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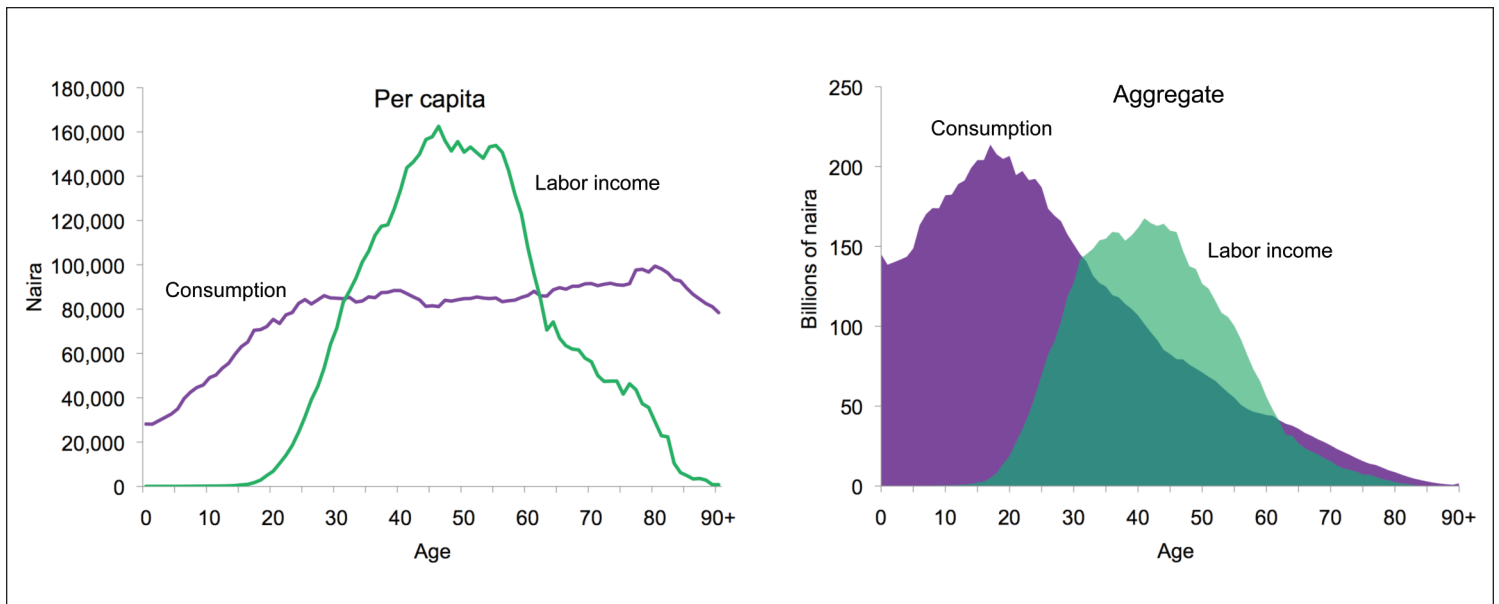
## Population Change and Economic Growth in Africa

In June 2013, the United Nations (UN) released its latest set of biennial population projections, *World Population Prospects*. One of the most striking changes comes from Africa, where fertility estimates for many countries have been revised substantially upwards.

“Although population growth has slowed for the world as a whole, this report reminds us that some developing countries, especially in Africa, are still growing rapidly,” said the Under-Secretary-General for Economic and Social Affairs, Wu Hongboan.

Commenting to the *Los Angeles Times*, the Population Council’s John Bongaarts expressed concern that rapid population growth will increase hunger and poverty in African countries where food, water, and farmland are already in short supply. The latest UN projections offer “a warning sign that people in Africa are in more trouble than we thought.”

Apart from increasing the total number of people who must be supported on a limited resource base, high fertility has a strong distorting effect on population age structure. High-fertility populations are dominated by large numbers of dependent children, leaving few resources to boost current consumption or to save and invest for the future. Even resources for the children themselves—for child health and education—are swamped by the numbers.



**Figure 1. Per capita (left) and aggregate (right) consumption and labor income by age in Nigeria, 2004.**

Source: Calculated from NTA data.

A look at consumption and labor income for one-year age groups in Nigeria illustrates the dilemma. Spending on each child in a high-fertility society such as Nigeria tends to be low because available resources have to be divided among so many children (Figure 1, left). When calculated for the population as a whole, however, children dominate overall consumption (Figure 1, right) because the child population is so large.

