Introduction

Uruguay’s demographic transition, because it changes individual economic behaviors and results in each age group, carries important economic implications. Broadly speaking, individuals go through three stages in life. The first is childhood and adolescence, when individuals do not yet generate their own resources and are sustained by the rest of society. A second period begins when the individual enters the labor market earning an income that helps sustain the individual and others, including children and adolescents. The third stage begins at retirement when labor income is lost and individuals begin relying on savings and, once again, transfers from the rest of society.

This description highlights the importance to a society of mechanisms that ensure that the surpluses created by second-stage individuals flow to people in the first and third stages. These mechanisms may be private (for example, when parents provide food to their children) or public (government collecting taxes to provide services and benefits). Ensuring these mechanisms are adequate creates two demographic challenges.

In one, falling birth and mortality rates progressively age the population, and, in its most advanced stage of the demographic transition, reduce the proportion of the population that generates resources. This progressively increases pressure on second-stage individuals to sustain the entire population. In other words, as chapter 2 explains, this change affects the dependency ratio, and as a result, the economic support ratio (between resources created and resources consumed).

Aging also increases the ratio of elderly individuals to children. The mechanisms that ensure transfers to children are distinct from those to the elderly. It is sufficient to observe that children live with adults, forming households which have to make various decisions, including those surrounding how to support each member. Meanwhile, group living situations are less common among individuals in the second and third stages, requiring coordination among households to make transfers among them. When the ratio increases it can mean that the well-oiled mechanisms used to carry out transfers in a society, accustomed to a certain balance between the populations of the elderly and children, may cease to function.
Specifically, public institutions tend to need more time to design, agree upon, and implement the necessary reforms. As a result, the eventual lack of resources to ensure support through the stages of the life cycle, as well as greater intergenerational equity, generally manifests itself in public transfer mechanisms rather than in private ones.

This chapter is interested in three aspects of this situation. It describes the economic life cycle in Uruguay and examines the role of public transfers, especially social spending, as necessary flows to ensure support in the first and last stages of the life cycle. And it analyzes the effect of demographic change on the economic support ratio, on public accounts, and, especially, on public social spending.

The dataset was prepared following the estimation methodology of the National Transfer Accounts System (known as the NTA System) presented in box 3.1. These accounts offer information on income, consumption, and, more generally, economic flows by age, allowing us to analyze ratios between age groups.

Box 3.1 The National Transfer Accounts System Relevance to Public Policy in Uruguay

The National Transfer Accounts (NTA) System was developed as part of an international project started in 2000 by Ronald Lee (University of California, Berkeley) and Andrew Mason (University of Hawaii) to compile information about intergenerational transfers in different countries. Specifically, the NTA System allows disaggregation of its principal components (and subcomponents) by age to understand how families, the market, and the government interact to sustain individuals throughout the life cycle.

Among other applications, the system has been identified as a fundamental source of information in the design of public policies, given that these have distinct impacts (explicit or implicit) on different age groups. For example, as Miller and Castanheira (2013) and Gragnolati and Troiano (2014) point out, public sector expenditure on primary education is mostly concentrated on ages 3–17, with less impact on individuals at other stages of the life cycle. The system accounts for this phenomenon, assigning the expenditure (or benefit) of education to the individuals that truly receive it. Thus, the NTA age profile captures both educational enrollment (which is greater among the 3–17 age group) as well as the benefit received by each student (thereby capturing the differences in the education subsystems).

NTA estimates for Uruguay exist for 1994 and 2006, while the estimates in this chapter refer to 2013, and are constructed based on two datasets. For each category macro-controls are calculated, which consist of the aggregate values of the various components and subcomponents (such as public education consumption, family allowances, labor income) which ensure consistency with the national accounts and official figures published by the relevant institutions. In Uruguay’s case, the macro-control values mainly come from the national accounts created by the Central Bank of Uruguay (2013), the Budget Performance information as reported by the General Accounting Office of the Nation (2013), and information from the Social Security Bank (2013). To perform the distribution of the macro-controls by age group,
Box 3.1  The National Transfer Accounts System Relevance to Public Policy in Uruguay (continued)

we primarily utilized information from the Continuous Household Survey (National Institute of Statistics 2013) and the Household Income and Expenditure Survey (National Institute of Statistics 2006). Finally, the NTA estimates are consistent with the 2013 population age group estimate carried out by the United Nations (2014).

In general terms, the method for estimating a component follows three steps. First, the average level of consumption or income obtained from the microdata (Continuous Household Survey or the Household Income and Expenditure Survey, depending on the situation) is attributed to each age group (single age groups). Second, a smoothing procedure is performed for each age group for the attributed levels. Third, the aggregate value by age group is calculated, taking into account the total population for each age group, and the data is then rescaled such that the aggregate value coincides with the macro-control. Throughout the chapter, more information is provided regarding the estimation of specific categories.

The Economic Life Cycle

Income and Consumption

In a calendar year, income generation relies on individuals in the middle-age groups. To measure this pattern, figure 3.1 presents average labor income by age in 2013 relative to average labor income for the 30–49 age group. Labor income includes the taxes and contributions paid by workers and employers; in other words, it includes the value of the entire cost of labor (see box 3.2). To calculate the average for each age group, one must account for the entire population; individuals who do not work and do not generate income are calculated as zero income. This explains why the curve has a bell shape. The early zero-income years correspond to the economically inactive years when individuals are children. During adolescence and youth, average labor income grows with age for two reasons: the number of people entering the labor market increases and remuneration per employed person grows. The maximum value is achieved around age 50. From that point on average income falls, mostly as an effect of retirement until it is once again nearly zero at more advanced ages. The general shape is similar to that from 2006, although the maximum point is now at a slightly older age (Bucheli and González 2011). International evidence uncovers similar profiles in all countries, while less developed countries exhibit higher levels of income generation at the early and advanced ends of the age spectrum (Mason and Lee 2011).

