Economic & Social Affairs

National Transfer Accounts

Manual

Measuring and Analysing the Generational Economy

United Nations

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Population Division
Department of Economic and Social Affairs

National Transfer Accounts Manual:

Measuring and Analysing the Generational Economy

United Nations
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Department of Economic and Social Affairs

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Preface

This manual is the result of numerous contributions by individuals and institutions, as noted in what follows. The United Nations Department of Economic and Social Affairs, Population Division, in partnership with the United Nations regional commissions for Latin America and the Caribbean (ECLAC), Asia and the Pacific (ESCAP) and Western Asia (ESCWA), implemented the Development Account project ROA167, "Strengthening capacity of national policy analysts in the social and economic sectors of developing countries in the production and use of National Transfer Accounts", during 2011-2013. The project sponsored an Expert Group Meeting in Belo Horizonte, Brazil, in December 2011, and two training workshops, one for ESCWA region countries in Amman, Jordan, in July 2012, and one interregional workshop in Bangkok, Thailand, in September 2012. At the same time, during this period, the preparation and revision of the material contained in the present manual was undertaken. This preface gives background information on the scientific and policy questions that led to the development of the NTA framework, the methods and applications, and that resulted in the production of the manual, acknowledging key contributions.

The demographic background: changing age distributions

The world population is undergoing profound changes in its age distribution, as nations move through the demographic transition from high to low fertility and mortality. Transitions unfold at different times and speeds, sometimes including baby booms and busts, or mortality crises. The corresponding changes in the population age structure have numerous economic consequences, presenting opportunities and challenges for development and for policymakers. At the same time, particular economic policies may benefit some generations and be costly for others, yet the aggregate economic data, such as the standard national accounts, provide little or no information about the age and generational dimension of the aforementioned changes. This lack of information severely limits our ability to understand the consequences of global fertility decline, population aging, the interaction between public and private transfer systems, and so on. This problem is compounded by the dearth of information on public and private systems for reallocating/transferring income from some ages and generations to others. These transfer systems, which operate through the family, the government and the market, are themselves in transition, as familial support systems are weakened by economic and demographic forces, and public programmes increasingly support the provision of education, old-age income and health care. The National Transfer Accounts (NTA) have been developed precisely to fill this gap by providing systematic, comprehensive and coherent methods for the age disaggregation of the major components of national accounts, as well as estimates of private transfers within households.

Research underlying the development of NTA

Conceptually, National Transfer Accounts grew out of a now extensive literature that began with work by Samuelson (1958), who introduced overlapping generation models into economics and highlighted the importance of intergenerational transfers. Arthur and McNicoll (1978) integrated mathematical demography into the Samuelson model and highlighted the importance of the age profiles of labour income and consumption, a theme elabourated in Lee (1980). Mason (1987 and 1988) demonstrated the value of this approach to study aggregate saving, while Willis (1988) expanded on this research and explicitly included both public and private transfers, saving and asset operations, and a production sector as well as a public sector. He derived some key accounting identities and comparative statics results, and Lee (1994a and 1994b) further developed the Willis model.

A number of controversies of continuing relevance heightened the interest in issues related to age, economic flows and economic growth. Feldstein (1974) suggested that public pension programmes reduce saving rates, while Barro (1978) countered that familial transfers would neutralize the effects of public transfers. Modigliani (1988) argued that the desire to provide for consumption in retirement (life cycle saving) explained saving and capital accumulation in the United States, while Kotlikoff and Summers (1988) argued that a more important motivation for saving and wealth accumulation was the desire to make intergenerational transfers.

Actual and projected population ageing led to concerns about the consequences for standards of living and the sustainability of government programmes. Generational accounting, developed by Auerbach, Gokhale and Kotlikoff (1991), assessed the intergenerational redistribution of income through the public sector. Rapid population growth in poor countries led to concerns about negative effects on economic growth and development. It also led to questions about externalities to childbearing—children's costs and benefits that are borne by society at large rather than by the parents. Intergenerational relations in traditional societies are of particular interest because of the system of family support, and its relation to fertility and the economic activities of children. Demographers became interested in the direction of "wealth flows",a key element in Caldwell's theory of the fertility transition.

All these and many other issues and controversies pose questions that can be addressed more effectively, and in some cases only, through a comprehensive system of age-based accounting drawing on the analytic methods of demography and economics.

Work using theory to inform practical policy questions had also began by the late 1980s. An early set of accounts incorporating time use and the formation of human capital was created by Lee and Lapkoff (1988). Lee (1994a and 1994b) further developed and analysed the accounts for money and goods, but time use was no longer included. These flow accounts were used to simulate the stock of capital and transfer wealth under the assumption of golden rule steady state growth. The development of this accounting framework was followed by some more specific applications. Lee and Tuljapurkar (1998) projected the long-term finances of the United States Social Security system using age profiles of taxes and benefits, while Lee and Miller (1997) analysed the long-term fiscal impacts of immigration in the United States. This required long-term projections of state, local and federal government budgets, as developed further by Lee and Edwards (2002) and Lee, Edwards and Miller (2003).

Other work used comprehensive accounts, including private transfers, to study the direction of income flows—upward or downward by age—in hunter gatherer, agricultural and industrial economies (Lee, 2000 and 2003). Drawing from this work, Stecklov (1997) estimated age-accounts for rural and urban Côte d'Ivoire, while Turra (2002) estimated a set

of accounts for Brazil. Mason and Miller (1998 and 2000) analysed familial intergenerational wealth transmission in Taiwan Province of China. Lee, Mason and Miller (2000, 2001a, 2001b and 2003) collabourated on a series of papers on savings and capital accumulation over the demographic transition, with detailed age accounting for individuals and households. This has work has brought increased attention to the role of familial and public transfers to children and the elderly.

The development of the NTA research programme

The above-mentioned research laid the groundwork for the development of National Transfer Accounts. The initial plan for a larger international project was hatched in 2002, involving the United States, Taiwan Province of China, Japan, Indonesia, Brazil, Chile and France, including researchers from each of these countries or territories. The United States National Institute on Aging of the National Institutes of Health provided the initial funding, which permitted a series of discussions leading to decisions on how to structure the accounts, as set forth in two works by Mason and colleagues (2009a, 2009b), and in more detail in this manual. Lee et al. (2008) provided additional analysis about alternative approaches to estimating the economic life cycle, and Alan Auerbach contributed insights from the perspective of generational accounting. Funding by UNFPA allowed adding China, India, Thailand and the Philippines to the NTA network, and the Republic of Korea joined soon thereafter. The project has continued to grow steadily, adding new members each year. The following table lists the current members in the project.

Table 1
Members of the National Transfer Accounts Network, as of June 2013

Asia-Pacific	The Americas	Europe	Africa
Australia	Argentina	Austria	Benin
Cambodia	Brazil	Finland	Kenya
China	Canada	France	Mozambique
India	Chile	Germany	Nigeria
Indonesia	Colombia	Hungary	Senegal
Japan	Costa Rica	Italy	South Africa
Philippines	El Salvador	Poland	
Republic of Korea	Jamaica	Slovenia	
Taiwan POC	Mexico	Spain	
Thailand	Peru	Sweden	
Vietnam	United States	Turkey	
	Uruguay	United Kingdom	

Another major supporter of the research programme has been the International Development Research Center (IDRC) of Canada, which supported work by ECLAC/CELADE in expanding the Latin American component of NTA. IDRC also funded a second phase of the Latin American project, and supported NTA work in sub-Saharan Africa with a grant to the African Economic Research Consortium (AERC). More recently, IDRC has provided support for the Asian NTA through a grant to Nihon University Population Research Institute. The United Nations Population Division was an early sup-

porter of the development of this manual, recognizing the value of the project as providing a link between population trends and the economy.

The European members of the project have been very active participants in all phases of the project and have received invaluable support from the European Science Foundation as well as contributions by European governments and institutions. Likewise, the African, Asian and Latin American and Caribbean members have been very active in the global network.

From the start, Ronald Lee of the University of California at Berkeley and Andrew Mason of the East-West Center and University of Hawaiiat Manoa, in Honolulu, have been co-leaders of the project. As the project has grown and evolved, it has become more decentralized and now has regional centres for Asia, Latin America, Africa, and Europe. At the same time, there is a small technical group at Berkeley and the East-West Center that continues to develop methods, give technical assistance, ensure methodological consistency across countries and carry out quality control. Global NTA meetings now take place approximately every other year, in various venues.

Scope and extensions

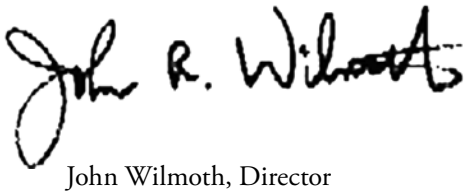
The National Transfer Accounts constitute a complete, systematic and coherent accounting of economic flows from one age group or generation to another, typically for a national population in a given calendar year. As indicated above, these accounts provide very rich and useful information for analysis and policy applications. However, there are several ways in which the accounts could be developed further to serve some analytical and policy objectives more fully. First, these accounts represent and describe actual financial flows; the analyst interested in understanding more fully how these flows might change in response to a changed demographic, economic or policy context should use these accounts in conjunction with a behavioural or dynamic model, including assumptions about how the estimated age profiles might change.

Second, in demography the most natural unit of account is the individual, but in economic accounting the household is a more natural unit because so many decisions and constraints operate at the household level—household members pooling resources, parents allocating resources to children and so on. Indeed, many kinds of economic data are available only at the household level. To implement individual-level accounts, it is sometimes necessary to make imputations or assumptions about the distribution of resources between household members. More detailed empirical information in this regard would improve the understanding of that intra-household distribution.

Third, National Transfer Accounts are consistent with the System of National Accounts (SNA) by construction. A great deal of thought and research has gone into SNA, but that system has its own limitations and shortcomings. For example, it excludes many important home production activities, such as cooking or childcare. Also, SNAs are based on survey and administrative data that may be incomplete or otherwise defective. This manual discusses several of these issues, including recommendations to address the matter of home-based activities and their impact on the recorded production and consumption of individuals of different ages.

Two publications are the most direct antecedents of this manual. The first is an earlier draft version of the manual written by Mason, Lee, Donehower and other members of the NTA project (Mason, Lee et al., 2009b). The second is the book Population Aging

and the Generational Economy (Lee and Mason, editors and main authors, 2011), which reflects the efforts of 50 researchers from 23 countries who played a central role in developing and refining the methods that underlie the National Transfer Accounts. Many of the examples and applications presented in this manual draw from that compendium of NTA research. This manual makes an additional and important substantive contribution that should assist researchers in countries all over the world, both to construct national transfer accounts in a systematic fashion and to understand, interpret and analyse them for the pertinent analytical or policy issues of interest.



John Wilmoth, Director
Population Division, UN DESA

Ronald Lee, Professor
Demography and Economics,
University of California, Berkeley

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We thank them, and particularly Andrew Mason and Gretchen Donehower, who drafted and revised the material contained herein, drawing also on the contribution from Jan van Tongeren and Ruud Picavet on the relationship between the SNA and NTA systems. The International Union for the Scientific Study of Population (IUSSP), including the Panel on the Impacts of Population Ageing, has provided substantive support for the development and dissemination of this and other training tools and technical materials. Jorge Bravo, staff of the United Nations Population Division and member of the aforementioned scientific panel, led the coordination and implementation of the Development Account project that provided core funding for the preparation and publication of this manual.

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Appendices

Abbreviations and acronyms

This chapter contains two tables. The first lists all abbreviations and acronyms found in the text, ordered alphabetically. The second gives the codes that the NTA project uses internally to denote age profiles, ordered by hierarchy in groups of accounts following the order presented in chapters 5, 6 and 7. It is recommended that your computer programs use these codes as much as possible, as it facilitates sharing programs and results among NTA researchers.

Abbreviations

AERC	African Economic Research Consortium
CFC	Consumption of fixed capital
CoE	Compensation of employees
COFOG	Classification of the Functions of Government
EAC	Equivalent adult consumer weights
ECLAC	Economic Commission for Latin American and the Caribbean
GDP	Gross domestic product
GFS	Government Finance Statistics
GNI	Gross national income (GDP plus net property income from ROW)
GMI	Gross mixed income
GOS	Gross operating surplus
NOS	Net operating surplus (gross amount less consumption of fixed capital)
HH	Household
HRS	Health and Retirement Study
IDRC	International Development Research Centre (Canada)
ITLS	Indirect taxes less subsidies (aka taxes on products and production less subsidies)
L	Labour
LSMS	Living Standards Measurement Survey
K	Capital
NPISH	Non-profit institutions serving households
NFNPA	Net non-produced, non-financial asset
NHA	National health accounts
NTA	National transfer accounts
NUPRI	Nihon University Population Research Institute
OECD	Organization for Economic Co-operation and Development
ROW	Rest of the world
SD	Statistical discrepancy
SNA	System of National Accounts
UN	United Nations
UNFPA	United Nations Fund for Population Activities

Main codes for NTA age profiles

Life cycle deficit age profiles—consumption

C	Consumption
CF	Private consumption
CG	Public consumption
CFE	Private consumption, education
CFH	Private consumption, health
CFX	Private consumption other than health and education
CGE	Public consumption, education
CGH	Public consumption, health
CGX	Public consumption other than health and education

Life cycle deficit age profiles—labour income

YL	Labour income
YLE	Labour earnings, including fringe benefit
YLS	Self-employment labour income

Age reallocation age profiles—transfers

Note that the codes for net transfer flows are listed here. Adding an "I" or "O" after the net flow code indicates a gross flow (I for inflow, O for outflow).

T[I/O]	Transfers [inflow/outflow]
TF[I/O]	Private transfers [inflow/outflow]
TG[I/O]	Public transfers [inflow/outflow]
TFB[I/O]	Private transfers, inter-household (between households) [inflow/outflow]
TFW[I/O]	Private transfers, intra-household (within households) [inflow/outflow]
TFWE [I/O]	Private intra-household transfers, for consumption of education [inflow/outflow]
TFWH [I/O]	Private intra-household transfers, for consumption of health [inflow/outflow]
TFWX [I/O]	Private intra-household transfers, for consumption other than health and education [inflow/outflow]
TFWS [I/O]	Private intra-household transfers, passed to household head for saving [inflow/outflow]
TFWC [I/O]	Private intra-household transfers, for consumption [inflow/outflow] (This profile is the sum of TFWE, TFWH, TFWX)
TGE [I/O]	Public transfers, education [inflow/outflow]
TGH [I/O]	Public transfers, health [inflow/outflow]
TGSOA[I/O]	Public transfers, pensions [inflow/outflow]
TGS[I/O]	Public transfers, social protection other than pensions [inflow/outflow]
TGXI[I/O]	Public transfers, other in-kind [inflow/outflow]
TGXC[I/O]	Public transfers, other cash [inflow/outflow]

Age reallocation age profiles—taxes

While not part of the NTA flow account, age patterns of taxes do constitute the basis for calculating public transfer outflows.

TGF	Taxes
TGFK	Taxes on income, profits and capital gains
TGFW	Taxes on payroll and workforce
TGFP	Taxes on property
TGFG	Taxes on goods and services (consumption taxes)
TGFF	Taxes on international trade and transactions
TGFX	Other taxes
TGP	Social contributions
TGPS	Social security contributions
TGPX	Other social contributions
TGG	Grants
TGGG	Grants from foreign governments
TGGF	Grants from international organizations
TGX	Other revenue

Age reallocation age profiles—asset-based reallocations

RA	Asset-based reallocations
RAF	Private asset–based reallocations
RAG	Public asset–based reallocations
SF	Private saving
SG	Public saving
YAF	Private asset income
YAG	Public asset income
YPF	Private asset income, property income
YKF	Private asset income, capital income
YKFB	Private capital income, business and non-profits
YKFH	Private capital income, owner-occupied housing

Note: The letter "F" is often used to indicate private flows, as it stands for "family". The letter "G" is often used to indicate public flows, as it stands for "government".

Chapter 1

The generational economy: foundations and applications

1.1. Introduction

The National Transfer Account (NTA) system was developed to improve our understanding of the age or generational dimension of economies at the national or subnational level. Conventional economic accounts and summary measures do not allow us to analyse how people at different stages of the life cycle are influenced by economic events, demographic change or public policy. This is a serious gap in the statistical systems of developing countries where spending on the education and health of youth may be critical to achieving more robust economic growth, for example. It is also a serious gap for developed economies that are faced with rapid population ageing, rising pension and health-care costs, and slower economic growth.

The work is motivated primarily by a fundamental feature of all societies, the economic life cycle. The economic life cycle refers to patterns of consumption and earnings across age that lead to a mismatch between material needs and the ability to satisfy those needs through own labour. In all contemporary societies, the young and the old, on average, consume more than they produce through their labour. Working-age adults, in contrast, consume less than they produce through their labour.

The economic life cycles observed can exist only because institutions—families, markets and governments—mediate the reallocation of economic resources from one age group to another. Important economic flows occur within families as family members support children and to varying degrees the elderly. Financial markets allow individuals to borrow at one age and lend at another; or to accumulate assets during the working years, which support consumption later in life. Governments tax those in the working ages most heavily and provide the greatest support to children and the elderly. The relative importance of particular institutions in responding to life cycle needs varies enormously around the world, but in all societies the generational role of these institutions, while critical, is poorly understood.

The issues being addressed by NTA are all the more important because changes in population age structure are pervasive and, in many countries, quite dramatic. Approximately half of the world's nations—all developing countries—are relatively young with large school-age populations and large numbers entering the work force. For the other half, mostly in the developed world, growth in the elderly population dominates. The idea that ageing is a developed country problem, however, is no longer valid. Rapid fertility decline in many developing countries is creating the prospect of countries growing old before they grow rich.

Why is it important to understand how societies are dealing with age or generational issues? First, children and many older persons are vulnerable—depending on others to

avoid poverty and to achieve an acceptable standard of living. Poverty and inequality in many nations depend on how successfully the material needs of children and the elderly are being met.

Second, the meaning of age is changing. The young are staying in school longer and delaying their entry into the labour force. People in their sixties and seventies are healthier and less likely to be disabled. Arbitrary definitions of childhood or old-age provide an incomplete and misleading picture of the needs and potential contributions of the young and the old. Arbitrarily defined age boundaries encourage the institutionalization of dependency through ill-advised, inflexible age-based policies.

Third, continued economic progress will depend, to a considerable degree, on the generational economy. On the one hand, this is because of the critical nature of human capital spending—investment in the health and education of children; and on the other, it is because responses to population aging can heavily indebt future generations and waste the economic potential of older people. It can also be because responses to population ageing may affect saving, the accumulation of capital and the productivity of the work force.

Fourth, the sustainability of support systems will be threatened by policies that are insufficiently attuned to the economic pressures arising from changes in population age structure.

Fifth, as consumption patterns change and public programmes are introduced or terminated, issues of intergenerational equity may arise. Are the young being overburdened with future support obligations? Are some working age generations short changed when pension structures are changed? Has rapid economic growth in some countries left retirees lagging behind economically?

Having a better understanding of the generational features of an economy is very important. The amounts involved are enormous. The flows are essential to maintaining standards of living among the most vulnerable segments of our population, children and older persons, and for insuring that future generations are better off than our own. The systems of generational flows are coming under considerable pressure as population age structure changes. NTA estimates are critical to understanding the varied and complex policies that will be needed to address these changes.

The conceptual foundations of National Transfer Accounts (NTA) can be traced to many important studies (Samuelson, 1958; Diamond, 1965; Willis, 1988; and Lee, 1994a and 1994b). National Transfer Accounts rely most directly on Lee's 1994 studies and many important applications by Lee, Mason, and other scholars that are discussed below. The most comprehensive discussion of NTA and estimates of accounts for 23 countries are provided by Lee and Mason (2011b). Many countries involved in constructing NTA are members of an informal research network whose members collabourate on research, training and data collection and dissemination. More information about the research network is available on the NTA website: www.ntaccounts.org. This manual relies heavily on material developed as part of the NTA project (Lee and others, 2008; Mason and others, 2009a; and Mason and others, 2009b).

1.2. Generational economy

The goal of National Transfer Accounts is to provide a systematic and comprehensive approach to measuring the economic flows from a generational perspective. The generational economy is defined in the following way:

- **Generational economy** *n.* (1) the social institutions and economic mechanisms used by each generation or age group to produce, consume, share and save resources; (2) the economic flows across generations or age groups that characterize the generational economy; (3) explicit and implicit contracts that govern intergenerational flows; (4) the intergenerational distribution of income or consumption that results from the foregoing (Mason and Lee, 2011).

1.2.1. Economic life cycle: producing and consuming

The economic life cycle is a universal feature of all contemporary societies. We experience a long period at the beginning and the end of our lives when we consume more than we produce through our labour. In the middle comes a period during which more is produced than is consumed. Many behavioural and non-behavioural factors influence how consumption and labour income vary with age. Average labour income at each age depends on hours worked, labour force participation, unemployment, and wages and the many cultural, political, social and economic factors that influence each of these elements of labour income (Lee and Ogawa, 2011). In similar fashion, average consumption at each age is influenced by historical events, preferences, prices, including interest rates, political systems and many other forces (Tung, 2011).

At the aggregate level, the economic life cycle also reflects the population age structure. In young populations, the aggregate economic life cycle is dominated by the large life cycle deficit—consumption minus production—of the young. Over the course of the demographic transition, populations age and the life cycle deficit of the old becomes increasingly important.

