Spring.

Sub-Saharan Africa also faces huge development issues, which were addressed in the third part of this volume, *Development Challenges*. Despite encouraging economic growth in recent years, SSA countries still need to diversify and strengthen their economies. This means not only improving the productivity of the agricultural sector, which will provide the bulk of the needed employment, but also increasing the productivity of the services and, more importantly, expanding the manufacturing sector.

Good governance (transparency and accountability), and the rule of law will be major policy levers that will be needed as the "solid ground floor" in order to facilitate future socioeconomic development.

The management of natural resources will also need improvement. Africa has more resource-rich states than any region in the world. However, the challenge will be to use judiciously those resources in order to help capturing a first demographic dividend.

Several regions of the continent face the threat of climate change, which will impinge on their prospects to achieve both food and water security. Again, the Sahel region comes to the fore, and so does the Horn of Africa. These fragile ecosystems cover huge areas, and their populations have the fastest demographic growth and the lowest levels of human development of the entire continent.

Agricultural commodities are a key component of ensuring food security as well as a major engine of the sub-Saharan economic growth. It is therefore important to explore new ways to better organize commodity exchanges in order to improve the market access of small farmers and safeguard their income from price fluctuations.

The last section of this book, *Assembling Sub-Saharan Africa's Jigsaw*, attempted to bring together the various threads and challenges that were covered in the research presented here. The main question is whether SSA will be able to undergo a rapid demographic transformation, similar to the one that has occurred in the countries of East Asia. These countries have often experienced significant fertility transitions in 30 years or less. For instance, Thailand achieved a decline of 3.7 children per woman between 1965–1970 and 1985–1990, a decrease of almost two children per decade.

On this count, however, the analysis presented in this volume points to rather mixed prospects. To be sure, the modeling of the demographic dividend indicates clearly the policy levers that could be used to open a demographic window of opportunity, which in turn could lead to capturing a first demographic dividend. Governments, the private sector, and the international community should rekindle their efforts. Their respective roles and contributions will be crucial as well. In particular, governments will need to demonstrate a much stronger commitment to tackle the high fertility levels.

Unfortunately, all these policies cannot be implemented everywhere in the continent, because several sub-regions of SSA are plagued by protracted conflicts and civil strife. Moreover, politicians always have a difficult time to envisage demographic processes that take much longer than the 4–5-year election-cycle of most countries.

As the conclusion of this book, several questions come to mind:

- The future of Africa starts with the management of its fertility. In this respect, what should be done, what could be achieved, and in which time frame?
- What are the main lessons learned from other parts of the world, in particular from Asia and some Muslim countries like Bangladesh, the Islamic Republic of Iran or Indonesia? For example, in one decade only, between 1985–1990 and 1995–2000, Iran achieved a decline of three children per woman. This demonstrates that rapid change is possible.
- Last but not least, what actionable recommendations could be put forward for sub-Saharan African policymakers and leaders? Here, the experience of some countries that have achieved rapid fertility transitions should come to bear, albeit some of these countries, like Iran, are now facing the challenge to create enough jobs for their youth.

Again, the key driver of the future demographic outcomes in SSA will be the pace of fertility decline in the coming two or three decades. On this front, with the exception of some countries (Ethiopia, Ghana, Kenya, Malawi, Rwanda, South Africa, etc.), it must be stressed that during the past 40 years very few SSA countries have implemented strong and efficient programs to accelerate their fertility transitions. African policymakers and leaders will need to be much more proactive on this front. Today, all emerging market economies are to be found in countries

where the total fertility rate is lower than three children per woman. According to the UN Population Division, SSA will not reach the critical threshold of three children per woman until 2055 (Medium Variant of the 2015 population projections), whereas the number of youth will grow exponentially in the meantime.

In fact, there will be no capturing of a first demographic dividend unless fertility rates decline rapidly and sharply in the SSA region. To reach this stage, SSA countries will need to improve and speed up women's health prospects and usher the contraceptive revolution. This has been achieved in all emerging market economies, including several large Muslim countries (Bangladesh, Indonesia, and the Islamic Republic of Iran), often over a time period of three decades or even less.

This decline in fertility rates will in turn facilitate the formation of human capital, namely education and health, which is another necessary prerequisite to capture a first demographic dividend. One should remember that the African young generation needs three things: a good health, a solid education, and last but not least a well-paying job as well as investments in jobs and supporting infrastructure. If the rapid and unprecedented demographic growth of SSA is a powder keg, the detonator might well turn out to be the unavailability of new jobs.

At this juncture, it has become clear that no single policy by itself will bring the needed changes. The analysis collected in this volume illustrates the diversity and complexity of the various situations as well as the interdependencies of the numerous drivers. This volume also highlights the need to design holistic and comprehensive policies. As such, the supply of family planning services alone will make no major difference, unless fertility norms are also modified. Efforts focused only at education will make no major difference either, as the growing number of school children may soon just overwhelm the education sector. Similarly, improving health or reducing all sorts of mortality conditions in isolation is no promising development recipe by itself. Finally, hopes for economic growth *per se* to "solve" the population issues at hand are woefully misplaced, especially as population and social policies will be needed also to achieve poverty reduction and shared prosperity as well as to reduce inequality.

Again, what is needed at this stage of Africa's population dynamics is a comprehensive development strategy, a strategy that would be truly demography-informed. Such a strategy has to take into account economic development, health, social, and cultural dimensions, as well as the political and good governance issues. This new strategy would help implement *concomitantly* several multisector interventions.

The goal of this volume is to help craft a bold vision and time schedule for the future of sub-Saharan Africa in the twenty-first century. In particular, the book is a call for African policymakers and their partners to take urgently the necessary actions that will determine not only the socioeconomic future of their own region, but also the future of the world at large.

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