Consumption, in contrast, occurs throughout the life cycle, which is reflected in the flatter age group profiles. In the Uruguayan case, the data from 2013 (the estimation methodology is presented in box 3.2) show that consumption increases continuously with age (figure 3.1). The international evidence indicates that in all countries consumption is lower during childhood than during old age, although in general the difference is less significant in developed countries (Tung 2011). In any case, not all countries show sustained growth at older ages, including Uruguay.
Box 3.2 Estimating Consumption and Labor Income by Age

The macro-controls related to consumption are based on the National Accounts (Central Bank of Uruguay 2013). Public consumption includes production of services from the central and departmental governments, as well as compulsory social security mechanisms (Social Security Bank and other parastatal funds). It does not include investment expenditure, transfers, or market production. To estimate the National Transfer Accounts (NTA) by age, we calculated three components separately: education, health care, and other (remainder). This required estimation of macro-controls for each component.

The consumption macro-control for public education was estimated based on the budget exercise information from the General Accounting Office of the Nation (2013), and considered each of the education subsystems separately. Specifically, it includes all of the services under the control of the National Administration of Public Education, including teacher training, early childhood education managed by the Uruguayan Institute of Children and Adolescents (Child and Family Care Centers Plan), and university education (University of the Republic). To estimate the profile by age group, we estimated per-student expenditure in each subsystem and then assigned those values to each age group based on the attendance statistics obtained from the Continuous Household Survey. In this case, we did not perform any data smoothing to reflect the changes resulting from the different costs at each level of education.

To analyze consumption, we obtained information about consumption in education, health care, and other types of consumption, divided into its public and private components. It is necessary to remember that private consumption is the total value of the goods and services purchased by family units, while public consumption reflects the goods and services individuals access through the public sector without having to pay a fee for them.

The consumption profile's upward trend as age increases is the product of the behavior of private consumption. This is clear in figure 3.2, where public and private consumption are presented separately. Moreover, the same figure shows what has been called the “consumption remainder,” in other words, consumption

To calculate private consumption, we followed the NTA methodology and used figures net of taxes minus grants. The consumption macro-control for education was estimated based on its share of private consumption in 2006, which is the year for which the Household Income and Expenditure Survey is available, corrected to account for changes in the price index and private tuition. The survey was also used to create the profile by age group. For health care, the macro-control was estimated based on Oreggioni and Rivas (2015), which reports household spending on premiums paid to the Collective Medical Assistance Institutions and health insurance companies, co-payments, and direct payments by households for medications and other health care goods and services. The profile is equal to the one showing the funding provided by FONASA, except for direct payments by households, which were estimated based on the profile provided by the Household Income and Expenditure Survey in the “non-sick expenditure” category.

Labor income comprises cash payments, social security benefits, direct taxes paid by workers, and self-employment income. The labor income macro-control is estimated by Burdin, Esponda, and Vigorito (2014) in a work that updated the Income Generation Accounts (the Central Bank of Uruguay stopped publishing this account in 2006). The labor income profiles and their subcomponents are estimated based on the Continuous Household Survey 2013.
minus health care and education. This allows us to note that the upward trend is particularly the product of the so-called “private consumption remainder,” which is the primary component of consumption.

Total public consumption is less than private consumption for all age groups. It is relatively higher during the early years of the life cycle: the public component’s proportion is around 40 percent of the total during childhood, but it is notably lower (from 12 percent to 18 percent) at other ages. It falls during middle age and increases again during old age. The significance of public consumption during childhood is primarily explained by education, while the increase in public consumption at advanced ages is due to consumption of health care. Thus, public consumption is redistributed among age groups, with higher spending on children and the elderly than on the working-age population.

Education is one component of human capital investment. In 2013, it represented an estimated 8 percent of total consumption, rising to 20 percent for the 0–29 age group. As an age group that does not generate sufficient income, this means that transfers are crucial for ensuring this investment occurs. A portion of these transfers come through private channels, primarily from other household and family members. These fund private consumption of education, including tuition for private establishments, spending on books and school supplies, payments to private tutors, and so on. Another portion, through public channels funded by taxes, is public consumption of education, which includes current expenditure on public education.
Figure 3.3 shows the age group profiles of public and private consumption of education through age 40. These profiles represent education consumption per person, thus simultaneously reflecting both consumption per student and educational enrollment. Public is always larger than private consumption, and around 65 percent on average for the age groups corresponding to early and primary education. It is lower for ages 13–18, remaining at 58 percent on average, and higher for age groups corresponding to tertiary education, reaching 70 percent for the 19–24 age group. Private consumption is higher for the age groups corresponding to secondary education.

In both 2006 and 2013, Uruguayan society designated 12 percent of labor income to education consumption. This means that the effort measured as a proportion of income was stable. However, a change is observed in the public/private structure: in 2013, 63 percent of consumption in education occurred through public channels, while in 2006, this figure was 47 percent. This change was especially apparent in secondary education, in which private channels were predominant over public channels in 2013. It is important to remember that while public consumption of education is almost totally dedicated to students in the public sector, private consumption of education includes students in both sectors, given that some resources and services (such as notebooks, supplies, and so on) are a family’s responsibility regardless of the type of educational establishment.

Health is another important determinant of human capital. Health care consumption is especially intense at advanced ages, however, in contrast with...
education, representing 10 percent of the entire population’s consumption and 15 percent of individuals over age 64.

Figure 3.4 presents the consumption profile in health care, differentiating between public and private components. Public consumption refers to the services funded through taxes: it includes direct provision and National Health Care Fund (Fondo Nacional de Salud; FONASA) funding. Private consumption is goods and services financed by individuals: spending in care facilities, payments for medical tests, purchases of medication, and so on. Remember that, in this case as well, average consumption is calculated for the entire population, thereby capturing both the number of and expenditure per consumer.

Sixty-seven percent of health care consumption occurs through public channels. The public sector is more important for the “deficit” age groups: that is, it represents around 70 percent of health care consumption for individuals under age 20 or over age 64. In contrast, 62 percent of spending for those aged 30–49 is private consumption.

