Intergenerational Resource Flows in Côte d'Ivoire: Empirical Analysis of Aggregate Flows

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WHILE THE THEORETICAL importance of intergenerational resource transfers to fertility and household formation has been recognized since John Caldwell's early work (1976) on this topic, empirical confirmation of his theory of wealth flows and fertility decline has been neglected largely due to the lack of appropriate methods and data. Recent developments in modeling intergenerational resource flows make it possible to measure the direction of such flows for a society as a whole. The purpose of this article is to apply these new models to detailed economic data from Côte d'Ivoire to demonstrate that wealth flows are downward—from older to younger generations—in this high-fertility, sub-Saharan African setting. Furthermore, the analysis sheds light on how wealth is accumulated by individuals across the life cycle and on the complementary roles of private and public transfers in the redistribution of resources between different age groups in Côte d'Ivoire.

Theory and evidence on intergenerational transfers

According to Caldwell, high fertility is a rational response by parents to existing conditions in developing countries. Fertility will only fall once the socio-cultural factors that make children net economic supports disappear and children become net economic burdens. Where fertility is high, as it is in Côte d'Ivoire, wealth flows should be upward (Caldwell 1976). Caldwell's (1982) own analysis of transfers in Nigeria is primarily based on qualita-

tive data and is hardly sufficient to provide a reliable quantitative answer on the net flows between parents and children. In a more recent study, Dow et al. (1994) also argue that wealth flows are upward in Kenya. While their analysis is provocative, their data are also subjective and unsuited for determining net economic flows.

More explicitly economic approaches to determining the relative costs of children tend to show that children are not net producers. Bulatao and Lee (1983) review a number of studies on net child costs and determine that excluding the most extreme cases—such as Cain's (1977) analysis of Bangladesh—the average child (boys and girls combined) does not provide net flows to parents before leaving the parental residence. Mueller's (1976) detailed life-cycle analysis of developing-country data was an early and important step in the quantitative evaluation of the direction and magnitude of wealth flows. Her findings strongly suggested that children are net financial burdens on parents in peasant societies when survivorship is included and a zero discount rate is used (i.e., the future is not discounted relative to the present). The sophistication of Mueller's analysis went beyond the existing theory at the time, and further advances have had to await theoretical explanations linking aggregate consumption and production profiles to life-cycle behavior.

Theoretical efforts stemming from Samuelson (1958) combine macroeconomic modeling with increasingly realistic demographic assumptions to examine a number of economic concerns, including aggregate savings rates in the economy, the impact of population aging, and the relationship between public and private economic transfers. Willis (1988)—following on Gale (1973), Arthur and McNicoll (1978), and Lee (1980)—develops a model to explain the relationship of economic stocks to flows and demographic rates in the economy. Lee (1995) extends these results and suggests a comprehensive framework to consider intergenerational transfers. In Lee's model, intergenerational transfers can be classified according to both the mechanism (transfers, credit, and capital) and the institutional channel (family, market, or public sector). In developed countries, this framework has generated important insights into a number of areas, including the economic effects of aging and the intergenerational distribution of wealth (Lee 1995). To date, there has been no application of this approach to nationally representative data from the developing world, mainly because the requisite data are difficult to obtain. The 1986 Côte d'Ivoire Living Standards Measurement Study offers an excellent source of high-quality data for a developing country. In addition, Côte d'Ivoire's fertility remains very high and provides an interesting contrast to places that have been previously studied—these include the United States (Lee 1995), Great Britain, and Japan (Ermisch 1989).

Consumption and labor earning estimates

The analysis in this article is based on data from the World Bank's 1986 Living Standards Measurement Study (LSMS) of Côte d'Ivoire, which is described in Ainsworth and Muñoz (1986) and by the World Bank (1994). The quality of the data is considered to be relatively high although they suffer from various problems often encountered in expenditure surveys, particularly for developing countries (see Deaton and Paxson 1991; Johnson, McKay, and Round 1990). A total of 1,596 households or 12,723 individuals are included in this analysis.[1] This section describes the method for calculating age profiles of per capita consumption and labor earnings.

For our purposes, consumption is based on reported expenditures that include the household's daily and annual outlays on food, health, clothing, and other consumables.[2] Consumption also includes imputed rental values for housing and other durable goods. The imputed rents were estimated by the World Bank (1994). The self-reported value of consumption of own-produced food and nonfood items is included as both consumption and production. Interhousehold transfers (remittances) and tax and loan payments are not included as consumption and are treated separately. In terms of income, labor earnings include the value of one's production activities, whether measured by wages earned or as a function of the household's enterprise revenue.

The average urban dweller in Côte d'Ivoire consumes roughly twice as much as the typical rural resident. Mean per capita consumption for the 5,374 urban households is estimated at 273,803 francs of the Communauté Financière Africaine (CFAF), compared with 164,619 CFAF for the 7,349 rural households.[3] Urban per capita labor income is also much larger than rural: 228,210 CFAF in the urban and 136,750 CFAF in the rural sector. For Côte d'Ivoire as a whole, per capita consumption is estimated at 210,737 CFAF and per capita labor income at 175,381 CFAF. Within both sectors, per capita consumption is about 20 percent greater than per capita labor income.

There are several explanations for the large gap between per capita consumption and labor income. First, nonlabor income presumably makes up part of the difference. Second, given the economic deterioration during the late 1970s and 1980s and the massive national debt accumulated during these years, it is likely that total expenditures are somewhat higher than income. However, it is also likely that incomes are systematically biased downward. An analysis of several LSMS surveys suggests that this is a common problem, although the effect appears relatively minor in Côte d'Ivoire (Johnson, McKay, and Round 1990). While it is difficult to determine the level of income when reports are biased downward, a simple approach is to assume that total consumption equals total labor earnings for

the economy as a whole. This is the assumption we make later in the article. In this earlier part of the article, actual levels of consumption and earnings should have little impact on the substantive conclusions.

Deriving individual consumption estimates

This section explains how individual-level consumption and labor earning measures are derived from the household-level data. Strong assumptions are made; however, since this analysis is based on the shape of age profiles, we are less concerned with errors in the levels of these profiles. The primary concern is with systematic biases that might affect consumption or earnings estimates for all persons of a particular age group. An alternative approach is proposed by Lee (1995), who measures intergenerational resource flows on the household level. Nevertheless, Lee notes that the household approach may not be appropriate in settings where households are large and multi-generational. This is exactly the situation in Côte d'Ivoire: mean household size in both urban and rural sectors exceeds eight persons. Barely 4 percent of households in Côte d'Ivoire fit the paradigmatic Western nuclear family ideal of two adults and two children.

When expenditure data are collected on the household level, there is no single acceptable method for allocating consumption among the appropriate household members. One obviously mistaken approach is to assign each individual in the household an equal amount. The method adopted here is to assign weights—or adult equivalency units (AEUs)—to represent the fraction of a full adult's consumption attributed to persons according to their age. We employ a scale based on Deaton and Muellbauer's (1986) analysis of Sri Lankan data, which has previously been applied in Côte d'Ivoire by Glewwe (1988). According to this scale, children ages 0–6 are allocated 0.2 AEUs, children 7–12 are allocated 0.3 AEUs, youths 13–17 are allocated 0.5 AEUs, and all persons 18+ are allocated 1.0 AEU. This scale suggests, for example, that children under 7 years consume only 20 percent the amount consumed by adults. These age scales ignore a number of important considerations such as differentiation by sex and between young and old adults. In addition, regional differences are glossed over, although it is likely that children are relatively less expensive in rural areas.