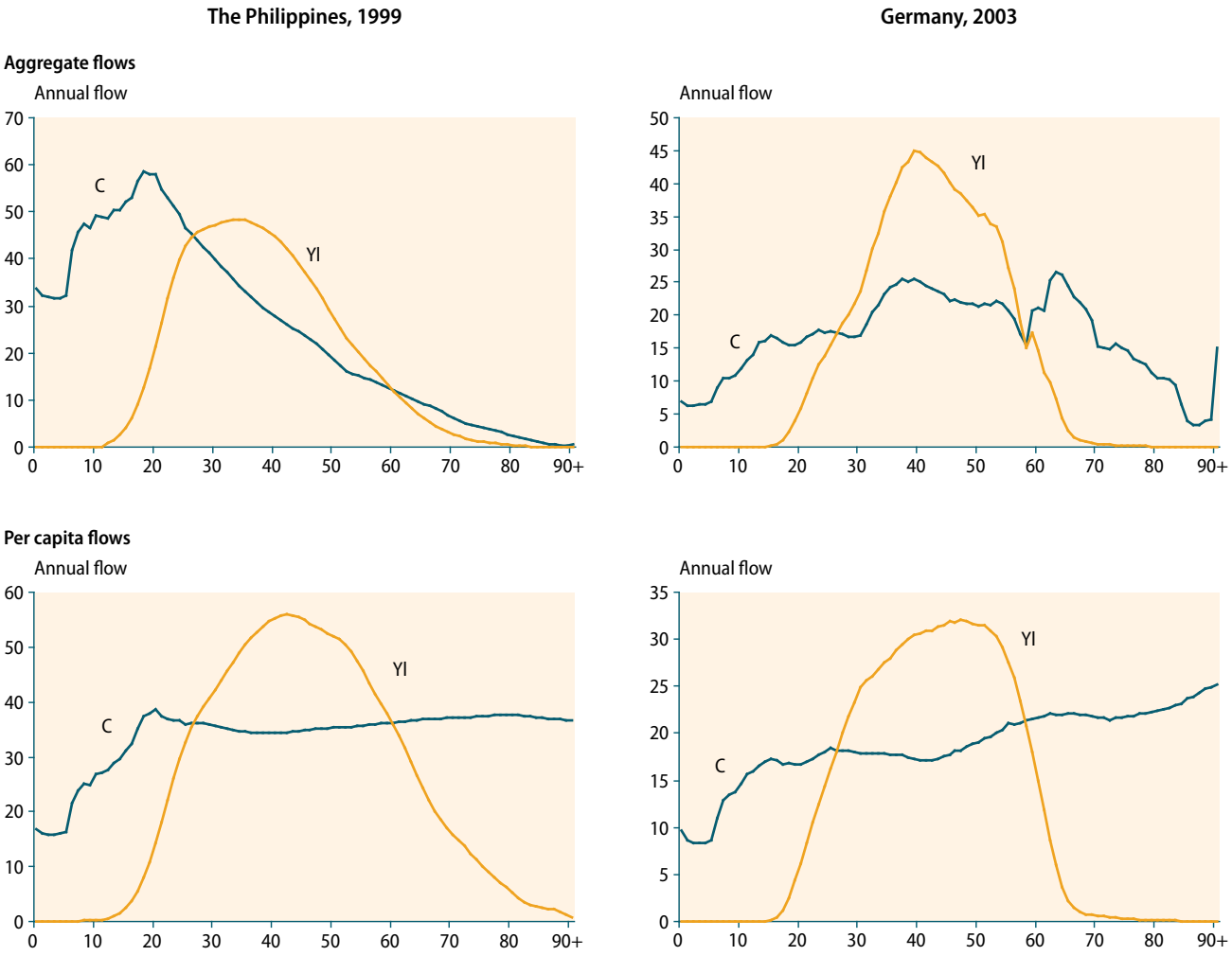
Figure 1.1 compares the economic life cycle of two countries at very different stages of the demographic transition. The Philippines has a relatively young age structure while Germany's is relatively old. The upper panels show the aggregate economic life cycles for both countries while the lower panels show the per capita values. Those under the age of 27 in the Philippines and in Germany are consuming more than their labour income. Those 60 years and older in the Philippines and 58 years or older in Germany are also consuming more than their labour income.

The sheer magnitudes of the life cycle deficits in both countries warrant emphasis. The combined deficit of young people and older persons is 65 per cent of total labour income in the Philippines and 52 per cent in Germany. The most striking difference between the two countries is that the child deficit is so large relative to the old-age deficit in the Philippines (almost 15 times larger), while in Germany the old-age deficit is 50 per cent larger than the child deficit. The difference between the two countries is to a great extent a consequence of population age structure, but there are also important differences between the per capita profiles of consumption and labour income for the two countries.

1.2.2. Age reallocation systems: sharing and saving

The life cycle deficits and surpluses are sustainable only because a complex system of institutions and economic mechanisms enabled flows of economic resources from surplus to deficit ages (Samuelson, 1958; Diamond, 1965; Willis, 1988; Lee, 1994a and 1994b; and Lee and Mason, 2011b). Economic flows across age are mediated by both the public and private sectors. The public sector reallocates resources relying on social mandates embodied in laws and regulations and implemented by local, regional and national governments. Education, public pensions and health-care programmes are important examples of public reallocation

Figure 1.1
Economic life cycle: consumption (*C*) and labour income (YI) in the Philippines, 1999, and Germany, 2003



Note: Upper panels are aggregate flows in billions; lower panels are per capita flows in thousands. The Philippines flows are in pesos and Germany in euros.
Source: www.ntaccounts.org accessed 23 July 2012.

programmes, but even public spending on defense or public diplomacy involve age reallocations to the extent that taxes are disproportionately born by some age groups while benefits accrue to all. Private-sector reallocations are governed by voluntary contracts, social conventions, and deeply ingrained behavioural patterns that are mediated by markets, households, families, charitable organizations and other private institutions. Important examples of private reallocations are private saving, credit transactions and familial support to children and older persons (table 1.1).

The economic mechanisms used for age reallocations fall into two broad categories: transfers and asset-based reallocations. A defining feature of transfers is that they involve no explicit quid pro quo or exchange. Resources flow from one party to another either voluntarily, in the case of most private transfers, or not, in the case of public transfers.

Table 1.1.
A classification and examples of national transfer account age reallocations

	Asset-based reallocations		
	Capital income	**Property income**	**Transfers**
Public	Negligible	Public debt Student loan programmes Sovereign wealth funds	Public education Public health care Unfunded pension plans
Private	Housing Consumer durables Structures, production facilities, vehicles, other machinery	Consumer debt Land Subsoil minerals	Familial support of children and parents Charitable contributions Remittances

Source: Mason and Lee (2011) adapted from Lee (1994).

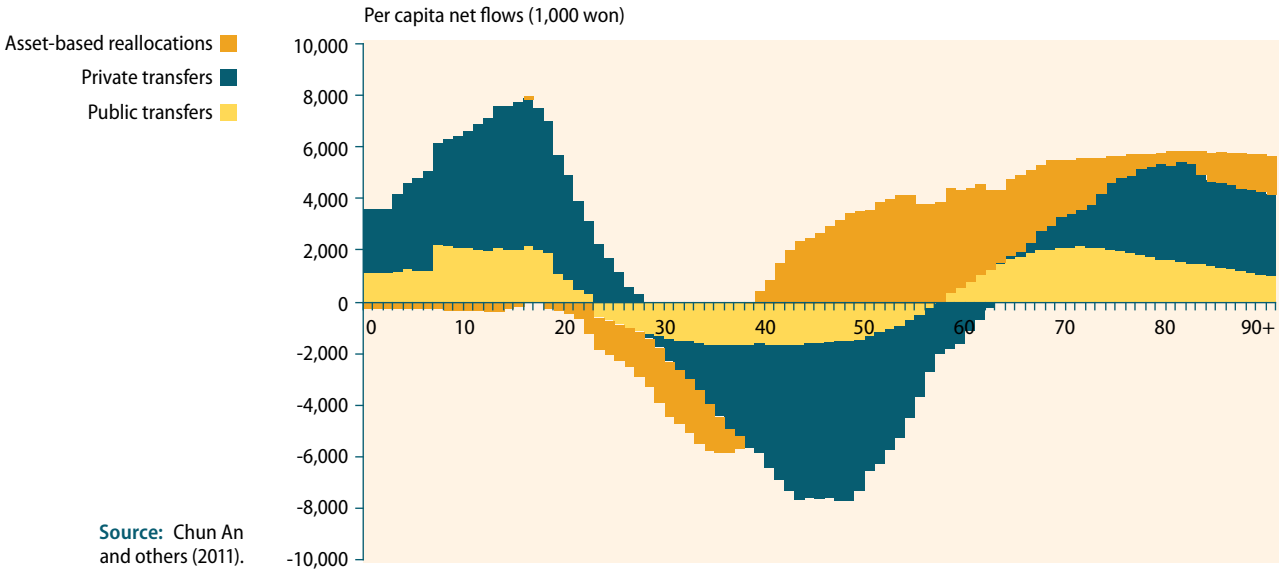
Asset-based reallocations realize inter-age flows through inter-temporal exchange. An asset such as gold, for example, can be acquired using labour income when young. It can be sold later, thereby generating an inflow that can be used to fund old-age consumption. More generally, asset-based reallocations involve two kinds of flows, asset income and savings. When individuals accumulate pension funds or personal saving during their working years and rely on asset income and/or dissaving of those assets during their retirement years, they are relying on asset-based reallocations. On the other hand, when individuals borrow to finance their education, they are relying on asset-based reallocations while they are young.

Capital and property are distinguished in table 1.1. Capital is produced, durable and used in production processes to yield a stream of income or services over more than one period. Hence, capital can be used to reallocate resources across time and age. Individuals can invest today in a factory, a farm or some other form of business and realize a stream of income in the future. Property income derives from financial assets and natural resources. All property income flows involve counter-parties. Interest received by one party, for example, must be matched by interest paid by another party. Royalties on natural resources are paid by the user of the natural resources to the owner of the natural resource. The existence of a counter-party has important implications for the use of credit and other forms of property income for realizing age reallocations at the aggregate level (Samuelson, 1958).

Public capital is shown in table 1.1 as being negligible. This is a feature of the way national economic accounts are constructed. Public investment in national accounts does not yield asset income because the value of the output is calculated as the cost of the inputs. Thus, public capital does not yield an operating surplus or asset income.

Per capita age reallocation flows for the Republic of Korea in 2000 are shown in figure 1.2. Public and private transfers are reported separately while public and private asset-based reallocations are combined. The reallocation system varies considerably with age. Children rely on public and private transfers to fill the gap between what they consume and what they earn. Older persons rely on all economic mechanisms to fund their retirement: public and private transfers and asset-based reallocations. For prime age adults, public and private transfer outflows exceed inflows because they are funding the life cycle deficits of children and older persons. Young adults in the Republic of Korea have negative asset-based reallocations because their saving exceeds their asset income. But from their late 30s onward, asset-based reallocations are positive because some asset income is being used by working-age adults whose labour income is insufficient to fund their own consumption plus their net transfers.

Figure 1.2.
Age reallocations, per capita values, the Republic of Korea, 2000



Source: Chun An and others (2011).

1.3. Generational theory

NTA are governed by accounting principles that are definitional in nature and the results are purely descriptive in nature. The accounts do not rely on any particular behavioural theory. There is no particular causal ordering in the accounts. One cannot take one set of variables as exogenous and another set as endogenous. The patterns revealed may shed light on the validity of alternative behavioural models and may yield unexpected results that are not explained by any existing theories. Great care must be taken, however, in interpreting the results as supportive or not of any particular behavioural theory.

Many generational theories rely on a cohort framework that involves following individuals over time. NTA and other national accounts are cross-sectional by their very nature. They describe economic flows from one party to another, such as an age group, during a particular time period. Repeated estimates of NTA can be used to construct pseudo-panel data and to analyse cohorts. For a few countries, time series estimates have been constructed and this is an important goal for other countries constructing NTA. The methods described here and the estimates presented, however, are cross-sectional and it is important to exercise great care when interpreting these cross-sectional age profiles as though they were longitudinal profiles.

With these warnings in mind, interpreting the empirical patterns found in NTA is enriched by an understanding of the important theories advanced to explain the economic life cycle, intergenerational transfers, life cycle saving, fertility and other relevant issues. Only the highlights can be emphasized here and interested readers should consult Lee and Mason (2011b) and other references cited below for more information.

1.3.1. Economic life cycle: consumption and production profiles

The economic life cycle is in part a consequence of biology. Infants and young children are unproductive and become fully productive only as they mature physically and intellectually. As ageing occurs the ability to produce is affected by two countervailing forces. Individuals

accumulate experience increasing their ability, but they also experience physical and mental decline (Mincer, 1958; Becker, 1964; and Skirbekk, 2003). These biological forces seem to give rise to the inverted U-shaped pattern of labour productivity that characterizes all contemporary societies.

The age pattern of consumption is also influenced by biology. The young require fewer resources to meet their basic needs such as food, clothing and housing. Additional resources are required, however, for human capital investment that is concentrated at young ages. Within the broad parameters established by biology, however, economic, social and political forces govern important details about the age patterns of both labour income and consumption (Lee and others, 2008; Lee and Ogawa, 2011; and Tung, 2011).

Three important forces that influence labour income profiles warrant emphasis. The first is the demand for education. Economic development has led to an increase in the returns to education and delayed entry into the labour force. As a consequence, labour income in high-income countries tends to remain low until later in life, because of delayed entry to the labour force, but to rise more steeply because of the effects of technological innovation on the returns to education (Mincer, 1962 and Autor and others, 2003).

The second broad trend is the emergence of retirement. Historically, in the developed world and still in many poor countries, most older persons worked in agriculture and other informal sectors where the distinction between work and retirement is unclear. As formal sector employment grew, retirement became a distinct part of the life cycle that increased greatly in importance during the twentieth century in the industrialized world for a variety of reasons. With higher income, individuals opted for more leisure in the form of retirement. The development of public pensions undermined work incentives at old ages (Costa, 1998; Gruber and Wise, 1999; and Gruber and Wise, 2001). The development of leisure activities provided an attractive alternative to continued employment (Costa, 1998).

Changing work patterns for women are a third change with potentially important implications for the age profile of labour income. The labour income of women has increased rapidly in many countries as women have achieved higher levels of educational attainment, increased their labour force participation, and increased their representation in highly skilled and highly paid occupations. As fertility has declined, women have become much more likely to continue in the labour force and realize the gains in productivity associated with continued employment (Hill, 1983 and Bloom and others, 2009).

Overlaying these important trends are many complexities that influence the age patterns of labour income. Labour markets have imperfections and inflexibilities that work against some who would like to be employed. This may affect workers who are young or old in particular. Economic fluctuations have effects that influence different age groups in different ways. Public policy may create strong incentives and disincentives for older workers.

Standard economic theory envisions age profiles of consumption as the outcome of a life cycle planning process in which individuals choose an optimal consumption path influenced by time preference and interest rates and constrained by a lifetime budget constraint. Many researchers have gone well beyond this simple textbook characterization to consider the influences of household composition, constraints on indebtedness, uncertainty about age at death, income, health, and public policy, altruism and bequests, and so forth (Tung, 2011).

One of the most striking features of all economies, however, is the pervasive nature of the links between generations or across age groups. The consumption of children obviously depends on the decisions made for them by their parents, but also consumption by the elderly depends on decisions made within extended households and public sector decisions, rather than on individual optimizing behavior on the part of the elderly.

1.3.2. Transfers

Transfers between generations are important in every contemporary society. In young developing countries, the dominant flow is from adults to children. As countries develop and begin to age, the direction of these flows reverses and eventually upward transfers, from prime-age adults to the elderly, are as large or in a few countries even larger than the downward flows (Lee, 2003). This trend seems likely to be reinforced as population ageing continues.

The public and private sectors play important and distinctive roles. In families, transfers to children dominate, while familial transfers to the elderly are very important in some societies but small in others (Lee and Donehower, 2011). The nature of the public sector changes substantially with development but there are also strong regional patterns. Transfers to children in the form of public education are important in all countries. Public transfers to the elderly have been more important in Europe and Latin America than elsewhere (Tanzi and Schuknecht, 2000; Lindert, 2004 and Miller, 2011).

What explains intergenerational transfers—their magnitude, their direction and the respective roles of the private and public sectors? Research on transfers to children going back to Becker, Willis and others is concerned with the number of children and spending per child by parents (or grandparents) (Becker and Lewis, 1973; Willis, 1973 and Becker and Barro, 1988). In this framework, parents have children and spend on their children because they derive satisfaction or utility from having children. Economic development has two important effects on fertility and private transfers to children. First, as parents become richer they prefer to spend more (transfer more) on each child. This makes children more expensive and induces parents to substitute quality for quantity. Second, with development, market opportunities for women increase and the opportunity cost of childbearing rises. This leads couples to have fewer children. Economic development leads to lower fertility and a rise in net private transfers received by each child.

Other theories of fertility emphasize services that children provide to their parents. In some economies children might be net producers at a relatively young age to the economic benefit of their parents. Children might be valued for the old-age support that they will provide to parents. Or children might be viewed as a way of insuring against a variety of risks. In these frameworks, fertility declines because the economic flows to children increase relative to the flows from children. This might happen because of a change in the cost of children, a decline in employment opportunities for young children, or the development of public or market systems (pension system, insurance) that provide a lower cost alternative to children (Hotz and others, 1997; Schultz, 1997 and Arrondel and Masson, 2006).

Similar theoretical models have been used to explain private transfers to the elderly. Adult children may make transfers to the elderly out of a sense of altruism or because they derive satisfaction from their parents' consumption or utility. Or transfers to the elderly may be a form of exchange. Adult children may provide support to their parents in return for the transfers they received as children. Grandparents may provide help with child-rearing and receive financial support in return. Adult children may provide attention or time transfers to their elderly parents, receiving bequests or other financial transfers in return. The elderly and adult children may insure each other against a variety of risks by implicitly pooling resources.

The role and importance of the public sector changed dramatically during the twentieth century. Public education, publicly funded health care, public pensions, other forms of social insurance, and income maintenance programmes were established around the world. There is considerable diversity, however, partly reflecting differences in development but also strong regional patterns. Public transfer systems have been particularly important in many parts

of Europe and Latin America and less so in Asia, North America and Australia. In most of Africa, the public sector plays a relatively limited role in intergenerational transfers.

Many important issues arise with respect to public transfers. One important area is the relationship between public and private transfers. Becker and Murphy (1988), for example, see public investment in education as a mechanism for dealing with inefficient investment in human capital by parents. A second issue is the impact of public transfers on generational equity. Particular attention has been devoted to whether growth of public spending on the elderly is coming at the expense of the young or of future generations (Preston, 1984). A third issue is whether public programmes are sustainable given rapid population ageing (Lee and Tuljapurkar, 2000 and Miller, Mason, et al., 2011).

1.3.3. Assets, saving and the life cycle

The life cycle saving model is the classic economic model of how assets can be employed to shift resources from the working ages to the retirement ages. The key idea is that individuals save during their working years, accumulating assets on which they can rely during retirement. Retirees can fund retirement relying on income generated by their assets or by spending down their assets as they age. The elderly can accomplish the same thing by relying on an annuity that serves the additional purpose of minimizing the effect of uncertainty about the age at death (Modigliani and Brumberg, 1954; Ando and Modigliani, 1963; Mason, 1981; Mason, 1987; and Attanasio and others, 1999). In most countries, life cycle saving occurs in the private sector as workers participate in employment-based retirement plans or accumulate assets such as a home or personal savings. In a few countries, pension programmes can fall into the public sector or can be a mixed undertaking as governments mandate life cycle saving that is accumulated in publicly managed (Singapore) or privately managed (Chile) pension funds.

Young adults can also rely on an alternative form of life cycle behaviour to smooth consumption over their lifetime. They can increase consumption when young, beyond what is available from labour income and net transfers by accumulating debt. They might do this by relying on a credit card or getting a student loan. Later, when their labour income is sufficiently high, they can save in order to retire their consumer debt. This form of life cycle saving is readily apparent in some high-income countries like the United States of America.

An important alternative hypothesis is that saving is driven by the bequest motive (Kotlikoff and Summers, 1981). Bequests are substantial in countries for which reliable data are available, but there is disagreement about the extent to which bequests are intentional or are an unintended consequence of uncertainty about the age at death.

One of the important issues that concern economists is the extent to which public policy undermines saving and, as a consequence, rates of economic growth. To the extent that saving is motivated by the life cycle motive, public transfers to the elderly through pensions or publicly funded programmes will crowd out private saving (Feldstein, 1974). If saving is motivated by bequests, public pension programmes that are funded by increasing taxes on younger generations may have an entirely different effect on behavior. The elderly may increase their saving with the intention of leaving a larger bequest to compensate their descendants (Barro, 1974). They may also increase private transfers to their children to offset the increased public transfers they have received from their children's generation.

Another important issue that has concerned many economists is how population ageing is likely to affect financial markets. Of particular concern is that the baby-boom generation will begin to liquidate assets as it enters retirement leading to a sharp decline in asset prices (Abel, 2001; Poterba, 2001; and Abel, 2003).

1.4. Applications of National Transfer Accounts

1.4.1. Demographic dividends: using NTA to understand development

The possibility that demographic change can help low-income countries achieve more rapid economic growth has attracted a great deal of interest in recent years (Bloom and Williamson, 1998; Mason, 2001; Bloom and others, 2002; Mason, 2005; Lee and Mason, 2007; and Mason and Lee, 2007). The demographic transition leads to systematic changes in population age structure that influence the share of the population in the working ages, a phenomenon often referred to as the first demographic dividend. Demographic change may also lead to a second demographic dividend due to favourable changes in spending on human capital formation (Lee and Mason, 2010) or savings and physical capital accumulation (Mason and Lee, 2007). For countries in the later stages of the demographic transition, changes in age structure appear to be unfavourable as the share of the population in the working ages declines. NTA can be used to understand why demographic dividends vary among countries and how they can be influenced by public policy.

A simple identity can be used to distinguish the important effects of age structure on economic growth:

$$\frac{C}{N} = \frac{(1-s)Y}{L}\frac{L}{N} \tag{1.1}$$

Consumption per consumer (C/N), a measure of the material standard of living, depends on two factors. The first is the amount of income each worker produces and consumes, equal to 1 minus the saving rates (s) times income per effective worker (Y/L). The second term is the support ratio (L/N), which is the ratio of the number of workers relative to the number of consumers.

Equation 1.1 is transformed into growth terms by taking the natural log of both sides and differentiating with respect to time yielding:

$$gr\left[\frac{C}{N}\right] = gr\left[\frac{(1-s)Y}{L}\right] + gr\left[\frac{L}{N}\right] \tag{1.2}$$

where gr[z] represents the growth rate of z. The second demographic dividend operates through the growth rate of net productivity per worker. The first demographic dividend operates through growth in the support ratio. Given the growth rate of net productivity (C/L), a 1 percentage point increase in the support ratio leads to a 1 percentage point increase in the standard of living.