Finally, figure 3.5 presents income and consumption aggregated by age. These values are obtained by multiplying the average for each age group (figure 3.1) by the population of each age group, such that the sum of these values represents the country’s labor income and consumption. Because the weight of each age group within the population is distinct, the shapes of the income and consumption curves by age in figure 3.1 are different from those in figure 3.5. As a result, we observe two peaks in labor income, one around age 30 and another around

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**Figure 3.4 Per Capita Health Care Consumption by Age, 2013**

*percent of average labor income for individuals ages 30–49*

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**Sources:** Elaboration based on National Institute of Statistics 2006 and 2013; Central Bank of Uruguay 2013; Burdin, Esponda, and Vigorito 2014; the General Accounting Office of the Nation 2013; and the National Information System 2015.
age 50. The plateau shape of the aggregated values reflects the absence of individuals from the middle-aged generations, which is a result of Uruguay’s substantial emigration (chapter 2). For consumption, the feature contrasting most with the per capita profile is the downward slope of the curve as age increases, which results because age cohorts of older individuals are smaller than those of younger individuals.

**The Life-Cycle Balance**

The life-cycle deficit describes the situation in which consumption is greater than labor income, in contrast with the life-cycle surplus which occurs when resource generation is more than sufficient to finance personal consumption. Figure 3.6 presents an estimate of the deficit for each age group, in other words, consumption minus income. The positive values signal that a deficit exists, meaning that consumption is greater than income and thus it must be financed. In contrast, the negative values signal that a surplus exists for that age group, creating sufficient resources to be able to finance not only its own consumption, but also that of other age groups. The shape of the curve shows that, in 2013, individuals below age 28 and over age 57 faced a deficit situation and their consumption was financed by the middle-age groups. The per capita deficit is greater for the older age groups than for the younger, but the overall deficit for the older is less because their size is smaller than the younger generations (figure 3.7). Overall, 58 percent of the deficit is generated by individuals below age 28, while 42 percent corresponds to those over age 57.

The deficit and the surplus are sustainable because economic mechanisms, which are more or less formally institutionalized, channel the movement of
Figure 3.6 Per Capita Life-Cycle Deficit by Age, 2013

Percent of average labor income for ages 30–49


Figure 3.7 Aggregate Life-Cycle Deficit by Age, 2013

Uruguayan pesos (billions)

resources among age groups. In other words, individuals receive (inflows) and contribute (outflows) resources: the deficit is financed by inflows that are greater than outflows. These movements are channeled through two mechanisms: assets and transfers.

The reallocation of resources through assets occurs in the market. This process refers to income and expenditure derived from asset ownership, such as interest and rent and saving and dissaving, which frequently involve intertemporal exchanges. For example, one way that individuals reallocate resources over time is by purchasing a house when they are economically active (which generates an outflow) and selling it in their later years (creating an inflow).

As opposed to reallocation through assets, the transfer mechanism does not involve the market and does not entail—at least explicitly—an exchange of present or future commitments between recipients and contributors. For example, when parents feed their children or the public sector pays family allowances, a transfer is occurring; in one case it is voluntary and private and in the other it is under the auspices of a public program.

In reallocation through assets, as well as through transfers, the agents may be public or private. This study focuses on the role of the public sector in reallocation through transfers, with the understanding that any reform that seeks to adapt public policies to the changes in the age structure of the population benefits from previous discussions based on quantitative information. This is why we have only performed estimates for this reallocation mechanism. Nonetheless, estimates for previous years have produced some interesting results that deserve comment (box 3.3 presents the estimation method).

In particular, the NTA estimates for 1994 and 2006 indicated that, in Uruguay, private transfers played a principal role in financing consumption during childhood and adolescence, suggesting the importance of family relationships (Bucheli, González, and Olivieri 2010; Bucheli and González 2011). In addition,

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**Box 3.3 Estimating the Public Transfer Accounts**

Public transfers to households (inflows) are divided into in-kind and cash transfers. In-kind transfers are equal to household consumption directly financed by the public sector (public consumption). This is the case for public consumption of education, public health care, National Health Care Fund (Fondo Nacional de Salud [FONASA]) funding for private health care, and the rest of public consumption, for which estimates are presented in box 3.2.

Cash transfers, on the other hand, include social security and assistance benefits. They comprise all the programs under the Social Security Bank (contributory and noncontributory pensions and retirement benefits, and subsidies for illness, unemployment, maternity, and family allowances), retirements and pensions distributed by the Military and Police Funds, as well as the Uruguay Social Card directed toward low-income households and financed by the Ministry of Social Development.

Public transfers from households (outflows) comprise taxes and social security contributions.
the estimates showed that during old age the deficit was mainly financed by income derived from assets and public transfers, while net private transfers were negative. In other words, the elderly received public resources, utilized their assets, and made transfers, most likely to their families. One can make the interpretation that these transfers reinforced the importance of familial bonds in order to reallocate resources to children and adolescents. When consumption during the early stages of life mainly depends on resources generated by older members of the family, the environment at birth acquires greater importance. In contrast, public channels are able to collect resources from the middle-age groups in general, to a greater or lesser degree of progressiveness depending on the design of a country’s tax policy, and reallocate them to children and adolescents, making up for differences at birth. Thus, the structure of public and private transfer channels highlights a limitation to overcoming low intergenerational mobility and the inequality of opportunities.

Public transfers constitute an institutionalized and regulated mechanism for resource reallocation. The government collects taxes and contributions, which are utilized to fund its expenditures. This spending takes the form of public consumption (or household consumption directly financed by the public sector) and cash transfers. From an individual’s point of view, the government’s collections represent outflows while public expenditure represents inflows. Inflows exceeding outflows represent a surplus situation for the public sector, which must be financed by those individuals whose outflows (taxes and contributions) exceed their inflows (public consumption and transfers). As a result, net public transfers (inflows minus outflows) point to a sort of life-cycle balance for the public sector, whose age limits may differ from the limits for the life-cycle balance for the economy as a whole.

**Life-Cycle Deficit and Public Transfers**

Figure 3.8 presents the life-cycle deficit and net public transfers per capita in 2013. Up to age 19, net public transfers are positive, meaning that the resources received through the public sector are greater than payments made (taxes and contributions) to the public sector. Between the ages of 20 and 62, individuals turn over more resources to the public sector than they receive, while after age 62 the population again becomes a net recipient of public resources.

