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Prospects for Economic Growth in Nigeria: A Demographic Perspective

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We quantify the potential for economic growth created by Nigeria's demographic transition. Using a cross-country economic growth model, we first estimate the size of the demographic dividend Nigeria could enjoy under appropriate enabling conditions. Then, using an original analysis of the economic lifecycle of Nigeria's population, we explore the conditions needed to realize the dividend, focusing particularly on labor productivity and investments in health and education. We conclude with a policy discussion on the challenges Nigeria must overcome to realize its full potential for economic growth.

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1   Introduction

Nigeria's political and economic prominence within Africa, along with the country's position on the threshold of a major demographic transition, raises three related questions: (1) What is the potential for economic growth created by Nigeria's demographic transition? (2) What conditions must exist for the country to realize this potential and to sustain higher standards of living once the demographic transition is over? And (3) what are the challenges Nigeria will face in creating those conditions?

To answer the first question, we use a cross-country econometric model to estimate the following effects of demographic change by 2030 as compared with a business-as-usual scenario: the added per capita income, the additional size of the economy, and the number of people who can be lifted out of poverty because of added growth. To provide answers to the second question, we use an economic lifecycle analysis that highlights some surprising features of Nigeria's economy. To shed light on the third question, we discuss the policy challenges Nigeria faces in utilizing its demographic potential, and the opportunities it will see if it does realize this potential.

Our work builds on the concept of the "demographic dividend," the idea that economic growth in a country is correlated with an increase in the share of the population that is of working age (i.e., ages 15–64). For most low- and middle-income countries, changes in population age structure follow a well-observed pattern in which countries move from a high-fertility and high-mortality regime to one characterized by low fertility and low mortality (Bloom and Canning, 2008). These changes usually happen asynchronously, with death rates declining first and birth rates falling later. This lag produces a transitional period of population growth and a very young population. As fertility declines, population growth slows and the share of the population of working age rises.

The demographic transition creates potential for economic growth in several ways (Bloom et al., 2003). Mortality declines in high-mortality populations are usually associated with declines in infant and child mortality, driven by increased access to vaccines, antibiotics, clean water, and sanitation (Bloom and Williamson, 1998). This mortality decline produces a baby boom, not by causing more births, but by increasing survival among those births that take place. The baby boom ends when couples realize that fewer births are needed to reach their targets for surviving children and economic development simultaneously moderates these targets.

Baby booms can induce adverse economic consequences because more children require more resources such as food, clothing, housing, education, and medical care. Those resources must be diverted from other uses, such as building factories and infrastructure or investing in research and development, for example. This diversion of resources tends to slow economic growth, conventionally measured as the growth rate of income per capita.

However, individuals born as part of this baby boom soon reach working age, within 15–25 years of the initial decline in mortality. When that happens, the productive capacity of the economy expands on a per capita basis. This leads to a transitory increase in the share of the working-age population and an increase in female labor force participation (Pritchett, 1994; Bloom, Canning, Fink, and Finlay, 2009). Potential economic output also increases because the typical adult working years are also the prime

years for savings, which are key to capital accumulation and technological innovation. Finally, savings get a further boost as expected longevity increases in the latter phases of the demographic transition (Mason and Lee, 2007; Lee et al., 2003; Kinugasa and Mason, 2007; Bloom, Canning, Mansfield, and Moore, 2009).

Several studies provide empirical evidence for the effects of the demographic dividend. In Asian countries, an increase in the working-age share of the population was a significant driver of economic growth in the years between 1960 and 2005 (Bloom and Finlay, 2009). In East Asia, demographic change may account for one-quarter to one-third of the region's economic "miracle" (Bloom et al., 2000b; Mason, 2001). In Ireland, a similar process followed the legalization of contraception (Bloom and Canning, 2003). Similar evidence is emerging in African countries, as well (Canning 2013; Ashraf et al., 2013).

However, dividends from the demographic transition are not realized automatically. Obtaining these benefits requires good governance and judicious public policies. Latin America's recent history is an illustration of the consequences of inadequate public policies. After 1970, Latin American and East Asian countries experienced similar demographic conditions, but GDP per capita grew by only 0.7% annually over 1975–1995 in Latin America, compared with 6.8% in East Asia (World Bank, 2008). A combination of rigid labor markets, a somewhat closed economy and weak governance led to a period of stalled growth in Latin America. Neither is it clear how the demographic transition will play out in countries like Pakistan, which face an imminent demographic transition (British Council Pakistan, 2009) but struggle with weak institutions. In general, countries only reap a demographic dividend if young people have the benefit of good health and education, and if the economy offers opportunities to earn and save. In the absence of these factors, countries face potential social unrest caused by an underemployed generation of adults (Cincotta et al., 2003).

The prospect of reaping a demographic dividend is particularly salient for Nigeria in light of its lack of economic growth between 1980 and 2000[b]. The GDP per capita in 2003 was almost the same as it was in 1980 (Figure 1 depicts this trend beginning in 1990). Although this figure is now in question given the 2013 rebasing[c] of Nigeria's economy (BBC, 2014; WSJ, 2014), which had not been rebased since 1990, the growth more likely occurred after rather than before 2000. This growth pattern stands in contrast to peer countries like Indonesia and Pakistan.[d] In 1990, Nigeria's GDP per capita was nearly equal to Pakistan's, but considerably lower than Indonesia's. Through the 1990s into the early 2000s, Nigeria's economy stagnated, while Pakistan's and especially Indonesia's grew considerably. Per capita income in Indonesia is now substantially higher than in Nigeria and Pakistan; however, Nigeria has experienced

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[b] While this period of stagnation covers approximately two decades, as indicated by World Bank data, data for the 1980s are not available in comparable 2011 international dollar terms and are therefore not depicted in Figure 1.

[c] A country typically rebases its economy every three to five years to ensure GDP statistics and sector weightings accurately reflect the nation's economic activity. For Nigeria, the components of its GDP base year had not been updated for well over a decade (since 1990).

[d] We compare Indonesia and Pakistan to Nigeria because all three countries began with a similar GDP per capita in 1980 (not pictured); have large, heavily Muslim populations (although Nigeria less so); and have a history of inter-group conflict, a hot climate, and ample coastline. Indonesia and Nigeria are also major oil producers. Pakistan and Nigeria have a history of British rule, and Indonesia a history of Dutch rule. All three have also had a history of authoritarian or military rule.

continued economic growth since 2004 and now considerably outperforms sub-Saharan Africa as a whole (see Figure 12 in the Appendix).

Nigeria's relatively slow economic growth is due in part to demographic conditions (see Appendix for detailed data). Since its independence in 1960, Nigeria has struggled with very high fertility and mortality rates, resulting in a high ratio of children to the adult population. Only since the 1980s have fertility rates begun to decline, albeit very slowly. Nigeria's current fertility rate remains higher than that of sub-Saharan Africa as a whole and more than twice the world average fertility rate. Today in Nigeria, only around 1.2 working-age people are available to support each child.

Figure 1: GDP per capita for Nigeria, Indonesia, and Pakistan (Source: World Bank, 2014)

However, the demographic tide may be turning in Nigeria. Fertility rates are expected to continue declining along with crude birth and death rates. As a result, the share of working-age people (i.e., 15-64 year olds by convention and assumption) in the population is expected to rise moderately from now until 2050, when there will be around 1.4 working-age individuals for every non-working age individual. If productively employed, these "extra" adults will be able to drive significant economic growth in Nigeria, even more so in the case of skilled individuals.

However, whether this window of opportunity yields a demographic dividend depends on changes in several other factors that have historically hampered Nigeria's economic growth. Nigeria's institutions, including rule of law, government capabilities, corporate ethics, civil liberties, and interaction between public goals and private actions, are mediocre when compared with those of other African countries and poor when compared with those of countries in other regions (Nigeria: The Next Generation, 2010). Nigeria ranks 114 out of 120 countries in a recent World Economic Forum human capital index that focuses on education, health, and workforce opportunities (WEF, 2013). In addition, regional and ethnic inequalities, low levels of investment in education and health (Mason et al., 2010b), and a culture of

youth violence pose significant challenges to Nigeria's ability to benefit from its demographic transition (Alao, 2010). If left unaddressed, some or all of these issues may prevent Nigeria from realizing the potential for economic growth that its demographic transition offers.
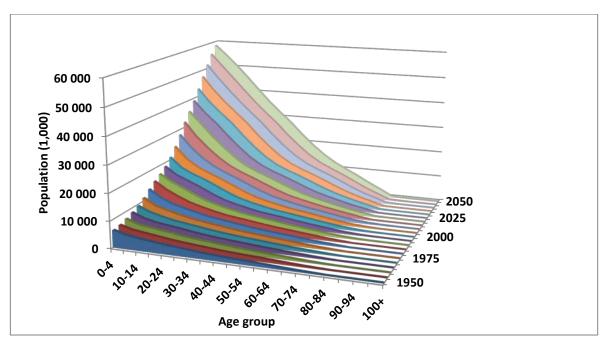

Figure 2: Nigeria's population projections (Source: United Nations, 2013)

2   Understanding Nigeria's potential demographic dividend

We first quantify the potential demographic dividend available to Nigeria under appropriate conditions and then discuss the obstacles Nigeria may face in creating those conditions.

2.1   Model

Empirical cross-country regressions are a well-established method for estimating economic growth (Bloom and Williamson, 1998; Bloom et al., 2000b). These regressions are based on a Barro and Sala-i-Martin–type income per worker growth model (Barro and Sala-i-Martin, 2004), which relates income per worker growth to income per capita growth and working-age population growth. We present the model below.