The demographic situation in Africa contrasts sharply with trends in most other parts of the world. In East Asia, for example, fertility declined very rapidly over the past 60 years, slowing population growth and creating dramatic changes in population age structure.

With fewer dependent children relative to the number of productive workers, countries such as Japan, South Korea, Indonesia, and Thailand enjoyed an immediate and striking acceleration of economic growth, which has been termed the “first demographic dividend.” Investment of the resources gained from this demographic jump-start ushered in a “second demographic dividend” that has provided the basis for sustained economic development.

But will Africa enjoy an economic boost as seen in Asia? The timing and magnitude of each country’s demographic dividend depend on population change, economic conditions, and the policies that influence them.

This issue of the *NTA Bulletin* explores the current situation in lower- and middle-income countries in Africa and describes the possibilities for economic growth given alternative demographic trends. The discussion is based on analysis conducted by the National Transfer Accounts (NTA) project for seven African countries—Ethiopia, Ghana, Kenya, Mozambique, Nigeria, Senegal, and South Africa. Lee and Mason (2011) provide a comprehensive overview of the NTA project’s methodologies, analysis, and results.

### Changes in population age structure

Apart from a population’s overall size and growth rate, its age structure is important because people consume more than they produce for extended periods at the beginning and end of life. The periods of dependency that occur over the economic lifecycle are made possible by the public and private transfer of resources between

age groups. And these transfer systems are strongly affected by changes in population age structure.

Changes in age structure are an inevitable consequence of a demographic transition that has occurred all over the world. Before the transition, high fertility is balanced by high mortality. Then mortality—particularly infant and child mortality—starts to go down. Population growth accelerates, and the share of children in the population can increase dramatically. Many countries in Africa are currently at this stage of the demographic transition.

In other parts of the world, countries responded to this dilemma by reducing fertility, in some cases very rapidly. As a result, the number of children needing support declined relative to the number of workers and taxpayers. At the same time, the number of elderly people remained small. With relatively few children and few old people, the proportion of the population in working ages reached an all-time high, and many countries enjoyed an immediate boost to economic growth.

Population age structure does not tell the whole story, however. How much labor income people earn and how much they

consume at each age vary considerably across countries depending on culture, infrastructure, economic conditions, public policies, and individual choices. In some countries, for example, 20-year-olds tend to be economically self-sufficient, while in other countries they rely heavily on their parents and their governments for support.

For this reason, the NTA project constructs a refined measure of each country's workforce that incorporates age differences in employment and wages. This makes it possible to estimate the number of effective workers for one-year age groups at each stage of the economic lifecycle. Consumption, which is defined to include both private consumption and goods and services provided by the public sector, is also measured for each one-year age group.

