Population ageing, intergenerational transfers and social protection in Latin America and the Caribbean

UNITED NATIONS

ECLAC

NATIONAL
TRANSFER
ACCOUNTS

Understanding the
generational economy

IDRC ✳ CRDI

Cover design: Alejandro Vicuña Leyton

Contents

Tables

Figures

Abstract

In October 2009 CELADE, together with the Population Division of the United Nations Department of Economic and Social Affairs and in the context of the National Transfer Accounts project, organised a meeting of experts in which certain government representatives, in particular from the five countries participating in the project, as well as those from different regional and international organisations, analyzed the consequences of population ageing on economic growth and the sustainability of Latin American transfer systems using information produced in the first phase of the project. This volume presents a selection of articles that were presented there, including work by professors Ronald Lee and Andrew Mason, as well as and the national teams in each of the countries participating in the project.

I. Introduction

Paulo Saad and Tim Miller

Countries in Latin America and the Caribbean are in the midst of a period of profound demographic change which will lead to a dramatic shift in the age structure of the population, with sharp declines in the proportion of children and increases in the proportion of older persons. Though they are at different stages in this process, the majority of countries in the region are currently in the midst of the period of the demographic dividend, which is characterized by a relative increase in the number of working-age people relative to those who are dependent upon them. However, sooner or later this favourable situation will end due to the rising demand for resources on the part of a progressively older population. The transition to economically-aged societies in Latin America and the Caribbean —in contrast to that of the more developed countries— will take place in a context of high and persistent levels of inequality and of lower per capita income and less developed political and financial institutions.

This new situation will pose unprecedented challenges to Latin American and Caribbean society and will require adjustments in diverse areas, especially in health and pensions. Ideally public policies should anticipate demographic changes, redesigning the financing mechanisms for social protection systems so that the increased pressure on public and private spending can be sustained financially without reducing the coverage and quality of benefits.

The social and economic impacts of changes in the age structure of the region's population are the subject of ongoing reflection in the Population Division of the CELADE - ECLAC. In particular, the Division has been participating over the past two years in an international effort to measure national economic activity by age, in the context of the international project on National Transfer Accounts (NTA) led by professors Ronald Lee of the University of California, Berkeley, and Andrew Mason of the East-West Center in Honolulu.[1]

National Transfer Accounts (NTA) estimate the flows of economic resources between different age groups in a way that is consistent with national income and product accounts. These flows mainly arise due to the fact that children and the elderly tend to consume more than they

---

[1]   For more information on the NTA project, please see ‹http://www.ntaccounts.org›.

produce from their work and therefore tend to depend on resources that mainly come from the working-age population to satisfy their consumption needs.

In addition to distinguishing between the different types of flows (capital accumulation, transfers and credit transactions), the accounts also distinguish between the institutions that mediate these operations, be they governments, markets or families. This information allows one to study, among other things, the consequences of ageing on transfer systems, both familial as well as public; the interaction between these two systems, and the economic effects on different generations of changes in support systems. In addition, intergenerational transfers represent a substantial proportion of GDP and for that reason their composition, order of magnitude and direction can influence economic growth as well as the income distribution.

Over 30 countries from five continents are currently participating in the global NTA project. These countries differ in terms of their demography, their levels of development, their systems for supporting people in old age, their capacity to invest in human capital, and their populations' capacity to save. A comparative analysis of these countries' accounts not only sheds light on these differences, but it also helps to clarify the economic implications that population ageing has under different institutional arrangements.

ECLAC, through CELADE, is coordinating the regional National Transfer Accounts project for Latin America and the Caribbean, with financial support from the Canadian International Development Research Centre (IDRC)[2] and the University of California, Berkeley. The first stage of the project recently concluded[3] with participation by five countries (Brazil, Costa Rica, Mexico and Uruguay).[4] The second stage has also begun, for which 4 new countries were included: Argentina, Colombia, Jamaica, and Peru.

The overall objective of the project is to improve the fiscal sustainability and equity of social protection systems in Latin America in the face of population ageing. There are four specific aims: (i) To strengthen the capacities of participant national centers to develop, implement, and use NTA method; (ii) To better inform social protection policy decisions by an analysis of the impact of population ageing on economic growth, fiscal sustainability, and equity; (iii) To better inform policymakers on the importance of long-run transformations brought about by population ageing; and (iv) To foster cross country comparison, collaborations, and regional perspectives.

Based on these goals, CELADE has made ample use of new information on the generational economy in Latin America. Diverse studies have been undertaken in this area, many of them in collaboration with other organizations like the United Nations Population Fund, the Pan-American Health Organization and the World Bank.[5]

A significant proportion of these studies were focused on the cases of Brazil, Costa Rica, Chile, Mexico and Uruguay, the countries participating in the first stage of the project. The case of Brazil has been an interesting one, not just because of it represents a large share of the Latin American economy and population, but also because of the rapid ageing process its population is undergoing and the presence of a fairly significant public transfer system. In fact, toward the end of the 1980s a reform was introduced in the country to expand the coverage of the pension system to poor and rural sectors, in addition to informal workers, and it currently covers a large proportion of the population. In

---

[2]   Project #104231 (for more details see: ‹www.idrc.ca›).

[3]   Project *Transferencias intergeneracionales, envejecimiento de la población y protección social en América Latina* (*Intergenerational transfers, population ageing and social protection in Latin America)* (for further details, see ‹www.cepal.cl/celade/proyecto_transferencias›).

[4]   Participation by Brazil, Costa Rica, Mexico and Uruguay has been financed with funds from the IDRC, while Chile's has been financed with funds from the University of California, Berkeley. .

[5]   A complete list of the studies produced on the issue in the context of the NTA project can be found on the project's website (‹www.cepal.cl/celade/proyecto_transferencias›).

Chile the analysis of NTA has allowed the fiscal and macroeconomic implications of social reforms to be examined, especially in the areas of pensions and health, sectors that have undergone structural reforms over recent decades.

The case of Costa Rica has been an interesting one because of its citizens' high life expectancy, the relative stagnation of social investment in education and the importance of its public health programs. For its part, Mexico is characterised by an intense migratory movement that, in addition to Mexicans, includes a significant number of people from other countries in the region, essentially Central Americans, who seek to reach the United States. This makes the analysis of private transfers (remittance movements) and other types of intergenerational reallocations particularly interesting. With regard to Uruguay, it bears the distinctive characteristics of being the oldest country in the region and having a long-standing social protection system with significant levels of coverage, which like Chile's has undergone various reforms over recent decades.

In October 2009 CELADE, together with the Population Division of the United Nations Department of Economic and Social Affairs and in the context of the National Transfer Accounts project, organised a meeting of experts in which certain government representatives, in particular from the five countries participating in the project, as well as those from different regional and international organisations, analyzed the consequences of population ageing on economic growth and the sustainability of Latin American transfer systems using information produced in the first phase of the project. This volume presents a report on this expert meeting accompanied by a selection of articles that were presented there, including work by professors Ronald Lee and Andrew Mason, as well as and the national teams in each of the countries participating in the project.

II. Population ageing, intergenerational transfers, and economic growth: Latin America in a global context

Ronald Lee and Gretchen Donehower[6]

A. Introduction

The demographic transition has brought sweeping changes to population age distributions in almost all developing nations, and all industrialized countries, with more profound changes to come in the next few decades. In some respects, these changes are welcomed, for the slower population growth and reduced child dependency ratios that they bring. In other respects, they are feared for the anticipated shrinking of the labor force and the rapid increases in the old age dependency ratios, which will make current public pension programs unsustainable and perhaps health care systems as well. Because the generations are closely linked through family relationships and public programs, their changing relative numbers have many profound effects.

Here we will focus on some economic consequences of the demographic transition in Latin America, and more specifically, in the five Latin American countries that are part of the National

Transfer Accounts (NTA) project. The NTA project views the set of public and private intergenerational transfers in a comprehensive and coherent way. We will look at how the patterns of intergenerational transfers interact with the demographic changes over the demographic transition with special attention to the phase of population ageing.

B. The demographic transition changes the relative numbers of young and old. Illustrated by Mexico

The demographic transition is the process through which populations move from an initial state of high fertility, high mortality, and a young population, to a state of lower fertility, low mortality, and an old population. With very few exceptions, the transition begins with falling mortality and followed by rising life expectancy. Fertility remains high for a number of decades, so the population begins to grow increasingly rapidly. Consequently, in families and the population, children become increasingly plentiful. Eventually, fertility begins to decline as well, slowing population growth and reducing child dependency ratios. During this phase of the transition, child dependency falls rapidly and since the proportion of elderly remains low, each person in the working ages has fewer dependents to support. During this phase, a population experiences the "demographic dividend", an acceleration in the growth rate of per capita income or consumption that occurs mechanically, as a result of lower fertility. Some analysts suggest that this occurs only if it is possible to employ the rapidly growing labor force. We prefer to think of the dividend as arising from declining fertility rather than from rapid labor force growth, so that even if unemployment rises, per capita income will be higher than it would have been without the decline in fertility. Eventually this dividend phase comes to an end when fertility levels off, and the proportion of elderly starts to rise. The pre-transitional stage, which is characterized by high child dependency and few elderly, is replaced by the post-transitional stage, which is characterized by high old age dependency and few children. No country's population has yet reached the end of this process, so even today's oldest countries will experience a doubling or tripling of their old age dependency ratios in the coming decades. There are, or course, many uncertainties. Among them, there are questions about how far fertility will decline and whether life expectancy will continue to rise.

Pérez Brignoli (2009) has reconstructed the demographic histories of many Latin American populations, revealing considerable diversity. Argentina, Uruguay and Cuba all initiated early fertility transitions with timing similar to those in Europe. However, contrary to the classic pattern of the demographic transition, fertility decline stalled at moderate levels in the middle of the 20th century. Chile followed a similar pattern but stalled at a relatively high level of fertility. These countries have not followed the classic pattern of a demographic transition. Other countries in the region maintained high fertility until well after 1950, with decline in Mexico, for example, not starting until around 1970 or 1975. Similarly, mortality decline in the region sometimes began before 1900, sometimes around 1900, and sometimes two or three decades later. Current demographic structures reflect this diverse past, with Uruguay, for example, having a much older population than most other countries. Some of the Latin American countries are projected to experience significant population decline after the middle of the 21st century, while others are projected to continue to grow.

The demographic transition in Mexico appears to have adhered fairly closely to the classic pattern, and it will be used here to illustrate the points made earlier. Figure II.1 is based on Perez Brignoli (2009), on United Nations (2009) estimates, and on United Nations (2009) projections from 2010 to 2100. The first panel plots fertility and shows the sudden and rapid decline starting around 1975, from above 6.5, and falling to 2.3 in 2008. Before this sustained fertility decline, there was a major fluctuation in fertility that may have been prompted by the revolution, but which persisted long afterwards. The next panel shows life expectancy, which dropped from around 30 years at birth to below 20 during the revolution and flu pandemic of the 1910s. It then began a steady ascent in 1920, reaching 75 in 2008. The

third panel shows the population growth rate, which rose rapidly to peak at 3% per year around 1975. It is projected to fall steadily until turning negative after 2050. The fourth panel shows population size, which has grown from under 20 million in 1900 to 110 million in 2008. It is projected to reach 129 million slightly before 2050, and then to decline. The last panel shows the changes in age distribution. The fluctuations in fertility and mortality in the first half of the century led to a major fluctuation in the youth dependency ratio, which is not part of the classic transition pattern. We will focus here on the initial increase in the total dependency ratio due to improving child survivorship and rising child dependency ratios, reaching 1.0 before fertility decline begins. The total dependency ratio then declines, and is projected to reach .5. After this, the elderly proportion rises strongly, and total dependency reaches a level quite similar to its starting point in 1900. Whereas in 1900 child dependency was high and old age dependency was low, in 2100 the situation will be reversed.

To appreciate the implications of these deep changes in population age distribution, we used estimates from NTA to examine the shape of the economic lifecycle.

FIGURE II.1
MEXICO: DEMOGRAPHIC TRANSITION, 1900 TO 2010, AND PROJECTED TO 2100

Total Fertility Rate

Life Expectancy

Growth Rate

Population Size

(continued)

17
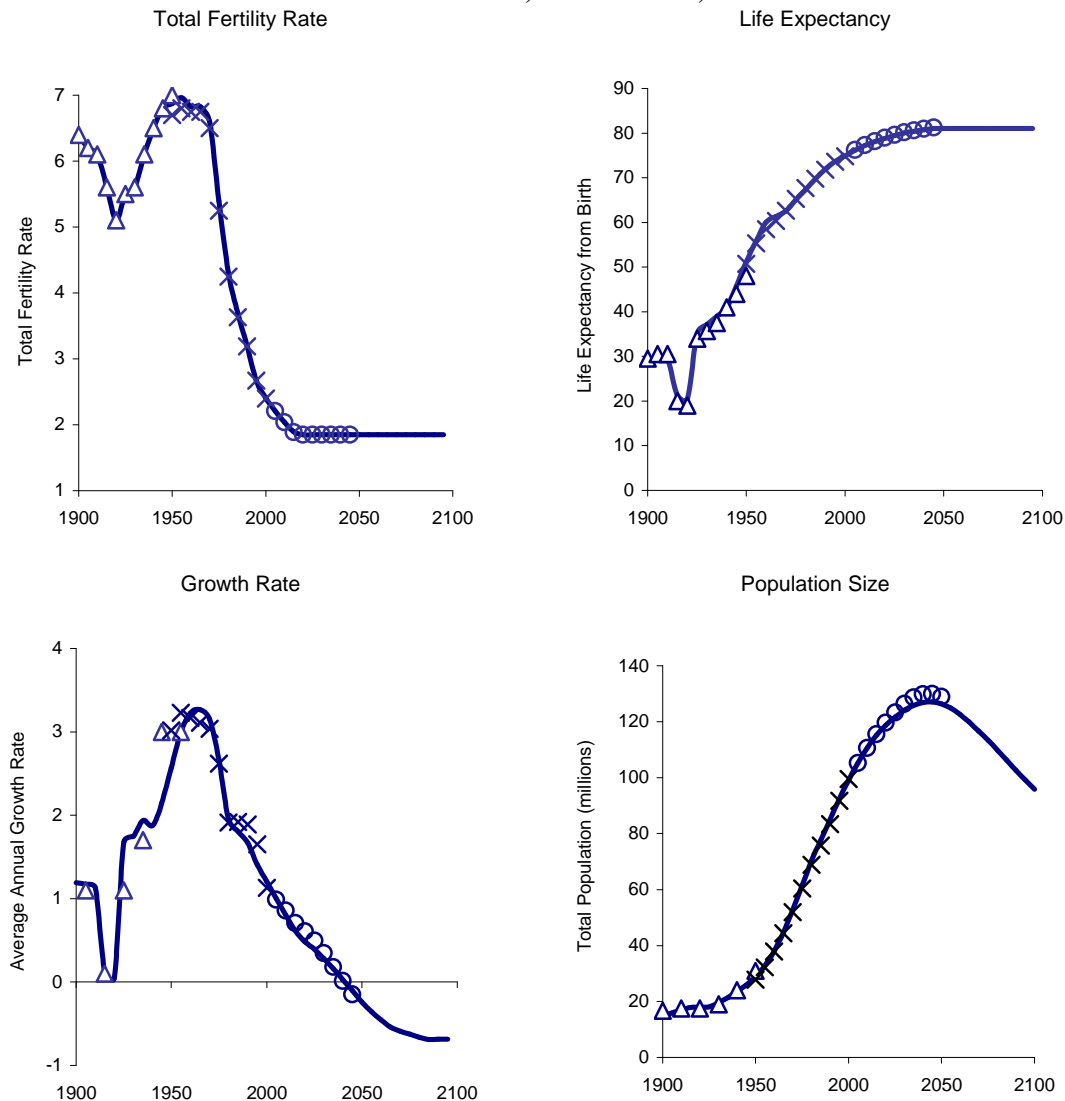
Figure II.1 (concluded)

Dependency Ratios
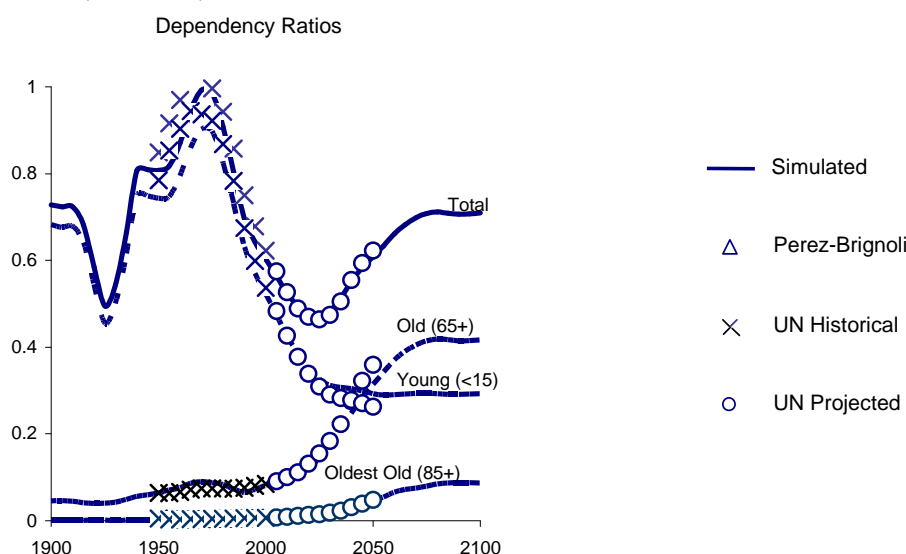
Source: Authors' estimates, based on Héctor Pérez-Brignoli, "The demographic transition in Latin America", document presented at the workshop on "Long-Term Implications of the Demographic Transition", Madrid, Fundación Ramón Areces/Grupo de Estudios Población y Sociedad (GEPS), 24 to 26 of September, 2009, and United Nations, "World Population Prospects: the 2008 Revision", New York [online database] ‹http://esa.un.org/UNPP/›, 2009.
Note: that simulation includes assumption of net outmigration by ages 15-64 of approximately 0.6% per year from 1980. (Data driven to match observed population sizes).

C. Changing economic behavior across the lifecycle: Age profiles of consumption and labor income

Changing population age distributions matter because human behavior varies systematically across the lifecycle. These variations are rooted in biology: children are born helpless and take many years to mature and become independent; the elderly are weaker and frailer than younger adults, on average. But biology is only one of a number of factors that shape the economic lifecycle. Children may begin work very young or may not start earning income until well into their 20s. This depends in part, on educational enrollments, and in part, on family needs and expectations. The elderly may continue to work until they die despite weakness, illness, and pain, or they may retire in their 50s and enjoy leisure while still in excellent health. Public programs, the level of wealth, availability of financial institutions, and cultural expectations all have an important influence. Relative consumption across the lifecycle also depends in part on biological needs, but also on family living arrangements, public programs for children and the elderly, birth rates of the poor versus the rich, long term care arrangements, cultural expectations, and so on.

The National Transfer Accounts project, NTA, has estimated average per capita labor income and consumption across the lifecycle from birth until 90 and older for 23 countries. For labor income, everyone in the population at each age, whether in the labor force or not, and whether male or female, is included. We count salary and wages, including fringe benefits, as well as two-thirds of any self employment income, which in poor agricultural countries can be very important. These labor income estimates, therefore, reflect in a single number the labor force participation rates by age, the hours worked by participant, and the income earned per hour. For consumption, household expenditure data is used. Private expenditures for both health and education are estimated for each age. The remainder of household consumption expenditure is allocated to the members of each household in proportion to

a simple set of equivalent adult consumer weights (see Lee et al., 2008). Finally, we average across all individuals at each age to obtain our consumption measure. For purposes of comparing the shapes of the age profiles across countries, all values of labor income and consumption are standardized by dividing by the average labor income for ages 30 to 49.

The resulting estimates are plotted in Figure II.2. For ease of exposition, the unweighted average for four of the poorer NTA countries (India, Indonesia, Kenya and the Philippines) and for four of the richer ones (Japan, US, Sweden and Finland) are plotted. We have also plotted the average of the five Latin American countries in our sample: Brazil, Costa Rica, Chile, Mexico and Uruguay. In comparison to the richer countries, labor income starts earlier and is higher at younger ages in the poorer countries. In spite of higher income levels, the Latin American average lies surprisingly close to that of the poorer countries. The peak labor income in the poor countries not only occurs earlier, but also declines earlier than in the richer countries. Latin America shares both these patterns. Starting around age 60, labor income in the rich countries drops precipitously, reflecting the incentives built into their generous public pension programs (Gruber and Wise, 1998). In both the poorer countries and the Latin American countries, labor income continues at the older ages at around twice the level of the rich countries.

FIGURE II.2
AGE PROFILES OF LABOR INCOME AND CONSUMPTION FOR FOUR RICH, FOUR POOR, AND FIVE LATIN AMERICAN COUNTRIES
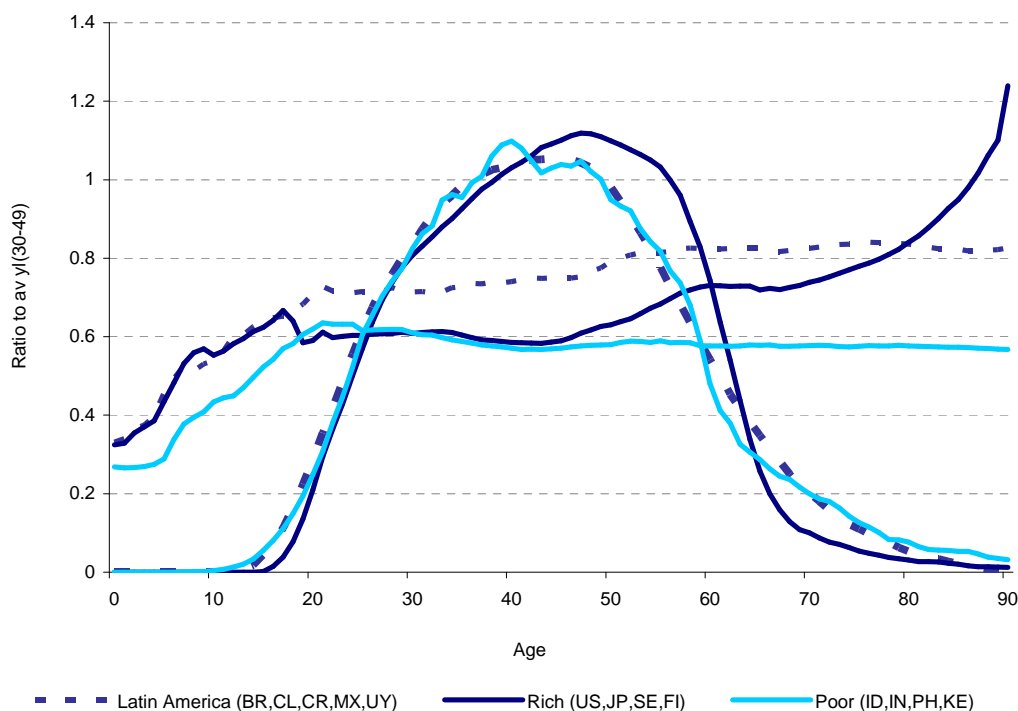
Source: Authors' estimates using database from the "National Transfer Accounts Project", [online] ‹http://www.ntaccounts.org/›.

As for consumption, in the richer countries, there is a strong hump in childhood consumption, corresponding to heavy investment in the human capital of children, primarily through education. This is largely absent in the poor countries, and surprisingly, it is also absent in middle-income Latin American countries. It is striking that in the poorer countries, consumption is quite flat from the earlier

twenties up to the oldest ages. This probably reflects the fact that the elderly largely co-reside with their adult children and share in the household budget. By contrast, in the rich countries, consumption rises with age. A large part of this increase reflects increasing public and private expenditures on health care for older people, especially long term health care for those over 80. However, some of it is due to rising private consumption expenditures of other sorts as well.

The height of the consumption curve for Latin America is substantially greater than that of either the rich or poor countries; this reflects a generally low level of savings and a high ratio of aggregate consumption to labor income in Latin America. Focusing on the shape rather than the height of the curve, we see that Latin America does not have a strong hump for children's consumption like the rich countries. Unlike the poor countries, consumption tends to rise with age in Latin America. In both Brazil and Uruguay, consumption rises very strongly with age. These two countries are unique among all the non-rich countries in the NTA for their upward sloping consumption. Mexico, on the other hand, has declining consumption with age, while Costa Rica and Chile have more mildly rising profiles. In Latin America, there is a very mild increase in consumption with age; the curve is flatter and more closely resembles the poor countries than the rich ones.

D. Age structure and economic behavior interact: Trends in support ratios

The empirical literature has consistently found that population age distribution is important in cross-national studies of economic growth (Higgins and Williamson, 1997; Bloom and Canning, 2001; Bloom and Williamson, 1998; Kelley and Schmidt, 2005). Here, we expand on the simple simulation approach developed in Cutler et al. (1990). To get a rough idea of the effect of changing population age distributions on the macro economy, the average age profiles for Latin America are used to calculate the "support ratios" implied by changing population age distributions. The support ratio is the ratio of effective workers to effective consumers, where effective workers are calculated by multiplying average labor income age profiles times population at each age, and then summing the values; effective consumers are calculated similarly. The support ratio is a more refined measure of the number of workers per dependent. For the same level of labor productivity per worker, both per capita income and consumption per effective consumer vary in proportion to the support ratio. Of course, the age profiles on which the support ratio is based change over the course of economic development and in response to public policies, so what they will look like in 2100 is unknown. Consequently, the support ratio based on age profiles estimated from data collected around 2000 are necessarily a rough indicator. However, some features of these profiles appear to be quite robust, and the profiles for poor and rich countries give an idea of the amount of variation that might be expected. By using an average of the profiles for a number of countries, some of the transitory features of the profiles for a particular country may be minimized.

Figure II.3 presents support ratios for the five Latin American NTA countries from 1950 to 2100, using the average Latin American profiles together with the demographic data for each country based on United Nations (2008) estimates and projections. Quite clearly, Uruguay is a case apart. It had an earlier fertility decline, and its population proportion 65+ is the same as the United States. Age distribution changes for Uruguay over this period are very muted. For the other four countries, there is a strong trough in the support ratios around 1970. Subsequent declining fertility raises the support ratios until they peak somewhat after 2010. After this, the ratios, including Uruguay's, will decline steadily until 2100. For simplicity, we can contrast the next forty year period from 2010 to 2050. Table II.1 calculates the growth rates of the support ratios from 1970 to 2010. These are contrasted with growth rates from 2010 to 2050. The difference in the support ratio contribution is around 1% per year. That is, other things equal, the changes in the support ratios will make per capita income and

consumption growth about 1% per year less rapid in the next four decades than in the previous four decades. Of course, many other things will surely be different, and other things will not be equal. However, some of the changes will be systematically related to the changing demography, and we will discuss these over the remainder of this paper, starting with the rising demand for wealth.

TABLE II.1
CHANGE IN THE SUPPORT RATIO ADDED 1% MORE ANNUALLY TO GROWTH FROM 1970 TO 2010 THAN IT WILL 2010 TO 2050 (EXCLUDING URUGUAY)

Ratios and Growth Rates	Brazil	Chile	Costa Rica	Mexico	Uruguay
SR(2010)/SR(1970)	1.278	1.250	1.375	1.342	0.986
Gr Rate of SR (%)	0.6	0. 6	0. 8	0. 7	0.0
SR(2050)/SR(2010)	0.940	0.895	0.937	0.944	0.977
Gr Rate of SR (%)	-0.2	-0.3	-0.2	-0.1	-0.1
2nd Gr - 1st Gr (%)	-0.8	-0.8	-1.0	-0.9	-0.0

Source: Authors' estimates.
Note: SR=support ratio. Gr = growth rate. SR(2010)/SR(1970) means the ratio of the support ratios at these dates. The Gr is calculated as the natural logarithm of this ratio divided by the years between the two dates. The last row is the difference between the growth rate of the support ratio from 1970 to 2010, and the growth rate from 2010 to 2050. These calculations are based on the data plotted in Figure II.3. The changed impacts of the support ratios are slightly larger if we measure them from trough to peak and from peak to trough for each country instead of using 1970, 2010 and 2050 as the dates for all countries.

FIGURE II.3
LATIN AMERICA: SUPPORT RATIOS, 1950-2100
(Own-country populations, average of 5 country profiles)
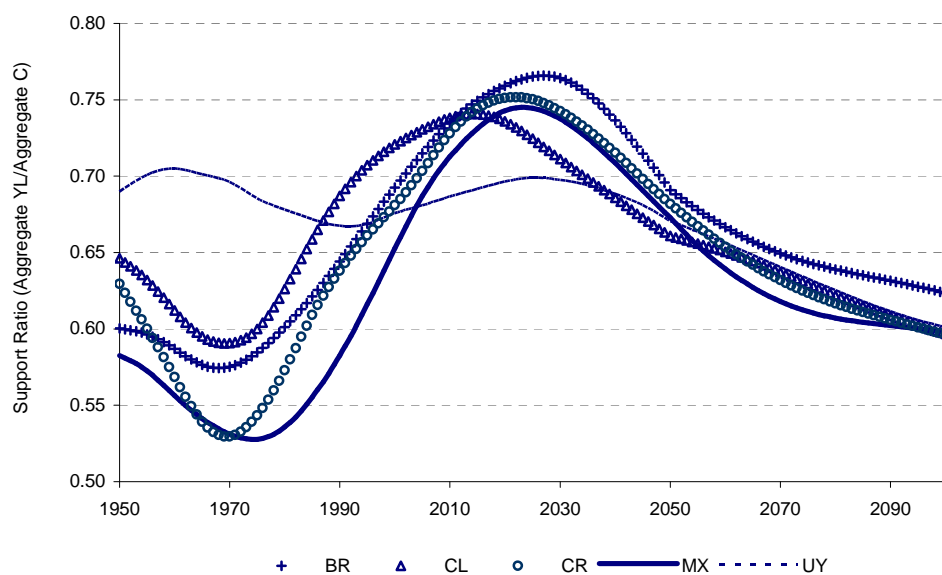
Source: Authors' estimates.

E. Longer life, lower fertility, and older populations raise the demand for wealth

In many countries, the elderly continue to supply a significant amount of labor and to fund an important part of their consumption through labor income. However, in every country in the NTA collection, the elderly, on average, consume much more than they earn. This difference between consumption and labor income at certain ages is referred to as the "lifecycle deficit". As working age individuals think about their future old age, they must be aware of this lifecycle deficit and the need to deal with it in one way or another. Later, we will consider differences across countries in the way the lifecycle deficit is funded. For now, we will just note that older people do consume more than they produce, and presumably, working-age people expect to be able to do so in the future. Expectation of future income in excess of labor income constitutes wealth, a point that will become clearer later. The main point is that the need for such wealth, for expectations of future funding for consumption, are powerfully affected by population ageing.

Indonesia has had relatively high fertility in the past, so the elderly comprise only a small share of the population. In Figure II.4, we see that the aggregate lifecycle deficit of the elderly is very small compared to the lifecycle deficit of children, only about 15% as large. Japan, however, has a high share of elderly, and in the figure, we see that the aggregate lifecycle deficit of the elderly is slightly larger than that of children, 115%. Since the average person in Japan has a much greater need to provide for future funding of a lifecycle deficit than does the average person in Indonesia, we might say that the per capita demand for wealth is higher in Japan.

FIGURE II.4
INDONESIA (2005) AND JAPAN (2004): THE AGGREGATE LIFECYCLE DEFICIT
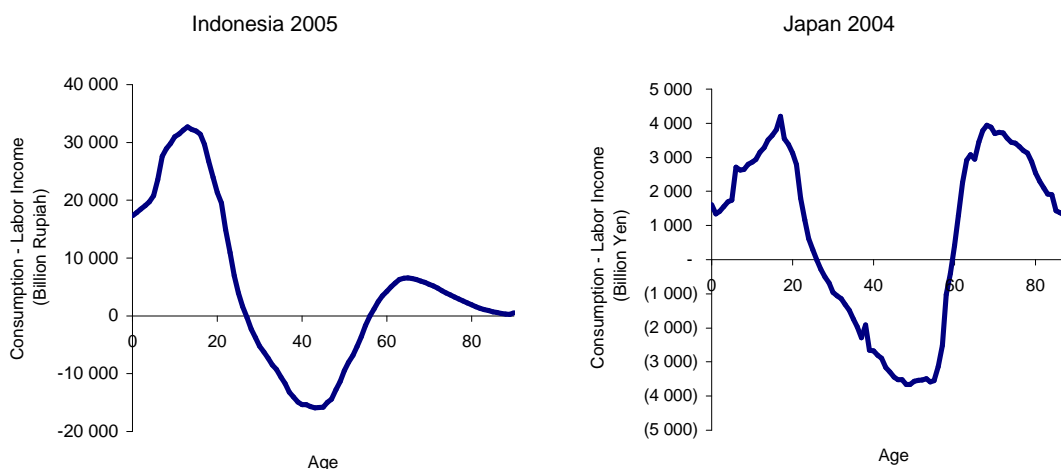
Source: Authors' estimates using database from the "National Transfer Accounts Project", [online] ‹http://www.ntaccounts.org/›.
Note: The aggregate lifecycle deficit is consumption minus labor income at each age, multiplied times the size of the population at that age.

One way to measure the importance of this demand for wealth is to calculate the lifecycle deficit of the elderly as a share of aggregate consumption in a country. In Japan, this share is high; in Indonesia, it is low. Figure II.5 plots this share for 22 NTA countries against the proportion of the population that is 65+. There is a close relation between the two (the descriptive R^2 is .975), suggesting that population ageing is a powerful influence on the demand for wealth. However, the

shapes of the age profiles are different in rich than in poor countries because rich countries are older. To isolate the pure effect of population ageing independent of differences in the age profiles of consumption, the figure shows a second set of points and a dashed line, which are constructed by using a standard age profile of consumption (the average age profiles of four poorer countries, see Figure II.2) weighted by the actual population age distributions of each country. There is still a strong relationship to population ageing, but it is now evident that about one-third of the increase in wealth is due to differences in age profiles, and about two-thirds is due to population ageing alone.

FIGURE II.5
NET CONSUMPTION BY THE ELDERLY AS A SHARE OF TOTAL CONSUMPTION
FOR 23 NTA COUNTRIES, VS PROPORTION AGE 65+: ACTUAL (SOLID)
AND HYPOTHETICAL WITH FIXED AGE PROFILES (DASHED)
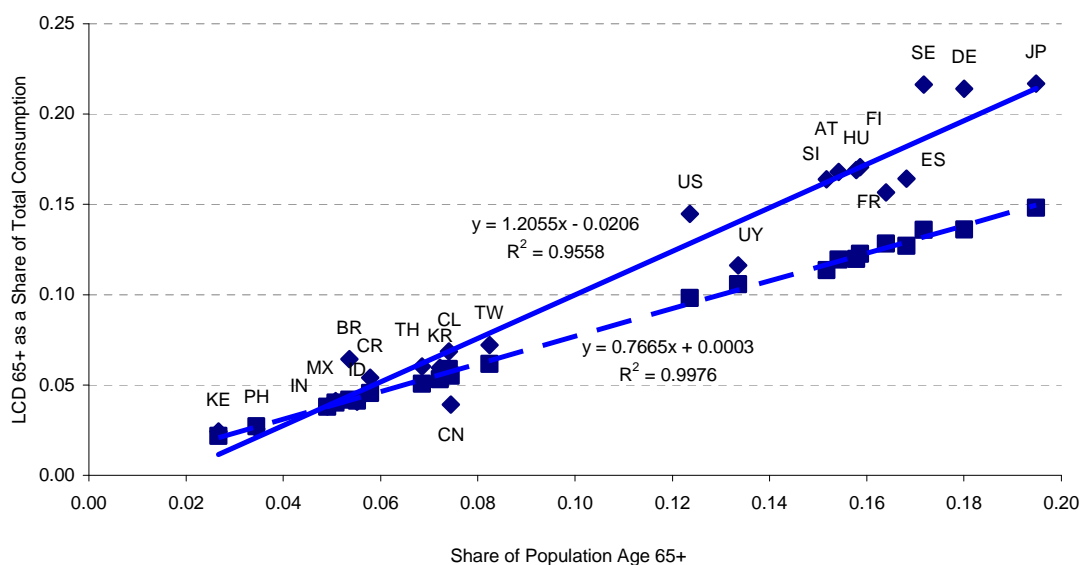
Source: Authors' estimates.

F. What is wealth? Capital, expected public pensions, or expected private old age support

Wealth, as the term is used in NTA, can take a variety of forms since it is a future claim on future output. Owning an asset like a home, a farm, financial assets or gold jewelry gives a claim on future output because the asset can be sold or mortgaged, and the income it earns can be used to fund consumption. However, participation in a public pension system, and the resulting expectation of receiving net benefits when elderly, is another form of wealth, often called "pension wealth". This concept of wealth can be enlarged to include expectations of public provision of health care and long term care. It should then also include the expectations of taxes to be paid in the future, with benefits measured net of these.

A further extension of this concept covers the expectation of old age support to be received from one's adult children less the support that a person expects to give to others. Formal models incorporating these relationships and forms of wealth have been developed by Willis (1988), Lee (1994), and Bommier and Lee (2002), building on ideas implicit in Samuelson (1958). In a country like Taiwan or Thailand, where familial net support of the elderly is important, there is positive private or familial transfer wealth.

But we have found that in most countries, even developing countries, older people, on average, make transfers to their younger family members rather than the reverse.

G. How is old age deficit (net consumption) financed around the world?

The NTA project estimates the public and private transfers given and received at different ages for many, but not all, NTA countries. It also measures asset income received by age. From these data, the various forms of wealth can be calculated (Lee and Mason, 2009). Here, we use a triangle graph to show the proportion of the old age lifecycle deficit (that is, consumption minus labor income above age 65) that is funded through use of assets, public transfers, or private transfers. If an elderly individual holds assets and receives asset income, but saves these rather than using them to fund her consumption, then assets would get a zero share in this accounting. Presumably, the individual will eventually die and bequeath her assets to younger relatives, which would show up as bequests, but these do not appear in this graph.

The results for a dozen countries are shown in Figure II.6. The shares (assets, family transfers, and public transfers) are measured along the axes on the three sides of the triangle. These shares for a country must always sum to 100% by construction.

FIGURE II.6
SHARE OF LIFECYCLE DEFICIT OF THOSE 65 AND OLDER
FUNDED BY ASSET-BASED FLOWS, PUBLIC TRANSFERS,
AND FAMILIAR TRANSFERS, NTA COUNTRIES, 1998-2004
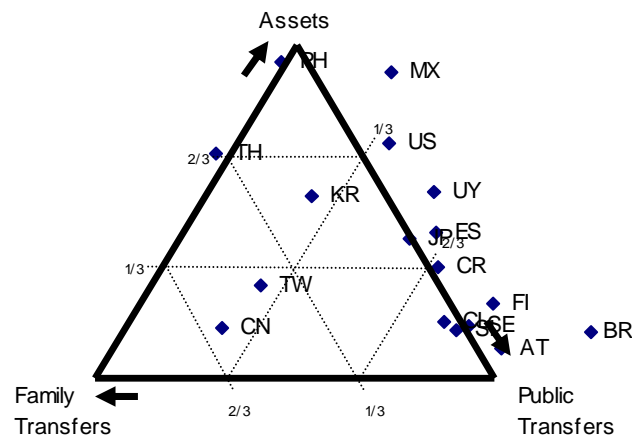
Source: Authors' estimates using database from the "National Transfer Accounts Project", [online] ‹http://www.ntaccounts.org/›.

The right hand side of the triangle measures the share of public transfers. At the lower right hand point, public transfers fund 100% of the old age lifecycle deficit. Austria (AT) is closest to this position. At the other end of this axis is the Philippines (PH), where public transfers cover almost none of the old age lifecycle deficit.

The bottom of the triangle measures family transfers. In Austria, for example, these are close to 0%, as they are for all countries lying on the right side of the triangle, such as Japan (JP), Slovenia (SL), Sweden (SE), Chile (CL) and Costa Rica (CR). The elderly in Thailand (TH) get about one-third of their deficit funded by familial transfers; in Taiwan (TW), the share is slightly more, while in S. Korea (KR), the family covers about 15%. In China, 60% of the lifecycle deficit is covered by familial transfers. It is also important to note that many countries, such as Mexico, Uruguay, and Brazil, are to the right of the triangle, indicating that instead of receiving, they make net transfers to others. Mexico, Uruguay and Brazil all are in this category. Brazil is particularly interesting because compared to other countries, its elderly both receive the greatest share of public transfers among the countries evaluated (considerably more than 100% of their lifecycle deficit), but also give more to others (presumably younger family members) than do the elderly of any other country.

Finally, the left side of the triangle measures the contribution of assets. Only in Thailand, the Philippines, Mexico and the United States do assets fund two-thirds or more of the deficit. In Mexico, assets fund 100% of consumption. Public transfers play a very modest role as there are very substantial downward familial transfers from the elderly to younger people. In Costa Rica, Brazil, Chile, Germany, Finland, Sweden, Slovenia, Austria, and China, assets fund one-third or less of the deficit. Japan, Spain, Uruguay and S. Korea fall somewhere in between.

Taiwan is the only country that is near the center of the triangle. It sits on a different kind of "three legged stool", where the third leg is familial transfers. None of the elderly in the Latin American countries in the diagram receive net private transfers. However, it is important to note two points. First, the diagram shows net transfers, that is, transfers received minus transfers made. Many elderly may receive private transfers, but these are outweighed by the private transfers made by other elderly. Second, these are averages for all elderly aged 65 and over. In a number of countries, the younger elderly, age 65 to 74, make transfers, while the older elderly, 75 and over, receive substantial private transfers.

In Latin America, the role of the public sector in financing the elderly lifecycle deficit is particularly prominent. All five of the non-rich Asian countries support less than one-third of their elderly lifecycle deficits through the public sector, whereas four of the five Latin American countries support more than one-third. Three of the five support more than two-thirds publicly. Brazil publicly funds a higher share than any other NTA country.

These different institutional arrangements are interesting in their own right, but they also have important implications for how the demographic transition, and particularly population ageing, affects the economy. As seen, population ageing leads to a major increase in the population's demand for wealth. This demand for wealth might be satisfied through saving and asset accumulation, or it might be satisfied by an increase in transfer wealth, that is, by a higher proportion of the population expecting to be supported by their adult children or by public transfers. Increased asset accumulation would lead to increased income and possibly to higher productivity and wages for workers. Increased transfer wealth would simply lead to higher transfers of income from the working age population to the elderly, with no increase in income. This means that transfer wealth, whether public or private, substitutes for capital (Feldstein, 1974; Lee et al., 2000 and 2003; Borsch-Supan et al., 2006). However, increased wealth transfers can be viewed positively insofar as they are subject to different kinds of risks (death of a child, alienation of a child, changes in the pension benefit structure, changes in old age dependency ratio which makes either public or private programs unsustainable, etc.) than are assets (melt down of asset values as in the current crisis, erosion of bond values through rapid inflation, housing price instability, etc.), and transfers are a concrete expression of social or familial solidarity.