1.4.2. The support ratio

The support ratio has become a standard tool used to consider the economic effects of changing population age structure, but it is defined in different ways. In some studies, the support ratio is defined in strictly demographic terms counting each person in the 15-64 age range as one worker and each member of the population as one consumer. The support ratio as defined here is similar to an approach introduced by Cutler, Poterba, et al. (1990). The effective number of workers, the numerator of the support ratio, incorporates age variation in labour force participation, hours worked, unemployment, and productivity or wages. In similar

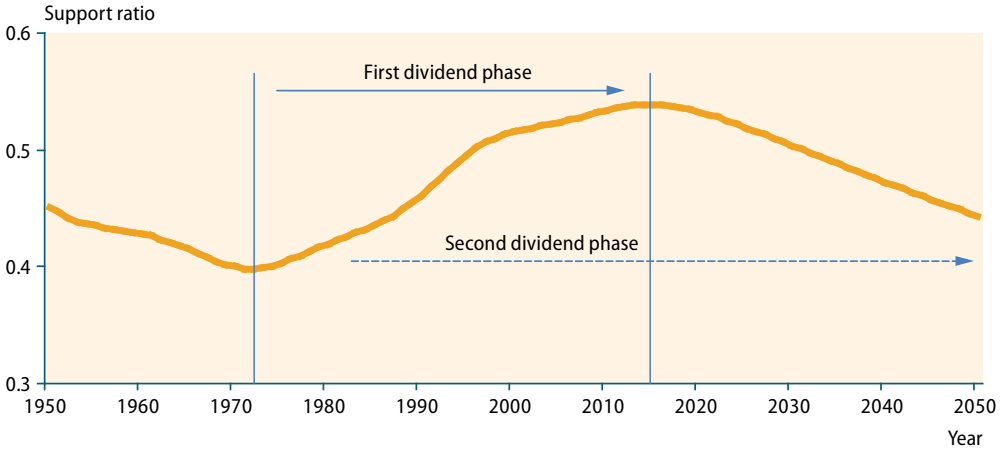
fashion, the effective number of consumers, the denominator of the support ratio, allows for age-specific variation in consumption to calculate how the effective number of workers varies over time (see chapter 5 for a detailed discussion of the support ratio).

This approach offers two advantages. First, it is based on real differences in the economic life cycle that the support ratio is intended to measure. The economic meaning of age is changing and varies greatly across countries, even those at similar levels of development. There are very significant differences in consumption and production patterns over the life cycle between high- and low-income countries. Moreover, there have been enormous changes over time—later entry and earlier withdrawal from the labour force and increased spending on health care at older ages. The second advantage is that the method offers ways to incorporate changes in behavior or policy that influence the economic life cycle. Delayed retirement, for example, is expected to reduce the support ratio by increasing the number of workers relative to the number of consumers.

The dramatic swings in China's support ratio illustrate the importance of population change to economic growth (Wang Feng and Mason, 2008). The support ratio for China from 1950 to 2050 has been updated using the most recent NTA estimates for China (Li, Chen, et al., 2011) and exhibits the swings that occur over the demographic transition (figure 1.3). In the 1950s and 1960s, the support ratio in China declined as the decline in infant and child mortality led to an increase in the child population and, hence, in the effective number of consumers. The impact of fertility decline became apparent in the 1970s as the support ratio began to rise to the peak level expected in just a few years. Finally we see the decline in the support ratio that is projected in the future as the share of China's elderly population increases. At the end, in 2050, China's support ratio is projected to be very near the level that it was in 1950.

The first dividend phase is marked by the interval during which the support ratio is rising, between 1972 and 2014, adding to economic growth. In the case of China, the rise of the support ratio pushed per capita income and consumption higher by 42 per cent. The annual addition to economic growth during this period was 0.7 per cent. This compares with a decline between 1950 and 1972 of 0.6 per cent per year and, hence, a net swing in economic growth of 1.3 per cent per year. The projected decline for 2014 to 2050 is 0.5 per cent per year

Figure 1.3.
Support ratio for China and annual growth rate of support ratio in China, 1950-2050



Source: Constructed by the authors using NTA profiles from www.ntaccounts.org accessed 26 June 2012 and United Nations, World Population Prospects 2010 (United Nations Population Division, 2011).

or a shift of 1.2 per cent per year in growth between the dividend phase and population ageing phase. The effects of demographic change are important, but they explain a modest portion of the very rapid rate of economic growth that China has experienced in recent decades.

China's demographic transition is quite compressed as compared with many other countries because its fertility decline has been very rapid. Other countries in East Asia have had similar experiences and in some cases the effect on economic growth has been more substantial than in China. In the Republic of Korea and Viet Nam, for example, rapid growth in the support ratio led to more rapid growth in per capita income by about 0.9 per cent per year (Mason and Lee, 2011). In many other countries, the demographic transition has been more gradual. The total change in the support ratio in other countries is similar to China's but the annual change can be much slower.

The second demographic dividend does not have a clear demarcation. It depends on how resources generated by the first demographic dividend are used—invested to enhance development prospects or exclusively to raise current consumption. Some of the most important applications of National Transfer Accounts address this issue.

1.4.3. Human capital

The rise in the support ratio during the dividend phase and its decline once population ageing begins is largely a consequence of the decline in fertility. As discussed in section 1.2, the decline in childbearing that occurs with development is accompanied by an increase in spending per child. In the terminology of Becker, parents substitute quality for quantity. The public sector behaves in a similar way—spending per child also increases as fertility declines.

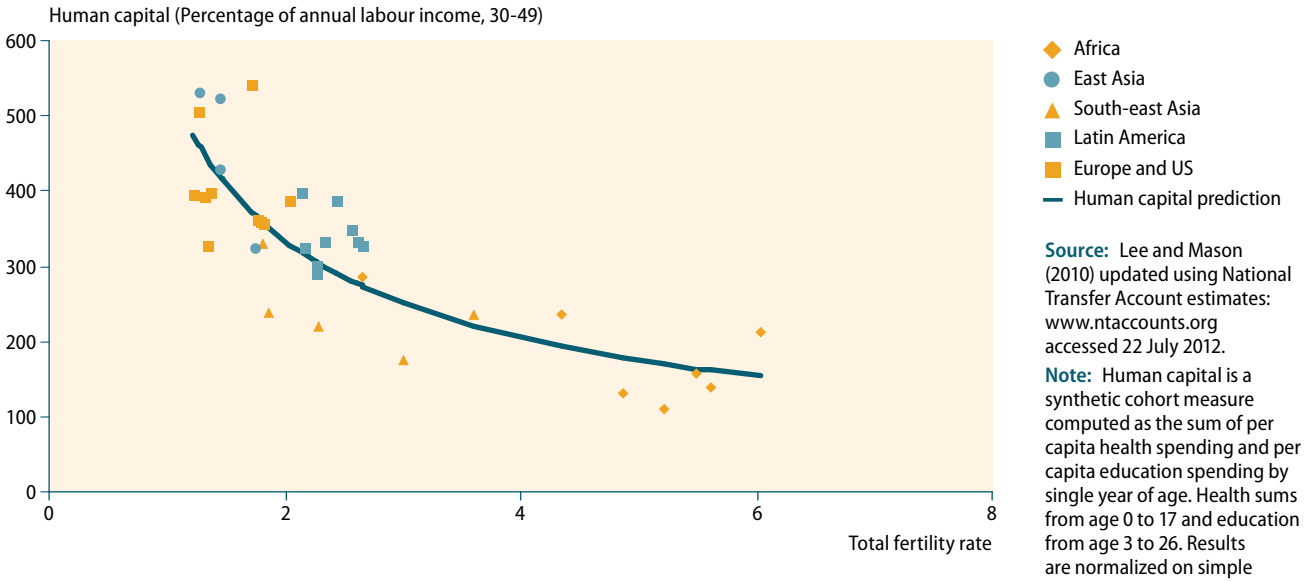
The quantity-quality tradeoff is important to understanding the development effects of changes in population age structure (Becker and Barro, 1988). Greater investment in human capital will raise the net productivity of the work force once the smaller, but more educated, cohorts begin to enter the workforce. This will reinforce the pro-growth effects of the increase in the support ratio during the dividend phase, and it will offset the growth retarding effects of the decline in the support ratio when population ageing sets in. Analysis by Lee and Mason (2010) shows that the human capital effects are large enough to produce a second demographic dividend: an increase in education-related productivity that more than offsets the decline in the support ratio.

A key empirical issue is the strength of the quantity-quality tradeoff. Quality, as the term is used in the economics of fertility literature, refers to total spending per child. This can be quantified using NTA data, but much of the increase in spending per child has no particular effect on subsequent productivity. A more relevant measure is spending on health and education—human capital spending.

The tradeoff between fertility and human capital spending based on cross-sectional data is shown in figure 1.4. The measure of human capital is a synthetic cohort measure constructed by cumulating annual public and private spending on health and education at age 0-17 for health and 3-26 for education. The age limits for health were chosen to exclude most health spending on maternal health because of uncertainty about the extent to which that spending enhances the human capital of the mother as compared with the unborn child. Education spending was counted from age 3 to exclude spending on care provided to very young children that is more often commercialized in rich countries than in poor countries.

The most important factor that influences human capital spending is surely the level of development. Rich countries spend more on education and health than poor countries. The salaries of teachers are much higher in rich than in poor countries. To control for level of

Figure 1.4.
Human capital and the total fertility rate in selected countries



Source: Lee and Mason (2010) updated using National Transfer Account estimates: www.ntaccounts.org accessed 22 July 2012.

Note: Human capital is a synthetic cohort measure computed as the sum of per capita health spending and per capita education spending by single year of age. Health sums from age 0 to 17 and education from age 3 to 26. Results are normalized on simple average of per capita labour income for persons 30-49.

development human capital spending has been normalized by dividing by the simple average of labour income of 30 to 49 year olds. Hence, the values show the synthetic lifetime cost of human capital spending per child as a percentage of the pre-tax per capita labour income of adults in their prime working ages.

Public and private spending increases steeply as fertility declines. In high fertility countries, like Nigeria and Kenya with total fertility rates of 5 or more, lifetime human capital spending per child varies from roughly 100 to 200 per cent of prime-age labour income. In some low fertility countries, human capital spending exceeds 500 per cent of labour income. The estimated elasticity is slightly less than one. This means that total human capital spending on children is declining as the number of children decline, but not by very much.

Cross-sectional estimates like these may not provide a very good indication about what happens over time as fertility declines in individual countries. For the United States and some East and South-east Asian countries relatively long time series of NTA estimates have been analysed. The estimated elasticity for the US is similar to that found for cross-sectional data (Lee and Mason, 2010). The estimated elasticities are very large for East and Southeast Asia (Ogawa, Mason, et al., 2009).

1.4.4. Saving and capital

The effect of population age structure on saving and capital is key to understanding the second demographic dividend and other important macroeconomic effects. NTA estimates have been used extensively to consider how changes in population age structure influence saving and the demand for wealth and capital (Lee, Mason, et al., 2000; Lee, Mason, et al., 2001b; Lee, Mason, et al., 2003; Lee and Mason, 2010; Mason, Lee, et al., 2010; and Sánchez Romero, Patxot, et al., 2012).

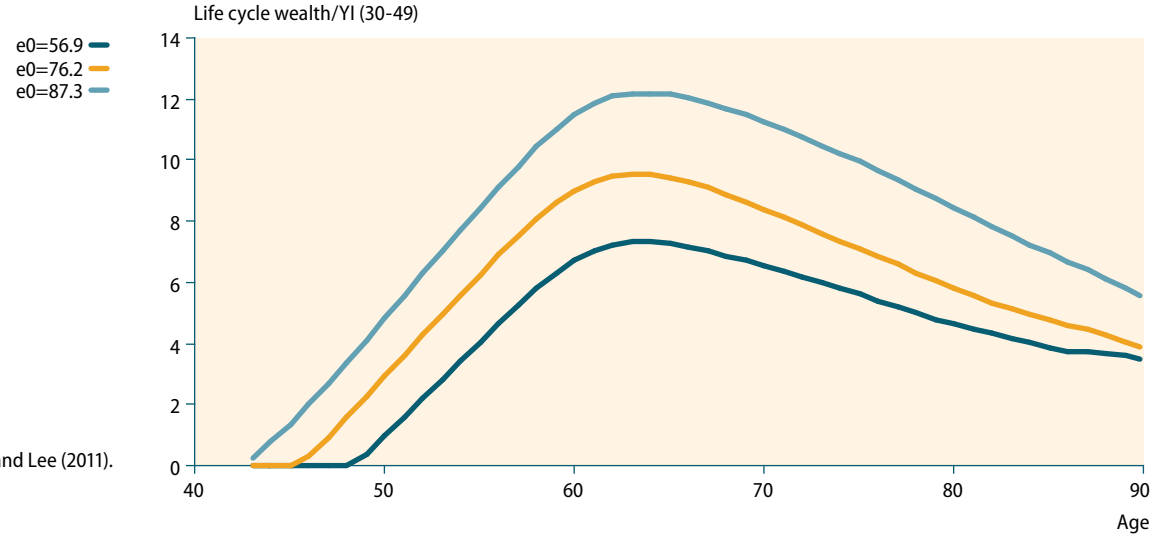
The old-age life cycle deficit, the gap between consumption and labour income, provides a measure of the demand for old-age support and how it changes with population age-

ing. The demand for old age support is summarized by life cycle pension wealth, the present value of the anticipated difference between consumption and labour income over the remainder of an individual's or group's lifetime. Per capita life cycle pension wealth for individuals at each age will depend on four factors: the amount they expect to earn and consume at each age, the discount rate and the probability of surviving to each age.[1]

Estimates of life cycle pension wealth by age for Japan are presented in figure 1.5.[2] The values are constructed for three different survival schedules for Japan capturing the increase in life expectancy at birth for both sexes combined from 56.9 in 1949 to 76.2 in 1979 to 87.3 in 2009. Life cycle pension wealth increases with age reaching a peak in the early 60s and then declines thereafter. Given the 2009 survival schedule, the average Japanese in his or her early- to mid-sixties would need life cycle pension wealth equal to about 12 times the average labour income of persons 30-49 to fund old age consumption. Life cycle pension wealth at each age increases as life expectancy rises, because the expected number of years in retirement is increasing. Of course, other responses are possible. Japanese might decide to consume less or to work more in old age, but in the application presented here the economic life cycle is held constant at the values observed in 2004 (Ogawa, Matsukura, et al., 2011).

Life cycle pension wealth for the economy as a whole will depend both on the age profiles of life cycle pension wealth, as shown in figure 1.5, and the population at each age. Over time life expectancy is shifting upward and the population age distribution is becoming increasingly concentrated at older ages. Simulations show that these demographic changes lead to an increase in national life cycle pension wealth from 1.9 times total labour income in 1950 to 12.7 times total labour income in 2000 based on the medium fertility scenario from the United Nations Population Division. This result is not peculiar to Japan. In general, population ageing is leading to very substantial increases in the economic resources that will be required to fund old age. The implications of this trend will depend, however, on the ways in which these resources are generated.

Figure 1.5.
Life cycle pension wealth by age, Japan, three survival schedules



Source: Mason and Lee (2011).

1 Chapter 4 provides a detailed explanation of the calculation of life cycle pension wealth.

2 Details of the estimates are available in Mason and Lee (2011).

Transfers or assets?

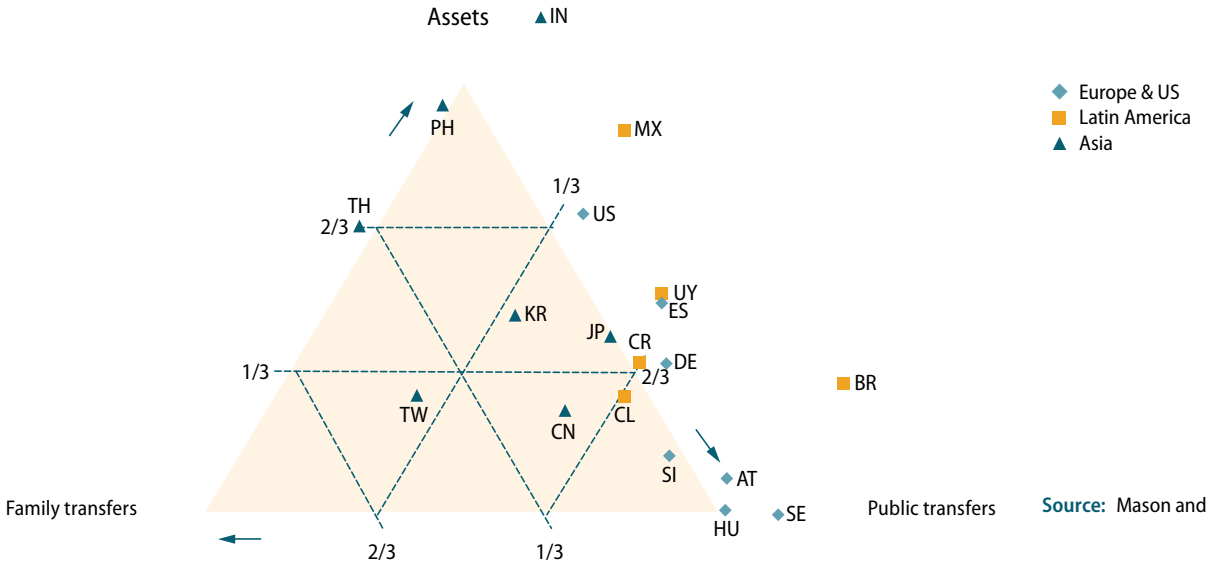
Additional resources for old age support can be generated in three ways. Older adults can rely more on family members, i.e., their adult children. Public programmes, namely public pensions and publicly-provided health care can be expanded. Third, contributions to funded pension systems and other forms of saving can be raised. There is great diversity across countries and within countries over time, however, in the importance of each of these mechanisms for funding old age support.

The triangle graph, figure 1.6, shows how the elderly are funding their life cycle deficit in 17 economies for which NTA estimates are available. Each of the vertices represents exclusive reliance on one source of support: assets, family transfers, and public transfers. In the Philippines (PH), for example, the elderly rely almost exclusively on assets. Many countries are located near the right-hand-side of the triangle. Along this side the elderly, on average, are relying on some combination of assets and public transfers and not at all on their families. We see the elderly in four countries, Japan (JP), Costa Rica (CR), Germany (DE), and Chile (CL), relying on net public transfers for about two-thirds of their support and on assets for the other third. Another group of countries, all in Europe, are relying entirely or almost entirely on public transfers to fund the gap between their consumption and their labour income.

In many developing countries, transfer inflows and outflows between the elderly and their family members are substantial. In many cases, the very old are much more financially dependent on family support systems. On average, however, net familial transfers to the elderly are small in most countries analyzed.

Net familial transfers to the elderly are substantial in a few Asian economies: Taiwan, Thailand, and the Republic of Korea. In another group of countries, those lying to the right of the triangle, net transfers to the elderly are negative. In Brazil (BR) and Mexico (MX) the elderly are providing more economic support to their children and grandchildren than they are receiving.

Figure 1.6.
Family transfers, public transfers and asset-based reallocations as a share of the life cycle deficit, persons 65 and older



Source: Mason and Lee (2011).

Given the status quo approach to funding old age needs, population ageing would lead to an increase in the demand for assets that would be greatest in the four countries that rely on assets to fund two-thirds or more of old age deficits—Mexico, the Philippines, Thailand, and the United States. The impact on the demand for assets would be very small in Austria, Hungary and Sweden where old age needs are not met by relying on assets. In other countries the effects would be intermediate.

An increase in the demand for assets would reinforce the increase in the demand for human capital, both of which would cushion the impact of population ageing on living standards. Ageing societies may have fewer workers but they should have greater skills and more capital. In the absence of reform, however, population ageing will also lead to a very substantial increase in the burden of pension and health-care systems on the public sector and, hence, on taxpayers.

1.4.5. Fiscal issues

Applications of National Transfer Accounts to the analysis of fiscal issues rely on analysis of the structure of taxes and benefits and how these vary by age. The methods used to estimate NTA public sector flows and summary measures are described in detail in chapter 6.

Governments are heavily engaged in intergenerational transfers. Children and, in many countries, the elderly are important beneficiaries of public programmes that emphasize education, health care and pensions. National Transfer Accounts have been used extensively to analyse public intergenerational transfers. Some of the methods employed are illustrated here using NTA estimates for Brazil (Turra, Holz, et al., 2010; and Turra, Queiroz, et al., 2011). The case of Brazil is by no means representative. It is used here because of its unusually generous public pension system. As shown in figure 1.7, total per capita public transfer inflows to those in their 70s are almost as large as the pre-tax labour income of a 30-49 year old adult because of the generous public pensions provided to seniors.

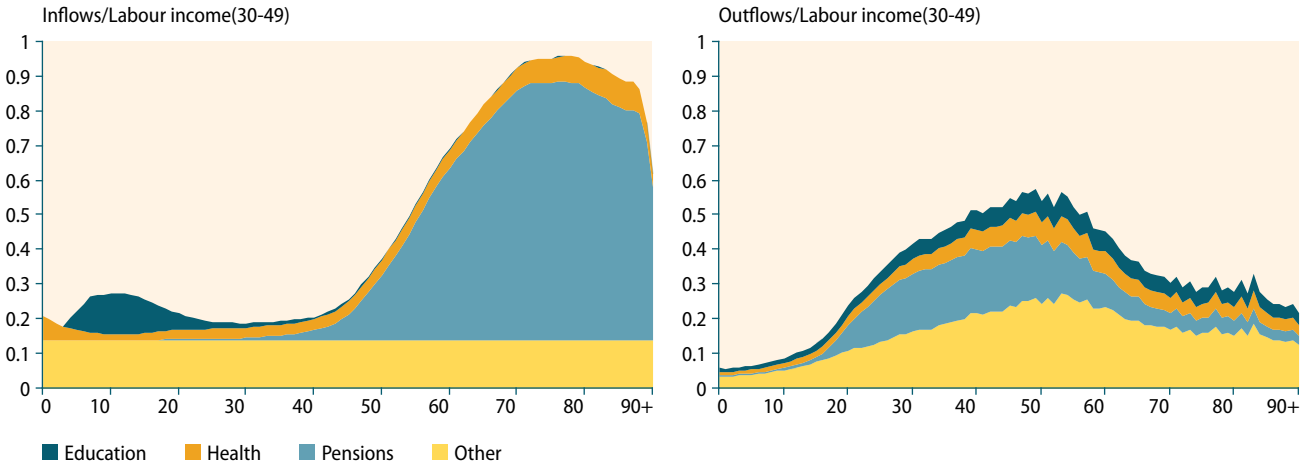
The age structure of taxes varies around the world depending on the resources that are taxed and the distribution of those resources by age. In general, taxes fall more heavily on prime-age adults. In Brazil, per capita taxes peak at about age 50 and then decline as earnings and other forms of income drop. The elderly, and children to a lesser degree, do pay taxes that are assessed on consumption and in the case of the elderly on property and income from assets.