A comparison of trends in the number of effective consumers and workers in two

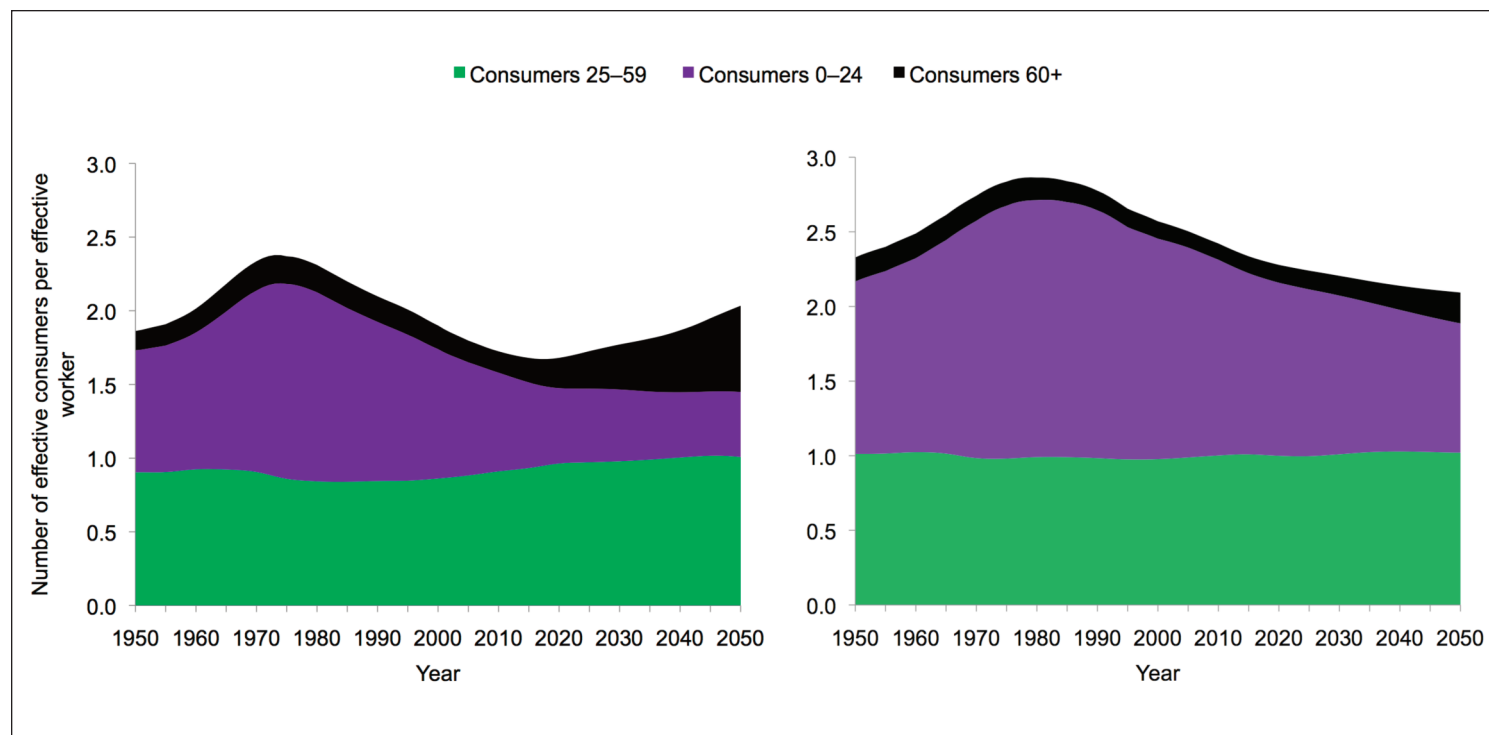
countries illustrates the potential for economic growth linked to very different demographic patterns. In Vietnam (Figure 2, left), the population of young consumers grew rapidly during the 1950s and 1960s, peaked in the late 1970s, and then began going down rapidly with steeply declining fertility. Today, Vietnam is in a very favorable position for economic growth, with relatively few consumers for each worker.

In Kenya (Figure 2, right), the population of young consumers reached a much higher peak in the early 1980s, linked to earlier levels of fertility that were extraordinarily high. Since then, fertility has been declining, but much more slowly than in Vietnam. Even in 2050, when the population of elderly dependents in Vietnam will be much larger, each worker in Kenya will still be supporting many more consumers than in Vietnam.

## The support ratio

The support ratio, calculated as the number of effective workers divided by the number of effective consumers, provides a useful summary measure of how population age structure affects economic performance. A support ratio of 48, the average value for Africa, means that every 48 effective workers are supporting 100 effective consumers. By contrast, with a support ratio of 58, Vietnam has 10 more effective workers for each 100 effective consumers than the average for Africa.

What might the future hold for Africa? The UN projects population age structure under four fertility scenarios. The medium scenario is based on the recent trend in the total fertility rate (TFR, the average number of births per woman), while the high and low scenarios assume that the TFR is one-half child higher or lower than the medium



**Figure 2. Effective number of consumers (children, working-age adults, and the elderly) for each effective worker in Vietnam (left) and Kenya (right), 1950–2050.**

Sources: Calculated from NTA data; population estimates and projections from United Nations 2013, medium-fertility variant.

Note: To facilitate international comparisons, NTA defines one effective worker as a person earning the average labor income of the prime working-age group of 30–49. Those in each one-year age group are counted as more or less than one effective worker based on their average labor income. The effective number of consumers is calculated similarly by comparing the average per capita consumption at each age with average consumption at ages 30–49. Values are based on population estimates for 2010 and estimates of consumption and labor income by age for 2008 in Vietnam and 2005 in Kenya.

scenario. The constant-fertility scenario assumes no change in fertility from the current level.

Table 1 shows the support ratio in 2010 for seven African countries plus projections for 2030 and 2050 assuming the UN's medium-fertility scenario. As background, the first two columns give current TFR and per capita gross national income (GNI) based on estimates from the UN and the World Bank.

In 2010, the support ratio was much higher in Senegal and South Africa than in the other countries. Why was this the case? South Africa, with a TFR of 2.4 children per woman, is much further along in the demographic transition than the other countries. And Senegal's support ratio is high because of an unusual pattern of labor income, with people earning a substantial income at relatively young and old ages.