Theoretical and empirical problems with estimating child costs and using such weights have been reviewed in detail (see Gronau 1991; Gautier 1994). Deaton and Paxson (1993) argue that such weights are "arbitrary"; nevertheless, the set of weights used here can be considered conservative estimates of child costs. If weights were based instead on caloric needs, as in Cain (1977), children would be allocated larger shares of the household budget. Since this analysis is mainly focused on comparisons by age, relatively low consumption weights for children will lead to understatement

of the needs of children and underestimation of the level of transfers from adults to children. On the other hand, this approach ignores economies of scale when assigning consumption to household members. This will presumably lead to some overestimation of the consumption of children. Consumption estimates for each household member are based on dividing the total household consumption among the household members according to the appropriate weights (AEUs).

Deriving individual labor income estimates

This section briefly describes the methodology used to estimate individual labor earnings (further details can be found in Stecklov 1996). Two general types of labor can be distinguished. The first is wage-based labor where payment is for services rendered outside a person's own household. The second category is household enterprise labor. This refers to all farm or nonfarm labor activity for an enterprise belonging to one's own household.[4]

Labor income is calculated from reports by all individuals ages 7 and older on all labor activities over the past week and over the past 12 months.[5] All individuals earning wages are assigned their reported wage income. While slightly over one-third of urban labor is wage labor, only about one percent of rural workers earn wages. Nonwage labor earnings are more difficult to estimate and are taken to be a proportion of the total household enterprise income (including the self-reported estimate of consumption of own production). The proportions are derived by multiplying the individual's reported number of hours worked by an age-specific productivity index. This index allows us to assign different levels of productivity per hour worked for individuals of different ages. In the urban sector, the index is derived from an age profile based on wage earnings. In the rural sector, because there are too few wage earners, the index is based on Mueller's (1976) study of agricultural labor.[6]

Since earnings for nonwage laborers are based on dividing total farm and nonfarm income among the workers within the household according to reported hours worked and productivity weights, earnings will inevitably include returns to physical assets that cannot all be subtracted as costs. Returns to land, in particular, are difficult to subtract since land markets are practically nonexistent in Côte d'Ivoire (Kozel 1990). While this may mean that the earnings profiles are biased, it is the preferable approach adopted by Deaton in his analysis of the Côte d'Ivoire LSMS (1992) and of Taiwanese data (Deaton and Paxson 1993). Most likely, allocating returns to land as earnings will tend to bias the earnings profiles toward younger ages since the land is typically controlled by the elder members of the household.

Analysis of the consumption and labor income profiles

We now construct profiles of consumption and labor earnings by age group for the urban and rural sectors of Côte d'Ivoire. Individual consumption, c_i, and individual labor income, y_i, are summed for all persons aged x and divided by the number of persons aged x in the survey, $N(x)$. The result is the consumption and labor income profiles, $c(x)$ and $y(x)$:

$$c(x) = \frac{\sum_{i=1}^{N(x)} c_i(x)}{N(x)} \qquad y(x) = \frac{\sum_{i=1}^{N(x)} y_i(x)}{N(x)}$$

Figure 1 presents the urban (broken lines) and rural (solid lines) $c(x)$ and $y(x)$ profiles. They both display a familiar pattern: children and the elderly tend to consume more than their labor earnings, while middle-aged adults produce in surplus. Comparison across the two sectors highlights a number of interesting differences. For example, we can compare the ages at which the average person in each sector makes the transition from net consumer, $c(x) > y(x)$, to net producer, $c(x) < y(x)$. In the urban sector, labor earnings rise and surpass consumption slightly after age 27.5, while in the rural sector the crossover occurs during the late teens or early 20s.[7] The crossovers in both sectors are surprisingly late, especially considering Cain's (1977) work in Bangladesh where he calculates that male children become net producers by age 12. However, Cain's analysis focuses only on the caloric value of consumption and production and ignores females since their labor is restricted for cultural reasons. A subsequent survey by Cain (1982) of results for other Asian populations is more in line with the results presented here. Deaton and Paxson (1991: 31) analyze age profiles of household consumption and labor earnings by the age of household heads and also note the very early peak found in the earnings profile of the Côte d'Ivoire data.

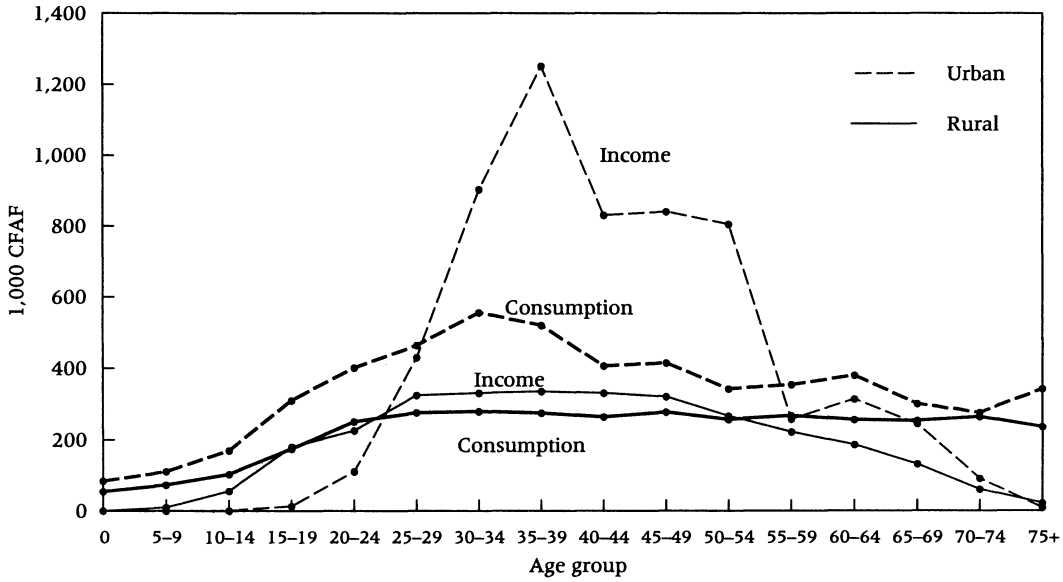
Several factors may explain the late crossover ages for young adults in Côte d'Ivoire:

(1) Consumption of young adults may be overestimated. Young adults in Côte d'Ivoire most often live with their families and may consume far less of the household total than older members. However, the method used here assigns the weight of a full adult to all persons ages 18 and older.

(2) Mueller's productivity profile may not be appropriate for Côte d'Ivoire and may underestimate the productivity of young rural adults relative to older adults.

(3) The method for estimating labor income may have underestimated levels for young urban adults. Wage labor may not be a good indicator of relative productivity by age because of labor market inefficiencies.

FIGURE 1 Urban and rural per capita consumption and labor income by age group: Côte d'Ivoire 1986



On the other hand, the late crossover may indeed signify something real. For example, higher returns to human capital, particularly in the urban sector, should motivate young urban adults to invest more in human capital and delay their entrance into the labor force (Willis 1982). In addition to more time in the formal education system, large numbers of young men in Côte d'Ivoire apparently work as unpaid apprentices (Kozel 1990). Such late ages of economic "independence" may also seem odd for the rural sector, but the finding is consistent with a setting where the young have limited wage potential and the elderly control the land (Foner 1984).

Also, while the labor force participation of young urban Ivoirians seems implausibly low, it was strongly supported from observations during my fieldwork in Côte d'Ivoire. According to a variety of accounts, gathered from both focus group interviews and discussions with researchers and policymakers, young men since the 1980s have found it extremely difficult to find employment in the cities. Many who wanted to continue with studies were forced to stop because of cuts in government educational subsidies. It was during this period that the Côte d'Ivoire government began a national campaign to motivate urban youths to return to the villages—to reduce both unemployment and crime problems (see Le Pape and Vidal 1987).