Let Y, W, P denote aggregate income, total working-age population size, and total population in a country. Then define the log measures of derived quantities: y as log of income per capita, $\log(Y/P)$; z as log of income per working-age person, $\log\left(\frac{Y}{W}\right)$; w as log of the working-age population, $\log(W)$; and p as log of the total population, $\log(P)$. Finally, denote the growth rates of these quantities: g_y as growth rate of per capita income y, g_z as growth rate of income per working-age person z, g_w as growth rate of total working-age population l, and g_p as growth rate of total population p.

The log income per worker growth model expresses growth at a given time 0 as $g_z = \lambda(z^* - z_0)$, where z^* is the steady-state income per worker, z_0 is the income per worker at time 0, and λ is the

convergence rate. This equation states that growth of income per worker is proportional to the difference of the current log income per worker and the steady-state log income per worker. The further a country is below its steady-state income, the faster its income is expected to grow. The steady-state log income per worker is usually expressed as $z^* = X\beta$, where X is a matrix of variables that include physical resources, human capital, population growth, and institutional strength and β is a set of coefficients.

To relate the income per worker growth model, $g_z = \lambda(X\beta - z_0)$, to the more readily available income per capita growth and to demographic factors, we use the identity $\frac{Y}{P} = \frac{Y}{W}\frac{W}{P}$ to obtain the following relations (where the subscript 0 denotes quantities at the start of a period):

$$y_0 = z_0 + \log\left(\frac{W}{P}\right)_0, \text{ and } g_y = g_z + g_w - g_p.$$

Denoting $g_{wp} = g_w - g_p$ gives the following formulation for estimation, where ε is the disturbance.

$$g_y = \lambda X\beta - \lambda y_0 + \lambda \log\left(\frac{W}{P}\right)_0 + g_{wp} + \varepsilon. \tag{1}$$

2.2 Data

We use five-year country-level panel data from 1965 to 2005 for estimation. In addition to income and demographic variables, we follow the general cross-country comparisons literature and consider geographical characteristics, human development indicators, and institutional measures as explanatory variables. See Table 1 for a complete description of variables and their data sources.

Geographical characteristics include tropical area and landlockedness. We use tropical area based on the expectation that a larger share of tropical area in a country is associated with lower steady-state per capita income and therefore lower growth in that country. Landlockedness relates to transport conditions; the expectation is that countries without a coastline have fewer opportunities for trade and hence fewer growth opportunities.

Human development indicators include years of secondary schooling and life expectancy at birth. "Average years of secondary schooling" is a proxy for the productivity of the workforce; the expectation is that a more educated workforce is likely to be more productive and therefore more likely to seize opportunities for growth. "Life expectancy" is a measure of health and is expected to lead to economic benefits through lower morbidity, higher returns on investment in human capital, and increased savings.

Table 1: Variable descriptions and data sources

Variable	Description	Source
Population growth	Annual average growth rate of the total population over a 5-year period	WDI 2006
Working age population growth	Annual average growth rate of the 15- to 64-year-old population over a 5-year period	WDI 2006
Ratio of working age to total population	Working-age population/population	WDI 2006

Growth GDP per capita	Annual average change in the log of real GDP per capita over 5 years	PWT 6.2
Real GDP per capita	Real GDP per capita (Constant International Prices: Laspeyres)	PWT 6.2
Tropical location	Fraction of a country's land area in the tropics	Sala-i-Martin et al. (2004)
Landlocked	Dummy = 1 if a country is landlocked	Sala-i-Martin et al. (2004)
Trade openness	Exports plus imports divided by real GDP per capita. Constant 2000 prices	PWT 6.2
Average years of secondary schooling	Average years of secondary schooling of individuals >15 years of age	Barro and Lee (2001)
Sachs Warner openness	Sachs Warner classification of a country's economy as open=1 or closed=0	Sachs and Warner (1997)
ICRG score for quality of institutions	Sum of rule of law, bureaucracy efficiency, corruption, government stability, expropriation risk	Knack and Keefer (1995)
Life expectancy	Life expectancy at birth	WDI 2006
Sources: PWT 6.2, Penn World Table version 6.2 (Heston et al., 2006); Barro and Lee (2001); WDI 2006, World Development Indicators 2007 (World Bank, 2007). GDP, gross domestic product.		

Income data are drawn from the Penn World Table version 6.2 (Heston et al., 2006). Whenever income data are not available for 2005, we extrapolate to 2005 using the latest available annual growth rate. For most countries, income data are available up until 2004. Historical demographic data such as working-age share, working-age population growth, and population growth are drawn from the World Bank's world development indicators (World Bank, 2007). Future demographic data are drawn from the United Nations world population prospects (United Nations, 2007), which include projections up until 2050.

Data for series that were available only for limited periods, such as the ICRG score, were extended by using the earliest available value to apply for all years backward and the latest available value to apply for all years forward. We chose this method instead of trend extension because extrapolation based on the trend value of the first two and the last two points led to undesirable results. For example, when extrapolated backward, several countries with decreasing ICRG scores in the early years ended up with perfect ICRG scores. The extension of data in this manner was done for other variables with missing values prior to 1970 or 2000 and after.

Even after the extrapolation, several countries lacked complete data. Instead of making further interpolations, we restricted our regressions to the set of 88 countries for which we had complete data. See Table 2 for descriptive statistics for the 88 countries we used in the sample and for Nigeria.

Table 2: Descriptive statistics averaged over the panel 1965–2005 for 88 countries and for Nigeria (schooling data for Nigeria were not available)

	Global				Nigeria			
Variable	Mean	Stdev	Min	Max	Mean	Stdev	Min	Max
Population growth	2.0	1.4	-3.4	16.6	2.6	0.2	2.2	3
Working age population growth	2.3	1.5	-1.2	18.9	2.6	0.2	2.4	3
Ratio of working age population to total population	58.4	6.6	47.1	73.9	52.0	0.7	51.1	52.7
Growth GDP per capita	2.1	5.3	-13.8	68.7	0.6	2.5	-3.4	3.1

Real GDP per capita	8,321	8,595	171	64,640	1,056	100	946	1,210
Tropical location	0.5	0.5	0	1	1	0	1	1
Landlocked	0.1	0.3	0	1	0	0	0	0
Trade openness	63.3	45.1	3.8	462.9	48.1	32.5	16.2	92.4
Average years of secondary schooling	1.5	1.1	0	5.2	0	0	0	0
Sachs Warner openness	0.5	0.5	0	1.0	0	0	0	0
ICRG score for quality of institutions	24.2	8.7	6.0	38.0	15.8	4.6	11.7	21.1
Life expectancy	63.7	11.8	34.9	82.1	44.6	1.5	42.1	46.4

Although less useful for some variables, the mean, standard deviation, and maximum/minimum broadly indicate that the sub-sample of 88 countries retains the diversity of the global sample, in terms of low and high growth rates, low and high population growth rates, working-age population growth rates, and low and high income. Some of the maximum values are skewed because of extreme data points. For instance, the annual population growth rates in the United Arab Emirates were greater than 10% for the years 1970, 1975, and 1980 mainly because of the large influx of foreign workers to power the oil economy in the 1970s and. Similarly, Kuwait in 1970 ($64,000) and the UAE in 1975 and 1980 (above $43,000) skew the real GDP per capita (again likely because of the oil boom at that time).

Table 2 also presents Nigeria's data for comparison with those of the global sample. The most striking figure is Nigeria's average GDP per capita growth of only 0.6%. Although this average is close to 0%, the country's growth has seen extreme fluctuation over the last four decades, reflecting Nigeria's chaotic economic history. Also striking is the low mean institutional quality score, which has historically been more than a standard deviation below the global mean of 24.2.

2.3 Estimation

Table 3 presents the results of the estimation. We started parsimoniously and then added sets of variables to see how each addition affected the explanatory power of the regression. We thus included only geographical, income, and working-age share variables in column (1); added the human development measures in column (2); added the demographic growth variables in columns (3) and (4); and added institutional variables incrementally to see which ones are important: ICRG score in columns (5) and (6); Sachs Warner openness in addition to ICRG score in (7) and (8); and replacement of Sachs Warner openness with trade openness (keeping the ICRG score) in (9) and (10). For column (3) onward, we try both Ordinary Least Squares (OLS) and instrumental variables versions. The instrument for the instrumental variables specification is the five-year lagged difference of the working-age and total population growth rates. All specifications include time dummies to control for global trends in growth.