Assuming the current rate of fertility decline, the support ratio will improve in every country over the next four decades. Improvement will be largest in Ethiopia and Ghana and smallest in Nigeria.

### A closer look at the economic lifecycle

The economic lifecycle is important because people consume and earn labor income at very different levels over the course of their lives. In Africa, as in other regions of the world, labor income rises for those in their 20s, reaches a peak in the 40s or 50s, and declines thereafter. There are important variations within this broad pattern, however, stemming from differences in employment levels and income earned by workers in different age groups.

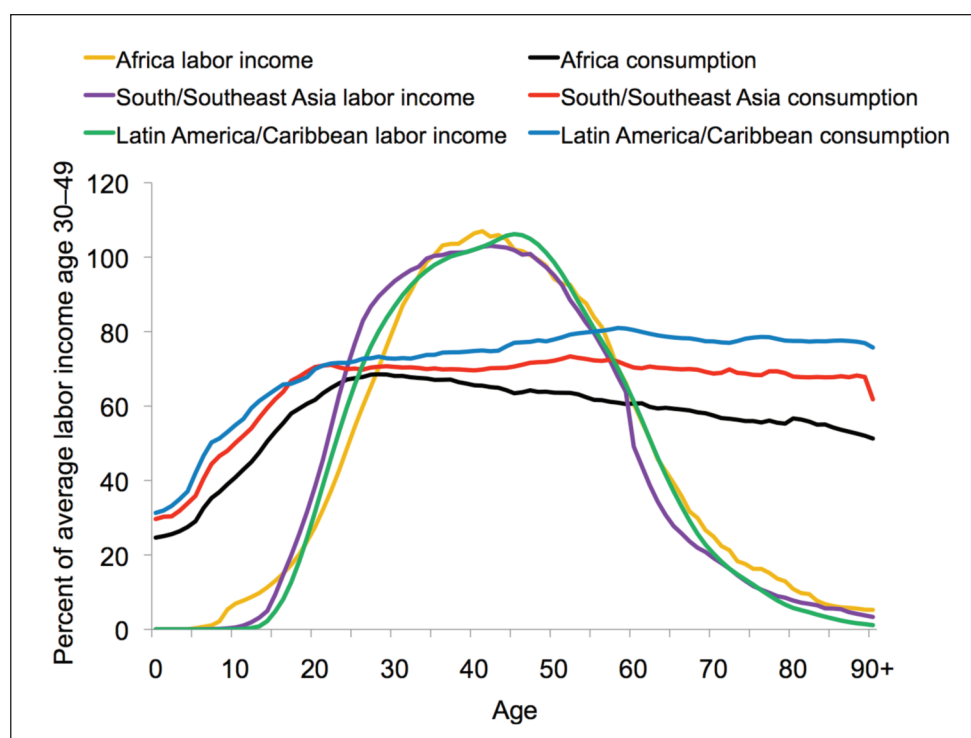
Labor income at specific ages can be compared meaningfully across countries and regions when it is expressed as a proportion of average labor income at the prime earning years of 30–49. For example, people age 40 might, on average, earn more than people in the prime working-age group as a whole, in which case their average labor income would be greater than 100 percent of the income of prime-age adults. A young adult age 20 and an

**Table 1. Total fertility rate, gross national income, and support ratio for seven African countries.**

Country and NTA base year	Total fertility rate (TFR) 2010–2015	Gross national income (GNI) per capita, 2012 (PPP international dollars)	Support ratio (effective number of workers per 100 effective consumers)		
			2010	2030	2050
Ethiopia 2005	4.6	1,140	44	52	58
Ghana 2005	3.9	1,940	47	54	60
Kenya 2005	4.4	1,760	41	45	48
Mozambique 2008	5.2	1,020	49	51	56
Nigeria 2004	6.0	2,420	42	43	44
Senegal 2005	5.0	1,920	60	64	68
South Africa 2005	2.4	11,190	54	58	60

Sources: TFR from United Nations 2013; GNI from World Bank 2013; support ratio calculated from NTA data.

Note: The effective number of workers sums the population in each one-year age group, weighted to incorporate age differences in employment and productivity estimated for the base year. The effective number of consumers sums the population in each one-year age group, weighted to incorporate age differences in consumption estimated for the base year. Values for 2030 and 2050 are based on UN medium-fertility projections.