The point is not that transfers are bad and assets are good, but rather, that policy makers should be aware of the consequences of relying on each. It is probably best to support the elderly through a mixture of the two. Some countries have perhaps gone too far in reliance on public pensions.

H. The demographic transition promotes investment in human capital

It is a well-known theory in economic demography that there is a trade-off between the number of children a couple has (quantity) and the amount they invest in each (quality) (Becker and Lewis, 1973; Willis, 1973). Total expenditures on children are the product of quantity and quality times the price of child goods. Because of this peculiar nonlinear interaction in the budget constraint, the "price" of a child depends on the chosen quality; and the price of a unit of quality depends on the chosen quantity. It is believed that as income rises, the demand for quality rises more rapidly than the demand for quantity, and the consequent increase in the price of a child causes the number of births to decline at the same time that expenditure on each increases. This is a leading explanation for the decline in fertility as incomes rise across nations and across individual couples. At any given level of income, an independent decrease in fertility (due to a change in the availability or price of contraceptives or abortion, for example) could then cause an increase in quality of child. Similarly, an independent increase in the quality of children (due to availability of cheaper or more effective health care or education, for example) could lead to a decrease in fertility. For these reasons, we might expect that as fertility declines over the demographic transition, it might be accompanied by an increase in expenditure per child, with no assertion made about the direction of causality.

We have explored this possibility using NTA data, while focusing on health and education, the kinds of human capital investments in children that would promote their future labor productivity and wages. The investment made in the education of the average child is measured as the sum until age 26 of public and private spending per child at each age. Health is measured similarly through age 17. These are synthetic cohort estimates of human capital investment per child, combining public and private investments. Ordinary consumption by children is not included in the measurement. Finally, this measure is standardized by dividing by average labor income for ages 30 to 49, which allows us to measure human capital investment per child in units of labor input. To examine the potential quantity-quality tradeoff, this measurement is compared to the level of fertility (Total Fertility Rate, or TFR) for each country, measured over a five-year period just preceding the measure of investment. The result is shown in the left hand panel of Figure II.7.

The results show that there is a definite negative relationship, consistent with the quantity-quality theory, but it is noisy. Some of this is due to the standardization used- dividing by labor income. For example, Mexico is a positive outlier, but this is partly because Mexico has the highest ratio of aggregate consumption to labor income of any NTA country, and education spending is included in consumption. China, on the other hand, is a negative outlier, but that is, in part, because China has an exceptionally high saving rate, and it has the lowest ratio of aggregate consumption to labor income of any NTA country.

All five of the Latin American countries have very similar levels of fertility. Except for Mexico, they are all quite close to the regression line, which is to say, that given their levels of fertility, they are spending about as much on human capital per child relative to their average labor incomes as would be expected based on international evidence.

The right panel of Figure II.7 shows some longitudinal relations between human capital investment and fertility in three NTA countries, i.e., the United States, Taiwan, and Japan. In each case, there is a strong negative relationship.

Mankiw et al. (1992) developed an extension of the Solow growth model that included human capital. In empirical work, they found this to be important. They also found that the estimated model showed greater sensitivity if per capita income growth was used rather than population growth, as in the original Solow model. Lee and Mason (2009) present a simple recursive model of economic growth with three overlapping generations, including dependent elderly, assuming that human capital boosts wages as estimated in the recent literature (Card, 1999; Heckman and Ochner, 2008), and that

this estimated relationship continues to hold in the future. We find that over a stylized demographic transition, rising human capital per worker would more than offset the decline in number of workers and rising old age dependency ratio.

FIGURE II.7
THE RELATION OF HUMAN CAPITAL INVESTMENT PER CHILD TO FERTILITY
IN A CROSS-SECTION OF COUNTRIES AND IN THREE COUNTRIES
OVER TIME, BASED ON NTA DATA
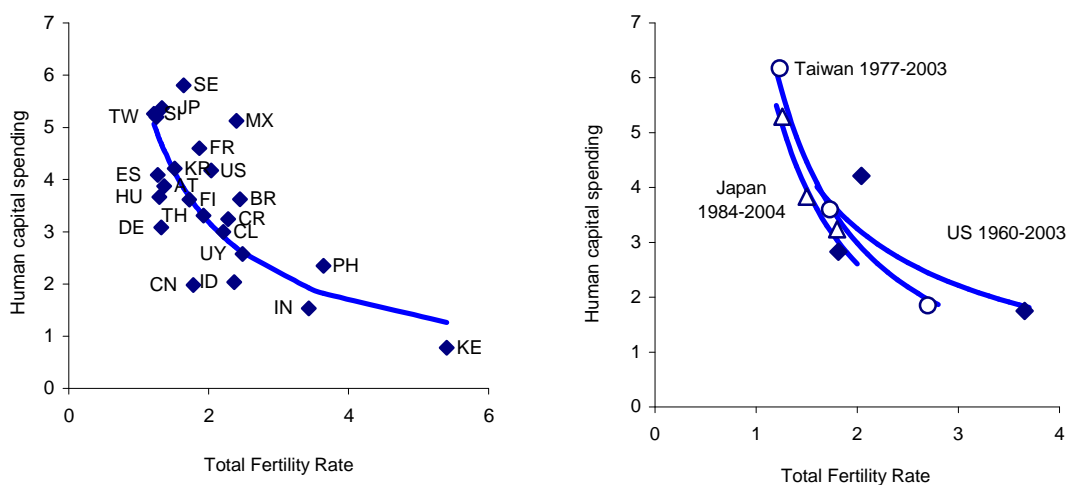
Source: Ronald Lee y Andrew Mason, "Fertility, human capital, and economic growth over the demographic transition", European Journal of Population, vol. 26, Nº 2, 2010.
Note: Human capital spending is the sum of average age specific public and private spending per child for health and education, summed over ages 0-17 for health, and 0-26 for education. The total is divided by the average labor income for each country and period for ages 30-49. The total fertility rate is for the 5 year period closest to the year of the human capital estimate.

I. Policy can alleviate the economic impact of population ageing

The declining fertility and mortality of the demographic transition eventually causes population ageing. This leads to falling support ratios as the proportion of dependent elderly rises. Other things equal, these changes lead to lower lifecycle consumption and lower per capita income than if support ratios remained unchanged. However, the same demographic changes that cause support ratios to fall also promote the accumulation of physical and human capital.

Population ageing raises the per capita demand for wealth, in part through the increasing share of wealth-holding elderly, and in part through the longer life (Kinugasa and Mason, 2007) and fewer children that lead each individual at a given age to hold more wealth. If this increased demand for wealth is not met entirely by rising transfer wealth, and instead is met at least, in part, by asset accumulation at home or abroad, then population ageing will raise the level of per capita assets, and perhaps, the level of capital per worker and wages. The outcome depends on the culture and institutions of the country, including the availability of reliable financial institutions that can serve as a vehicle for private saving. Public policy should seek to establish an appropriate balance between funded programs and unfunded transfer programs for support of the elderly, although this mix will surely vary from country to country. It seems clear that some countries have gone too far in the direction of unfunded transfer programs, and it is possible that some have gone too far in the direction of funded programs. Compared to Asian non-rich countries, most of the Latin American NTA countries rely heavily on public transfers to the elderly. Latin American NTA countries also tend to

have consumption profiles that rise with age, except for Mexico, which combines weak public transfers to the elderly and declining consumption in old age.

To the extent that the retirement age rises, as is indeed likely to happen in many countries, the support ratio will decline less, and the impetus to increase asset accumulation will also be reduced.

The low or declining fertility that is largely responsible for population ageing also promotes greater investment in the human capital of children. The resulting smaller labor force is better educated, healthier, and more productive. Additionally, there are possible positive spill-over effects of a more educated population. Public policy should facilitate these investments in human capital and seek to protect them from being crowded out by the fiscal pressures that population ageing will bring. Of course, there certainly must be limits to how far societies can go in this direction, substituting human capital per worker for numbers of workers, but it does not appear that any country has yet reached those limits.

During a middle stage of the demographic transition, a favorable trend in support ratios relaxes public and private budget constraints, giving rise to the demographic dividend. The analysis reported here suggests that much of this dividend has been invested in human capital, and that depending on institutional arrangements, an additional share of the dividend may be invested in assets. We have suggested that normal optimizing responses by individuals will go in these directions. Public policy should remove institutional obstacles to these individual responses by, for example, fostering the development of financial institutions. As populations age and support ratios decline, the accumulation of physical assets may continue to raise capital intensity and productivity. In some ways, population ageing is certainly costly, and these are the most visible consequences and receive the most attention. However, there are other less visible consequences that work in the opposite direction, and that should temper our concerns about population ageing.

Bibliography

Becker, G. and H. G. Lewis (1973), "On the interaction between the quantity and quality of children", *Journal of Political Economy*, 84(2 pt. 2), S279-288.

Becker, G., K. M. Murphy et al. (1990), "Human capital, fertility, and economic growth", *Journal of Political Economy*, 98(Part II), S12-37.

Becker, G. and K. Murphy (1988), "The Family and the State", *Journal of Law and Economics* v.31 (April), pp.1-18.

Becker, G. and R. Barro (1988), "A Reformulation of the Economic Theory of Fertility", *Quarterly Journal of Economics* v.103 n.1 (February), pp.1-25.

Becker, G. and N. Tomes (1976), "Child Endowments and the Quantity and Quality of Children", *Journal of Political Economy* 84(4 pt. 2): S143-162.

Bloom, D. E. and D. Canning (2001), "Cumulative causality, economic growth, and the demographic transition", in N. Birdsall, A. C. Kelley and S. W. Sinding (eds.), *Population Matters: Demographic Change, Economic Growth, and Poverty in the Developing World*, Oxford, Oxford University Press, pp. 165-200.

Bloom, D. E. and J. G. Williamson (1998), "Demographic transitions and economic miracles in emerging Asia", *World Bank Economic Review,* 12(3), 419-456.

Bommier, A. and R.D. Lee (2003), "Overlapping generations models with realistic demography", *Journal of Population Economics* 16:135-160.

Borsch-Supan, A.; A. Ludwig and J. Winter (2006), "Aging, pension reform and capital flows: A multi-country simulation model", *Economica* 73(292):625–658.

Card, D. (1999), *The causal effect of education on earnings. Handbook of Labor Economics*, O. C. Ashenfelter and D. Card.

Cutler, D.; J. Poterba; L. Sheiner, and L. Summers (1990), "An Aging Society: Opportunity or Challenge?", *Brookings Papers on Economic Activity* v.1, pp.1-56 and 71-73.

Feldstein, M. (1974), "Social Security, Induced Retirement, and Aggregate Capital Formation", *Journal of Political Economy* v.82.

Gruber, J. and D. Wise (1998), "Social Security and Retirement: An International Comparison", *American Economic Review* (May) v.88 n.2, pp.158-163.

Heckman, J. J.; L. J. Ochner et. al. (2008), "Earnings functions and rates of return", NBER Working Paper 13780.

Higgins, M. and J. G. Williamson (1997), "Age structure dynamics in Asia and dependence on foreign capital", *Population and Development Review*, 23(2), 261-293.

Kelley, A.C. and R.M. Schmidt (2005), "Evolution of recent economic-demographic modeling: A synthesis", *Journal of Population Economics* 18:275–300.

Kinugasa, T. and A. Mason (2007), "Why nations become wealthy: The effects of adult longevity on saving", *World Development*, 35(1), 1-23.

Lee, R. D. (1994), "The Formal Demography of Population Aging, Transfers, and the Economic Life Cycle", in Linda G. Martin and Samuel H. Preston (e ds.), *Demography of Aging*, Washington, D.C., National Academy Press, pp. 8-49.

Lee, R.; A. Mason and T. Miller (2000), "Life Cycle Saving and the Demographic Transition: The Case of Taiwan", in Cyrus Chu and Ronald Lee (eds.), *Population Change in East Asia, Transition, Development, and Aging*, a supplement to v.26 of *Population and Development Review*, New York, Population Council, pp.194-222.

Lee, R. and A. Mason et al. (2003), "From transfers to individual responsibility: Implications for savings and capital accumulation in Taiwan and the United States", *Scandinavian Journal of Economics*, 105(3), 339-357.

Lee, R. D., A. Mason et al. (2001), "Saving, wealth, and the demographic transition in East Asia", in A. Mason (ed.), *Population Change and Economic Development in East Asia: Challenges Met, Opportunities Seized*, Stanford, Stanford University Press, pp. 155-184.

Lee, R. D., S.-H. Lee, and A. Mason (2008), "Charting the economic lifecycle", in A. Prskawetz, D. E. Bloom and W. Lutz (eds.), *Population Aging, Human Capital Accumulation, and Productivity Growth*, a supplement to *Population and Development Review* 33, New York, Population Council, pp. 208-237.

Lee, R., S.-H. Lee et al. (2008), *Charting the Economic Lifecycle. Population Aging, Human Capital Accumulation, and Productivity Growth*, a supplement to *Population and Development Review* 33, A. Prskawetz, D. E. Bloom and W. Lutz. New York, Population Council, pp. 208-237.

Mankiw, G., D. Romer et al. (1992), "A contribution to the empirics of economic growth", *Quarterly Journal of Economics*, 107(2), 407-437.

Mason, A., R. Lee et al. (2009), *Population Aging and Intergenerational Transfers: Introducing Age into National Accounts. Developments in the Economics of Aging*, D. Wise, Chicago, NBER and University of Chicago Press, pp. 89-122.

Pérez Brignoli, H. (2009), "The Demographic Transition in Latin America", paper presented at the Madrid Conference on Long-Term Implications of the Demographic Transition, September 24-26.

Samuelson, P. (1958), "An Exact Consumption-Loan Model of Interest With or Without the Social Contrivance of Money", *Journal of Political Economy*, vol. 66, no. 6 (December), pp. 467-482.

Willis, R. (1988), "Life Cycles, Institutions and Population Growth: A Theory of the Equilibrium Interest Rate in an Overlapping-generations Model", in Ronald Lee, W. Brian Arthur and Gerry Rodgers (eds.), *Economics of Changing Age Distributions in Developed Countries*, Oxford University Press, pp.106-138.

———— (1973), "A new approach to the economic theory of fertility behavior", *Journal of Political Economy*, 81(2 pt. 2), S14-64.

III. New perspectives from national transfer accounts for national fiscal policy, social programs, and family transfers

Andrew Mason and Ronald Lee[7]

A. The generational economy

The generational economy consists of institutions and economic mechanisms that are employed to shift economic resources across age groups or generations. The generational economy is important because the timing of consumption over our lives differs so greatly from the timing of our labor production. In all human societies, past and present, children depend heavily on resources generated by working adults. And in all contemporary societies, the old depend on resources that originate during the prime working ages.

The generational economy is important for many reasons. At the most basic level, insuring that the young and the old have the economic resources necessary for a fulfilling life is one of the most important challenges shared by families, governments, and other social institutions. Economic

growth depends, in part, on the assets accumulated by those who plan for retirement or to pass on wealth to their descendants. Likewise, economic progress depends on how successfully we invest in our children —providing for their basic needs, their health, and their education. Decisions about childbearing are heavily influenced by the cost of bearing and rearing those children. Health and mortality are influenced by how much is invested in health, both late in life and during childhood. Consequently, decisions about how economic resources should be allocated across age or generations touch the most important features of an economy in one way or another.

Key features of the generational economy are changing in important and inter-related ways. First, the economic lifecycle, the balance between what is consumed and what is produced through our labor, is changing over time and as economies develop. The duration of child dependency is increasing as the returns to education increase and children spend more years in school, as productive economic opportunities for children decline, and as child labor laws restrict the employment of children. The importance of retirement has increased as societies have become wealthier and demand for leisure has increased, as public pension and health care systems have developed to provide support for the elderly, as the importance of formal employment has increased, and as mandatory retirement and a variety of incentive systems have been adopted that discourage work by older adults (Costa, 1998; Gruber and Wise, 1999).

Second, the reallocation systems are changing. In traditional societies, families and, in some cases, local communities (villages) were exclusively responsible for reallocating economic resources across age. In more contemporary settings, governments have become increasingly involved in transfers both to children and to the elderly (Lee, 2003). However, there is no one-to-one relationship between the level of development and the importance of the public sector. Some of the least developed countries have introduced important public transfer systems, and both regional and inter-country differences in systems are widespread.

Assets, in various forms, also play an important role in age reallocations. Hunting and gathering societies probably accumulated little in the form of assets, but with the advent of settled agriculture and property rights in land, the accumulation of capital became a more important economic opportunity. Capital served two roles. First, it raised the productivity of labor and fostered more rapid economic growth. Second, it created an economic mechanism by which economic resources generated through labor during the prime working ages could be stored and used to support consumption at older ages. In contemporary societies, there is a vast array of assets. As financial systems have developed, the accumulation of assets is no longer exclusively an individual or family -business endeavor. Moreover, the development of financial systems has led to the development of credit markets. This has been important because the existence of debt means that individuals can, to a limited extent, rely on asset systems to fund current consumption out of labor income that will be accumulated in the future.

The third important change in the generational economy can be traced to the global transition in population age structure. One of the important points discussed later is that changes in population age structure have enormous effects on the generational economy. Changes in population age structure are leading to changes in the direction of net intergenerational transfers, and they are straining the systems that are so important to the generational economy.

B. The global age transition

The global age transition is an intrinsic feature of the demographic transition. Early in the transition, the decline in infant and child mortality, sometimes reinforced by higher fecundity and childbearing, led to an increase in the share of children in the population. Later, as fertility rates declined, the share of children in the population declined and the share of the working-age population increased. As the

end of the transition approaches in many countries, continued low fertility and higher survival rates at older ages are leading to an increase in the share of the older population.

Although the basic demographic processes are similar in all countries, there are important differences between the developing and the developed world. The transition began much earlier in the industrialized world. Mortality began to decline in some European populations in the 18th century and fertility in the 19th century. The changes were more gradual in these populations, and as a consequence, the swings in age structure have been slower and more moderate than in the developing world of today. In the United States, further complexity was introduced into the age transition by the temporary increase in birth rates in the aftermath of World War II, known as the baby boom. The share of the child population increased and then ebbed, leading to an increase in the working-age population during the later decades of the 20th century, and presently an increase in the older population.

The age transition for non-industrial countries and industrial countries in Figure III.1 are based on population estimates beginning in 1950 and projections until 2050 (United Nations, 2008). The child share (percentage under 25) is plotted against the percentage 60+ separately for countries experiencing an increase in the percentage under 25 (blue line) and a decrease in the percentage under 25 (purple line).

As the child share declines, the percentage 60 and older increases, but very gradually at first. As a consequence, the percentage in the 25-59 age group increases, first passing 40 percent of the population and then peaks at almost 50% of the population.

FIGURE III.1
AGE TRANSITION PATH, 1950-2050
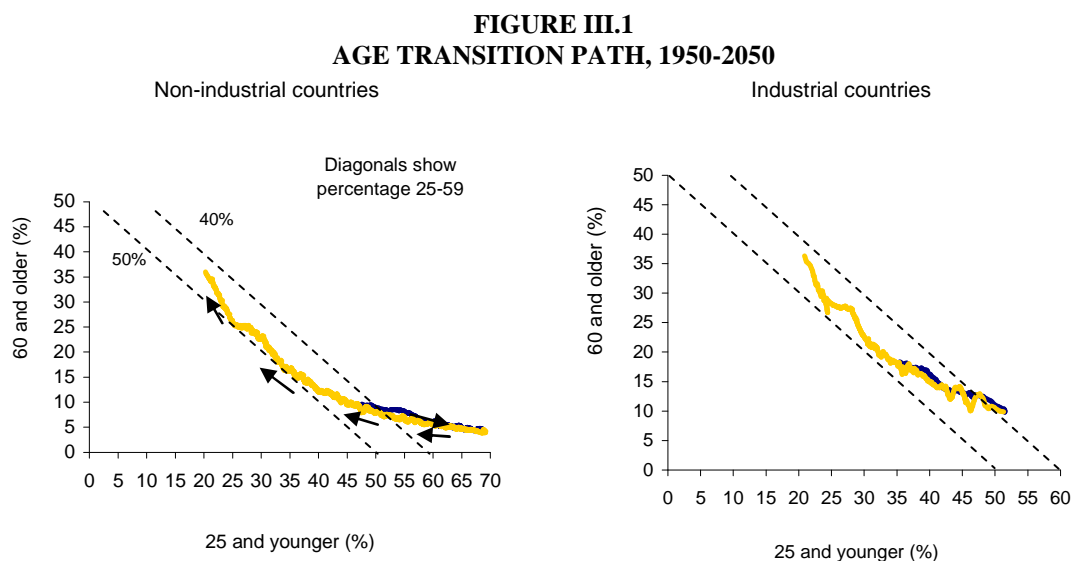
Source: Constructed from UN population projections and estimates (United Nations Population Division, 2009).

For a period, the 25-59 age group is relatively stable as the decline in the percentage in the child ages is matched by an increase in the percentage at older ages. Eventually, however, the decline in the child share moderates and the increase in the share at older age is matched by a significant decline in the working-age population. By the end of the transition, as measured in the UN projections to 2050, the percentage 25-59 is approaching 40%.

The age transition for industrialized countries for 1950-2050 differs from that for the developing world in several important ways. The industrialized countries were much older than developing countries at the beginning and the end of the baby boom. The child share did not reach 55% before it began to decline. In contrast, the child share for many developing world countries approached 70%. A second difference is that the industrialized countries did not experience an

increase in the share of their working-age population (25-59) as large as that of the developing world.[8] In other respects, the age transition paths followed in the developing and the developed worlds are similar. Many developing countries, however, will not be near the end of the age transition by 2050.

The timing of the age transition varies widely around the world. In many African countries, the child share of the population has been increasing until very recently; they are just beginning to experience a decline in the child share and an increase in the share of the working-age population. Many countries in the West, Latin America, and Asia have essentially completed the second phase of the age transition —the share of their working-age population is near its peak. Japan and a few countries in the West have begun the final phase of the age transition. In these countries, the share of the working age population has begun to decline, and the share 60 and older is rising (Figure III.2).

FIGURE III.2
DISTRIBUTION OF COUNTRIES BY PHASES OF THE AGE TRANSITION, 1950-2050[a]
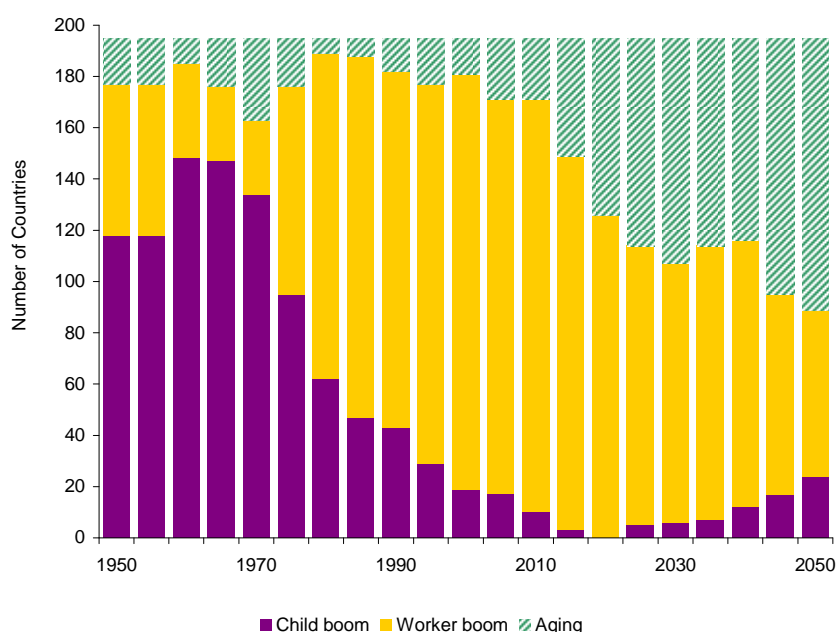
Source: Authors' estimates using data from United Nations, *World Population Prospects: The 2008 Revision*, New York, 2008.
[a] If the percentage under age 25 increased during a five-year period, both the beginning and ending year were counted as being in the child boom phase. If the child share declined and the share 25-59 increased, both the beginning year and the ending year were included, except for those years already counted in the child boom phase. The ageing phase includes years not otherwise counted. Child share must be declining and working age must be declining.

The countries in the National Transfer Account study have been selected, in part, to capture the full range of the age transition to date (Figure III.3). Japan is the oldest country in the world with almost 30 percent of its population over 60. In other Western countries, the share of the

---

8   The reasons for these differences are not an important issue here, but are due in part to the greater speed of the demographic transition in the developing world.

working age population has begun to decline (Germany, Finland, Sweden, and the United States) or will soon begin to decline (Spain, Hungary, and Slovenia). Japan aside, Asian countries are somewhat earlier in their age transitions, but they are changing very rapidly. South Korea's population is heavily concentrated in the working ages, but decline will commence starting in 2010. The situation in China, Taiwan and Thailand is similar to that in Korea, while other Asian countries (India, Indonesia, and the Philippines) are at earlier points in their age transitions. The age structures in the Latin American countries represented here are similar in some respects to Asian developing countries. They have younger populations than in the West, and the working share of their populations is increasing. Of the Latin American countries included here, Uruguay has the oldest population, and Mexico has the youngest. The Latin American path is somewhat different than the Asian path. Given the child share of the population, Latin American countries have a larger share 60 or older and a smaller share 25-59. The differences are small, however. The share 25-59 of the combined Latin America population reaches a peak of 46.6% in 2025, while the share for the combined Asia population reaches a peak of 47.8% in 2030.[9]

FIGURE III.3
AGE STRUCTURE OF STUDY COUNTRIES, 2010
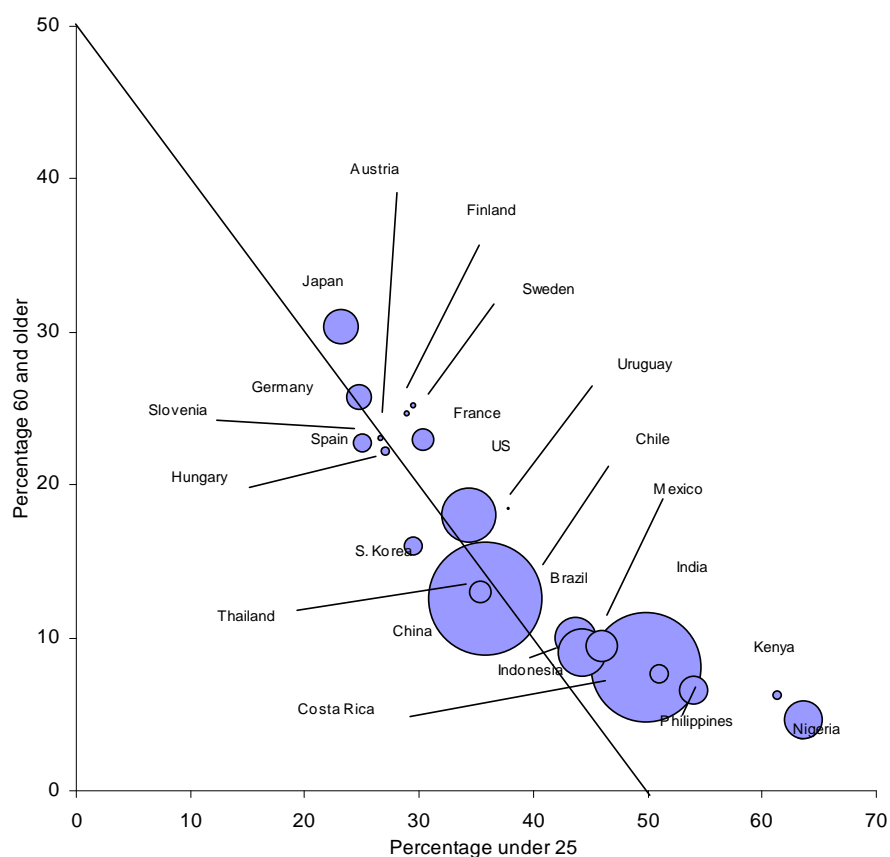
Source: Constructed using population estimates from the UN Population Division (United Nations, 2009).
Note: Area of balloon is proportional to population.

---

[9]   Calculations are in world age transition.xls.

C. Data: National Transfer Accounts

The analysis presented here is based on National Transfer Accounts (NTA), which provides aggregate measures of how those at each age acquire and use economic resources. The accounts are constructed in a manner consistent with National Income and Product Accounts, but extend the accounts to allow a comprehensive tracking of flows across generations (Lee et al., 2008, Mason et al., 2009). The conceptual foundations for the accounts rely heavily on work by Willis (1988) and Lee (1994). Construction and further development of the NTA system relies on research teams from twenty-eight countries listed in Figure III.3 above. Complete information about the NTA network and the research teams as well as a full description of the methods are available on the NTA website (online, ‹www.ntaccounts.org›).

National Transfer Accounts are governed by the flow identity:

$$C(x) - Y^l(x) \quad = \quad \tau^+(x) - \tau^-(x) \quad + \quad Y^A(x) - S(x)$$

Lifecycle Deficit b = Net Transfers   + Asset-based Reallocations

Age Reallocations

The lifecycle deficit is the excess of consumption over labor income $[C(x) - Y^l(x)]$ for each age x. Inter-age flows or age reallocations come in two economic forms: net transfers, $[\tau(x) = \tau^+(x) - \tau^-(x)]$ and asset-based reallocations $[Y^A(x) - S(x)]$ for age group x. Although the flow constraint as written in the equation emphasizes the connection between the economic lifecycle and age reallocations, it must hold irrespective of the motives or purpose governing any of its elements. The constraint is an accounting identity that follows from the simple principle that for any age group, inflows (labor income, transfer inflows, and asset income) must be matched by outflows (consumption, transfer outflows, and saving).[10]

The economic lifecycle reflects many behavioral and non-behavioral factors that influence the relationship between age, on the one hand, and consumption and labor income, on the other. Average labor income at each age depends on hours worked, labor force participation, the age profile of wages, and the many cultural, political, social, and economic factors that influence each of these elements of labor income. In similar fashion, average consumption at each age is influenced by historical events, by preferences, by prices, including interest rates, by political systems, and by many other forces.

At the aggregate level, the economic lifecycle also reflects the population age structure. In young populations, the aggregate economic lifecycle is dominated by the large lifecycle deficit, i.e., the economic resource requirements of the young. Over the course of the demographic transition, populations age and the lifecycle deficit of the old becomes increasingly important. For example, the importance of age structure is apparent in comparing the Philippines, with a relatively young age structure, and Germany, with a relatively old age structure (Figure III.4). The major generational problem facing the Philippines is to generate resources for the young, while in Germany, the young and the old have lifecycle deficits that are more nearly equal.

The mechanisms by which economic resources are reallocated across age are illustrated in Figure III.5 using results for the Philippines. (Note that the values plotted in Figure III.5 are aggregate, not per capita, values, and they taper down as age increases only because of the population age

---

[10] Some forms of asset income are negative, e.g., interest on debt or a business loss. These are treated as negative inflows, but could as easily be classified as outflows. Likewise, saving is an outflow if positive, whereas negative saving (dis-saving) generates an inflow. In the classification used here, saving is counted as an inflow and dis-saving as a negative inflow.

distribution.) First, the lifecycle deficit of the young is met almost entirely through transfers. In the Philippines, the young depend much more on private transfers, namely intra-household transfers, than public transfers. Assets do not play a role. Net public transfers are negative between the ages of about 21 and 71, while net private transfers are negative between the ages of 27 and 70. Net transfers turn positive for the elderly only when they are in their 70s, and even at these advanced ages, they are relatively modest. Those 72 and older fund 2 percent of their lifecycle deficit from net public transfers, 27 percent from net private transfers, and the remainder rely on assets.

FIGURE III.4
PHILIPPINES (1999) AND GERMANY (2003): AGGREGATE
CONSUMPTION AND LABOR INCOME BY AGE
(Values for the Philippines are millions of pesos and for Germany millions of euros)
Philipines 1999
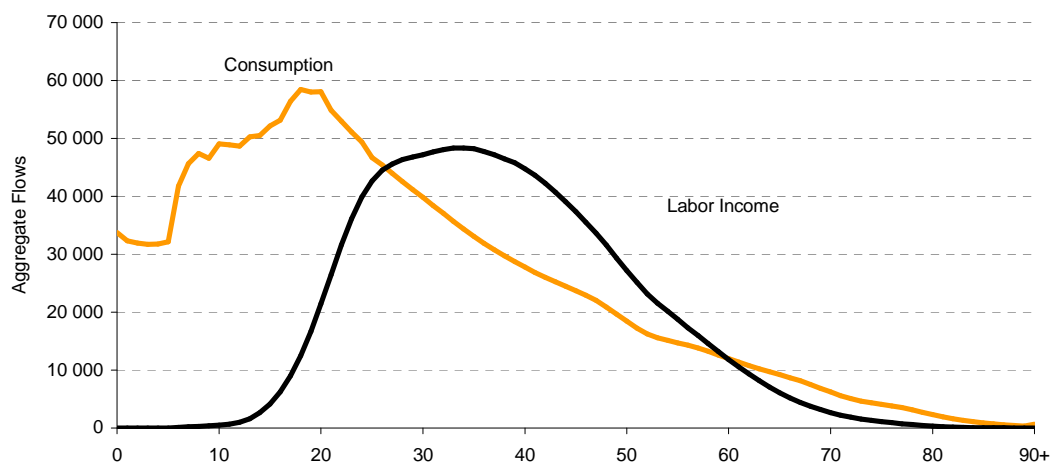
Germany 2003
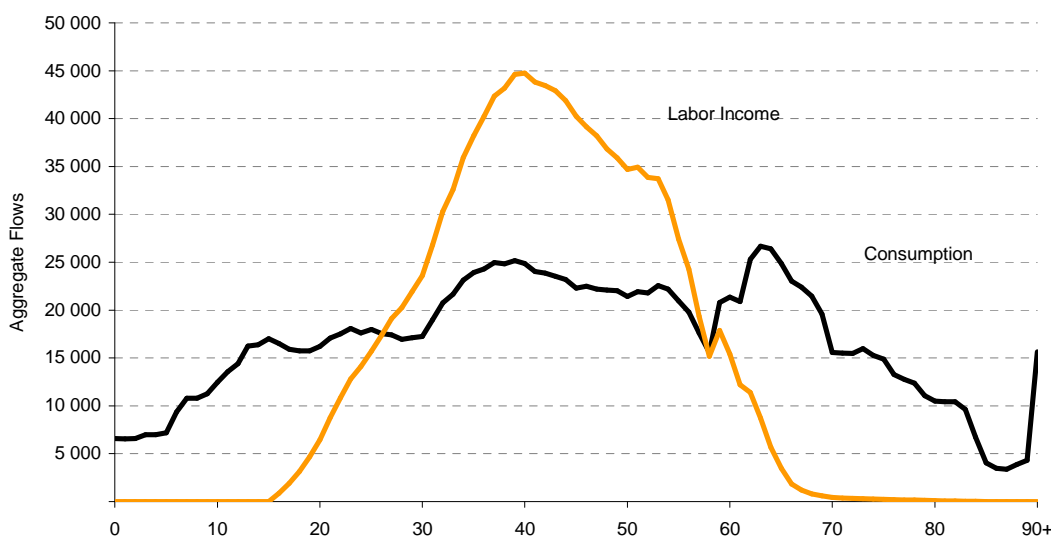
Source: Racelis, R. and J. M. Ian Salas, "Measuring economic lifecycle and flows across population age groups: data and methods in the application of the National Transfer Accounts (NTA) in the Philippines", Discussion Paper Series, N° 2007-12, Makati City, Philippine Institute for Development Studies, October 2007 and F. Kluge, "Labor income and consumption profiles, Germany 2003", NTA working Paper, 2009.

Asset-based inflows are essentially positive at all adult ages in the Philippines. This means that asset income exceeds saving. The largest inflows come during the 40s because labor income is insufficient to cover consumption of those in these age groups, and net transfers flow mostly to children. Thus, assets are being used to fund the large amount of resources being directed toward children's consumption. Asset-income also plays a very important role in funding the lifecycle deficit of the elderly. This does not necessarily mean, however, that the elderly are funding their retirement by dis-accumulating their wealth. They may be using asset income rather than disposing of their assets. This has proven to be the case in all countries that have been analyzed to this point.

FIGURE III.5
PHILIPPINES: AGGREGATE AGE REALLOCATIONS, 1999
(In millions of pesos)
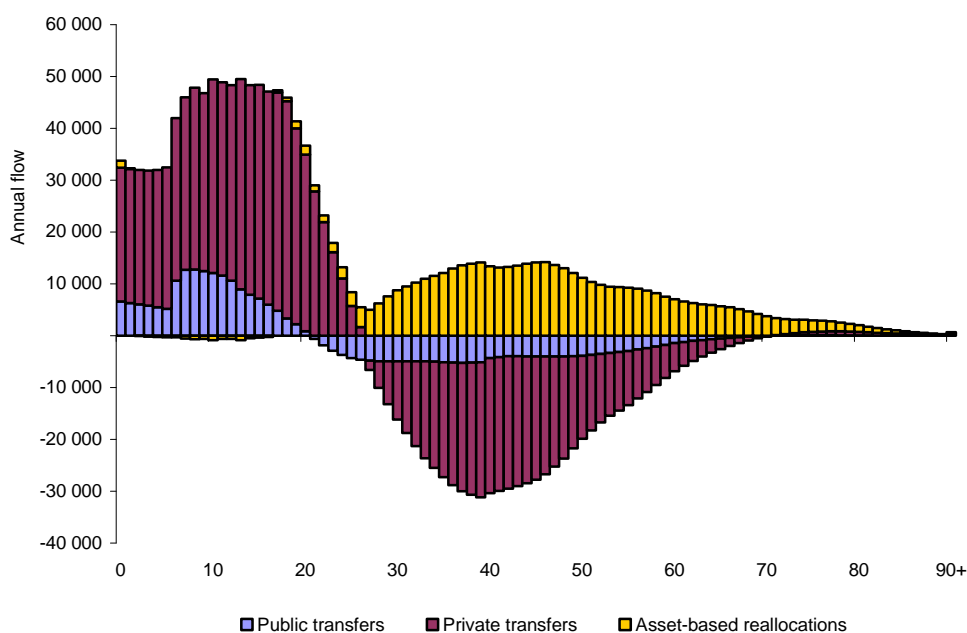
Source: Racelis, R. y J. M. Ian Salas, "Measuring economic lifecycle and flows across population age groups: data and methods in the application of the National Transfer Accounts (NTA) in the Philippines", Discussion Paper Series, N° 2007-12, Makati City, Philippine Institute for Development Studies, October 2007.

D. Five key findings

The results presented below summarize five key findings about the generational economy and population ageing based on NTA estimates.

In all countries, private transfers are downward, dominated by transfers from adults to children.

How private transfers evolve over the demographic transition is an important issue. Several theories of fertility have emphasized private intergenerational transfers. Caldwell (1976), for example, argued that the fertility transition began when economic flows reversed from downward to upward. Other scholars have suggested a 'payback hypothesis' where children are a form of investment with downward flows to children matched by return flows to parents in old age (Lillard and Willis, 1997). These ideas are also closely related to the quantity-quality tradeoff theory of fertility (Becker and Lewis, 1973) in that they provide an estimate of "child quality", i.e. per child spending by parents.

Estimates for Japan in Figure III.6 illustrate NTA estimates of private transfers and the methods used to summarize them. In 2004, those under the age of 30 and over the age of 77 had net positive transfers, while those between the ages of 30 and 77 had net negative transfers. As is apparent, net private transfers to the young greatly exceeded net transfers to the old, and clearly, the direction of net transfers was downward.

FIGURE III.6
JAPAN: NET PRIVATE TRANSFERS BY AGE AS A SHARE
OF TOTAL LABOR INCOME, 2004
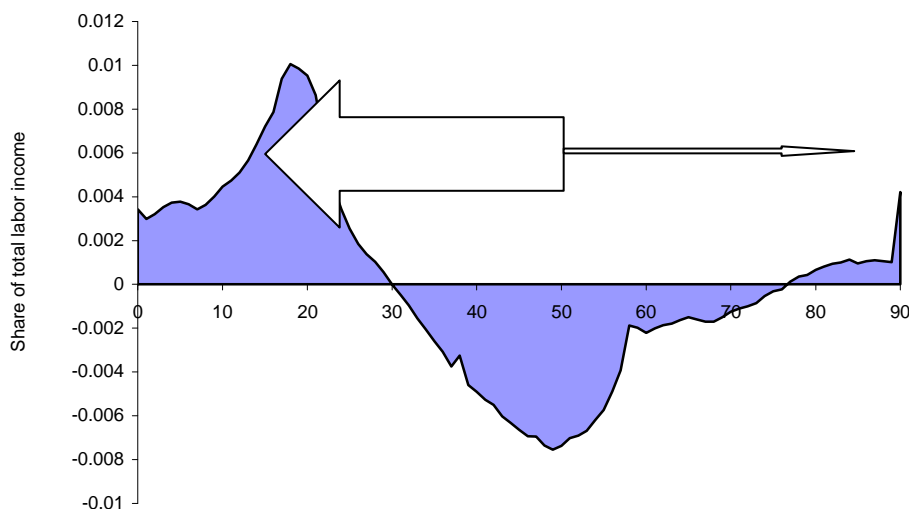
Source: N. Ogawa et al., "Declining fertility and the rising cost of children: what can NTA say about low fertility in Japan and other Asian countries", *Asian Population Studies*, Vol. 5, Issue 3, 2009.
Note: Mean age of outflows: 50.0; mean age of child inflows: 15.2; mean age of old-age inflows: 86.4. Private child transfers as a share of total labor income: 0.146; private old-age transfers above age 77 as a share of total labor income: 0.012.

A useful way of summarizing transfers, however, is to employ arrows (as in Figure III.6) that represent the direction, the magnitude, and the average age span of transfers. For downward transfers, those to children, the annual flow was 14.6% of total labor income, while for upward transfers, the average flow was only 1.2% of total labor income. The mean age of inflows for downward transfers was 15.2 years and for upward transfers was 86.4 years. The average age of net transfer outflows was 50.0 years.[11] Lee (1994) has shown that under highly specialized assumptions, the product of the annual transfer flow and the mean age span gives a measure of transfer wealth. Under more general and realistic circumstances, however, the product of the flow and mean age span provides a good indicator of transfer wealth. In the figure, transfer wealth is represented by the area of the respective arrows. If the arrow is pointed toward younger ages, transfer wealth is negative. If the arrow is pointed toward older ages, transfer wealth is positive. Thus, downward transfer wealth in Japan was .146 X (15.2 – 50.0) = - 5.09 times total labor income and upward transfer wealth was 0.012 X (86.4 – 50.0) = 0.54 times total labor income.

---

[11] Calculations have been simplified by assuming that the average age of outflows is the same for upward and downward transfers. To the extent that this assumption does not hold, estimates of downward and upward transfer wealth were? influenced, but not the estimate of combined transfer wealth.

How do we interpret these values? Let's begin with upward transfer wealth. Under special circumstances (Golden Rule growth), this is the net present value of upward transfers made less upward transfers received over the lifetime of the current population. This is the same method used to convert any stream of income into a measure of wealth. In this case, the wealth is the commitment or obligation of future generations to maintain the current system of transfers. The counterpart of net upward transfer wealth is implicit debt on the part of future generations. Those who are not yet born are obligated to provide these transfers to the current population in the future.