As to the labor income of the rural elderly, one might anticipate a slow decline, particularly if economic inactivity is delayed because of the lack of alternative revenue sources. In fact, this appears to be the case: by

ages 55–59, both rural and urban elderly are net consumers. The urban rate of income decline is steeper than the rural, suggesting a possible cohort effect. Adults who entered the labor force during the booming economic years continued to profit, while those who entered earlier never enjoyed the same level of earnings. A similar cohort-like effect may explain why rural incomes decline after the early 30s. Much of Côte d'Ivoire's wealth is based on coffee and cocoa exports. However, coffee and cocoa plantations have natural life cycles, which may help to explain why elderly rural workers earn lower returns to their labor than younger workers who may be farming newer plantations.[8]

It is obvious from the consumption and labor earning profiles in both urban and rural sectors that residents can be split into three groups: the young and the old, who both consume more than they earn; and the middle aged, who earn more than they consume. How do certain age groups manage to consume more than they produce? One explanation is that the profiles observed in 1986 do not represent a stable phenomenon. It may be that in 1985, the young earned more than they consumed, saved, and are consuming in 1986 the fruits of their own prior labor, rather than the 1986 earnings of other age groups. In the model economy proposed by Samuelson (1958), there are no durable goods; therefore, net consumption must be financed by resource flows from net producers. In the real-world economy of Côte d'Ivoire, dissaving and disinvestment are possible. We assume, however, that the age profiles observed in the 1986 data do not vary greatly from year to year. In the next section, we assume that the profiles rise exponentially over time at the same rate at which productivity grows in the economy.

In the data, we find that rural 5–9-year-old children consume on average about 74,000 CFAF (US$214) per year; their labor earnings are negligible at about 10,000 CFAF (US$29). It seems reasonable to assume that they are not consuming savings, rents, or proceeds from the liquidation of capital assets that have not yet been accumulated. Therefore, they must be consuming resources produced by other, more productive age groups in society that are made available to the children either as private or public transfers or as market loans. Presumably in Côte d'Ivoire, most of the resources consumed by children are provided in the form of transfers from their parents. Certain goods and services such as education are provided by the public sector through taxation of the working population and are discussed in a later section.

While the young clearly depend on transfers, the situation of the elderly is more complicated. Given the limited availability in Côte d'Ivoire of instruments for savings and asset investment (land in particular), much of the consumption of the elderly must be due to transfers. According to the basic model, transfers allow individuals to overcome the life-cycle problem by reallocating resources from productive age groups to less productive age

groups. An alternative model, the life-cycle theory of savings, suggests that individuals save and dissave over their lifetimes to smooth consumption; however, Deaton and Paxson (1991) show that this theory is not supported by the Côte d'Ivoire data.

Resource flows are discussed in detail in several articles relating individual behavior to fertility decline (Caldwell 1976; Willis 1982). Given the high levels of fertility in Côte d'Ivoire (total fertility rate equal to about 6.8 children per woman; République de Côte d'Ivoire 1995), the Côte d'Ivoire Living Standards Measurement Study would appear to afford an excellent opportunity to test whether resources flow from younger to older persons. To evaluate the direction of resource flows in Côte d'Ivoire, we use the consumption and labor income profiles in conjunction with the population age distribution in order to calculate the average ages of consumption and labor income in society, *Ac* and *Ay*:

$$Ac = \frac{\sum_{x=0}^{w} c(x) \cdot N(x) \cdot x}{\sum_{x=0}^{w} c(x) \cdot N(x)} \qquad Ay = \frac{\sum_{x=0}^{w} y(x) \cdot N(x) \cdot x}{\sum_{x=0}^{w} y(x) \cdot N(x)}$$

The average ages are presented in Table 1. The average age of labor earnings, *Ay*, is greater than the average age of consumption, *Ac*, by almost 11 years in the urban sector and 2.5 years in the rural sector. Since the average age of consumption is less than the average age of earnings ($Ac < Ay$), there must be a substantial downward flow of resources in Côte d'Ivoire. Large elderly populations could force the average age of consumption to rise above the average age of earnings and induce resources to flow upward. Note that we are considering resource flows as a whole. No attempt is made to distinguish between credit market flows, capital asset flows, and family or nonfamily transfers. For now, we can say only that the flow of resources in urban and rural Côte d'Ivoire is downward, from older to younger persons.[9] Only public-sector flows are excluded and are analyzed separately in a later section (the data will show that public-sector flows indicate an even more pronounced downward flow of resources). In the following section, we impose a set of additional assumptions to allow the measurement of life-cycle wealth and the composition of aggregate wealth in Côte d'Ivoire.

TABLE 1 Average ages of consumption, *Ac*, and labor income, *Ay*, in Côte d'Ivoire 1986

	Total	Urban	Rural
Consumption	29.3	26.8	32.4
Labor earnings	36.4	37.7	34.9

Derivation of per capita wealth and per capita transfers

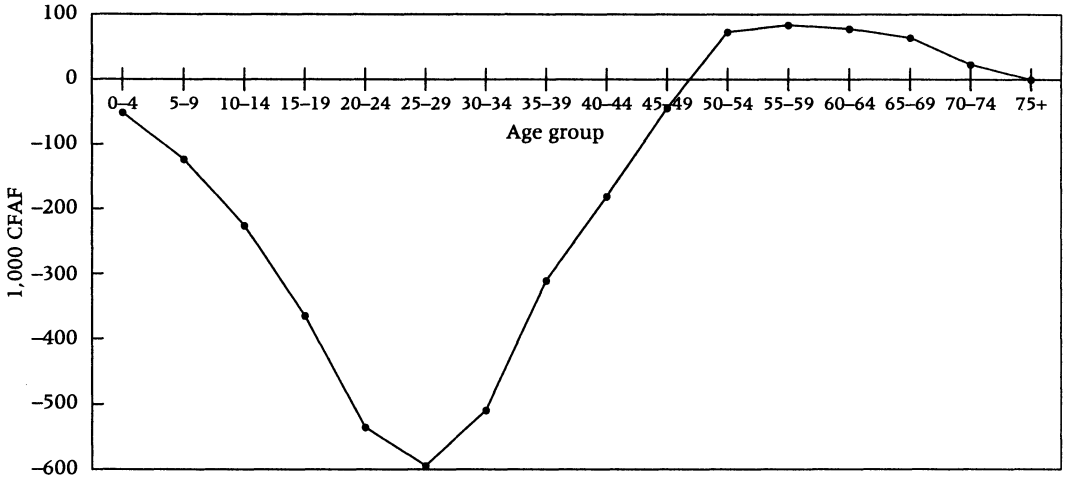
Lee's framework (1994, 1995), building on Willis (1988), Kotlikoff and Summers (1981), and Lee (1980), allows us to represent economic flows in considerable complexity, under stable-theory assumptions.[10] Here, we take a step backward and apply a restricted portion of Lee's model to the Côte d'Ivoire annual data on consumption and labor earnings to study how the average individual accumulates wealth over the life cycle. We focus in this section on the basic results. Details on the underlying assumptions and derivation of life-cycle wealth can be found in Lee (1994, 1995) and Stecklov (1996).

We can think of life-cycle wealth, when the productivity of capital in the economy is unchanging[11] as the value of resources attributed to a newborn that must "borrow" at interest rate i in order to pay for its consumption in excess of labor earnings. In the years when earnings exceed consumption, the difference is "deposited in the bank" to earn interest at rate i. The balance of the newborn's bank account at each age, x, corresponds to the concept of life-cycle wealth, $w(x)$. In reality, the difference between consumption and labor earnings at each age is made up by net transfers received, plus returns on capital (or investment in capital), plus net borrowing or lending.

The pattern of life-cycle wealth in developed countries typically begins with rapid negative wealth accumulation, which reaches a minimum during the 20s, increases and turns positive in the mid-30s, peaks in the 60s, and declines toward zero at the oldest ages (Lee 1995). This is in sharp contrast to Lee's (forthcoming) calculations on data for Amazonian hunter/gatherer/horticulturist groups, where he finds that wealth is increasingly negative until the early 20s and then increases over the remaining life cycle but never turns positive. The results for Côte d'Ivoire, shown in Figure 2, present an interesting contrast to both cases.[12] Initially, wealth accumulation is strongly negative and reaches a minimum during the late 20s. It then rises and turns positive just before age 50, thereafter declining toward zero. Thus there is a short stage of the life cycle when the average surviving member of a cohort possesses positive wealth.