**Figure 3. Per capita consumption and labor income by age for Africa, South and Southeast Asia, and Latin America and the Caribbean.**

Source: Calculated from NTA data.

Note: Calculated as a proportion of labor income at age 30–49. Regional averages for Africa are based on data from Ethiopia, Ghana, Kenya, Nigeria, Mozambique, Senegal, and South Africa; averages for South and Southeast Asia are based on data from Cambodia, India, Indonesia, the Philippines, Thailand, and Vietnam; averages for Latin America and the Caribbean are based on data from Argentina, Brazil, Chile, Colombia, Costa Rica, Jamaica, Mexico, Peru, and Uruguay. All data are for a recent year that varies among countries.



elderly person age 70 are both likely to earn considerably less than a person age 30–49, so their average labor income would be less than 100 percent of a prime-age adult's income.

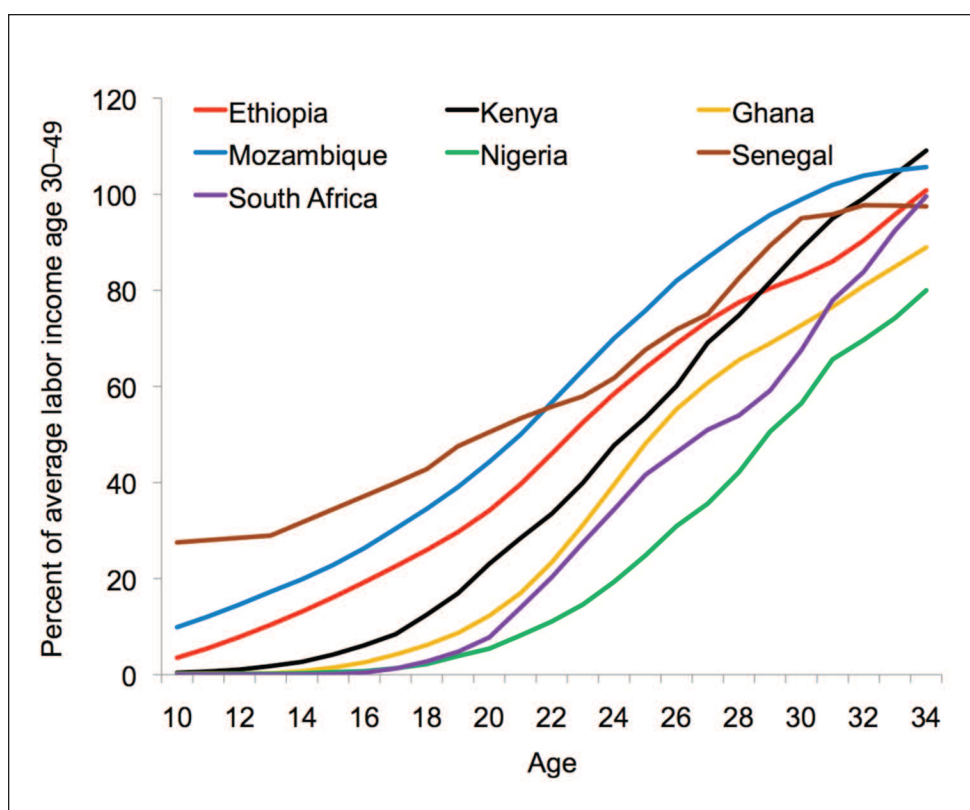
Compared in this way, the average labor income of a 25-year-old in Africa is 55 percent of the average labor income of a prime-age adult (Figure 3). By comparison, in South and Southeast Asia a 25-year-old earns 77 percent, and in Latin America and the Caribbean a 25-year-old earns 66 percent of the income of a prime-age adult.

Although young people in Africa may begin earning some income at an early age, throughout their 20s their labor income lags behind that of their counterparts in the other two regions. They only catch up in their early 30s. Workers in general tend to have low labor income in Africa, but this problem is compounded by the special barriers that appear to confront young adults entering the labor market.

Among individual African countries, young people begin earning an income earliest in Senegal and Mozambique and latest in Nigeria and South Africa (Figure 4). Compared with labor income at prime working ages, young people earn the least throughout their 20s and early 30s in Nigeria, South Africa, and Ghana.

This late rise in labor income stems from low wages and low employment among young adults. It suggests that many young people are, at least to some degree, financially dependent on their families for many years.