Table 3: Cross-country growth regressions over 1965–2005; all regressions include time fixed effects

VARIABLES	(1) Geographical only (OLS)	(2) Geographical and human only (OLS)	(3) Geo, human, and dem only (OLS)	(4) Geo, human, and dem only (IV)	(5) Column (4) with ICRG score (OLS)	(6) Column (4) with ICRG score (IV)	(7) Column (5) with SW openness (OLS)	(8) Column (5) with SW openness (IV)	(9) Column (5) with trd openness (OLS)	(10) Column (5) with trd openness (IV)
Difference working-age and total population growth			2.083***	1.972***	1.896***	1.923***	1.907***	1.951***	1.888***	1.887***
			(0.602)	(0.624)	(0.684)	(0.620)	(0.682)	(0.618)	(0.674)	(0.619)
Trade openness									0.00772**	0.00772**
									(0.00313)	(0.00310)
Sachs Warner openness							0.389	0.391		
							(0.479)	(0.469)		
ICRG score for quality of institutions					0.108**	0.107**	0.105**	0.104**	0.104**	0.104**
					(0.0445)	(0.0419)	(0.0466)	(0.0441)	(0.0446)	(0.0420)
Log average years of secondary schooling		-0.172	-0.429	-0.415	-0.447	-0.450	-0.454	-0.459	-0.450	-0.450
		(0.325)	(0.334)	(0.332)	(0.333)	(0.332)	(0.328)	(0.326)	(0.332)	(0.331)
Log life expectancy		8.606***	5.434**	5.603***	5.357**	5.317***	5.146**	5.079**	5.269**	5.271***
		(1.926)	(2.161)	(2.044)	(2.154)	(1.957)	(2.283)	(2.081)	(2.150)	(1.958)
Tropical location	-0.699*	-0.407	-0.648*	-0.635*	-0.477	-0.481	-0.533	-0.539	-0.731*	-0.731*
	(0.363)	(0.349)	(0.344)	(0.343)	(0.368)	(0.361)	(0.390)	(0.380)	(0.392)	(0.382)
Landlocked	0.332	0.805**	1.008***	0.998***	0.725**	0.729**	0.699*	0.705**	0.734**	0.734**
	(0.367)	(0.386)	(0.382)	(0.384)	(0.358)	(0.358)	(0.358)	(0.358)	(0.357)	(0.357)
Log working-age population to total population	14.20***	12.94***	16.68***	16.48***	12.89***	12.95***	12.50***	12.59***	12.91***	12.91***
	(2.420)	(2.259)	(2.650)	(2.597)	(3.437)	(3.118)	(3.287)	(3.018)	(3.403)	(3.084)
Log real GDP per capita	-0.902***	-1.844***	-1.617***	-1.630***	-1.828***	-1.825***	-1.852***	-1.846***	-1.897***	-1.897***
	(0.280)	(0.337)	(0.350)	(0.342)	(0.369)	(0.354)	(0.370)	(0.356)	(0.368)	(0.353)
Constant	18.85***	-9.351	3.388	-0.490	0.853	-2.463	1.618	-1.619	1.564	-2.027
	(3.441)	(8.028)	(8.945)	(8.396)	(9.759)	(8.752)	(10.27)	(9.260)	(9.762)	(8.766)
Observations	610	610	610	610	610	610	610	610	610	610
R-squared	0.146	0.198	0.253	0.253	0.274	0.274	0.276	0.276	0.282	0.282
Cragg-Donald F-stat				318		322		321		322

Robust standard errors in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Broadly, the results indicate that (i) that both human development and demographic growth variables significantly increase the explanatory power of the regression, (ii) institutional variables are important, and (iii) ICRG score and trade openness are more significant than ICRG score and Sachs Warner openness in this data set. In all regressions, the difference in demographic growth rates enters with a positive and highly significant coefficient. Among human development measures, schooling is less important, but life expectancy has a positive and significant coefficient in all columns. Among geographical variables, tropical area is sometimes important, while landlockedness appears significant in all but the first regression.

Columns (3) and onward (the first two columns are for comparison only) indicate that after controlling for the working-age population share, life expectancy remains significant but decreases in magnitude (from 8.6 to 5.4). This suggests that age-structure dynamics that lead to increases in life expectancy play a role in explaining cross-country differences in economic growth. In column (3) we report the association between the demographic variables and GDP per capita growth. To control for reverse causality, i.e. that GDP per capita growth might affect demographic outcomes, we apply an instrumental variable (IV) approach in column (4). The coefficient on the difference between working-age and population growth declines only slightly, indicating a correction of potential omitted variable bias.

Columns (5) and (6) include the ICRG score as a control variable for institutional quality, which improves the robustness of the resulting specification. In column (5) we report the OLS coefficients, noting that institutional quality is positively and significantly correlated with GDP per capita growth. The explanatory power of the model in column (5) is also improved over the demography model in columns (3) and (4). In column (6) we control for reverse causality using IV. The decrease in the coefficient of the difference between the working-age and population growth from the OLS in column (5) to the IV in column (6) indicates that the simultaneity bias has been corrected. This means that the results in column (6) can be taken to infer causality: as institutional quality improvements lead to improvements in GDP per capita growth, so too does an increase in the difference between working-age and population growth.

In column (7), we include the Sachs Warner measure of openness to test whether openness (a subset of the ICRG score) is a leading institutional factor driving GDP per capita growth. It is not, but other institutional factors captured by the ICRG score do have a positive and significant effect on GDP per capita growth. Column (8) is the IV counterpart of column (7).

In column (9) we remove Sachs Warner openness and include a simple measure of trade openness, which enters positively and significantly and increases the explanatory power of the regression. All other variables are significant, with the exception of schooling. This indicates that institutional quality, trade openness, and growth of the working-age population each have a significant and positive effect on GDP per capita growth. Life expectancy, a proxy for health, also has a positive and significant effect on GDP per capita growth. Column (10) is the IV version of the model in column (9).

2.4 Potential dividend

Table 3 presents one possibility for quantifying the potential demographic dividend that Nigeria could enjoy, under appropriate conditions. Broadly, we focus on opportunities in three areas: changes in the ratio of working-age to non-working-age population, health improvements, and institutional improvements. We include the latter two because of concern about very low health indicators and institutional weakness and corruption in the country (Nigeria: The Next Generation, 2010). We can quantify the first area because the working-age share of the population and the difference between the working-age and total population growth rates are present in the regressions. For the second and third areas, we use the proxy measures of life expectancy and ICRG score, respectively. Life expectancy, while not a perfect measure of health, is nevertheless both available and widely used in the context of cross-country regressions. For Nigeria, life expectancy is about 15 years below the global average (World Bank, 2013), indicating high potential for improvement through minor health investments.

Table 4 reports the potential demographic dividend using results from column 10 of Table 3. Specifically, to compute potential added growth, we first project Nigeria's demographic growth variables and life expectancy out to 2030, using the medium-growth fertility scenarios from the World Population Prospects (United Nations, 2007). We then project improvements in institutional quality and a more optimistic life expectancy increase in which Nigeria reaches the average world life expectancy of 64 by 2030. Because institutional quality projections are unavailable for Nigeria, we assume a reasonable target of 28.8 by the year 2030 by comparing the country with other countries and then assuming a linear increase between 2010 and 2030.

We first project the business-as-usual scenario in Table 4 using a 4.02% annual growth rate for 2010, which was Nigeria's average annual GDP per capita growth rate between 2000 and 2008 (World Bank, 2009). This could be an optimistic assumption, given that Nigeria has only experienced this level of growth in the past decade: the five-year growth average was 3.78% in 2000–2005, 0.31% in 1995–2000, and -0.41% in 1990–1995.

Nonetheless, assuming a 4.02% steady-state growth rate for Nigeria, the GDP per capita would eventually converge to its corresponding steady-state value as shown in column (1) of Table 4. The column uses the 2008 GDP for our projections ($1,924 PPP in constant 2005 international $), giving a GDP per capita of $2,070 for 2010, the starting year for our projections. To estimate the potential demographic dividend, we use coefficients for the GDP per capita, working-age share of the population, population growth difference, and life expectancy from Table 3 to compute the added annual growth that Nigeria could enjoy due to demographic change, increased life expectancy, and institutional reforms.

Table 4 shows that Nigeria could attain almost 7% additional per capita GDP by 2020 and as much as 29% additional per capita income by 2030, if it could capitalize on its demographic transition (column 4). By improving institutional quality and reaching the contemporary world average life expectancy by 2030, Nigeria could add 9% more income by 2020 and 43% more by 2030 (column 7). Accounting for population growth (Table 5), Nigeria's economy in 2030 could be approximately 2.7 times larger than it

is today, as compared with around 1.8 times larger than today under the business-as-usual growth scenario.

To understand the impact of these numbers, we estimated the effect of the demographic dividend on the proportion of individuals living in poverty (income less than $1.25/day) in Nigeria. Table 6 shows the results. The additional growth due to the demographic dividend and life expectancy increase can lift around 2 million individuals out of poverty by 2020 and around 27 million more by 2030, over and above the business-as-usual scenario of constant fertility. With institutional improvements and better life expectancy, the number of additional people lifted out of poverty by 2030 increases to around 32 million. We arrived at these impressive numbers by using two sources of information. Because income distribution data are not available for Nigeria, we first used a proxy income distribution derived from the Nigeria 2008 DHS survey's wealth index (DHS, 2009), adjusted to scale for the per capita GDP income. Second, we used the current poverty level estimates from the 2009 World Development Indicators (World Bank, 2009).

Education is not a significant variable in our regression, which appears to reflect the difficulty of identifying the independent influences of secondary education and life expectancy. This suggests that investments in health and education are closely and positively connected, and the benefits of one cannot be realized without the other.

Table 4: Nigeria's GDP per capita projected with and without demographic dividend and life expectancy increases according to UN projections

Year	(1) GDP/cap "business-as-usual"	(2) WA share of TP (%)	(3) Life exp. (years)	(4) GDP/cap with DD & added LE	(5) Improved ICRG score	(6) Improved life exp. (years)	(7) GDP/cap improved ICRG & LE
2010	$2,070	54.02	48.45	$2,070	21.10	48.45	$2,070
2015	$2,521	55.62	50.38	$2,565	23.03	52.33	$2,565
2020	$3,015	57.53	52.35	$3,221	24.95	56.22	$3,283
2025	$3,547	59.64	54.39	$4,107	26.88	60.11	$4,336
2030	$4,112	61.73	56.37	$5,311	28.80	64.00	$5,886

WA, working age population; TP, total population; LE, life expectancy at birth; DD demographic dividend. Starting GDP per capita taken as $1,924 PPP (constant 2005$) for 2008 from World Bank (2009). Default business-as-usual growth rate of 4.02% in 2010 taken as the average annual growth over 2000–2008 from World Bank (2009).