The most obvious difference between the life-cycle wealth profile in Côte d'Ivoire and the United States is that most of the life cycle in Côte d'Ivoire is spent in debt. The discounted sum of earnings minus consumption is less than zero for all ages until almost 50. In the United States, this period is much shorter and the period of positive accumulated wealth is longer. The $w(x)$ result tells us how wealth is accumulated over the life cycle. However, in order to measure the overall direction of flows, we must also consider the population age structure.

FIGURE 2 Accumulated per capita life-cycle wealth by age group: Côte d'Ivoire 1986



Estimating population wealth

Following Lee's framework (1995), under certain conditions a very simple relationship can be shown to exist between per capita values of consumption, c (or labor income, y), and the level of per capita wealth in society, W.[13] Per capita wealth is equal to per capita consumption, c, times the difference between the average ages of consumption and earnings, Ac and Ay:

$$W = c(Ac - Ay)$$

If the average age of consumption is greater than the average age of labor income, the average person in the population possesses positive life-cycle wealth. Lee (1995) shows that in the United States, the average age of consumption is about four years greater than the average age of labor income. Similar results have been found for England and Japan (Ermisch 1989).

When this measure is applied to the Côte d'Ivoire 1986 Living Standards Measurement Study data, the average age of consumption, Ac, is found to be 7.1 years lower than the average age of labor earnings (see Table 1). In addition, per capita consumption is 210,737 CFAF (roughly US$608). Therefore, average aggregate wealth per capita is estimated at –1.5 million CFAF (roughly US$4,300).

Total per capita wealth, W, is distributed between per capita real wealth, K, and per capita transfer wealth, T (Lee 1995; Kotlikoff and Summers 1981; Willis 1988). These calculations clearly indicate that W is nega-

tive in Côte d'Ivoire. In addition, K must be positive because real capital wealth cannot be negative; therefore, T must be at least as negatively large as W: $T \leq W$. Per capita transfer wealth in Côte d'Ivoire must be a large negative quantity, implying that resources flow downward from older to younger individuals over the life cycle. In contrast to Caldwell (1976), who maintains that resources must flow upward from children to parents in high-fertility settings, our results imply that individuals, on average, will receive net resources from their parents and give resources to their children.

Evolutionary biologists argue that resources must flow downward since the alternative—that parents receive net resources from their children—is inconsistent with evolutionary principles. The basis of the evolutionary argument is that "parents are likely to have evolved to invest in offspring throughout the life course, and therefore a system is unlikely to arise in which children more than return the resources and services their parents gave them when they were young" (Turke 1989: 76). The evolutionary explanation is strongly supported by Kaplan's (1994) analysis of hunter-gatherer populations in South America, which shows that the elderly remain active and parents continue to invest in their children well beyond the end of reproduction. It is also supported by our results as well as those of Lee (forthcoming).

The role of population growth

Can one determine the extent to which these results are driven by the demographic structure of Côte d'Ivoire—a structure that reflects very high fertility rates? Whereas Caldwell's theory focuses on the role of economic flows in determining fertility, we can also ask the opposite question: How important a role does the demography of Côte d'Ivoire play in influencing the average age of consumption and production? Although measurement of the impact of fertility and mortality rates on micro-level economic behavior is difficult, one can quantify, for example, the direction of wealth flows in a hypothetical country where the economic profiles are the same as in Côte d'Ivoire, but where fertility has been reduced to replacement levels, that is, the population is stationary.

The first step in answering this question is to fit the right life table to the Côte d'Ivoire population. Life expectancy in Côte d'Ivoire is 53.7 years for females and 50.3 for males; the crude birth rate is 49.9 per thousand and the crude death rate is 14.7 (United Nations 1993). Given these parameters, the Coale–Demeny West Model life table level 14 (Coale and Demeny 1983) seems most appropriate. The observed consumption and labor earnings profiles in combination with the life table stationary population age structure provide the hypothetical average ages of consumption and labor income and are shown in Table 2.

TABLE 2 Average ages of consumption and labor income for the survey population of Côte d'Ivoire and an equivalent stationary population

	LSMS survey population ($r \approx 3.5\%$)	Life-table population ($r = 0$)
Consumption	29.3	39.1
Labor earnings	36.4	40.5

From our earlier analysis (see Table 1), we know that the difference between *Ac* and *Ay* is about –7 years for Côte d'Ivoire as a whole. When the consumption and labor income profiles for the entire population are multiplied by the age structure of the hypothetical stationary life table population, the difference between the average ages is reduced to –1.4 years. In a population with mortality similar to Côte d'Ivoire's but with fertility at replacement level, the difference between *Ac* and *Ay* is reduced by four-fifths. Of course, such comparative static calculations should only be taken as an indication of the *potential* role played by the population age structure. In reality, the consumption and labor income profiles may themselves depend on the pace of population growth (or the age structure).

The effect on the average ages should also be considered in relation to Lee's (1994) analysis of Eva Mueller's data, where he experiments with average age calculations using life tables and Mueller's consumption and labor income profiles. Lee finds that *Ac* increases from 5 years less than *Ay* to slightly more than *Ay* when he substitutes a low-mortality age structure (e_0=75) in place of a high-mortality age structure (e_0=25). Our results and Lee's both indicate that resources flow downward in settings of high population growth and that the age structure plays a pivotal role in the calculation.

Intergenerational flows of public-sector resources

There is another dimension to the costs and benefits of children. When parents make the childbearing decision, they can be expected to include only private costs. Social costs, however, may be just as important, and as Lee (1991) has shown for India, these may imply that the externalities to childbearing are negative. Large negative externalities have important policy implications; in particular, they indicate the potential benefits for countries from investing more heavily in family planning services, female education, and social security in order to reduce fertility. By not incorporating the full societal cost into their decisions, parents cannot be expected to choose a level of fertility optimal for society as a whole. Some fear that this

could lead parents to bear too many children and could eventually result in overpopulation. In the foreboding words of one pessimist, "[F]reedom to breed will bring ruin to all" (Hardin 1968).

Côte d'Ivoire presents an opportunity to examine this issue. Although we do not directly measure externalities in this article,[14] we can examine a related indicator—the direction of public-sector resource flows. The family, market, and public sector are the three primary institutions within which resources are allocated (Lee 1995). The earlier sections of this article focused on family and market transfers. This is appropriate because poor countries normally have high fertility but small public sectors. Côte d'Ivoire, however, has one of the world's most rapid population growth rates but also an unusually large public sector. Thus, although the family remains the main locus of economic activity in Côte d'Ivoire, we must also show how public-sector resources are reallocated between age groups.[15]

Governments employ taxation and other financial instruments to collect resources from individuals and corporations (both domestic and foreign-owned) in order to pay for the government's budget. The budget includes such outlays as government salaries, defense, infrastructure, and basic services for the population, for example schooling and health. Some of these outlays, such as defense and roads, are public goods since persons cannot be excluded from their consumption. There is no canonical way to allocate public goods to individuals. Other government expenditures, such as education, social security, and health care benefits, are private goods and therefore more easily attributed to individuals. The costs of education, for example, can be considered a transfer to young persons in school. The funds for these service transfers can come from any part of the government budget, and it is again difficult to attribute the government inflows by age for most sources. One source of government revenue that is relatively simple to attribute is income tax.

The rest of this section develops the methods to estimate government receipts and expenditures according to the ages of persons who are sources of revenue and the ages of recipients of transfers and services. The various public-sector inflows and outflows indicate a substantial transfer of resources from older to younger individuals in society, supporting results presented earlier in this article that familial and interfamilial transfers also point downward. These results for the public sector are not surprising given the very young age structure of the Ivoirian population. Together, the two pieces of evidence strongly support our claim that resources within Côte d'Ivoire flow downward, from older to younger individuals.