Figure 3.8 shows that, in per capita terms, net public transfers received by the population at older ages are greater than those received by children and adolescents. This means that children and adolescents make more intensive use of other channels to finance their life-cycle deficit, which one can appreciate from the gap that exists between the life-cycle deficit and net public transfer curves.

Figure 3.9 presents the aggregate values by age group for the life-cycle deficit as well as for net public transfers. Because the cohorts of children and adolescents are more numerous than those of the elderly, the two curves are higher for the younger age groups than for the older ones. In any case, one can still appreciate that the difference between the curves is greater for children and adolescents. In other words, private channels are more important for this age group.
Figure 3.8 Life-Cycle Deficit and Net Public Transfers per Capita by Age, 2013

percent of average labor income for ages 30–49


Figure 3.9 Aggregate Life-Cycle Deficit and Net Public Transfers by Age, 2013

Uruguayan pesos (thousands)

These estimates reaffirm the conclusions drawn from 1994 and 2006: public transfers play a noticeably more important role in the later stages of life than in the earlier. Essentially, less than a quarter of the consumption of individuals below age 19 is financed by net public transfers. Meanwhile, 45 percent of the consumption of individuals over age 64 is financed with public transfers. Note that these observations propose a different interpretation of the financing of consumption compared to the one developed in the “Income and Consumption” section on page 43. In that case, we saw that public consumption (in-kind transfers) played a larger role in sustaining children’s and adolescents’ consumption relative to the elderly. Once the role of cash transfers per population (for example, pensions and retirement benefits, family allowances, and other cash transfer programs) is included in the discussion, as well as the resources that the population turns over to the public sector (taxes and social security contributions), it is possible to capture a complete picture of net public financing offered by the public sector (in-kind and cash public transfers received by the population, taxes, and contributions). Specifically, thanks to retirement benefits and pensions, the elderly find in the public sector a source of essential support for their consumption. On the other hand, even though public consumption represents 40 percent of total consumption by minors, the importance of the public sector in sustaining children and adolescents is diminished because they finance part of public expenditure through the payment of indirect taxes.

Suggestions have been made that this “distribution of responsibilities” between public and private actors has been moderated over time as a result of two processes.

In a comparison between 1994 and 2006, Bucheli, González, and Olivieri (2010) show that the public transfer gap between children and the elderly narrowed during this period. A medium-term process of increasing public consumption in education played a very important role in this. Even though methodological differences between the 2006 and 2013 estimates mean that a comparison between them is not possible; in an analysis of public social spending by age group from 2005 to 2012, the Ministry of Social Development (MIDES; 2014) revealed that this trend had continued.

In addition, average labor income among the elderly has grown in recent decades, allowing them to sustain their own consumption. The increase in labor income has two causes. Greater economic activity at older ages is in part the consequence of generations with a greater proportion of economically active women reaching old age. Moreover, activity is growing as a result of the postponement of retirement (Alvarez and others 2009).

**Public Transfers by Age Group**

Figure 3.10 presents per capita inflows and outflows for public transfers, which form the curve of net transfers presented in the previous section. It is readily apparent that the inflow is higher among the older age groups than for the rest of the age groups. Those over age 64 receive an average per capita transfer
3.3 times greater than those under age 21. Meanwhile, the outflow is bell-shaped: resource generation mainly falls on the middle-age groups. As a result of the sizes of the generations or cohorts, at the level of the state’s general resources, the differences between age groups are diminished, as figure 3.11 illustrates.

Below, the first section analyzes the categories that comprise the inflows, while the second looks at the components of the outflows.

**Inflows**

The age pattern illustrated in figure 3.10 indicates that the inflow shows a hump for children, adolescents, and youth. This is the result of public consumption in education, which grows among the younger age groups, reaching its highest peak around age 10, as figures 3.12 and 3.13 reveal. After age 10, public consumption in the education component falls, and even though it recovers around the ages that correspond with the second cycle of middle education, it subsequently continues to fall. Consumption of public education is the most significant inflow during the early years of the life cycle, followed by the rest of public consumption, health care transfers, and finally cash transfers that at this age are practically all from the family allowance program.

Around middle age, the inflow remains stable at low levels. As can be observed in figures 3.12 and 3.13, the principal component is the “public consumption, remainder,” followed by health care, and, with a noticeably lower proportion, cash transfers, which mostly consist of subsidies related to employment administered by the Social Security Bank.

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Figure 3.11 Aggregate Public Inflows and Outflows by Age, 2013


Figure 3.12 Components of Public Inflows per Capita by Age, 2013

After age 50, the inflow grows uninterruptedly, driven by the transfers from retirement programs and, to a lesser extent, by public consumption of health care. The remainder of public consumption is next, followed by the rest of the cash transfers, which for these age groups mostly correspond to the Elderly and Disability Program (noncontributory pensions) administered by the Social Security Bank.

Significant differences exist in inflows of public transfers to the deficit age groups. On one hand, the level of the inflow to older age groups is notably higher than that to the younger. On the other, the makeup of the inflow is different. Table 3.1 allows comparison of the composition of transfers at the two extremes of the life cycle.

The flow to the elderly is mostly in cash (76.5 percent of the total per capita inflow and 75.9 percent of the aggregate), while consumption plays a lesser role (23.5 percent and 24.1 percent, respectively). Just retirement benefits and pensions (contributory and noncontributory) account for approximately 76 percent of total flows. In contrast, the flows to children and adolescents are mostly in-kind (92 percent of the total), particularly in education (45 percent of the total). Family allowances represent just 6 percent of public transfers to this age group. In turn, health care transfers exhibit a different makeup among age groups. Health care consumption has two components: care in public facilities and subsidies for care in private facilities through FONASA. As a proportion of total...
health care consumption, transfers through subsidies for care in private facilities are higher for individuals over age 64.

**Outflows**

As was previously mentioned, the outflow by age group has a bell shape both in per capita and aggregate value terms (figures 3.14 and 3.15). As for labor income, within the active age groups one observes a greater proportion of the younger age groups due to the emigration process.