Table 5: Nigeria's GDP projections; due to demographic dividend and life expectancy increases the economy can be more than 2.7 times larger in 2030 than 2010, compared with 1.8 times larger under the business-as-usual scenario

Year	Population projection	GDP business-as-usual (billions)	GDP with DD & added LE (billions)	GDP with improved ICRG+LE (billions)
2010	158,313,209	$328	$328	$328
2015	175,715,469	$443	$451	$451
2020	193,099,080	$582	$622	$634
2025	210,128,768	$745	$863	$911
2030	226,854,804	$933	$1,205	$1,335

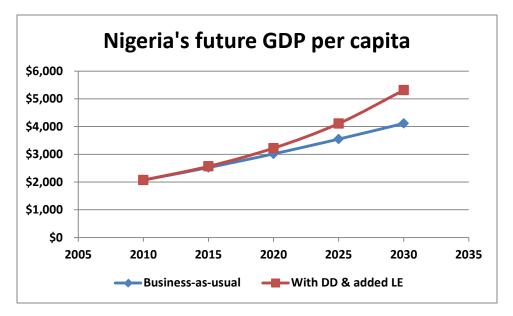**Nigeria's future GDP per capita**

Table 6: Additional people lifted out of poverty (LOP) through the demographic dividend and increased life expectancy and through improved institutions and further improvements in life expectancy

Year	% poor business-as-usual	% poor with DD & added LE	Additional # LOP due to DD & added LE	% poor with improved ICRG & LE	Additional # LOP due to improved ICRG & LE
2010	64%	64%	-	64%	-
2020	58%	57%	1,930,991	56%	3,861,982
2030	50%	38%	27,222,576	32%	31,759,673

3   Realizing the potential dividend: challenges and opportunities

The potential demographic dividend provides a benchmark for Nigeria's latent development prospects. Favorable changes in age structure create an opportunity for more rapid economic growth. How the country actually performs, however, will depend critically on little-understood features of the Nigerian economy. Perhaps the most important of these features is Nigeria's unfavorable economic lifecycle, as summarized by the amount consumed and the amount produced through labor at each age (Figures 4 and 5). This lifecycle is critically dependent on human capital development and productive employment opportunities. If Nigeria does not take successful steps to improve employment rates among young adults, the demographic dividend will be delayed at best and unrealized at worst.

Closely examining the Nigerian economy also allows us to identify options created by the potential demographic dividend. One possibility is to devote the entire demographic dividend to raising current standards of living. This is attractive given the extent of poverty in Nigeria. If Nigeria pursues this path, however, standards of living will eventually decline as the dividend period draws to a close. Instead, permanently higher standards of living can be realized through sound and careful policy. One particularly promising approach is to substantially increase investment in human capital as incomes rise.

3.1 Features of Nigeria's generational economy

The shape and structure of the economic lifecycle is important in understanding the interaction between age structure and the economic development of any country (Lee et al., 2008). For extended periods at the beginning and end of life, members of the population on average consume more than they produce through their labor. These periods of "dependency" bracket a period during which labor income substantially exceeds consumption.

Figure 4 shows Nigeria's economic lifecycle, incorporating labor income and consumption profiles by age group and measured in per capita terms (see Appendix for how this figure was constructed).[e] Two aspects of this age profile deserve mention. First, the profile displays average labor income for all members of the population and is determined by variation in labor force participation, hours worked, unemployment, and wages and labor productivity. Second, it is a cross-sectional curve and not the path that any particular cohort will follow. Average consumption is also measured in a comprehensive fashion including both private and public consumption. Per capita consumption in Nigeria increases substantially from birth until the mid-twenties, after which consumption is relatively flat.

Figure 4: Economic lifecycle for Nigeria, per capita values, 2004 (Source: Soyibo et al., 2011)
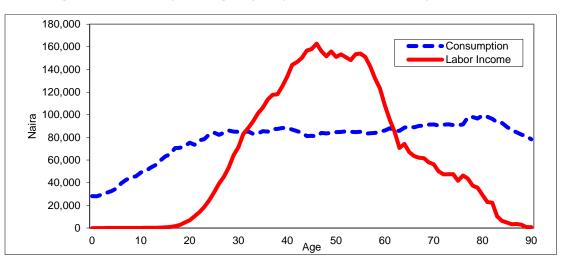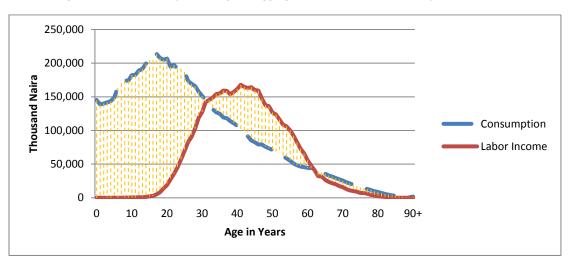

Figure 4 reveals that, on average, Nigerians consume more than they produce through labor during the first 33 years of their lives. For the next 30 years, their labor income exceeds their consumption. After age 63, Nigerians once again consume more than they produce. The critical middle period, in which income exceeds consumption, is remarkably short in Nigeria. With the exception of Kenya and Mexico, this period is longer in other developing countries for which data exist: 35 years in India, 34 in Indonesia and the Philippines, and 37 in China (Mason, 2007).

Combining population data with per capita consumption and labor income profiles provides estimates of total consumption and labor income by age (Figure 5); a tool for understanding, from a generational perspective, some important macroeconomic issues facing Nigeria because of its young age structure.

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[e] The national transfer accounts (NTA) methodology was used to estimate the economic lifecycle of Nigeria. A discussion of the concepts and methods is presented in Lee et al. (2008), Mason et al. (2009), and United Nations (2013) and also on the NTA website: www.ntaccounts.org.
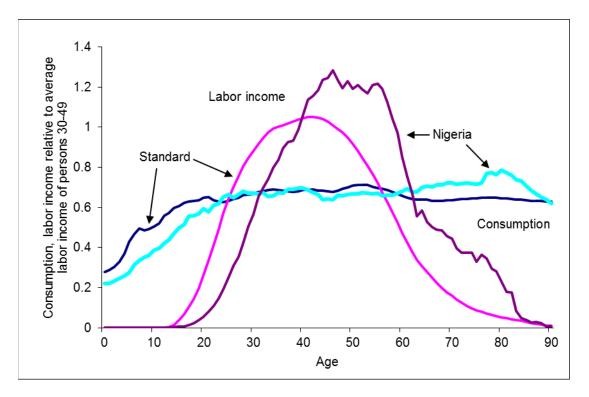
The large lifecycle deficit for the young, i.e., the gap between consumption and labor income, is the dominant feature of the aggregate economic lifecycle. The lifecycle deficit for the young is substantial (nearly 80% of total labor income), while the deficit for the old is much smaller (about 3% of total labor income). The lifecycle surplus comprises only 14% of total labor income, and hence the combined deficit is almost 70% of total labor income. Meeting the material needs of children requires heavy reliance on income from assets, remittances from abroad, and in some cases even dis-saving.

Figure 5: Economic lifecycle for Nigeria, aggregate values, 2004 (Source: Soyibo et al., 2011)

A comparison of Nigeria's economic lifecycle with other countries is also instructive, as seen in Figure 6. We draw on estimates for seven economies with relatively young populations: Chile, China, Costa Rica, Mexico, South Korea, Taiwan, and Thailand. We refer to the average economic lifecycle of these seven countries as the standard lifecycle. Nigeria's age profile of labor income is quite different from the standard profile (Lee and Mason (2011)). In Nigeria, per capita labor income is very low for young adults and relatively high for older adults. The per capita income of a 30-year-old, for example, is only 56% of the average per capita income of those in the 30–49 age group. In contrast, a 30-year-old in the standard profile has an average labor income of 88% of the per capita value of those in the 30–49 age group. The other noticeable feature is that labor income in Nigeria remains high for much longer and declines relatively slowly in old age.

Figure 6: Per capita labor income and consumption by age; values are relative to average labor income for persons 30–49; Nigeria estimates for 2004; standard is simple average of normalized values for seven economies: Chile, China, Costa Rica, Mexico, South Korea, Taiwan, and Thailand (Source: www.ntaccounts.org)

The nature of Nigeria's economic lifecycle focuses our discussion on potential paths for Nigeria's economy. The current economy operates with a very large lifecycle deficit (LCD) (see the Appendix for a discussion of how this deficit is currently financed). An LCD can only be funded in three ways: net transfers, asset income, and dis-saving. Like any country, Nigeria's economy is governed by a fundamental flow constraint that must hold in every period: the LCD plus saving must equal net transfers from the rest of the world plus asset income.[f] A similar flow constraint governs the LCD of any age group, but net transfers from other age groups represent an important source of funds.

Broadly, the LCD suggests several possible outcomes of demographic change. First, the LCD may not decline in response to favorable changes in age structure, because the consumption profile either shifts upward or the labor income profile shifts downward. To the extent that consumption increases, standards of living will increase and current welfare will be enhanced. A downward shift in the labor income profile could result from a reduction in work and an increase in leisure, but this seems somewhat unlikely at this time in Nigeria. A second outcome resulting from demographic change is that saving rates could increase. Standards of living would not be enhanced in the short run, but economic growth and future standards of living would be higher. If the additional savings were invested domestically, wages and labor income would be higher. A third outcome is that the decline in the LCD could lead to a decline in net transfers from abroad. As economic conditions improve, foreign aid might decline or Nigerians working abroad may reduce their remittances to family members. Asset income, the fourth component of the macroeconomic constraint, is only influenced indirectly through changes in the saving rate.[g] The choice of one of these paths, or some combination of paths, will have profound

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[f] See UN (2013) for detailed exposition of the macroeconomic flow constraint.
[g] Population change could influence rates of return to capital in a closed economy, but is unlikely to have much effect in Nigeria.

implications for the development consequences of changing population age structure in Nigeria. This will depend, in turn, on a combination of public policy and private behavior.