The public sector in Côte d'Ivoire

Félix Houphouët-Boigny, president of the Republic from independence in 1960 until 1993, is considered one of the great leaders of postindependence

Africa—having had the foresight to invest heavily in education and health. In contrast to many other African countries during postindependence, development efforts in Côte d'Ivoire went beyond the urban sector and a more equitable rural–urban approach was adopted. Nevertheless, large public works programs, including construction of the second largest basilica in the world, and one of the highest debt service ratios in the world, meant that by the late 1980s Côte d'Ivoire was obliged to reduce the size of the public sector in response to demands of the World Bank's and the International Monetary Fund's structural adjustment and stabilization programs.

Public-sector resources accounted for almost one-third of Côte d'Ivoire's gross domestic product of 3,172 billion (B) CFAF in 1986 (République de Côte d'Ivoire 1992a). In that year, Côte d'Ivoire spent a higher proportion of GDP on the government sector than the average spent by high-income countries (World Bank 1988). In fact, as a group, only the highly centralized economies of Eastern Europe and China appear to have spent more. For example, central government expenditures accounted for over 60 percent of GNP in Hungary in 1986 (World Bank 1988).

It is also important to note that direct transfers are only one of the tools with which governments may effect transfers between various segments of society, including socioeconomic classes, urban–rural residents, and age groups. For example, a shift in exchange-rate policies may lead to immediate increases in the wealth of producers of marketable exports and a loss by subsistence agriculturalists. Similarly, government policies toward inflation and interest rates may result in important resource reallocations between different age and socioeconomic groups. Estimating the effects on inter-age resource flows of such policy choices is extremely difficult, but ignoring it may mask important transfers between groups. Nevertheless, the focus in this article is on direct government transfers.[16]

Government expenditures

Only a portion of expenditures can be analyzed in terms of the age of recipients of government transfers and services. Public goods such as defense and infrastructural expenditures are practically impossible to allocate, but privately consumed services and transfers such as education, health, and social security can be examined. Total government expenditures in 1986 were 1,141 B CFAF. The breakdown by major categories of spending is shown in Table 3. Expenditures on education, health care, and social security comprise 22.4 percent of the total government budget. While these expenditures are estimated for urban and rural sectors separately (see details in the Appendix), the distinction is somewhat artificial. It is common, for example, for rural parents to send their children to live with relatives in order to attend urban secondary schools. Since the population is mobile and can shift between urban and rural areas, to take advantage of differ-

TABLE 3 Government receipts and expenditures: Côte d'Ivoire 1986

	Amount (billions of CFAF)	Percent
Receipts		
Income taxes	162.1	15.4
Production taxes	183.3	17.4
Import duties	237.6	22.6
Export taxes	78.7	7.5
Other revenues	391.0	37.1
Total	1,052.7	100.0
Expenditures		
Education	200.6	17.6
Health	31.5	2.8
Social security	22.9	2.0
Economic services	294.6	25.8
Defense	36.5	3.2
Other	554.8	48.6
Total	1,140.9	100.0

SOURCES: République de Côte d'Ivoire (1992a, 1992b); Chia, Wahba, and Whalley (1992).

ences in the level of government services, analysis of the two sectors separately draws a line that is not always clearly defined. Nevertheless, because of the large gaps in welfare levels between urban and rural areas, we continue to explore government receipts and expenditures separately in the two sectors.

Another concern is to determine what portion of government spending on services should be considered a transfer. A portion of these expenditures goes toward salaries, and it is likely that public-sector employees in many developing countries are paid above their market value. While this is an important question, we ignore the problem and suppose for the purpose of these calculations that all government expenditures on these programs are received and consumed by those targeted.[17]

Details on the procedure for estimating education, health, and social security transfers by age are included in the Appendix. Essentially, census data are combined with the LSMS survey data and data from Table 3 to construct profiles of per capita transfers in education, health care, and social security. The profiles are estimated separately for the urban and rural sectors. The education profile is based on census data regarding school attendance and estimates of the relative costs of primary, secondary, and post-secondary education. The health care profile is based on the average private reported health care expenditures by age group from the LSMS. Per capita social security estimates are derived from LSMS data on the propor-

tion of total social security receipts in each of the two sectors. The total value of social security transfers to each sector is divided by estimates of the number of elderly living in each sector.

In general, the shapes of the per capita transfer profiles are similar in the two sectors (not shown here). Education transfers to children are large for both sectors, although they fall off at earlier ages in the rural sector where there is limited access to secondary and postsecondary schooling. In both sectors, individuals typically receive their largest transfers in the form of education. In the urban sector, there is a notable increase in the value of services from health care transfers and from social security beyond age 50. In contrast, social security in the rural sector brings only a marginal benefit since few rural elderly receive government pensions. In both sectors, public health efforts such as vaccination and oral rehydration programs are focused on children; therefore, they tend to substitute for private expenditures on health care for children and will lead us to underestimate the level of public-sector health transfers to children (see Appendix). While the elderly receive relatively large per capita public transfers, the magnitude of the transfers on the aggregate level is quite small due to the youthful population age structure (see Figures 3 and 4 below). In fact, although social security flows are as large as the education transfers on a per capita level, they actually represent a small fraction of education expenditures when compared on the population level. Figures representing each of the transfers in the urban and rural sectors can be found in Stecklov (1996).

Government revenues

The total revenue of the Côte d'Ivoire government in 1986 was 1,053 B CFAF. The breakdown by source of revenue was given in Table 3. The following two sections discuss each of the revenue sources as well as the method of deriving income tax receipts by age of payee. Unfortunately, sources for more than one-third of the total government revenues are not allocable and are simply labeled "other revenues."

Income taxes. Income taxes are clearly the easiest portion of government revenues to allocate to particular sources. Taxes on income represent 24.5 percent of tax revenues and 15.4 percent of total government receipts (Table 3). The total revenue from income taxes is estimated at 162.1 B CFAF. The income tax system in Côte d'Ivoire is considered progressive (Chia, Wahba, and Whalley 1992); however, we assume a flat income tax in order to simplify our analysis. This assumption is likely to lead to underestimation of the age of the average payer since richer persons will typically be older but will be weighted less. And while only income taxes are allocated and used in this analysis, the income tax age profile should be correlated with age profiles for other government revenues. Most likely,

other revenues are derived from some age distribution of individuals that is at least as old as the income tax profile. Any tax, such as the production tax or import tax, that is based on subtraction from returns to factors other than labor (rent, for example) should on average be shifted to older ages since nonlabor income increases with age.

Since data are not collected on individuals' income tax payments, income taxes are estimated from the LSMS earnings data using the flat tax rate assumption. We assume that the relative amount of income in each sector is proportional to the relative amount of income tax paid by the two sectors. However, not all of the estimated income for the two sectors should be included. A large fraction of production, particularly in the rural sector, is consumed by households and is never monetized. This fraction of production—33 percent in the rural sector and 1.3 percent in the urban sector—is exempted and only the remainder might be taxable by the government.

Profiles of the estimated per capita tax payments are not presented here (see Stecklov 1996). Both the urban and rural profiles have the same shape as their respective earnings profiles since they are estimated as a flat-rate income tax (see Figure 5 for the national per capita tax profile). The urban sector provides a far greater share of the government's income tax revenue. The tax burden is greatest between ages 30 and 75, with adult urban residents paying about 140,000 CFAF (roughly US$400) per head per year. Rural residents during these ages pay about one-fourth this amount. Although the income tax burden weighs heaviest on urban residents, production and export taxes may impose a compensating, heavy, tax burden on the rural sector.