The lowest outflow values occur during childhood and adolescence. As figures 3.14 and 3.15 illustrate, these flows correspond to the payment of indirect taxes that takes place as part of consumption (the value added tax, for example). As individuals enter the labor market, they begin to gain significance in terms of the flows that correspond to social security contributions, other taxes, contributions to FONASA, and direct taxes on individuals. During old age, the second deficit period, the main outflows once again are made up of indirect taxes, in addition to direct taxes on individuals.

**The Effects of Demographic Change on the Support Ratio and the Public Accounts**

We have waited until now to address the life-cycle deficit from the point of view of how it is financed and the resource flows that make this possible. An interesting perspective emerges based on considering that total labor income represents 66 percent of total consumption. This indicator, which presents the percentage of consumption financed by resources generated during the current period, is an estimate of the economic support ratio.

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**Table 3.1 Categories of Public Transfers as Percentages of the Total Inflow**

<table>
<thead>
<tr>
<th>Category</th>
<th>Per capita as percentage of the total inflow</th>
<th>Aggregate as percentage of the total inflow</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ages 0–20</td>
<td>Ages 65+</td>
</tr>
<tr>
<td>Total consumption</td>
<td>91.4</td>
<td>23.5</td>
</tr>
<tr>
<td>Public consumption, education</td>
<td>44.8</td>
<td>0.0</td>
</tr>
<tr>
<td>Public consumption, health care</td>
<td>19.5</td>
<td>15.4</td>
</tr>
<tr>
<td>Public care</td>
<td>9.1</td>
<td>5.5</td>
</tr>
<tr>
<td>FONASA funding to private providers</td>
<td>10.4</td>
<td>9.9</td>
</tr>
<tr>
<td>Other consumption</td>
<td>27.0</td>
<td>8.1</td>
</tr>
<tr>
<td>Total transfers in cash</td>
<td>8.6</td>
<td>76.5</td>
</tr>
<tr>
<td>Retirement benefits and pensions</td>
<td>0.9</td>
<td>76.2</td>
</tr>
<tr>
<td>Family allowances</td>
<td>6.3</td>
<td>0.0</td>
</tr>
<tr>
<td>Other social protection, in cash</td>
<td>1.5</td>
<td>0.2</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>


**Note:** FONASA = National Health Care Fund (Fondo Nacional de Salud).
Figure 3.14 Components of Per Capita Public Outflows by Age Group by Average Labor Income for the 30–49 Age Group, 2013


Note: FONASA = National Health Care Fund (Fondo Nacional de Salud).

Figure 3.15 Components of Aggregate Public Outflows by Age Group, 2013


Note: FONASA = National Health Care Fund (Fondo Nacional de Salud).
Traditionally, the support ratio is measured through the dependency ratio, that is, the proportion of working-age individuals. In this manner, one attempts to measure to what extent the productive population is sufficiently numerous to be able to economically sustain the entire society. As chapter 2 discusses, the purely demographic indicator exhibits some defects associated with the fact that productivity and the propensity to consume vary according to age. Mason and Lee (2006, 2007) propose fine-tuning the measurement of this indicator, both in its numerator and its denominator. The authors seek to make the numerator representative of the effective generation of resources (observed in economic terms), not the potential generation of resources (based on demographic measurements). To achieve this, they propose adjusting the working-age population by average income for each age group. In turn, they seek to make the denominator capture the use of these resources; thus, they propose adjusting the population to reflect average consumption for each age group.

In summary, the support ratio is defined here as the ratio of income to consumption, which allows for an “economic” measurement versus a purely “demographic” view of dependency. Thus, one way of analyzing the effect of demographic change on the support ratio consists of forecasting the income/consumption ratio, assuming that per capita income and consumption by age group maintain their 2013 values, while changing the number of individuals in each age group according to population forecasts. In this way, the support ratio forecast varies solely as a result of demographic changes, allowing us to analyze future challenges that are the result of population dynamics. The analysis of this exercise is presented in the section “The Support Ratio.” Subsequently, in the “Public Social Spending” and “Fiscal Support Ratio” sections, we employ an analogous method to analyze the effects of demographic change on public social spending and on the fiscal support ratio (defined as the outflow/inflow ratio for public transfers).

The simulations presented in this section make the following assumptions:

1. The income, consumption, and transfer profiles by age group remain constant, leaving the discussion of how they might vary and the effect of these variations for chapters 4, 5, 6, and 7. This allows us to isolate the effect of the demographic transition from other social and economic changes.

2. The averages for labor income, consumption, and other transfers by age group grow at the same rate. An arbitrary value of 2.5 percent is assumed for this growth rate. In other words, the average labor income for an individual of age \( x \) in year \( t \) will be 2.5 percent higher than that of an individual of age \( x \) in year \( (t-1) \). This value is consistent with similar forecasts in developing countries (Miller and Castanheira 2013).

3. Finally, to forecast gross domestic product (GDP), we assumed that the proportion of labor income was \( N \), in constant GDP, which was equal to the value observed in 2013 (49.9 percent). This assumption is consistent with an economy that maintains a Cobb-Douglas production function in a steady state.
Note that the combination of these assumptions offers some advantages. In particular, if income, consumption, and transfers grow at the same constant rate and labor income’s proportion of GDP is also constant, it is not necessary to make direct estimates of the GDP growth rate through 2100, given that GDP can be derived from the growth in labor income. In any case, the arbitrary value chosen in this case (2.5 percent per year) implies that the economic growth rate will be consistent with the rate estimated by the International Monetary Fund (IMF, 2014) for Uruguay during 2012–19, and is situated around the average rate observed during the last 30 years (see chapter 7). Additionally, it is important to point out that, given that all income and transfers grow at the same rate, according to assumption 3 the forecasts of public expenditure as a percentage of GDP are robust for any value that is assumed as the growth rate.

The present, purely analytical exercise, even if simplistic, allows us to obtain an approximation of the magnitude of the effects of demographic change on the results of social policies. To that effect, while the economic and political future can be difficult to predict, demographic trends represent a gradual, certain change. For that reason, the current forecast’s goal is not to obtain a set of exact numbers related to income, consumption, and social expenditure for every moment in time, but rather to reflect the importance of taking into account a predictable factor like the demographic transition in the design and impact of public policies.