Downward transfers have a similar interpretation although in this case, downward transfers are an obligation of the current population to make net transfers to future generations. Hence, in this case, the current population has negative transfer wealth equal to the present value of net transfer it will make to future generations. The counterpart is an implicit asset for future generations equal to the present value of the net transfers to be received from members of the current population.

Comparing the downward and upward wealth conveys important information. If the two were equal, it would imply that the value of the private transfers that future generations would receive from the current population was identical to the value of the private transfers that future generations would give to the current population. The combined transfers would net to zero, meaning that the current population would not be burdening future generations through their private transfers, nor would they be benefitting unduly from current generations. Rather, current generations would be receiving the golden rule rate of return on transfers.

A final point to be made here is the importance of incorporating the span of transfers into the calculation. It is important to know more than the magnitude of transfers in each period. It also matters how long the lag is between when transfers are made to the young and when return transfers are received. This information is incorporated appropriately using the differences between the mean ages of transfer inflows and outflows.

The case of Japan is instructive. Private downward transfer debt exceeds private upward transfer wealth by a massive amount. For families in Japan, children do not represent an investment for old age support because the expected returns in old age are very small in comparison to the investment made.[12]

In the absence of additional information, the imbalance of net private transfers appears to be consistent with the low fertility found in Japan. Japan's total fertility rate is about 1.3 births per woman, among the lowest in the world. Estimates presented in Table 1 show that this conclusion is unwarranted. These values do not distinguish downward and upward flows, but present results only for the combined flows: downward private transfer wealth plus upward private transfer wealth.[13] The estimates are arranged in order of per capita income with the highest income at the top and the lowest income at the bottom of the table. In every country, the transfer wealth estimates, listed in the second to the last column, are negative, showing that downward transfers to children exceed upward transfers to the elderly. The highest values (relative to labor income) are found in the lowest income countries because they generally have higher fertility Economic transfers always flow downward, particularly in high fertility, low income countries.

---

[12] There may be returns in other forms not captured in these calculations. Children may give personal attention to their parents. They may insure against risks that are not realized. Presumably, children provide "consumption value" that justifies large spending on children.

[13] Note that the average age of outflows for Japan is slightly different in this table than in the figure because calculations are based on gross rather than net flows. Similarly, the annual flow is larger because it represents the gross rather than the net flow. The calculation of transfer wealth, however, is unaffected by these differences.

TABLE III.1
PRIVATE TRANSFER SUMMARY, WITH OWN AND STANDARD
POPULATION AGE DISTRIBUTIONS

Country (from richest to poorest)	Average age of inflows	Average age of outflows	Transfers/ Normalized labor income	Wealth	Adjusted Wealth
United States	34.2	46.9	0.25	-3.17	-3.47
Austria	36.4	46.2	0.17	-1.67	-2.34
Japan	42.1	50.6	0.29	-2.46	-4.03
Slovenia	32.6	43.4	0.19	-2.05	-3.17
Taiwan (Province of China)	31.3	40.3	0.35	-3.15	-3.31
South Korea	33.8	44.2	0.45	-4.68	-5.13
Mexico	28.1	42.6	0.47	-6.81	-5.86
Chile	30.3	45.2	0.33	-4.92	-4.46
Costa Rica	28.6	42.4	0.35	-4.83	-4.11
Thailand	33.3	43.7	0.33	-3.43	-3.26
Brazil	28.9	44.0	0.39	-5.89	-4.72
Indonesia	24.8	43.8	0.29	-5.51	-5.07
China	32.9	43.9	0.20	-2.20	-2.25
Philippines	27.6	42.9	0.42	-6.43	-4.23

Source: R. Lee and A. Mason, "Generational economics in a changing world", *Population and Development Review*, Vol. 37, January 2011.
Note: Private transfers are normalized on the labor income of those in the 30-49 age group. Adjusted wealth uses a standard population age distribution to calculate private transfers.

An additional point follows from the final column in the table. The calculations here use the per capita transfer profiles for each country and the "average" age distribution for all countries to recalculate transfer wealth. The variation in transfer wealth is greatly reduced by eliminating the effects of the population age distribution. For the countries in the table, there is no relationship between adjusted wealth and income.[14] As a first approximation, low income countries have large downward transfers and large negative transfer wealth relative to their labor income because they have so many children.

The direction of public transfers reverses from downward in the least developed to upward in the most developed economies. As populations age, public transfer wealth will grow and, hence, implicit debt of future generations will increase.

The magnitude and direction of public transfer programs for NTA countries are summarized in Table III.2 using arrow diagrams and calculations of transfer wealth as explained in the preceding section. The direction of public transfers is much more varied than the direction of private transfers. In Europe, public transfers are upward and in some cases, relatively substantial. Public transfer wealth is particularly high in Austria, Sweden, and Slovenia, ranging from 170 percent to 185 percent of the labor income of 30-49 year olds, which is equal to nearly two years of labor income. In Latin America, public transfers are upward, especially in Uruguay and Brazil. In Japan, public transfers are also upward and substantial. Mexico is the only Latin American country with strongly downward public transfers, and the United States is the only industrialized country among the NTA group with

---

[14] China is something of an outlier because of its very high rate of saving. Consumption at all ages is low; and hence, transfers relative to labor income are quite low. If China is excluded, there is a modest positive relationship between per capita income and transfer wealth. The effect of age structure is about twice as great as the effect of per capita income with China excluded.

downward public transfers. Japan aside, public transfers are strongly downward in the Asian NTA countries, particularly in South and Southeast Asia.

Age distribution is an important factor that affects the direction of public transfers. In the youngest populations, public transfers to children, particularly of education, outweigh public transfers to the elderly in the form of pensions, health care, and long-term care. The compositional effects of age structure can be judged using the same kind of analysis employed above for private transfers. The age-specific transfers for each country have been multiplied by a common population age distribution —the average age distribution of the sample. The results, displayed in Table III.3, show age structure plays an important, but by no means exclusive, role in determining the direction of public transfers.

In the industrialized countries of Europe, the United States, and Japan, population age structure shifts the transfers in an upward direction. Indeed, if the countries had the younger age structure characterized by the combined population, few would have upward public transfers. Comparing among these countries, the United States and Japan stand out as having per capita patterns that are less favorable to the elderly than European countries.

Among the non-industrialized countries, the patterns observed above are reinforced; South and Central American countries have strongly upward public transfer programs, while Mexico and developing Asian countries have strongly downward public transfer systems.

TABLE III.2
PUBLIC TRANSFER WEALTH FOR REGIONS AND NTA COUNTRIES

	Average age of transfers receptors	Average age of tax-payers	Average amount of transfers (in percentage)	Wealth (in percentage)
Europe and United States	43.7	46.5	33	94
Germany				
Austria	45.1	50.3	35	185
Slovenia	41.0	46.6	30	170
Spain	44.4	47.1	26	69
United States	42.6	46.4	24	-93
Finland	42.7	45.5	39	124
France				
Hungary	42.0	43.6	36	57
Sweden	45.7	49.9	42	177
East Asia	37.6	41.0	20	-69
China	33.6	36.5	13	-37
Japan	47.5	51.4	30	109
Republic of Korea	33.3	37.5	19	-80
Taiwan (Provincia de China)	33.5	39.8	21	-134
Latin America	38.2	39.5	20	28
Brazil	36.9	40.9	29	116
Chile	39.2	39.3	17	3
Costa Rica	36.5	36.7	18	-4
Mexico	29.5	38.1	17	-143
Uruguay	39.9	46.4	19	122
Southeast Asia	26.5	37.7	11	-128
Philippines	25.8	36.8	12	-127
India	25.6	35.7	12	-124
Indonesia	24.4	36.2	8	-193
Thailand	28.5	40.3	13	-156

Source: R. Lee and A. Mason, "Generational economics in a changing world", *Population and Development Review*, Vol. 37, January 2011.
Note: Wealth is per-capita and normalized on mean labor income of 30-49 years old.

TABLE III.3
PUBLIC TRANSFER WEALTH CONTROLLING FOR POPULATION AGE STRUCTURE

	Average age of transfers receptors	Average age of tax-payers	Average amount of transfers (in percentage)	Wealth (in percentage)
Europe and United States	39.6	41.0	31	-42
Germany				
Austria	42.1	44.0	32	61
Slovenia	38.3	39.2	28	26
Spain	39.7	42.2	24	-58
United States	39.8	45.1	23	-144
Finland	37.9	39.1	37	-43
France				
Hungary	37.1	39.8	34	-89
Sweden	40.6	41.7	38	-43
East Asia	36.3	40.8	20	-89
China	35.4	37.9	13	-32
Japan	38.8	43.2	27	-117
Republic of Korea	34.6	38.6	19	-75
Taiwan (Province of China)	35.3	41.3	21	-126
Latin America	40.5	45.5	22	108
Brazil	40.6	50.1	35	329
Chile	41.2	45.2	19	75
Costa Rica	39.7	44.3	20	90
Mexico	39.0	42.0	18	-72
Uruguay	39.3	44.9	19	103
Southeast Asia	32.9	42.6	12	-116
Philippines	39.9	45.2	14	-90
India	32.0	42.1	13	-132
Indonesia	29.9	39.8	8	-78
Thailand	30.6	42.2	13	-153

Source: R. Lee and A. Mason, "Generational economics in a changing world", *Population and Development Review*, Vol. 37, January 2011.
Note: Values are constructed using the age-specific profiles for each country with a common population age distribution which is the average of all countries. Wealth is per-capita and normalized on mean labor income of 30-49 years old.

The importance of age structure as a determinant of public transfers inevitably leads to questions about the future; populations will be much older than today in every country under consideration. Several governments, including the European Union, the United States, Australia, New Zealand, and the United Kingdom, have recently begun to issue long-run projections of their budgets. Miller, Mason, and Holz (2008) have recently completed projections for Latin American countries that show that, on average, the fiscal impact of population ageing will be as large in Latin America as in Europe. Additionally, the fiscal impact of population ageing varies among the 10 countries —with pension reforms playing a large role. Moreover, increases in health care obligations are likely to rival those of pensions. Finally, population ageing greatly reduces the costs of educational investments in the region.

Support systems for the elderly vary widely in ways not closely connected to the level of development. Public transfers are very important in Latin America and Europe. Private, familial transfers play a significant role in developing Asian countries. Reliance on assets by the elderly varies widely.

The elderly rely on three sources to fund their lifecycle deficit: net public transfers, net private transfers, and assets. The share of each of these three components for each country is represented on

the triangle graph (Figure III.7).[15] A number of features of the old-age support system are striking. First, net familial transfers to the elderly are positive in only China, Thailand, South Korea, and Taiwan, all developing Asian economies. In all other countries, net family transfers to the elderly are zero (Japan and Finland) or negative (the United States, most European countries, the Philippines, and every Latin American country). In this latter group, the elderly are providing more financial support to younger generations than they are receiving.

Second, the importance of public transfers varies widely among countries. In the Philippines, Mexico, Thailand, Taiwan, South Korea, and the United States, public transfers range from about 40 percent of the lifecycle deficit in the United States down to slightly negative values in Thailand and the Philippines (meaning they pay more in taxes than they receive in benefits). In the remaining countries, which include Japan, European countries, and most Latin American countries, public transfers range from more than 50% in Uruguay to over 95% in Austria.

Third, the importance of assets for funding the life-cycle deficit varies very substantially. In the United States, Thailand, Mexico, and the Philippines, asset-based flows are equal to at least two-thirds of the lifecycle deficit. In Taiwan, Germany, Finland, and Austria, asset-based flows are less than one-third of the lifecycle deficit. In many countries, the elderly hold substantial assets, but they save their asset income rather than using it to finance consumption.

One cannot, on the basis of these simple descriptive statistics, reach firm conclusions about substitution across support systems. Outside of developing Asia, support systems appear to vary primarily along two dimensions —relying heavily on either asset-based flows or public transfers. The role of familial transfers, however, is more pervasive than suggested by Figure III.7 because in most Asian and Latin American developing countries, net familial transfers increase with age. Typically, those who are 75 or older have positive net family transfers. It is difficult to say whether expansion of public transfer programs will lead to a decline in familial support, a decline in asset-based flows, or some combination of the two. For example, time series data for South Korea and Taiwan (not shown here) indicate that there has been a substantial increase in public transfers and a decline in familial transfers over the last few decades. Among the Latin American NTA countries, assets are used only where public pensions are weak (Mexico). In countries with more generous public pensions and similar levels of asset income, they are saved.

There is a strong tradeoff between human capital spending on children and fertility. Low fertility will lead to populations with fewer workers and a lower support ratio, but those workers may be much more productive due to the higher investment in their human capital.

There is a tradeoff between the quantity and quality of children according to an influential hypothesis introduced by Becker, Willis, and others (Becker and Lewis, 1973; Becker and Tomes, 1976; Becker and Barro, 1988; Willis, 1973). In the economic model of fertility decision-making, a decline in the number of children lowers the price of raising higher quality children. Likewise, raising higher quality (more expensive children) increases the price of having many children. Thus, changes that encourage lower fertility also encourage more spending per child, while changes that encourage more spending per child encourage lower fertility.

---

[15] Movement along axes and gridlines in the triangle graph shows changes in two of the components, where the third component is held constant. Along the bottom of the triangle, asset-based flows are zero; along the right-hand side, private family transfers are zero; and along the left-hand side, public transfers are zero.

FIGURE III.7
SOURCES OF SUPPORT AS A SHARE OF LIFECYCLE DEFICIT,
PERSONS 65 AND OLDER, NTA COUNTRIES
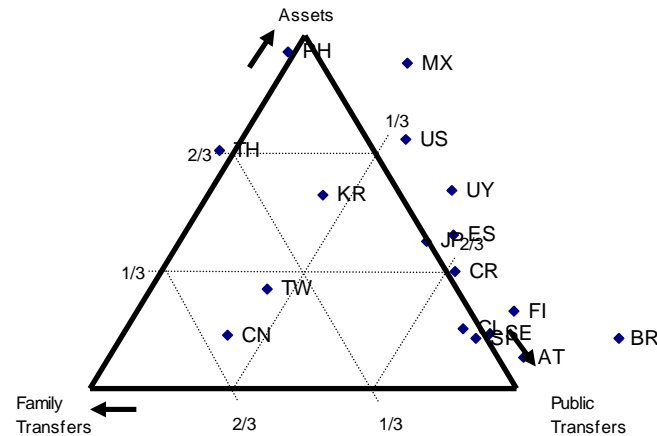
Source: Authors' estimates based on R. Lee and A. Mason, "Fertility, Human Capital, and Economic Growth over the Demographic Transition", *European Journal of Population*, Vol. 26, Nº 2, 2010.

The existence of a quality–quantity tradeoff is important to understanding the economic implications of population ageing because population ageing is primarily a consequence of low fertility. When our attention is focused exclusively on the number of people in the working ages, a very important part of the picture is missed —i.e., the quality of those workers. If the quality-quantity tradeoff is strong enough, and if productivity is raised strongly by human capital, then the smaller workforce of the future will be as productive, or even more productive, than the larger workforce of the present because of the increase in the resources invested in children.

Although all resources invested in children may influence their productivity, the focus here is on human capital spending, i.e., spending on health and consumption. We construct a synthetic cohort measure of human capital spending per child as the sum of both public and private age specific spending per child on health, summed over the 0 to 17 age span, and education, summed over the 0 to 26 age span. Health spending above age 17 is excluded because much of this spending is for maternal health. To facilitate cross-country comparisons and to control for differences in income, human capital spending is divided by the mean labor income of persons aged 30-49.

Estimates of the quantity-quality tradeoff for 22 NTA countries for a recent year are plotted in Figure III.8. There is a relatively close relationship between human capital spending per child and the total fertility rate. Regressing the natural log of human capital on the natural log of TFR, purely as a descriptive device, yields an estimated elasticity of -0.91.

The analysis can be replicated using time series estimates for those economies where NTA estimates are available: Japan 1984-2004; Taiwan 1976-2004; and the United States 1960-2003. The estimated elasticity for Japan and Taiwan is very high at -1.46 and -1.40 respectively. For the United States, the estimated elasticity is somewhat less than for the cross-sectional data at -0.72.

FIGURE III.8
SYNTHETIC COHORT VALUES OF HUMAN CAPITAL NORMALIZED ON MEAN PER CAPITA INCOME OF PERSONS 30-49 VERSUS THE TOTAL FERTILITY RATE; 22 COUNTRIES FOR A RECENT YEAR
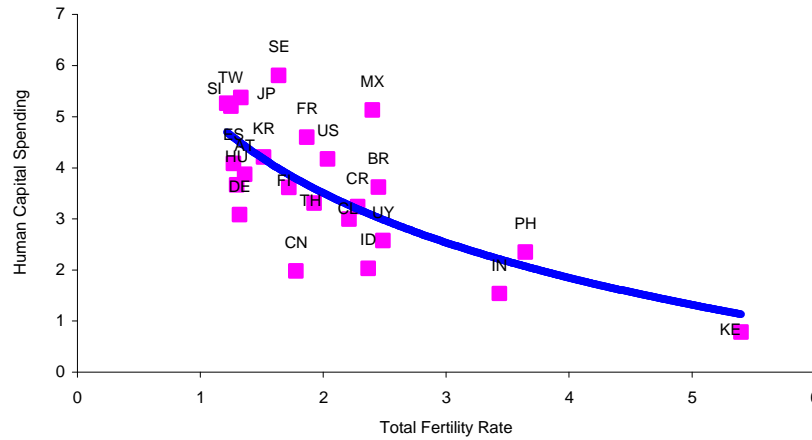
Source: R. Lee and A. Mason, "Generational economics in a changing world", *Population and Development Review*, Vol. 37, January 2011.

FIGURE III.9
SYNTHETIC COHORT VALUES OF HUMAN CAPITAL, NORMALIZED ON MEAN PER CAPITA INCOME OF PERSONS 30-49 VERSUS THE TOTAL FERTILITY RATE; THREE ECONOMIES
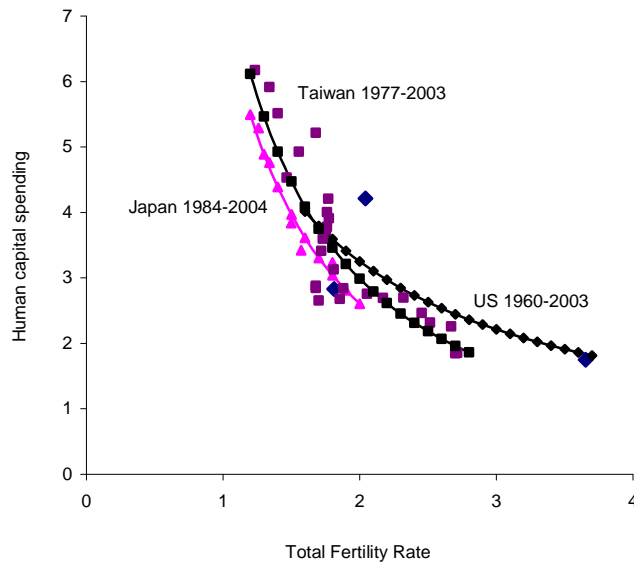
Source: For Japan and Taiwan Province: N. Ogawa et al., "Declining fertility and the rising cost of children: what can NTA say about low fertility in Japan and other Asian countries", *Asian Population Studies*, Vol. 5, Issue 3, November 2009. For United States: authors' estimates using R. Lee and A. Mason, "Fertility, Human Capital, and Economic Growth over the Demographic Transition", *European Journal of Population,* Vol. 26, Nº 2, 2010.

High elasticities have important implications for assessing the economic consequences of low fertility and population ageing. An elasticity equal to -1 implies that the total stock of human capital does not decline with the drop in fertility. Rather, the same amount of human capital investment is spread across fewer individuals. The implications depend, first, on the effectiveness with which human capital spending enhances the abilities of those in whom the resources are invested; and, second, on the extent to which enhanced abilities result in higher productivity once "higher quality" children become adults. Using estimates of the returns to human capital investment found in the literature, Lee and Mason (2010a) show that human capital investment may be sufficient to entirely offset the decline in the support ratio due to population ageing.

Assets play two important lifecycle roles in the generational economy. First, in many countries, the elderly rely, to an important degree, on assets to support themselves in old age. Second, asset-based inflows to working-age adults are critical to meet their heavy financial obligations —supporting their own consumption, that of their children, and, through the taxes they pay and familial transfers, the consumption of the elderly.

In the conventional lifecycle saving model that has been widely used by economists, saving during the working years is used to support consumption during retirement. This is very important because saving serves a dual purpose —addressing the old-age lifecycle problem and providing the capital needed to build a high-performing industrial economy.

NTA estimates show that the importance of assets in funding the old-age lifecycle deficit varies substantially around the world (Figure III.7). In the United States, Mexico, the Philippines, and Thailand, the elderly fund a substantial portion of their old-age needs by relying on assets. They are not dis-saving, on average, but they rely heavily on asset income. In contrast, European countries and some Latin American ones rely heavily on public transfer programs and very little on assets to fund their retirement needs. In these countries, the pension motive for saving is very weak, which undermines capital accumulation.

The importance of assets to prime-aged adults has received much less attention though it is widely recognized that many middle-aged adults are subject to a financial squeeze due to their lifecycle circumstances: funding their own consumption, that of their children, as well as that of the elderly. Some of this burden is private, but much of it is public and felt through a high tax burden.

Results presented for Japan in Figure III.10 illustrate the point. The solid blue area in the figure shows the per capita lifecycle deficits and surpluses by age. In Japan, the lifecycle surplus, the gap between labor income and own consumption, reaches a peak at around age 50. Net transfers are shown as the solid line. They also reach a peak (in negative terms) at about age 50. Moreover, net transfer outflows consistently exceed the lifecycle surplus throughout the surplus ages. The gap can only be filled in one way —through asset-based inflows. Prime-age adults are relying on assets to fund their own consumption and the large net transfers with which they are burdened.

Asset-based inflows are generated in a variety of ways that vary across countries. First, inflows can be generated by relying on public debt, rather than taxes, to fund public transfers and consumption. Second, young adults may accumulate personal debt (student loans or credit card, for example). Third, those who have assets (financial assets, a business, a farm, or a home, for example) can rely on the income generated from those assets to fund their consumption and transfers. And, fourth, those with assets can dis-save by liquidating their assets, for example, to fund their lifecycle needs.

FIGURE III.10
JAPAN: LIFECYCLE DEFICIT, NET TRANSFERS, AND ASSET-BASED
REALLOCATIONS (YEN), ANNUAL PER CAPITA FLOWS, 2004
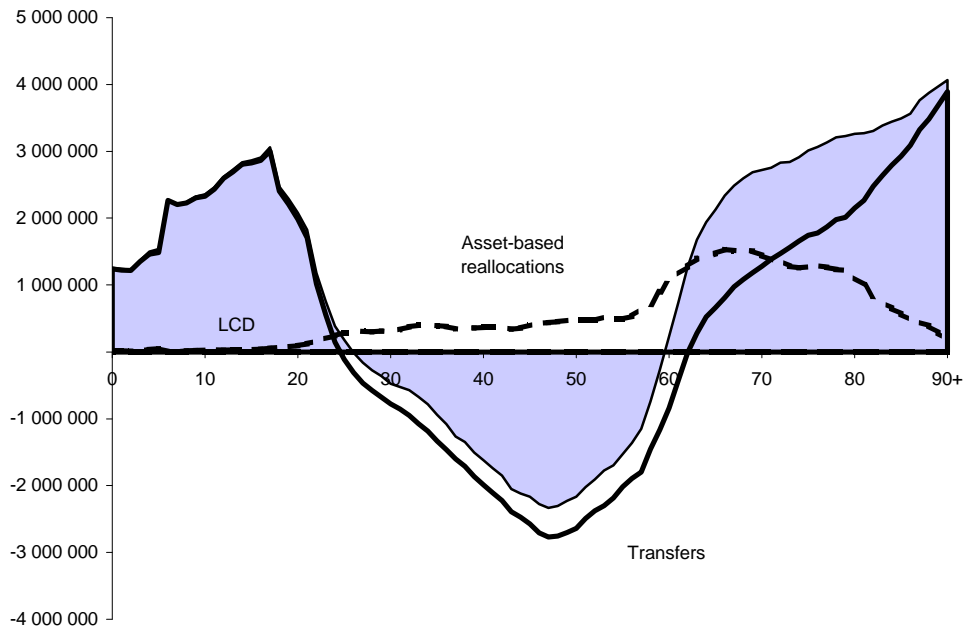
Source: N. Ogawa et al., "Declining fertility and the rising cost of children: what can NTA say about low fertility in Japan and other Asian countries", *Asian Population Studies*, Vol. 5, Issue 3, November 2009.

Japan is the oldest country in the world. The upward transfers are large compared to many other countries, although as shown above, upward transfers are no larger in Japan than in some European countries, nor are they as large, barring significant reform, as they will likely be in Latin American countries. However, reliance on assets by prime age adults is not confined to ageing populations. Indeed, in most cases in developing countries, transfers to children just exceed the lifecycle surplus. In Figure III.11, the lifecycle deficit of children is compared to the lifecycle surplus. In most countries in the West, the lifecycle surplus is sufficient, or more than sufficient, to fund the child deficit. The one exception is the United States. In none of these countries, however, is the lifecycle surplus greater than the combined deficit of children and the elderly. The situation in East Asia is similar to that found in the West. The exception is China, the only country in which the lifecycle surplus exceeds the combined deficit of children and elderly. In Southeast Asia and Latin America, however, the child deficit is far greater than the lifecycle surplus. In all of these countries, asset-based inflows are critical to meeting the consumption and transfer obligations of prime-age adults.

FIGURE III.11
AGGREGATE LIFECYCLE SURPLUS VERSUS THE AGGREGATE
CHILD DEFICIT FOR AVAILABLE NTA COUNTRIES
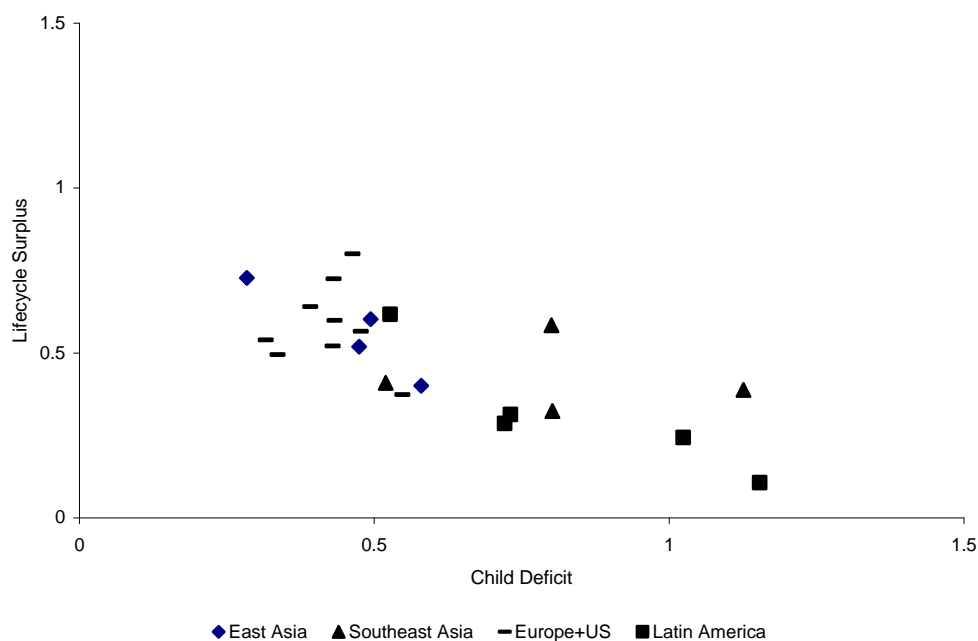
Source: authors' estimates using R. Lee and A. Mason, "Fertility, Human Capital, and Economic Growth over the Demographic Transition", *European Journal of Population*, Vol. 26, N° 2, 2010.
Note: All values normalized on aggregate labor income from 30-49. The child deficit is the total difference between consumption and labor income cumulated from age 0 up to the age at which consumption and labor income are equal. The surplus is consumption less labor income cumulated over all ages for which consumption exceeds labor income.

E. Conclusions

In high fertility, low-income countries, the resource needs of children are very substantial and lead to large public and private downward transfers. These economic resources are spread over many children and, consequently, spending per child and human capital investment per child are low compared to industrialized countries. As fertility declines, human capital spending per child increases, which attenuates the effects of a declining support ratio as the population ages. The causal mechanisms that link fertility and human capital investment are complex, however. Policies that reduce fertility by no means guarantee that more human capital investment will take place. Indeed, much of the additional investment in human capital has been undertaken by the public sector, not by parents. The key point here is that policies that match reduced fertility with higher investment in children are likely to have long-term success in sustaining economic growth over the global age transition.

Public policy towards old-age transfers is also very important. In many European and Latin American countries, upward transfers are very large as compared with the retirement needs of the elderly. Heavy reliance on public transfers undermines a potentially important motive for accumulating wealth. The consequences of this may be reduced capital accumulation, and thereby, reduced job creation and wages.

As populations age, the share of the population employed is expected to decline. If disincentives, including both pension structures and mandatory retirement policies, are phased out, the employed share of the population will decline more slowly. Nevertheless, it will almost certainly decline. Other things equal, this will lead to lower standards of living and render unsustainable public transfer programs targeted at the elderly. However, effective public policies can yield a much more favorable long-term outcome. Those policies include investment in human capital and avoiding excessive reliance on large-scale transfer programs to the elderly. It is equally important to strengthen financial systems and to develop mechanisms for encourageing higher rates of saving.

Bibliography

Becker, G. and H. G. Lewis (1973), "On the Interaction between the Quantity and Quality of Children", in *Journal of Political Economy*, Vol. 84, No. 2, pt. 2.

Becker, G. and N. Tomes (1976), "Child Endowments and the Quantity and Quality of Children", in *Journal of Political Economy*, Vol. 84, No. 4, pt. 2.

Becker, G. S. and R.J. Barro (1988), "A Reformulation of the Economic Theory of Fertility", in *Quarterly Journal of Economics*, Vol. 103, No. 1.

Caldwell, J. C. (1976), "Toward a restatement of demographic transition theory", in *Population and Development Review*, Vol 2, 321-66.

Costa, D. L. (1998), *The Evolution of Retirement: An American Economic History, 1880-1990*, Chicago, The University of Chicago Press.

Gruber, J. and D. A. Wise (1999), "Introduction and Summary", in J. Gruber and D. A. Wise (eds.) *Social Security and Retirement around the World*, Chicago, The University of Chicago Press.

Lee, R. (2003), "Demographic Change, Welfare, and Intergenerational Transfers: A Global Overview", in *GENUS*, Vol. LIX, No. 3-4.

Lee, R. D. (1994), "The Formal Demography of Population Aging, Transfers, and the Economic Life Cycle", in L. G. Martin and S. H. Preston (eds.), *Demography of Aging*, Washington, D.C., National Academy Press.

Lee, R. and A. Mason (2010a), "Fertility, Human Capital, and Economic Growth over the Demographic Transition", *European Journal of Population* 26(2) 159-182.

Lee, R. and A. Mason (2010b), *National Transfer Accounts Version 1.0*, Center for the Economics and Demography of Aging, University of California - Berkeley and Population and Health Studies, East-West Center, October.

Lee, R. and A. Mason (2011), "Generational Economics in a Changing World", *Population and Development Review*, Vol. 37, January.

Lee, R. D.; S.-H.Lee and A. Mason (2008), "Charting the Economic Lifecycle", in A. Prskawetz, D. E. Bloom and W. Lutz (eds.), *Population Aging, Human Capital Accumulation, and Productivity Growth, a supplement to Population and Development Review 33*, New York, Population Council.

Lee, R.; A. Mason and T. Miller (2003), "Saving, Wealth, and the Transition from Transfers to Individual Responsibility: The Cases of Taiwan and the United States", *The Scandinavian Journal of Economics*, v. 105, No. 3, pp. 339-357.

Lillard, L. A. and R. J. Willis (1997), "Motives for Intergenerational Transfers: Evidence from Malaysia", in *Demography*, Vol. 34, No. 1.

Mason, A. et al. (2009), "Population Aging and Intergenerational Transfers: Introducing Age into National Accounts", in D. Wise (ed.), *Developments in the Economics of Aging*, Chicago, NBER and University of Chicago Press.

Ogawa, N. et al. (2009), "*Declining Fertility and the Rising Cost of Children: What Can NTA Say about Low Fertility in Japan and Other Asian Countries*", *Asian Ppulation Studies*, Vol. 5, Issue 3.

United Nations (2009), *World Population Prospects: The 2008 Revision*, Population Division, New York.

Willis, R. (1973), "A New Approach to the Economic Theory of Fertility Behavior", in *Journal of Political Economy*, Vol. 81, No. 2, pt. 2.

Willis, R. J. (1988), "Life cycles, institutions and population growth: A theory of the equilibrium interest rate in an overlapping-generations model", in R. D. Lee; W. B. Arthur and G. Rodgers (eds.), *Economics of Changing Age Distributions in Developed Countries,* Oxford, Oxford University Press.

IV. Intergenerational equity in Brazil: social security and public education transfers between generations born from 1923 to 2000

Tatiana Araujo, Cassio M. Turra and Bernardo L. Queiroz[16]

In a recent article, Turra, Queiroz and Rios-Neto (forthcoming) showed that the elderly in Brazil receive much higher per capita public transfers than children. The ratio of net per capita public transfers (i.e. public expenditures net of taxes paid) for the elderly (ages 65+) to net per capita public transfers for children (ages 0-15) is between 2.5 and 8 times larger than the ratios estimated for the U.S, Japan and NTA European and Latin American countries. Some theoretical models discussed in the literature may help explain such large public transfer flows to the elderly. One possible explanation is the increasing relative share of the elderly population, and its corresponding political power (see Preston, 1984 for a discussion on the US). Another competing reason concerns intergenerational equity (Becker and Murphy, 1988): current public expenditures directed to the elderly may be compensation for contributions they made during their prime working ages to the development of the public education system.

Historical evidence, however, suggests that the rise of public expenditures on education in Brazil started much later than in other nations. For example, Bommier et al. (2010) showed that in the US, public expenditures on education started by the end of the nineteenth century and that the public pension system emerged in the 1930s. In Brazil, the consolidation of primary public education did not occur before most of the elderly population had begun receiving retirement benefits. Although the first law to establish public education in Brazil dates back to the XIX century, it was only a hundred years later that the system started to be structured according to the principles of decentralization, universal coverage and a secular state. The 1988 Constitution determined that the Federal government should spend 18% of its budget on education, while the states and municipalities should spend 25%. In general, primary education is provided by the municipalities (3.6% of GDP), state level government is responsible for secondary education (0.8% of GDP), and the central government funds most of the

---

[16] Cedeplar-UFMG.

public higher education (0.5% of GDP) (Camargo, 2004; Schwartzman, 2003; Almeida, 2001). Since 1971, 8 years of primary education have been mandatory. Since 2000, almost all children aged 7 to 14 have been enrolled in school, but many problems have persisted, including grade retention and school drop-out after age 15. Although the Brazilian government spends a similar percentage of GDP on education as other countries, the pattern of expenditures per pupil is dramatically different. For example, while in Brazil per pupil expenditures for higher education are about 14 times larger than on primary education, in OECD countries the ratio is only 2.7, emphasizing the unequal distribution of public resources by level of education in Brazil (Almeida, 2001).

The expansion of the Brazilian public pension system occurred after World War II (Queiroz, 2008) and has accelerated over the last 20 years. The last major change in regulation was a product of the 1988 Constitution. It extended mandatory social security coverage to many excluded groups, including rural workers, but did not require equivalent increases in revenues from contributions. Other measures made the system more generous than before. These included establishing the minimum wage, indexing all pensions to the minimum wage, and reducing the minimum age of retirement (Stephanes, 1998). In 2000, the PAYGO system, the general pension program, had 27 million workers contributing and 16 million beneficiaries, representing about 77% of the over 60 population(Queiroz, 2005). Alongside the general pension system, civil servants have their own pension program. Although smaller in absolute numbers when compared to the general program, expenditures related to the civil servants program are not trivial, reaching 4.7% of GDP in 2002 (Medici, 2004). There are two main advantages to the civil servant system: higher replacement rates (ratio of retirement benefits to pre-retirement earnings) and a shorter mandatory contribution time required to receive full pension benefits. The program's deficit is high and has been increasing over the past decade. In addition, the program has a very high dependency ratio; that is, there are few active workers per retiree, which increases doubts about its future sustainability.

The historical evolution of total expenditures for public education and pensions (general system and public servants) is shown in Figure IV.1. Since the 1940s, expenditures for pensions (currently around 10% of the GDP) have been far larger than expenditures for public education (currently around 4%). One should note, however, that these are crude measures and do not account for compositional effects. Therefore, since the Brazilian population was very young during the XX century, the discrepancies would certainly be larger when controlling for age structure.

The development of public transfer systems in Brazil is closely related to the model of economic development adopted during the second half of the twentieth century. Filgueiras (2005) and Draibe (2007) have argued that the expansion of the Brazilian social welfare system occurred concurrently with the industrialization process and that both were coordinated by the federal government. Therefore, the evolution of the social protection system has mainly concerned the relation between capital and labor. In the early stages, social policy in Brazil was biased in favor of the urban areas and the formal labor market, which helps explain why social protection existed only for civil servants and workers in the modern industrial sector (Filgueiras, 2005). Consequently, the expansion of the social welfare system depended on the structure of production and political influence of the professional class. In addition, economic development based on import substitution increased the importance of the social security system, while allowing investments in education and health to be neglected (Draibe, 2007).

FIGURE IV.1
BRAZIL: TOTAL EXPENDITURES ON PENSIONS AND PUBLIC
EDUCATION AS A PERCENTAGE OF GDP, 1933 TO 2000
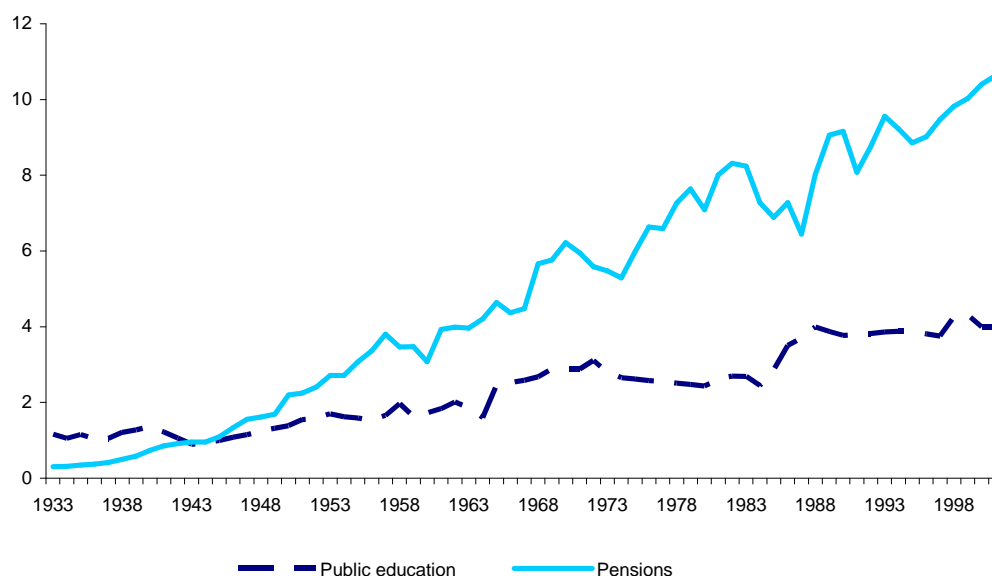
Source: Authors' estimates.

Unfortunately, theoretical studies have not discussed the consequences of the evolution of the welfare state in Brazil in terms of intergenerational equity. Also, early empirical studies looked at just one period of time, which many not reflect what happens between real cohorts. By constructing historical transfer accounts and then utilizing an accounting framework that is capable of providing lifecycle measures, this limitation can be addressed. Following the methodological approach developed by Bommier et al. (2010), we have constructed historical transfer accounts of public education and social security in Brazil and examined the financial redistributions implied by these public systems to the generations born between 1923 and 2000.

A. Estimation of historical accounts and forecasts of public transfers

For the three Brazilian generations born between 1923 and 2000, we calculated the net present value (NPV) at birth as public education and pension benefits received minus taxes paid. To do so, we first constructed a complete age-time matrix of benefits and taxes for each birth cohort. Under the assumption that life ends at age 100, we used historical account estimates and also forecasted transfers until 2100. The historical data used came from both census and administrative data.

For public education, age-specific benefit data were derived from information on school enrollment rates available in census data. To obtain single year age-specific estimates, the age profiles between census years (1960-2000) were interpolated. For the years 1923 to 1959, the age-specific benefit profiles were assumed to be equal to the 1960 profile. To adjust the age profiles according to total expenditures for public education, we used the historical series of per-beneficiary expenditures constructed by Junior (2007) for the years 1933 to 2000, which were based on administrative data. Because information on per-beneficiary expenditures for the years 1923 to 1932 is unavailable, we assumed them to be fixed at the 1933 level.

For pensions, age-specific benefit data for the years 1960 to 2000 were derived from information on mean benefits received by age, available in the census data. For the years 1923 to 1959, the 1960 census profile was used. To adjust the age profiles according to macro controls, year-specific information on total expenditures (both general and public servants systems) was obtained from administrative data.

Although different taxes pay for education and pensions, historical information on their allocation by age is not available, so age-specific tax data were generated based on labor income age profiles in the census data. Previous studies for Brazil (Turra, 2000) suggest that labor income age profiles are a good proxy for most types of taxes. The historical age-specific tax profiles were adjusted based on a balanced budget assumption.

For the projection, we followed Bommier et al. (2010) and assumed a fixed cross-sectional age-shape for benefits and taxes. In addition, we shifted the levels of tax age profiles upwards at a rate of 1% per year to account for the potential effect of productivity growth on wages. For pensions, the budget for each period was balanced using population age distribution and according to two specific balancing assumptions: (i) only cutting benefits and (ii) only raising taxes. For education, we also assumed two balancing scenarios after weighting the estimates by the projected population age structures: (i) only cutting taxes with no enrollment or benefit-per-pupil gains after 2000 and (ii) only raising expenditures.

After having estimated the entire age-time matrix of benefits and taxes for each birth cohort, we used survival rates and a constant real interest rate of 3% to calculate the NPV at birth for each cohort. A sensitivity analysis was constructed by comparing the results based on three other interest rates: 2%, 4% and 5% a year.

B. NPV Results

Figure IV.2 presents NPV for pensions for each birth cohort born from 1923 to 2000 using the two budget balancing adjustments. The creation of the social security system in the 1960s led to financial gains for early participants. The current elderly population in Brazil (cohorts born until late 1940s) have received larger benefits than the taxes they paid into the system. The gains decrease for younger cohorts as the taxes paid over the life course become larger than the benefits received. The NPVs are negative for cohorts born after the mid 1960s and early 1970s (depending on the adjustment made). These are the cohorts who, as adults, have mostly borne the costs of the expansion in social security benefits after 1992. The increasing negative NPVs for the youngest cohorts also reflect declining support ratios over the twenty-first century, due to population ageing.