Turning to consumption, the contrast between NTA member countries in Africa and those in other regions is striking. A young person in Africa consumes, on average, 65 percent of consumption by a prime-age adult, while a young person in East Asia consumes 91 percent of an adult's consumption (Table 2). Values for other regions fall in between these two extremes. Among the seven African countries, consumption by young people is lowest in Nigeria and South Africa.



**Figure 4. Per capita labor income at age 10–34 in a recent year in seven African countries.**

Source: Calculated from NTA data.

Note: Values are expressed as proportions of average per capita labor income in each country at age 30–49. All data are for a recent year that varies among countries.

**Table 2. Annual per capita consumption by children and young adults as percent of consumption by prime-age adults.**

Country or region	Annual per capita consumption at age 0–24 (% annual per capita consumption age 25–64)		
	Private	Public	Combined
<b>Africa</b>	<b>57</b>	<b>131</b>	<b>65</b>
Ethiopia	66	123	67
Ghana	56	144	65
Kenya	58	142	69
Mozambique	62	144	70
Nigeria	56	102	59
Senegal	60	125	66
South Africa	42	139	59
<b>Latin America &amp; Caribbean</b>	<b>61</b>	<b>156</b>	<b>73</b>
<b>South &amp; Southeast Asia</b>	<b>66</b>	<b>169</b>	<b>77</b>
<b>Europe &amp; US</b>	<b>59</b>	<b>177</b>	<b>86</b>
<b>East Asia</b>	<b>76</b>	<b>153</b>	<b>91</b>

Source: Calculated from NTA data.

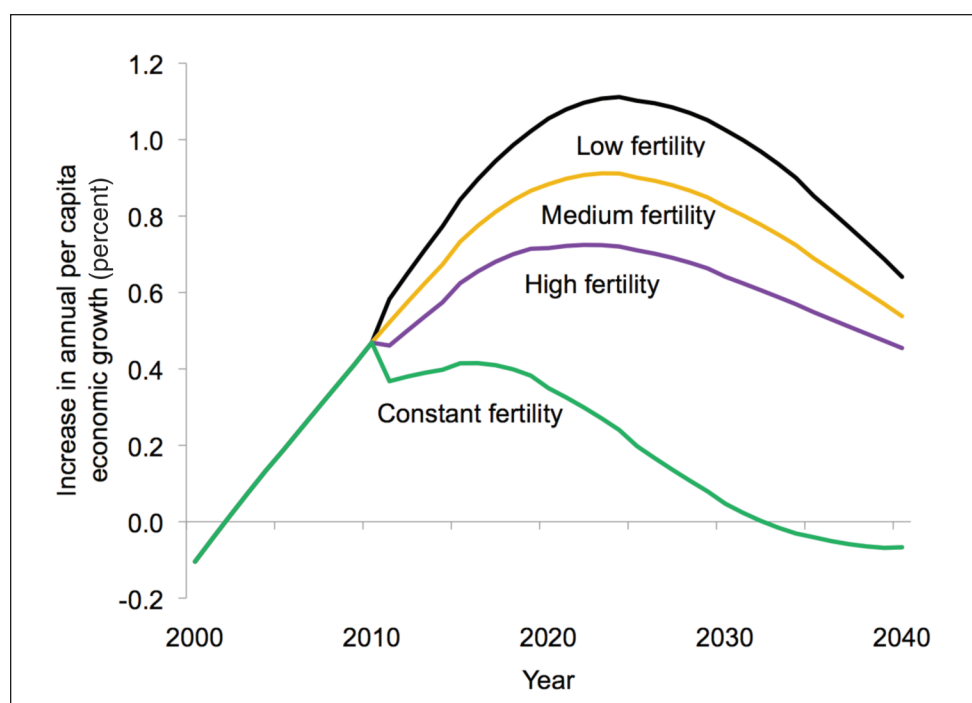
## Accelerating fertility decline and the first demographic dividend

The first demographic dividend occurs because of the effect of fertility decline on the number of dependent children. Rapid fertility decline increases the proportion of workers in the population, which accelerates growth in per capita income. Countries in East Asia were particularly successful in realizing large demographic dividends, in part, because their fertility decline was so rapid.

The potential for a demographic dividend in African countries is directly linked to a decline in birth rates that shifts the population's age structure away from a pattern dominated by large numbers of dependent children. For all seven countries discussed here, the most favorable of the UN's fertility scenarios is the low-fertility scenario. In Ethiopia, for example, a rate of fertility decline following the UN's low-fertility scenario would immediately boost per capita income growth by one-half percent per year, rising to more than one percent per year between 2020 and 2030 (Figure 5).