The age profiles of public transfer inflows (benefits) presented in figure 1.7 may appear to be too high as compared with the public transfer outflows (taxes and public asset-based flows), but this is not the case. By construction, national transfer inflows and outflows are equal for each use and for all public transfers combined.[3] The per capita inflow and outflow structure shown for Brazil is possible because Brazil's population is concentrated at ages where tax levies are substantial rather than at older ages where per capita benefits are so large.

Public transfer inflows and outflows can be combined with population projections to produce fiscal projections. NTA estimates have been used for this purpose by Lee and Tuljapurkar (1998b and 2000) and by Miller, Mason and Holz (2011). These studies can be consulted for detailed information about some of the important issues that arise in constructing fiscal projections.

3 See chapter 5 for a detailed explanation.

Figure 1.7.
Per capita public transfer inflows and outflows by age and use, Brazil, 2002, all values normalized on per capita labour income of those 30-49



Source: NTA database (www.ntaccounts.org) accessed 21 June 2012.

Public transfer wealth and debt

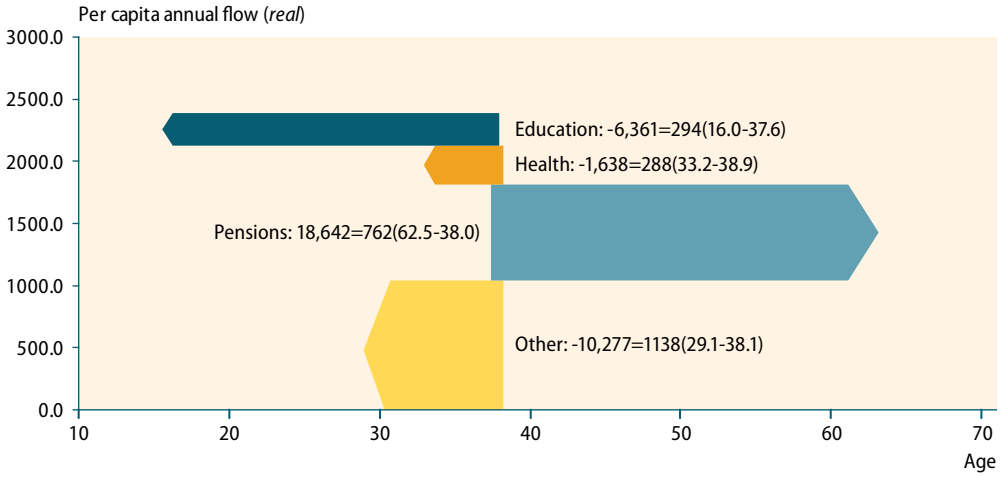
The conventional approaches to describing public transfers would be to report the annual flow, perhaps as a share of the total government budget or as a share of GDP. This is useful information, but it fails to capture important features of intergenerational transfers measured in National Transfer Accounts, such as the age direction of transfers and information about which ages are paying and which ages are receiving. This kind of information turns out to be critical to gaining a better understanding of the economic impact of intergenerational transfers.

Lee (1994a and 1994b) develops an approach that captures these key elements of intergenerational transfers—arrow diagrams such as the one shown in figure 1.8. The annual per capita flow is represented on the vertical axis and age on the horizontal axis. The height of each arrow is equal to the annual flow, in this case the per capita flow for education, health, pensions and other public goods, services, and cash transfers measured in real. Combined, the per capita annual flow in Brazil was about 2,500 *real* per year—30 per cent of the pre-tax labour income of a prime-age adult (30-49). The base of the arrow is aligned with the average age of the outflow, the average age of the taxpayers weighted by the average tax payment at each age to each programme. The average age of the outflows are very similar across programmes, but they are not identical because programmes have different funding mechanisms. The head of the arrow is aligned with the average age of the inflow, the average age of the beneficiary weighted by the amount of their benefit. Education transfers are downward from those who are about 38 on average to those who are about 16 on average. Pension transfers are upward from those who are about 38 on average to those who are 62.5 on average.

The area of each arrow has an important interpretation—it is approximately equal to public transfer wealth per person, the present value of anticipated transfers that will be received less anticipated transfers that will be made over the lifetime of the current population divided by the total population.[4] Public transfer wealth for downward transfers, like

4 The approximation is exact for economies in steady-state equilibrium and golden rule growth (Lee, 1994a and 1994b). It provides a reasonable approximation under other circumstances

Figure 1.8.
Per capita public transfer wealth, annual flows and mean ages of inflow and outflows, Brazil, 2002



Note: Public transfer wealth for each use is calculated as the annual flow times the mean age of inflow less the mean age of outflow. Unit for public transfer wealth is in *real*. Source: Calculated using data from NTA database (www.ntaccounts.org) accessed 21 June 2012.

education, is negative because most people have already received benefits when young but as adults are expected to pay for the education of younger generations. Payments for those who are currently members of the population have no effect on transfer wealth because the cost for those paying is balanced by the benefit of those receiving. The transfer wealth derives entirely from obligations of the current population for those who will be born in the future.

Transfer wealth is positive if the intergenerational flow is upward. By funding programmes for the elderly, taxpayers are creating wealth through a social contract that obligates future generations to treat them in similar fashion.

The transfer system as a whole can also be characterized by Lee arrows. In the case of Brazil, public transfer wealth was relatively small in 2002 because the upward flows and the downward flows balanced. The mean age of inflows was 38.3 and the mean age of outflows was 38.1. Thus, public transfer wealth was 365 *real*, about 4 per cent of the average labour income of a prime-age adult.

An important feature of transfer wealth is that it is always balanced by counterpart flows involving future generations. Any programme that creates transfer wealth for the current population does so by creating transfer debt for future generations. Resources are merely being shifted from future generations to current generations via the public transfer system.

The construction of public transfer wealth has been used to look at the generational impact of public programmes in the United States (Bommier, Lee, et al., 2010). Public transfer wealth also bears many similarities to Generational Accounts (Auerbach, Gokhale, et al., 1991 and Auerbach and Kotlikoff, 1999).

Fiscal support ratio

Changes in population age structure have a direct effect on the budgetary pressures faced by governments that are trying to fund education, health, pensions and other intergenerational transfer programmes. A rise in the number of taxpayers relative to the number of beneficiaries for any particular programme allows governments to reduce taxes or raise benefit levels without running deficits. Conversely a decline in the number of taxpayers relative to the number

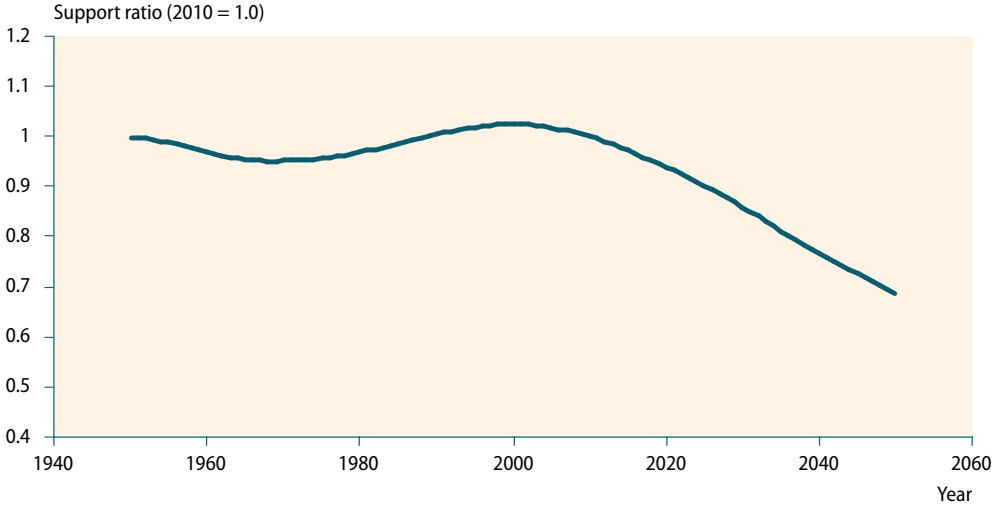
of beneficiaries means that taxes must be raised, benefits reduced or some combination of the two. Relying on deficit spending offers no solution to this problem; that option would just lead to higher taxes to pay interest on public debt.

The overall impact on the public budgets of changing population age structure can be readily assessed using the fiscal support ratio—the ratio of the effective number of tax payers to the effective number of beneficiaries. The effective number of taxpayers is calculated by weighting the population in each age by their contribution to taxes relative to a reference group, such as those 30-49. The effective number of beneficiaries is calculated in the same fashion. The fiscal support ratio can then be scaled to equal 1 (or 100) in a base year. In figure 1.9, a base year of 2010 is chosen.

The fiscal support ratio shows how taxes or benefits must be adjusted to compensate for differences between the age structure in each year relative to the age profiles in the base year. For Brazil, the fiscal support ratio was relatively constant before 2010. A very different picture emerges for the future, however, with a very substantial decline in the fiscal support ratio over the coming decades. Between 2010 and 2050, to compensate for changes in population age structure, benefits would have to be reduced by 30 per cent or taxes would have to be increased by a comparable amount.

In many low-income countries that are relatively early in their demographic transition, the fiscal support ratio is rising as populations become increasingly concentrated in the prime taxpaying ages. The population dynamics that lead to this outcome are very similar to those that lead to the first demographic dividend described above. There are other countries that are further along in their demographic transition, but public intergenerational transfers to the elderly are very modest. Given the status quo, Thailand's fiscal support ratio is not projected to decline because its public programmes for the elderly are so limited. For most countries that are experiencing population ageing, however, the fiscal support ratio is projected to decline. Of 20 economies examined in a recent study by Miller (2011), Brazil experienced the largest decline in the support ratio between 2010 and 2050. But Japan, many European countries and a number Latin American countries can expect substantial declines in their support ratios as well.

Figure 1.9.
Fiscal support ratio, Brazil, 1950-2050



Note: Value for 2010 set to 1.0.
Source: NTA database (www.ntaccounts.org) accessed 23 June 2012.

1.4.6. Wealth, golden rule growth and maximizing consumption

Wealth is a fundamental concept in National Transfer Accounts and figures prominently in many applications. Wealth is broadly defined for each age group as consisting of two components: the value of assets (A) as defined in the System of National Accounts (see chapter 2 for more details on the System of National Accounts); and transfer wealth (T)—the present value of net transfers anticipated over the remainder of each age group's life. Transfer wealth of those who are alive is balanced by transfer wealth (or debt) of future generations. Transfer wealth for current generations can only be created by obligating future generations to provide support in the future to those who are currently alive.

In principle, determining the value of assets is straightforward. They are directly observable, and they are valued by markets with some exceptions. Determining transfer wealth is more difficult because it is prospective and depends on what is anticipated by the parties involved. For example, the value of public pensions, particularly for young people, is uncertain. As low-income countries become richer, they may create public pension programmes that are not anticipated. Rapidly ageing countries may retrench their pension programmes in the future by amounts that exceed or fall short of what people anticipate. Likewise, private transfers that are received may differ greatly from those that are anticipated.

Most applications to date have constructed measures of transfer wealth by assuming that the age pattern of currently observed per capita flows will continue in the future. Economic growth can be accommodated by allowing per capita age profiles to shift upward at the same rate as productivity. An important complexity is that changes in age structure must be accommodated through changes in flows across age groups. Changes in the number of taxpayers relative to the number of beneficiaries, as noted above, must be accommodated by changes in public transfer inflows and public transfer outflows. And changes in public transfer inflows and outflows will affect other important features of the generational economy, such as consumption and saving. The same kinds of issues arise with respect to private transfers as well.

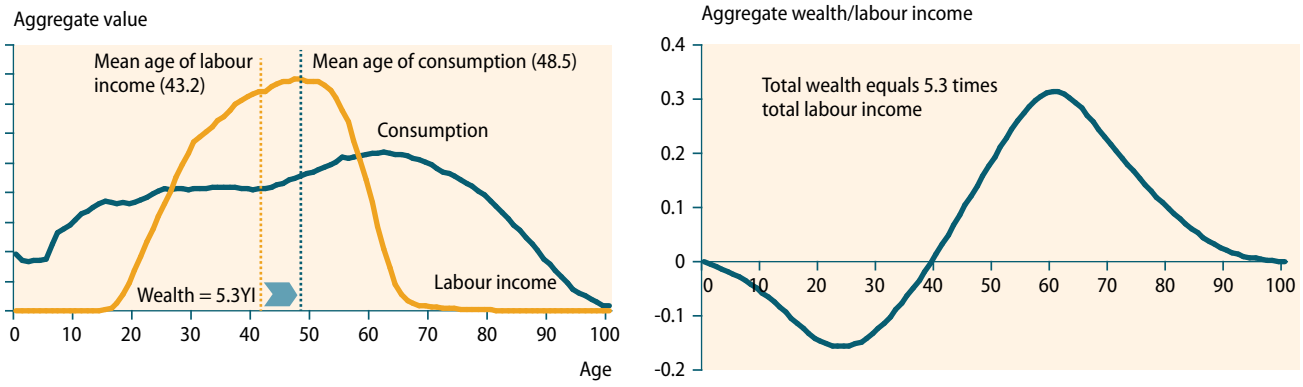
One approach to dealing with these problems is to rely on a macroeconomic model to incorporate how changes in age structure will influence the economy and, hence, the wealth of each cohort. Some previous applications have used very simple models while others have relied on partial or general equilibrium models of the economy (Lee, Mason, et al., 2000; Lee, Mason, et al., 2001b; Lee, Mason, et al., 2003; Lee and Mason, 2010; Mason, Lee, et al., 2010; and Sánchez Romero, Patxot, et al., 2012).

A second approach that is appropriate for analysis of very long-term issues is to analyse stable populations. Stable populations have constant fertility and mortality rates and eventually grow at a constant rate with a fixed age structure. This is a comparative static exercise that is useful, for example, for assessing the implications of having different levels of fertility or mortality or the long-run implications of different kinds of public policies with respect to transfers.

Lee and Mason (2010 and 2011b) use NTA data to construct wealth measures given golden rule growth, a special case of a stable population with constant productivity growth and a saving rate that insures the maximum possible consumption that can be sustained across all generations. The methods employed by Lee and Mason are used to construct estimates of life cycle wealth (figure 1.10) based on NTA estimates for Germany in 2003 (Kluge, 2011).

The age profiles of consumption and labour income in the left panel are aggregate values at each age, based on NTA estimates of the per capita profiles, a steady-state popula-

Figure 1.10.
Life cycle wealth, golden rule growth, based on consumption, labour income profiles and age specific survival rates for Germany and a population growth rate of -0.5 per cent per annum



Source: Constructed using methods described in Lee and Mason (2011b), figure 2.1 (p. 36) and NTA data for Germany (Kluge, 2011).

tion based on survival rates in 2010, and a population growth rate assumed to be -0.5 per cent per year. The consumption profile has been rescaled so that total consumption and total labour income are equal—a property of golden rule growth.

Aggregate life cycle wealth at each age is plotted in the right panel of the figure. Life cycle wealth is defined as the wealth demanded by households to realize the prospective consumption and labour income profile—the profiles shown in the left panel in this case. The life cycle wealth is calculated as the present value of consumption less labour income. It will equal total wealth plus net bequests, the present values of prospective inheritances to be received less bequests to be given.

An important feature of golden rule growth is that the life cycle wealth of the newborn cohort, W(0), is zero. Of course, assets are zero, but transfer wealth is zero as well. Over each birth cohort's entire life the present value of transfers received are equal to the present value of transfers given. In other cases, transfer wealth of the newborn cohort will not be zero. For the United States, for example, Bommier, Lee, Miller and Zuber (2010) show that United States public transfer wealth is positive for almost all living generations.

Children receive both public and private transfers until they become adults and in a sense they are accumulating debts that they must, in turn, pay to future generations once they become parents and taxpayers. This accounts for the negative life cycle wealth that increases in magnitude and then declines as the debt is paid off. Eventually life cycle wealth turns positive as adults make transfers to current generations of elderly for which they will receive future payments from younger generations. Life cycle wealth goes to zero by definition as the cohort dies out. Any bequests whether planned or accidental are not included in life cycle wealth. The wealth profile shown in figure 1.10 is also influenced by the age distribution of the population. Life cycle wealth is high at older ages in part because the population is very old.

The values in the right panel are expressed relative to total labour income. Life cycle wealth peaks at about age 60 when the combined wealth of all members of that age group is equal to about 30 per cent of total labour income. Total life cycle wealth will be constant at 5.3 or 530 per cent of total labour income.

Given golden rule growth there is a very simple relationship between life cycle wealth and the intergenerational flows that arise as a consequence of the economic life cycle. In the case of Germany reallocations are upward from younger ages to older ages. The mean age of labour income is 43.2 years of age while the mean age of consumption is 48.5 years of age. Willis has shown that given golden rule growth, life cycle wealth equals the annual flow of resources, either consumption or labour income, times the lag between labour income and consumption:

$$W = Y^l \left(A_c - A_{y^l} \right) \tag{1.3}$$

The values shown for Germany are consistent with this finding. The mean age of consumption exceeds the mean age of labour income by 5.2 years, the ratio of life cycle wealth to labour income computed using mean ages in the left panel and by cumulating life cycle wealth at each age over all ages in the lower.

Life cycle wealth is central to understanding the long-run economic implications of population age structure. A standard implication of the neo-classical growth model is that slower population growth always leads to higher income and higher consumption per worker due to the capital deepening effect. An increase in the rate at which the labour force is growing requires that a larger share of saving must be devoted to maintaining capital per worker and, hence, the capital-output ratio and output per worker must decline (Solow, 1956). Samuelson pointed out, however, that an optimum population growth rate might exist because age structure effects might offset the capital dilution effects of population growth at sufficiently low rates of population growth (Samuelson, 1975a; Samuelson, 1975b; and Samuelson, 1976). Arthur and McNicoll (1978) explored this issue for golden rule paths showing that the partial effect of population growth on welfare (or consumption) was equal to:

$$\begin{aligned} dC/dn &= Y^l \left(A_c - A_{y^l} \right) - K \\ d\ln C/dn &= A_c - A_{y^l} - K/Y^l . \end{aligned} \tag{1.4}$$

Willis (1988) and Lee (1994a and 1994b) built on this result to show that:

$$\begin{aligned} dC/dn &= W - K = T \\ d\ln C/dn &= T/Y^l . \end{aligned} \tag{1.5}$$

Given golden rule saving rates, the effect of population growth on consumption depends on the difference between life cycle wealth and capital or transfer wealth. Consumption reaches its peak when transfer wealth is zero and, equivalently, when the mean age of transfer inflows and the mean age of transfer outflows are equal, in other words, when the transfers to children and the elderly, measured in transfer wealth terms, are balanced.

1.5. Conclusion

Economics has made considerable progress toward providing a comprehensive theory of the way generations interact over the life cycle relying on markets, public institutions and the family. Developing a unified theory is a work in progress but it has successfully gone far beyond the traditional emphasis in economics on individuals and the role of the market.

In recent years survey data have greatly improved. The Health and Retirement Survey, SHARE and similar panel studies have greatly improved our understanding of the micro-level processes that govern the economics of ageing. Similar data have not been available to explore the macroeconomic implications of changing population aged structure.

Understanding generational issues and the connections between population and the economy is important for every country. The demographic transition has produced dramatic changes in population size, growth and age structure that will continue for decades to come. National Transfer Accounts provide a new tool that can be used to gain greater insights about how standard of living, generational equity, financial conditions and other important features of our economies are likely to be influenced by these demographic changes.

Chapter 2

An overview of National Transfer Accounts

2.1. Introduction

National Transfer Accounts provide an accounting of economic flows to and from residents of a country classified by their age. The accounts are comprehensive in that all economic flows that arise as a consequence of the production of goods and services during the year are incorporated into the accounts. The aggregate values are broadly consistent with those found in national accounts, as detailed in the System of National Accounts (SNA) methodology maintained by the United Nations (see box 2.1), but there are also important differences discussed in more detail below. National Transfer Accounts are structured to emphasize the generational economy and its key features: the economic life cycle and age reallocations realized by relying on intergenerational transfers and assets. The purpose of this chapter is to provide an overview of the accounts, while the remaining chapters in this manual will emphasize account details and the construction of National Transfer Accounts.

Box 2.1.
National accounts and the System of National Accounts (*SNA*)

National accounts, also called macroeconomic accounts, are national-level estimates of economic quantities. Modern national accounting was begun in the 1930s and provides a framework for numerically describing all aspects of a market economy. Gross domestic product (GDP) is the best known example of a national accounts estimate.

The System of National Accounts (SNA) is an internationally agreed upon standard set of concept definitions and recommendations on how to compile national accounts. The creation, distribution and revision of the SNA is coordinated by the United Nations. (http://unstats.un.org/unsd/nationalaccount/sna.asp). The SNA was most recently revised in 2008, but NTA methodology was developed based primarily on the 1993 version which is still implemented in many countries.

2.2. Conceptual elements of NTA

The broad features of National Transfer Accounts are discussed in this section highlighting the purpose of NTA, the relationship between the elements of NTA, the institutions, the structure of the accounts and the relationship to the System of National Accounts.

2.2.1. Economic life cycle and reallocations systems

National Transfer Accounts is organized around the economic life cycle which is a feature of all economies. There are extended periods at the beginning and, in all contemporary societies, at the end of life when people consume more than they produce through their labour. In the middle comes a period during which people produce more than they consume.

The economic life cycle cannot exist without economic mechanisms and social institutions that facilitate the reallocation of resources across age. Two economic mechanisms lead to reallocations. First, transfer systems embodied in families, non-profit institutions and governments channel resources across age. Second, assets provide a store of value that allows economic resources to be shifted over time and across age.

2.2.2. Age and the individual perspective

National Transfer Accounts classify all flows by the age group of the individual. The classification of economic flows by age is a central feature of NTA and essential to its purpose of providing the basic economic data to study the generational economy. All conceptual frameworks that have been developed to study generational issues rely on distinguishing economic activity of successive cohorts or at a point in time for different age groups. This is true of Generational Accounts, life cycle saving models and overlapping generation models.

