2. Comparative analysis of economic lifecycle deficits in Kenya and Nigeria: Some estimation results

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Abstract
This paper used the National Transfer Accounts (NTA) approach to estimate and compare the sources and size of economic lifecycle deficits of Nigeria and Kenya. The approach offers a framework for analyzing and interpreting the relationship between age structure and wealth flows, and for understanding how societies utilize different mechanisms to allocate resources across age groups. Consumption and labor income in Kenya and Nigeria have similar features. Public consumption expenditures on health and education are higher in Kenya and lower in Nigeria relative to the mean income of the reference age. Both countries have economic lifecycle deficits that cannot be offset by labor income. Therefore, individuals must rely on asset income and intergenerational transfers to finance the deficits.

Key words: National transfer accounts (NTA), child dependency, economic lifecycle deficits, Kenya, Nigeria

Analyse comparative des déficits du cycle de vie économique au Kenya et au Nigéria : quelques résultats d’estimations

Résumé
Le présent article se fonde sur l’approche des comptes de transfert nationaux (CTN) pour estimer et comparer les sources et l’ampleur des déficits du cycle de vie économique au Nigéria et au Kenya. Cette approche fournit un cadre pour analyser et interpréter la relation entre la pyramide des âges et les flux de richesse et pour comprendre comment les sociétés utilisent différents mécanismes pour distribuer leurs ressources selon les tranches d’âge. La consommation et le revenu du travail au Kenya et au Nigéria présentent des caractéristiques similaires. Les dépenses de consommation publique dans le domaine de la santé et de l’éducation sont plus élevées au Kenya et moins élevées au Nigéria par rapport au revenu moyen de l’âge de référence. Les deux pays enregistrent des déficits du cycle de vie économique que le revenu du travail ne parvient pas à combler.

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Par conséquent, les populations doivent se tourner vers le revenu du capital et les transferts intergénérationnels pour financer ces déficits.

**Mots clés:** Comptes de transferts nationaux (CTN), dépendance infantile, déficits du cycle de vie économique, Kenya, Nigéria

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### 1.0 INTRODUCTION

Every country faces the problem of optimal population to balance production and consumption activities. Population structure is such that while some are productive, others are dependent. Most basically, children and the elderly are typically dependent—children because they are either too young to engage in productive activities or because they are still acquiring the skills and knowledge needed to be productive; the elderly because of retirement or because the higher prevalence of health disability at older ages prevents them from engaging in economically productive activities. Both groups must rely on people in the productive age range to finance their consumption. If the labor income of those in the productive age range in a given country is sufficient to finance their own consumption and that of the dependent age groups, that country enjoys an economic lifecycle surplus; if not, that country is in economic lifecycle deficit (Lee and Mason 2011).

Depending on their stage of demographic transition, countries undergo shifts in the age structure of their population. For instance, in many parts of the world, changes in the total fertility rate and the infant mortality rate have increased the potential labor force and improved labor productivity. In Africa, however, high fertility combined with declining mortality has resulted in one of the youngest age structures in the world. In economies with high...
youth dependency ratios, families tend to be heavily burdened with health and education expenditures. And because these human capital investments must be spread over a large number of children, spending per child is low. Governments in such societies face the dual challenges of investing in the human capital of future generations, and the immediate, short-term need to invest in the physical capital required for economic growth.

Changes in population age structure enable countries to experience rapid economic growth in the period when youth dependency ratios have fallen, but old age dependency ratios are still relatively low. The economic gain associated with the changing phases of demographic transition, usually measured in terms of a higher growth rate, is known as the demographic dividend. The relatively high percentage of young age groups in African populations and the substantial declines in fertility and mortality in some parts of the continent suggest that Africa is well-positioned to reap the demographic dividend. This, however, is not an automatic consequence of completion of the demographic transition; policy-makers must create the right environment. At the moment, little empirical basis exists for understanding how population dynamics might affect contemporary African populations, because no evidence is available on resource flows across age groups or on how these flows operate to create human capital in various sectors, particularly education and health. The system of the National Transfer Accounts (NTA) offers a framework for analyzing and interpreting the relationship between age structure and wealth flows, as well as the sources of data for understanding how societies allocate resources across age groups. This paper presents and discusses some preliminary results of the estimation of NTAs of Kenya and Nigeria.

Kenya and Nigeria have similar demographic experiences. Fertility declined significantly over the past three decades, particularly in Kenya (Table 1), but in both countries, the decline was below the average decrease for the continent. Both countries faced a reduction in life expectancy; the decline in Kenya was sharper than that in Nigeria, mainly due to the effects of HIV/AIDS. But despite this decline, Kenya’s life expectancy is above the African average, which rose only marginally over the past three decades.