Combining the economic lifecycle with demographic data reveals another informative feature of Nigeria's economy: its economic support ratio. The economic support ratio resembles the measure of age structure (ratio of working-age to non-working-age population), which is used to estimate the potential demographic dividend. The differences are that the numerator, the effective number of producers, incorporates age-specific variation in labor productivity, and the denominator, the effective number of consumers, incorporates age-specific variation in "consumer needs." The per capita labor income profile and consumption profiles (Figure 4) are used as weights. If fertility declines in Nigeria as anticipated, the number of children and elderly will decline relative to the number of working-age adults. Consequently, the economic support ratio will rise, with favorable economic effects. How much the economic support ratio rises will depend on specific features of Nigeria's economic lifecycle. The most likely outcomes are that current standards of living will increase, investment in physical or human capital will increase, or some combination of the two will occur. Figure 7 displays the support ratio for Nigeria from 1950 to 2050. The ratio is expressed as a scaled index, with the value for 2003 set to 100 (chosen because Nigeria's support ratio reached a low point in 2003).
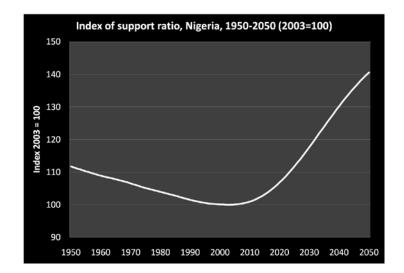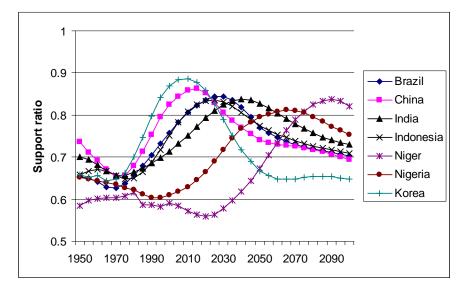
Figure 7: Nigeria's support ratio, 1950–2050, scaled so that 2003 equals 100 (Source: Soyibo et al., 2011)

The changes in Nigeria's support ratio resemble those in many less-developed countries (LDCs). Figure 8 shows the support ratio from 1950 to 2100 for Brazil, China, India, Indonesia, Niger, Nigeria, and South Korea. To construct the values for all countries, we used average developing country age profiles of consumption and labor income. In this way, differences across countries are entirely due to differences in population age structure. The timing obviously differs among these countries, because the demographic transition occurred earlier in Asia and Latin America than in Africa. The figure also highlights the impermanence of the rising support ratio effect. It disappears as the age transition ends, which leads to important questions: Are the gains from the favorable support ratio sustainable, or do they inevitably dissipate over time? If the gains are sustainable, can they be maintained by realizing a second demographic dividend? Two main channels are of potential importance. One is the saving and

investment channel (Mason and Lee, 2007). The second channel, discussed here, is the human capital channel.

Figure 8: Support ratios for six developing countries, 1950–2050; population projections from United Nations; NTA age profiles of consumption and labor income are averages of estimates for seven young countries (www.ntaccounts.org) (Source: Lee and Mason, 2010b)
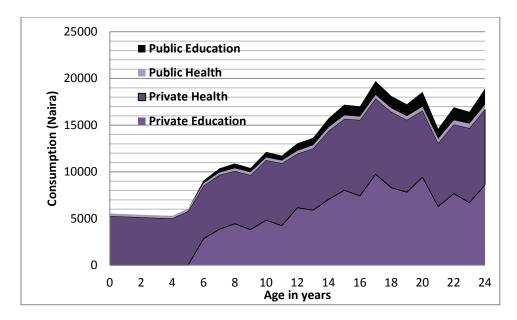

3.2 Human capital investment for Nigeria

Although all spending on children counts as consumption in national accounts, a portion of that consumption is widely accepted to be human capital[h] spending. We use the term "human capital spending" to mean public and private spending on health and education for the young. Figure 9 shows per capita estimates of these four components, broken down by age (Soyibo et al, 2011). At very young ages, almost all human capital investment is privately funded health care spending. Education begins to play a more important role at age 7, with privately funded spending still dominant. Privately funded education spending continues to increase in share, peaking in the late teens and then declining slowly.

These cross-sectional data for 2004 do not represent the human capital investment that any specific birth cohort will receive in Nigeria. Those in their early 20s in 2004 likely received less investment than shown in the figure, and those who were very young in 2004 will hopefully receive more investment over their lifetimes. Nonetheless, we can aggregate spending across these ages as a convenient and intuitive way of describing the amount being invested in children in 2004.

Figure 9: Per capita human capital spending, single years of age (0–24), Nigeria 2004 (Source: Soyibo et al. 2011)

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[h] Human capital refers to the skills and capacities that people may put to productive use.

In calculating the total human capital investment, education spending includes all spending up to and including age 24. Health spending is only included up to age 17, however, to exclude spending on childbearing. Whether spending on childbearing should be considered human capital investment in the mother, or in the child, is ambiguous. Per capita lifetime human capital investment in Nigeria in 2004 for a synthetic cohort was approximately 258,000 Naira. Education and health were equally important, with combined public and private education representing 55% of human capital investment.

Table 7 reports normalized values for human capital spending. We divide spending by the average labor income earned by all members of the population, whether employed or not, between the ages of 30 and 49. This normalization serves two purposes. First, it provides a useful metric for comparing countries with distinct standards of living. Second, it crudely controls for variation in the cost of labor across development level, a dominant input in human capital investment. The total normalized human capital investment in Nigeria was essentially 2.0 (time the average labor income of an adult in the 30-49 age range). Given current spending levels, the lifetime human capital investment per child was two years' worth of prime adult labor income. If we take the net reproduction rate in Nigeria, estimated at 1.91 for 2000 to 2005 (UN, 2009), as a measure of the number of children raised per parent, then the typical adult devoted 3.8 years of labor effort to the human capital of children.

Table 7: Human capital spending, Nigeria, 2004, synthetic cohort measures (Source: Soyibo et al. 2011)

	Actual (Naira)	Distribution (%)	Normalized
Education, public	18,931	7.33	0.149
Education, private	123,091	47.63	0.971
Health, public	5,189	2.01	0.041
Health, private	111,228	43.04	0.877
Total	258,439	100.00	2.039
Total public	24,121	9.33	0.190

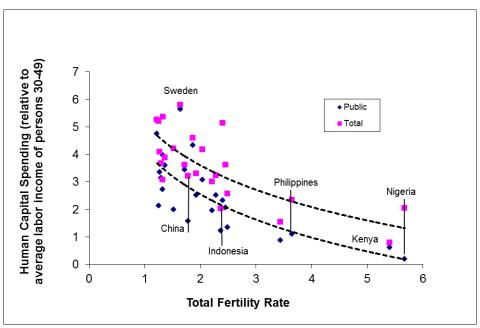|			
Total private	234,318	90.67	1.848

3.2.1 Comparative human capital investment trends

Demand for and returns on investment in human capital increase with development because structural changes in the economy increase the returns to cognitive ability relative to physical ability and falling mortality reduces the probability that investment in a child will be lost through premature death. Whether spending per child is a normal consumer good, or should be treated as an investment, is debated. Becker, Willis, and others have advanced an influential idea that a quality-quantity tradeoff exists for children (Becker and Lewis, 1973; Willis, 1973). As the number of children declines, the price of achieving a desired quality per child also declines (Montgomery et al., 2000; Montgomery and Lloyd, 1996; Ahlburg and Jensen, 2001; Jensen and Ahlburg, 2001; Willis, 1973; Becker and Lewis, 1973).

Figure 10 illustrates this quantity-quality tradeoff by plotting the total fertility rate (TFR) against normalized lifetime human capital investment for 24 economies, including Nigeria. These values were constructed using the same method as the measure of human capital spending for Nigeria, reported in Table 7 and employed in Lee and Mason (2009a). Both total and public human capital investment are plotted in the figure, with the vertical distance between the two points equal to private human capital spending. All 24 economies reveal a strong negative correlation between TFR and human capital investment. Normalized investment in low-fertility countries is substantially higher than in high-fertility countries. The highest rates of investment are in Sweden, Japan, and Taiwan, which invest more than five years' worth of labor income per child. Kenya and India have the lowest rates of investment, followed by Indonesia and Nigeria. When it comes to public investment in human capital, Nigeria is ranked last among the 24 economies. Nigeria invests less than one-third of the normalized public human capital investment found in Kenya (0.61) and India (0.88) and only about 15% of what is invested in China (1.57). Because these values are normalized on mean labor income of persons aged 30–49, they indirectly control for the level of development. Thus, the low levels of investment do not arise as an automatic feature of low income.

Also shown in Figure 10 are two fitted lines that show the relationship between the TFR and human capital investment. Along these isoelastic curves the percentage change in the TFR is a constant proportion of the percentage change in human capital investment. A special case of interest is an elasticity of -1, which implies that the human capital investment in all children combined does not decline along with the number of children. In other words, the investment would simply be spread over fewer children. The estimated elasticity for total human capital investment is -0.81, and -1.42 for public human capital investment. These estimates imply that human capital investment rises sharply as total fertility rate declines, which is entirely a consequence of public human capital investment.