The Support Ratio

An important concern that emerges after reviewing the demographic transition is related to the ability of the working population to finance those who are economically dependent on them while the age structure is changing and the average age is increasing. Grouping individuals into the categories of workers or dependents based on arbitrary age limits (such as those suggested by international standards, for example, which consider all adults over age 65 to be dependents) hinders this type of discussion insomuch as it does not allow one to reflect on the implications of changes in socioeconomic behavior, which can be expected in terms of productivity, labor market participation, and educational system retention, among others.

Additionally, a purely demographic dependency ratio assumes that the ability to generate income and the propensity to consume are homogeneous within the working-age and dependent groups of individuals. However, factors like unemployment, salary, and propensity to consume differ among age groups, as is reflected in labor income and consumption by age group estimates.

Based on these considerations, and utilizing the NTA estimates, the economic-support ratio (SR) is defined as the ratio between the quantity of effective workers and effective consumers. According to Mason and Lee (2007), if we define $x_{a,t}$ as the number of individuals at age $a$ at moment $t$, $\omega$ as the maximum age one can reach, $\gamma_a$ as per capita labor income at age $a$, and $\varphi_a$ as per capita
consumption at age \( a \), we can then define effective producers or workers \((L_t)\) and effective consumers \((N_t)\) as is defined in equations 3.1 and 3.2:

\[
N_t = \sum_{a=0}^{\infty} \varphi_a x_{a,t} \quad (3.1)
\]

\[
L_t = \sum_{a=0}^{\infty} \gamma_a x_{a,t} \quad (3.2)
\]

Note that the number of effective workers (and consumers) depends on the per capita income (or consumption) for each age group, as well as the number of individuals in each cohort. Therefore, the economic support ratio is defined as:

\[
SR_t = L_t / N_t \quad (3.3)
\]

This indicator allows one to account for the differences in consumption and income among age groups. In practical terms, the economic support ratio is calculated here based on the ratio between income and aggregate consumption (public and private, which does not include cash transfers), given that these variables reflect, on one hand, the labor income and consumption profiles by age group, and, on the other, the age structure of the population. Consequently, changes in the age structure of the population produce changes in the economic support ratio.

Figure 3.16 presents the simulation of the support ratio during 2013–2100, utilizing the population forecasts presented in chapter 2, based on the aforementioned assumptions. It demonstrates that as the window of opportunity closes, the support ratio also falls.

Another way to visualize the effect of population aging is to calculate the aggregate life-cycle deficit as a percentage of consumption and forecast it, changing just the population. This indicator reflects the number of net effective workers per consumer (that is, the difference between aggregate labor income and aggregate consumption, divided by aggregate consumption). Given that this indicator is a measure of the deficit or surplus of the aggregate life cycle, it takes on negative or positive values depending on age. In other words, because each age is associated with the condition of being either a net producer or consumer, by changing the weight of each age group in the total population, the aggregate life-cycle deficit also changes.

Figure 3.17 shows the calculation of this indicator for 2013, 2050, and 2100. As mentioned, the simulation assumes that the income and consumption profile by age group remains constant and equal to the estimate for 2013. Thus, the aggregate life-cycle deficit by age group changes over time solely as a result of demographic change or, in other words, because of the changes in the size of each cohort. We observe that the aggregate life-cycle deficit (as a percentage of consumption) decreases in the first deficit stage but increases in the second deficit stage, while the middle-age group’s surplus remains relatively stable.
Figure 3.16 Evolution of the Economic Support Ratio, 2013–2100

Figure 3.17 Life-Cycle Deficit/Consumption by Age Group, 2013, and Simulations for 2050 and 2100 Aggregate Values
The analysis of the aggregate life-cycle deficit allows for a better understanding of the distinct forces behind the support ratio’s downward trend, as illustrated in figure 3.16. Figure 3.18 presents the forecast of the indicator separately for three age groups: the first deficit period (under age 27), the surplus group (28–57), and the second deficit period (58 and older). The results suggest that the support ratio’s fall is mainly due to the negative contribution of an ever more numerous group of dependent elderly persons, which more than offsets the reduction in resources required to support the lower proportion of dependent young people. The contribution from net workers remains stable, although it falls slightly due to the increase in the group’s average age.

**Public Social Spending**
Social spending represents one of the most important components of public expenditure. In strategic terms, the centrality of social spending is the result of its role as the “expression of the public commitment to the population’s well-being” (MIDES 2014). In quantitative terms, MIDES reported that in 2012, this component of public expenditure exceeded 250 billion Uruguayan pesos (MIDES 2014), representing some 25 percent of GDP and 75 percent of total...
public expenditure. The estimate made in this chapter for public transfers attributable to social ends (education, health care, and cash transfers) differs from MIDES’ estimate because the former is concentrated in some specific sectors (it does not include dwellings, water, sewer, and other nonconventional social spending for example) and only considers in-kind (public consumption) and cash transfers, leaving out investment. Thus, these transfers added up to something more than 220 billion Uruguayan pesos in 2013, representing approximately 19.4 percent of GDP.

The goal of the current section is to study the effect of demographic change on the various social components of public transfers. Specifically, policies such as education, health care, retirement benefits, and family allowances target distinct age groups. Consequently, each of these components will be affected differently by the progress of the demographic transition. The following paragraphs present the results of the forecasts to show the impact of purely demographic changes, leaving the discussion of eventual changes in behaviors favored by these changes and by the implementation of new policies for the sectoral chapters.

The methodology used by Miller and Castanheira (2013) was adapted for the forecasts. The aggregate benefit of each of the social programs is defined as:

\[ B_a = \sum_{a=0}^{\omega} b_a x_{a,t} \]  

(3.4)

where \( b_a \) is respectively the per capita benefit in education, health care, retirement benefits and pensions, and the remainder of social protection transfers to age group \( a \). As box 3.1 presented, this parameter captures both the average benefit amount as well as the coverage of each program. To study the effect of demographic change, we assume that the per capita benefit for each age group remains at 2013 levels, with the exception of retirement benefits and pensions. An ad hoc modeling exercise is utilized for the pension system. It accounts for contributors’ transition from a public distribution system managed by the Social Security Bank to an individual capitalization scheme with public-private management in which the Retirement Savings Fund Administrators (Administradoras de Fondos de Ahorro de Pensiones) play a central role. This transition has been in progress since the 1996 pension reform, and thus the preexisting policy informs this exercise. The assumptions and parameters utilized for this simulation are defined in chapter 4.