The two countries are important in their sub-regions. Kenya has the largest economy in East Africa, and Nigeria has the largest in West Africa. Both countries currently face challenges in meeting the Millennium Development Goals (MDGs), particularly poverty reduction and improvements in human capital. Understanding their population profiles and how they affect economic growth is important. Individuals pass from dependency during
childhood into a stage of surplus during their productive years, and then end in dependency during old age. The policy challenge is whether the surplus income generated during the productive years can cover the deficits of the two dependency periods.

This paper estimates lifecycle deficits for Kenya and Nigeria. This study analyzes the underlying reasons for the size and structure of these deficits.

Table 1: Demographic indicators, Kenya, Nigeria and Africa, selected years, 1975 to 2005-10

<table>
<thead>
<tr>
<th>Geography</th>
<th>Fertility</th>
<th>Life expectancy</th>
<th>Ageing index</th>
<th>Dependency ratios</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1975-80</td>
<td>2005-10</td>
<td>1975-80</td>
<td>2005-10</td>
</tr>
<tr>
<td>Kenya</td>
<td>7.6</td>
<td>5.0</td>
<td>56.2</td>
<td>50.3</td>
</tr>
<tr>
<td>Nigeria</td>
<td>6.9</td>
<td>5.3</td>
<td>44.5</td>
<td>44.2</td>
</tr>
<tr>
<td>Africa</td>
<td>6.6</td>
<td>4.7</td>
<td>48.7</td>
<td>49.9</td>
</tr>
</tbody>
</table>


Note: OADR = 60+/Age (15-59)

The paper is organized as follows. Section 2 contains a literature review. Section 3 explains the methodology and describes the National Transfer Accounts (NTA) approach, which attempts to estimate National Income and Production Accounts (NIPA) by age groups. Section 4 presents the estimates of economic lifecycle deficits for Nigeria and Kenya. Section 5 is a discussion of the results. Section 6 contains a conclusion and policy implications.

2.0 LITERATURE REVIEW

Lifecycle deficit is the difference between labor income and consumption over the life course. The economic lifecycle is the cross-sectional age pattern that shows the age at which individuals reach economic independence or fall back into dependency (Lee et al 2006). It measures how consumption, labor productivity, and hence, economic dependency, vary with age. The theory underlying lifecycle deficits postulates a long period of child dependency and long life during which elders support the young (Chu and Lee
Despite assumptions that the elders also become dependent in old age, studies have shown that they remain net producers until death (Lee and Mason 2011), which enables them to transfer surplus output to the young. However, Becker and Lewis (1973) and Willis (1987), among others, argue that parents’ altruism toward their children is often limited by the parents concern for their own consumption. As a result, parents balance their own lifetime consumption with that of their children.

This is a refinement of the assumptions of Samuelson (1958) who described how consumption might be sustained throughout the lifecycle via a distribution between generations. In his overlapping generations model (1958), an individual’s life consists of two periods—the productive worker phase and the unproductive retiree phase (Bengtsson and Scott 2011). Those in the productive period finance the consumption of those in the unproductive period. Arthur and McNicoll (1978) expanded Samuelson’s two-generation model to include the entire population, not only workers and retirees, but also, children.

Building on this model, the National Transfer Accounts (NTA) approach estimates age profiles of consumption and production from age 0 to 90 (Mason et al 2011a). Because the approach introduces age estimates into a country’s national income accounts, NTA estimates must be compatible with the National Accounts of the country (Mason et al 2009). The NTA approach has been used to quantify the surplus and/or deficit throughout the lifecycle, and has been calculated for more than 30 countries (Lee and Mason 2008 and Lee and Mason 2011b).

As individuals age, they pass through a deficit-surplus-deficit cycle. This can be depicted by age curves of consumption and production (labor income). The lifecycle deficit illustrates the importance of age structure in the economic development of any country (Lee, Mason, and Miller 2003). Lifecycle deficits must be financed from the surplus period. The intergenerational transfer is such that funds are transferred from the surplus period to the deficit periods. The direction of this transfer depends on the age profile of a particular country. In many developing countries, the direction of intergenerational transfer is mainly downward to finance children’s consumption. However, in some rich nations, the direction is also upward to finance elderly people’s consumption (Lee and Mason 2011b). As old age dependency grows in such countries, it is possible that the system of public transfer to the elderly might not be fiscally sustainable. However, many African countries must still find innovative ways of financing child dependency, which accounts for more than 70% of their lifecycle deficit (Soyibo 2010).
3.0 DATA AND METHODS