All NTA flows are classified from the perspective of the age groups or the members of the age group and not from the institutions that serve as intermediaries. Some non-NTA studies use the household as the unit of analysis and distinguish economic flows by the age of the household head. In these studies, the household, and not the individual, is the basic unit of analysis. Understanding that NTA uses the perspective of the individual or age group is essential to the correct interpretation and construction of the accounts. Economic flows that are resources from the perspective of an age group or its members are referred to as *inflows.* Resources used by the age group are referred to as *outflows.* Saving is a balancing item. When individuals save they generate an outflow and when they dissave they generate an inflow.

Some economic flows can be classified by age based on observable transactions. Earnings, consumption of individual goods and some forms of public transfers are examples. But many economic flows cannot be readily classified by age for several reasons.

First, some flows go to and from institutions that serve as the agents for individuals rather than to the individual. An important principle that guides NTA is that all institutions are treated as agents, representatives or intermediaries for individuals and, hence, age groups. Flows to and from corporations, non-profit institutions and governments are treated as flows to and from individuals that explicitly or implicitly bear the cost or reap the benefit associated with those flows.

Second, some flows are inherently indivisible. Public goods provide value to all, not to a particular individual. The consumption of public goods by one individual or one group does not affect their availability to another individual or group. In NTA, however, public goods are allocated to age groups using simple methods described in later chapters.

A third problem is that many flows can be documented for households, but not for the individual household members involved in the flow. In some cases, this may be because they are indivisible, household public goods, but other flows may not be readily assignable

to a particular household member. Two examples are flows related to assets (saving and asset income) and inter-household transfers. Household surveys do not generally provide information that can be used to assign these flows to individuals.[1]

2.2.3. Institutions

National Transfer Accounts distinguish three kinds of institutions or sectors: the private sector, the public sector and the rest of the world. The private sector consists of corporations, households including household enterprises and non-profit institutions serving households (NPISH). The public sector consists of the government.[2] All institutions are treated as intermediaries between individuals. All economic flows are assigned to age groups including flows to non-household institutions. Firms are considered the agents for the individuals who own them and governments the agents of taxpayers and beneficiaries of public programmes. The institutional structure of the flows is completed by distinguishing flows to and from the rest of the world—individuals or institutions that are not resident in the country in question.

The total economy is defined as the flows to and from residents or age groups. Flows to and from the rest of the world are not part of the total economy, but they are included in total flows as shown below.

2.2.4. Households

An important feature of NTA is that the individual rather than the household serves as the unit of analysis. Using the household could offer some advantages because it aligns more easily with survey data that typically emphasize the household while providing little information about how resources are allocated or used within the household. All economic activity in the household cannot be fully viewed as a simple agglomeration of individual activities that can be unbundled given sufficient information. Household members jointly consumer pure public goods and benefit from economies of scale. Some income is clearly individual in nature, but part of income is a return to jointly owned household enterprise and other household assets.

There are several disadvantages to using the household as the unit of analysis, but perhaps the most important is that flows to the household provide an incomplete description of the generational economy. Everywhere transfers within the family are essential to the well-being of children. In many parts of the world transfers between adult children and the elderly who are residing together are very important. One of the key objectives of NTA is to estimate the direction and value of the flows across generations through families, as well as through the public sector. Intra-household transfers are very large as compared with inter-household transfer.

Estimating economic flows between individuals living together relies on a simple model of the household. In general, we assume that the members of the household share economic resources in an altruistic or egalitarian fashion. With the exception of consumption of health and education, we assume that adults within each household have the same

1 The Taiwan Family Income and Expenditure Survey (FIES) is an exception, but almost all asset income is assigned to the household head rather than to other household members.

2 Note that this is all sectors of the government consolidated into one set of accounts, i.e., central and local levels of government combined.

level of consumption while children consume less, reflecting their lower material needs. Hence, differences in age patterns in consumption across countries or over time reflect differences in household composition, household consumption and the interaction between the two. Actual, but unobservable, differences in sharing rules within households are not captured in NTA. The same sharing rules are used for all applications. The sharing rules also influence intra-household transfers which are determined in large part by the estimated consumption of individual members. For a more extensive discussion of sharing rules and an assessment of alternative approaches to this issue, see Lee, Lee and Mason (2008).

A second important simplifying assumption is that for some economic flows the household head serves as the agent for the household. All inter-household transfers are assumed to flow to and from the household head. The household head is assumed to hold all of the household's assets and, hence, asset income and saving are assigned to the household head. Intra-household transfers between household heads and other household members also occur because the head is assumed to receive asset income and to save. This assumption has a more important bearing on estimates in societies where co-residence of adult children and the elderly is common.

2.2.5. NTA and the System of National Accounts (SNA)

Many of the concepts and definitions employed in NTA are broadly consistent with those in the SNA. This is useful for a number of reasons. First, NTA builds on the experience gained over many decades in constructing the most widely used aggregate economic accounts worldwide. Second, the consistency between NTA and SNA facilitates macroeconomic analysis that draws on both sources of information. Third, SNA values are used as macro controls for many important NTA components, meaning that the NTA flows are adjusted to match aggregate flows as measured in the SNA (see box 2.2).

There are a number of important differences between NTA and SNA. First is the treatment of institutions. In NTA age groups or and individuals are primary. Other institutions are secondary and distinguished only as intermediaries.

Second, a fundamental feature of NTA is the assignment of all income from production as a return to labour or a return to capital. This is central to distinguishing a key element of the economic life cycle, producing through labour, from a key element of the asset-based reallocation system, capital income. Neither labour income nor capital income has an SNA counterpart for two reasons. The first is that mixed income includes the return

Box 2.2.
Macro controls and adjustment in NTA.

Also called "control totals", macro controls are aggregate measures of economic flows, as measured in the System of National Accounts (SNA). They are used to scale NTA age profiles so that the NTA aggregate estimates match the estimates from the SNA. Note that not all NTA age profiles have an exact SNA macro control—some NTA age profiles are combinations of SNA concepts, so the macro control will be computed as the combination of SNA amounts.

Scaling of NTA age profiles is done by finding a multiplicative factor that makes the NTA aggregate match the SNA aggregate. For example, if total consumption of private education in SNA was 110 units but the population aggregate NTA estimate based on data from a consumption survey was only 100 units, the NTA value for each age would be multiplied by 1.1.

to labour and the return to capital in household enterprise. In NTA we allocate mixed income between labour and capital. Second, in SNA, taxes on products and production are a component of GDP and are not allocated to labour or capital. In NTA, we estimate labour income, capital income and consumption before taxes on products and production are assessed.

Third, SNA does not distinguish any flows within households. These are estimated and central to NTA. Thus, intra-household transfers and the components detailed below do not have a counterpart in SNA.

At this time, only the construction of an NTA flow account has been finalized and documented in this manual. A complete set of National Transfer Accounts should include three additional sub-accounts: an account that documents bequests and other wealth transfers; an account of holding gains that incorporates changes in assets prices and the value of transfer systems; and a balance sheet that reports both assets and transfer wealth.

Technical information about the relationship between NTA and SNA is provided in chapters 3 and 4.

2.3. The Accounts

2.3.1. NTA flow identity

The NT Flow Account is based on the following flow identity:

$$\underbrace{Y^{l}(x)+\tau^{+}(x)+Y^{k}(x)+Y^{p+}(x)}_{\text{Inflows}}=\underbrace{C(x)+\tau^{-}(x)+Y^{p-}(x)+S(x)}_{\text{Outflows}} \tag{2.1}$$

The left-hand-side consists of all current inflows to the age x group: labour income, $Y^{l}(x)$, transfer inflows, $Y^{k}+(x)$, capital income, $Y^{k}(x)$, and property income inflows, Y^{p+}. The right-hand side consists of all outflows from the age x group: consumption, $C(x)$, transfer outflows, $\tau^{-}(x)$, property income outflows, Y^{p-} , and saving, $S(x)$, the balancing item in NTA. The flow identity holds for either aggregate values or per capita values at each age. The equation above shows all values indexed by age x, but the identity also holds for national aggregates, in other words, all age groups combined.

Rearranging terms represents inflows and outflows in a way that matches the conceptual foundations for National Transfer Accounts by highlighting the economic life cycle and the economic mechanisms used to reallocate resources across age. The economic life cycle is represented on the left-hand side by the life cycle deficit, the difference between consumption and labour income ($C(x)-Y^{l}(x)$). The right-hand-side represents the reallocation system that consists of two economic mechanisms: net transfers, $\tau(x)=\tau^{+}(x)-\tau^{-}(x)$ and asset-based reallocations, $Y^{A}(x)-S(x)$, where asset income, $Y^{A}(x)$, is equal to capital income plus property income, $Y^{A}(x)=Y^{k}(x)+Y^{p+}(x)-Y^{p-}(x)$:

$$\underbrace{C(x)-Y^{l}(x)}_{\text{Lifecycle Deficit}}=\underbrace{\underbrace{\tau^{+}(x)-\tau^{-}(x)}_{\text{Net Transfers}}+\underbrace{Y^{A}(x)-S(x)}_{\text{Asset-based Reallocations}}}_{\text{Age Reallocations}} \tag{2.2}$$

The components of the flow constraint are further disaggregated in a number of ways: distinguishing the public sector and the private sector and reallocations by purpose (health, education, pensions and other purposes).

2.3.2. NTA, aggregate values, and aggregate constraints

The NTA flow identity in equation 2.1 can be summed across all ages to yield aggregate values for each of the flows:

$$Y^l + Y^k + Y^p + \tau = C + S \tag{2.3}$$

The terms on the left-hand side are inflows to the resident population during the accounting period in question. Labour income plus capital income and property income (Y^l+Y^k) is primary income or net national income measured using pre-tax (or basic) prices. It is the compensation paid to assets and labour as a consequence of their role in the production process. Net property income for the economy as a whole, Y^p, consists of the income from foreign assets received by residents less the payments of interest and dividends to foreign parties that have invested in the domestic economy.[3] The final inflow is net transfers from the rest of the world, τ. These four flows taken together are net national disposable income: the flow or resources generated during the year that can be devoted to two broad uses: public and private consumption (C) and saving (S).

Box 2.3.
Net versus gross in NTA and SNA

Most of the time in NTA, a "net" flow refers to the balance between "gross" inflows and outflows. For example, an age profile of net transfers would be the age profile that results from subtracting the inflow age profile from the outflow age profile. Also, a net flow could refer to an amount that is flowing between the country and the rest of the world.

In SNA, however, the term "net" often refers to a quantity less the associated consumption of fixed capital, which can usually be interpreted to mean net of depreciation. For example, net domestic product is gross domestic product less consumption of fixed capital In a few instances where this is an issue in NTA, flows net of the consumption of fixed capital are used.

The key economic aggregates in NTA differ in some respects from their SNA counterparts because of the treatment of taxes on products and production (often known as indirect taxes). The aggregate values in NTA are taken prior to the assessment of taxes on products and production. The details of this adjustment process are discussed below.

Equation 2.3 also holds for each age group with the same interpretation. The net disposable income for an age group consists of the income earned as part of the productive process, net property income earned from holding financial assets and liabilities, and net transfers. Net disposable income is equal to public and private consumption of the age group plus saving.

Transfers and property income have an important feature—they must balance. Aggregate inflows and outflows must be the same, because these flows always involve a counterpart. A transfer given must be matched by a transfer received. Interest income must be matched by interest expense. Dividends received are always matched by dividends given. This property applies to transfers as a whole, to public and private transfers, to transfers by

3 Note that the gross flows contain much larger amounts of exchanges between entities within the country, but these will cancel each other out in the net flow.

purpose (education, health, etc.), to inter- and intra-household transfers and to all types of property income—interest, dividends, rent,[4] and royalties.

Public property income inflows do not necessarily equal public property income outflows, however, because of flows between the public and private sector. For example, the payment of interest on public debt is classified as a public transfer outflow (from taxpayers). If the debt is held by a private institution, the interest income to that institution is classified as a private property income inflow.

Total transfers and property income do not sum to zero for the total economy (residents or all age groups combined) because of inflows to and outflows from the rest of the world. Transfer inflows to the resident population and the rest of the world must equal transfer outflows to the resident population and the rest of the world. Likewise, property income inflows to the resident population and the rest of the world must equal property income outflows to the resident population and the rest of the world.

2.3.3. Economic life cycle and age reallocation accounts

NTA consists of three accounts. The economic life cycle account provides a measure of the extent to which individuals at each age are able to provide for their material needs through their current labour. The economic life cycle account is composed of consumption, labour income and the difference between the two—the life cycle deficit/surplus.

The two age reallocation accounts quantify the economic flows that shift resources across age with the net effect of eliminating the deficit at young and old ages and the surplus at prime ages. Public and private age reallocations are captured in separate accounts.

2.3.4. Economic mechanisms for age reallocations

Age reallocations are accomplished through two economic mechanisms: transfers and asset-based reallocations. The defining feature of a transfer is that there is no explicit quid pro quo. This distinguishes transfers from exchange in which payment is made for some good or service. Of course, transfers may be viewed as a form of implicit exchange. Adult children may provide financial support to their parents as a form of compensation for childcare services provided by grandparents. In the absence of market exchange or an explicit contract, however, NTA classifies these kinds of flows as transfers following the same principles as in SNA.

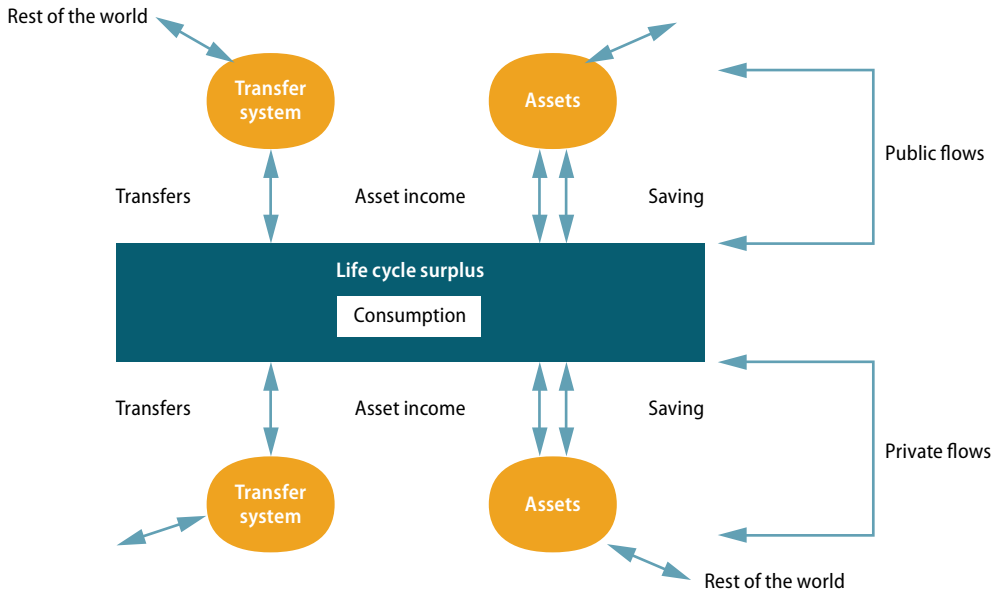
Asset-based flows rely on income from assets and the accumulation and dis-accumulation of assets to reallocate resources across age. Asset-based flows involve inter-temporal flows. Assets are accumulated in one period at one age creating wealth that can support uses at later ages. The accounts only document asset-related flows during the current accounting period—asset income and saving.

Asset income comes in two forms: capital income and property income. Capital income is the return to capital realized by firms and the flow of services to households from owner-occupied housing. Property income consists of interest, dividends, rent and royalties. A feature of property income that distinguishes it from capital is that all property income involves a counterpart. Interest income is always matched by interest expense, for example.

4 Rent is defined in SNA as a payment to an owner of a natural resource, e.g., land, for making that resource available to another user. This is not to be confused with a rental payment, such as for a residence.

A simple schematic shown in figure 2.1 represents key elements of NTA flows. The total economy consists of all residents classified by age group represented as falling within the dash oval. The flows for one age group are represented. The economic life cycle consists of consumption and labour income. (The age group represented is consuming less than its labour income.) The public sector, private sector and the rest of the world are involved in age reallocations. The public transfer system consists of transfers and asset-based flows that rely on governments that collect taxes, provide in-kind and cash transfers, pay interest on public debt, and accumulate public assets and public debt.

Figure 2.1.
Schema of NTA flows to and from an age group with a life cycle surplus—labour income in excess of consumption



The private transfer system consists of household and non-profit institutions serving households that serve as intermediaries for all private transfers. Private assets involve the household sector and financial and non-financial corporations that invest, borrow, loan and so on in the private sector.

The rest of the world operates through the public and private sectors and the intermediaries that serve them.

2.3.5. Distinguishing flows by purpose

NTA distinguishes consumption and transfers by their purpose emphasizing those particularly relevant to the generational economy: education, health, public pensions and all other flows.

2.3.6. A stylized NTA flow account

A stylized example, shown in table 2.1, illustrates important features of the NTA flow account. The population is represented in three broad age groups—children, workers and

elderly—as compared with 91 age groups (0 through 90+) in standard NTA.[5] The flows are aggregate values rather than per capita values. The sums of flows to and from the three representative age groups are defined as the flows for the total economy. Flows to/from the rest of the world are stated from the perspective of the foreign entities and arise because non-resident institutions (governments, firms, individuals, etc.) may consume and earn labour income, pay taxes and receive benefits, exchange private transfers with residents and acquire and dispose of financial assets and liabilities. The flows are summarized here with further, important detail presented in subsequent chapters.

The economic life cycle (panel A) is summarized by three flows: consumption, labour income and the life cycle deficit which is equal to consumption less labour income. The flows capture both age-specific variation at the individual level and the population age distribution. In this stylized version only those in the working ages have labour income except for a small amount of labour income earned by non-resident workers. Children and the elderly have a life cycle deficit—they consume more than they produce through their labour.

Table 2.1.
NTA Flow Account, stylized, value of aggregate annual flows

	Children	Working age	Elderly	Total economy	Rest of the world	Total
Panel A. Economic life cyle						
Life cyle deficit	**20**	**-15**	**10**	**15**		
Consumption	20	70	10	100	2	102
Labour income	0	85	0	85	1	86
Age reallocations	**20**	**-15**	**10**	**15**		
Panel B. Public age reallocations						
Public age reallocations	**5**	**-8**	**5**	**2**		
Public transfers	5	-11	5	-1	1	0
Public transfer inflows	5	0	5	10	2	12
LESS: Public transfer outflows	0	11	0	11	1	12
Public asset-based reallocations	0	3	0	3	0	3
Public asset income	0	-4	0	-4	0	-4
LESS: Public saving	0	-7	0	-7	0	-7
Panel C. Private age reallocations						
Private age reallocations	**15**	**-7**	**5**	**13**		
Private transfers	15	-22	2	-5	5	0
Private transfer inflows	15	10	3	28	6	34
LESS: Private transfer outflows	0	32	1	33	1	34
Private asset-based reallocations	0	15	3	18	-1	17
Private asset income	0	21	1	22	2	24
LESS: Private saving	0	6	-2	4	3	7

Total labour income is insufficient to fund total consumption. This is typical although there are cases where total labour income exceeds total consumption. For this economy, however, consumption by children and the elderly cannot be funded exclusively by transferring the surplus generated by working-age adults. Other resources must play a role in satisfying the material needs of children and the elderly.

5 The upper-age interval varies depending on the availability of data at older ages.

The remainder of the flow account documents the economic mechanisms and institutions that are the complement to the life cycle deficit. From the NTA flow constraint, age reallocations must equal the life cycle deficit for each age group and for the total economy. Note that this condition is met in the stylized account. It is tempting to discuss the age reallocations as though they are a response to life cycle deficits, but it is important to keep in mind that this is an accounting framework and it does not by itself suggest any particular causal relationship.

Public and private age reallocations are separately identified in panels B and C, respectively. The two forms of public age reallocations are shown—public transfers and public asset-based reallocations. Children and the elderly have positive net public transfer, perhaps because of large education transfers to children and large pension and health-care transfers to the elderly (not shown here). Net public transfers are negative for working age adults as the burden of funding transfers to children and the elderly falls on them. In this highly stylized representation public transfer, outflows fall exclusively on working age adults although in actual NTA, children and the elderly also pay taxes.

The rest of the world also plays a role here. In this example, net public transfers to the rest of the world are positive (1). Inflows to the rest of world (2), perhaps foreign aid or public pensions paid to foreign nationals, exceed outflows from the rest of the world (1), possibly taxes paid by foreign entities.

Total net public transfers must be zero because transfers always have a counterpart—a transfer outflow is always matched by a transfer inflow. This is true for both public and private transfers. For the total economy, however, net public transfers differ from zero depending on net transfers to the rest of the world.

Public age reallocations are also being funded by public asset-based reallocations (3). A few countries have substantial asset income from natural resources or financial assets that have been accumulated in previous years. These countries can rely on public asset income to fund life cycle deficits (or they may choose to save it). Here, asset income is negative possibly because taxpayers are paying interest on public debt (–4). Taxpayers are generating additional resources by borrowing—public saving is negative (–7).

The public asset–based flows are assigned based on the age profile of taxes paid. Here the public asset-based flows are assigned to workers and the rest of the world. (The rest of the world values round to zero.)

Private age reallocations complete the picture. One component of private transfers is transfers between households (or transfers between households and non-profit institutions serving households and between households and the rest of the world). A very important feature of NTA is that transfers within households are also included. This feature is evident in table II.1 because of the large net private transfers to children. The elderly also have positive net private transfers (2). Those in the working ages have large negative net private transfers (–22).

Net private transfers are very substantial in the stylized flow account. Residents are making large transfers to non-residents (6). There is a counter flow (1), but it is much smaller than the inflow to the rest of the world. Note that the flows in the rest of the world column are always from the perspective of the non-residents, so an inflow in this column is from residents to rest of the world. A net negative flow in this column represents some net flow from Rest of the world to residents.

Private asset income for the working ages is substantial (21). Some part of that is being saved (6), but the remainder (15) is available to fund consumption and net public and private transfers. The elderly have relatively small asset income but they are generating additional resources by dissaving. Thus, private asset–based reallocations for the elderly are relatively significant (3).

2.3.7. Algebraic representation of NTA

This section provides an algebraic representation of all National Transfer Account flows. Note that ROW below refers to flows to and from the rest of the world.