Figure IV.3 displays the NPVs for public education. Cohorts born before the 1970s, regardless of the budget balancing adjustment used, have received benefits lower than the taxes paid, with the cohorts born between 1952 and 1962 experiencing the greatest windfall loss. These are the cohorts who did not benefit from universal public education during childhood and that latter, when they became adults, paid for most of the expansion of basic education in Brazil. The NPVs become positive for younger cohorts as the educational system needs no further expansions and the youth dependency ratio continues to decline.

Figure IV.4 shows the NPVs for the two systems combined. We compare the combined NPVs for pensions for each of the the two budget balancing adjustments. For public education, we used the results assuming tax cuts only. The older generations —the first to bear the costs of public education— were compensated with generous social security benefits. The combined NPVs are positive for all cohorts born until the early 1950s.

FIGURE IV.2
BRAZIL: NPV AT BIRTH OF EXPECTED LIFE TIME PENSION
BENEFITS BY YEAR OF BIRTH, 1923 TO 2000
(In 2008 rentes)
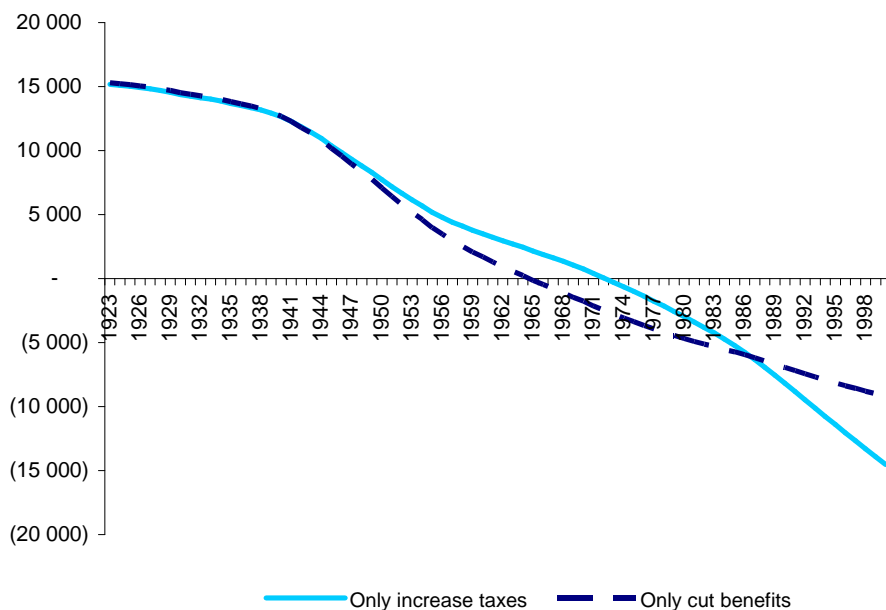
Source: Authors' estimates.

FIGURE IV.3
BRAZIL: NPV AT BIRTH OF EXPECTED LIFE TIME PUBLIC
EDUCATION BENEFITS BY YEAR OF BIRTH, 1923 TO 2000
(In 2008 rentes)
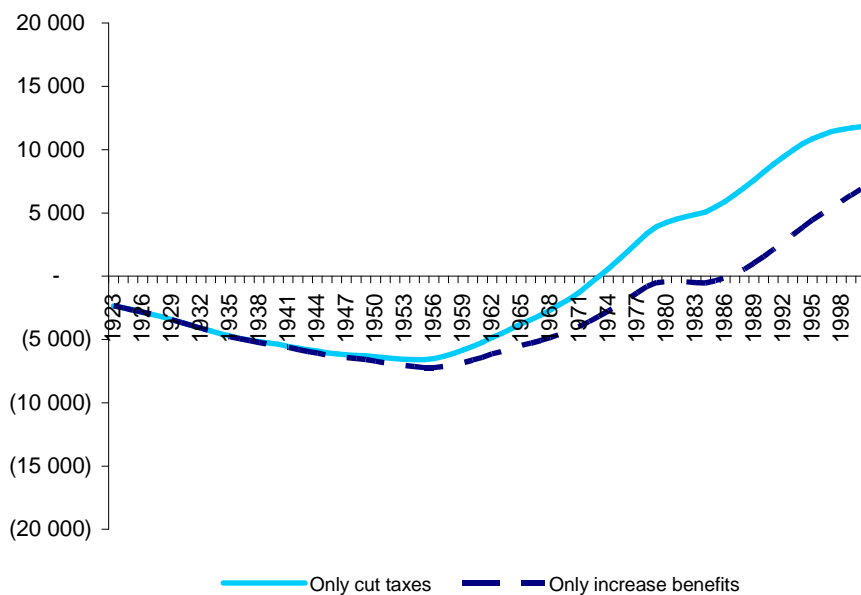
Source: Authors' estimates.

The combined NPVs are negative for cohorts born between 1950s and 1970s; these are the generations who have borne both the costs of the expansion in social security benefits for the older generations and public education for the younger generations. Finally, the cohorts that benefited from public education (born from the early 1970s on) are too young to gain from the social security system and therefore, experienced NPVs close to zero.

FIGURE IV.4
BRAZIL: NPV AT BIRTH OF EXPECTED LIFE TIME OF TOTAL TRANSFERS
(PENSIONS + EDUCATION) BY YEAR OF BIRTH, 1923 TO 2000
(In 2008 rentes)
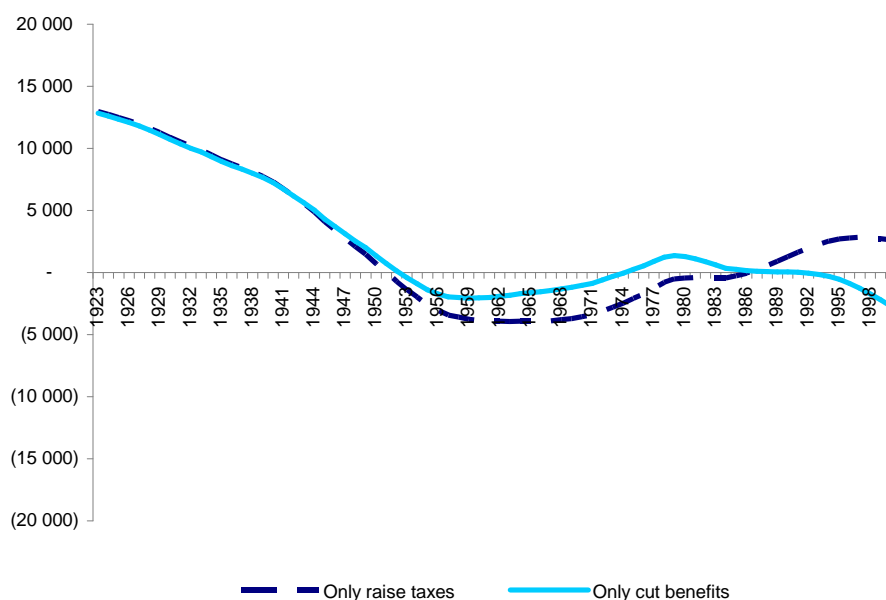
Source: Authors' estimates.

Figure IV.5 shows that the results are sensitive to the discount rate used, but the main conclusions are fairly similiar. Lower rates of interest improve the importance of benefits received late in life, relative to those received early. Thus, because pension transfers dominate educational transfers, the NPVs calculated based on lower discounting rates are higher. Regardless of the rate used (2 to 5%), the NPV pattern by year of birth is similar: older cohorts have the highest NPVs, whereas the current cohorts of adults have the lowest gains (or highest losses).

In their study, Bommier et al. (2010) expressed NPVs relative to the present value of life time earnings. Relative measures are a more accurate way to compare the gains and loss for each cohort. Although accurate measures of earnings prior to 1960 are unavailable, our preliminary results suggest that net gains experienced by the early cohorts represent a large fraction of their life time earnings. This makes the relative differences across cohorts even more striking.

FIGURE IV.5
**BRAZIL: SENSITIVE TESTS OF NPV FOR TOTAL TRANSFERS (ONLY CUT BENEFITS
SCENARIO) USING VARIOUS DISCOUNT RATES, BY YEAR OF BIRTH, 1923 TO 2000**
(In 2008 rentes)
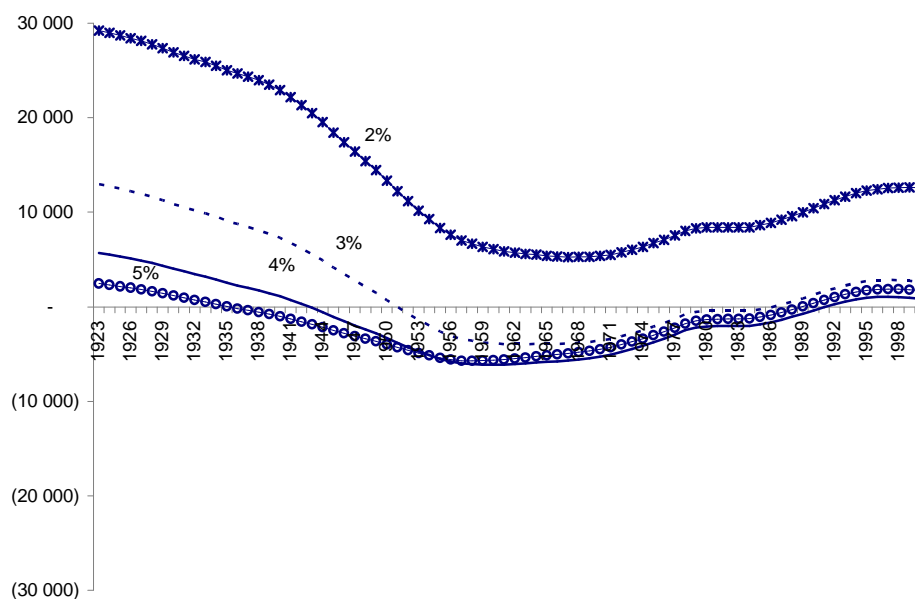
Source: Authors' estimates.

C. Summary

This article uses historical and projected public transfer accounts to examine how public transfers in Brazil have been redistributed across generations. The example of Brazil refutes Becker and Murphy's argument that there is a lag of at least one generation between the expansion of public education and the expansion of public pension programs. This study corroborates earlier findings based on period data (Turra, 2000; Turra, Queiroz and Rios-Neto, forthcoming) in showing that the public sector has been generous to the current generation of elderly in Brazil. These findings are consistent with Draibe (2007), who argued that economic development based on import substitution increases the importance of the social security system, while allowing investments in education and health to be neglected.

There is an increasing literature that documents the central role that public transfers, particularly through povery alleviation, have played in improving the well-being of the elderly in Brazil (e.g. Turra, Marri, and Wajnman, 2008; Turra and Rocha, 2010). However, little was known on how such welfare gains have been financed. Our study shows that the current generation of adults (those born between 1950 and 1980) has been the biggest net loser. They have been responsible both for funding the pension system for older cohorts and for providing the resources to expand the educational system. This "dual burden" borne by current adults has probably limited the ability of the public sector to re-distribute more resources in the form of human capital to the younger generation. It is also interesting to note that current generations of adults have been responsible for providing larger net taxes not only at the individual level —as presented here— but also at the group level, since they represent relatively larger age groups.

Lastly, our analysis has several limitations that should be highlighted. Some, such as the assumptions used to construct historical transfer accounts, have little or no impact on our main conclusions. . Others however are more significant. . This group includes the scenarios used to project transfers accounts

and the lack of information on certain public sector systems (eg. health and budget deficit). This secondary group merits greater discussion and is a potentially fruitful source of further study.

Bibliography

Almeida, I. (2001), "Gastos com educação no peróodo de 1994 a 1999", *Revista Brasileira de Estudos Pedagógicos*, Vol. 82, Nº 200/201/202, Brasilia.

Becker, G., and K. Murphy (1988), "The family and the state", *Journal of Law and Economics* 31(1), pp. 1-18.

Bommier, A.; R.Lee; T. Miller and S. Zuber (2010), "Who Wins and Who Loses? Public Transfer Accounts for US Generations Born 1850 to 2090", *Population and Development Review*, 36 (10).

Camargo, J. (2004), "Política social no Brasil: Prioridades erradas, incentivos perversos", *São Paulo em Perspectiva* 18(2), pp. 68–77.

Draibe, S. M. (2007), "Brazilian developmental welfare state: Rise, decline, perspectivas", in M. Riesco (ed.), *Latin America: A new developmental welfare state model in the making?*, Ch. 6, London, Palgrave.

Filgueira, F. (2005), "Welfare and democracy in Latin America: The development, crisis and aftermath of universal, dual and exclusionary social states", Research Paper, Social Policy and Development Programme Area, Geneva, United Nations Research Institute for Social Development.

Junior, P. R. R. M. (2007), "Taxas de Matrícula e Gastos em Educação no Brasil", Master Thesis, Departament of Economics, Fundação Getúlio Vargas, Rio de Janeiro, RJ.

Preston, S.H. (1984), "Children and the elderly: Divergent paths for America's dependents", *Demography*, 21(4), pp. 435–547.

Queiroz, B. (2005), "Labor Force Participation, Social Security and Retirement in Brazil", Ph.D. Dissertation, Department of Demography, University of California at Berkeley.

Queiroz, B. (2008), *Labor force participation and retirement behavior in Brazil: Impacts of economic development and social security system on labor supply in a developing nation*, Saarbrücken, VDM Verlag DR. Mueller.

Schwartzman, S. (2003), "The Challenges of Education in Brazil", Working Paper, Center for Brazilian Studies - Oxford University.

Stephanes, R. (1988), *Reforma da previdência*, Rio de Janeiro, Record.

Turra, C.M. (2000), "Contabilidade das gerações: Riqueza, sistema de transferencias e consequencias de mudanças no padrão demográfico", Master's thesis, Centro de Desenvolvimento e Planejamento Regional, Universidade Federal de Minas Gerais.

Turra, C. M.; I. G. Marri and S. Wajnman (2008), "Os argumentos de proteção social e equidade individual no debate sobre previdência e gênero no Brasil", in Ministério da Previdência Social, *Mudança Populacional: aspectos relevantes para a Previdência*, Brasília, DF, Coleção Previdência Social, v. 27, pp. 55-69.

Turra, C.M., B.L. Queiroz and E.L.G. Rios-Neto (Forthcoming), "Idiosyncrasies of Intergenerational Transfers in Brazil", in R.D. Lee and A. Mason (eds.), *Population Aging and the Generational Economy: A Global Perspective,* Cheltenham, UK, Edward Elgar.

Turra, C.M. and R. Rocha (2010), "Public Transfers among Dependent Age Groups in Brazil", Paper presented at the Authors Workshop for the Brazil country study on aging, World Bank, Brasilia and Washington.

V. The significance of inter-age economic transfers in Chile

Jorge Bravo and Mauricio Holz[17]

Chile is a middle-income country with a relatively small, ageing population. The evolution of its economy in recent decades has been scrutinized by scholars and policy analysts interested in gauging Chile's structural-adjustment programs, reforms, and policies, particularly as reflected in some macro indicators. One body of research has paid considerable attention to the effect of economic policies on Chile's stability and growth; to the effects of the privatization of the pension system on aggregate saving, investment, and growth; and to the distributive effects of public expenditure and transfer programs. Another body of research has analyzed the demographic trends and noted potential economic consequences of population ageing. However, despite clear connections between the two spheres of concern, there has been little research integrating them.

This chapter examines the mechanisms by which the Chilean population is able to satisfy its consumption needs over the stages of the lifecycle. It explores the extent of economic dependency in different age groups, the means of financing their consumption, and some of the effects that inter-age resource reallocations have on the living conditions of each generation of the population. The analysis is based on new estimates of Chilean national transfer accounts for 1997 (NTAs). These accounts allow for a systematic and detailed examination of some important aspects of the economic lifecycle.

A. Economic setting

The Chilean economy and the living standards of the population have changed substantially over recent decades. The country currently ranks high within the region in many socioeconomic indicators, including a per capita income of about USD $14,510 (adjusted for purchasing power parity) in 2008, the second highest value in Latin America after México (IMF, World Economic Outlook Database, April 2009). Annual growth of per capita GDP accelerated from averages of a little over 2% during the 1980s to 5% during the 1990s (Loayza and Soto, 2002, page 5, table 2). Growth in per capita GDP has decelerated somewhat since, but in spite of short-term variations, it still averaged a healthy 3.2% per year during the first half of the last decade. Since 1990, Chile has maintained a reasonably stable macro economy and sustainable external accounts. In 2000, the government introduced a fiscal rule of "structural balance" (Marcel et al., 2001). This policy set spending levels relative to the estimated medium-term trend in GNP, a policy that has countercyclical effects. Moreover, fiscal discipline has contributed to a greatly reduced public and external debt, resulting in record low-risk premiums for the nation (Marcel, 2006).

One of the engines of aggregate growth has been the capital accumulation financed by national savings. During the 1960s and 1970s, the national saving rate fluctuated significantly, averaging only about 12% of GDP (Bennett, Schmidt-Hebbel, and Soto, 1999, Annex table 1). Following the economic crisis of 1982-83 (when the ageing of the population structure started to become noticeable), savings increased sharply, reaching over 20% of GDP by the end of the 1980s, and remained at about that level during the 1990s. By 1997, the main year examined in this chapter, national savings were at 23.1% of GDP, while investment was at 27.7%. This performance is better than average within Latin America, but it lags considerably behind that of other developing regions and countries, particularly those of Asia.

Another area in which Chile has made substantial progress is the reduction of poverty, which was very high (of the order of 45% of the population) during the 1980s, the last decade of the military government. Poverty rates have fallen sharply since, from 38.6% in 1990 to 13.7% in 2006. In addition to the aforementioned macro stability and structural balance policy, the population has benefited from better protection against economic cycles due to targeted public transfers (Leiva, 2006).

B. Demographic characteristics and trends

Chile's population, which in 2008 stood at 16.3 million, is undergoing a significant demographic transition. The first half of the twentieth century featured a total fertility rate of more than 6 children per woman and life expectancy at birth under 55 years. The elderly constituted a small portion of the population, and relatively few survived to ages much older than the normal retirement age: fewer than 40% survived to the age of 70, and fewer than 20% lived to the age of 80. As in all pre-transitional societies, the main demographic burden was on the maintenance of children, with old-age dependency being a low risk for individuals and a concern of only modest aggregate dimensions for the nascent social-protection systems.

By the beginning of the 1980s, a decade when important reforms were introduced to the pension system and to the health and education sectors, fertility had dropped to nearly 2.5 births per woman, and life expectancy had surpassed the 70-year mark. In more recent years, important policy changes have been introduced in the health sector, and in 2007, a comprehensive new reform of the pension system was approved that stimulates contributions and expands benefits, especially for lower income workers. Changes to the education system may come next. All this has occurred at a time when the demographic transition has advanced to below-replacement fertility of about 1.9 births per

woman and to an average life expectancy of 78 years, a level comparable to that of some developed countries (e.g., the United States).[18]

These changes are causing significant demographic ageing and imply that an increasing fraction of the lifecycle of individuals is spent in retirement. Today, men who survive to age 60 can expect, on average, to live more than 20 additional years, and women can expect to live more than 24 additional years. These numbers should continue to rise because the general ageing trend is projected to accelerate over the coming decades. The process of demographic ageing has converse expression in the number of children, whose proportion in the population has decreased continuously since the 1960s, and whose absolute numbers have started to decrease during the last few years. Viewed in their entirety, the current and projected changes in the population age structure translate into a demographic dependency ratio that is still low and falling. However, it is projected to cease falling in less than ten years, when it will reach its historically lowest level of about 45 persons in the conventionally dependent age groups (younger than 15 years and 65 years or older) per 100 persons in the main productive ages (between 15 and 64 years). This indicates that there is little time left to reap the benefits of the "demographic dividend" associated with low demographic pressure on the consumption and distribution of national production.

The economic and demographic trends summarized above have direct implications for inter-age transfers and the different ways in which individuals, families, and the public sector reallocate production and economic resources to satisfy the consumption needs of the population in different stages of the lifecycle.

C. National transfer accounts for Chile in 1997

Following the methodology developed by Mason et al. (2009), we examine next the first set of national transfer accounts (NTAs) for Chile. The results refer to the year 1997 and include the lifecycle deficit, public and private transfers, and asset reallocations —that is, all the major modules of the generational transfer accounts.

Intergenerational reallocations are measured in terms of the size and component elements of the lifecycle deficit, which is the difference between consumption and production at each age. One useful summary expression of the analytical and accounting framework is the equation of the lifecycle deficit and its component elements:

$$\underbrace{C - Y_l}_{\text{Lifecycle deficit}} = \underbrace{Y_A - S}_{\text{Asset-based reallocations}} + \underbrace{\underbrace{\tau^+_g - \tau^-_g}_{\text{Net public transfers}} + \underbrace{\tau^+_f - \tau^-_f}_{\text{Net private transfers}}}_{\substack{\text{Net transfers} \\ \text{Age reallocations}}}$$

In this framework, inflows to individuals of any given age consist of labor income (Y_l), income from assets (Y_A), transfer inflows from the public sector (τ_g+), and transfer inflows from the

---

[18] Within Latin America, life expectancy ranks highest in Chile and Costa Rica (which are followed closely by Cuba, with life expectancy at birth near 77 years); fertility is second lowest in Chile, following Cuba's very low rate of 1.6 births per woman.

private sector (τ_f +). Outflows consist of consumption (C), investment in capital, credit and land (I), which in the aggregate must equal savings (S), transfer outflows to the government (τ_g-), and transfer outflows to the private sector (τ_f-). In other words, the equation states that the lifecycle deficit must be matched by age reallocations consisting of asset-based reallocations and net transfers. The specific estimation methods are presented in detail in the NTA project Website (online, ‹http://www.ntaccounts.org/›).

For Chile, two key micro-level databases for the NTA estimates are the national Budget and Expenditures Survey (BES) of 1996/97 and the Socio-Economic Characterization Survey (Encuesta de Caracterización Socioeconómica, CASEN) of 1998. The BES is the main data source for the estimation of private consumption, and it reports in great detail on 726 categories of expenditures on goods and services in the household. Although both surveys contain information on the sources of income for each individual household member (labor income, income from assets, transfers), we prefer the CASEN survey for the estimation of labor income because it contains greater detail on the categories of income (43 in all, versus five in the BES) and because the individuals are classified in single ages (whereas in the BES, they were categorized in five-year age groups). The CASEN is also the most pertinent database, as well as the official source, for the statistics and analysis of income distribution, poverty, and the impact of government transfer programs on living conditions of the population, especially for low-income groups.

We use the aggregate figures on public expenditures by program, which is reported annually by the Budget Directorate of the Finance Ministry (Ministerio de Hacienda, 2006), and the figures on the age profiles of income taxes, which is provided by the National Tax Service (Servicio de Impuestos Internos, SII). Together, these allow for the estimation of net public transfers. All the age profiles have been scaled to match the appropriate aggregates of the national and income accounts (National Income and Products Account, NIPA) published by the Chilean Central Bank (Banco Central de Chile, 2006).

D. Lifecycle deficit

Figure V.1, displays the lifecycle deficit for Chile in 1997. The curve of per capita labor income (dark thick line) has the characteristic inverted U-shape, but with relatively higher values in the older ages. The result is due mostly to the significant income from self-employed workers (dashed bottom line). In Chile, these workers have significantly higher average earnings than employees and represent an increasing fraction of labor income at the older working ages.

Comparatively, the overall Chilean age pattern of labor income falls between the higher income countries, which maintain high labor income until later peak ages and fall much more sharply afterwards, and the lower income countries, whose labor income falls off more gradually toward the older ages.

The per capita consumption profile (thick grey line) has a much smaller hump, which is commonly observed in developing countries. The age pattern is dominated by private consumption (dashed grey line), which represents 86% of total consumption.[19] Public consumption (i.e., the value of the in-kind goods and services that are provided by the government) accounts for the other 14%. This value falls between the lowest registered values to date, found in developing countries such as Indonesia and Thailand, and the much higher values observed in developed countries such as Japan, Sweden, and the United States. Compared with other Latin American countries, the Chilean slight

---

[19] The various components of the lifecycle deficit, including private consumption, are discussed in Bravo and Holz (2008).

downturn of consumption at the older ages is a bit different than the flatter Costa Rican pattern and differs from the moderately increasing one of Brazil.

FIGURE V.1
CHILE: LIFECYCLE DEFICIT RELATIVE TO AVERAGE LABOR
INCOME OF PERSONS AGED 30 TO 49, 1997
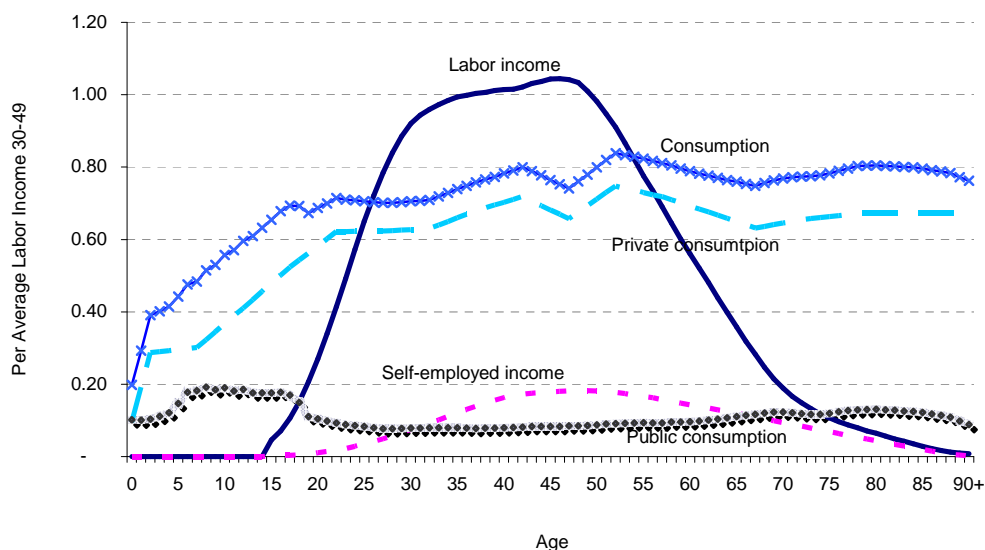
Source: Authors' calculations, based on Households Surveys, Budget Surveys and National Income and Product Accounts.

Public consumption (dot-patterned bottom line) has a distinct, roughly inverted U-shape. However, its moderate upturn at the older ages is not strong enough to change the slope of the total consumption curve to positive as occurs in today's more developed countries, where there are very large government expenditures on health and other social services for the elderly. In Chile, these public programs are also important, but our data show that, especially after the privatization reforms in the pension and health systems instituted in the 1980s, the elderly have been relying less on in-kind public consumption and more on other sources of income, including transfers and asset reallocations. Another interesting aspect of the lifecycle deficit is the age at which individuals become net producers and net consumers. In the Chilean case, the first transition occurs at about age 26 and the second at age 54. The length of the net-producing period of 28 years is somewhat below the average of NTA countries, but in line with the average of the Latin American countries that have comparable estimates so far.

Although those younger than 26 and older than 54 years of age are dependents from the point of view of the lifecycle deficit (because individuals in both groups produce less through their work than what they consume), there are evident differences in their economic status and degree of economic dependency. First, younger dependents produce only 26% of their average consumption (young children produce 0%), whereas older dependents produce about 55% of their consumption, and thus, rely to a much lesser extent on other sources of support. Second, older adults draw upon substantial asset income, whereas children do not, and adolescents and younger adults do so to a very limited extent. Therefore, older adults are much less dependent on transfers than are children. As we shall see, the public–private transfer mix differs considerably across the age groups. Third, in systems that are mostly contributory, such as Chile, the pensions that older adults receive constitute an

instituted compensation for the contributions they made when younger; i.e., they are part of an explicit inter-temporal, intergenerational social contract.[20] In the case of children, however, there is no explicit, or necessarily proportional, linkage between the public transfers received when young with the taxes paid later in life.

E. Public transfers

In the NTA framework, public transfer inflows to individuals refer to all current (non-asset based) government expendituresrather than to specific cash programs, as they are generally understood in the public-financecontext. Public transfer inflows to individuals include all the activities and associated spending of the public sector that produce goods and services which either directly or indirectly benefit the population. Some of these benefits accrue only to specific groups such as students, pensioners, or persons in poverty programs, whereas others accrue to the population at large. Examples of the latter are public infrastructure, foreign relations, and general government operating expenditures. In the NTA framework, the former benefits are assigned to the pertinent population groups; the latter are allocated on a uniform per capita basis to all age groups. Public transfer outflows refer to the payments (taxes and social security contributions) that individuals make to the government within a given year.

Public transfer inflows are categorized as cash or in-kind and differentiated by social sector —i.e., health, education, social security, etc. Public transfer outflows consist mostly of direct and indirect taxes, which include income and property taxes on the one hand, and consumption and excise taxes on the other.[21]

F. Transfer inflows

In 1997, aggregate in-kind transfers represented 11% of Chile's GDP, more than half of which (6% of GDP) was consumption of collective goods; health and education programs accounted for the remaining 5%. Cash transfers represented 4.8% of GDP, virtually all of which was accounted for by public pensions, with a small proportion of spending in training and unemployment subsidies.

As shown in Figure V.2, in-kind transfers were concentrated on children and adolescents through public education expenditures, and on the elderly through public health programs.

Compared with the public education and health transfers of other countries in the NTA project, Chile's transfers were in an intermediate range. They were close to those of other developing countries such as Costa Rica and Taiwan, well above those of Indonesia, but much lower than those of developed countries such as Japan and the United States.

As expected, education expenditures were high for children, teenagers, and young adults, whereas health expenditures benefited mainly older adults and, to a lesser degree, young children. Other public consumption expenditures had no clear age correlation.

---

[20] In non-contributory schemes, the taxes paid and pensions received at different stages of the life-cycle are de-linked at the individual level; they are more clearly pure transfers.

[21] In addition to taxes, public transfer outflows include mandatory contributions, fees, and bond purchases to the government (see details in ‹http://www.ntaccounts.org, under public transfers›).

FIGURE V.2
CHILE: PER CAPITA IN KIND TRANSFERS RELATIVE TO AVERAGE
LABOR INCOME OF PERSONS AGED 30 TO 49, 1997
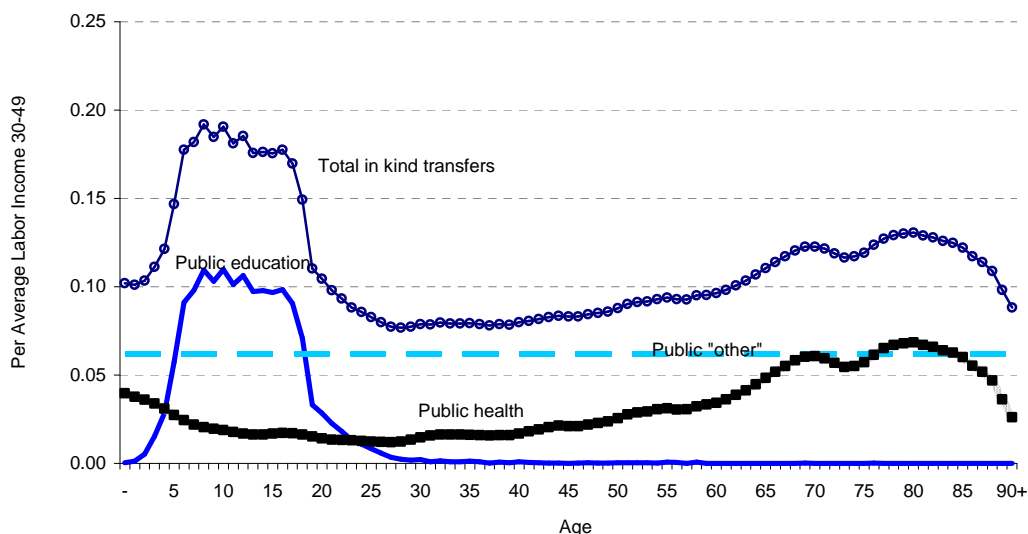
Source: Authors' calculations, based on Households Surveys and National Accounts.

Cash transfers consisted basically of old-age and survivors' pensions, both of which were geared mostly to the elderly and constituted the lion's share of public transfers to this group (Figure V.3). This Figure V.also shows that per capita public benefits for the elderly dwarfed those received by children; however, because the population age structure is still heavily tilted toward the younger ages, the public expenditure on children and the elderly were of comparable aggregate magnitude.

FIGURE V.3
CHILE: PER-CAPITA PUBLIC TRANSFERS INFLOWS IN TERMS OF AVERAGE
LABOR INCOME OF PERSONS AGED 30 TO 49, 1997
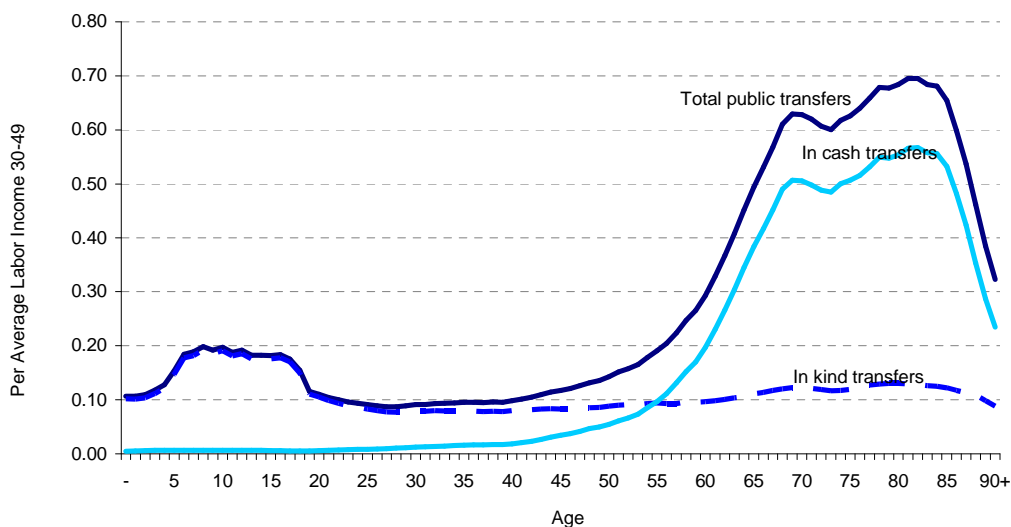
Source: Authors' calculations, based on Households Surveys and National Income and Products Accounts.

These transfers can have a significant impact on the income distribution within a society. Drawing on an estimation procedure developed by Uthoff and Ruedi (2005), Bravo (2007) has assessed the impact of government cash transfers on poverty rates by age in several Latin American countries. Figure V.4 shows Bravo's estimates for Chile in 1997.

FIGURE V.4
CHILE: POVERTY BY AGE, 1998
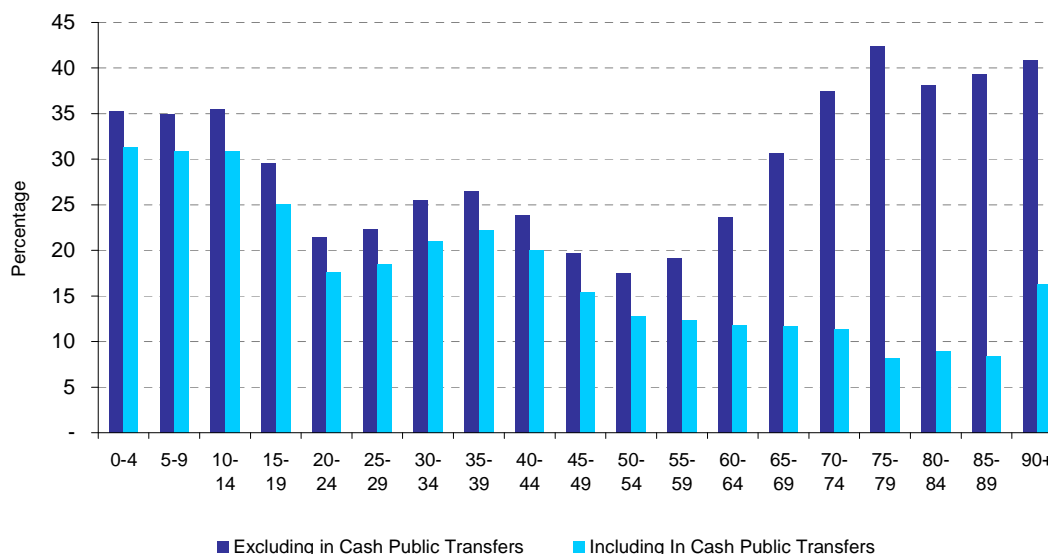
Source: Athours' Calculations. Estimated from CASEN 1998 (Encuesta de Caracterización Socioeconómica).

The results confirm our previous finding for Chile (which are also observed in varying degrees in Brazil, Mexico, and El Salvador); namely, the poverty-reducing effect of cash transfers was much greater for the elderly than for other age groups. Although the effects of government cash transfers were not insignificant for younger adults and children, they were still insufficient; children had much higher poverty rates than the other generational groups. This result is troublesome from the viewpoint of both intergenerational equity and an inter-temporal economic perspective. It suggests an underinvestment in the younger generations, i.e., in their future productivity. Thus, Chile's recently inaugurated governmental program aimed at improving the wellbeing and social protection of all children appears to be well targeted (Chile, MIDEPLAN, 2007).

This is only one piece of evidence for the analysis of the distributional effects of transfers. One should also consider in-kind transfers and public transfer outflows in order to have a complete view of the net generational impact of public policies. The series of NTAs that we are currently constructing will provide the basic data with which to make these more integrated, comprehensive assessments.[22]

---

[22]   Ideally, one would like to examine the incidence inter-temporally, allowing for a true generational analysis. Doing so, however, requires a long series of NTAs, which are not yet available for Chile. See Bommier et al. (2005) for an interesting analysis of long lifecycle deficit series for the United States and France.

G. Transfer outflows

Chile's tax structure, which draws three-fourths of tax proceeds from indirect taxes, results in an age profile of public outflows quite different from that of developed countries, where direct taxes on income and assets play a much more important role.

As a result of the Chilean tax structure and allocation rules, income taxes have an older age distribution than the value-added tax (Figure V.5). Indirect taxes are more evenly distributed across different ages, whereas direct taxes are concentrated in the highest earning adult ages.

FIGURE V.5
CHILE: PER-CAPITA PUBLIC TRANSFERS OUTFLOWS (TAXES) RELATIVE
TO AVERAGE LABOR INCOME OF PERSONS AGED 30 TO 49, 1997
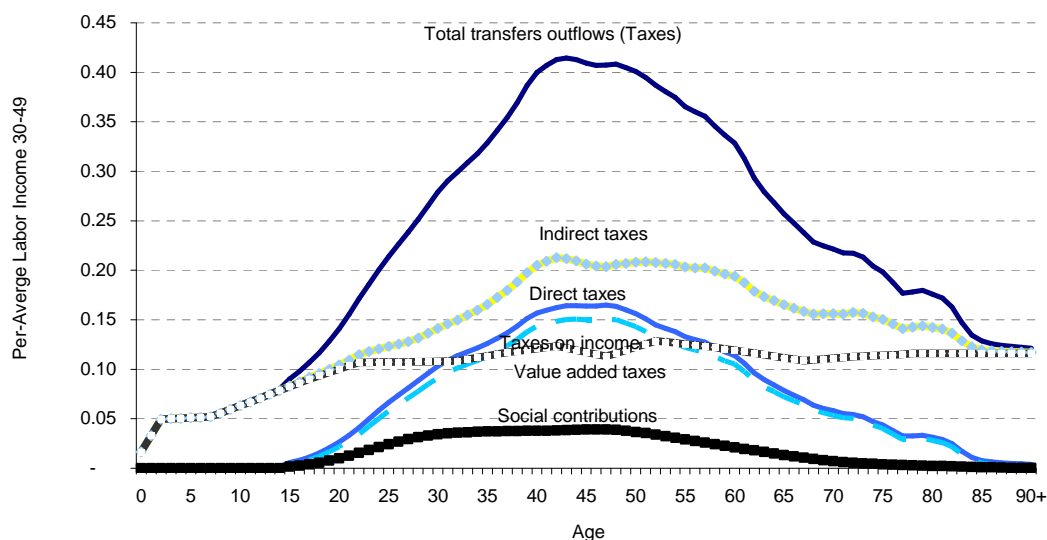
Source: Authors' calculations, based on Households Surveys and National Income and Products Accounts.

Figure V.6 shows both inflows and outflows of public transfers and summarizes the results of net aggregate public transfers. This may be particularly relevant to public finance policy as they reflect the aggregate net amounts the government transfers to and from the population by age group. That is, it shows the benefits received from the government, less taxes paid by the population, in each age group.

Figure V.6 shows that individuals under the age of 20 and those over age 60 received net public inflows from the government, whereas those in between, especially those in the late 30s to early 50s age range, were net taxpayers. After the age of 70, the absolute value of public transfers for the elderly tends to fall with age, mostly because of their reduced population numbers and because of the smaller net percapita transfers at older ages.

FIGURE V.6
CHILE: AGGREGATE NET PUBLIC TRANSFERS, 1997
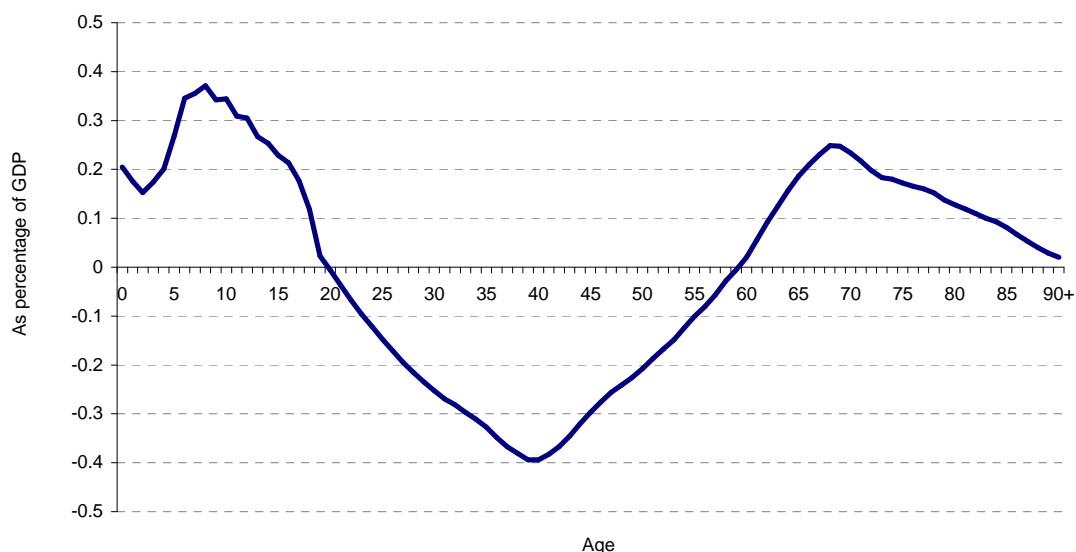
Source: Authors' calculations, based on Household Survey and National Income and Products Accounts.