The data and methods employed in this paper are from the estimates of the National Transfer Accounts of Kenya and Nigeria (Soyibo et al 2008 and Muriithi and Mwabu 2009). The methodology is explained in Lee and Mason, 2011 and NTA 2011. The aggregate NTA figures are estimated to be consistent with figures of the National Accounts. Construction of the NTA is illustrated by Equation (1). This is a summary expression obtained by rearranging the basic inflows = outflows identity:

\[
\begin{align*}
C - Y_i & = Y_A - S + \tau_g^+ - \tau_g^- + \tau_f^+ - \tau_f^- \\
\text{Lifecycle deficit} & \quad \text{Asset-based reallocations} & \quad \text{Net transfers}
\end{align*}
\]

In Equation (1), the key variable of interest is \( C - Y_i \), and is defined as the lifecycle deficit (the difference between consumption and labor earnings at each age). Inflows to individuals of any given age consist of labor income \( Y \), income from assets \( Y_A \), and transfer inflows from the public sector \( \tau_g^+ \) and the private sector \( \tau_f^+ \). Outflows consist of consumption \( C \), investment \( I \) in capital, credit and land, and transfer outflows to the government \( \tau_g^- \) and to the private sector \( \tau_f^- \). To obtain Equation (1) by rearranging terms in the basic Inflows = Outflows identity, saving \( S \) is set equal to investment \( I \). Thus, Equation (1) states that the difference between consumption and production, that is, the lifecycle deficit (LCD), must equal age reallocations made up of asset-based reallocations and net transfers.

The method introduces age into the National Accounts figures. The starting point is the age profile of the National Accounts figures associated with the consumption and labor income in the two countries. To estimate the age profile of labor income, individuals are identified based on whether they generate income. Income is calculated as earnings from wage and salaries, including fringe benefits. Self-employment income is also included. To incorporate self-employment income in the national aggregate, two-thirds of the mixed income in the National Accounts is used, according to the standard NTA approach, which assumes that the remaining third accrues to property or capital. The age profile of the labor income is derived from survey data in the two countries, and together with population, is adjusted so as to be consistent with the totals in the countries’ National Accounts.
For the consumption age profile, total consumption is divided into private consumption and in-kind public consumption. Because of the importance of human capital to the development of any nation, both education and health consumption are identified: private education and health consumption as reported in household surveys, and public health and education consumption from government spending on these two sectors. As is done for labor income, estimated private expenditure for health, education and other consumption is adjusted to be consistent with the totals in the national income account. NTA is constructed to be compatible with the National Income and Production Accounts (NIPA), meaning that the per capita NTA figures for each age group are the counterfactual amounts that would be obtained if the NIPA per capita figure (for example, per capita compensation of employees) was disaggregated by age.

Estimates of consumption, incomes, asset-based reallocation and transfer inflows and outflows obtained from different sources are adjusted to ensure that they are equal to aggregate totals in NIPA (the control totals). The NIPA of the country for which NTA is being estimated must contain enough detail to provide estimates such as aggregate consumption of public and private education, health, and housing. In addition, NIPA estimates using the income approach must have details such as compensation of employees, operating surplus, mixed income, and indirect and direct taxes.

The currency units in the two countries differ. To make the shapes of the age schedules of income, consumption and lifecycle deficits comparable, the levels were adjusted by dividing the average level of labor income across ages 30 to 49. This age range was chosen because it is the least affected by educational enrolment and early retirement, and because for most countries that have estimated NTAs, it is the period when incomes peak (Bixby, 2011; Lee and Mason 2011a). Thus, the graphs are plotted as ratio to average labor income at ages 30 to 49. In essence, the figures use a monetary scale of one income unit equals average labor income at ages 30 to 49. Details of the methodology are provided in Soyibo et al (2008) and Mwabu and Muriithi (2009).

This study used both primary and secondary data sources. Primary sources played a dominant role in the estimation of age profiles for incomes and consumption, asset re-allocation, and public and private transfer. For Kenya, the primary data source is the Welfare Monitoring Survey of 1994; for Nigeria, the Nigeria Living Standard Survey conducted in 2004. Secondary data sources include Central Bank of Kenya, Kenya Annual Report and Statement of Accounts, Central Bank of Nigeria Annual Reports and Statement of Ac-
counts, Government Budget documents in both countries, publications of the statistics bureaus of both countries, and NIPAs for Kenya and Nigeria.