The fertility-human capital tradeoff portrayed in Figure 10 does not represent any particular causal relationship. The two variables are interdependent and mutually determined by a host of factors. The key point is that the two variables strongly tend to move together. In high-fertility countries, investment in human capital tends to be low; in low-fertility countries, it tends to be high. The relationship reported here is based on cross-sectional data, but it holds (with high negative elasticities) for the few time series data that have been analyzed (Japan 1984–2004 and Taiwan– 1978-2004, Ogawa et al., 2009; United States 1960–2004, Lee and Mason, 2009b). It is also important to understand that after controlling for TFR and indirectly for development through normalization, much of the variation in human capital investment remains unexplained. The TFR "explains" 57% of the variation in total human capital investment and 64% of the variation in public human capital investment. Other factors not analyzed here, including public policy decisions, undoubtedly also have a very important impact on human capital investment.

3.2.2   Benefits of human capital investment for Nigeria

As fertility continues to decline in Nigeria, the economic support ratio will increase and current per capita consumption may rise for an extended period, but eventually the support ratio will decline. Holding all else constant, a few fortunate generations will have enjoyed higher standards of living during their lives, but no benefits will remain for the following generations. Alternative outcomes are possible, however. Importantly, favorable demographics may be accompanied by greater investment in human capital. Using a highly stylized model, we show that standards of living can be permanently raised if the fertility-human capital tradeoff operates with sufficient magnitude.

The analysis presented in Table 9 is based on a model of human capital investment developed by Lee and Mason (2010a). Our results are based on the same theoretical framework, but our model

parameters have been updated and fine-tuned to fit the circumstances in Nigeria. We follow Lee and Mason's assumption that the elasticity of output with respect to human capital is 0.33. The second key parameter is the effect of fertility on human capital, and we rely on the updated estimate of the elasticity of the quantity-quality tradeoff (-0.81) discussed above.

Demographic variables are exogenously specified in the model: the net reproduction rate (NRR) and the proportion of the population surviving from working ages to old age. We selected the demographic variables to conform closely to Nigeria's demographic experience, where period 0 is matched to 1980, period 1 is matched to 2010, and period 2 is matched to 2040. Thereafter, the NRR is assumed to stabilize at 1.0 (replacement rate) and the old-age survival rate at 0.8. Immigration is not incorporated into this model, although the more general implications of immigration are considered below. Table 8 reports several other demographic variables generated by the model, including the population growth rate, the age distribution of the population, and the support ratio.

The basic features of Nigeria's demographic transition are represented in the baseline simulation. Table 9 reports a selection of corresponding demographic data for Nigeria. We selected the NRR in the baseline simulation based on corresponding estimates and projections from the United Nations, and the baseline values and the corresponding estimates are therefore identical. The population growth rates for the baseline simulation and the estimates are similar, as are the age distributions. The matches are by no means exact and are an inevitable consequence of the stylized nature of the simulation model and the facts that "period" in the simulation model refers to a generation, whereas the period demographic variables for Nigeria are for five-year periods.

Table 8: Demographic variables, baseline simulation

Period	NRR	Survival to old age	Population growth rate	Children	Workers	Elderly	Support ratio
0	2.3	0.3	2.51	66.3	28.8	4.8	0.432
1	1.7	0.5	2.20	58.3	34.3	4.8	0.484
2	1.1	0.8	1.35	42.8	38.9	7.5	0.495
3	1.0	0.8	0.51	36.7	36.7	18.3	0.449
4	1.0	0.8	0.09	35.7	35.7	26.7	0.435
5	1.0	0.8	0.00	35.7	35.7	28.6	0.435
6	1.0	0.8	0.00	35.7	35.7	28.6	0.435

Note: "Percent of population" spans the Children, Workers, and Elderly columns.

Table 9: Nigeria, demographic variables for comparison with the baseline simulation

Period	NRR*	Growth rate	% <30	30–59	% 60+
1980	2.3	2.67	70.6	24.6	4.8
2010	1.7	2.12	70.5	24.6	4.9
2040	1.1	1.16	58.3	34.4	7.4

NRR and growth rates are for the subsequent five-year interval, medium scenario (UN, 2009).

Figure 11 reports the key results for the baseline simulation. Fertility decline produced an increase in the support ratio that was concentrated between period 0 and 1, but increased modestly until period 2. After period 2, the support ratio declined and stabilized at a level essentially equal to the support ratio

in period 0. In the absence of a response in human capital investment, consumption per equivalent adult would exactly track the support ratio. Those who were alive in periods 1 and 2 would enjoy higher consumption, but demographic effects would not last. If, however, fertility decline produced a response in human capital investment along the lines assumed in the baseline model, consumption per equivalent adult would increase between periods 0 and 1 and again between periods 1 and 2. Consumption would be lower under these conditions, because resources previously used to fund consumption would be diverted to human capital investment (recall that human capital investment is not included in consumption in the model). The benefits of this response become evident in period 2. In period 3 and all subsequent periods, including those not shown, consumption is higher by more than 20%. Again, this is a permanent increase and not a transitory gain.

Figure 11: Macroeconomic indicators: Baseline results (impact of demographic transition on consumption per equivalent adult (C/EA) and per capita GNP (GNP/N) from human capital investment–fertility tradeoff)

The gain in per capita gross national product (GNP) is even greater, stabilizing at about 50% more after the demographic transition. This overstates the gains in welfare associated with greater human capital investment, because the gain in per capita GNP is realized, in part, by diverting economic resources away from consumption and toward investment in human capital. The importance of using consumption to measure economic gains is clearly evident. To the extent that human capital investment has benefits beyond pure productivity effects, however, average consumption understates the welfare gains from increased human capital investment.

Table 10 provides information about human capital spending and its impact on wages. Human capital spending per child, as a share of wages, nearly doubles over the demographic transition, from about 7% of wages in period 0 to 14% of wages in period 3 and thereafter. This doubling occurs because wages also increase during this period. A virtuous circle emerges: greater human capital spending leads to greater human capital, greater wages, and still more human capital spending. Human capital spending as a share of gross domestic product (GDP) declines slightly during the period. The human capital investment rate drops, because the elasticity of the quantity-quality tradeoff is -0.81. If it were 1.0, the human capital investment rate would remain constant.

Period	Human capital spending per child/wage	Wage	Human capital spending per child	Average human capital of workers	Human capital spending/GDP
0	0.072	0.319	0.023	0.031	0.166
1	0.092	0.288	0.027	0.023	0.157
2	0.131	0.302	0.040	0.027	0.144
3	0.142	0.345	0.049	0.040	0.142
4	0.142	0.369	0.052	0.049	0.142
5	0.142	0.378	0.054	0.052	0.142
6	0.142	0.381	0.054	0.054	0.142

3.3 Potential pathways for Nigeria

Like most other countries in sub-Saharan Africa, Nigeria is just beginning a demographic transition in which the working-age share of the population will rise for the next few decades. Consequently, per capita income has the potential to receive a boost in growth—a "demographic dividend"—over the next four or more decades (Bloom and Canning, 2008). While this boost will range from less than 0.5% to more than 1% annually over and above growth due to other factors, changes in age structure could produce a cumulative increase in per capita income of as much as 40% by 2030.

The boost to growth from the demographic dividend will depend on the speed of fertility decline over coming decades. The share in the working ages will rise more rapidly and the opportunities for rapid economic growth will be greater if couples opt for smaller families.

Demographic transition, however, will not automatically produce either rapid or sustained economic growth. That depends on the effectiveness of a broad range of efforts to harness the potential that can arise with the demographic dividend.

Job creation is critical. To employ its rising workforce, Nigeria must create roughly 2–2.5 million new jobs annually from 2010 to 2030. Table 11 projects Nigeria's future job requirements using a labor participation rate of 77% and a step-wise reduction in unemployment from the current rate of 20% to 7% by 2030. The chosen labor participation rate and the target unemployment rate in 2030 are comparable to those of peer countries: Indonesia and Pakistan. Without the creation of 24 million new jobs in the next decade, and almost 50 million new jobs by 2030, Nigeria will struggle to realize the benefits of its demographic dividend.

Table 11: Jobs needed to accommodate the working-age population in Nigeria, assuming a labor participation rate of 77%

Year	WA pop	Unemployment in year	Jobs needed in year	Jobs to be added	Between years
2010	85,525,401	20%	52,358,719		
2015	97,731,223	15%	63,570,579	11,211,860	2010–15
2020	111,088,850	10%	76,509,768	12,939,189	2015–20
2025	125,325,513	8%	88,233,036	11,723,268	2020–25
2030	140,036,212	7%	99,661,452	11,428,415	2025–30

Many factors play an important role in successful job creation. These include policies that aid economic growth, such as good trade policies, sound macroeconomic policies, well-functioning financial markets, good relations with neighboring countries, and the absence of civil conflict. East Asia provides compelling examples of countries that capitalized on their demographic changes in part because their policies emphasized competing in global markets by producing low-cost exports, thereby creating plentiful employment opportunities for a growing working-age population. While no panacea exists for job creation, clearly large-scale, quality job creation requires preexisting inputs, such as the availability of trained labor and a healthy investment climate (Lutz and Samir, 2011).

Job creation requires strong institutions. Nigeria's current institutional quality, as measured by its ICRG score of 21.1, is slightly less than the global mean of 24.2. However, Nigeria's historical average of 15.8 is well below the global average. In addition, comparison with the global mean does not give a full picture of Nigeria's institutional situation. In fact, in our unbalanced sample of 208 countries, only 16 countries had a lower ICRG score. The composite ICRG score also disguises the fact that Nigeria's rankings in corruption, rule of law, and bureaucratic efficiency are exceptionally low (2, 3, and 3 on a scale of 1–6). These factors are particularly important to Nigeria's youth, as they affect young people's sense of inclusion and vulnerability (Alao, 2010). Institutions, however, are only the means to an end.