H. Private transfers

Transfers that take place among individuals without the mediation of the government can be either intra-household (the more common case) or inter-household. In the case of Chile, household surveys ask only about transfers received, not about transfers given; and therefore, no information exists about the givers of the transfers. Consequently, armed with only the information on transfers received for each individual household member, assumptions were made about the givers vis-à-vis the receivers in order to estimate net private inter-household transfers. Two possibilities were considered: (i) that all private transfers were made only among household heads (this is the standard method of the NTA project), or (ii) that the recipient was the person identified in the survey and the givers were only household heads. In both cases, we assumed that giving was proportional to household total factor ("autonomous") income.

The results for inter-household transfers differed according to the assumption used. Under the first assumption, the young and the old received a very small portion of net transfers, whereas individuals of intermediate adult ages were large net givers. This outcome was expected since most household heads are indeed middle-aged adults. Under the second assumption, net inter-household transfers were more evenly spread out. Nevertheless, as inter-household transfers represented only 18% of private transfer inflows, the reliance on one assumption or the other did not have a large effect on total net private transfers.

Inter-household transfers were larger in Chile than in some other countries; in Thailand, for example, they represented only 6% of all private transfers.

However, Chile is similar to virtually all the other countries in that by far the largest part of private transfers took place within households. Figure V.7 shows the estimates of private transfers based on the standard NTA methodology.

FIGURE V.7
CHILE: PER CAPITA NET PRIVATE TRANSFERS RELATIVE TO AVERAGE
LABOR INCOME OF PERSONS AGED 30 TO 49, 1997
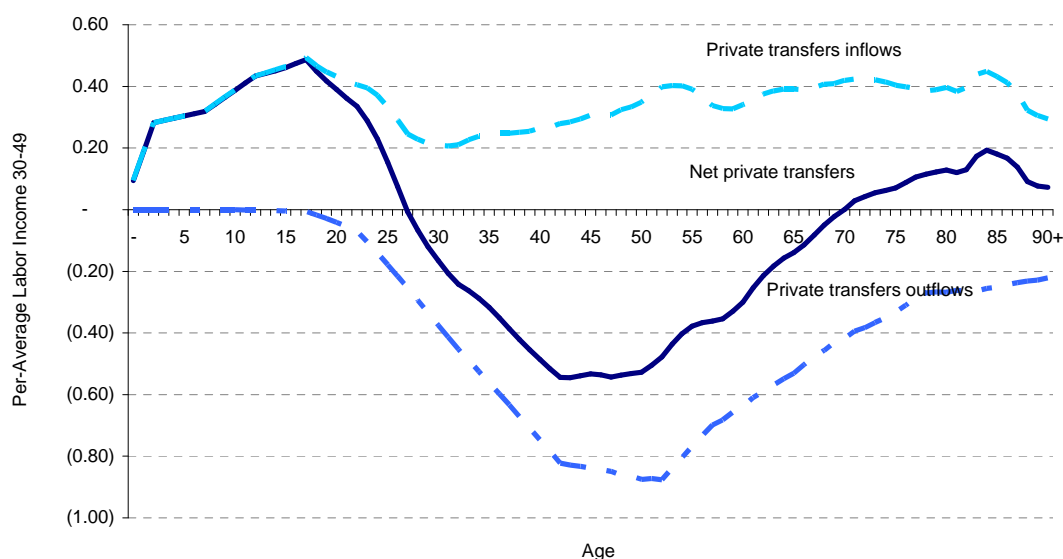
Source: Authors' calculations, based on Household Survey and National Income and Products Accounts.

The results show that for all ages above 18, individuals were both givers and receivers of private transfers. This result is consistent with findings from SABE (Salud, Bienestar y Envejecimiento; In English: Health, Well-Being, and Ageing) surveys, which sample populations of selected Latin American cities (Palloni and Peláez, 2004). The surveys show extensive evidence of mutual support (Saad, 2005). If we consider net flows, however, we see that children and young adults are net receivers of substantial private transfers, while older adults receive much smaller net private transfers, and then, only after the age of 70.

I. Asset reallocations

Individuals who do not generate substantial labor income or receive many transfers may resort to inter-age asset-based reallocations to finance their consumption. Recall that asset-based reallocations are the difference between asset income and savings at each age. Figure V.8 shows that in Chile in 1997, per capita net asset reallocations began to rise in the early 20s and leveled off between the ages of 42 and 60. At age 60, they then fell almost continuously until the age of 85 and after 90, there was a sharp upturn. The estimates at the older ages are surely less reliable due to the small population size. However, taken at face value, they seem to suggest that after the age of 85, individuals obtain more liquidity by reducing their savings, not at all an unreasonable behavior. Looking at the components of asset reallocations, income from assets rose gradually from the mid 20s, reaching a maximum just past the age of 65.[23] They then fell, except for a brief upsurge around age 82 to 83, before resuming their decline thereafter. Viewed from a life-cycle perspective, these age patterns seem roughly consistent with economic theory and prior expectations.

---

[23]   This is likely associated with a large drawing of assets at about the time of retirement.

FIGURE V.8
CHILE: PER-CAPITA ASSET BASED REALLOCATIONS RELATIVE
TO AVERAGE LABOR INCOME OF PERSONS AGED 30 TO 49, 1997
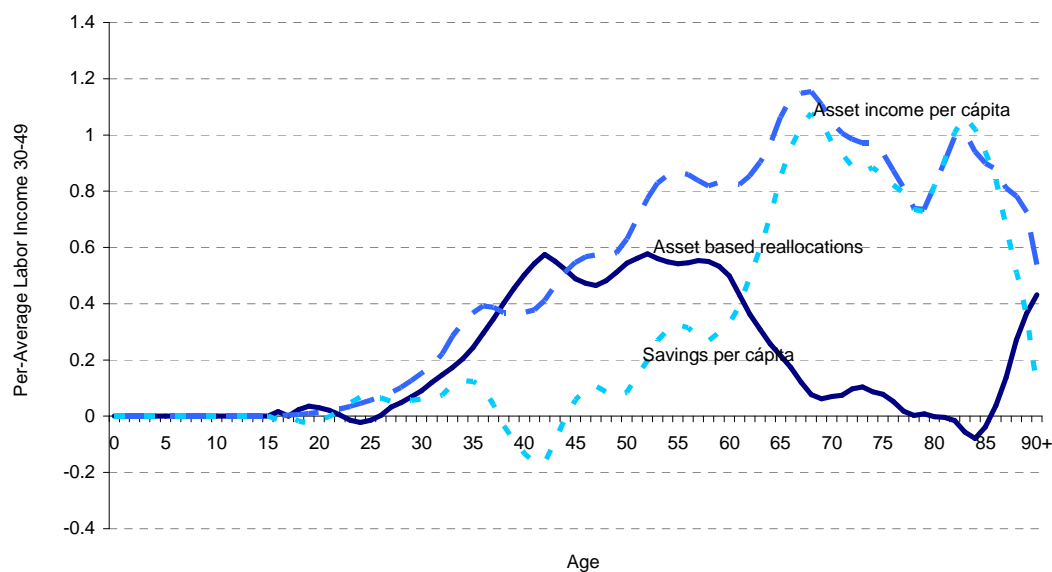
Source: Authors' calculations, based on Households Survey and National Income and Products Accounts.

The implied lifecycle behavior of savings, however, is more intriguing. Savings became clearly positive only after the age of 45, and generally increased and remained high as late as age 85. Savings fell sharply thereafter, but remained positive throughout. This pattern differs from countries such as the US and Costa Rica, where net asset reallocations had no turning point, but rather kept increasing even at older ages, with savings falling toward negative values. It is noteworthy that, in Chile, the variations in savings virtually mirror those of asset income between the ages of 65 to 85. It is as if within this age range, all asset income were saved, and thus remained available for withdrawal at the oldest ages.

J. Financing consumption at different stages of the lifecycle

A useful way to summarize the foregoing results is to examine the sources of financing of the lifecycle deficit for different broad age groups of "dependents" and "net producers", shown in Figure V.9. It confirms that middle-aged adults, between the ages of 26 and 54, were substantial net producers; their labor income was 28% higher than their own consumption. They also obtained important positive net asset reallocations, equivalent to 43% of their consumption. This provided them with sufficient resources to be net transfer givers of both private and public transfers, representing 46% and 25%, respectively, of their average consumption.

Children and youth below the age of 25 and adults aged 55 and older were net consumers ("dependents"), but their sources of support and degree of dependence were radically different. More than three-fifths of the consumption by younger dependents was funded by private (mostly intra-household) transfers, and another one-fifth was funded by labor income. The remaining one-fifth was

72

composed of net public transfers (15%) and asset reallocations (2%).[24] On the other hand, the older dependents (aged 55 or older) financed more than one-half of their consumption with their own labor and could count on asset reallocations to finance another 37%. Together with public transfers, which account for 31% of their consumption, they command sufficient resources to still be net providers of private transfers, which amount to 18% of their consumption. The more conventional cut-off age of 65 or older reveals the expected larger reliance on public transfers (almost two-thirds of their consumption) and a smaller contribution from their own labor (about one-fifth of their consumption). Asset reallocations account for 11 % of consumption in this age group, and as indicated earlier, the elderly do not rely greatly on private transfers for their support; they are modest net recipients (3% of their consumption) of private transfers from younger adults.

FIGURE V.9
CHILE: FINANCE OF CONSUMPTION, 1997
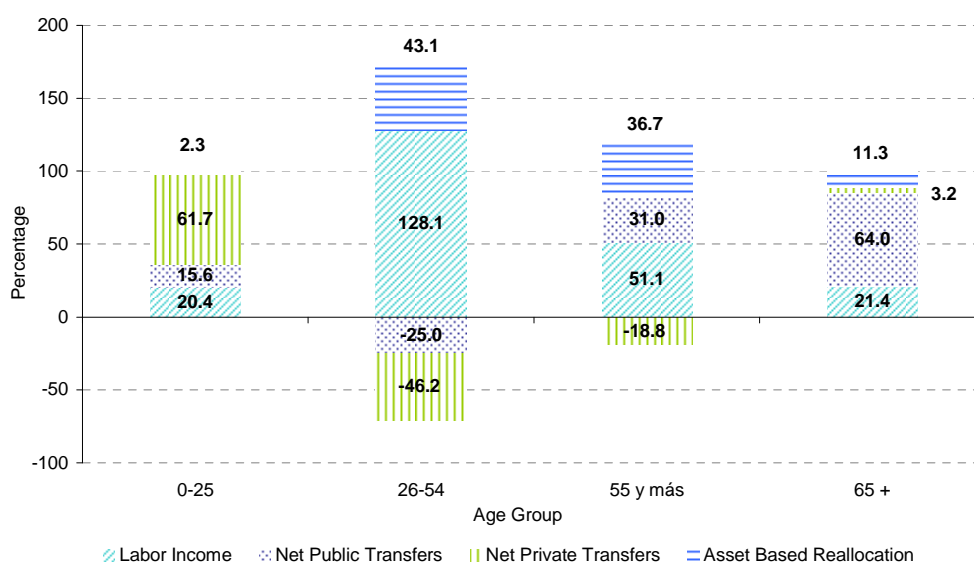
Source: Authors' calculations based on National Transfers Accounts Chile.

K. Conclusion

Our analysis of intergenerational reallocations for Chile in 1997 leads us to conclude that labor income is a more important source of support for the great majority of adults, including the elderly, than it is in some countries with similar levels of development, urbanization, and social security coverage. Consumption displayed a smooth, somewhat dampened, age profile that fell between the more pronounced inverted-U shape found in the lowest-income countries and the upward-sloping consumption curve observed in today's more developed countries.

Those younger than age 26 and those older than 54 were, on average, economically dependent in the sense that individuals in both groups produced less through their work than what they consumed. However, there were clear differences in their economic status and degree of economic dependency. Older adults were much less dependent than children and young adults on sources other

---

[24]   Asset reallocations in this age group result from a combination of very small asset income and some debt (negative saving), which probably includes student loans.

than their own labor income and asset reallocations. In 1997, our main year of analysis, this result was probably influenced by the privatization reforms initiated in the 1980s, especially that of the pension system, which has increased private saving for old age. Nevertheless, government pensions, which comprise the bulk of public transfers to the elderly, represent the primary means of sustenance for the elderly. Public inflows (benefits) to individuals were mostly comprised of health care, education, and collective goods. These were received in different degrees by each population age group. Cash transfers (basically pensions) represented by far the largest public transfer received by the elderly, who enjoyed total net per capita public transfers several times larger than children or young adults. However, since there were still more younger than older persons/people in the population, the aggregate public spending on children and teenagers was roughly comparable to that on the elderly.

Cash public transfers appear to have had a much greater impact in reducing poverty among the elderly than in any other age group; there is a legitimate concern that poverty is still heavily concentrated among children, who represent future generations of citizens, producers, and taxpayers. Nonetheless, a comprehensive distributional analysis must also take into account in-kind transfers and public outflows (taxes). The NTA time series under construction will generate an appropriate database for such an analysis in generational terms.

Private transfers were the main source of financing consumption for children, but they were not of great importance for any other age group. The elderly relied to a very large extent on net public transfers, but they were not substantial receivers of net private transfers. Interestingly though, persons in all the adult age groups both gave and received private transfers, thus confirming previous evidence from Chile and other Latin American countries that private support tends to be mutual.

Even though asset reallocations financed just over 11% of the consumption for the elderly in Chile in 1997, we expect their share to increase, especially for the generations reaching retirement age after 2000, as they are affiliated in greater proportion to the privatized pension system reform of the 1980s. The full extent of this effect, however, will not be felt until after 2020, when the first cohorts fully covered by the private system begin to retire.

Bibliography

Bennett, H.; K. Schmidt-Hebbel and C. Soto (1999), "Series de ahorro e ingreso por agente económico en Chile, 1960–1997" [Series of saving and income by economic partner in Chile, 1960–1997], Working Papers of the Central Bank of Chile, No. 53, Santiago, Chile.

Bommier, A.; R. Lee; T. Miller and S. Zuber (2004), "Who Wins and Who Loses? Public Transfer Accounts for US Generations Born 1850 to 2090", NBER Working Papers 10969, National Bureau of Economic Research, Inc.

Bravo, J. (2007), "Intergenerational transfers in Latin America" (ESA/P/WP.201), [Proceedings of] United Nations Expert Group Meeting on Changing Age Structures, Mexico City, Mexico, September 2005, Department of Economic and Social Affairs, Population Division, New York.

——— (2006), "Constructing a baseline NTA for Chile: Preliminary results", Paper presented at the 3rd Workshop on the Macroeconomics of Aging, January, Honolulu, Hawaii.

Bravo, J. and M. Holz (2008), "Intergenerational reallocations in Chile, 1987-1997", Paper presented at the Expert Group Meeting on Age Strcutural Transitions, Vienna, Austria, 7-9 October.

Chile, MIDEPLAN (Ministerio de Planificación) [Ministry of Planning] (2007), *Chile crece contigo: El sistema de protección integral a la primera infancia*, [online], ‹http://www.mideplan.cl/final/ categoria.php?secid=10&catid=51/›.

——— (1999), "Encuesta de Caracterización Socioeconómica 1998, Santiago, Chile.

Chile, Ministry of Finance, Budget Directorate (various years), "Estadísticas finanzas públicas: Series trimestrales" [Public finance statistics: Quarterly series], [online], ‹http://www.dipres.cl/572/propertyvalue-15492.html›.

Central Bank of Chile (2004), Cuentas Nacionales de Chile 1996-2004, [online], ‹http://www.bcentral.cl/publicaciones/estadisticas/actividad-economicagasto/aeg01a.htm›.

ECLAC (Economic Commission for Latin America and the Caribbean) (2006), *Panorama social de América Latina 2006* (LC/G.2326-P/E), Santiago, Chile.

——— (2005), *Panorama social de América Latina 2005* [Social Panorama of Latin America] (LC/G.2288-P/E), Chile.

IMF (International Monetary Fund) (2009), "World Economic Outlook Data Base, April 2009", World Economic and Financial Surveys, Washington, DC, [online], ‹http://www.imf.org/external/pubs/ft/weo/2009/01/weodata/index.aspx›.

Larrañaga, O. (1999), "Desigualdad del ingreso en Chile, 1960–2000" [Inequality of income in Chile, 1960–2000], Working Paper 178, Department of Economics, Universidad de Chile, Santiago, Unpublished manuscript.

Leiva, A. (2006), "Sistema de protección social: Fundamentos y components" [System of social protection: Fundamentals and components], Paper presented at the Expert Group Meeting on Population and Poverty, ECALC/CELADE, Santiago, Chile, November.

Loayza, N. and R. Soto (2002), "Economic growth: Sources, trends and cycles", *Series on Analysis of Economic Policy*, Vol. IV, Santiago, Central Bank of Chile.

Marcel, M. (2006), "Cinco años de balance estructural en Chile: Una evaluación" [Five years of structural balance in Chile: An evaluation], Paper presented at the 18th Seminar on Regional Fiscal Policy, ECLAC, Santiago, January.

Marcel, M.; M. Tokman; R. Valdés, and P. Benavides (2001), "Balance estructural: Metodología y estimaciones para Chile, 1987–2000" [Structural balance: Methodology and estimations for Chile, 1987–2000], *Estudio de Finanzas Públicas* [Study of Public Finances], No. 1, Santiago, Dirección de Presupuestos, Ministerio de Hacienda, Septiembre.

Mason, A.; R. Lee; A. Tung; M. Lai, and T. Miller (2009), "Population aging and intergenerational transfers: Introducing age into national accounts", in D. Wise (ed.), *Development in the economics of aging*, Cambridge, MA, and Chicago, National Bureau of Economic Research and University of Chicago Press.

National Transfer Accounts Project (2007), [online], ‹http://www.ntaccounts.org/›.

Saad, P.M. (2005), "Los adultos mayores en América Latina y el Caribe: Arreglos residenciales y transferencias informales" [Older adults in Latin America and the Caribbean: Residencial arrangements and informal tranfers], *Notas de Población* [Population Notes], No. 80 (LC/G.2276-P), Santiago, Chile, ECLAC/CELADE.

Uthoff, A. and N. Ruedi (2005), "Protección social en las familias. Un análisis a partir de las encuestas de hogares", in I. Arriagada (2005) (ed.), *Políticas hacia las familias, protección e inclusión sociales*, serie *Seminarios y Conferencias* N°46 (LC.L.2373-P), Santiago, Chile.

VI. Intergenerational transfers in Costa Rica

Luis Rosero-Bixby and Paola Zúñiga[25]

A. Introduction

This paper presents estimates of the system of intergenerational transfers in Costa Rica in 1991 and 2004. The most noteworthy finding is that the surplus age range in the economic lifecycle is relatively brief and that labour income becomes insufficient to cover consumption after the age of 55. Consequently, the government plays a crucial role in financing the deficit of the elderly, while that of children and youths largely depends on familial transfers. It was also observed that the elderly do not generally represent a "burden" for their families and that, on the contrary, they make more transfers than they receive, even at a very advanced age. In fact, income from assets and savings are surprisingly high and increase with time until an age of about 70.

Combining these findings with population projections leads to the conclusion that population ageing in Costa Rica will not fulfil predictions of catastrophe, though it will present a challenge to public finances in the near future, especially in the areas related to pensions and health. The data and analysis presented here suggest demographic bonuses that may be exploited to improve the welfare of

the Costa Rican people. Thus, the challenge is to implement the measures needed in order to take advantage of this opportunity.

Costa Rica is a Central American country with 4.5 million inhabitants that is characterised by a culturally and ethnically homogenous population, political stability, and a Constitution that abolished the armed forces in 1949. It is considered a "textbook case" of a "mixed" economy in Latin America, as it is in an intermediate position between the Chilean market economy and Cuba's socialist one (Mesa-Lago, 2000).

The country has been more successful with its social development than with economic development. In 2009, the United Nations Development Program (UNDP) ranked it 54th in the world on its Human Development Index (HDI) and fourth in Latin America (UNDP, 2009). Costa Rica ranks 33 in the world and first in Latin America in terms of life expectancy. Its achievements in health, education, and social security are in part, the result of a welfare state that does not have defence expenditures (Mata and Rosero-Bixby, 1988).

Life expectancy at birth is 79, the second highest in the Americas after Canada, and therefore higher than even the United States (World Bank, 2008). The country has quasi-universal health coverage provided by the Caja Costarricense de Seguro Social [Costa Rican Social Security Fund] (CCSS), the institution that is also the main provider of these kinds of services. Health coverage, which is obligatory for all workers, covers the needs of employees and their dependents without co-payments. In addition, Costa Rica has universal primary education coverage, though it is still below the Latin American average in terms of secondary school enrolment (ECLAC, 2009).

A third pillar of the country's social programs is its generous pension system: 64% of the elderly —defined as those 65 and over— receive pensions and an additional 12% for the spouses of for those who live with a beneficiary. The pension system has two components: (i) a pay-as-you-go contribution system in which young people finance current pensions on the understanding that in the future, theirs will be paid for by younger generations; and (ii) a non-contributory system for people below the poverty line. Close to one-third of pensions for the elderly correspond to the non-contributory system. It is mandatory for all salaried workers and all employers to make contributions to the pension funds of the social security system, for which workers also participate with their own accounts with subsidised contributions. Additionally, since 2000, there have been complementary fund programs administered by both private and public agents that operate much like individual savings accounts (Mesa-Lago and Bertranou, 1998; Fernández and Robles, 2008).

The country is believed to have completed its demographic transition in 2002, when fertility reached the replacement level (INEC and CCP, 2008). The global fertility rate of 1.98 births for every 1,000 women in 2005 was lower than that of the United States and is the second lowest in Latin America, after Cuba. In addition, Costa Rica is one of the few Latin American countries with a substantial number of international immigrants: 10%, which is close to the 12% of the United States, for example (United Nations, 2006).

Since the demographic transition in the country took place recently and very quickly, the population has not yet aged: only 5.6% of Costa Ricans were 65 years old or older in 2005. However, this proportion will change dramatically and will surpass 20% by 2050 (INEC and CCP, 2008).

Though it has not yet experienced demographic ageing, the age structure has changed significantly since fertility began to drop in the 1960s. This change has broadened the population pyramid in the middle and has narrowed its base. Children and young people under the age of 20, who represented 57% of the population in 1965, totalled 38% in 2005, while the percentage of adults between 20 and 64 years of age increased from 39% to 56% over the same period. This percentage of adults will not change between now and 2050. However, the percentage of children and youths will fall to 23% while the elderly population will increase from its current 6% to 21% in that time (INEC and CCP, 2008).

The dependency ratio summarises these changes in the population's age structure. Two trends stand out: (i) its rapid drop- from 153 dependent people per every 100 of working age in 1965 to a minimum of 60 in 2020, recovering partially to 89 in 2060; and (ii) the substantial shift in the composition of the dependent population, as the elderly will comprise over 50% in 2050, compared to 6% in 1965 and 13% in 2005 (see Figure VI.1).

FIGURE VI.1
COSTA RICA: DEPENDENCY RATE, 1970-2060
(In number of dependants for every 100 of working age)
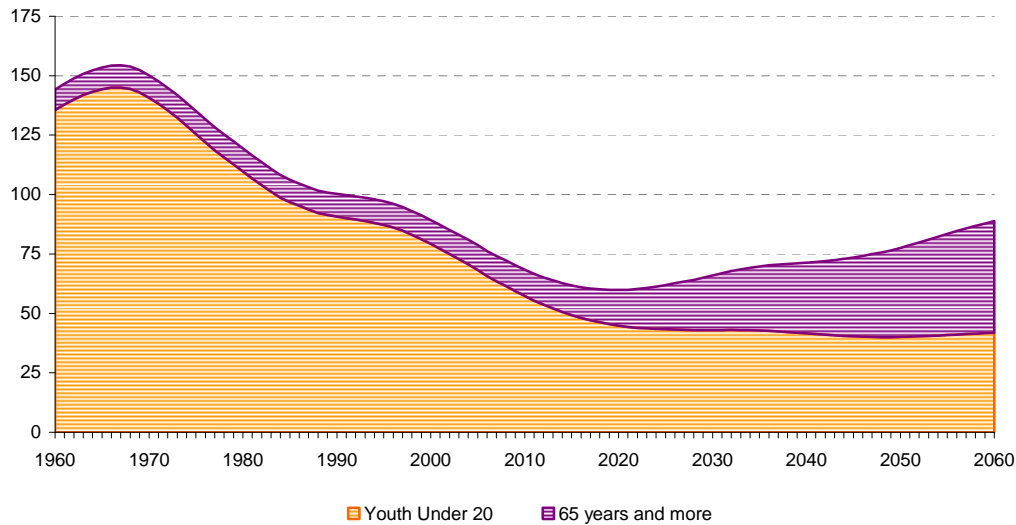
Source: Central American Population Centre and the National Statistics and Census Institute (CCP and INEC), Costa Rica: estimaciones y proyecciones de población por sexo y edad (cifras actualizadas) 1950-2050, [Costa Rica: Population estimates and projections by sex and age (Updated data) 1950-2050], San José (Costa Rica), INEC, 2008.

The population's age composition and its expected future changes are especially relevant when one considers that an individual's economic lifecycle has deficit periods between what consumption and production, both at the beginning as well as toward the end of life, which must be subsidized with transfers from other generations or from other stages of life within a same generation (Lee, Sang-Hyop and Mason, 2008). Changes in the population's age composition, especially those as drastic as Costa Rica has experienced and those it will experience in the future, generate variations in the importance of deficit or surplus ages, and consequently affect the economy.

This paper presents the estimates of the Costa Rican intergenerational transfer system, which is closely related to the country's economic, social and demographic development and the co-residence arrangements that its inhabitants have adopted. One characteristic of Costa Rican households is that the elderly often live with their adult children: only 10% live alone, while 57% live with a son or daughter. In a developed country like the United Kingdom, these numbers are 33% and 11% respectively (Puga et al., 2007). In addition, in 96% of cases of co-residence with adult children in Costa Rica, children live with their parents, not the other way around.

B. Data and methods

For the analysis in this paper, Costa Rican intergenerational transfer accounts were created based on macroeconomic data from the National Accounts System (SCN) of the country's Central Bank. The age profiles were estimated based on the National Household Income and Expenditure Survey (ENIG) by the National Statistics and Census Institute (INEC).

In the case of the surveys, micro-data was used from the ENIG for 2004-2005 and 1987-1988, provided by the INEC. This will be referred to as 2004 and 1988, respectively, as those were the years in which most of the interviews were completed. These surveys provide detailed information on personal income from work or from other sources as well as the expenditures incurred from household consumption. The 2004 ENIG is a nationally representative survey that considered 4,200 households and 15,600 people, while 3,900 households and 18,200 people were interviewed for the 1988 ENIG.

The information on national accounts was taken from the Central Bank website (BCCR, 2007) and was complemented with unpublished data provided by officials at the institution's Department of Macroeconomic Statistics.

There is an internally coherent historic series of Costa Rican national accounts dating back to 1991. The majority of those corresponding to previous years are difficult to compare with the series beginning in 1991. Considering this difficulty, the decision was made to adjust the 1988 ENIG profiles to the 1991 national accounts under the assumption that the age profiles did not change in those three years. This estimate is therefore referred to as the one from 1991, and it is comparable to the one undertaken with the ENIG for 2004 and the national accounts for that year.

The national transfer accounts (NTA) for Costa Rica were estimated using the methodology described in the international "National Transfer Accounts (NTA)" project webstite.[26] Some of the adaptations made to these methods for the particular case of Cosa Rica are presented below:

- The original expansion factors of the ENIGs were modified to reproduce the population estimates for the country by age in 1991 and 2004 (INEC and CCP, 2008).

- The head of household was considered the person with the highest income instead of the hierarchical head reported in the survey. This decision tends to reduce elderly people's income from assets since they are replaced with younger economic heads (and by assumption all asset income is assigned to the head).

- The macroeconomic aggregates of mixed income and the exploitation surplus of households —imputed rental of homes owned— were calculated based on the ENIG, as in the former case there is no data in the national accounts and in the second they are undervalued, according to the opinion of Central Bank officials. Mixed income is defined as "the surplus or deficit accruing from production by unincorporated enterprises owned by households" (United Nations, 1993). Based on information from the survey, mixed income was considered to be that of independent workers of companies that employ less than 10 workers[27].

---

[26] National Transfer Accounts Project, [on line], ‹http://www.ntaccounts.org/›.

[27] Alternative definitions of mixed income were tried, such as the one provided by workers at companies not registered in the Property Registry, or companies with less than 30 workers. Depending on the definition used, the 2004 lifecycle deficit varied between 9% and 18%.

- The profile of public consumption for education and health was created based on the usage data for these services as reported in the ENIG and complemented with administrative information on the costs. In the case of health, average values were used for consultations and hospitalization, as supplied by the Costa Rican Social Security Fund's Statistics Department via personal communication. For education, cost data corresponding to educational level was supplied by the Public Education Ministry (Costa Rica, MEP, 2007) and in regard to higher education, by the National Council of Rectors (CONARE).

The estimate used the 2004 data as a starting point, given that the information available for that year is more detailed and reliable. The data from 1991 is based on a smaller amount of information and on adaptations aimed at making it compatible with that of 2004. Consequently, it should be used with caution.

The main methodological differences between the estimates of these two years in question are:

- The reallocation of both public and private assets was calculated for 2004. Private savings were obtained from the difference between the lifecycle deficit, income from private and public assets and from public spending, meaning that private asset reallocation —in other words, income from assets less private savings— was also calculated based on a difference. For 1991, however, it was not possible to separate public from private assets, meaning that total asset reallocations were obtained from the aggregate difference in the lifecycle deficit. For this reason, differences between 1991 and 2004 could be due to the inclusion of the public sector in assets and the increased disaggregation of data for 2004.

- The corresponding ENIG estimate for 1991 only reported total transfers received per family. In other words, it did not separate them into their public and private components. As a result, they were estimated using a regression based on 2004 information which estimated transfers in terms of variables like age, sex, entitlement to a pension, the fact that the head of household gender, and according to the different age groups. Once this equation was calculated, coefficients were used to obtain the estimated value of intergenerational transfers.

Transfer accounts were calculated in thousands of 2004 colones. However, they are presented in US dollars in this paper, using the 2004 exchange rate of 450 colones per dollar.

Intergenerational transfer accounts were combined with population estimates and projections for Costa Rica from 1960 to 2060 (INEC and CCP, 2008) in order to determine the induced demographic growth of different components. The analysis was based on simulating what would happen if the only variable that changed over time was the population by age group; in other words, if everything except the population remained constant. For example, for the consumption account, potential consumption for each year was determined to be the sum of products that the population consumed per capita during the respective year in each age group. Changes in this potential consumption over time estimate demographically induced growth. Two series of estimates were made to calculate this simulation's sensitivity to modifications to the transfer accounts' profile by age: one with the profiles of 2004 and another with those of 1991. Demographically induced growth rates were determined or simulated for the following categories:

- Consumption.

- Labour income (or labour factor).

- Income from assets (considered a proxy of capital accumulation).

- Fiscal revenues.

- Transfers provided by the government.

- Private transfers provided (i.e., from familial providers).

- Private transfers received (the recipients).

The comparison between these rates reveals whether demographic change is having positive or negative effects on diverse aspects of the economy. For example, if potential growth in labour income —or the labour factor— is greater than that of consumption, then the demographic shift would open a window of opportunity to improve living standards through increased consumption. This is known as the demographic dividend or bonus (Mason and Lee, 2007).

C. Results

1. The lifecycle deficit

In 2004, the Costa Rican economy operated with a total lifecycle deficit —defined as the difference between labour income and consumption— of just over US$ 3 billion in 2004 and US$ 2.283 billion in 1991 (see Table VI.1). Though it increased in absolute terms, it fell from 31% to 24% when considered as a proportion of consumption. In other words, consumption increased less than labour income during that period.

All age groups, except the 30-49 group, showed a lifecycle deficit. The lifecycle deficit for children and youths was almost five times greater than the one corresponding to the elderly in 2004, due to the fact that their population was seven times larger. The surplus registered by the 30-49 age group (see Table VI.1) helps cover the deficit in other age groups via inter/intragenerational transfers, but it is not sufficient.

Transfers, especially private ones, were the main source of financing for the lifecycle deficit of younger ages, while asset reallocations and public transfers were the primary source for the older age groups. Negative transfers indicate that at those ages, people give more than they receive, which is most pronounced in the group of people between 30 and 49 years of age, both in the private as well as the public spheres. It is noteworthy that that net private transfers in the elderly group were practically zero —negative in 2004 and only slightly positive in 1991. This indicated that the elderly do not constitute a "burden" for their families. However, they were beneficiaries of a high public transfers. Although the aggregate amount of public transfers to the elderly was only half the amount to the youth, it should be borne in mind that in 2004, the elderly constituted a group only one-seventh the size of the youth population.

With the information provided in Table VI.1, it is possible to calculate per capita amounts of consumption and labour earnings by dividing the aggregate amounts in millions of dollars by the population. Figure VI.2 shows the disaggregated detail of the two components of the lifecycle deficit, consumption and labour income, per capita by age group. This reveals the exact age at which the curves intersect, which is the moment at which the deficit of the youth disappears and the one for older adults appears. In 1991, the age group in which income exceeded consumption lasted from 27 to 50, while in 2004, it expanded to the age of 55 due to the significant increase in labour income during that period and the curve's displacement to the right, reaching a maximum at the age of 43 in 2004 (at US$ 4,800 per capita), compared to 37 years of age in 1991 (at US$ 3,700 per capita).

TABLE VI.1
COSTA RICA: LIFECYCLE DEFICIT BY AGE GROUP, 2004 AND 1991
(In millions of 2004 dollars)

Year and accounts	Total	0 -19 years	20 - 29 years	30 - 49 years	50 - 64 years	65 years and over
			2004			
Population (thousands)	4 232	1 634	751	1 168	435	245
Distribution (%)	100	39	18	28	10	6
Lifecycle deficit	3 130	3 383	508	-1 555	102	692
Consumption	12 815	3 621	2 640	3 949	1 696	909
Labour income	9 685	238	2 132	5 504	1 594	217
Reallocation of assets	2 923	-101	406	1 589	784	246
Income from assets	4 845	4	274	2 006	1 599	962
Savings	1 922	105	-131	417	815	715
Net Transfers	207	3 485	102	-3 143	-682	446
Public	6	833	-252	-1 032	-1	458
Private	201	2 651	354	-2 112	-681	-13
			1991			
Population (thousands)	3 166	1 425	581	756	250	153
Distribution (%)	100	45	18	24	8	5
Lifecycle deficit	2 283	2 068	143	-474	194	352
Consumption	7 296	2 387	1 595	2 127	739	449
Labour income	5 013	319	1 452	2 601	545	96
Reallocation of assets	2 126	202	324	1 024	390	186
Income from assets	2 843	67	490	1 266	553	467
Savings	717	-135	166	242	162	281
Net Transfers	156	1 866	-182	-1 498	-196	166
Public	90	320	-131	-304	52	153
Private	67	1 547	-51	-1 194	-249	13

Source: Authors' calculation.

Until shortly after the age of twenty, the consumption curve shows a predictable increase with age. After that, it shows a certain amount of stability. This curve increased substantially between 1991 and 2004, which indicates that the level of welfare in the country has improved. In 2004, per capita consumption presented a remarkable profile among adults, with a double hump around the ages of 20 and 60, and a nadir shortly after 40. These "ups and downs" may be due to a cohort effect rather than age. If it were age related/dependent —i.e., that people close to the age of 40 consume less, perhaps because they have families to support— then it ought to also occur with the 1991 curve. Since this is not the case, an alternative explanation is that of a generational effect. Namely, the around 40 age group were teenagers in 1981-82, when Costa Rica suffered through its most severe economic crisis in decades. During that critical time, many young people were unable to continue their secondary school studies or were educated under circumstances of great austerity, deteriorating their future earning potential (Gutiérrez Saxe, 2004).

Figure VI.2 also shows that the gap between the curve of consumption and that of labour income is much higher among the elderly than among young people. This contrasts with the observation made at the bottom of Table VI.1, which shows a far more significant lifecycle deficit among young people. This apparent paradox is explained by the substantial difference in the size of these two age groups. The per-capita lifecycle deficit for the elderly is far greater, but since they are less numerous, the total for young people is greater. This will obviously change as the population ages.

FIGURE VI.2
COSTA RICA: CONSUMPTION AND LABOUR INCOME, 1991 AND 2004
(In annual dollars per capita at 2004 prices)

Source: Authors' calculation.

2. Generational transfers

As has already been noted, there are three possible ways to finance the lifecycle deficit: (i) public transfers, (ii) private transfers and (iii) reallocating assets. Figure VI.3 presents the profiles by age for these three sources. The three sub-graphs on the right describe the transfers paid and those received. Those on the left show their net value, i.e., the difference between what each age group paid and what they received. The age profiles of public and private transfers bear a certain resemblance to those of labour income and the lifecycle deficit (described above) , with a range of central ages in which the transfers provided are greater than those received (net negative)and are necessary to cover the deficit in the ages on the extreme ends of the lifecycle.

The public transfers paid age profile is similar to the labour income profile; a maximum in the middle ages, around 40 years in 1991 and 50 years in 2004. Economic growth over this period led to a substantial increase in transfers by the Costa Rican people to the government. This growth was partially the result of tax reform and also a process of tariff liberalization in the 1990s that reduced dependence on import taxes while increasing the tax burden via direct taxes.

In 2004, the elderly received more transfers per capita from the public sector than the young, both in terms of money as well as in services. These transfers consisted mainly of pensions, but t health services transfers also increased for these age groups. The majority of transfers aimed at young people consisted in public education services.

Private transfers mainly take place within the family, and they indicate the direction of economic flows among generations. People begin to make more transfers than they receive starting at the age of approximately 25. This trend continues until they reach an advanced age: 71 in 1991 and 77 in 2004 (see Figure VI.3). Thus, the predominant direction of economic flows would appear to be from older generations to younger ones. People between the ages of 65 and 75 —the majority of the group of people over 65— transfer more than they receive. In other words, instead of being a "burden" for their families, the contrary is the case. This result should be kept in mind in studies on

population fertility since it questions the premise that children constitute an insurance policy for old age which influences the decision of whether or not to have children.

FIGURE VI.3
COSTA RICA: TRANSFER ACCOUNTS AND REALLOCATIONS BY AGE, 1991 AND 2004
(In annual dollars per capita)
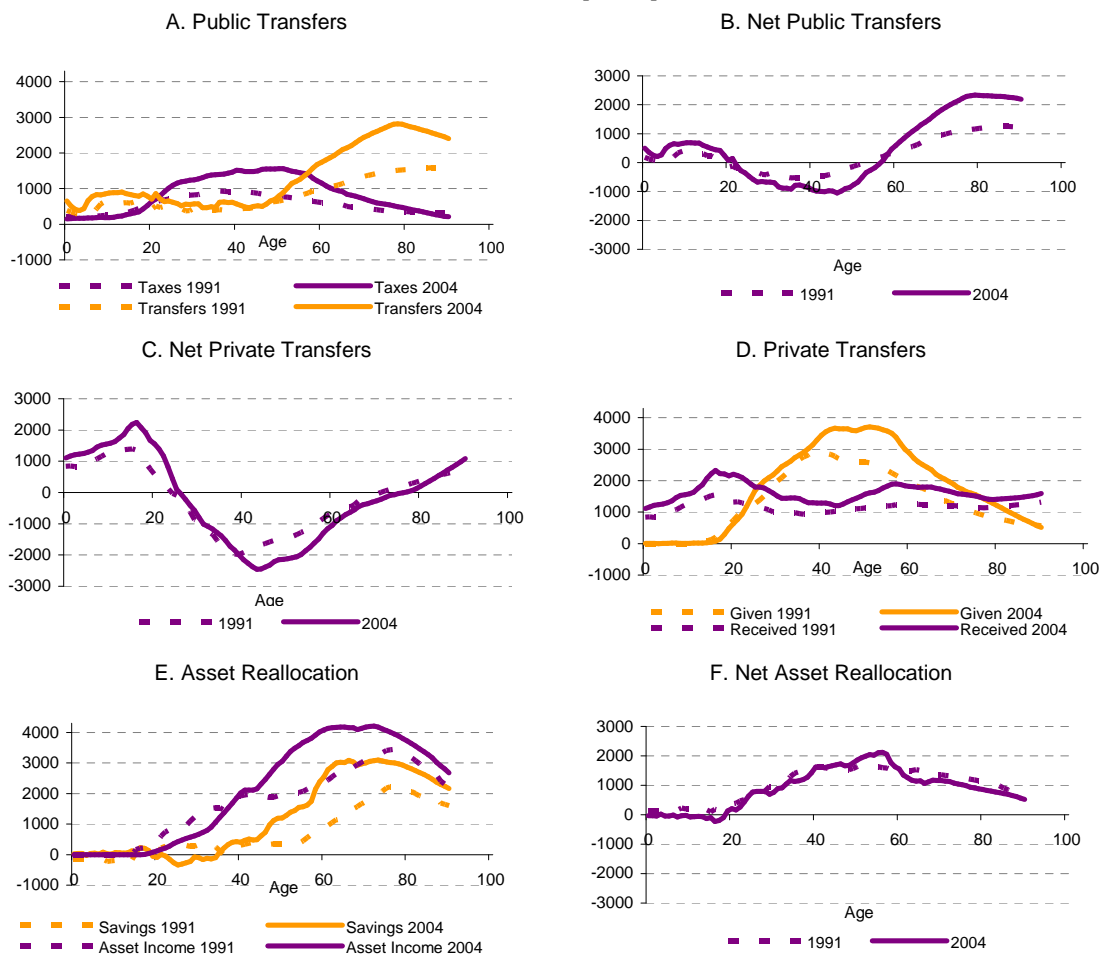
Source: Authors' calculation.

The per capita value of private transfers increased between 1991 and 2004, but the profile by age did not change significantly. The biggest change was a certain displacement to the right of the curve for transfers received, signifying an increase in transfers from older people.

The reallocation of assets is the third source of financing for the lifecycle deficit. These do not imply an intergenerational transfer —except in the case of inheritances, which are not considered in this estimate— but rather postponed consumption (savings) within the same generation so they can have an income from assets later. These reallocations represent the difference between income from assets and savings, as is shown in Figure VI.3. The graph of per capita savings is different from the expected profile, similar to the case of labour income. In particular, savings do not diminish after the age of maximum labour income (between 40 and 50 years of age), but rather only begin to do so at around the age of 80. The elderly are, therefore, important savers and their savings are probably financed with their own income from assets or from the public transfers received —i.e. pensions.

The 50-60 age group significantly increased savings between 1991 and 2004. In 2004, the maximum was reached at 73 years, but it was already very close to that level as from the age of 60, remained constant until the late 70s and then began to decline. In 1991, maximum savings were registered at an older age and continued to increase for people aged 70. It is important to note that this increase in savings at ages prior to retirement could be the result of methodological differences in calculating asset reallocations, as was mentioned above, or it could be due to an increase in savings as a consequence of people earning higher labour incomes during this period (50-65 years).