Import duties, export taxes, and production taxes. Import duties appear to be the largest single source of government revenue, accounting for 237.6 B CFAF. Import duties, besides being relatively easy to collect, serve a number of purposes. First, in Côte d'Ivoire they are typically imposed on luxury goods and thus are progressive, leading to resource transfers from richer to poorer groups. They are also used by the government to help develop import substitution industries within Côte d'Ivoire. Despite their magnitude and importance, they are difficult to allocate. Presumably, import duties primarily tax the urban sector since urban households are wealthier and more likely to buy imported goods.

Export, import, and production taxes are also difficult to allocate. Government statistics report that export taxes provide about 78.7 B CFAF in revenues. Export taxes are highly inefficient—particularly for countries trying to increase market-oriented production—and since 1986 they have been all but eliminated due to pressure by international funding agencies (Chia, Wahba, and Whalley 1992).

Another element in the government's budget further complicates the picture. Exports are not directly sold on a free market; instead government marketing boards determine the prices to be paid to producers for coffee,

cocoa, cotton, and rice.[18] Côte d'Ivoire has been among the world's leading exporters of cocoa and coffee for many years. Exports are managed by marketing boards, or Caisse de Stabilisation (CAISSTAB), which were set up by the government in 1962, shortly after independence. The CAISSTAB operates by guaranteeing producers a price for coffee and cocoa after the harvest, regardless of fluctuations in the world price. The presumed advantage of this arrangement is that the government reduces the risk of growing cash crops and helps to stimulate domestic production. Since world prices rose consistently through the late 1970s and early 1980s, the government managed to extract large revenues by paying farmers well below the world price. In more recent years, the government has often found itself subsidizing production. Because statistics are not made public, it is difficult to distinguish the proportion of government revenues that is derived from the CAISSTAB. There is no way of knowing how to allocate these revenues, which may partly include production taxes. One reasonable guess is to assume they are paid in the same proportion as income taxes, although presumably larger shares are paid by older people who possess more capital.

As mentioned earlier, income taxes are the only source of government revenue that can be easily attributed. The age incidence of any of the other sources of revenue is unknown, but we can assume that taxes are on average proportional to income. This presumably shifts the age profile of government revenue to lower ages than the true ages and therefore works against what we will ultimately argue—that public-sector flows, too, are downward. The shape of the profile and the division of revenue between the urban and rural sectors are based on income tax payments. However, the profiles are scaled upward so that the sum of the taxes paid by the population is equal to the sum of the services and transfers received by the population (255 billion CFAF).

Net public-sector inter-age resource flows. When the per capita public-sector transfers and receipts by age are multiplied by the population numbers distributed by age, the large net transfers that older age groups make to the younger age groups are highlighted. Figures 3 and 4 show the aggregate transfer and tax data for the two sectors. The imbalance could also be explained by intersectoral resource flows, which are difficult to quantify because only a small fraction of total government expenditures and taxes is included. Nevertheless, urban households pay more in income taxes, for example, and this may provide important resources for rural residents.

Government tax receipts are clearly concentrated on the middle-age groups, and the mean age for tax payments is estimated at 43.7 years in the urban sector. The mean per capita tax payment is 15,874 CFAF (about US$45). The government expenditure profile contrasts sharply with the tax receipt profile. The mean age for transfers and services received is 25.7

FIGURE 3 Aggregate urban public-sector taxes and expenditures: Sources and recipients by age group, Côte d'Ivoire 1986

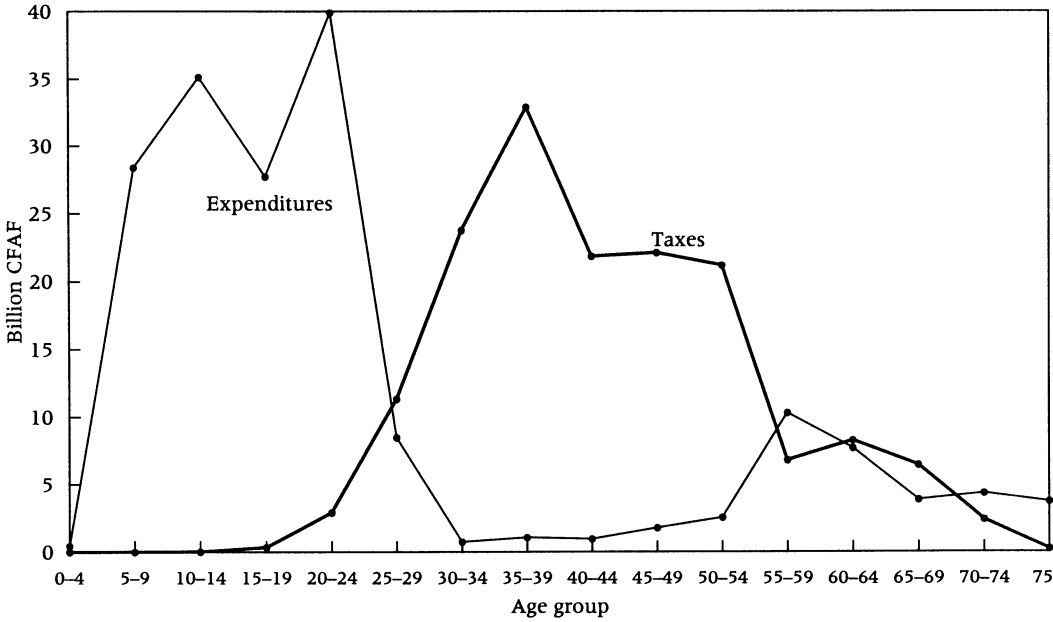
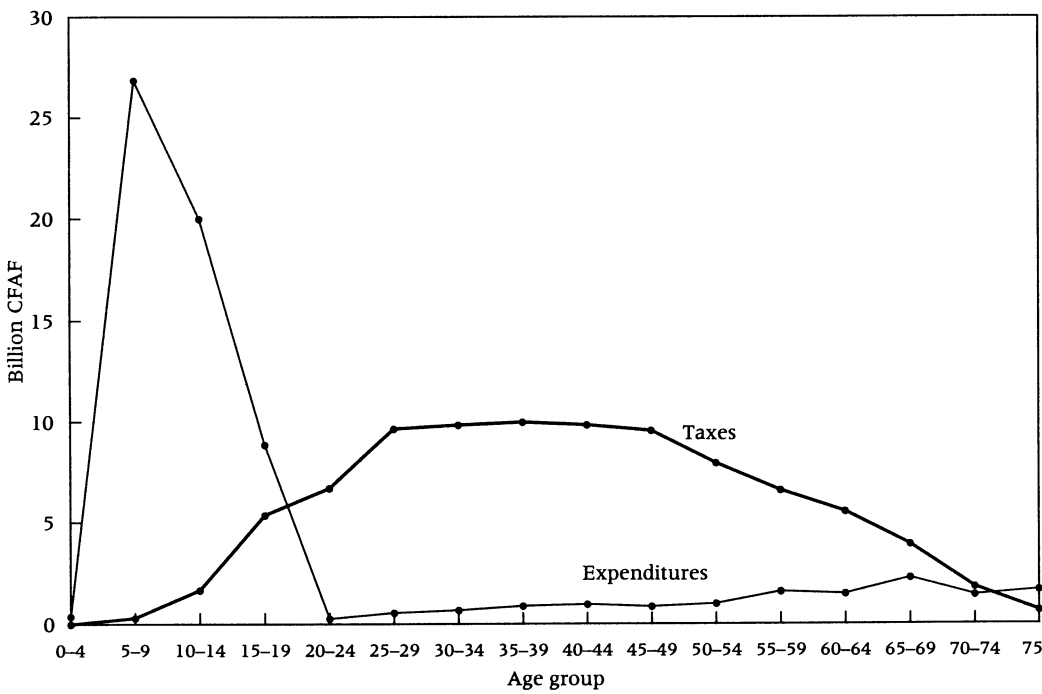


FIGURE 4 Aggregate rural public-sector taxes and expenditures: Sources and recipients by age group, Côte d'Ivoire 1986



years. The distribution of transfers and services received is dominated by services provided for the youngest members of society, primarily for schooling, which is by far the largest of the three government expenditures included in the analysis. A much smaller peak at older ages represents social security transfers. Comparing the government expenditure and receipt profiles, we find that public-sector resources are provided by individuals who are on average 18 years older than the recipients of government services. A massive flow of resources from ages 25–54 to ages 0–24 is channeled through the public sector as opposed to familial, tribal, or market institutions.