Life cycle account

Life cycle deficit = consumption
– labour income

Consumption = public consumption
+ private consumption

Public consumption = public consumption, education
+ public consumption, health
+ public consumption other than health and education

Private consumption = private consumption, education
+ private consumption, health
+ private consumption other than health and education

Labour income = earnings
+ self-employment labour income

Self-employment labour income = two thirds of gross mixed income

Age reallocations

Life cycle deficit = reallocations

Age reallocations = transfers
+ asset-based reallocations

Transfers = public transfers
+ private transfers

Asset-based reallocations = public asset–based reallocations
+ private asset–based reallocations

Public age reallocations

Public age reallocations = public transfers
+ public asset–based reallocations

Public transfers = public transfers, inflows
– public transfers, outflows

Public transfers = public transfers, education
+ public transfers, health
+ public transfers, pensions
+ public transfers, other in-kind
+ public transfers, other cash

Public transfer inflows = public transfers, education, inflows
+ public transfers, health, inflows
+ public transfers, pensions, inflows
+ public transfers, other in-kind, inflows
+ public transfers, other cash, inflows

Public transfer outflows = public transfers, education, outflows
+ public transfers, health, outflows
+ public transfers, pensions, outflows
+ public transfers, other in-kind, outflows
+ public transfers, other cash, outflows

Public transfers, education = public transfers, education, inflows
– public transfers, education, outflows

Public transfers, health = public transfers, health, inflows
– public transfers, health, outflows

Public transfers, pensions = public transfers, pensions, inflows
– public transfers, pensions, outflows

Public transfers, other in-kind = public transfers, other in-kind, inflows
– public transfers, other in-kind, outflows

Public transfers, other cash = public transfers, other cash, inflows
– public transfers, other cash, outflows

Public asset–based reallocations = public asset-income
– public saving

Public asset-income = public operating surplus + public property income

Taxes

Taxes = public transfers, outflows – transfer deficit (+)/surplus (–)

Taxes = taxes on labour income + taxes on asset income + taxes on consumption + taxes on assets + taxes on asset transactions + other taxes on residents + taxes paid by ROW

Private age reallocations

Private age reallocations = private transfers
+ private asset–based reallocations

Private transfers = private transfers, inflows
– private transfers, outflows

Private transfers = inter-household transfers
+ intra-household transfers

Inter-household transfers = inter-household transfers, inflows
– inter-household transfers, outflows

Intra-household transfers = intra-household transfers, inflows
– intra-household transfers, outflows

Intra-household transfers = intra-household transfers, consumption
+ intra-household transfers, saving

Intra-household transfers, consumption = + intra-household transfers, education
+ intra-household transfers, health
+ intra-household transfers, consumption other than health and education

Intra-household transfers, consumption =	intra-household transfers, consumption, inflows – intra-household transfers, consumption, outflows
Intra-household transfers, education =	intra-household transfers, education, inflows – intra-household transfers, education, outflows
Intra-household transfers, health =	intra-household transfers, health, inflows – intra-household transfers, health, outflows
Intra-household transfers, consumption other than health and education =	Intra-household transfers, consumption other than health and education, inflows – intra-household transfers, consumption other than health and education, outflows
Intra-household transfers, saving =	intra-household transfers, saving, inflows – intra-household transfers, saving, outflows
Private asset–based reallocations =	private asset-income – private saving
Private asset income=	private capital income + private property income
Private capital income =	private capital income, business and non-profits + private capital income, owner-occupied housing
Private capital income, business and non-profits =	net operating surplus + capital share of mixed income
Capital share of mixed income =	one third gross mixed income – consumption of fixed capital associated with mixed income
Private property income =	private property income inflows – private property income outflows
Private property income inflows =	private interest, inflows + private royalties, inflows + private rent, inflows + private dividends, inflows
Private property income outflows =	private interest, outflows + private royalties, outflows + private rent, outflows + private dividends, outflows
Private consumer interest =	private consumer interest, inflows – private consumer interest, outflows
Private commercial interest =	private commercial interest, inflows – private commercial interest, outflows
Private saving =	public age reallocations + private transfers + private asset income – life cycle deficit

2.4. Examples

2.4.1. NTA tables with broad age groups

A complete set of National Transfer Account estimates with full age details are available for many countries online at www.ntaccounts.org. In this section the accounts are presented for the United States in 2003, aggregated into three broad age groups. More detailed components than those presented here are available for some variables (see chapters 3-6).

Table 2.2 summarizes per capita flows to life cycle deficit, transfers (public and private) and asset-based reallocations (public and private), while table 2.3 summarizes these as aggregate flows.

Table 2.2.
Summary of annual per capita flows, United States, 2003 (*United States dollars*)

	All ages (Total economy)	Age group		
		0-24	25-64	65+
Life cycle deficit	6,040	20,526	-9,164	38,045
Consumption	31,377	23,951	34,069	43,734
Labour income	25,337	3,425	43,233	5,689
Age reallocations	6,040	20,526	-9,164	38,045
Public age reallocations	642	8,482	-7,515	16,133
Public transfers	-106	8,345	-8,673	15,443
Public asset–based reallocations	748	137	1,158	690
Private age reallocations	5,398	12,044	-1,648	21,913
Private transfers	-175	11,215	-6,733	-3,233
Private asset–based reallocations	5,573	829	5,085	25,146

Table 2.3.
Summary of aggregate flows, United States, 2003 (*United States dollars*)

	Age group				
	All ages (Total economy)	0-24	25-64	65+	ROW
Life cycle deficit	1,756,757	2,100,174	-1,645,563	1,302,146	
Consumption	9,125,897	2,454,467	5,113,085	1,558,345	
Labour income	7,369,140	354,293	6,758,648	256,198	
Age reallocations	1,756,757	2,100,174	-1,645,563	1,302,146	
Public age reallocations	186,679	866,974	-1,202,859	522,564	
Public transfers	-30,855	852,825	-1,380,295	496,614	30,855
Public asset-based reallocations	217,534	14,149	177,436	25,950	
Private age reallocations	1,570,078	1,233,201	-442,704	779,582	
Private transfers	-50,764	1,147,442	-1,094,722	-103,484	50,764
Private asset-based reallocations	1,620,842	85,758	652,018	883,066	

Below are examples of a life cycle account: table 2.4 shows per capita and table 2.5 shows aggregate numbers.

Table 2.4.
Life cycle account, annual per capita flows, United States, 2003 (*United States dollars*)

	Age group			
	All ages	**0-24**	**25-64**	**65+**
Life cycle deficit	**6,040**	**20,526**	**-9,164**	**38,045**
Consumption	**31,377**	**23,951**	**34,069**	**43,734**
Public consumption	7,941	9,451	5,771	14,310
Public consumption, education	1,814	4,842	194	0
Public consumption, health	2,216	699	1,666	10,400
Public consumption, other than health and education	3,910	3,910	3,910	3,910
Private consumption	23,436	14,500	28,298	29,424
Private consumption, education	516	913	344	76
Private consumption, health	2,817	1,322	3,524	5,417
Private consumption, other than health and education	20,103	12,265	24,431	23,930
Labour income	**25,337**	**3,425**	**43,233**	**5,689**
Earnings	21,999	3,265	37,390	4,287
Self-employment labour income	3,338	160	5,842	1,402

Table 2.5.
Life cycle account, annual aggregate flows, United States, 2003 (*Millions of United States dollars*)

	Age group			
	All ages	**0-24**	**25-64**	**65+**
Life cycle deficit	**1,756,757**	**2,100,174**	**-1,645,563**	**1,302,146**
Consumption	**9,125,897**	**2,454,467**	**5,113,085**	**1,558,345**
Public consumption	2,309,575	967,040	867,246	475,290
Public consumption, education	527,661	496,968	30,693	0
Public consumption, health	644,588	71,238	238,646	334,703
Public consumption, other than health and education	1,137,327	398,833	597,907	140,587
Private consumption	6,816,322	1,487,428	4,245,839	1,083,055
Private consumption, education	150,111	93,362	54,260	2,489
Private consumption, health	819,326	135,408	503,395	180,523
Private consumption, other than health and education	5,846,885	1,258,658	3,688,185	900,042
Labour income	**7,369,140**	**354,293**	**6,758,648**	**256,198**
Earnings	6,398,410	337,808	5,867,869	192,733
Self-employment labour income	970,730	16,485	890,779	63,465

Tables 2.6 and 2.7 show examples of public reallocation accounts, as per capita and aggregate flows, respectively.

Table 2.6.
Public reallocation account, annual per capita flows, United States, 2003 (*United States dollars*)

	Age group			
	All ages	**0-24**	**25-64**	**65+**
Public reallocations	**642**	**8,482**	**-7,515**	**16,133**
Public transfers	**-106**	**8,345**	**-8,673**	**15,443**
Public transfers, inflows	10,556	10,304	7,829	25,273
Public transfers, outflows	10,662	1,959	16,502	9,830
Public transfers, education	1	4,777	-2,482	-3,300
Public transfers, education, inflows	1,814	4,842	194	0
Public transfers, education, outflows	1,813	64	2,676	3,300
Public transfers, health	-3	433	-2,094	9,611
Public transfers, health, inflows	2,216	699	1,666	10,400
Public transfers, health, outflows	2,219	266	3,760	789
Public transfers, pensions	-85	-109	-1,995	9,504
Public transfers, pensions, inflows	1,594	159	846	9,835
Public transfers, pensions, outflows	1,679	268	2,840	331
Public transfers, other in-kind	1	2,836	-1,795	-362
Public transfers, other in-kind, inflows	3,910	3,910	3,910	3,910
Public transfers, other in-kind, outflows	3,909	1,074	5,705	4,272
Public transfers, other cash	-51	399	-352	-44
Public transfers, other cash, inflows	1,021	694	1,213	1,128
Public transfers, other cash, outflows	1,072	295	1,565	1,172
Public asset–based reallocations	**748**	**137**	**1,158**	**690**
Public asset income	-682	-125	-1,056	-629
Less: Public saving	-1,430	-263	-2,214	-1,319

Table 2.7.
Public reallocation account, annual aggregate flows, United States, 2003 (*Millions of United States dollars*)

	Age group			
	All ages	**0-24**	**25-64**	**65+**
Public reallocations	**186,679**	**866,974**	**-1,202,859**	**522,564**
Public transfers	**-30,855**	**852,825**	**-1,380,295**	**496,614**
Public transfers, inflows	3,070,072	1,054,513	1,149,032	866,527
Public transfers, outflows	3,100,927	201,688	2,529,327	369,912
Public transfers, education	412	490,345	-372,039	-117,895
Public transfers, education, inflows	527,661	496,968	30,693	0
Public transfers, education, outflows	527,249	6,623	402,732	117,895
Public transfers, health	-870	43,684	-346,022	301,468
Public transfers, health, inflows	644,588	71,238	238,646	334,703
Public transfers, health, outflows	645,458	27,554	584,668	33,235
Public transfers, pensions	-24,755	-11,309	-348,187	334,740
Public transfers, pensions, inflows	463,598	16,406	97,407	349,785
Public transfers, pensions, outflows	488,353	27,715	445,593	15,045
Public transfers, other in-kind	309	288,441	-267,833	-20,299
Public transfers, other in-kind, inflows	1,137,327	398,833	597,907	140,587
Public transfers, other in-kind, outflows	1,137,018	110,392	865,740	160,885

	Age group			
	All ages	0-24	25-64	65+
Public transfers, other cash	-14,968	40,788	-53,080	-2,676
Public transfers, other cash, inflows	296,898	71,067	184,379	41,452
Public transfers, other cash, outflows	311,866	30,279	237,459	44,128
Public asset–based reallocations	**217,534**	**14,149**	**177,436**	**25,950**
Public asset income	-198,496	-12,910	-161,907	-23,679
Less: Public saving	-416,030	-27,059	-339,343	-49,629

Tables 2.8 and 2.9 show examples of private reallocation accounts, as per capita and aggregate flows respectively.

Table 2.8.
Private reallocation account, annual per capita flows, United States, 2003 (*United States dollars*)

	Age group			
	All ages	0-24	25-64	65+
Private reallocations	**5,398**	**12,044**	**-1,648**	**21,913**
Private transfers	**-175**	**11,215**	**-6,733**	**-3,233**
Private transfers, inflows	11,337	12,238	11,903	5,314
Private transfers, outflows	11,512	1,023	18,637	8,547
Inter-household transfers	**-175**	**127**	**-254**	**-909**
Inter-household transfers, inflows	281	144	395	80
Inter-household transfers, outflows	456	17	649	989
Intra-household transfers	**0**	**11,088**	**-6,479**	**-2,324**
Intra-household transfers, inflows	11,056	12,094	11,508	5,234
Intra-household transfers, outflows	11,056	1,006	17,987	7,558
Intra-household transfers, consumption	2	11,188	-6,515	-2,600
Intra-household transfers, consumption, inflows	8,971	11,874	7,954	4,822
Intra-household transfers, consumption, outflows	8,969	686	14,469	7,422
Intra-household transfers, education	0	591	-355	-33
Intra-household transfers, education, inflows	266	622	88	8
Intra-household transfers, education, outflows	266	32	443	41
Intra-household transfers, health	0	973	-545	-259
Intra-household transfers, health, inflows	871	1,093	803	654
Intra-household transfers, health, outflows	871	120	1,348	913
Intra-household transfers, consumption other than health and education	2	9,624	-5,615	-2,308
Intra-household transfers, consumption other than health and education, inflows	7,833	10,159	7,062	4,160
Intra-household transfers, consumption other than health and education, outflows	7,832	534	12,677	6,468
Intra-household transfers, saving	-1	-100	35	276
Intra-household transfers, saving, inflows	2,085	219	3,554	412
Intra-household transfers, saving, outflows	2,087	319	3,519	136
Private asset–based reallocations	**5,573**	**829**	**5,085**	**25,146**
Private asset income	7,692	218	8,920	23,749
Private capital income, business and non-profits	6,085	172	6,882	19,539
Private capital income, owner-occupied housing	696	26	1,001	1,304
Private property income	910	20	1,038	2,905
Less: Private saving	2,119	-611	4,735	-1,396

Table 2.9.
Private reallocation account, annual aggregate flows, United States, 2003 (*Millions of United States dollars*)

	Age group			
	All ages	0-24	25-64	65+
Private reallocations	**1,570,078**	**-61,137**	**-53,630**	**-37,873**
Private transfers	**-50,764**	**-50,764**	**-50,764**	**-50,764**
Private transfers, inflows	3,297,404	1,253,217	1,816,995	227,193
Private transfers, outflows	3,348,168	105,774	2,911,717	330,677
Inter-household transfers	**-50,876**	**13,112**	**-32,567**	**-31,421**
Inter-household transfers, inflows	81,684	14,896	63,240	3,548
Inter-household transfers, outflows	132,560	1,784	95,807	34,969
Intra-household transfers	**112**	**1,134,331**	**-1,062,155**	**-72,063**
Intra-household transfers, inflows	3,215,720	1,238,321	1,753,755	223,645
Intra-household transfers, outflows	3,215,608	103,990	2,815,910	295,708
Intra-household transfers, consumption	461	1,144,704	-1,059,290	-84,954
Intra-household transfers, consumption, inflows	2,609,158	1,215,657	1,189,396	204,106
Intra-household transfers, consumption, outflows	2,608,697	70,953	2,248,685	289,059
Intra-household transfers, education	62	60,025	-58,499	-1,464
Intra-household transfers, education, inflows	77,488	63,301	13,901	286
Intra-household transfers, education, outflows	77,426	3,276	72,401	1,749
Intra-household transfers, health	-142	99,185	-91,172	-8,155
Intra-household transfers, health, inflows	253,327	111,624	114,756	26,947
Intra-household transfers, health, outflows	253,468	12,439	205,927	35,102
Intra-household transfers, consumption other than health and education	540	985,494	-909,618	-75,336
Intra-household transfers, consumption other than health and education, inflows	2,278,343	1,040,732	1,060,739	176,873
Intra-household transfers, consumption other than health and education, outflows	2,277,803	55,238	1,970,357	252,208
Intra-household transfers, saving	-348	-10,373	-2,866	12,891
Intra-household transfers, saving, inflows	606,562	22,664	564,359	19,539
Intra-household transfers, saving, outflows	606,911	33,038	567,224	6,649
Private asset–based reallocations	**1,620,842**	**85,758**	**652,018**	**883,066**
Private asset income	2,237,075	22,528	1,364,791	849,757
Private capital income, business and non-profits	1,769,775	17,745	1,052,896	699,134

	Age group			
	All ages	0-24	25-64	65+
Private capital income, owner-occupied housing	202,500	2,738	153,098	46,664
Private property income	264,800	2,044	158,797	103,959
Less: Private saving	616,233	-63,231	712,774	-33,309

2.4.2. A graphical representation of NTA

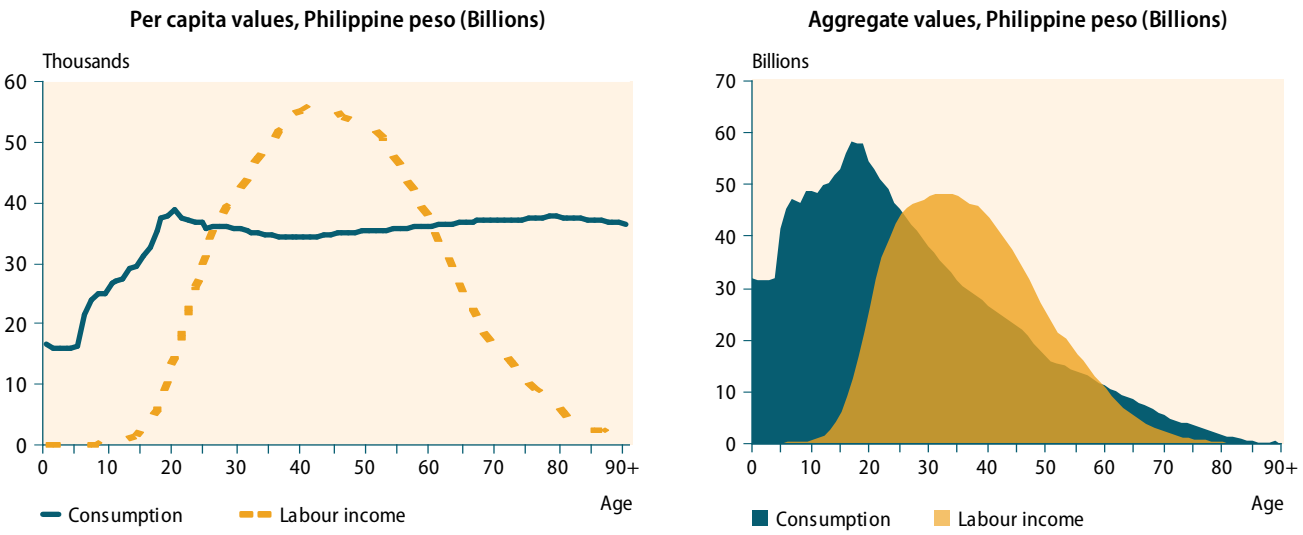
A graphical representation of National Transfer Accounts if very useful because it fully captures detailed variation by age. Single-year-of-age estimates are not easily presented or understood in tabular form. This section provides selected NTA estimates for the Philippines in 1999 from Racelis and Salas (2011) updated from www.ntaccounts.org (accessed on 25 July 2012). For each graph, per capita values by age are presented to the left and aggregate values by age to the right.

Economic life cycle

The economic life cycle is summarized by the consumption and labour income profiles by age (figure 2.2).

Figure 2.12 distinguishes intra-household transfer inflows by purpose: education, health and consumption other than education and health. Also shown are transfers inflows within the household received by household heads for the purpose of saving.

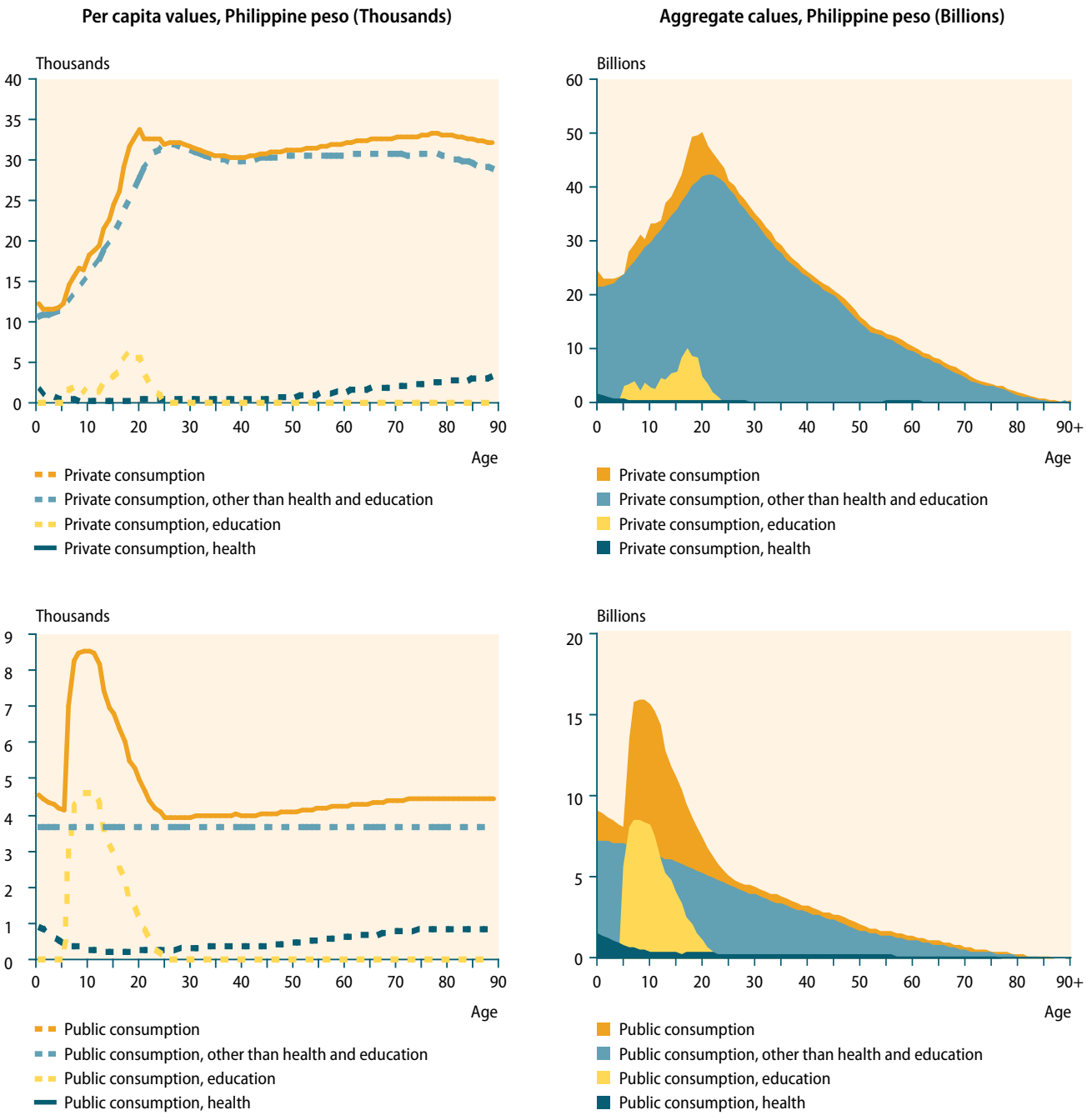
Figure 2.2.
Consumption and labour income by age, the Philippines, 1999



Note: Per capita values (left) in thousands of pesos. Aggregate values (right) in billions of pesos.