Income from assets increases with age until around the age of 70, when it begins to drop slightly, though not significantly, until the end of life. At its maximum, per capital income from assets —US$ 4,000 annually in 2004 and US$ 3,000 in 1991— is almost as high as labour income at peak earning age. This is therefore a very significant economic component for financing consumption or generating additional savings in old age. In addition, it reflects the assets or capital holdings of the population.

It should be noted that the imputed rent from homes owned is one of the most important sources of income from assets. In fact, in the euro zone, 60% of families' wealth comes from real estate (Papademos, 2007), which shows the value that housing represents as an asset to the elderly. Given the scant existence of long term financial savings instruments in Costa Rica, this could be the most common way to save. According to the 2004 estimate made in this study, imputed rent from homes owned represents 12% of consumption, a number that increases at older ages.

Though the two components of asset reallocation increased substantially between 1991 and 2004, the net values —or income from assets less savings— show an age profile and level that is very similar in both years.

To summarise the lifecycle deficit financing scenario in Costa Rica, Table VI.2 shows the percentage of consumption from the four possible sources of financing for the under 20 and 65 and over age groups. It is clear that net private transfers are young people's main source of financing; they accounted for 65% and 73% of consumption in 1991 and 2004, respectively. Generational transfers from parents to children are the fundamental source of young people's maintenance. The situation is totally different for the elderly; private transfers are practically zero in net terms. The major sources of financing for their consumption are public transfers and asset reallocations. In addition, labour income accounts for around 25%.

TABLE VI.2
COSTA RICA: FINANCING OF CONSUMPTION AMONG THE YOUNG
AND ELDERLY, 2004 AND 1991
(In percentages)

	People under the age of 20		People 65 years old or older	
	2004	1991	2004	1991
Consumption	100	100	100	100
Labour income	7	13	24	21
Asset reallocation	-3	8	27	41
Private transfers	73	65	-1	3
Public transfers	23	13	50	34

Source: Authors' calculation.

3. Demographic dividends

As has already been noted, if the per capita values by age for the transfer accounts are weighted for the population at each age and summed, then the total for each variable of interest is obtained. Repeating this calculation for several different years, while only allowing the population age

distribution to change yields the demographically-induced growth in the variable of interest if everything remained constant, except population. Figure VI.4 shows these growth rates for three variables of interest from1960 to 2060: (i) consumption, (ii) the work factor (labour income), and (iii) the capital factor It assumes a constant rate of return and that, as a result, growth in income from assets reflects growth in capital. These increases were calculated with the estimated accounts for 2004, and also, in order to observe the results' sensitivity to the premise that these accounts are constant over time, with the estimates from 1991. The results in both cases are very similar. Due to the decline in births, the curves tend to fall over time. The exception is the spike in the decade of the 90s, a result of an exceptional inflow of Nicaraguan immigrants.

FIGURE VI.4
COSTA RICA: THE TWO DEMOGRAPHIC DIVIDENDS, 1960-2060
(In percentage growth)
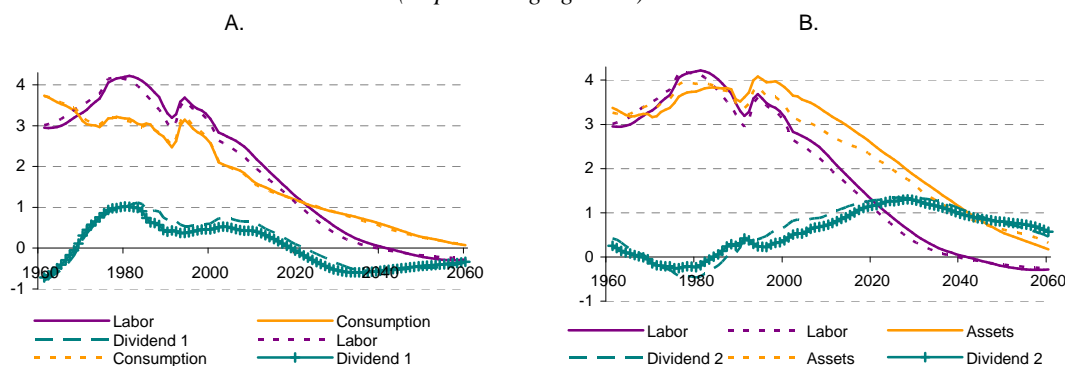
Source: Authors' calculation.
Note: The dotted lines correspond to estimates based on the transfer accounts for 1991.

Figure VI.4 shows that between 1970 and approximately 2020, labour increase more rapidly than consumption. In this 50 year period, demographic change creates a favourable economic situation: the well being of the population can increase thanks to the fact that the number of people of productive ages increases faster than the number of consumers. This is known as the first dividend or the demographic dividend and is calculated as the difference between the two growth rates, as shown in the lower curve in Figure VI.4a. Values higher than zero indicate the existence of a dividend, while negative ones indicate the opposite, a situation that will not occur in Costa Rica until around 2020. The curve also shows the boost this dividend received from the inflow of immigrants —who in general are young working-age adults— in the 1990s.

A second demographic bonus would result from the faster growth in the capital production factor than in the work production factor (Figure VI.4b) which would make possible an increase in labour productivity. There are two interrelated factors that have contributed to increased capital growth: The first is that the owners of capital goods tend to be older. Secondly, they are increasing relatively faster as part of the demographic ageing process. This second demographic dividend began in Costa Rica around 1990 and will continue to increase until around 2040. Though it will slow down after 2040, it will not become negative until the end of the projection, in 2060. While the first dividend will end around 2020 and will even become an obstacle to improved welfare, the second will remain almost indefinitely. These estimates are not sensitive to the use of different National Transfer Accounts.

The first demographic dividend mainly operates in two areas: (i) in the public sector, where the number of fiscal contributors is growing faster than the number of public transfer recipients, and (ii) in households, where transfer providers are increasing faster than the recipients. These two components of the first demographic dividend may be characterized as the fiscal bonus and the family bonus (see Figure VI.5). The fiscal dividend (the image on the left) began to operate around 1970 and

will end in 2012. It reached its maximum around 1982. The family dividend (the image on the right) also began around 1970 but will continue to benefit households until 2033. Importantly, this family dividend is larger than the fiscal dividend.

FIGURE VI.5
COSTA RICA: THE FISCAL AND FAMILY COMPONENTS OF THE FIRST
DEMOGRAPHIC DIVIDEND, 1960-2060
(In percentage growth)

Source: Authors' calculation.
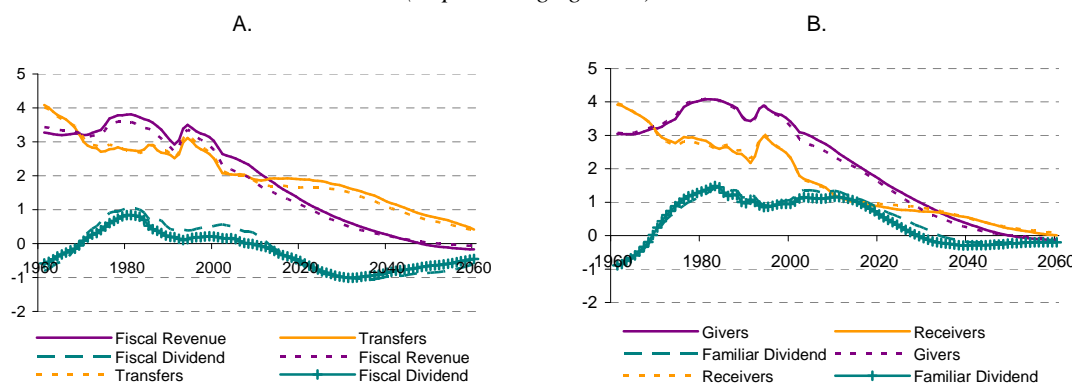Note: the dotted lines correspond to estimates based on the transfer accounts for 1991.

As already noted, the differences between these two components of the first demographic dividend is due to the fact that the lifecycle deficit for young people is mainly covered by private transfers, while that of the elderly is covered by public transfers. As birth rates fall, the youth lifecycle deficit decreases. Households are the primary beneficiaries of this change. The increased financial burden of the elderly deficit, on the other hand, will mainly affect the state.

D. Conclusions

The most noteworthy observations of the lifecycle deficit and generational transfers estimate for Costa Rica are that: (i) the government is crucial in financing the deficit of the elderly; (ii) the elderly are not generally a "burden" for their families and on the contrary, they give more than they receive in terms of transfers, including at a very advanced age; (iii) for their part, children and youths depend to a great degree on transfers from their parents; (iv) the surplus age range is relatively short in duration and after the age of 55 Costa Ricans' labour income is not enough to cover their consumption; (v) income from assets (and savings) is surprisingly high and increases until the age of 70; (vi) though there have been significant changes in the level of the per capita curves between 1991 and 2004 as a result of economic growth, the age profile follows a similar pattern.

The combination of the generational transfers system and the population trends and projections by age suggests that the ageing process among Costa Ricans is far from suggesting the catastrophe that some circles had anticipated. This can be seen in Table VI.3, which summarises the demographic dividends in three periods: (i) the past, corresponding to the last quarter of the 20th century; when the government benefited directly from the demographic dividend (ii) the present, the first quarter of the 21st century, when the government ceases to benefit from the first dividend but a second demographic dividend emerges as individual households continue to benefit from the first dividend; and (iii) the future, the second quarter of the 21st century, when the government will have to

face the end of the first demographic dividend, though it will see continued contributions to the economy from the second dividend.

TABLE VI.3
COSTA RICA: DEMOGRAPHIC DIVIDENDS, 1975-2050
(Potential annual growth per capita in percentage)

Demographic dividends	1975-1999	2000-2024	2025-2049
Bonus 1	0.81	0.43	-0.46
Bonus 1 fiscal	0.69	-0.02	-0.97
Bonus 1 familial	1.13	1.11	-0.01
Bonus 2	0.02	1.04	1.14

Source: Authors' calculation.

The demographic bonus estimates in Table VI.3 assume that the national transfer accounts remain constant over time and equal to those calculated for 2004. Though this might seem like a daring assumption, it has been shown that using the transfer accounts from another year (1991) produced essentially the same results for the demographic dividends. Therefore, the estimate appears to be quite robust and not very sensitive to the assumptions for estimating the age profiles of transfers.

After being favoured for several decades by faster growth in the demographic base of contributors than in the demand for public services and transfers, Costa Rican population ageing will certainly present a challenge to public finances in the very near future The challenge will be particularly difficult for the government sub-sector in charge of pensions and health: i.e., the Costa Rican Social Security Fund. Important adjustments will probably have to be introduced, both in terms of the benefits provided, such as the retirement age, as well as revenues. In contrast to the governmental situation, the change in the demographic structure will continue to be advantageous for household welfare for an additional 20 years.

Although the first demographic bonus is nearly extinguished for the government, it is still vigorous in households. This results from the fact that, prior to ageing, the population experienced a period of several decades of extraordinary vitality in the most productive ages. The benefit for households not only comes from the fact that there are relatively more income earners per household, but also that the balance of generational transfers involving the elderly tends to favour younger generations. Consequently, the presence of more elderly people in a household is to a certain degree beneficial. Additionally, the most important familial transfers are those made by parents to children and young people, whose relative numbers have fallen along with the birth rate.

The second demographic dividend is less obvious. It derives from the relatively significant increase in the population size of 40-70 year olds, the group that historically has the greatest accumulation of wealth and capital. It is even possible that this dividend will be substantially higher if this group increases savings in anticipation of extended life expectancies (Mason and Lee, 2007).

The increase in per capita wealth that demographic ageing would bring through investments in capital goods would deepen the capital-labour ratio and increase worker productivity. If demographic ageing leads to increases in per capita wealth and greater investment in public goods, the capital-labour ratio will deepen and worker productivity will increase; thus, spurring the second demographic dividend. As its materialisation depends on the appropriate institutions for the accumulation of productive wealth as part of the economic lifecycle, it is necessary for public policies to create or shore up such institutions.

A secondary effect of the increase in per capita wealth and the increased relative importance of income from assets will probably be an increase in social inequality and income distribution inequality. It is the responsibility of public policies to neutralise this trend with redistributive actions,

both in terms of taxes as well as transfers. For example, the government might consider taxing accumulated wealth and the income from assets so as to finance non-contributory pensions for the elderly. This would replace the current system, where such pensions are financed with salary taxes that are then allocated to the Fondo de Desarrollo Social y Asignaciones Familiares (Social Development and Family Allowances Fund, FODESAF).

The demographic dividends presented here do not guarantee increased welfare. Rather, they constitute a window of opportunity that the country may or may not take advantage of, to a greater or lesser degree. Given that the first dividend originated in the relatively swift growth in the workforce, it is vital to not only maintain but expand formal or quality employment opportunities that respond to young people's labour demands. As long as the Costa Rican economy continues to maintain close to full employment, the first dividend may continue to improve household welfare and provide relief from fiscal pressures. However, there remain potential pitfalls. If it has only served to increase consumption in households —and not for example to send children to university or to accumulate assets— then it will have improved welfare but not to its full potential. In the fiscal context, much depends on how the government uses/has used the largess of the dividend. If it has been used to postpone necessary tax reforms rather than exploited to generate increased social investment —particularly for the formation of human capital—, then its positive effect will to a certain degree have been distorted.

Bibliography

BCCR (Banco Central de Costa Rica) (2007), "Cifras de Cuentas Nacionales", [online Excel file], San José (Costa Rica), Banco Central de Costa Rica, [consulted on 11 November 2007], ‹http://www.bccr.fi.cr/flat/bccr_flat.htm›.

CCP and INEC (Centro Centroamericano de Población e Instituto Nacional de Estadística y Censos) (2008), *Costa Rica: estimaciones y proyecciones de población por sexo y edad (cifras actualizadas) 1950-2050*, San José (Costa Rica), INEC.

CCSS (Caja Costarricense de Seguro Social) (2007), *Anuario Estadístico, 2006*, "Capítulo I. Costo por consulta por año según unidad programática 1996-2006", Cuadro E52, [online], San José (Costa Rica), Actuary Division, CCSS Statistics Department, [consulted on 2 April 2008], ‹http://www.ccss.sa.cr/html/transparencia/estadisticas/actuarial/estadist/html/Anua0106.html›.

Costa Rica, MEP (Ministerio de Educación) (2007), "Solicitud formal sobre costos", [e-mail], San José (Costa Rica), Despacho del Ministerio.

ECLAC (Economic Commission for Latin America and the Caribbean) (2009), "CEPALSTAT. Estadísticas de América Latina y el Caribe", [online], Santiago, [consulted in 12 March 2009], ‹http://websie.eclac.cl/sisgen/ConsultaIntegrada.asp›.

Fernández, X. and A. Robles (coords.) (2008), *I Informe estado de la situación de la persona adulta mayor en Costa Rica*, San José (Costa Rica), University of Costa Rica.

Gutiérrez Saxe, M. (2004), "Exploración de datos censales sobre pobreza aproximada según necesidades básicas insatisfechas en la Costa Rica actual", in L. Rosero Bixby (ed.), *Costa Rica a la luz del censo del 2000*, San José (Costa Rica), Imprenta Nacional, pp. 175-204.

INEC (Instituto Nacional de Estadística y Censos) (2006), "Encuesta Nacional de Ingresos y Gastos de los Hogares", [CD-ROM], San José (Costa Rica).

INEC and CCP (Instituto Nacional de Estadística y Censos y Centro Centroamericano de Población) (2008), *Estimaciones y Proyecciones de población por sexo y edad (cifras actualizadas): 1950-2050*, San José (Costa Rica), INEC.

Lee, R.; L. Sang-Hyop and A. Mason (2008), "Charting the Economic Lifecycle: Population Aging, Human Capital Accumulation, and Productivity Growth", *Population and Development Review*, edited by A. Prskawetz, D. E. Bloom and W. Lutz, New York, Population Council.

Mason, A. and R. Lee (2007), "Reform and support systems for the elderly in developing countries: capturing the second demographic dividend", *GENUS* LXII (2), pp. 11-35.

Mata, L. and L. Rosero-Bixby (1988), *National Health and Social Development in Costa Rica: A Case Study of Intersectorial Action*, Washington, D.C., Pan American Health Organization, Technical Paper Nº 13.

Mesa-Lago, C. (2000), *Market, Socialist, and Mixed Economies: Comparative Policy and Performance-Chile*, Cuba, and Costa Rica, Baltimore, Johns Hopkins University Press.

Mesa-Lago, C. y C. Bertranou (1998), *Manual de la economía de la seguridad social en América Latina*, Montevideo, Centro Latinoamericano de Economía Humana (CLAEH).

Papademos, Lucas (2007), "Exploring the Future of Pension Finance and the Dynamics of Institutional Pension Reform", speech by Vice-President of the European Central Bank at the Conference Amsterdam, [online], [accessed 23 March, 2007], ‹http://www.ecb.int/press/key/date/2007/html/sp070323_2.en.html›.

Puga, D.; L. Rosero-Bixby; K. Glaser and T. Castro (2007), "Red social y salud del adulto mayor en perspectiva comparada: Costa Rica, España e Inglaterra", *Población y Salud en Mesoamérica*, 5(1), [online], San José (Costa Rica), Centro Centroamericano de Población, University of Costa Rica, ‹http://ccp.ucr.ac.cr/revista/index.htm›.

UNDP (United Nations Development Programme) (2009), *Human Development Report 2009,* [online], ‹http://hdrstats.undp.org/indicators/indicators_table.cfm›.

United Nations (2006), "International Migration 2006", Department of Economic and Social Affairs, Population Division, [online], New York, [accessed 12 March, 2009], ‹http://www.un.org/esa/population/publications/2006Migration_Chart/2006IttMig_chart.htm›

———— (1993), "System of National Accounts 1993 Glossary", [online], New York, [accessed May 25th, 2007], ‹http://data.un.org/Glossary.aspx?q=mixed%20income›.

World Bank (2008), *World Development Indicators 2008*, Washington, D.C.

VII. The first demographic dividend and social protection systems in Mexico

Iván Mejía Guevara, Félix Vélez Fernández Varela and Juan Enrique García López[28]

A. Introduction

This paper presents estimates of the first demographic dividend in Mexico, using population projections for the country and the most recent estimates derived from the National Transfers Account project that utilizes a systematic and consistent methodology for constructing age profiles of labour income and consumption. Special emphasis is given to the role played by social security and recent protection policies. Additionally, a brief overview is presented regarding productivity, employment, and informal labour, with the purpose of identifying the obstacles that have prevented the country from reaping the benefits of this dividend.

Measurement of the demographic dividend yielded contrasting results because its significant contribution to growth in effective workers have not been realized due to a number of factors: an economic situation worsened by world recession; the high extent of informal labour, exacerbated by the social protection programs' failure to adequately fight poverty; the excessive dependence on oil revenues, and the effort invested in tax collection.

The Mexican dividend is projected to continue for approximately another 17 years. Therefore, in light of the pressure on health and social security systems that population ageing foretells, it is imperative

---

that investment in human capital increase and that sufficient sources of formal employment be generated to effectively maximize the demographic dividend.

B. Background

Economic literature has extensively analyzed the relation between population variables and associated economic development characteristics. Some studies have exclusively considered the effect of population growth on the measurement of welfare or economic growth (Malthus, 1986; Kuznets, 1967). These conform to neoclassic theories, such as those modelled by Solow and Swan, that consider population growth an important component of economic growth (Solow, 1956; Swan, 1956). In recent years, however, research has considered the possible incidence of the age structure of the population and its associated demographic variables. Lee's study of intergenerational transfers (1994a, 199b), which was based on studies by Willis (1988) and Samuelson (1958), follows this approach and serves as a foundation for this paper.

One aspect of this approach is what is known as the demographic window of opportunity. This refers to the period when the age structure of the population has a larger number of individuals of potential working-age, an opportunity that arises during the demographic transition and is experienced by all countries at one time or another. However, this effect is more noticeable in developing countries such as Mexico.

Numerous empirical studies and different theoretical explanations have examined the connection between the demographic dividend and the window of opportunity phenomena (Bloom and Williamson, 1998; Mason, Merrick and Shaw, 1999). Mason (2007a) outlined three types of analysis that attempt to account for the economic impact of changes in the age structure of the population: (i) studies based on panel data, where there is strong evidence of age structure changes affecting both economic growth (Bloom and Williamson, 1998; Bloom and Canning, 2001; Kelley and Schmidt, 1995) and savings (Williamson and Higgins, 2001; Bloom, Canning and Graham, 2003; Deaton and Paxson, 2000); (ii) case studies of East Asian countries, which also show substantial and consistent evidence of the role of demographic transition in the economic growth rate (Bloom and Williamson, 1998; Mason, Merrick and Shaw, 1999; Mason, 2001), and (iii) macroeconomic simulations aimed at explaining the effect of age structure (Cutler et al., 1990; Lee, Mason and Miller, 2001 and 2003). Mason and Lee have identified two types of demographic dividends, which they designate as the first and second demographic bonus (Mason and Lee, 2006; Mason, 2007a).

Using panel data, Mojarro and Mejía-Guevara (2005) found important evidence of the effects of demographic change on national savings and investment in Mexico. Studies by Mason (2007b) and ECLAC (2008) also showed preliminary results for the country based on macroeconomic simulations. This follows the findings of other global studies that have included Mexico in the Latin American context (Bloom and Canning, 2001).

Among the lessons emerging from empirical studies, the experience of East Asian countries is particularly noteworthy. These countries were able to take full advantage of their demographic opportunity and achieved high growth rates, which they sustained throughout several decades. Latin America, on the other hand, has not fared as well. Although the window of opportunity is still open, the unstable growth and development indicators observed in the recent past lead to unfavourable conclusions. Recommendations arising from the Asian experience persistently reiterate the need to formulate policies aimed at boosting the favourable transition period through human capital formation, employment creation, increasing productivity, and generation of savings (Mason, 2007b). Simultaneously, there is a need to fight poverty and provide equal opportunities to every individual in society (ECLAC, 2008).

This paper presents estimates of Mexico's demographic dividend using (i) macroeconomic simulations, (ii) the population projections for the country (Partida Bush, 2008), and (iii) the most recent estimates (Mejía-Guevara, 2008 and 2009) derived from the study of national transfer accounts (NTA Project, 2009)[29]. The study confers special attention to the factors indicated in the preceding paragraph, particularly to those related to social policy and employment, as well as the obstacles that hinder the country from capitalising on this dividend.

In summary, it highlights the role played by social security and recent protection policies and the government's effort in pursuing them, and at the same time presents a brief overview of productivity, employment, and informal sector. It also provides estimates corresponding to three different years for the economic lifecycle in Mexico, which are the basis of the first demographic dividend calculation. Lastly, the most relevant issues emerging from the study are discussed.

C. Demographic analysis

1. Demographic transition

Mexico is presently at an advanced stage of its demographic transition. The decline in fertility began after the 1960's. Mortality decline dates from the post-revolutionary period. Meanwhile, international migration has had a significant impact on the population, affecting its volume, dynamics, structure and distribution. During the earlier part of the 21st century, the country recorded the largest population loss due to international migration in its history.

In 2009, the Mexican population was estimated at 107.6 million inhabitants, an increase of 9.1 million from the year 2000. This increase of 9.3% is equivalent to an average annual growth rate of 0.98%. The decline in fertility resulted in a reduction in the number of births from 2.41 million in 2002 to 1.94 million (estimation for 2009). On the other hand, a faster ageing process than the decline in mortality will increase deaths from 480,000 to 527,000 by the end of the same decade. Thus, the natural population increase was 1.93 million in 2000, but dropped to 1.41 million in 2009 —from 1.96% to 1.31% annually.

The net population loss caused by migration has remained at significant levels for several decades. The projected number for 2009 (556,000), would be 11% lower than the historical maximum recorded in 2000 (650,000). Immigration and emigration, together with the reduction in natural growth, result in a total growth rate that is increasingly lower: in 2000, the Mexican population increased by 1.31 million inhabitants, while in 2009, net growth came to 857,000, a total growth rate decrease from 1.33% to 0.80% (see Figure VII.1).

---

[29] Data prior to 2004 are estimates calculated on the basis of population projections for Mexico for 2005 (Partida-Bush, 2008).

FIGURE VII.1
MEXICO: EVOLUTION OF THE POPULATION AND NATURAL
AND TOTAL GROWTH RATES, 1950-2050
(In millions of individuals and percentages)
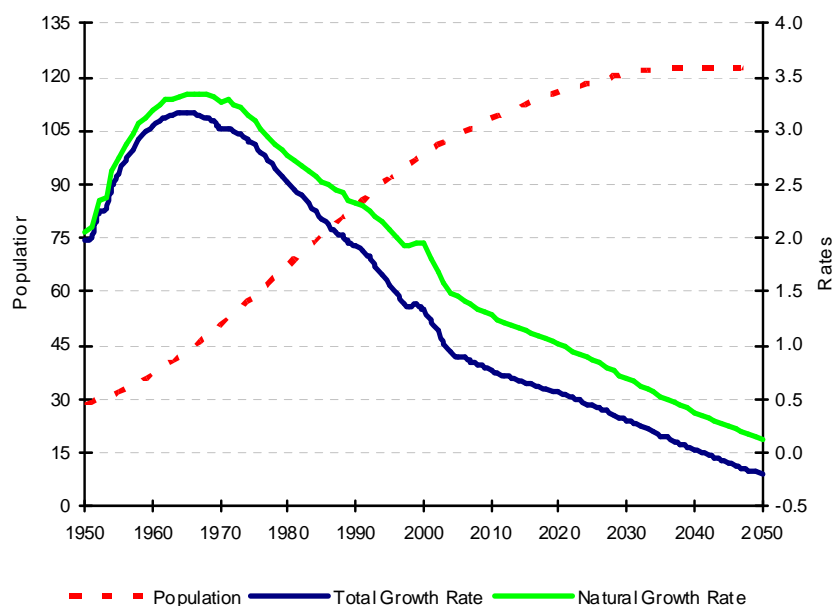
Source: National Population Council (CONAPO), *Proyecciones de la población en México, 1950-2050*, México, D.F., 2006 [online] ‹http://www.conapo.gob.mx› [consultation date: 1 October, 2009].

2. Population structure

Over the course of the coming decades, Mexico will move into even more advanced stages of the demographic transition, with an increasingly lower population growth. At present, the age structure change is favourable, which means a lower relative weight of the dependent population with respect to the working-age population.

The age structure is changing in the medium and long term: the number of children and adolescents under 15 years old is increasingly lower —in 2000, they numbered 33.6 million, whereas currently they are 30.9 million. This progressive decline is expected to continue, reaching 25.1 million in 2030 and a mere 20.5 million in 2050. Therefore, the relative weight of this age segment of the Mexican population will drop by slightly more than half, falling from 34.1% in 2000 to 16.8% in 2050.

On the other hand, the working-age population —i.e., from 15 to 64 years of age— increased during the first decade of the 21st century from 60.3 million to 70.5 million, and it is expected to continue growing until it reaches 81.5 million in 2030. Then it will decline to 75.5 million by 2050. This represents an increase in this population group from 61.2% to 65.5% between 2000 and 2009. It is expected that in 2030, two out of every three Mexicans will be part of this age segment (67.4%). This will fall to 61.9% of the population by 2050.

The number of elderly individuals will increase significantly during the first half of the current century. They totalled 4.6 million in 2000, but less than 10 years later, they have increased by one third, climbing to 6.2 million. According to population projections, this number will climb to over 14 million by 2030 and barely 20 years later, will swell to 25.9 million. Their share in the population will also increase, from 4.7% to 5.8% between 2000 and 2009; subsequently, their relative weight will

grow to 11.8% of the population, and by 2050, it is estimated that one out of every five Mexicans will be 65 years old or older (See Figure VII.2).

FIGURE VII.2
MEXICO: POPULATION PYRAMIDS, 2000-2050
(In age and percentages)
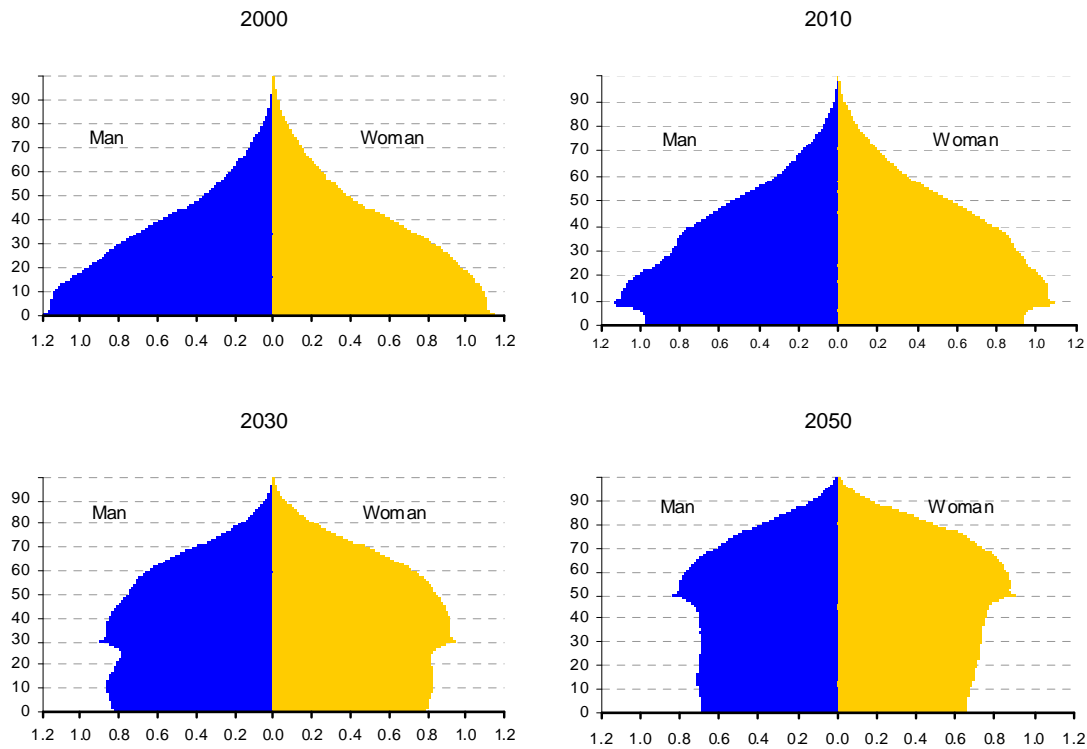
Source: National Population Council (CONAPO), Population Projections in Mexico [Proyecciones de la población en México], 1950-2050, México, D.F., 2006 [online] ‹http://www.conapo.gob.mx› [consultation date: 1 October, 2009].

The change in age structure has caused a reduction of the dependency ratio, which has given a boost to development. This ratio decreased from 63.3 dependent individuals for every 100 working-age inhabitants in 2000 to 52.7 in 2009, and it is expected that it will continue to decline until it reaches 48.4 dependents for every 100 labourers in 2030After that, it is estimated that it will begin to increase, reaching a ratio of 61.5 in 2050 (see Figure VII.3).

The growing working-age population generated the need for the creation of around 985,000 formal jobs each year between 2005 and 2010. Progress toward this goal has been moderate, as the growth rate of the economically active population has exceeded the creation of formal jobs. Therefore, this will be one of the greatest challenges in the coming five-year periods.

FIGURE VII.3
MEXICO: DEMOGRAPHIC DEPENDENCY RATIOS, 2000-2050
(In number of dependents for every 100 working-age individuals)
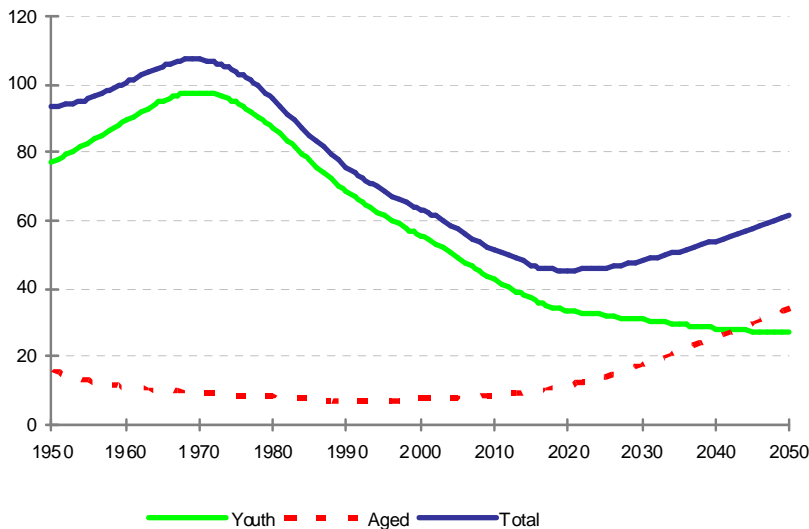
Source: National Population Council (CONAPO), Population Projections in Mexico [Proyecciones de la población en México], 1950-2050, México, D.F., 2006 [online] ‹http://www.conapo.gob.mx› [consultation date: 1 October, 2009].

D. Social protection, employment and informality

Previous studies have stressed that it is only possible to reap the benefits of the demographic dividend when certain conditions are met. The highest priority elements are human capital development, labour market flexibility, and the generation of savings. In the following paragraphs, the first two issues are addressed within the context of the mechanisms of protection and social security in Mexico, given the enormous setbacks and worsening problem of extreme poverty in recent decades.

1. Social security and strategies to fight poverty

Development and economic growth cannot take place in a country with the poverty and inequality indicators that have been recorded in Mexico in the recent past. Recurrent crises, unstable educational and health indicators, as well as lack of opportunities, are all factors that have escalated in the last quarter century and have hindered growth. Past governments have focused on overcoming the social gap that has existed historically in Mexico, with the goal of empowering the capacity of disadvantaged population groups and promoting development.

In the poverty fighting strategies implemented by the Mexican government in the past few years, the "Progresa-Oportunidades" programme undoubtedly represents the most important achievement.[30] This initiative emerged in the mid-1990s while the country was busy recovering from the economic debacle of 1994-1995, and when the only anti-poverty programmes were food subsidy

---

[30] This programme began to operate in 1997 under the name "Progresa", during President Ernesto Zedillo's administration. In 2002, during the government of President Vicente Fox, it was re-named "Oportunidades", and has maintained this name throughout President Felipe Calderón's mandate. In this paper, it is mentioned as "Progresa-Oportunidades".

mechanisms that provided mainly milk and tortillas. These programmes' ineffectiveness, the distortions they caused in local markets, the poor coverage in rural zones, and the detection of significant mistakes in the beneficiaries' inclusion or exclusion criteria, led the government to consider alternative strategies to address poverty. According to Levy (2006), in countries that have enormous income inequalities, such as Mexico, food subsidy programmes (in general, subsidy to consumption) are highly ineffective and inefficient as income transfer mechanisms.

Although the principal objective of "Progresa-Oportunidades" is to be a monetary transfer programme favouring human capital formation through temporary assistance, it also aims in the medium-term, to encourage capacity building in beneficiaries and promote their eventual self-sufficiency. For these purposes, the programme is divided into three components: education, health, and nutrition. Granting of assistance is contingent on beneficiaries meeting certain requirements such as attending schools and health care centres. Another important characteristic is that benefits are received directly by women, the homemakers, so there are no intermediaries between the federal government and the beneficiaries in this respect.

A fundamental feature of the programme is that from its inception, it has been exposed to external evaluations of its progress and shortcomings. These findings have then been incorporated into its design. Figure VII.4 illustrates the evolution of the programme's budget in terms of different benefit schemes. The assistance, in terms of quantity, has grown significantly. Adjustment by each year's number of beneficiaries shows an increase in the average annual budget per capita of 142% in health, 28% in both education –scholarships and school supplements —and money transfers, and 33% in food supplements. At the same time, operational expenses have fallen by an average of 9%. Traditionally, a considerable amount of resources have been allocated to the operation of this type of program. However, an important feature of "Progressa Oportunidades" is unlike other previous programs, it avoids the proliferation of intermediaries in the delivery of assistance.

FIGURE VII.4
MEXICO: "PROGRESA-OPORTUNIDADES" PROGRAMME'S BUDGET
EVOLUTION, BY COMPONENTS, 1997-2005
(In millions of Mexican Pesos of 2005)
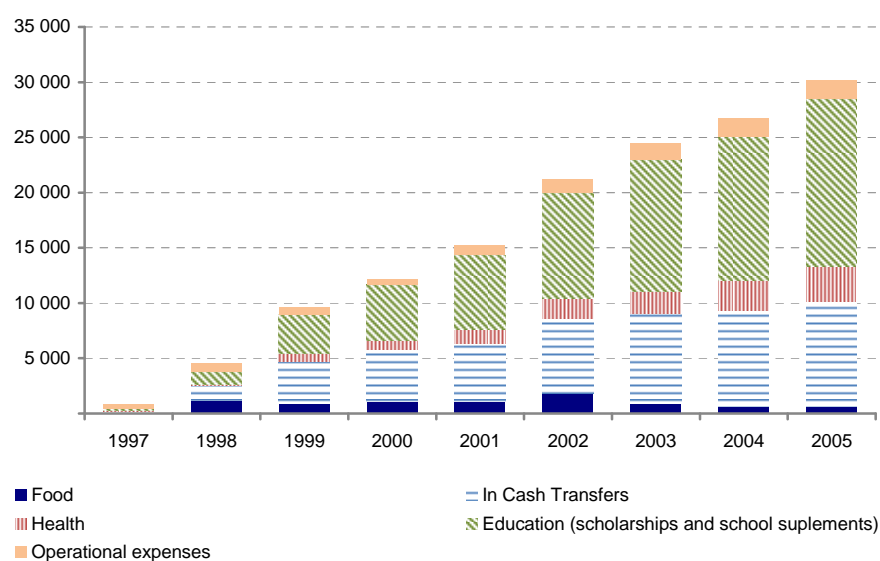
Source: Authors' calculations, based on S. Levy, Progress Against Poverty: Sustaining Mexico's Progresa-Oportunidades Programme, Washington, D.C., Brookings Institutions Press, 2006.

The Progresa-Oportunidades program covers the majority of Mexican households living in extreme poverty. In 2005, it served 5 million families in 86,091 localities throughout the country. This represented approximately one-fourth of the national population.[31] Of these localities, 85% recorded very high or moderate marginalization rates (72% and 13%, respectively); furthermore, 83,103 localities were in rural areas (97%), where most of the marginalized population is concentrated and where hardly any social protection programmes have been able to reach with this coverage level.

FIGURE VII.5
MEXICO: EVOLUTION OF "PROGRESA-OPORTUNIDADES" BUDGET COMPARED WITH OTHER PROGRAMMES AND FOOD SUBSIDIES, 1994-2005
(In millions of Mexican Pesos of 2005)
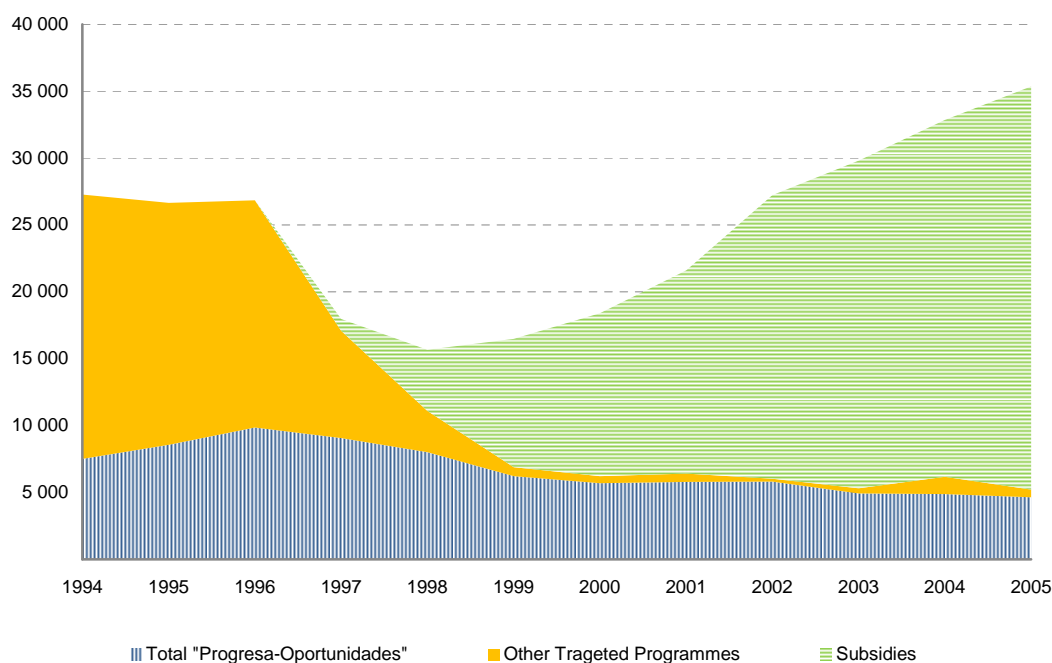
Source: Authors' calculations, based on S. Levy, *Progress Against Poverty: Sustaining Mexico's Progresa-Oportunidades Programme*, Washington, D.C., Brookings Institutions Press, 2006.

Figure VII.5 shows the evolution of the "Progresa-Oportunidades" budget in relation to other targeted subsidy programmes (the Trust Fund for Tortilla Subsidy Payment (FIDELIST), the Liconsa milk subsidy, the Children in Solidarity programme, the food packages from the National Indigenous Institute (INI), the National System for Integral Family Development (DIF) and a category that includes other benefits) and other generalized subsidies (for wheat flour, the tortilla, and those of the state-owned company Diconsa) (Levy, 2006). It shows that resources allocated to generalized subsidies have been dramatically reduced and that targeted subsidies have remained within a fairly constant range, though evidencing a downward trend. In contrast, the increase in real resources assigned to "Progresa-Oportunidades" is significant, making it the mainstay of the central government's strategy to fight poverty.

---

[31] Considering an average of 4.5 inhabitants per family, the programme's coverage for that year was approximately 22.5 million beneficiaries. In 2005, the country had a population of 103.9 million inhabitants (CONAPO, 2006).

2. Productivity, employment and informality

It is certainly very positive that the "Progresa-Oportunidades" budget has been incremented every year in real terms, particularly in view of its evident success in actual practice, a fact endorsed by several external assessments (Levy, 2006). Notwithstanding, there are several factors that must be taken into consideration. First, though poverty has not been eradicated, it is unrealistic to expect a single program to comprehensively address the problem. Additionally, it is unfair to criticize the program for not having produced the expected effect, i.e., its beneficiaries having become self-sufficient after a period of receiving assistance. It is important to realize that this was not the programme's stated purpose. Rather, it aimed at increasing insertion opportunities for underprivileged populations by means of human capital formation. Consequently, the root of the problem is not the programme's design or its results, but rather, it is the lack of programs complementary to it. It should be kept in mind that past poverty eradication strategies have failed because they were unable to offer employment schemes other than informal labour (Levy, 2008).

Secondly, the government's effort to increase social spending has not been supported by the generation of additional resources. Graph 6A presents the programmable expenditures in the public sector's budget according to their functional classification (SHCP, 2009). Between 2003 and 2008, over half of the budget was allocated to social development, economic development represented one-third, and the rest was allocated to government and autonomous authorities' duties. In other words, social spending represented almost twice the amount allocated to economic development, which includes such duties as developing the agriculture and livestock sector, communications, transport, and science and technology, among others.