Job creation must also be addressed from the supply side to insure that each young adult is able to realize his or her full potential. Strategic and sustained investment in human capital, e.g., education and health, is essential to realizing this goal. Uneducated workers are typically limited to activities with relatively low value-added, such as subsistence farming. Similarly, unhealthy workers are often limited in the energy and productivity they can bring to their jobs. In contrast, well-educated and healthy workers are much more likely to contribute productively to a country's economy. They are more likely to attend work regularly and to learn new skills and apply them reliably. The human capital embodied in educated, healthy individuals is invaluable for promoting economic growth (Bongaarts and Sinding, 2011).

Investment in health is one of the most important opportunities for realizing higher rates of economic growth. Nigeria's projected life expectancy of 56 years by 2030 (United Nations, 2007) falls short of our global sample average of almost 64 years. If Nigeria achieves the current global average by 2030, it could experience greater economic benefits than under the business as usual scenario. This would result from increased productivity, lower morbidity and mortality costs, and higher returns on human capital investment. Given very low health expenditures and poor population health indicators in Nigeria, significant improvements are possible through relatively low investments. To give a sense of the magnitude of investment required, the World Health Organization (WHO) ranked Nigeria's health system in 2000 at 187 out of 191 countries. WHO estimated per capita public spending on health at $10 per year in 2006, well below the cost of the "set of essential interventions" of $34 computed by the WHO Commission on Macroeconomics and Health in 2000 (Nigeria: The Next Generation, 2010).

Addressing gender issues is another important opportunity for Nigeria. Gender equality is essential for realizing essential human rights. In addition, eliminating gender imbalance is an essential part of realizing a healthy and educated labor force that is employed to its full potential. Average life expectancy and average years of schooling cannot improve significantly when women are marginalized.

Nigeria's gender inequality—including inequality in the vital areas of health and education— is among the most extreme in the world. Nigeria ranks 177 out of 194 countries in terms of the narrowness of the gap in life expectancy between men and women (female life expectancy that is significantly higher than male life expectancy is considered "typical"); high maternal mortality is a chief cause of this gap (Nigeria: The Next Generation, 2010). Women's education also significantly lags behind men's in terms of both enrollment and completion rates at both primary and secondary levels. This lack of educational attainment and opportunity for women also prevents the realization of other drivers of economic growth, such as reduced fertility (Nigeria: The Next Generation, 2010). Most importantly, it affects the education and potential of the next generation, given the dominant influence of women on their children's development.

Substantial difficulties must be addressed if Nigeria is going to successfully overcome its human capital challenges. Nigeria's ranking in the World Economic Forum's Human Capital Index (WEF, 2013), which evaluates the long-term economic potential of each country's workforce, is not encouraging. The index focuses on four aspects of a country's environment: education, health and wellness, workforce and employment, and an enabling environment to realize the economic benefits of human capital. Nigeria ranks 114 among 122 countries in the overall index, and even lower in education (116) and health (120). The only countries ranking lower than Nigeria in health are Guinea and Yemen. Further evidence comes from the Forum's Executive Opinion Survey, which covers more than 14,000 business leaders in more than 140 countries, including Nigeria. The survey asks business leaders about company investments in training and employee development, perceived quality of the country's education system, and perceived quality and access to the country's health system. Results from this survey between 2011 and 2013 indicate increasing levels of dissatisfaction among Nigeria's business leaders with their country's primary schools, math and science education, and overall economic competitiveness (Bloom et al., 2014).

Nigeria will also need to increase its human capital prospects by improving the quality of graduates of Nigeria's educational system. In Nigeria's popular press, employers commonly allege that Nigerian university graduates lack employable skills, including life and leadership skills. An oft-cited reason for this is a weak link between universities and the private sector. However, efforts are already in place to promote university-private sector collaboration and to introduce students to entrepreneurship and innovation. The hope is that fostering entrepreneurship will help create new markets over time. In addition, staff and students of universities and other tertiary institutions are now being introduced to the concept of commercializing their research, through exposure to intellectual property concepts and practices. The National Office for Technological Acquisition and Promotion (NOTAP), in conjunction with the World Intellectual Property Organization (WIPO), has established Intellectual Property and Technology Transfer Offices in 13 Nigerian tertiary institutions and research centers as a way of enhancing university-private sector collaboration and promoting entrepreneurship (Soyibo, 2009). Though a good start, this and other efforts will need to be broadened and deepened.

Human capital development in Nigeria and other sub-Saharan African countries faces another problem: outmigration or "brain drain." If substantial numbers of educated, healthy individuals migrate to other countries for better opportunities, the economic benefits to Nigeria of investing in its youth are diminished. We cannot yet quantify the extent of this effect, but emigration does bring benefits to

emigrants and the family members who remain in Nigeria. Remittances in sufficiently large amounts can add to per capita income, raise standards of living, providing greater economic security making a significant positive difference in the welfare of recipient families. Remittances can provide a means for funding the education of children who remain behind helping to offset the very low level of public human capital spending in Nigeria.

Over the longer term, training Nigerians who then emigrate is not a sustainable strategy. The loss of highly qualified Nigerians inhibits development opportunities for the next generation. Then, if the next generation of Nigerians remains in low-paying and unproductive jobs, the benefits of the demographic transition cannot be realized. The answer to emigration, however, is to create better opportunities for those who have the skills and motivation to succeed. A final issue concerns the sustainability of Nigeria's demographic dividend. One method for achieving sustainable higher standards of living is to channel some of the gains from the demographic dividend into savings and investment. The age transition itself will lead to an increased demand for assets, as Nigerians live longer and the duration of their retirement increases. Although labor income is now relatively high at older ages, this may decrease as more Nigerians are employed in the formal sector, standards of living improve, and the demand for leisure increases. Nigeria launched its Public Pension System in 2005, through the passage of the National Pension Commission (PENCOM) Act of 2004. However, Nigeria's pension system must be expanded and enhanced to involve more participants. Presently only federal government employees and some private sector workers are involved, with most Nigerian workers yet to be covered.

Whether Nigeria should begin to concern itself with the social security of the elderly is open for debate, as more pressing issues may exist. However, persons who are just entering the workforce will not reach retirement age until mid-century. At that time, they may face an extended retirement with a support system that is not up to the task. Nigeria must therefore consider how its financial system can be improved and must encourage retirement saving among today's workers.

4   Conclusions

We have examined prospects for economic growth in Nigeria from both demographic change and human capital perspectives. Our principal conclusion is that Nigeria has a substantial demographic opportunity on the horizon. Even though features of Nigeria's economy make capitalizing on this opportunity challenging, Nigeria has policy options that can translate its demographic transition into indefinite, sustained growth.

In particular, we have estimated that Nigeria's potential demographic dividend could raise per capita incomes more than 30% by 2030, increase the size of the economy to 2.7 times that of its current size, and lift around 27 million additional people out of poverty by 2030. Using a new analysis that highlights previously neglected features of Nigeria's economy, we have highlighted the principal challenges in achieving these benefits: unemployment, low job productivity, and low levels of human capital. Using our estimates and analysis, we have identified channels, human capital spending and higher rates of saving and investment that can translate Nigeria's demographic opportunity into permanent gains.

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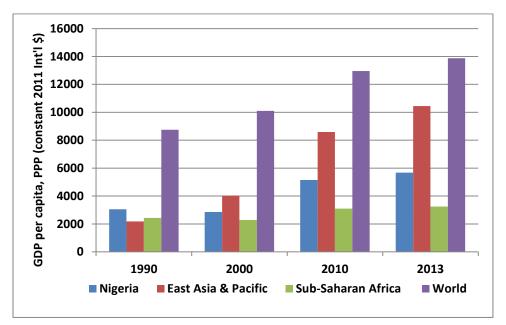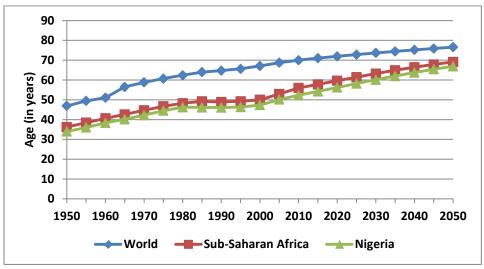
6 Appendix

6.1 Descriptive data for Nigeria's economy and demography

Figure 12: GDP per capita for Nigeria in comparison with other geographies (Source: World Bank, 2014)

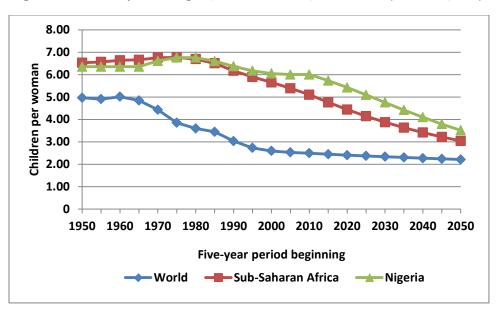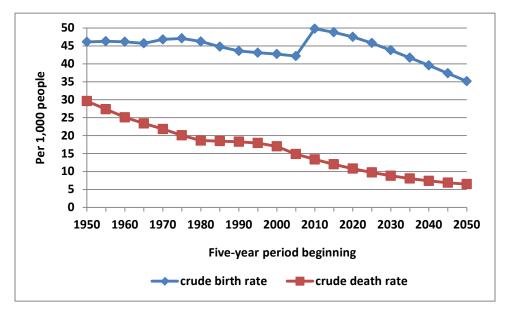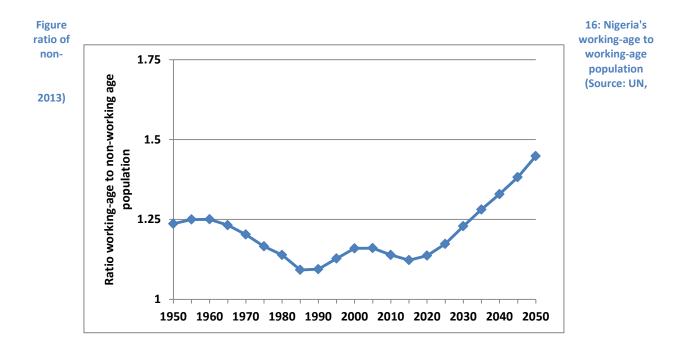Figure 13: Life expectancy for Nigeria, sub-Saharan Africa, and the world (Source: UN, 2013)