Figure 3.19 presents the results of this simulation in terms of GDP, broken down into four components: education, health care, retirement benefits, and pensions (contributory and noncontributory), and the remainder of cash transfers (in Social Security Bank benefits to active beneficiaries, family allowances, and the Uruguay Social Card distributed by the MIDES).

In education, as Uruguay progresses through the demographic transition, the fiscal effort required to maintain current coverage and per-student expenditure is reduced, driven by a decrease in the target population. In other words, as the
number of younger cohorts falls, aggregate expenditure in education falls, freeing up resources that can be used to improve investment within the sector (increased coverage and/or increased per-student expenditure) or can be used to cover emerging needs in other sectors. According to this simulation, which demonstrates just the effects of the demographic change, approximately 0.9 percent of GDP could be freed up between 2013 and 2100. The size of this gain is limited as a result of the already advanced state in which Uruguay finds itself in the demographic transition in the base year.

The health care sector, in contrast, will face fiscal challenges due to changes in the demographic structure. The simulation implies that health care consumption financed by the public sector will grow from approximately 5.2 percent of GDP in 2013 to 6.8 percent in 2100. Even though the target population in this sector includes all age groups, differences in health care spending among age groups exist. Specifically, as has been previously described, health care spending is higher among older age groups. Thus, an increase in the average age of the population will result in increased fiscal effort in the sector. Note that if the public/private ratio of services offered to the elderly remains the same, this increase will be
reflected above all in increased FONASA financing to private providers and, to a lesser extent, in the use of public health care services.

Social protection and assistance transfers, with the exception of retirement benefits and pensions, comprise a markedly heterogeneous set of programs over the age groups they target. On one hand, family allowances are designed to support the development of children up to age 18, while unemployment and illness insurance clearly target working-age individuals. Maternity benefits complete this set; they are aimed at women of ages 20–45. Meanwhile, the Uruguay Social Card targets low-income households.

Expenditure on this type of transfer is notably less than for other categories of social spending, which means that changes of any significant size in terms of GDP are not visible. Essentially, the resources destined for these transfers will remain approximately constant (from 1.3 percent of GDP in 2013 to 1.2 percent in 2100), indicating that the positive effects of a decrease in the relative weight of the younger age groups will be offset by the negative effect of an increase in the older age groups.

Finally, contrary to what one might intuitively expect in a context of demographic aging, public sector expenditure on retirement benefits and pensions will fall until approximately 2040/2045 due to the gradual shift of a portion of pension payments from the Social Security Bank to the Retirement Savings Fund Administrators. The incorporation of the individual capitalization scheme will allow public spending on pensions to decrease from 9.4 percent of GDP in 2013 to 8.6 percent in 2043. Subsequently, as the new mixed regime matures, the demographic component will become more significant, and will drive growth in expenditure on retirement benefits and pensions, until reaching 13.1 percent of GDP in 2100. These results do not establish an alarm related to the eventual stress that an older population will cause for the pension system in the medium term.

The results suggest that the fiscal weight of public social transfers in terms of GDP will remain approximately constant and may even decrease during the next four decades. In effect, from the point of view of the public accounts, the resources that are freed up during the transition from a purely public pension system to the current mixed system, combined with the decreased fiscal effort required by the education sector, will be more than sufficient to offset the negative fiscal effects of population aging. Beginning in the second half of the century, spending on social transfers will begin to rise, reaching 24 percent by 2100.

In relative terms, the health care sector will become the most significant sector in total public transfers, especially during the first half of the century. In the forecast, financing of health care consumption will grow from 27 percent of total public social transfers in 2013 to 30 percent in 2050. On the contrary, maintaining per-student expenditure and coverage in the education sector at current levels will require fewer fiscal resources. As a result, the elderly will remain the most favored group for public transfers, given that they represent not just the entire beneficiary population for retirement benefits, but also the population that uses the most health care services. While in 2013 net beneficiaries among
the elderly population (ages 63+) captured 40 percent of total social benefits distributed by the public sector, in the forecast this group will receive 53 percent of the total inflows in 2050 and 63 percent in 2100.

Thus, the demographic change allows a rethink of the eventual reassignment of resources among sectors because resources will be freed up in some sectors, while others will require increased fiscal effort. Nonetheless, it must be kept in mind that each type of transfer requires a different institutional structure to be set up by the state. As a result, the eventual reassignment of resources among sectors will have not just fiscal implications but also consequences for their administration. In addition, demographic change affects public resources, which is analyzed in the next section.

**The Fiscal Support Ratio**

After observing the evolution of social spending in the education, health care, and retirement and pensions sectors, it is fair to ask how public transfers will evolve as a whole (inflows to households), and, moreover, what changes can be expected in outflows. Where the support ratio provides a measure of workers’ ability to support the economically dependent population, the fiscal support ratio captures the sustainability of the public transfer system, taking into account the current collections structure and expenditure per age group. Within the public sector, the population is also divided into contributors and beneficiaries. Thus, following the same logic utilized to determine the support ratio, the number of effective contributors \((U_t)\) and effective beneficiaries \((Q_t)\) is defined as:

\[
U_t = \sum_{a=0}^{\infty} \beta_a x_{a,t}
\]

and

\[
Q_t = \sum_{a=0}^{\infty} \alpha_a x_{a,t}
\]

where \(\beta_a\) and \(\alpha_a\) are the per capita outflow (tax pressure) per age group and the per capita inflow (benefit received through public in-kind or cash transfers) per age group, respectively.

Just as with the support ratio, one way of visualizing the effect of population aging on public transfers is to calculate \((Q_t - U_t)/Q_t\), keeping tax pressure and the per capita benefit per age group constant, while changing the sizes of the cohorts according to the population forecast. Remember that our calculation differs from this general method because it takes into account that a portion of the new contingents of dependents belong to the mixed system, which means that, in the forecast, the average benefit per dependent varies from the 2013 level.