FIGURE VII.6
MEXICO: PUBLIC SECTOR BUDGET'S PROGRAMMABLE
EXPENDITURE, BY CATEGORY, 2003-2008
(In percentages)

A. Percentage structure
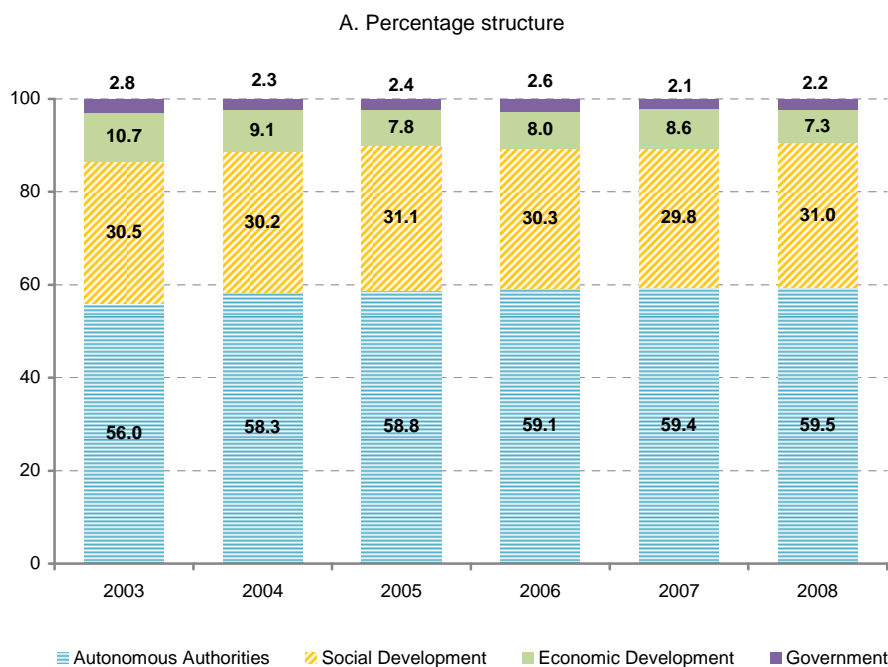
B. Social development

C. Spending as a percentage of GPD
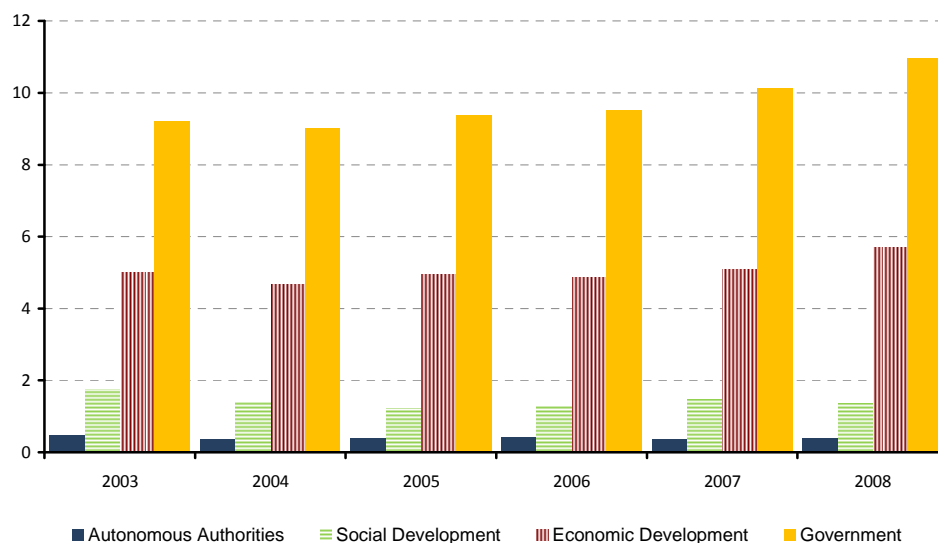
Source: Finance and Public Credit Ministry (SHCP), Federal Public Finance Account 2004, México, D. F., 2009 [online] ‹http://www.shcp.gob.mx› [consultation date: 13 October, 2009].

The federal government's budgetary income for the past twenty years has been funded mainly by tax and oil revenues —representing an average of around 90% during that period. The mean share of tax revenues between 1986 and 2007 was close to 60%, whereas the mean share of oil revenues amounted to around 30%. During the mid-1990's, the proportional share of tax revenues dropped to around 50% as a result of the crisis. This was offset by a higher share of oil revenues. Once the recovery started, government tax revenues grew, reaching their peak, close to 74%, in 2002, before shrinking again. It should be emphasized that oil revenues are influenced both by production factors and by fluctuations in external markets and international prices. Assessing the real growth of oil revenues, rather than their share of budgetary revenue, reveals a boom between 2003 and 2008. In contrast, the real growth rhythm of tax revenues declined significantly over the same period (see Table VII.1).

TABLE VII.1
MEXICO: TAX AND OIL REVENUE SHARE IN FEDERAL GOVERNMENT BUDGETARY INCOME AND AS A PERCENTAGE OF THE GDP IN SELECTED YEARS, 1986-2008
(In percentages)

Year	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Tax revenues	55.6	50.4	57.8	55.7	59.9	62.5	61.0	64.3	61.6	51.1	48.7	51.7
Oil revenues	38.3	43.3	35.0	31.8	29.5	28.8	28.3	27.1	27.2	35.5	37.6	36.0

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Tax revenues	59.2	60.7	67.0	69.7	73.6	67.7	60.6	57.4	57.1	58.6	48.6
Tax revenues (in percentages of the GDP)						10.1	9.0	8.8	8.6	8.9	8.2
Oil revenues	31.4	31.1	25.1	20.9	14.9	23.8	31.0	37.1	37.5	32.2	44.2
Oil revenues (in percentages of the GDP)						3.6	4.6	5.7	5.6	4.9	7.5

Source: Authors' calculations, based on Finance and Public Credit Ministry (SHCP), Federal Public Finance Account 2004, México, D. F., 2009 [online] ‹http://www.shcp.gob.mx› [consultation date: 13 October, 2009].

Although social development spending represents an important portion of programmable spending, there has been no significant increase in tax revenues to sustain it. Instead, there has been a dependency on oil revenues. From 2003-08, average spending for social development amounted to around 10% of the gross domestic product (GDP) (see Figure VII.6C). Tax revenues represented an annual average of 9% of GDP during this period, while oil revenues averaged around 5%. Considering that budgetary revenues are not allocated to specific spending items —i.e., it is not possible to know what proportion of the tax or oil revenue is allocated to a specific task—, these figures can be evaluated from different perspectives. One is that social development is financed almost entirely through tax revenues, with the remaining 1% coming from other sources. Alternatively, half the social spending may have been financed with oil revenues.

If during a given year, all tax revenues cover social development spending, oil revenue would cover the remaining government responsibilities. However, the uncertainty posed by the constant risk of international market fluctuations cannot be overlooked. Likewise, considering the probability and size of oil revenue reduction in 2009 and thereafter, a tax adjustment to offset the loss of this income will be necessary. In order to allocate more resources to both social development and economic tasks promoting growth and employment, an adjustment will be required to offset the loss of oil revenue.

A third factor that should be considered in this analysis of the government's strategy to fight poverty is that there is an important employment lag in the Mexican economy, which has only been exacerbated by the current economic crisis. According to Hernández Laos (2004), during the 1970-2000 period, the difference between the economically active population (EAP) and formal employment rose steadily, reaching a level equivalent to a fourth of the EAP in 2000 —in this difference, informal employment is registered as part of the EAP—.[32] The difference, as a proportion of the EAP, is shown in Figure VII.7, which clearly shows that the informal sector has played a predominant role for at least the past 25 years.

---

[32] Hernández Laos (2004) defines residual employment as the difference between the EAP and gainful employment. The author considers formal employment to be the estimate of the number of job positions required to generate production, i.e., the number of remunerated job positions estimated as necessary to produce goods and services. This difference (EAP – formal employment = residual employment) comprises both the open unemployed population (the unemployed who are actively seeking employment) and a fraction of the active population who work as self-employed. These workers have few labour benefits and, in general, are in the informal economic sector.

The Encuesta Nacional de Ocupación y Empleo (ENOE - National Survey on Occupation and Employment) of the Instituto Nacional de Estadísticas y Geografía (INEG - National Statistics and Geography Institute) utilized a different methodology to analyze the employment data, but their findings follow those of Hernandez Laos. The ENOE tabulated residual employment by subtracting the unemployed and those employed in the informal sector from the EAP total.[33] Figure VII.7 also includes these values, and it may be noticed that the previously defined trend is maintained, although in intermediate levels amounting to 27% of the EAP. If only the number of unemployed is considered, the corresponding rate has averaged around 3.5% during the past 10 years. That is to say, the level of informal labour in Mexico has averaged approximately 23% of the EAP.

In a more general context, this informal labour growth trend increased considerably following the 1982 crisis and, albeit with some fluctuations, it has maintained an upward trend.[34] During subsequent crises, there has been an increase in residual employment levels. The most recent case is that of the 2009 crisis, when an average rate of unemployment of 5.1% was recorded in the first two quarters of the year.

FIGURE VII.7
MEXICO: RESIDUAL EMPLOYMENT, 1970-2009 AND UNEMPLOYMENT RATE, 2000-2009A
(In percentages)
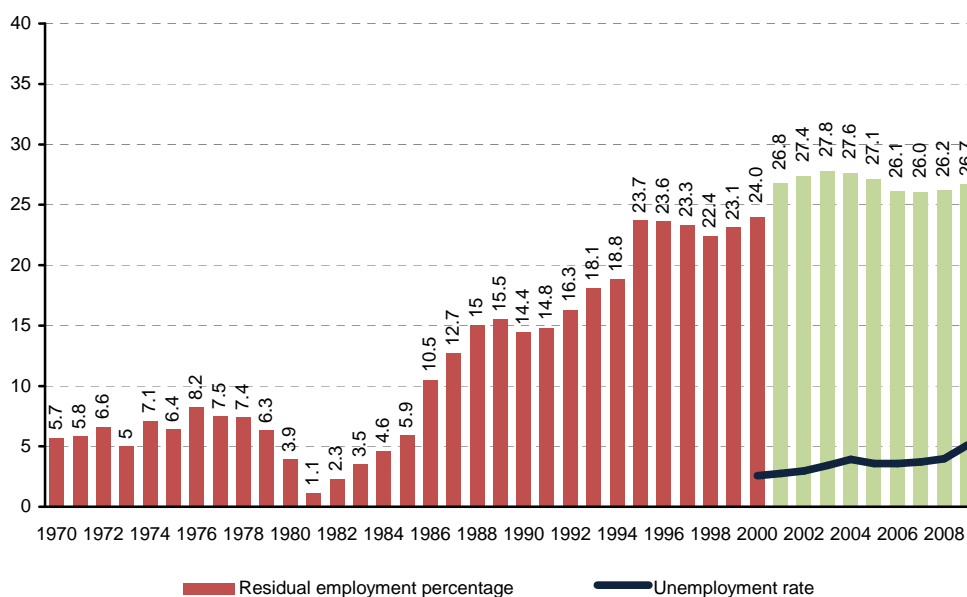
Source: Authors' calaculations, based on E. Hernández Laos, Demographic and Economic Development in Mexico (1970-2000-2030), Mexico, D.F., National Population Council (CONAPO), 2004 and Instituto Nacional de Estadística y Geografía (INEGI), "Banco de Información Económica (BIE)", [online] ‹http://dgcnesyp.inegi.gob.mx/› [consultation date: October 10, 2009].
a To calculate residual employment, use was made of the EAP information corresponding to interpolations of data provided by the National Population Council (CONAPO) for the years 1970, 1988 and 2000. Given the existence of several publications and the revision and correction of the figures prepared by the Instituto Nacional de Estadística y Geografía (INEGI), data on formal employment result from data chaining and organization of the available information.

Levy (2008) analyzed the relation between formal and informal labour in the context of social protection in Mexico. His main argument is that the incentive structure implicit in social programmes leads workers and companies to behave in ways that work against fostering long term productivity.

---

[33] Note that it is not necessarily the same definition as the one proposed by Hernández Laos.

[34] Assuming that the behaviour of informal labour has been similar to its behaviour during this period.

The author contends that it is essential to understand the difference between formal and informal labour within the context of Mexican reality. In this framework/context, the term "wage-earner" is a core concept. The denomination suggests the contractual relation executed between an employee (subordinate) and his/her employer, in which there is a compensation involved that is defined by the same labour laws that establish both the obligation to make social security contributions and the right to receive the benefits[35]. Workers who do not earn a wage are defined by exclusion, with the most important categories being the independent, or self-employed, workers and those who work for a commission, i.e. those who do not establish a subordinate contractual relation and whose compensations are not in the form of wages, but rather are commissions or a share of profits. Thus, formal workers are those wage earners registered in the Mexican Social Security Institute (IMSS). Informal workers are the self-employed, those who work legally for a commission, and those wage earners engaged by a company but not registered in the IMMS (illegally).

The previous distinction is essential to understand the differences between social security and social protection. Although social security is only guaranteed for labourers registered in the IMSS, social protection provides non-wage earners access to a series of programmes with essentially the same types of benefits. The social security program has numerous flaws: it forces workers to pay for benefits that are probably unwanted; it is expensive; there is an incompatibility between the government's objectives and the valuation of benefits by the workers, and the services are low-quality. The combination of these flaws and the social protection programmes' similar benefits makes informal labour attractive to both workers and companies, among workers and companies, to the detriment of both output and better qualified jobs (Levy, 2008).

Thus, workers are stuck in a poverty trap because they are pushed into the informal labour sector, or must emigrate in search of better working conditions. This is counter to the objectives of income transfer mechanisms such as "Progresa-Oportunidades", which is aimed at human capital formation and closing the opportunity gap for those living in poverty or otherwise marginalized. Despite their proliferation and the resources invested in these programs, they have not meaningfully contributed to fighting poverty. Clearly, in terms of eradicating poverty, the demographic dividend has not been effectively exploited.

E. Demographic dividend

1. Definitions

The demographic dividend is defined as a single period during the demographic transition when the decline in fertility and child mortality gives rise to an increase in the proportion of people at a productive age relative to the dependent age groups (Mason, 2003). The output potential of this population generates a window of opportunity to substantially increase national output. This effect can be attributed to not only a lower proportion of dependents, but also to the fact that women have more opportunities to enter the labour market because the fertility decline implies less productive time devoted to care for children. The window of opportunity, however, will eventually close because the drop in mortality leads to an increase in life expectancy and, therefore, to overall societal ageing.

To illustrate, Mason's (2007a) formulas are presented below. The number of effective consumers *(N)* and the number of effective producers *(L)* for a given year *(t)* are defined as:

---

[35]   Articles 20 and 21 of the Federal Labour Law (SEGOB, 2010).

$$N(t) = \sum_{a} \alpha(a)P(at) \quad y \quad L(t) = \sum_{a} \gamma(a)P(a,t)$$

where $P(a,t)$ is the population aged a in the year t.

Thus, the product per effective consumer (Y/N) is given by:

$$\frac{Y(t)}{N(t)} = \frac{L(t)}{N(t)} \quad x \quad \frac{Y(t)}{L(t)}$$

The first term to the right of the equation is known as the support ratio, defined as the ratio between labour income and consumption. Both are weighted by population structure. Therefore, the first demographic dividend is expressed as the growth rate of the support ratio, obtained by deriving the logarithm in the first term to the right in the following equation:

$$[\dot{L}(t) - \dot{N}(t)]$$

That is to say, this dividend is obtained when labour income growth offsets increased consumption; both are affected by the changes in the population structure. For that reason, it is said that population structure is determinant in its definition. By deriving the logarithm of the second term to the right in the formula, the rate of growth of labour output is obtained. Mason and Lee designate this as the second demographic dividend (Mason and Lee, 2006; Mason, 2007a):

$$[\dot{y}^{l}(t)]$$

In brief, the growth rate of the product per effective consumer is defined as:

$$\dot{y}(t) = \dot{L}(t) - \dot{N}(t) + \dot{y}^{l}(t)$$

In this paper, however, analysis focuses exclusively on the first demographic dividend.

Based on the aforementioned, three elements are required to calculate the demographic dividend: (i) the historical series of age profiles of average labour income, (ii) the historical series of per capita consumption by age, and (iii) the historical series of the population's age structure. Unfortunately, in Mexico, like most other countries, historical estimates are only available for the third component. Consequently, in order to obtain income and consumption profiles, Mason (2007b) recommends using cross-sectional estimates, which he assumes remain constant during the demographic transition period,

For Mexico, income and consumption estimates for the years 2000, 2002 and 2004 were used to calculate the first dividend. The profiles for 2004 (see Figure VII.8A) can also be found in Mejía-Guevara (2008 and 2009).

On the basis of the available information, Figure VII.8B compares the lifecycle deficit (difference between consumption and labour income) using the profiles corresponding to 2000, 2002 and 2004. Notably, the results do not show a significant change when using the different profiles. This is consistent with Mason's assumption (2007b) that it is possible to use a single profile throughout the entire transition period. When using the three scenarios to calculate the demographic dividend, their similarities are evident. Moreover, there is hardly any difference between 2000 and 2002 (see Figure VII.9).

FIGURE VII.8
MEXICO: LIFECYCLE DEFICIT
(In Mexican Pesos by years of age)

A. 2004

Legend: Economic Life Cycle deficit — Labor Income — Consumption
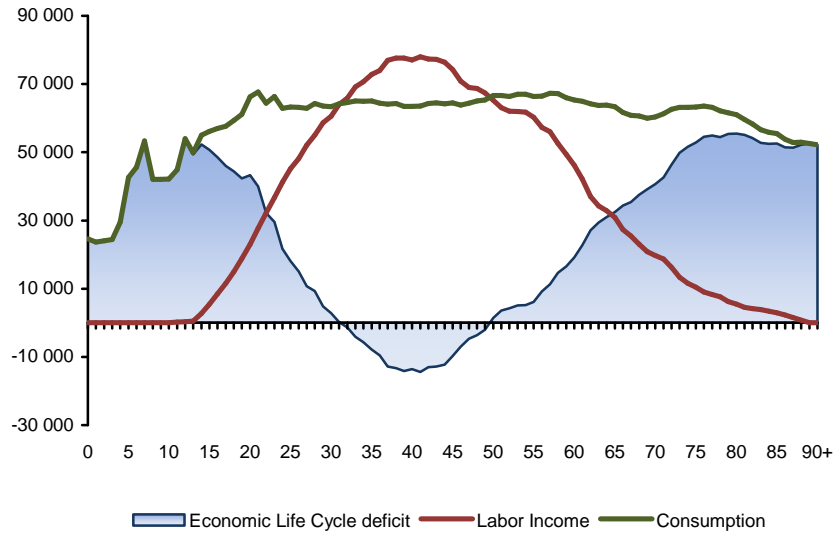
B. Lifecycle deficit and periods of surplus, 2000, 2002 and 2004[a]
(In percentages by years of age)

Periods of surplus

2004 : 32-49 (18 years)

2002 : 31-52 (22 years)

2000 : 28-51 (24 years)

Legend: 2000 — 2002 — 2004
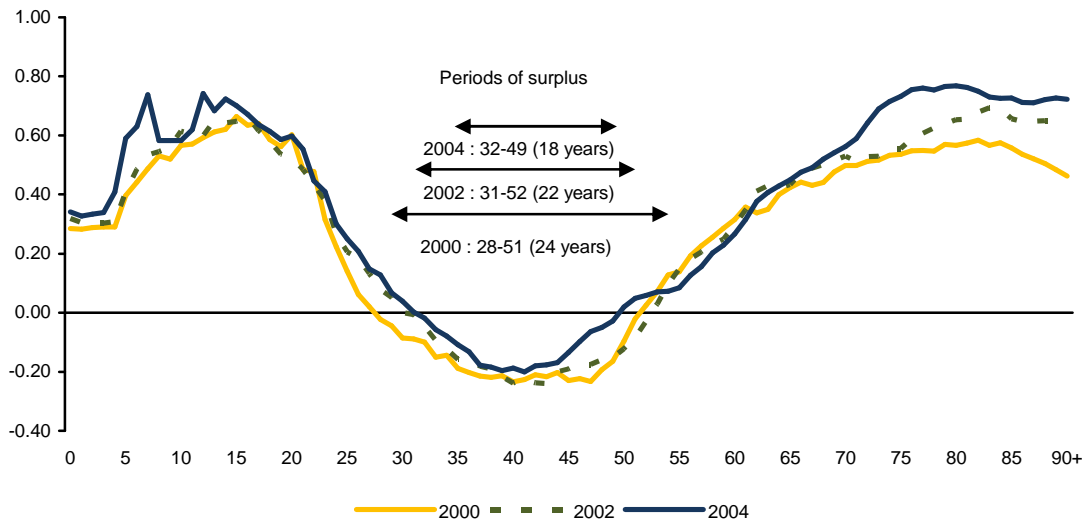
Source: Authors' calculations.
[a] Relative to the average labour income of the population between 30 and 49 years old.

FIGURE VII.9
MEXICO: FIRST DEMOGRAPHIC DIVIDEND BY AGE PROFILES, 2000, 2002 AND 2004
(In percentages)
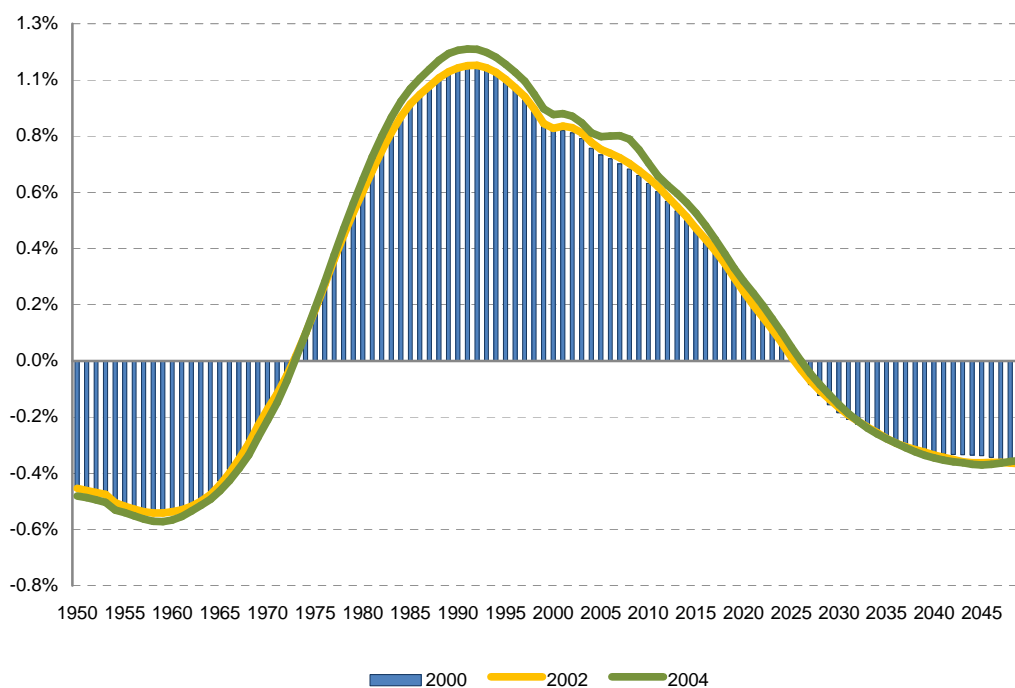
2. Results

Table VII.2 shows the long-term estimates of the first demographic dividend's economic impact, as well as the positive bonus evidenced by per capita growth rates during the period 1973-2016. The third column shows the quantification of the first demographic dividend during the period mentioned. Considering the estimates with the 2002 lifecycle profile, it may be seen that for the period 1951-1973, the demographic dividend was -0.4%. This indicates that the growth of output per effective consumer decreased at an average rate of 0.4% per year. The accumulated negative effect was close to 10%. After, from 1974 to 2008, the dividend was +0.8%; i.e. the average output growth increase per effective worker was 0.8% or, in equivalent terms, the accumulated contribution of the dividend was of the order of 28%.

The procedure followed by Mason (2007a) was used to measure the demographic impact on output. However, since no complete historical series is available on Mexican per capita GDP for the period 1950-2050, three series were chained to construct the series. The first, taken from Mejía-Guevara (2000), considers the period between 1950 and 1970; the second, constructed by the Centro de Estudios de las Finanzas Públicas (CEFP, 2003), covers 1970 to 2001;[36] and the third, covering 1980 to 2014, used data from the International Monetary Fund (IMF, 2009). To calculate the data for the years following 2014, three sustained annual growth rate scenarios were used: 2.5%, 3% and 3.5%, respectively.

---

[36] It was necessary to apply this methodology due to the discrepancies observed in the official reports of the GDP growth rate when compared with the 1970 and 1980 base years.

The results for this exercise are shown in Table VII.2. In the 2.5% growth scenario, the annual output per effective consumer during the bonus period (1974-2026) grows by 0.7% —i.e., the number of producers per effective consumer in 2026 will increase by 29.7% with respect to 1974. Looking forward, from 2009, the remaining dividend is estimated at an annual 0.4%. Due to population ageing, a negative effect of 0.3% is expected for the 2027-2050 period.

Additionally, the output growth rate per effective consumer, defined as the difference between the growth rate of per capita GDP minus the average growth rate of effective consumers, was estimated (Mason, 2007a). Table VII.2 shows that once the dividend period began, the growth rate of effective consumers was higher than the growth rate of the overall population. This growth resulted from the rapid increase of the proportion of individuals with high consumption patterns. After adjusting the per capita GDP by discounting the needs of average consumption for the period, the differences fall within a range of 3% to 15% or less at the ageing stages. The broadest differences were recorded in the positive dividend period, which implies a reduction in the per capita GDP of 15%.

TABLE VII.2
MEXICO: AVERAGE DEMOGRAPHIC DIVIDEND AND GDP GROWTH RATES,
BY EFFECTIVE CONSUMER, 1951-2050
(In percentages)

Study period	Accumulated Dividend	Demographic Dividend (support ratio) (a)	GDP per capita (b)	Effective Consumers (c)	GDP per effective consumer (d)=(b)-(c)	Contribution of the demographic dividend to growth in GDP per effective consumer (a)/(d)
1951-1973	-10.1	-0.4	3.4	-0.1	3.5	-12.5
1974-2008	28.0	0.8	1.6	0.3	1.3	64.0
GDP's average real growth rate = 2.5% (2015-2050)						
1974-2026	35.4	0.7	1.7	0.3	1.4	46.5
2009-2026	7.4	0.4	2.0	0.2	1.8	22.9
2027-2050	-6.8	-0.3	2.4	0.0	2.4	-11.8
GDP's average real growth rate = 3% (2015-2050)						
1974-2026	35.4	0.7	1.8	0.3	1.5	43.2
2009-2026	7.4	0.4	2.3	0.2	2.1	19.3
2027-2050	-6.8	-0.3	2.9	0.0	2.9	-9.8
GDP's average real growth rate = 3.5% (2015-2050)						
1974-2026	35.4	0.7	1.9	0.3	1.7	40.2
2009-2026	7.4	0.4	2.6	0.2	2.5	16.7
2027-2050	-6.8	-0.3	3.4	0.0	3.4	-8.4

Source: Authors' calculations.

Under the above assumptions, it may be observed that the first bonus has contributed, to date —i.e., between 1974 and 2008— 64% of the output growth per effective consumer will contribute 23% during the remaining time of the dividend and is expected to have contributed close to 47% over the entire period (1974-2026). The negative effect expected due to ageing (negative dividend) is quantified at around 12%. For comparison purposes, Mason (2007a) estimated that in the United States, the first dividend contributed around 20% of the GDP's growth rate per effective consumer throughout the course of the period 1970-2000. In Japan (1959-1980) and India (1975-2005), its contribution was around 12% in both cases. It is worth noting that in comparison with Mexico, not only is the effect of the bonus on the output significantly lower in these countries, but the positive dividend periods are also lower –30 years for the United States and India and 25 years

in the case of Japan. Rosero-Bixby and Robles (2008) calculated that in Costa Rica, the dividend will last until 2021 and the accumulated effect will be 37.9%. They estimated that between 1976 and 1985, rates of over 1% per year were recorded. They found that in Costa Rica, the dividend was 0.7% in 2005, which is the annual average value obtained in Mexico. Mexico also reached rates of over 1%, but they started in 1986 and were verified until 1999; their maximum value was recorded in 1992 (1.17%) From 1992, they drop, becoming negative in 2027, due, as already noted, to the ageing of the population.

The ageing of the population will have a negative impact on output, meaning that increases in labour income will no longer offset increases in consumption —and the age structure of the population at that time will considerable accentuate this effect. One can conclude therefore that population ageing is a determining factor in that its appearance leads to the end of the window of opportunity.

F. Demographic dividend or burden?

The results presented here confirm the presence of a window of opportunity in Mexico with sound estimates based on careful analysis of income and average consumption. These estimates show that the positive effects of the demographic transition are still in force and will continue to be so during the first quarter of the century. Nevertheless, the economic situation, worsened by the ongoing world recession, constitutes an adverse outlook, both currently and in the near future. Even though the economy depends on many other factors, the benefit of the demographic transition must be maximized. It is estimated that the remaining window of opportunity is 17 years. During this time, the greatest efforts must be made to increase investment in human capital and labour output in order to boost the human capital provided by the transition.

It is also necessary to end the choice between formality and informality in labour markets and to link the fight against poverty with strategies aimed at breaking the vicious circle of poverty and informality. Finally, growth policies must be formulated in other sectors and must become more inclusive. In the past, opportunities have been missed. Considering the huge pressure population ageing will put on the health and social security systems in the coming decades, it is imperative that future action be carefully and responsibly considered. This is probably the last chance to do it.

The fact that social protection programmes promote informality is contradictory, as one would expect a more educated and healthier population to contribute to greater national development. The problem consists in the incentives that social programmes provide. On the one hand, there is an attempt to provide opportunities for the disadvantaged population sectors. On the other hand, however, practices that encourage informality, a detriment to both social security and development, are promoted. This shortcoming must be addressed. Informality erodes productivity, diminishes economic growth, reduces participation, and squanders the human capital that the social programmes themselves, with great effort and resources, attempt to foster. After young people have received support aimed at integrating them into the formal labour market, their failure to do so, or their emigration abroad in search of better opportunities, is a great blow to the program's objectives. In these conditions, the contribution of an individual at a productive age, who theoretically contributes to the demographic dividend in his/her capacity as a producer (and also as a consumer), results in one more case of failing to take advantage of an opportunity.

This does not mean that these social programs do not work, but rather, that there is a lack of effective complementary mechanisms. Inevitably, this discussion leads to proposals for alternative mechanisms and reforms that will break these pernicious circles, improve productivity, and favour development. Unfortunately, the sectors in need of fundamental change are numerous and entrenched. There are corporate structures unwilling to lose the privileges they have managed to secure, groups

with monopolies on strategic sectors that wield great economic power, as well as a partisan political system that does not favour dialogue and obstructs decision making.

The previous arguments do not emerge from the analysis of a complex model, but rather from the measurement of a demographic opportunity provided by a favourable population structure. Two contrasting results may be inferred. On the one hand, the measurement of the demographic dividend's positive effect on the average growth rate per worker, and on the other, an outlook that does not favour full advantage of this dividend: low productivity, reduced levels of gainful employment and high levels of informal labour. All of the above with an additional element: the effort to boost this dividend, at least in terms of fighting poverty and reducing inequality levels, does not seem to connect properly with the employment needs mentioned.

G. Conclusions

Measurement of the economic effect of demographic indicators is a topic with widespread implications, owing to population dynamics and the differences in both growth and structure between various countries. Results inferred from multiple studies show correlations between the concepts, either positive or negative, depending on the type of study in question. In the framework of this study, the link between the effects of the demographic transition and economic growth is particularly important and especially the one related to what has been called the demographic dividend or the window of demographic opportunity.

The main purpose of this paper is to revisit the recommendations of several studies on East Asian countries that have fully taken advantage of the demographic dividend. The experience of East Asian countries suggest the need for greater investment in human capital, the promotion of gainful employment policies, and the search for methods to reduce poverty and inequality. These have been analysed in this paper within the framework of the Mexican social protection policy and the evolution of employment and informality indicators. Of particular importance is "Progresa-Oportunidades", the country's primary anti-poverty programme. The figures presented confirm the government's success and interest in preserving and strengthening this important programme in order to trigger development in the more marginalized areas, home to one-fourth of the national population.

Notwithstanding, this significant effort and, in general, the tasks related to social development spending, stand in contrast to the energy devoted to tax collection and the high dependency on oil revenues. This unfavourable evaluation does not refer to the availability of these resources, but to the fact that they are not utilized sufficiently to generate enough economic development to complement social development actions. In addition, the risk that international oil market volatility may exercise pressures on public finances is a persistent concern. Though there are occasions when this risk results in favourable outcomes, other times, such as now with the current recession and low reserves, increasing tax collection must be resorted to in an attempt to recover part of the loss in oil revenues.

Another key element has to do with the pressures that the demographic transition puts on the labour market, particularly because a large part of the working-age population has been forced to join the informal labour market due to the lack of opportunities. This situation is exacerbated by the pernicious incentives of the social programmes themselves, which counterproductively work against inclusion in the formal labour markets.

Measurement of the demographic dividend yields contrasting results, as it estimates significant contributions to the growth rate per effective worker that has not been capitalized on. The Mexican dividend has been projected to continue for approximately another 17 years. Therefore, the recommendations to increase investment in human capital and create enough sources of formal employment are no longer a policy option but rather an imperative,

considering the expected pressures on the health and social security systems due to the ageing of the population, a process that is already underway.

Bibliography

Bloom, D. E. and D. Canning (2001), "Cumulative causality, economic growth, and the demographic transition", in N. Birdsall, A.C. Kelley y S.W. Sinding (eds.), *Population Matters: Demographic Change, Economic Growth, and Poverty in the Developing World*, Oxford, Oxford University Press.

Bloom, D. E.; D. Canning and B. Graham (2003), "Longevity and life-cycle savings", *The Scandinavian Journal of Economics*, vol. 105, Nº 3.

Bloom, D. E. and J. G. Williamson (1998), "Demographic transitions and economic miracles in emerging Asia", *World Bank Economic Review*, vol. 12, Nº 3.

CEFP (Centro de Estudios de las Finanzas Públicas) (2003), *Encadenamiento de series históricas del producto interno bruto de México, 1970-2001*, México, D.F., Cámara de Diputados, H. Congreso de la Unión.

CONAPO (Consejo Nacional de Población) (2006), *Proyecciones de la población en México, 1950-2050*, México, D.F., [online] ‹www.conapo.gob.mx› [date accessed: October 1, 2009].

Cutler, D. M. et al. (1990), "An aging society: opportunity or challenge?", *Brookings Papers on Economic Activity*, vol. 1.

Deaton, A. and C. H. Paxson (2000), "Growth, demographic structure, and national saving in Taiwan", *Population and Development Review*, vol. 26, *Supplement: Population and Economic Change in East Asia*, R. Lee y C.Y. Cyrus Chu (eds.), New York, Population Council.

ECLAC (Economic Commission for Latin America and the Caribbean) (2008), *Demographic Change and its Influence on Development in Latin America and the Caribbean* [LC/G.2378(SES.32/14)], Santiago, Chile.

Hernández Laos, E. (2004), *Desarrollo demográfico y económico de México (1970-2000-2030)*, México, D.F., Consejo Nacional de Población (CONAPO).

IMF (International Monetary Fund) (2009), "World Economic Outlook Database" [online database] ‹http://www.imf.org/external/data.htm› [date accessed: October 13, 2009].

INEGI (Instituto Nacional de Estadística y Geografía) (2009), "Banco de Información Económica (BIE)", [online] ‹http://dgcnesyp.inegi.gob.mx/› [date accessed: October 10, 2009].

Kelley, A. C. and R. M. Schmidt (1995), "Aggregate population and economic growth correlations: the role of the components of demographic change", *Demography*, vol. 32, Nº 4.

Kuznets, S. (1967), "Population and economic growth", *Proceedings of the American Philosophical Society*, vol. 111, Nº 3.

Lee, R. D. (1994a), "The formal demography of population aging, transfers, and the economic life cycle", *Demography of Aging*, L.G. Martin and S.H. Preston (eds.), Washington, D.C., National Academy Press.

_____ (1994b), "Population age structure, intergenerational transfers, and wealth: a new approach, with applications to the United States", *Journal of Human Resources*, vol. 29, Nº 4.

Lee, R.; A. Mason and T. Miller (2003), "Saving, wealth and the transition from transfers to individual responsibility: the cases of Taiwan and the United States", *The Scandinavian Journal of Economics*, vol. 105, Nº 3.

_____ (2001), "Saving, wealth, and population", in N. Birdsall, A.C. Kelley y S.W. Sinding (eds.), *Population Does Matter: Demography, Poverty, and Economic Growth*, Oxford, Oxford University Press.

Lee, R.; S.H. Lee and A. Mason (2008), "Charting the economic life cycle", *Population and Development Review*, vol. 34, *Supplement: Population Aging, Human Capital Accumulation,*

and Productivity Growth, A. Prskawetz, D. E. Bloom and W. Lutz (eds.), New York, Population Council.

Levy, S. (2008), *Good Intentions, Bad Outcomes: Social Policy, Informality, and Economic Growth in Mexico*, Washington, D.C., Brookings Institutions Press.

_____ (2006), *Progress Against Poverty: Sustaining Mexico's Progresa-Oportunidades Program*, Washington, D.C., Brookings Institutions Press.

Malthus, T. R. (1986), *An Essay on the Principle of Population*, London, W. Pickering.

Mason, A. (2007a), "Demographic dividends: the past, the present, and the future", in A. Mason and M. Yamaguchi (eds.), *Population Change, Labor Markets and Sustainable Growth: Towards a New Economic Paradigm*, Oxford, Elsevier Press.

_____ (2007b), "La transición demográfica y el bono demográfico en países desarrollados y en desarrollo", paper presented at the "Reunión de expertos sobre las implicaciones sociales y económicas de los cambios en la estructura por edad de la población", México, D.F., Departamento de Asuntos Económicos y Sociales (DAES)/Consejo Nacional de Población de México (CONAPO), August 31 – September 2, 2005.

_____ (2003), "Population change and economic development: what have we learned from the East Asia experience?", *Applied Population and Policy*, vol. 1, N° 1.

_____ (ed.) (2001), *Population Change and Economic Development in East Asia: Challenges Met, Opportunities Seized*, Stanford, Stanford University Press.

Mason, A. et al. (2009), "Population aging and intergenerational transfers: introducing age into national accounts", in D. Wise (ed.), *Developments in the Economics of Aging*, Chicago, National Bureau of Economic Research (NBER), University of Chicago Press.

Mason, A. and R. Lee (2006), "Reform and support systems for the elderly in developing countries: capturing the second demographic dividend", GENUS, vol. LXII, N° 2.

Mason, A.; T. Merrick and R. Paul Shaw (eds.) (1999), "Population economics, demographic transition, and development: research and policy implications", *WBI Working Papers*, Washington, D.C., World bank Institute (WBI).

Mejía-Guevara, I. (2009), "Economic life cycle and intergenerational redistribution: Mexico, 2004", paper presented at the 26th International Population Conference, Marrakech, International Union for the Scientific Study of Population (IUSSP), September 27 - October 2.

_____ (2008), "Ciclo de vida económico en México", in F. Vélez Fernández Varela (coord.), *La situación demográfica de México 2008*, México, D.F., Consejo Nacional de Población (CONAPO).

_____ (2000), "La transición demográfica en México y su impacto económico", Master's Thesis in Economics, México, D.F., El Colegio de México.

Mojarro, O. and I. Mejía-Guevara (2005), "Efectos de los cambios en la estructura por edades de la población sobre el ahorro y la inversión en México", in E. Zúñiga-Herrera (coord.), *México ante los desafíos de desarrollo del Milenio*, México, D.F., Consejo Nacional de Población (CONAPO).

NTA Project (National Transfer Accounts Project) (2009), "National Transfer Accounts Project" [online] ‹http://www.ntaccounts.org› [date accessed: April 23, 2009].

Partida Bush, V. (2008), *Proyecciones de la población de México, de las entidades federativas, de los municipios y de las localidades 2005-2050*, México, D.F., Consejo Nacional de Población (CONAPO), [online] ‹www.conapo.gob.mx› [date accessed: October 1, 2009].

Rosero-Bixby, L. and A. Robles (2008), "Los dividendos demográficos y la economía del ciclo vital en Costa Rica", *Papeles de población*, N° 55.

Samuelson, P. (1958), "An exact consumption-loan model of interest with or without the social contrivance of money", *The Journal of Political Economy*, vol. 66, N° 6.

SEGOB (Secretaría de Gobernación) (2010), "Ley federal del trabajo", *Diario Oficial de la Federación. Leyes y reglamentos*, México, D.F., [online] ‹www.gobernacion. gob.mx› [date accessed: January 26, 2010].

SHCP (Secretaría de Hacienda y Crédito Público) (2009), "Cuenta de la Hacienda Pública Federal 2004", México, D.F., [online] ‹www.shcp.gob.mx› [date accessed: October 13, 2009].

Solow, R. M. (1956), "A contribution to the theory of economic growth", *The Quarterly Journal of Economics*, vol. 70, Nº 1.

Swan, T. W. (1956), "Economic growth and capital acumulation", *Economic Record*, Nº 32, noviembre.

Williamson, J. G. and M. Higgins (2001), "The accumulation and demography connection in East Asia", in A. Mason (ed.), *Population Change and Economic Development in East Asia: Challenges Met, Opportunities Seized*, Stanford, Stanford University Press.

Willis, R. J. (1988), "Life cycles, institutions, and population growth: a theory of the equilibrium rate of interest in an overlapping generations model", in R. D. Lee, W. B. Arthur and G. Rodgers (eds.), *Economics of Changing Age Distributions in Developed Countries*, Oxford, Clarendon Press.

VIII. Public transfers to children and the elderly in Uruguay (1994-2006)

Marisa Bucheli, Cecilia González
and Cecilia Olivieri[37]

A. Introduction

In this paper we analyze the allocation of public resources by age group, estimate the net public transfers and study their role in financing consumption, comparing 1994 and 2006 in Uruguay. We use the National Transfers Account system, specially built for measuring economic flows between age groups. The main conclusions are: (i) net public transfers implied resource flows from middle aged people to children as well as to the elderly; (ii) net flows to the elderly were larger than those to children; (iii) this gap between the net transfers received by the elders and those received by the children decreased between 1994 and 2006 due to the increase of public education expenditure and the decrease of public pensions outlays.

Uruguay is presently at an advanced demographic transition stage in comparison with the rest of Latin American countries, and since the 1950's it is deemed to have an ageing population. In 2006, it featured a global fertility rate of 2.03 children per woman, individuals over 60 years of age make up 18% of its total population, while those under 14 years old represented 22%.