4.0 RESULTS

The results examine the two components of the lifecycle deficits: consumption and income. The relationship between them indicates the surplus or deficit age span, which, when aggregated, yields either lifecycle deficit or surplus.

4.1 Profile of labor income

Figure 1 shows the normalized components of labor income, where the reference is the 30 to 49 age group. In Kenya, average labor income rises sharply during the late teens and early twenties, reaching a peak at age 40. In Nigeria, labor income does not start to increase until the early twenties, and peaks at age 46. Thereafter, average labor income falls in both countries, but remains relatively high well into old age, reflecting the traditional sectors in which older people continue to work. This contrasts with the profile in developed countries, where labor income drops sharply after age 60. In accordance with the practice in the literature, the means for these variables were normalized for comparison purposes using the average labor income of prime age adults (30 to 49).
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4.2 Components of consumption

Figures 2 and 3 show the age profile of public and private consumption in Kenya and Nigeria. No age group in either country has a mean consumption expenditure that exceeds the mean income of the reference age group (30 to 49). In both countries, the pattern of per capita total consumption is similar to that of other countries studied under the global NTA project (Mason et al. 2008).

Consumption rises steeply in childhood and remains relatively stable among working-age adults. Among the elderly, however, relative to the mean income of the reference age group, consumption is higher in Nigeria than in Kenya. In Kenya, the ratio of per capita public (government) consumption to the mean income of the reference age group is elevated, particularly for education, which, at its highest point, is about six times the corresponding ratio for Nigeria (Figure 2). By contrast, the ratio of per capita private consump-
tion is much higher in Nigeria than in Kenya, particularly with respect to health care (Figure 3). At its highest point, the ratio for private education consumption in Nigeria relative to the mean income of the reference age group, is about four times the corresponding ratio for Kenya.

Government spending on health is relatively higher in Kenya than in Nigeria. The Kenyan government spends more than 6.2% of average labor income on health, compared with 1.8% by the Nigerian government.

**Figure 2: Composition of per capita public consumption in health and education, Kenya (1994) and Nigeria (2004)**
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Figure 3: Composition of per capita private consumption in health and education, Kenya (1994) and Nigeria (2004)

The private sector accounts for most of the spending on human capital in Nigeria. At the peak, private consumption on education in Nigeria accounts for 7.9% of average labor income, compared with 2% in Kenya. And while private spending on health continues to rise over the lifecycle, it peaks at more than 14% in Nigeria, compared with around 2% in Kenya.

4.3. Economic lifecycle

The Lifecycle Deficit (LCD)—the difference between consumption and labor income at each age—indicates when child dependency ends and old age dependency begins. Figure 4, which compares the LCDs of Kenya for 1994 and Nigeria for 2004, shows that child dependency ends at age 24 in Kenya and at age 31 in Nigeria. Old age dependency begins at age 59 in Kenya and at age 62 in Nigeria.
The positive values in Figure 4 indicate the ages during which more is consumed than is produced; hence, there is a deficit at those ages. The negative values indicate the ages when more is produced than is consumed; hence, there is surplus at those ages.

**Figure 4: Profile of lifecycle deficit, Kenya (1994) and Nigeria (2004)**

![Profile of lifecycle deficit, Kenya (1994) and Nigeria (2004)](image)

Table 2 shows the per capita NTA flows of Kenya in 1994 and Nigeria in 2004. Kenya’s LCD is financed mainly by surpluses generated by people in the 20 to 29, 30 to 49, and 50 to 64 age groups; Nigeria’s LCD is financed by surpluses generated by the 30 to 49 and 50 to 64 age groups. Although per capita labor income is higher in Nigeria than in Kenya, consumption expenditure is also higher, which explains Nigeria’s greater lifecycle deficit: about $180 per person versus $25 per person in Kenya. This is the result of the shorter surplus age range—30 to 64—in Nigeria. In Kenya, the surplus period is ten years longer: 20 to 64.
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Table 2: Per capita National Transfer Accounts (NTA) flows (US$), Nigeria (2004) and Kenya (1994)