This indicator exhibits positive values if the age group is a net recipient of public resources; conversely, it exhibits negative values when an age group contributes more than it receives. Because each age group is a net contributor or recipient in 2013, as the relative sizes of the cohorts are modified, the values of
the net aggregate transfers also change. Figure 3.20 shows their values for 2013 and the forecasts for 2050 and 2100. As a result of the decrease in the youth population, the net resources received by these age groups are diminished. However, one does not observe a significant increase in the net resources captured by the older age groups because the simulation accounts for the reduction of the public pension system’s coverage. In fact, this situation translates into an increase in the age at which individuals switch from net contributors to net recipients: 63 years old in 2013, and 65 in 2050 and 2100. Finally, the middle-age groups increase their net contribution in 2050, but by 2100 it falls below the 2013 level.

The fiscal support ratio (FS) can be defined as:

$$FS_t = \frac{U_t}{Q_t}$$  \hspace{1cm} (3.7)

This ratio tells us what proportion of public transfers can be directly financed by collections of taxes and social contributions, without considering other ways of obtaining resources, such as market production, debt, or external financing.

Figure 3.21 shows a forecast of the support ratio, keeping the average inflow and outflow for each age group stable while adjusting the population. In this scenario, up until 2040–2045 resources from net contributors more than offset the effect of population aging. This growth in the FS is exhausted for two reasons: the demographic change and the end of the transition period of the social...
security reform. Thus, in the second half of the century, the FS begins to deteriorate to an ever greater degree as Uruguay progresses through the demographic transition. In contrast with the economic support ratio, the FS benefits less from the decrease in the proportion of young people in the population, given that this age group’s consumption is mostly financed by private, intrafamily transfers.

**Conclusions**

This chapter makes an initial presentation of an information system specially designed to analyze how the life-cycle deficit is financed. In particular, this system shows how public and private consumption, labor income, and transfers to and from the public sector change with age. As a result, the changes that one can expect in the age structure of the population and especially its aging in general have fundamental economic and social implications for Uruguay. As the country progresses through the demographic transition, public policies must adapt to account for the changes that the transition will create in the composition and productivity of the labor force, the fiscal space, and the demands placed on social sectors (education, health care, and social protection and assistance), among others. Although it is obvious, this fact is not well recognized in the analytical debate of public policies in Uruguay, mostly due to the lack of detailed information regarding the age-specific changes in inflows and outflows throughout the life cycle. The information presented in this chapter allows us to overcome this
obstacle and offers the foundation for a rigorous and wide-ranging discussion of the effects of the demographic transition that is developed throughout this book.

The estimates for 2013 in particular indicate that, in Uruguay, public transfers play a notably more significant role in financing the deficit in the later stages of life than in the early stages. As a result, we find evidence of a pattern of “allocation of responsibilities” by which households take primary responsibility for financing children’s and adolescents’ consumption, while the public sector has a more significant role in sustaining the elderly. Public sector transfers differ by age group in more than just quantitative terms. While children and adolescents receive support principally through public consumption, that is, through in-kind transfers, older adults receive most of their transfers in cash. Finally, while children and adolescents are the target population in the education sector, the elderly are the most intensive users in the health care sector.

The information generated is utilized to analyze the impact of demographic aging on the economic support ratio and on the public channels of financing for the life-cycle deficit, highlighting public social spending. The forecasts of the support ratio, the fiscal support ratio, and social spending are made using certain assumptions that in general terms consist of maintaining age group profiles of variables as in the current levels. This is the case for productivity, propensity to consume, tax collections, and public expenditure (with the exception of the changes that the 1996 social security reform created for the average pension in the future).

Remaining chapters consider changes in the said variables in order to analyze the most plausible scenarios. However, it is important to keep in mind that even though the assumption that these variables will remain constant is not representative of the future, it is useful for taking such a scenario as a baseline so that we can isolate the effects of purely demographic changes from other effects.

The simulations suggest that the magnitude of the effect of demographic change is not alarming. In terms of the support ratio, the simulation shows a fall after the mid-2030s; in terms of the fiscal support ratio, values below current levels appear from the 2060s on. Pressure on social spending is contained at the beginning and increases from the 2040s on. Two changes have effects during this decade: the demographic transition and the end of the transition begun with the 1996 Social Security Reform. All of the above indicates that Uruguay has time to adjust its policies to deal with the challenges that the population aging process entails.

Nonetheless, it is important to begin an informed debate, in particular in order to fully understand the tensions that will present themselves as a result of the changes in the relative requirements of the public social sectors. The increase in retirement benefits and pensions is not surprising if one assumes that the retirement age will not change while the number of older adults rises. This increase is accompanied by the growing role of health care spending, which results because the elderly are the most intensive consumers of these services. In contrast, the education spending forecast indicates that resources will be freed up due to a decrease in the school-age population, assuming that coverage remains at current levels. In conclusion, demographic changes may offer opportunities to reach various policy objectives, depending on the strategy the country chooses.
Notes

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2. Following suggestions from the NTA System, no smoothing was applied to the profiles in education because the discontinuities observed in consumption by age group in this sector are not typically random, but rather are associated with entry and exit ages for the different educational levels.

3. Note that even though in order to estimate health care consumption by age group we used the FONASA capita values, the smoothing procedure absorbs some of the differences. In particular, the capita for individuals less than one year old is very elevated, which is not reflected in the profile presented in figure 3.4.

4. In the 1994 and 2006 estimates, family allowances were assigned to the head of the household, who, in any case, utilized them to make a private transfer to the minors in his or her care. In the 2013 estimates, family allowances were allocated directly to minors, meaning that a direct comparison with the 2006 estimates is not possible. In addition, the equivalency scale for health care expenditure is different in 2013 compared to previous estimates.

5. For a discussion of how reasonable it is to assume profiles that are constant from the base year in these simulations, see Mason and Lee (2006).

6. For a justification of this assumption, see Lee and Edwards (2002) and Miller and Castanheira (2013).

7. Note that, in the case of labor income, the estimate of the profile by age group reflects both salary by age group as well as the labor market participation of each cohort in the base year.

8. Note that the null values for the life-cycle deficit are the same as in figure 3.1.

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