Figure 14: Total fertility rate for Nigeria, sub-Saharan Africa, and the world (Source: UN, 2013)

Figure 15: Nigeria's crude birth and death rates (Source: UN, 2013)

Figure 17: Nigeria's population pyramid in 2010 (Source: UN, 2013)
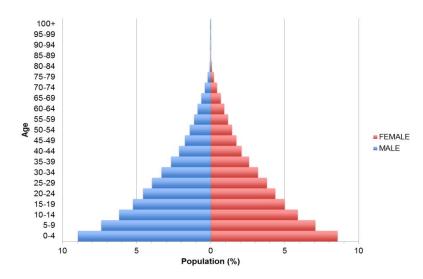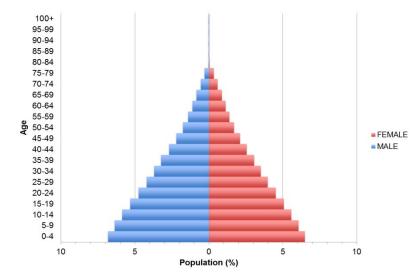

Figure 18: Nigeria's population pyramid in 2050 (Source: UN, 2013)

6.2 Nigeria's institutional quality in comparison with select other countries

Table 12: ICRG institutional quality score (Knack and Keefer (1995)) for Nigeria compared with Bangladesh, India, Indonesia, and Pakistan over 1980–2005

Year	Bangladesh	India	Indonesia	Nigeria	Pakistan
1980	9	21	13	11.7	11
1985	9.6	22.5	16.2	12.0	17
1990	9.2	19	17.3	15.8	14.5
1995	21.0	29.6	29.7	20.9	24.5
2000	24.3	30	28.7	21	28.8
2005	24.3	30	28.7	21	28.8

Figure 19: ICRG institutional quality (Knack and Keefer (1995)) comparison for Nigeria, Bangladesh, India, Indonesia, and Pakistan over 1980–2005
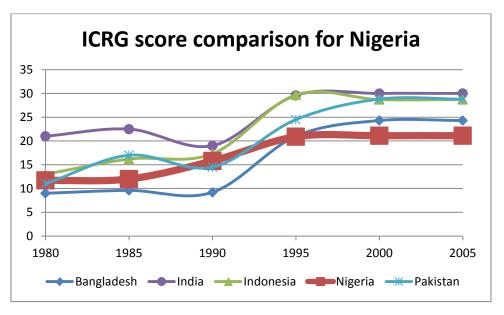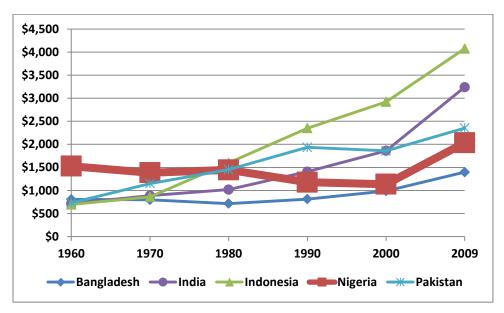

Figure 20: Historical GDP per capita comparison for Nigeria, Bangladesh, India, Indonesia, and Pakistan over 1960–2009; real GDP per capita in constant international prices (Source: Heston et al., 2011)

6.3 Nigeria's economic lifecycle

In Figure 6, labor income is an estimate of all returns to labor normally measured in national income and product accounts (NIPA), including wages, employee benefits, and a portion of self-employment income estimated to be a return to labor before any taxes have been assessed. Labor income of unpaid family workers has been estimated to ensure that the contribution of the young and the old has not been understated. Household surveys were used to estimate age profiles of labor income. All values have

been adjusted to match NIPA estimates. In 2004, labor income was somewhat low for children and young adults, reached a plateau of about 160,000 Naira per year for those in their late forties and fifties, and began to decline fairly rapidly near age 60.

All consumption measured in NIPA, including public and private consumption, has been allocated by age. Private consumption by age is estimated using the 2004 National Living Standard Survey conducted by the National Bureau of Statistics. Private consumption of education, health, and other consumption is estimated separately. Some public consumption, such as spending on education and health, is assigned to the beneficiaries of those public services based on administrative records and regression methods. Non-assignable public consumption is assumed to flow equally to each member of the population.

6.4 Funding Nigeria's lifecycle deficits

Almost exclusively, transfers fund the lifecycle deficits of the young in all countries. Children depend on public transfers[i] (cash or in kind) to fund education, health, and other public goods and services that children consume. In every country for which estimates are available except Hungary, private transfers (especially intra-household intergenerational transfers) are more important to children than public transfers. Typically, public transfers fund between 30% and 40% of the lifecycle deficit of children, and private (familial) transfers fund about 60%. In this context, the discrepancy between Nigeria's entire lifecycle surplus and the lifecycle deficit of children is important and striking. If the entire lifecycle surplus were transferred to children, it would fund only 30% of the child deficit. The remainder is supported almost exclusively by transfers, but these transfers are funded by relying on assets. Hence, Nigeria's large child deficit is primarily funded indirectly by relying on assets.

Public transfers to children can be funded by taxing assets or asset income; using income from public assets, e.g., oil revenues; increasing public debt; or disposing of public assets. Families can rely on private asset income, borrowing, or dis-saving to fund their transfers to children. Thus, Nigeria's large child deficit is funded from both the lifecycle surplus of prime-age adults, shown in Figure 5, and from public and private assets. However, assets play a minor role in directly funding the lifecycle deficit for the young. In general, minor children do not own assets and, hence, cannot rely on asset income or dis-saving to fund their consumption.
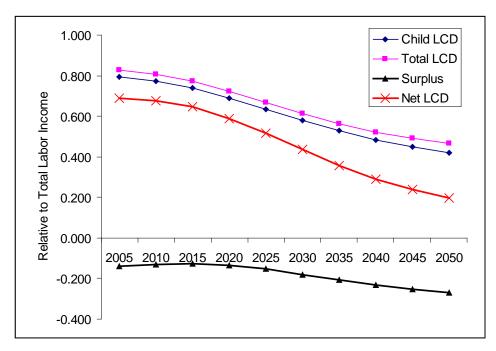
Young adults may rely to some extent on private assets to fund their lifecycle deficits. They may be able to rely on inheritances or other capital transfers, e.g., dowry. Although young adults in many countries rely on consumer credit (credit cards, education loans, and other forms of consumer credit) to fund the gap between labor income and consumption, the low level of financial market development limits this option for Nigeria. As a result, the lifecycle deficit at young ages is funded overwhelmingly through public and private transfers. In addition, Nigeria funds its lifecycle deficit in part by relying on net transfers from the rest of the world. As the largest remittance recipient in Africa, Nigeria receives remittances from Nigerians living and working abroad, receiving an estimated 65% of the total official remittance inflows within sub-Saharan Africa.

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[i] Public transfers are broadly conceived to include all cash transfers and all public consumption.

For the private sector, the role of asset accumulation in funding retirement, as envisioned by the lifecycle saving model, has been emphasized in many economic studies. The importance of lifecycle saving to asset accumulation is widely debated. In addition to funding retirement needs, however, assets play another very important and oft-ignored role in the generational economy – providing the resources parents need to support their children.

Because of the complex nature of the support system, changes in population age structure may have important implications for consumption, public and private transfers, and saving and capital accumulation. The importance of the changes in age structure, if not their exact effects, can be assessed by calculating how changes in age structure effect life cycle deficits and surpluses for broad age groups holding age profiles of per capita consumption and labor income constant. The aggregate deficits can be calculated directly using Nigeria's projected population. The results are presented in Figure 21, where the child deficit is projected to decline immediately and the old age deficit changes very little. The surplus is somewhat constant until 2020 and then begins to increase (the surplus is measured as a negative value, a negative deficit, here). The net lifecycle deficit declines with increasing speed and drops from almost 70% of total labor income in 2005, to 52% of total labor income in 2025, and to 20% of total labor income in 2050.

Figure 21: Projected aggregate lifecycle deficits and surpluses holding per capita lifecycle deficit at 2004 levels

6.5   Nigeria's economic support ratio

A feature of Nigeria's support ratio is that the takeoff is very slow. This is partly a consequence of the somewhat slow fertility decline and hence gradual changes in population age structure. Another reason for the slow takeoff of the support ratio is the very low levels of labor income for young adults in Nigeria. If an enhanced economic lifecycle could be realized, the support ratio would grow much more rapidly over the next decade and remain at a much higher level in the future.

However, many factors account for the depressed levels of labor income at young ages. These include poor employment opportunities, particularly for educated, highly skilled workers; low female labor force participation; and low investment in human capital. Other factors include emigration of educated workers and poor health among young adults. Many of these factors are interrelated and self-reinforcing. The lack of employment opportunities leads to emigration of skilled workers and undermines incentives to invest in human capital. In fact, 36% of tertiary-educated Nigerians emigrated out of the country in 2005 (Mason et al., 2010b). The lack of highly skilled workers undermines opportunities to foster economic growth and create jobs for them. High rates of childbearing increase the opportunity cost of employment for women and reduce their labor force participation. Moreover, high rates of childbearing increase the cost of raising the average educational attainment of the next generation of workers.