Uruguay has traditionally been part of the group of countries within Latin America with lower levels of inequality and poverty (ECLAC, 2008). This performance is associated to a long tradition of social programmes and high public spending, which in 2006 reached 21% of the GDP, the third highest in the region (ECLAC, 2008). However, as is the case in most Latin American countries, poverty concentrates in the youngest population. In 2008, 40% of children between 6 and 12 years old

---

lived in poor households, while only 6% of the people over 60 years old were in the same situation (Uruguay, INE (National Statistical Institute), 2009). It should be noted that the needier sectors were at an early stage of demographic transition, which helps in accounting for these gaps (Calvo and Giraldez, 2000; Varela, 2007).

The low prevalence of poverty among the elderly is linked to an extensive pension plan coverage, which dates back to the mid-20th Century. Although these plans are widely approved by public opinion and decision-makers, academic and political circles have been repeatedly questioning the inequality in access to public benefits by children and the aged. In this context, in the mid-1990s, a set of policies began to be implemented aimed at improving the situation of children.

The purpose of this paper is to describe the allocation of public resources in Uruguay, from the perspective of the transfers received and made by age. The analysis focuses on the role of public transfers in consumption financing for children and for the elderly, and in the changes that took place in this matter during the 1994-2006 period.

The principal innovation in this paper is the use of an accounting system that allows measuring economic flows between the ages, with sound data provided by the national accounts system, known as *National Transfer Accounts* (NTA). More specifically, the estimate obtained with this system provides information on age profile regarding payment of taxes and social security contributions, and the benefits received from the public sector, thus making it possible to have an estimate of the average net transfers received by each age group, in 1994 and 2006, in this particular case.

The paper is organized in five sections, the first one of which is this Introduction. The second section presents the basic aspects of Uruguay's social policies and their amendments from 1994 to 2006; the third shows the most outstanding aspects of the methodology to estimate through the NTA system; the main results are discussed in the fourth section, and the fifth presents the conclusions arrived at through this analysis.

B. Main changes in Uruguayan public policies from 1994 to 2006

In 2006, Uruguay's real public spending was barely lower than in 1994 (2%). However, as may be seen in Table VIII.1, its structure changed: education and health in 2006 had a much higher weight, while the elderly experienced a decrease in their share of social security benefits. A general review of the main changes in public policies will shed light on the reasons underlying this change in structure.

Between 1994 and 2006, public expenditure in education grew by 66%, boosted by an increase in primary and secondary education spending, which in its turn was based on the incremental expenditure per student rather than in enrolment. Particularly during the latter half of the 1990s, the government channelled public resources toward primary and secondary education, with the purpose of financing the implementation of policies aimed at mitigating the high repletion and dropout rates in the second of these levels. Among the measures applied, a public provision of preschool education for children aged 3-5, initially being mandatory for the latter and, in 2006, for 4 year olds. Furthermore, measures were especially targeted at schools located in low socio-economic level areas, such as increasing the time children spend at school, the creation or modification of schools aimed at reducing the number of students per class —particularly in secondary education— implementing changes in the meal supply policy to encourage attendance, the implementation of teacher training programmes and the application of modifications to secondary education contents, among others.

TABLE VIII.1
URUGUAY: PUBLIC SPENDING, 1994-2006
(In percentages)

	Share in public spending		1994/2006 Variation
	1994	2006	
Public consumption	56.2	64.8	13.0
Public education	8.1	13.7	66.0
Primary and secondary level	5.9	10.9	79.0
Tertiary level	1.9	2.4	24.0
Administration and other	0.3	0.4	67.0
Public health	12.1	16.8	36.0
In cash	5.8	7.5	27.0
In kind	6.3	9.3	45.0
Other public goods and services	36.0	34.3	-7.0
Social security	42.2	34.6	-19.0
Retirements and pensions	39.6	31.5	-22.0
Family allowances	1.1	1.6	46.0
Other monetary programmes	1.5	1.5	-1.0
Others	1.6	0.6	-65.0
Total	100.0	100.0	-2.0

Source: Estimates based on the information provided by the National Accounting Office ("CGN" acronym for name in Spanish), *Budget Implementation Rendering of Accounts and Balance Sheet,* Volume II: Resources, and Volume III: Operating Expenses, 1994 Fiscal Year, Montevideo, 1994; Social Insurance Bank (BPS, acronym for name in Spanish), *2007 Statistical Bulletin*, General Consultancy in Social Security, Economic and Actuarial Consultancy, Montevideo, 2007, and Central Bank of Uruguay ("BCU" acronym for name in Spanish), National Accounting Office, *Rendering of Accounts and Balance Sheet of Budget Implementation,* Volume II: Resources and Volume III: Operating Expenses, 2006 Fiscal Year, Montevideo, 2006; Social Insurance Bank, *2007 Statistical Bulletin*, General Consultancy in Social Security, Economic and Actuarial Consultancy, Montevideo, 2007, and Central Bank of Uruguay. Complete information on national accounts is available online, ‹http://www.bcu.gub.uy/autoriza/sgoioi/cuadros.htm›.

In turn, public spending in health grew by 36% (see Table VIII.1). This expenditure has two major components. On the one hand, the public sector pays the private medical care insurance premiums corresponding to formal private workers —identified as the "in cash" component in Table VIII.1. With a stable value of the insurance premium, the increase in beneficiaries caused a 26% growth in this component, to a large extent because in the late 1990s, the programme was extended to include low-income elderly people.

On the other hand, the public sector provides the following to low-income beneficiaries, free of cost: medical services, medicines and hospital care, among other elements —component identified as "in kind" public health spending in Table VIII.1. This type of expenditure grew by 45% in the period 1994-2006, as a result of a 32% increase of the population using these services and 10% increase in spending per beneficiary.

Social security spending, by contrast, fell during this period, save for the expense caused by the family allowance programme, which grew by 46%. However, in the two years under consideration, this programme had a very small share in total spending, due to the low amount transferred and to the limited proportion of individuals it covered. In any case, it should be noted that the increased spending in family allowance is the result of several changes that took place between 1994 and 2006, which sought to target coverage to the low-income population and to increase benefits.

The drop in social security spending was caused by the performance of the retirement and pension programme. Its outlay fell by 22% in the period considered in this analysis, which is related to a reform implemented in 1996.

Up to 1995, the programme was based on a social security or pay-as-you-go contribution financing scheme. Contributions paid by workers and employers financed both the benefits provided to retirees and the pensions paid to low-income individuals or the elderly; the share of the latter was traditionally very low —around 6%. The reform substituted this system for another that combines two pillars: a social insurance and an individual account system. Up to a determined salary limit, workers contribute to the first pillar; for the salary amount received in excess of that limit, they must contribute to an individual savings account —with a ceiling over which they are exempt of payment. Thus, the benefit obtained during the retirement stage is composed by a public benefit plus an insurance premium originating from the amount accumulated in the individual savings account. The creation of a double pillar for the system implied that the average benefit assumed by social insurance will be lower for new generations of retirees.

Furthermore, the number of these new retirees has decreased in the past few years. This phenomenon is also a result of the changes introduced by the reform, due to the following: (i) it delayed women's minimum retirement age (from 55 to 60 years old), making it equal to that of men; (ii) it increased the number of work years required for retirement (from 30 to 35 years), and (iii) it changed the replacement rate, reducing it for those who retire with the minimum requirements of age and years of work, and progressively increasing the levels for those who do not comply with the requirements and continue working.

In brief, both the delay in the new retirees' retirement age and their reduced average benefits contributed to reduce the aggregate value of retirements and pensions paid by the social security.

The reform also adds elements to explain the reduced social contribution collection (see Table VIII.2). Indeed, the system's double pillar implied a loss of resources for social security financing. Counteracting this, the share of tax revenues experienced an increase, from representing 66% of public resources in 1994, to 77% in 2006.

Most of the public sector's income originates from indirect taxes —50% in 1994 and 52% in 2006, and more specifically, from value added tax (VAT), with a basic rate of 22% in 1994 and 23% in 2006, representing close to a third of the total income.

TABLE VIII.2
URUGUAY: TAXES AND SOCIAL CONTRIBUTIONS, 1994-2006
(In percentages)

	Collection distribution		Variation 1994/2006
	1994	2006	
Indirect taxes	50	52	28
Direct taxes	16	24	81
Social contributions	34	24	-15
Total	100	100	22

Source: Estimates based on the information provided by the National Accounting Office ("CGN" acronym for name in Spanish), *Rendering of Accounts and Balance Sheet of Budget Implementation,* Volume II: Resources and Volume III: Operating Expenses, 1994 Fiscal Year, Montevideo, 1994; Social Insurance Bank (BPS, acronym for name in Spanish), *2007 Statistical Bulletin*, General Consultancy in Social Security, Economic and Actuarial Consultancy, Montevideo, 2007, National Accounting Office, *Budget Implementation Rendering of Accounts and Balance Sheet,* Volume II: Resources and Volume III: Operating Expenses, 2006 Fiscal Year, Montevideo, 2006; Social Insurance Bank, *2007 Statistical Bulletin*, General Consultancy in Social Security, Economic and Actuarial Consultancy, Montevideo, 2007.

C. Data and methodology

The NTA system proposes as a starting point an accounting identity between sources and uses of economic resources at the individual level, each age group, and aggregate level. The sources (inflows) are made up of: (i) labour income (Y^l), including taxes and social security contributions paid by workers and employers; (ii) income from goods or assets (Y^a), that includes revenues (interest and dividends), disposals and inheritances, and (iii) transfers without a counterpart (T^+), both those received from public channels —provision of goods and services plus social security benefits— and from private channels, including donations from people who live in the same household. The uses (outflows) include public and private consumption (C), savings (S) and unreciprocated transfers (T^-), which may also be channelled both through the public sector (taxes and contributions) and the public sector.

Therefore, in average, for each age (e), we have:

$$Y^l\,(e) + Y^a\,(e) + T^+\,(e) = C\,(e) + S\,(e) + T^-\,(e)$$

From the perspective of the lifecycle analysis, it is possible to define its deficit for each age as the difference between the value of the goods and services consumed and produced:

$$(C - Y^l) = (Y^a - S) + (T^+ - T^-)$$

Thus, at each age, the average value of the lifecycle deficit may be financed with asset-based reallocations or from net transfers. At the same time, it is possible to distinguish between public and private net transfers.

To build these indicators, the age profiles of the different accounts were estimated using the micro-data from the Continuous Household Survey ("Encuesta Continua de Hogares –ECH") and the Household Income and Expenditure Survey ("Encuesta de Gastos e Ingresos de los Hogares - EGIH) implemented by the Uruguayan Instituto Nacional de Estadística (INE) (National Statistics Institute). The aggregate values of the different accounts are those provided by the country's official macroeconomic information. In particular, consumption, income and savings are consistent with the information provided by the national accounts system. The calculation methodology is extensively described on the NTA[38] project web site, and in Mason et al. (2009); its specific application to Uruguayan estimates is presented in Bucheli et al. (2007) and Bucheli et al. (2009). In any case, some of the methodological aspects that help to interpret the results are explained below.

Public consumption by age was estimated as the sum of three components: education, health and "other consumption". Using the micro-data, each individual was allocated an individual consumption, which allowed obtaining an average profile by age. The same was done with private consumption. It is assumed that the item "other public consumption" is uniformly distributed throughout the whole population, that is to say, it has the same average value for all ages.

Social security estimates correspond to the sum of different programmes. For each one, the benefit was attributed to the recipient, except in the case of family allowances, which are imputed to the head of household. This is because, although the beneficiaries are the children, it is the responsible adult who receives the benefit. In the case of Uruguay, where the family allowances programme has little weight considering the total income, the profile of social security transfers remains invariable when the value is assigned to the children instead of the head of household.

The NTA system assumes that all individuals pay indirect taxes. Children would do so through consumption of taxed goods. Direct taxes and social security contributions are assigned to those individuals that pay them, except in the case of net worth taxes, which are imputed to the head of

---

[38]   See [on line], ‹http://www.ntaccounts.org/web/nta/show/Methodology›.

household. As regards social security contributions, it was considered that all those for 1994 were part of the resources received by the public sector, but within those for 2006, only those contributions that flowed into social insurance were considered as public resources, while those destined to individual savings accounts were assumed to be part of the person's savings and were not considered among the financing sources of public spending.

Private transfers were divided into two types: those that take place among people from different households (inter-households) and those taking place between people of the same household (intra-household).

Since no official estimates were available on the aggregate value of inter-household transfers, an estimate was done that is not very precise. Said estimate consisted in calculating the aggregate value for all inter-households payments effected, as reported in the micro-data of the EGIH, and assuming that this value deviates from the actual one in the same proportion as the aggregate value of consumption obtained from these micro-data departs from the private consumption reported by the national accounts.

To calculate intra-household transfers, the available income was estimated first, i.e., the sum of labour income and net transfers received, both public and from other households. The data on flows originating from intra-household transfers came from the people whose consumption exceeded their available income, which theoretically was financed by members of the same household whose consumption was less than said income. In turn, if the total income available to the household exceeded its consumption, the methodology assumed that this surplus was saved by the head of household. When total income was lower than total consumption, it was assumed that the head of household financed the deficit from capital earnings or with savings from previous periods.

Lastly, to make the comparison between 1994 and 2006, values were deflated using the consumer price index.

D. Public transfers by age

This section analyses the allocation of public transfers by age profiles and their role in financing the consumption of individuals under 18 and over 64 years of age. First, there is a brief description of consumption profiles, labour income and lifecycle deficit followed by an analysis of the age profile of transfers received by the population and the payment of taxes and contributions. Finally, the role of public transfers in financing the lifecycle deficit for children and the elderly is examined.

1. Labour income and consumption-age profiles

Figure VIII.1 presents average consumption by age for 1994 and 2006, which at both dates experiences a rapid growth during childhood and adolescence years and then remains stable during adulthood.

Comparison of both curves shows that in 2006, average consumption for those under 18 was 15% higher, and that the greatest increase occurred in the lower ages. In contrast, average consumption in individuals over 64 years of age dropped by 5%. As a result, the gap between the ages declined: the ratio between average consumption of those aged over 64 and under 18 years old, went from 1.7 to 1.4 during that time.

FIGURE VIII.1
URUGUAY: CONSUMPTION PROFILE BY AGE, 1994 AND 2006
(In 1994 prices)
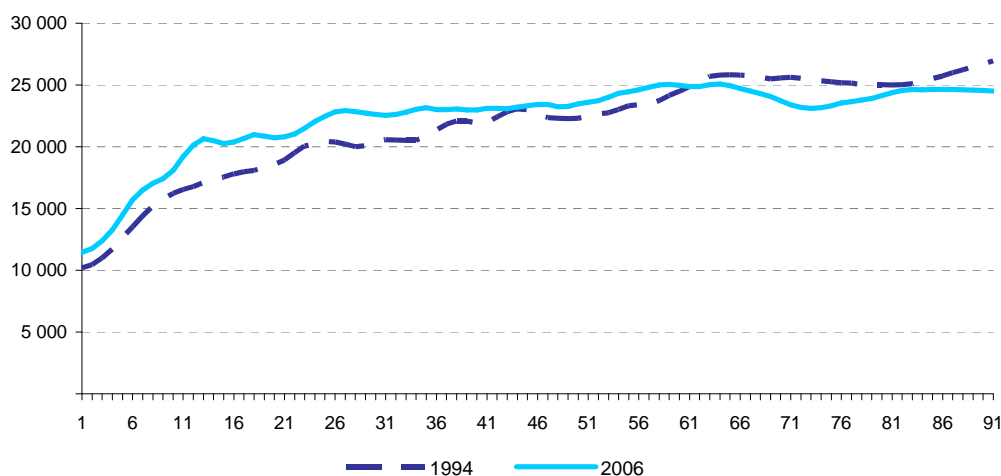
Source: Authors' calculations based on the NTA project.

Increased consumption by those under 18 years old was based on a significant growth of education expenditures (67%), sustained in increases in the public and private components (see Table VIII.3). In turn, consumption in health declined by 10% due to the contraction in private system spending, partially offset by the increased use of public services. On the other hand, consumption in health by the elderly increased 23%, mainly due to the increase in its private component.

TABLE VIII.3
URUGUAY: AVERAGE VARIATION IN CONSUMPTION BY AGE FOR INDIVIDUALS
UNDER 18 AND OVER 64 YEARS OLD, 1994-2006
(In percentages)

	Under 18 years old			Over 64 years old		
	Public	Private	Total	Public	Private	Total
Education	71.7	60.1	66.6	-	-	-
Health	28.3	-36.0	-10.1	4.4	33.1	23.0
Other	-8.8	10.4	6.1	-8.8	-11.1	-10.9
Total	23.7	10.6	14.6	-3.6	-5.5	-5.2

Source: Authors' calculations.

Figure VIII.2 shows the labour income profile by age for the two years under study. The general form of the curves is not surprising: at the beginning this income grows with age, reflecting the incorporation to the labour market and the increase in remunerations through time; then it decreases, due to a large extent to the retirement from the labour market. However, some interesting differences may be seen between 1994 and 2006.

FIGURE VIII.2
URUGUAY: LABOUR INCOME PROFILE BY AGE, 1994 AND 2006
(In 1994 prices)
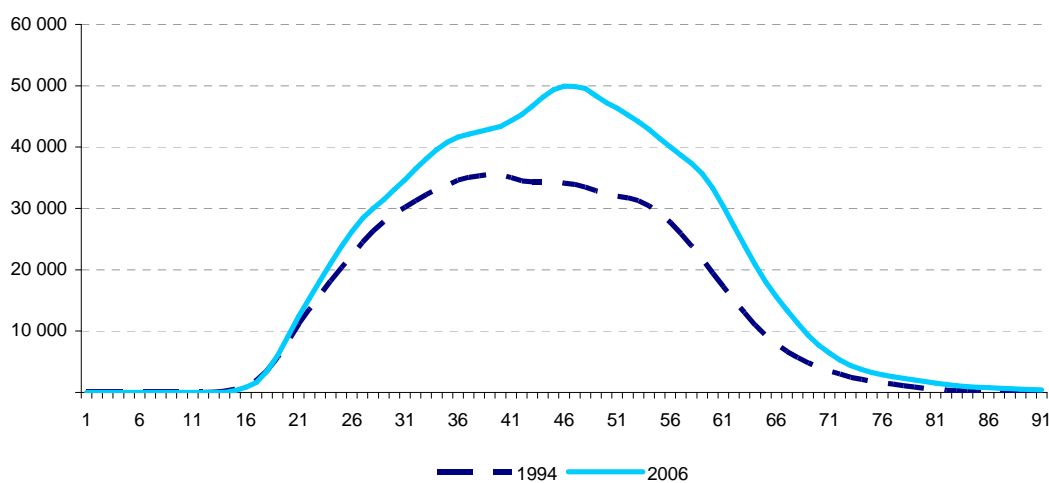
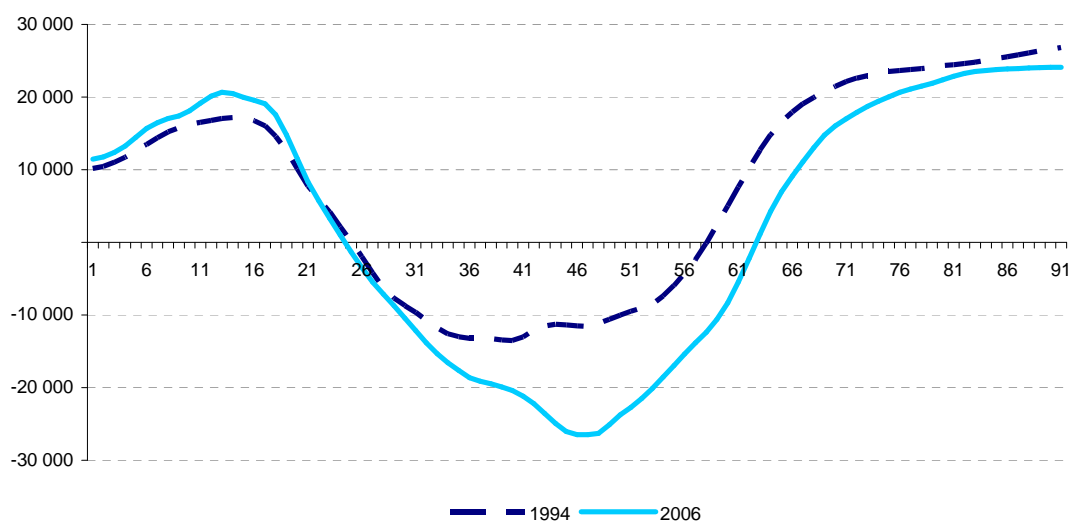Source: Authors' estimates based on the NTA project.

The most evident of these differences is the increase in labour income between 1994 and 2006. Indeed, in contrast with total consumption, which grew 9.8% during the period, labour income increased 39.6%. However, this increment was not homogeneous for all ages. The same figure clearly shows that the income profile by age in 2006 positioned itself to the right of that of 1994, so that those under 18 had a lower average income in 2006. This decline resulted from their lower participation in the labour market that year, in the context of a decreasing trend in labour activity by adolescents.

The shift to the right experienced by the curve in 2006 implied that labour income reached its peak at a later age than in 1994. Furthermore, the income increment was more significant among older people: the average labour income by age of the population aged 18 to 64 increased by 34%, while that of people over 64 increased by 102%.

This increase in labour income at older ages is consistent with delaying retirement age, encouraged by the 2006 social security reform. Two recent studies found that in the past few years Uruguay has gradually raised its average retirement age, which is expressed in the persistence of high activity rates even after the age of 60 (Álvarez et al., 2009a and b). The authors state that this is due essentially to two changes introduced by the reform, mentioned in the second section of this paper: on the one hand, women remain for a longer time in the labour market, due to the increased minimum retirement age; and, on the other hand, the changes in the replacement rate would be encouraging men to delay their retirement age.

Analysis of the lifecycle profile by age of the two years studied, shows two stages in which this deficit is positive: during childhood/adolescence and during old age. On the other hand, the surplus stage corresponds to intermediate ages (see Figure VIII.3).

FIGURE VIII.3
URUGUAY: LIFECYCLE DEFICIT PROFILE BY AGE, 1994 AND 2006
(In 1994 prices)

Source: Authors' estimates based on the NTA project.

During the 1994-2006 period, the lifecycle surplus stage increased from 32 to 37 years. At first, it remained practically unaltered (at age 25 in 1994 and 24 in 2006), but the cessation age went from 57 years in the first case and to 61 years in the second. This belated beginning of the second deficit stage concurs with the delaying retirement age.

Furthermore, the value of the lifecycle deficit by age changed: in 2006 it was higher for children and adolescents, which is consistent with their consumption increase and reduced income. In contrast, on the other end of the age groups the deficit was higher in 1994, when consumption by the elderly was higher and their labour income lower. Lastly, there was also a change in the intermediate ages, with a higher surplus in 2006.
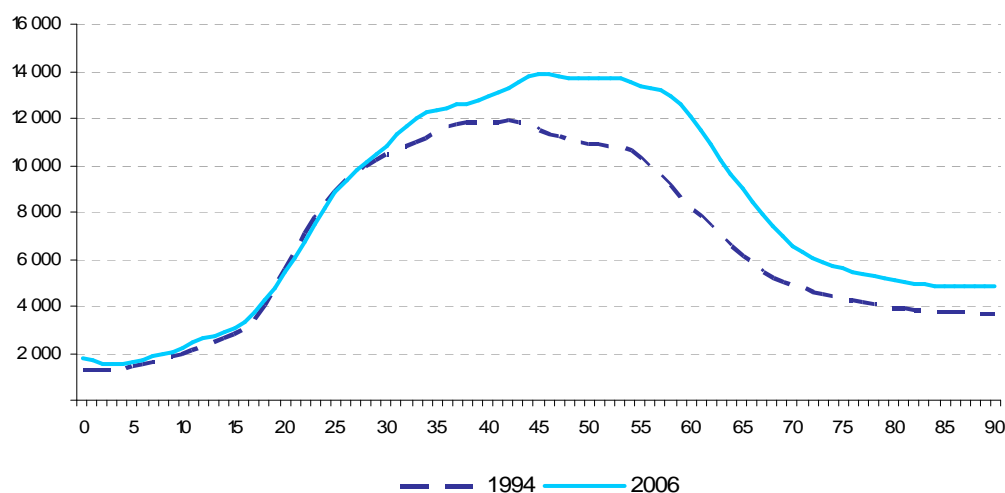
2. Public transfers profile by age

The age profile for the payment of indirect taxes is very similar to that of consumption. On the other hand, direct taxes and social security contributions essentially fall on the working age population. As may be seen in Figure VIII.4, the sum of these two profiles results in a bell-shape.

Although this general description is applicable to the two years under study, there are some differences among them. Taxes, both direct and indirect, increased for all ages, in particular for those over 24 years of age, which tended to cause an upward shift in the total payments profile. However, channelling part of the workers' social security contribution toward an individual savings account reduced the resources aimed at this item. In particular, the average payment of contributions fell for workers under 57 years of age, pushing the total payments profile downward. In any case, this decline was not so large as to offset the increase in taxes, resulting in an increase of total payments by individuals over 30 years of age, as may be seen in Figure VIII.4.

Delaying retirement age caused a slight increase in the payment of contributions for older individuals, which is the reason why this movement strengthened the increase in taxes.

FIGURE VIII.4
**URUGUAY: TAXES AND CONTRIBUTIONS PROFILE BY AGE, 1994 AND 2006**
(In 1994 prices)

Source: Authors' estimates based on the NTA project.

Average transfers by age received through public channels, or, in other words, the destination of public resources —are illustrated in Figure VIII.5. The profile of these transfers presents two "humps" at the dates in question, one before age 18 and another at age 64, markedly higher than the first one. Thus, public spending allocation by age is characterized by being aimed at extreme ages, and in particular, toward the older adult population.

Analysing the structure of these transfers toward these two groups reveals that, while spending aimed at children is mainly channelled through goods and services —especially education—three fourths of the resources received by the elderly correspond to retirements and pensions (see Table VIII.4).

FIGURE VIII.5
URUGUAY: PROFILE OF PUBLIC TRANSFERS RECEIVED BY AGE, 1994 AND 2006
(In 1994 prices)
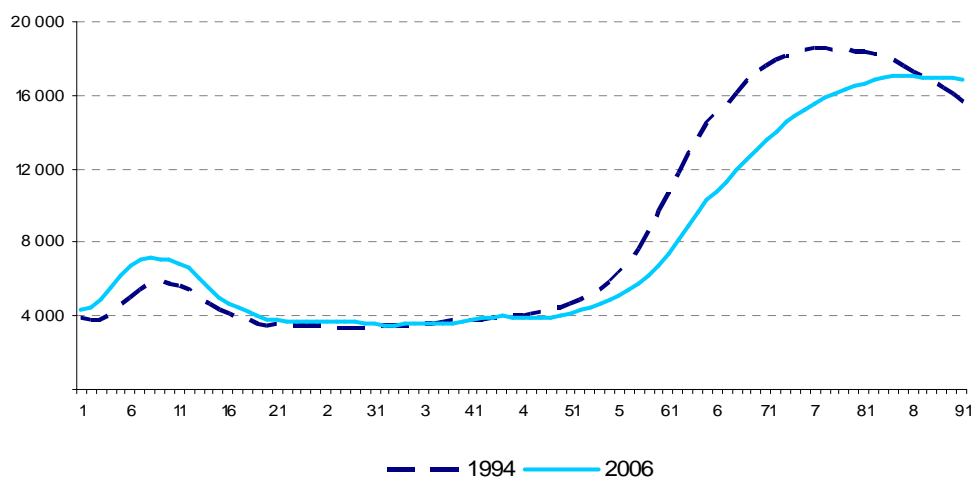
Source: Authors' estimates based on the NTA project.

TABLE VIII.4
URUGUAY: AGGREGATE VALUE OF TRANSFERS THROUGH PUBLIC SOCIAL
PROGRAMMES, BY AGE GROUPS, 1994 AND 2006
(In percentages)

	1994			2006		
	0 to 17 years	65 years +	Total	0 to 17 years	65 years +	Total
Public education	31.2	0.0	8.1	44.6	0.0	13.8
Public health	18.0	8.1	12.1	18.2	10.2	16.8
In cash	5.6	4.6	5.8	4.9	6.2	7.5
In kind	12.3	3.4	6.3	13.4	4.0	9.3
Other public goods and services	48.8	13.3	36.0	36.3	14.4	34.3
Retirements / Pensions	0.4	76.6	39.6	0.3	74.5	31.5
Family allowances	0.0	0.3	1.1	0.0	0.3	1.6
Other programmes (in cash)	0.0	0.1	1.5	0.1	0.0	1.5
Others	1.6	1.6	1.6	0.5	0.6	0.5
Total transfers received	100.0	100.0	100.0	100.0	100.0	100.0

Source: Authors' estimates.

Although the profile and structure maintained the same general characteristics in 1994 and 2006, at the end of the period the resources received by children were higher and those received by the elderly declined.

Increased transfers to those under 18 years old is essentially explained by the growth in the consumption component, particularly education. This increment was noticeably higher for the subgroup under 6 years of age, which relates to the implementation of the mandatory[39] preschool level. Therefore, as may be seen in Table VIII.4, between 1994 and 2006 the weight of public education in total transfers received by the young population increased from 31% to 44%.

In turn, the decline in transfers to the elderly was due to the reduction in retirements and pensions: their average by age for the population over 64 years of age fell by 13%.

In both years under study, total taxes and contributions paid exceeded transfers received. Thus, there is a surplus corresponding to payments made to the government that do not form part of the transfers among people through public channels. In other words, at an aggregate level, the amount transferred must be equal to the amount received, so the surplus must be eliminated from the payments to the public sector at the time of calculating net transfers by age.[40]

The profile of transfers channeled through the public sector is shown in Figure VIII.6. Both in 1994 and in 2006, children, adolescents and the elderly were net recipients, and the maximum values were clearly higher among elderly. However, the gap between the elderly and children was reduced during this period: the ratio between maximum values at each of these life stages dropped from close to 4 in 1994 to 2.3 in 2006.

---

[39] The number of children under 6 years old who attended public preschool went from 48,000 in 1994 to 82,000 in 2006 (ANEP, Education Observatory).

[40] The government may use the surplus to pay asset remunerations (such as paying debt interests) or increase public savings. These two components are part of the flows between ages carried out under the form of asset-based reallocations through public channels.

FIGURE VIII.6
URUGUAY: NET PUBLIC TRANSFERS PROFILE BY AGE, 1994 AND 2006
(In 1994 prices)
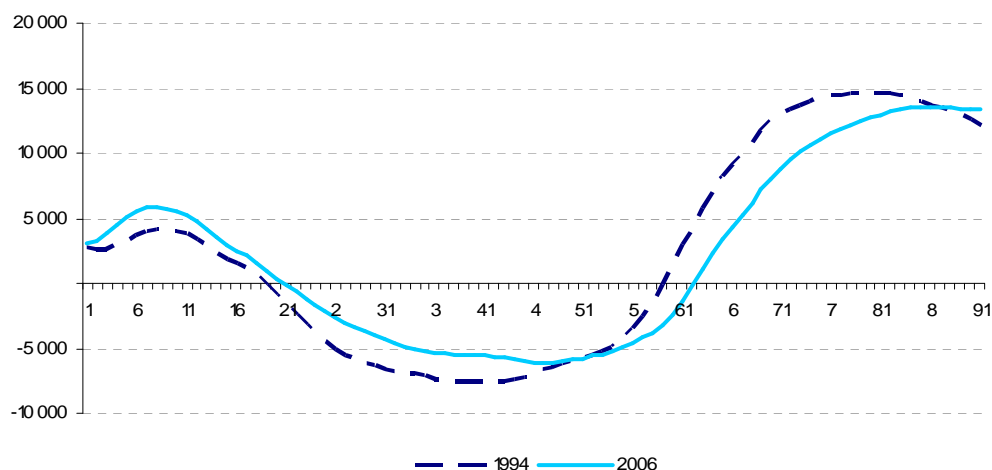
Source: Authors' estimates based on the NTA project.

3. The role of public transfers in consumption financing

As mentioned in earlier sections, lifecycle deficit stages are defined as those in which labour income does not cover consumption spending. Both in 1994 and in 2006, labour income represented barely 3% of the consumption of Uruguayans under 18 years of age. This proportion was somewhat higher for the elderly population, in whose case it increased from 7% in 1994 to 16% in 2006 (see Table VIII.5).

Therefore, in the first and last stages of life, consumption must be financed with transfers or through income derived from the ownership of assets (sales, asset income, among others), or else by means of both sources. The weight of items differs depending on whether the person is in the first deficit stage or in the second.

The younger population financed practically their entire consumption through transfers, essentially private ones, both in 1994 and 2006. Public transfers, on the other hand, financed close to one fifth of this age group's consumption. Among the elderly population, however, public transfers and asset-based reallocations were predominant. Transfers made through public channels financed around half their consumption. It should be noted that although the elderly were net recipients of public transfers in both dates under study, they made transfers (in net terms) through private channels.

TABLE VIII.5
URUGUAY: AVERAGE CONSUMPTION FINANCING FOR THOSE
UNDER 18 AND OVER 64 YEARS OF AGE, 1994 AND 2006
(In percentages)

	1994		2006	
	0 to 17 years	65+ years	0 to 17 years	65+ years
Labour income	3	7	2	16
Public transfers	19	52	23	45
Private transfers	76	-8	78	-7
Asset-based reallocation	2	49	-3	46
Total	100	100	100	100

Source: Authors' estimates based on the NTA project.

Figure VIII.7 shows the lifecycle deficit profile by age together with net public transfers in 1994 and 2006, thus making it easy to see the different roles played by the latter in childhood and old age. Indeed, such transfers financed over half of the deficit of those over 64 years old, but less than one fourth of the deficit of those under 18 years old. However, this distance was shortened between 1994 and 2006. In 1994, net public transfers represented, on average, 56% of the lifecycle deficit of the elderly, and 54% in 2006. However, in the case of children, this ratio increased from 20% to 24%.

FIGURE VIII.7
URUGUAY: LIFECYCLE DEFICIT PROFILE AND NET PUBLIC
TRANSFERS BY AGE, 1994 AND 2006
(In 1994 prices)
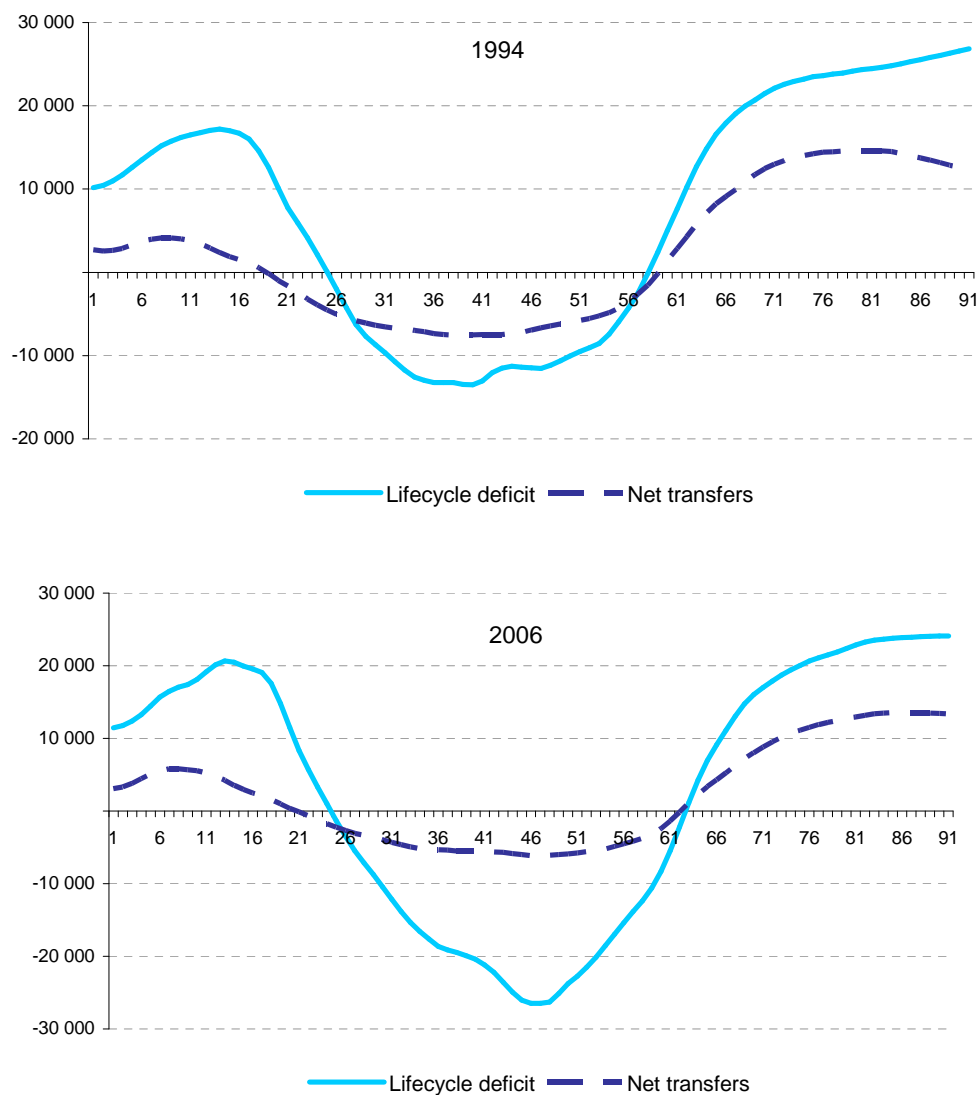
Source: Authors' estimates based on the NTA project.

E. Conclusions

Estimates realized for 1994 and 2006 provided a general description of a structural nature of the source and destination of public resources in Uruguay. Public reallocations calculated for those dates implied transfers from intermediate ages, in which labour income exceeded consumption, to children and the elderly. Public benefits received by the population under 18 years old were essentially in kind, with educational services predominating. The population over 64 years old, however, received mainly monetary transfers through the pensions programme. On average, net transfers were more significant for the elderly than for children.

The gap in public resource allocation between childhood and the aged is also observed in other Latin American countries with available estimates from the NTA system, such as Costa Rica, Chile and Brazil (Bravo and Holz, 2007; Turra and Queiroz, 2005). This is not the case in some Asian countries such as Thailand or Taiwan, where public transfers play a more important role in consumption financing for children than for the aged (Miller and Saad, 2009).

According to the estimates, during the 1994-2006 period Uruguay experienced an increase in public transfers aimed at children and a reduction in those meant for the elderly. Increasing resources targeted to children, within the context of their growing consumption, entails two positive aspects. One of them is the potential effect on their equity and equal opportunities, as it enables reducing their dependence on private transfers that characterizes childhood consumption. In other words, increased net public transfers help to mitigate the difference in funds that families can offer to their children, which would be expected to have a redistributive impact.

The second positive aspect is that the increase in resources destined to children was fundamentally due to an increased investment in public education, combined with the growth of private education. In any case, increased spending does not always translate in quality and results, and the effect of the reallocation of public resources to education has not been globally assessed. There are partial studies, such as the one by Berlinski et al. (2008), which found positive effects of the preschool education programme in reducing early desertion from the system.

The reduction of resources allocated to the over 64 year-old population was due to the drop in spending on retirement pensions. This fact was the result of various effects sought by the social security reform, within a context of an ageing process that, among other factors, affected the programme's financing. Thus, a delay in retirement age was observed, as well as a reduction of public benefits granted by social security.

In principle, the decline in net transfers for the elderly does not represent in itself a negative result, as it would be offset with the benefit originating in the individual accounts. With an increase in productivity, in the middle- and long-term the individual savings pillar would be significantly contributing to finance consumption in old age and to lighten the burden of net public transfers toward that age group.

Notwithstanding, some of the results found were not very auspicious. Average consumption of the elderly in 2006 was lower than in 1994. It is possible that this result may be concealing different situations related to socio-economic origin, so that average consumption may have been dragged down by the poorest elderly people. This suggests that the reduction of public transfers to the elderly may not be balancing out with private savings or with private transfers. Albeit the year 2006 is part of a transition period, it should be noted that in the middle- and long-term there is the risk that a considerable number of elderly people may be in a situation of poverty.

Bibliography

Álvarez, I.; N. da Silva; Á. Forteza and I. Rossi (2009a), "El retiro de los trabajadores uruguayos y la seguridad social", Working Document Nº 24/09, Department of Economics, Faculty of Social Sciences, Montevideo, Universidad de la República.

———— (2009b), "¿Qué incentivos al retiro genera la seguridad social? El caso uruguayo", Working Document Nº 23/09, Department of Economics, Faculty of Social Sciences, Montevideo, Universidad de la República.

ANEP (Administración Nacional de Educación Pública), "Observatorio de la educación", [online], ‹www.anep.edu.uy/observatorio›.

Berlinski, S.; S. Y. Galiani and M. Manacorda (2008), "Giving children a better start: Preschool attendance and school-age profiles", *Journal of Public Economics*, Volume 92, Issues 5-6, June, pp. 1416-1440.

BPS (Banco de Previsión Social) (2007), *Boletín estadístico 2007*, General Consultancy on Social Security, Economic and Actuarial Consultancy, Montevideo.

Bravo, J. and M. Holz (2007), "Inter-age transfers in Chile 1997: economic significance", CELADE-Population Division of ECLAC, Santiago, unpublished.

Bucheli, M.; C. González and C. Olivieri (2009), "Flujos económicos entre edades: Uruguay 2006", Working Document Nº 07/09, Department of Economics, Faculty of Social Sciences, Montevideo, Universidad de la República.

Bucheli, M.; R. Ceni and C. González (2007), "El sistema NTA: método de estimación para Uruguay (1994)", Working Document Nº 03/07, Department of Economics, Faculty of Social Sciences, Montevideo, Universidad de la República.

Calvo, J. J. y C. Giraldez (2000), *Las necesidades insatisfechas en Uruguay: de acuerdo al censo de 1996*, Working Document Nº 50, Multi-Discipline Unit, Faculty of Social Sciences, Montevideo, Universidad de la República.

CEPAL (Comisión Económica para América Latina y el Caribe) (2008), *Panorama social de América Latina 2008* (LC/G.2402-P/E), Santiago, Chile. United Nations Publication, Sales Nº S.08.II.G.89.

Mason, A.; R. Lee; A. Tung; M. Lai and T. Miller (2009), "Population aging and intergenerational transfers: introducing age into national accounts", in David Wise editors, *Development in the population of aging*, NBER and University of Chicago Press, forthcoming.

Miller, T. and P. Saad (2009), "National Accounts by age: an overview to generational economy" [Cuentas Nacionales por edad: una mirada a la economía generacional]", document presented at the seminar "Intergenerational transfers, population ageing and social protection", Montevideo, May.

Turra, C. and B. Queiroz (2005), "Intergenerational Transfers and Socioeconomic Inequality in Brazil: a First Look", Seminar "Demographic Changes, intergenerational transfers and social protection in Latin America", CELADE/CEPAL, Santiago, July.

Uruguay, INE (Instituto Nacional de Estadística) (2009), "Informe sobre pobreza e indigencia. Primer semestre de 2008", Montevideo, [online], ‹http://www.ine.gub.uy›.

Varela Petito, Carmen (2007), "Fecundidad. Propuestas para la formulación de políticas", in J. J. Calvo and P. Mieres (eds.), *Importante pero urgente. Políticas de población en Uruguay*, Montevideo, Fundación Rumbos and UNFPA.