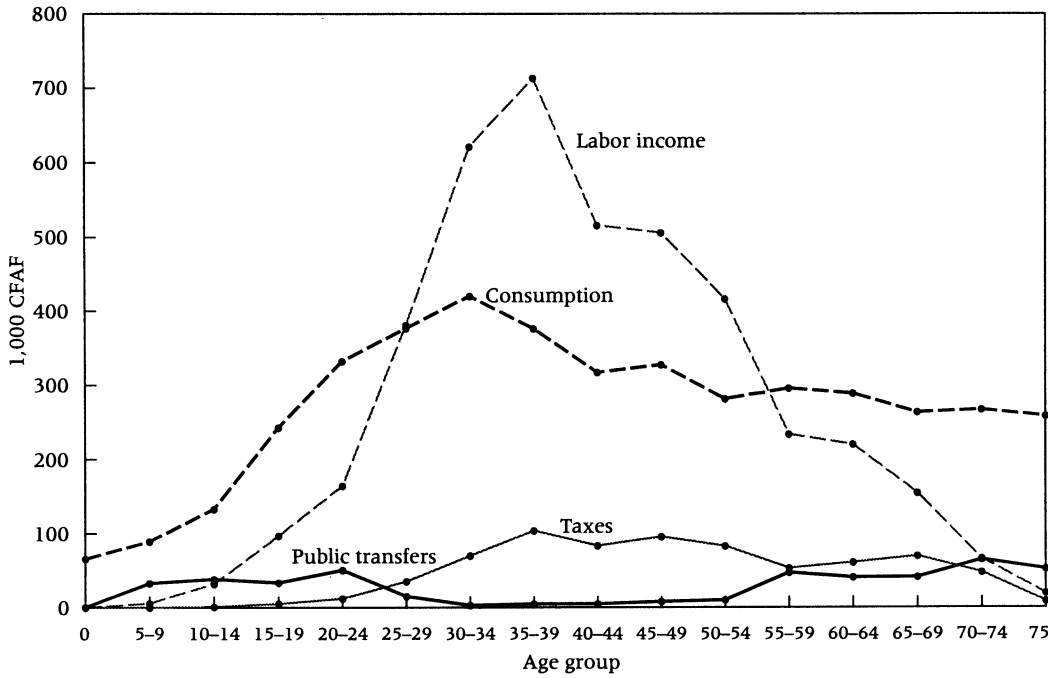
In the rural sector taxes are spread more evenly across the age distribution since there is less income variation with age. The mean age of tax payment is estimated at 41.4 years, and the per capita tax payment is estimated at 7,981 CFAF (about US$23), roughly half the urban level. Government services, however, are consumed by individuals who are on average even younger than in the urban sector. The majority of government expenditures on services consumed in the rural sector are for primary and secondary schooling. There are no postsecondary education transfers (except to a limited degree through scholarships) since most rural schooling ends at the primary level. Because higher levels of schooling are far more expensive than lower levels, the education age profile is much younger in the rural sector. Although there are more elderly in the rural sector, social security is barely noticeable because the majority of social security recipients in Côte d'Ivoire are former government employees who reside mainly in the urban sector. The mean age of those receiving government services according to these estimates is only 20.0 years and the per capita amount is 9,791 CFAF (about US$28), again indicating an important downward flow of resources.

Family and public-sector flows combined

The family and public-sector age profiles discussed above for Côte d'Ivoire are presented jointly in Figure 5. Recall that the value of consumption and income in the family profiles does not include the values of public transfers and services received or taxes paid. The per capita public-sector flows are shown on the same scale as the family consumption and income profiles; they are clearly a relatively small fraction of the size of the latter. A number of points stand out:

Public-sector transfers represent a substantial proportion of consumption for the youngest and oldest members of the population. For children aged 5–9 years, public transfers comprise about one-fourth of all resources consumed (combined consumption and public transfers). The elderly, aged 70 and older, also receive large public-sector transfers, approximately equivalent to those received by children. However, the private consumption of the elderly is higher and public-sector transfers constitute a smaller fraction of combined consumption (about one-fifth or less).

FIGURE 5 Per capita economic age profiles: Côte d'Ivoire 1986



The crossover ages for public-sector flows are very close to the crossover points found earlier for the family and interhousehold flows. This is certainly the case at the first crossover, when children finish with schooling and begin to earn. It is more difficult to estimate a crossover age for the elderly, but it appears that around ages 55–59 consumption of the elderly falls below income and the value of transfers received rises substantially—almost crossing, at that point, the estimated level of taxes paid. This is partly an artifact of the method of estimation, but it must also reflect shifts in private and public allocation over the life cycle.

Consumption of the elderly is due only in small part to their own earnings. Public-sector transfers are not very large either. The obvious excluded factors in this analysis are interhousehold transfers and dissavings. While we are unable to distinguish between them, these two income sources must provide most of consumption resources for the elderly.

Conclusion

Application of a newly developed accounting framework to data from Côte d'Ivoire—a framework previously applied only to industrial economies—yields important insights and allows measurement of the aggregate reallocation of wealth between age groups in a high-fertility population. The

results show that wealth flows downward in Côte d'Ivoire, and they suggest that children are costly to their parents: children receive more from their parents than they give in return. This is unexpected given Caldwell's (1976) theory on wealth flows and fertility decline. Our results are corroborated by Kaplan (1994) and Lee (1995; forthcoming). Perhaps as Lee (forthcoming) suggests, the reversal in the direction of total wealth flows may be an indicator of fertility levels—but in the opposite direction to that implied by Caldwell. Total wealth flows in high-fertility developing countries may be strongly downward. When populations age, the direction of wealth flows may reverse and flow upward as the weight of providing for the elderly exceeds the costs of children. Calculation of public-sector flows also shows that these are strongly downward and dominated by government expenditures on education. This is in contrast to the situation in the United States, where provisions for the elderly dominate the federal budget.

Furthermore, the analysis suggests that the average person in Côte d'Ivoire possesses negative life-cycle wealth until nearly age 50. Although the elderly in Côte d'Ivoire spend a number of years as net consumers, they are a relatively small group. Thus, given the young demographic structure of Côte d'Ivoire, the average person possesses large negative life-cycle wealth. Life-cycle wealth can be held in the form of either transfer wealth or capital. Since real capital wealth is also a significant factor in Côte d'Ivoire, transfer wealth is by definition even more negative. When fertility does fall and the age structure shifts, the relationship between these forms of wealth will prove important for economic development. Further research is needed to measure the relative magnitude of real capital wealth and transfer wealth.

If children are costly, why is fertility so high in such settings? One hypothesis is that children may be the best alternative for parents in a setting where other financial and insurance options are unavailable. Despite earning a negative return on their investment, parents may continue to have many children because children remain their best source of old-age support (Nugent 1985). If high fertility is promoted by the parental need for old-age security, governments should be more highly motivated to expand social insurance programs. Social insurance may not only improve welfare directly, it is likely also to lead to a decline in fertility.

Appendix: Government expenditures

Education

Government expenditures on education are easier to allocate to specific age groups than most other expenditures. This is partly because education is mainly provided to individuals of specific ages. It is also due to the relatively abundant statistics collected on education in many developing countries, including Côte d'Ivoire. Most

countries view education as a high priority and therefore collect data in the census and other surveys about the educational level of the population. The total expenditure of the Côte d'Ivoire government on education amounts to 200.6 B CFAF (see Table 3), a substantial proportion of the public-sector budget and a larger fraction than is spent by most other countries. For example, this amounts to 17.6 percent of the government's expenditures, whereas the average proportion of government resources spent on education in developing countries is between 9 percent and 14 percent and the average for industrial market economies is below 5 percent (World Bank 1988).