The components of private and public consumption are shown in figure 2.3. Three components of consumption are distinguished: education, health and consumption other than education and health.

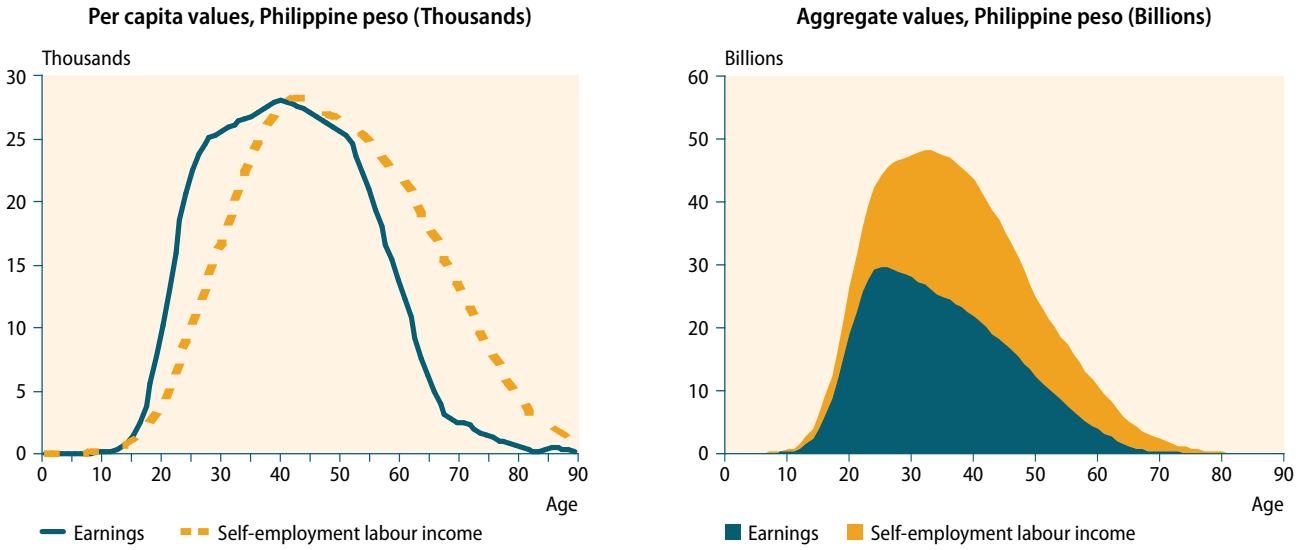
Figure 2.3.
Consumption and its components for the private sector (*top*) and the public sector (*bottom*), the Philippines, 1999



Note: Per capita values (left) in thousands of pesos. Aggregate values (right) in billions of pesos. Note that per capita profiles are not stacked but the aggregate profiles are stacked.

Labour income and its components are shown in figure 2.4. Note that in the Philippines earnings are higher for younger adults while self-employment labour income is higher for older adults.

Figure 2.4.
Labour income and its components by age, the Philippines, 1999

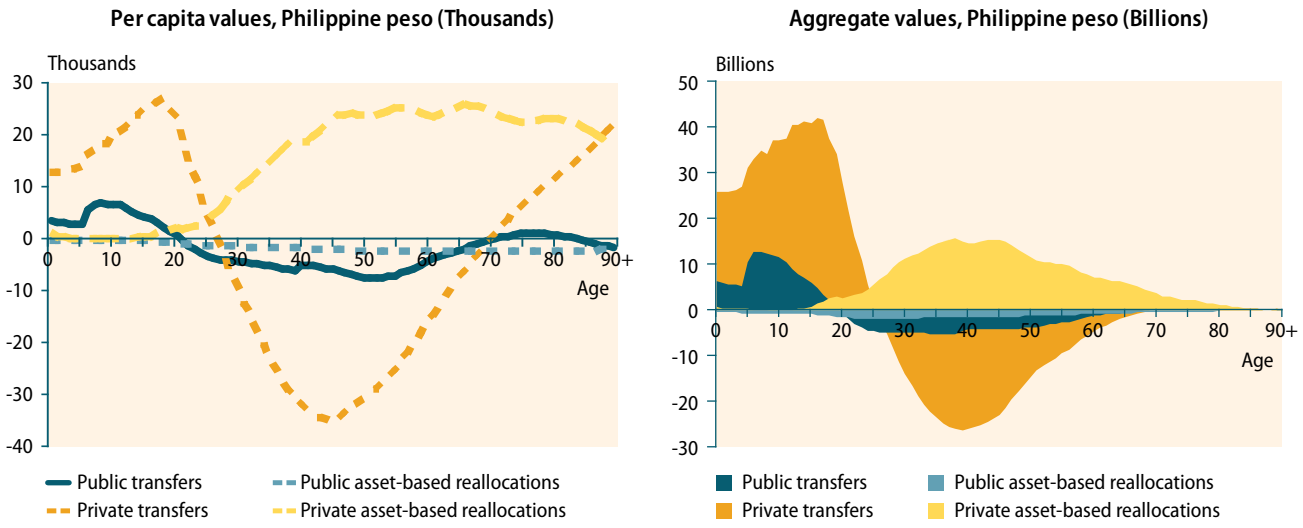


Note: Per capita values (left) in thousands of pesos. Aggregate values (right) in billions of pesos. Note that per capita profiles are not stacked but the aggregate profiles are stacked.

Age reallocations

The age reallocation system is summarized for the Philippines in figure 2.5 which shows transfers and asset based reallocations for the public and private sectors.

Figure 2.5.
Public transfers and asset-based reallocations and private transfers and asset-based reallocations by age, the Philippines, 1999

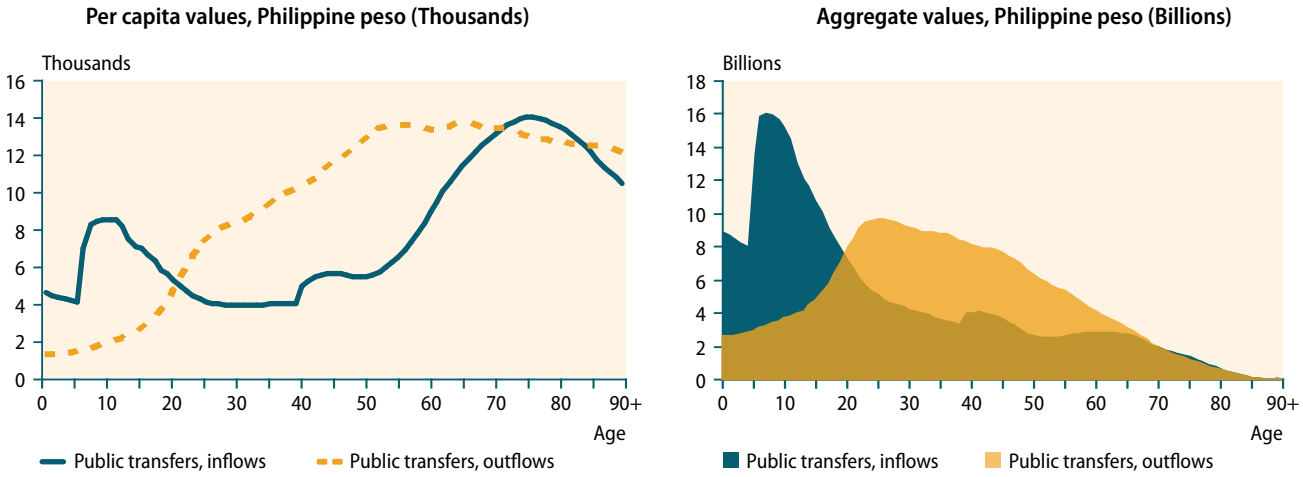


Note: Per capita values (left) in thousands of pesos. Aggregate values (right) in billions of pesos. Both per capita and aggregate values are not stacked.

Public age reallocations

Public age reallocations are summarized in figure 2.6 which shows both the per capita and aggregate inflows and outflows by age.

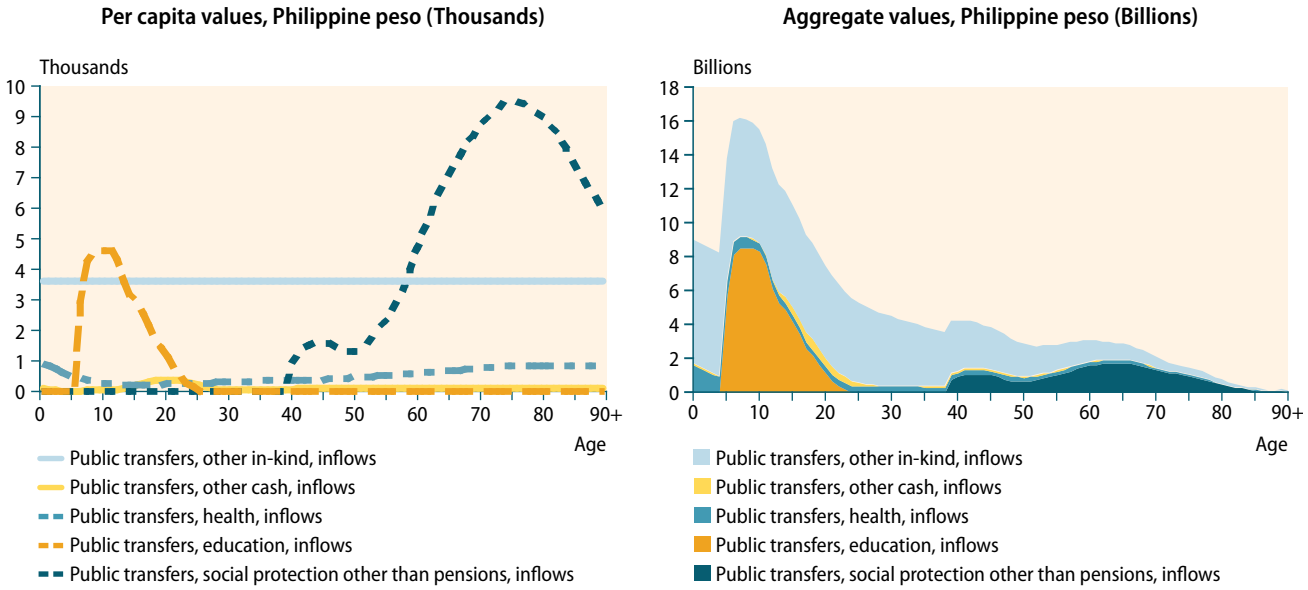
Figure 2.6.
Public transfer inflows and outflows by age, the Philippines, 1999



Note: Per capita values (left) in thousands of pesos. Aggregate values (right) in billions of pesos.

Public transfer inflows by purpose are reported in figure 2.7.

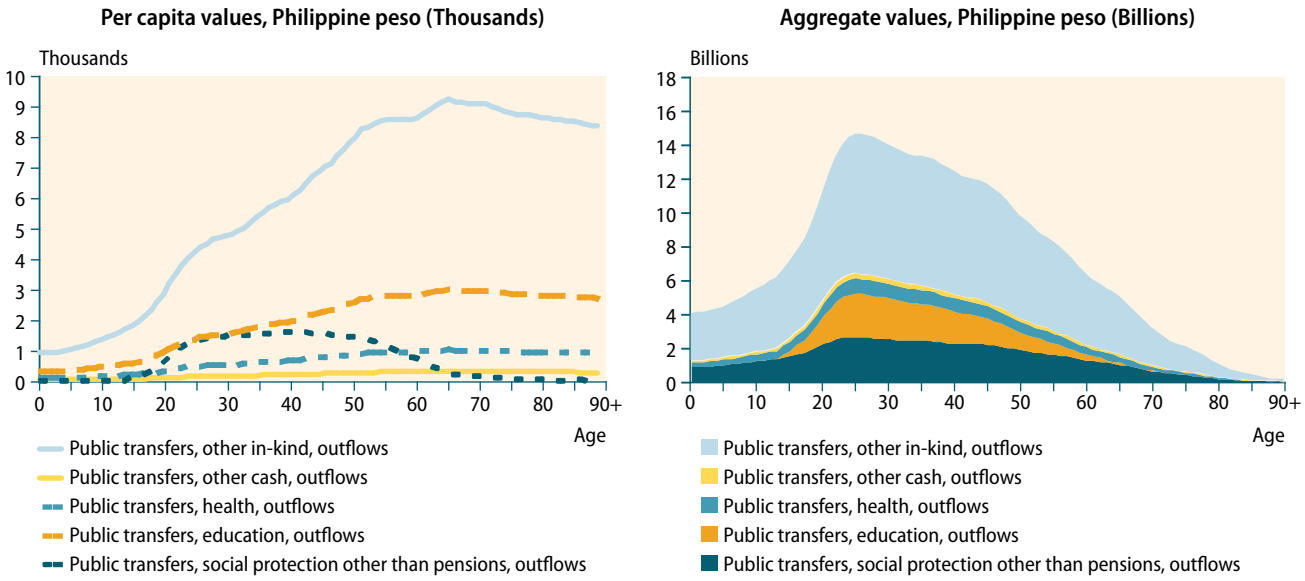
Figure 2.7.
Public transfer inflows, education, health, pensions and other by age



Note: Per capita values (left) in thousands of pesos. Aggregate values (right) in billions of pesos. Note that per capita profiles are not stacked but the aggregate profiles are stacked. The Philippines NTA includes pensions in the category "Public transfers, other cash".

Public transfer outflows by purpose are reported in figure 2.8.

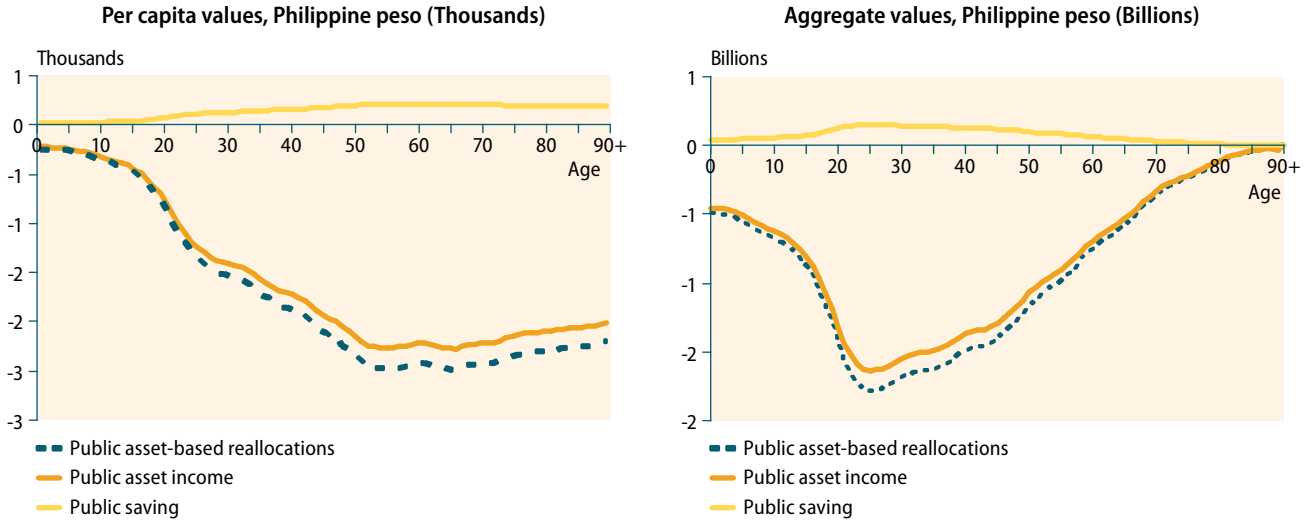
Figure 2.8.
Public transfer outflows, education, health, pensions and other by age



Note: Per capita values (left) in thousands of pesos. Aggregate values (right) in billions of pesos. Note that per capita profiles are not stacked but the aggregate profiles are stacked. The Philippines NTA includes pensions in the category "Public transfers, other cash".

Figure 2.9 reports public asset–based reallocations for the Philippines in 1999. Public asset income was large and negative due to interest paid on public debt. Public saving was small and positive in that year. Hence, public asset–based reallocations were negative.

Figure 2.9.
Public asset-income, saving and asset-based reallocations by age, the Philippines, 1999

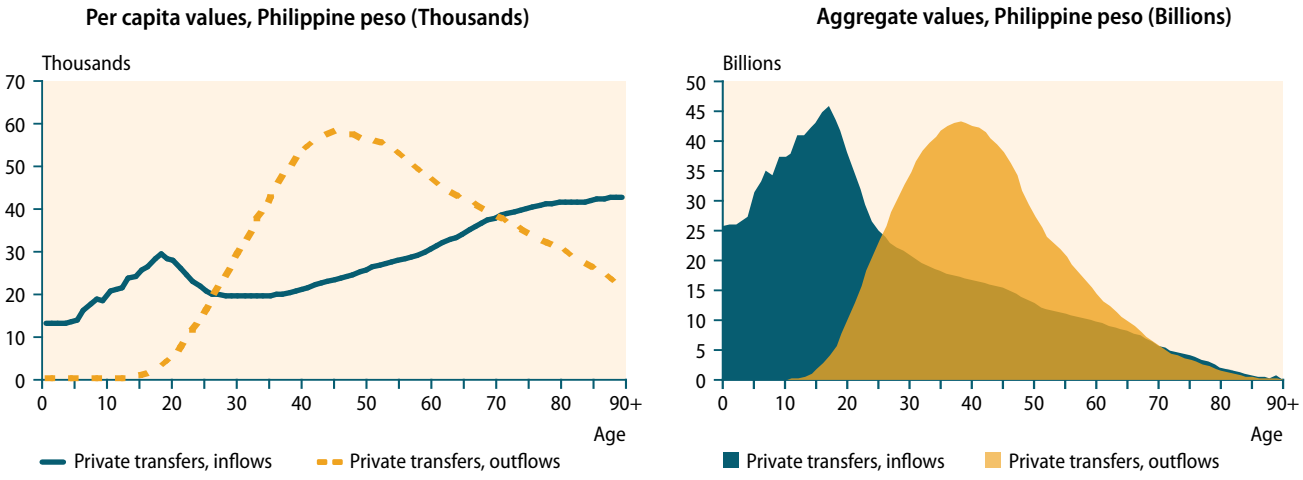


Note: Per capita values (left) in thousands of pesos. Aggregate values (right) in billions of pesos.

Private age reallocations

Private age reallocations are summarized in figure 2.10 which report transfer inflows and outflows by age.

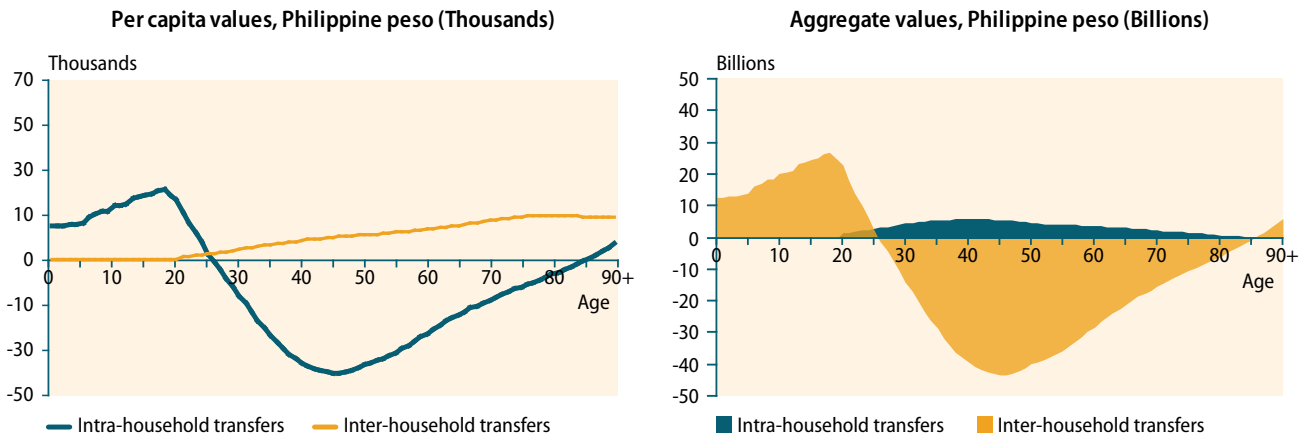
Figure 2.10.
Private transfer inflows and outflows by age, the Philippines, 1999



Note: Per capita values (left) in thousands of pesos. Aggregate values (right) in billions of pesos.