The worst-case scenario would be no change from the current fertility level. In the first two decades, the impact would still be positive because of Ethiopia's previous fertility decline, but it would be relatively small. And the country's population age structure would eventually impose a drag on economic growth.

The UN's low-fertility projections indicate a cumulative boost to per capita income of at least 12 percent for all countries by 2040 (Table 3). The projections look most promising for Ethiopia and Ghana and least promising for Nigeria. If Ethiopia can reduce child-bearing in line with the UN's low-fertility variant, the first demographic dividend could boost the Ethiopian economy by an impressive 32 percent.



**Figure 5. First demographic dividend for Ethiopia, based on UN population estimates and low-, medium-, high-, and constant-fertility projections, 2000–2040.**

Sources: Calculated from NTA data; population estimates and projections from United Nations 2013.

Note: The first demographic dividend is the increase in per capita economic growth due to changes in the support ratio. See Lee and Mason (2011) for additional details.

**Table 3. The first demographic dividend: Cumulative projected percentage increase in per capita income from 2010 to 2040, based on the UN's low-, medium-, high-, and constant-fertility projections.**

Country and NTA base year	Cumulative percentage increase, 2010–2040			
	Low fertility	Medium fertility	High fertility	Constant fertility
Ethiopia 2005	32.1	26.1	20.8	6.4
Ghana 2005	29.6	22.4	16.0	10.1
Kenya 2005	20.1	14.0	8.5	2.1
Mozambique 2008	13.5	9.2	5.4	-1.0
Nigeria 2004	11.5	6.5	1.8	-1.1
Senegal 2005	13.3	10.0	7.0	3.4
South Africa 2005	17.6	10.5	4.2	5.0

Source: Calculated from NTA data.

## Improving worker productivity by investing in child health and education

Particularly low consumption by children and young adults, as observed in Africa's high-fertility countries, has serious implications for their current wellbeing and may also inhibit their development into fully productive adults. The first demographic

dividend, among other advantages, can free up resources to increase investment in the health and education of children. As these children grow older and enter the labor force, earlier investments in their health and education will have a favorable impact on the economy by boosting worker productivity, contributing to a second demographic dividend.

Regional differences in spending on child health and education are dramatic, with spending lowest in Africa (Table 4). Total human-capital investment in each child ranges from less than two years of the average labor income of a prime-age adult in Africa to more than four years in Europe and the United States. Among African countries, human-capital investment is highest in Ghana, Nigeria, and South Africa and lowest in Senegal.

In most countries around the world, fertility decline has been accompanied by increased per capita spending on the health and education of children (Lee and Mason 2010). Estimates from 32 NTA member countries confirm a strong link between low fertility and high investment in child health and education.

If this widely observed relationship between fertility and investment in children extends to Africa, then per capita spending on children should increase as fertility declines. Of course projections of future fertility decline must be treated with caution, but if, for example, childbearing in Ethiopia goes down in line with the UN's low-fertility projection, then investment in each child is predicted to increase by an additional 67 percent over the next 10 years and by an additional 141 percent over the next 30 years (Table 5). If fertility declines in other African countries, per capita spending on children's health and education will also increase, although not quite as rapidly as in Ethiopia.

Another important feature of investment in children is the balance between public and private spending. In Nigeria and Ethiopia, a very large proportion of spending on children's health and education comes from families rather than from the government. In this situation, human-capital investment is primarily benefitting the children of relatively wealthy families. In Ghana, Kenya, Mozambique, and South Africa, a much larger proportion of spending on children comes from the government. This suggests that education and health resources may be distributed more equitably, depending on how government programs are implemented.

## Expanding earning opportunities for young adults

Apart from fertility decline and investment in the health and education of children, the single most important factor influencing a country's potential for a demographic dividend is the age profile of labor income. Around the world, the lowest support ratios are found in countries where young adults

have low employment and low incomes (Mason and Lee 2012). And low support ratios act as a drag on economic growth. One important component of labor income for young adults is the level of employment opportunity and income earned by young women (Bloom et al. 2009).