While individual-level data on the value of education "consumed" by each child are unavailable, several sources of data can be combined to derive reasonable estimates. School attendance rates are available from both the 1988 Côte d'Ivoire census (République de Côte d'Ivoire 1992b) and the 1986 Living Standards Measurement Study. In addition, education expenditures per head are clearly not equal at the various levels of schooling. Compared to the per-student amount spent for one year of primary school education, the government spends 4–5 times more per student in secondary school and about 22 times more per student attending university (Grootaert 1993). Separate profiles for the urban and rural sectors are estimated using the attendance rates by age and schooling level.

Health

Allocating the government's expenditure on health among age groups proves more difficult since health expenditure data are scarce in Côte d'Ivoire. It is estimated that total government expenditure on health-related services was roughly 31.5 B CFAF in 1986 (Grootaert 1993). It is particularly difficult to find data on the actual services provided. The LSMS data contain some information on self-reported illness and health care expenditures.

Household members in the LSMS report on health-related expenditures in the previous four weeks. The first step is to examine the relative size of expenditures in urban and rural sectors. About 42 percent of health care expenditures reported in the survey are in the rural sector and 58 percent in the urban sector. Therefore, 42 percent of the 31.5 B CFAF is allocated to the rural sector and 58 percent to the urban. The implicit assumption is that the profile of expenditures by age reflects the profile of services provided by the government.[19] Alternatively, it may be that the two types of expenditures are actually substitutes and have a negative relationship: expenditures on health care are large for age groups that do not receive government services. Since most primary health care services are traditionally focused on young children and mothers, a potential bias may be introduced that will lead to an underestimate of the services provided for children and an overestimate of the services provided to older persons. The ultimate effect will be to understate the level of resources flowing to young persons relative to older persons. Separate profiles are then estimated for the urban and rural sectors based on the average level of health care expenditure by age.[20] Next, separate weighting scales are derived for the urban and rural sectors in order to distribute the resources between age groups.

Social security

A small social security program, instituted by the government after independence in 1960, has grown to provide substantial support to a minority of Ivoirians—typically those who have worked in the formal sector. A total of 440,000 workers, primarily in the urban formal sectors, were reported to be covered in 1984 (Williamson 1993). Clearly, the majority of elderly Ivoirians depend on family sources for their old-age security as well as on savings.

The Côte d'Ivoire LSMS data report whether households received any social security income, although the actual recipient within the household is not identified. Of the 1,596 households included in the sample, 81 households report some income from Côte d'Ivoire's primary social security program (CNPS or Caisse Nationale de Prévoyance Social), and 47 households report income from some other pension or retirement fund. Since CNPS in some cases provides family benefits to needy families as well as pensions, it is difficult to devise a scale to distribute the transfers by age group. The data can be used, however, to allocate pension receipts between urban and rural sectors. According to the LSMS, 93.1 percent of the total reported social security and pension income was received by urban households and only 6.9 percent was received by rural households. Since retirement benefits from public-sector programs are payable after age 55 (Williamson 1993: 176), we crudely assume that 21.3 B CFAF (93.1 percent of 22.9 B CFAF) is divided equally among the estimated 205,074 persons aged 55 and older in urban Côte d'Ivoire and that 1.6 B CFAF is divided among the 608,937 rural elderly (number of elderly estimated from the LSMS).

Notes

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1 Four households were dropped due to missing data.

2 Certain expenditure items in the household budget are difficult to allocate as either consumption or savings. The best example is funeral expenditures, but dowries are also problematic. Funeral expenditures account for 2.5 percent of the total household budget and are considered obligatory social expenditures (Mahieu 1990; Vidal 1986). However, funeral expenditures also enable people to purchase social status and respect and are included here as consumption.

3 At the 1986 exchange rate $US1.00 equals roughly 350 CFAF. A price index provided by the World Bank is used to correct for regional price differences (see World Bank 1994 for details).

4 Home production activities such as cooking, cleaning, and collecting firewood are not included in this category. Limited data on such household activities available in the Côte d'Ivoire LSMS provide a similar impression: children spend far fewer hours than adults engaged in these activities. Therefore, including home production is unlikely to have any qualitative impact on our results. As a reviewer noted, if siblings do take care of each other, they may enable parents to work more hours in productive labor. While this is true, such "second-order" effects generally are not incorporated in the literature on child costs (see

Deaton and Muellbauer 1986; Cain 1977), and we must ignore them here.

5 The LSMS survey does not collect data on hours worked by children under 7 years of age. This might lead us to underestimate child labor contributions and overestimate transfers to children. We tested the sensitivity of our results to this constraint by arbitrarily increasing hours worked by children under 7 and found very little effect.

6 We have slightly adjusted Mueller's productivity estimates. Instead of allocating zero productivity to children ages 5–9, we have assumed they are 30 percent as productive as adults. This only slightly increases the labor value of children and has little net effect.

7 While it is more difficult to discern in the rural sector, there is almost a crossover in the 15–19 age group, and then, more definitely, income exceeds consumption by the 25–29 age group.

8 See Leonard (1995) or Balac's (1995) macrolevel study of population dynamics in Côte d'Ivoire and the age of coffee and cocoa plantations.

9 While child fostering has been shown to be an important social institution in Côte d'Ivoire (Page 1989; Ainsworth 1992) and it has been argued that child fostering arrangements reduce the incentives for individual couples to lower fertility (Dasgupta 1993), the impact of fostering is already incorporated within our consumption and labor earnings profiles. Thus, despite the importance of child fostering arrangements and the potential complexities they present for estimating the direction of resource flows, we need not be concerned with their impact on our results.

10 The stability assumption implies that age-specific fertility and mortality rates are constant over time.

11 Productivity growth can be easily accommodated (see Lee 1995) but is ignored for this simple example.

12 The discount rate, $i = -0.03865$, used in the calculation is the estimated internal rate of return in Côte d'Ivoire (see Stecklov 1996).

13 The conditions are that demographic rates have been constant over time so that the population age structure has converged to a fixed distribution; productivity grows at a constant rate; and the economy follows a Golden Rule path implying that the growth rate of per capita labor income depends entirely on the rate of technological progress. These conditions do not necessarily apply in the case of Côte d'Ivoire but they offer a useful benchmark. See Stecklov (1996) for details on the assumptions and their validity in Côte d'Ivoire.

14 See Stecklov (1996) for an attempt to measure externalities to childbearing in Côte d'Ivoire, and Lee (1991) for a description of his method and its application to Indian data.

15 Other institutions such as the tribe or village may need to be examined in Côte d'Ivoire, although they are not treated separately in this analysis.

16 Computable general equilibrium (CGE) models, social-accounting matrixes (SAM), and Generational Accounting (see Auerbach and Kotlikoff 1991) may shed light on these more complicated dynamics, but they are beyond the scope of this article. Chia, Wahba, and Whalley (1992) develop a CGE model to examine social policies in Côte d'Ivoire.

17 It might be argued that if the marginal productivity of public-sector workers is below their wage, part of the differential should be included as transfers to these workers and not as transfers to the people receiving the services. Not surprisingly, wages do not really reflect marginal productivity, even in the formal sector. Instead, wages reflect differences in human capital endowments such as education and not differences in returns to those endowments (Kozel 1990). A relatively simple method of figuring out the "surplus wage" is to compare the salaries of public employees to privately employed persons with similar characteristics. The differential is the transfer to the employee.

18 The rice and cotton marketing boards are of less importance.

19 Over 90 percent of reported health expenditures are made to public medical facilities.

20 Use of the self-reported illness data would lead to much younger estimates of the average age of persons receiving health care services.

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