<table>
<thead>
<tr>
<th>Age group (years)</th>
<th>0-19</th>
<th>20-29</th>
<th>30-49</th>
<th>50-64</th>
<th>65+</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nigeria</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Life cycle deficit (+)/surplus (-) ((\text{consumption minus labor income}))</td>
<td>322.97</td>
<td>311.25</td>
<td>-255.54</td>
<td>-329.88</td>
<td>291.69</td>
<td>180.29</td>
</tr>
<tr>
<td>Consumption</td>
<td>326.45</td>
<td>507.72</td>
<td>604.03</td>
<td>606.16</td>
<td>650.55</td>
<td>446.06</td>
</tr>
<tr>
<td>Labor income</td>
<td>3.48</td>
<td>196.47</td>
<td>859.57</td>
<td>936.04</td>
<td>358.85</td>
<td>265.76</td>
</tr>
<tr>
<td><strong>Kenya</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lifecycle deficit ((\text{consumption minus labor income}))</td>
<td>155.25</td>
<td>-43.64</td>
<td>-368.64</td>
<td>-44.70</td>
<td>180.93</td>
<td>24.55</td>
</tr>
<tr>
<td>Consumption (public and private)</td>
<td>161.14</td>
<td>232.20</td>
<td>245.04</td>
<td>231.92</td>
<td>253.43</td>
<td>198.51</td>
</tr>
<tr>
<td>Labor income</td>
<td>5.90</td>
<td>275.85</td>
<td>613.67</td>
<td>276.61</td>
<td>72.50</td>
<td>173.96</td>
</tr>
</tbody>
</table>

5.0 DISCUSSION

The age profile of labor income in Kenya and Nigeria has the typical inverted-U shape, with productivity concentrated among working-age adults. Labor income peaks at age 39 in Kenya and at age 46 in Nigeria. This compares with the average labor income peak, estimated at around age 40 in the low-income countries and 50 in the high-income countries for which the NTA has been computed (Lee and Mason 2011). In both Kenya and Nigeria, people older than 70 still generate substantial labor income. This contrasts with other NTA countries, notably, Spain, Germany and China, where labor income is almost zero around age 70 (Mason et al 2007; Kluge 2008).

Kenya and Nigeria have common economic features. Self-employment is a major source of income for the young and the elderly, and formal employment is a source of wage income mainly for people in the prime working age range. Some differences are also evident. In Kenya, earnings are the dominant form of income, whereas in Nigeria, self-employment dominates wage income. Also, on average, youth in Kenya start working at an earlier age than do Nigerian youth (this difference could be due to greater avail-
ability of data on child labor in Kenya than in Nigeria). Total labor earnings peak earlier in Kenya than in Nigeria.

Children and elderly in the two countries are a net economic burden to their families—the economic transfers they receive from their families exceed the amounts they transfer to their families. On average, child dependency lasts 33 years in Nigeria, compared with 24 years in Kenya. However, old age dependency starts four years earlier in Kenya (age 59) than in Nigeria (age 63). Kenyans enjoy a longer lifecycle surplus than do Nigerians: 35 years versus 30 years. In both countries, the surplus “age span” is within the range for many other developing countries, which extends from 18 years in Mexico to 38 years in Uruguay (Rosero-Bixby 2011). Nonetheless, most of the lifecycle of a typical Kenyan or Nigerian is spent in economic deficit. Based on life expectancy in the two countries, Nigerians, on average, live more years in deficit than do Kenyans.

This study reveals that the total lifecycle surplus in the two countries is inadequate to cover the lifecycle deficits. Thus, both countries have net lifecycle deficits. The lifecycle surplus can cover 28% of the total deficit in Nigeria, and 76% in Kenya. For example, if the entire surplus was used for child dependency, it would cover 29% of the child LCD in Nigeria and 81% in Kenya. Moreover, this still leaves elderly dependents, for whom 13% and 8% of the surplus is needed in Nigeria and Kenya, respectively. The implication is that the deficits must be covered from sources other than labor income, such as asset income and other transfers.

The lack of social welfare provisions in the two countries has implications for the economic well-being of the elderly. Both countries are in the midst of economic transition, which means that the senior population will continue to grow. As population aging progresses, the need to raise productivity will increase. Unemployment, which has raised the age at which Nigerians attain surplus, will have to be tackled, and child in-kind transfers will have to be implemented.

6.0 CONCLUSION AND POLICY IMPLICATIONS

High dependency ratios in Nigeria and Kenya have resulted in economic lifecycle deficits. The government in Kenya spends more, on average, on the human capital of children, than does Nigeria, where the burden lies more on the household. Relative to the mean income of the reference age group, public consumption expenditures on health and education are higher in
Kenya and rather low in Nigeria. However, because labor income in the two countries cannot pay for consumption at all ages, the excess consumption must be financed through asset incomes and transfers. Public transfers in both countries seem to be of the in-kind variety, although cash transfers can have a much greater impact in reducing poverty, particularly among the elderly. In Nigeria, private consumption is relied upon to finance children’s education, and the health of both children and the elderly. This suggests the need for more government welfare measures that would initiate in-kind and cash transfers to assist dependent age groups.

REFERENCES