Analysis of the economic lifecycle underlines the critical importance of the

**Table 4. Lifetime spending on the health and education of children.**

Country or region	Lifetime human-capital spending per child (% average annual labor income age 30–49)		
	Private	Public	Total
<b>Africa</b>	<b>83</b>	<b>98</b>	<b>181</b>
Ethiopia	107	32	139
Ghana	97	139	236
Kenya	34	97	131
Mozambique	20	137	157
Nigeria	191	21	212
Senegal	46	65	111
South Africa	89	196	285
<b>Latin America &amp; Caribbean</b>	<b>120</b>	<b>206</b>	<b>326</b>
<b>South &amp; Southeast Asia</b>	<b>91</b>	<b>151</b>	<b>242</b>
<b>Europe &amp; US</b>	<b>45</b>	<b>377</b>	<b>422</b>
<b>East Asia</b>	<b>143</b>	<b>247</b>	<b>390</b>

Source: Calculated from NTA data.

Note: Lifetime human-capital spending per child is a synthetic cohort measure constructed by cumulating per capita health spending for ages 0–17 and per capita education spending for ages 3–26.

**Table 5. Estimated percentage increase in human-capital spending per child in 2020–25 and 2040–45, compared with a base year, for three fertility scenarios in seven African countries.**

Country and NTA base year	Percentage increase due to fertility decline					
	2020–2025			2040–45		
	High fertility	Medium fertility	Low fertility	High fertility	Medium fertility	Low fertility
Ethiopia 2005	32	47	67	71	99	141
Ghana 2005	11	24	42	31	51	79
Kenya 2005	11	23	39	33	51	76
Mozambique 2008	8	18	30	35	52	74
Nigeria 2004	1	9	18	25	38	53
Senegal 2005	7	17	30	29	45	66
South Africa 2005	–1	18	46	8	31	69

Source: Calculated from NTA data.

Note: Lifetime human-capital spending per child is a synthetic cohort measure constructed by cumulating per capita health spending from ages 0–17 and per capita education spending from ages 3–26.

age pattern of labor income. A look at labor income by one-year age groups shows that young people in African countries earn less, compared with the labor income of prime-age adults, than their counterparts in South and Southeast Asia or Latin America and the Caribbean (Figure 3). Among individual countries, labor income for people in their 20s is lowest in Nigeria and South Africa (Figure 4).

These findings are particularly troubling because young adults represent a very large proportion of the populations of these countries. In every country covered by this analysis, young people age 15–34 comprise about one-third of the entire population, ranging from 33 percent in Mozambique and Nigeria to 36 percent in Ethiopia and South Africa (United Nations 2013).

Even when they are employed, young people are more likely than prime-age workers to have poor job security and low wages. The immediate effect is to delay and shorten the period of life in which there is a surplus of income over consumption. Over the longer term, international evidence suggests that youth unemployment has a scarring effect on wages in later life. This lowering of future earnings potential may limit the ability of prime-age workers to save and invest for the future, thus curtailing opportunities for their countries to enjoy a second demographic dividend.

### Some observations for policymakers

In order to achieve a robust demographic dividend, policymakers in Africa's high-fertility countries need to focus first and foremost on fertility decline. As illustrated in Table 3, the greatest improvements in economic growth will occur at the lowest projected levels of fertility.

A first demographic dividend, achieved through lower fertility, can increase the resources available to save and invest, both in physical capital and in the health and education of children. Per capita investment in children, both to provide for their overall consumption and to support their health and education, tends to lag in Africa (Tables 2 and 4), in part because

of the region's extraordinarily large child populations.

All over the world, per capita investment in children has tended to increase as fertility goes down. It is important that African countries follow this path, both to assure the wellbeing of children today and to boost the productivity of the workforce tomorrow.

Investments in children do not achieve a maximum economic impact, however, unless they are accompanied by a robust job market. If young adults can find productive employment, they will be able to enjoy higher consumption, invest in their own children, and set money aside for the future.

Post-apartheid South Africa, for example, has seen significant reductions in fertility and gains in young people's educational attainment. The inability of the economy to absorb young workers, however, has brought soaring unemployment rates, even among those who have completed secondary school. Widespread unemployment, the potential wage scarring for large numbers of unemployed youth, and the possibility of weakened investment in child health and education not only threaten Africa's first demographic dividend, but also its second.

Policymakers can support a second, sustained demographic dividend by encouraging investment—investment that contributes to high productivity and economic growth. Governments need to create an economic environment that helps working-age populations save and invest. Well-functioning financial markets, a strong banking system, secure property rights, a competitive economy, and financial literacy all play a role in assuring the economic security of all age groups.

In addition to general measures to assure a sound economic environment, policymakers in Africa need, in particular, to promote rapid fertility decline, investment in the health and education of children, and job growth for young adults. These are key requirements if African countries are to enjoy a strong demographic dividend.

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