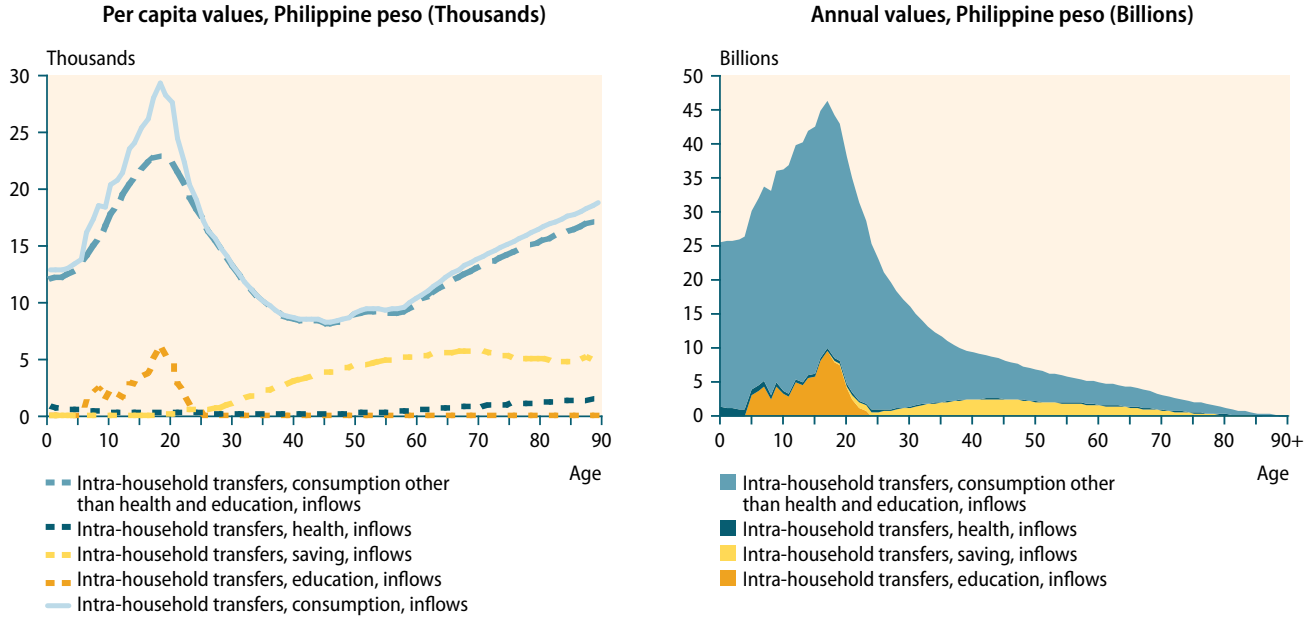
Figure 2.11 reports net private transfer distinguishing inter-household and intra-household transfers. Net inter-household transfers are positive at all ages in the Philippines because of large net private transfers from the rest of the world.

Figure 2.11.
Private inter-household and intra-household transfers, inflows and outflows, the Philippines, 1999



Note: Per capita values (left) in thousands of pesos. Aggregate values (right) in billions of pesos.

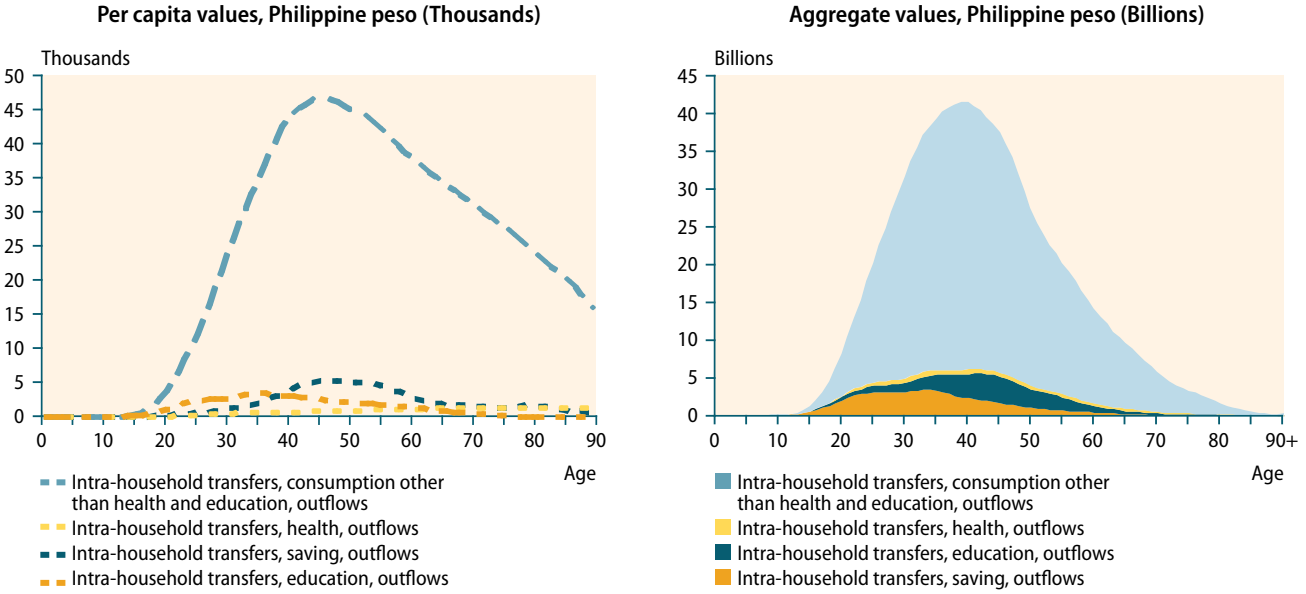
Figure 2.12.
Private intra-household transfer inflows, education, health, other consumption and saving by age, the Philippines, 1999



Note: Per capita values (left) in thousands of pesos. Aggregate values (right) in billions of pesos. Note that per capita profiles are not stacked but the aggregate profiles are stacked.

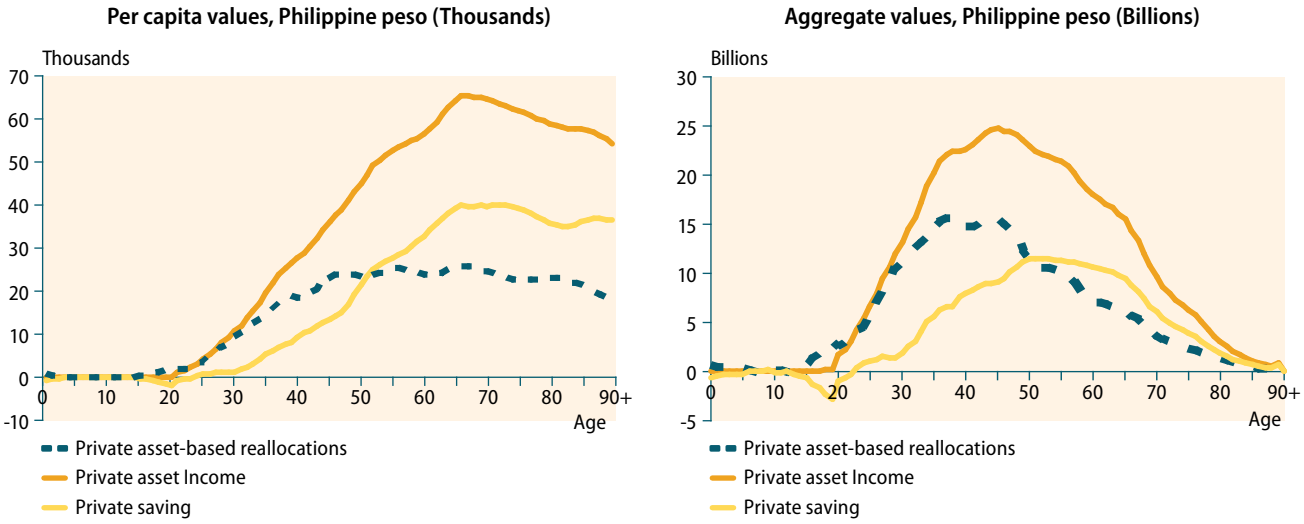
Intra-household transfer outflows by purpose are distinguished in figure 2.13.

Figure 2.13.
Private intra-household transfer outflows, education, health, other consumption and saving by age, the Philippines, 1999



Note: Per capita values (left) in thousands of pesos. Aggregate values (right) in billions of pesos. Note that per capita profiles are not stacked but the aggregate profiles are stacked.

Figure 2.14.
Private asset-income, saving and asset-based reallocations by age



Note: Per capita values (left) in thousands of pesos. Aggregate values (right) in billions of pesos.

2.5. Going beyond basic NTA

Many potential extensions and elabourations of National Transfer Accounts are not treated in detail in this manual. A few important areas, however, are briefly discussed in the following section and references are provided to work that is complete or underway.

Projections

National Transfer Accounts can be readily used for simple projections of economic flows. These can be very useful for accessing some of the economic implications of changing population age structure as shown in some of the applications discussed in chapter 1. Methods for projecting NTA flows are not treated in the manual, but a brief discussion is warranted.

Any of the per capita profiles can be easily combined with projections of population by age to show how changes in population size and age structure will influence economic aggregates, such as total consumption, labour income or public transfers, given the per capita profile of the corresponding flow. The value of such projections will depend in part on the stability of the age profile of any economic flow.

In some cases, it may be useful to construct projections that allow for changes in per capita flows. This might occur, for example, because economic development leads to systematic shifts in how resources are allocated. As countries become richer, the age profiles of public spending on health care and pensions may increase rapidly, for example (Miller, Mason, et al., 2011).

A particularly important projection issue is to recognize that the aggregate constraint that total inflows must equal total outflows insures that per capita inter-generational flows must adjust to changes in population age structure. If children decline relative to the number of adults, for example, the per capita age profile of transfers to children

must increase, the per capita age profile of transfers from adults must decline or some combination of the two. Transfers must balance in total and projections must explicitly accommodate these aggregate constraints in some fashion.

Bequests and other capital transfers

The NTA flow account classifies current transfers or transfers of income generated during the current period. These do not include capital transfers—the transfer of an existing financial or non-financial asset. Bequests are one important form of capital transfer, but there are others. In some countries, *inter vivos* capital transfers may be important. Adults may make capital transfers to their adult offspring at critical junctures over the life course. This may occur when adults retire, or when their offspring marry, or when their offspring give birth. *Inter vivos* capital transfers also may be motivated by tax avoidance.

Capital transfers may occur across or within households. Because of the simplifying assumptions made with regard to the household, however, capital transfers within the household are assumed to occur when the household head designation changes. Capital transfers within households will not be captured in the absence of a corresponding change in the head designation. Moreover, capital transfer may not occur in reality when the designation of the head changes.

Private capital transfers are very important, but public capital transfers also occur. Two common forms of public intergenerational capital transfers are the inheritance tax and foreign aid received to fund capital investment.

Bequests have been studied extensively, but the data available about bequests are relatively limited. Data on bequests are incomplete or absent altogether for most countries. Several ongoing studies are exploring ways of estimating bequests and other capital transfers employing the NTA framework.

Wealth accounts

NTA wealth accounts, an NTA balance sheet, will provide a more complete accounting of the resources available at any point in time to each age group or generation. NTA wealth accounts will be different in two ways from the balance sheet constructed as part of the System of National Accounts. First, wealth will be identified by the age of the wealth holder and, second, a broad definition of wealth will be used that includes transfer wealth, the present value of anticipated net transfers for each generation, in addition to assets.

Many of the conceptual foundations for constructing wealth accounts and transfer wealth have been developed by Lee (1994a and 1994b). Chapter 1 discusses a number of applications of NTA that involve constructing wealth estimates.

Assets are equivalent to net worth as measured in the System of National Accounts and reported in the SNA balance sheet. Assets can be assigned to age groups based on survey data on asset ownership or asset income.

Transfer wealth is the value of expected transfers made and received in future periods by members of an age group. For public transfer wealth these expectations depend on the legislated structure and regulations of current public programmes, on which NTA estimates are based. But in principle public transfer wealth also depends on the confidence that individuals have in the future of these programmes. Because confidence or government programmes can change rapidly, transfer wealth can be rapidly created or destroyed, with no direct change in the physical world. Moreover, transfer wealth is created or destroyed when policies and programmes are changed. Thus, transfer wealth is a

social construct. It is a very important social construct, however, because it is a valuation of uncertain, but real future resource flows that affect individual planning and saving, retirement and consumption behaviour.

Private transfer wealth is similar to public transfer wealth except it depends on expectations about the continuity of family support systems.

Expectations cannot be directly observed and NTA calculations are based on current practice as embodied in current flows. For each cohort, transfer wealth is constructed using a population projection or survival rates for that cohort, a discount rate, and a productivity growth rate that leads to shifts in transfer profiles over time. The balancing condition, that total inflows must equal total outflows, is imposed by assuming adjustments to the inflow or outflow profiles that accommodate changes in population age structure. Methods for constructing transfer wealth are provided in chapter 5.

Transfer wealth is different than standard generational accounts (Auerbach, Gokhale, et al., 1991) in several important ways. First, transfer wealth includes the value of private transfers, in addition to public transfers. Second, generational accounts often do not include the full range of government expenditures; for example, they often exclude public education.

Gender, time use and household production

Gender is an important dimension of the generational economy. The support system for men and women may be very different with potentially adverse implications for women or possibly men. Women are more likely to live to advanced ages, outliving their husbands, and to live the final years of their lives alone. The value of employment-based pensions may be less for older women than for older men because of differences in their employment history. Policies and practices about bequests may affect women and men in different ways, influencing the resources available to a surviving spouse. Family support for women may be different than that available for men. Access to resources for children are often influenced by gender, with girls disadvantaged with respect to spending on health, education and other material needs, for example. Girls and boys may also differ in their access to both public and private spending.

Women and men may also differ as providers of generational support. In particular, women may be the primary caregivers within households providing critical support both to children and to aging parents.

NTA methods described in this manual do not distinguish economic flows separately for males and females. There are no apparent methodological issues associated with estimating flows separately for males and females. Data availability may be a limiting factor, but the methods described here can be applied separately for males and females.

There are important issues that should be addressed, however, before NTA is estimated separately for males and females. The first is that women are much more likely to specialize in home production that is not measured in NTA (or SNA). The economic contribution of women will be systematically understated because of this gap in data. Moreover, the value of time transfers to children and the elderly, mostly by women, are not captured in NTA. Thus, an accurate understanding of the gender dimensions of the generational economy requires that home production be valued as part of constructing NTA by gender.

A second issue arises because the age of the household head is used in NTA to classify private inter-household transfers and private asset-based reallocations. In many

countries there is a strong gender bias in the designation of the household head that may or may not align with the ownership of assets within the household. Careful consideration of this issue is very important as gender-based NTA methods are developed.

Donehower and others involved in the NTA project have been developing and applying methods to estimate gender accounts including the value of home production. The details of these methods are described in Donehower (2011). Updates and further developments are available on the NTA website page for the gender and time use working group: http://ntaccounts.org/web/nta/show/Gender%2c%20Time%20use. Phananiramai (2007 and 2011) provides an earlier exploration of introducing time into National Transfer Accounts.

Inequality and poverty

National Transfer Accounts provide aggregate and per capita flows for each age or age group. This information can be used to consider variation among age groups in any of the economic flows, but no distributional information is provided within age groups. Moreover, mean values do not always provide a reliable indicator about economic circumstances for the typical person. The median is often a more appropriate summary measure for this purpose and it will differ from the mean to the extent that distributions are skewed. Because income and particularly wealth are rightward skewed, the mean values will exceed the median. The difference will be greatest in societies with high degrees of wealth and income inequality.

Some components of NTA are based on survey data and constructing estimates of the distributions of those components is possible. This applies primarily to estimates of the private sector and some features of the public sector, such as tax benefits and cash transfers, that are reported in household surveys. For other components of the public sector, distributional information is likely to be less readily available particularly information about in-kind transfers, such as education and health. It may be possible to obtain crude estimates using information about place of residence and consumption of public goods, such as survey information on public school enrolment.

The most promising approach to dealing with inequality and poverty is to construct accounts for population subgroups. In a number of studies, populations have been subdivided using household income or consumption (Turra and Queiroz, 2006; Abrigo, 2011; Angulo, 2011; and Bucheli and Gonzalez, 2011). Estimates for Indonesia have been constructed separately for urban and rural poor and non-poor groups (Maliki, 2011). In other cases, NTA have been constructed using variables that are highly correlated with income. Estimates for urban and rural households in China have been estimated (Li, Chen, et al., 2011). A potentially promising approach is to rely on educational attainment of the household head to construct accounts (Tovar, Urdinola, et al., 2011). This offers an advantage for longitudinal analysis because educational attainment of the head can be used to track households over time more effectively than poverty status or consumption or income class.

Subnational accounts

Subnational NTA have been constructed in a few instances. As mentioned in the previous section, separate accounts have been constructed for urban and rural populations. NTA could also be constructed for provinces or states. Whether reliable estimates can be constructed in practice is largely a matter of data availability. Household surveys at the

national level may have a sample that is sufficient to obtain reliable estimates, but sample size may be inadequate to carry out subnational analysis particularly for smaller age groups found at older ages. Macro-economic data may also be relatively limited so that the availability of aggregate controls will be affected.

Environmental accounts

An important long-term goal is to incorporate environmental accounts into NTA. This is clearly central to measuring how economic activity influences the wealth of future generations. There has been important progress in recent years in integrating environmental accounting into national accounts NTA (National Research Council, 2005; Dasgupta, 2009; and UHU-IHDP and UNEP, 2012). As this continues, these estimates should be incorporated into NTA.

Chapter 3

Getting started

3.1. Materials

Previous chapters have introduced the NTA system and given background on the main concepts. Now we turn to the practical matter of how to go about estimating NTA age profiles. This is a very complex and data intensive project, and this chapter outlines the basic steps and gives strategies to organize the work in the most efficient way. We begin with a discussion of the resources necessary for constructing National Transfer Accounts: skilled researchers, an appropriate set of computing tools and a lot of data. Later sections discuss how to organize the data, describe a general strategy for creating each age profile and recommend a sequence to follow in constructing a full set of accounts.

3.1.1. Necessary human and computer resources

Given sufficient time and commitment, NTA can be constructed by an individual, but it is helpful to have more than one person working on the estimates. In a number of cases, students pursuing a graduate degree have constructed NTA for their country. In most cases, of course, students worked closely with their academic advisors to complete the accounts. In other cases, teams of two or three members who are based at universities, research institutions or statistical agencies have constructed NTA.

At least one team member should have experience using national survey data and be familiar with computing strategies for dealing with large data sets, for using sample weights and for programming complex algorithms. Any familiarity with national accounting, specifically the System of National Accounts, is very helpful in this work, but many NTA team members have learned this material after beginning NTA estimates. Also, it is helpful if the researchers are familiar with the important institutional features of their country, particularly the public sector. Researchers will need to understand how the government is organized, what it spends its money on, how it taxes the public to pay for programmes, and how it reports data about those taxes and programmes. Appendix D includes a detailed inventory to be filled out by each country team about the macro-level flows of their country and how they relate to public and private institutions.

As for particular computing skills, researchers must be able to use spreadsheets as that is an important way that the NTA project shares final results. For the computations that produce those results, most NTA teams use the Stata statistical software package and may supplement that with some smoothing tools from the R statistical programming language. R is a free, open-source statistics and data management package. It can be downloaded from the R project (http://www.r-project.org/). See appendix B for more information on R. Teams may use any computing method they prefer, but we recommend that teams use Stata and R if

possible. All example code is given as Stata or R computer programs. Also, sharing programs with other researchers in the network is easier if we all use the same packages.

Estimates should be produced using computer code that is saved in programs and can be re-run, as opposed to using point-and-click interfaces where any replication would require the researcher to click the same sequence of commands again. Relying on saved programs makes it easier to reproduce results, correct mistakes and incorporate any future methodology improvements or corrections.

3.1.2. Data requirements

As discussed earlier, an NTA age profile is an estimated per capita age schedule of an economic flow, adjusted so that the aggregate amount implied by the estimate matches the aggregate amount measured in national accounts. Thus, three types of data are needed to construct NTA: population data, national account data and data on economic flows by age. Despite the large amount of data necessary, accounts have been constructed or are currently being constructed in more than 40 countries that range greatly in the quality and completeness of their statistical data. In some cases, complete flow accounts cannot be constructed, but construction of sub-accounts, such as the life cycle account or the public age reallocation account, is still very useful.

Population estimates

Estimates are usually available from a national statistical agency and from the United Nations Population Division. They should include the following features:

- Population counts given by single year of age to a desired maximum age of 90+ or older;
- Representative of the entire population including students, military and institutionalized populations (such as residents of nursing homes); and
- Corrected for any data problems such as age heaping[1] or under-reporting of certain age groups.

To evaluate your population data, plot population counts by age and look for inconsistencies like age heaping. If using locally provided population counts, compare your population counts to those estimated in the UN World Population Prospects database (http://www.un.org/esa/population/), or other international databases, to see if there are any major differences. If there are, make sure you understand why and use the source with the best data. See appendix A for a more detailed discussion about population estimates, including sample Stata code to review population data.

If possible, get population estimates by age and sex. This is not strictly necessary for producing the basic single-sex NTA accounts, but the project is incorporating sex-specific estimates in future research plans and sex-specific counts will be necessary for these. Also, if there are important sub-populations in the country that will have different age profile sources, your population data will need to include counts by age, sex and subpopulation. For example, some countries have large numbers of elderly people living in long-term care facilities such as nursing homes. This population has very particular age profiles of healthcare consumption which must be estimated separately from the rest of the population and

1 Age heaping is the tendency of people to report ages as a round number, resulting in "heaps" or peaks in the age distribution at ages ending in 0 or 5.

then combined with non-nursing home age profiles, based on counts of persons in nursing homes and not in nursing homes.

National accounts data

National account data are used to construct NTA aggregate controls, also called macro controls, which are used to scale NTA age profiles as described in chapter 2 (see box 2.2). Many countries use the United Nations System of National Accounts (SNA) to guide construction of their national accounts and organize their reporting, so this manual will discuss national accounts based on SNA estimates and concepts.[2]

In some cases, aggregate NTA values are the same as those from SNA tables, and getting the appropriate NTA aggregate control is just a matter of finding the particular SNA table for the necessary year. In other cases, several values from SNA tables or other sources are necessary to create aggregate controls specific to NTA concepts. Chapter 4 describes how to compute the necessary macro controls. This section describes generally what kind of SNA data will be necessary. To begin, identify the government entity that produces national account estimates for your country and find out how the data are made available to the public. Some countries have very detailed national account tables available through the Internet or published in an annual statistical yearbook. Also, learn about the publication and revision schedule for national accounts in your country. Many countries produce a first set of accounts as soon as possible after the fiscal reporting period is over, but these early estimates may be revised extensively over time. For NTA, it is important that we use the most recent revisions available. If you have trouble finding your country's national accounts, or cannot find them in sufficient detail, you can check one of several national account databases compiled by international organizations such as the OECD, the United Nations or the World Bank (see box 3.1). These databases also have sections on "metadata" that indicate which government agencies provided the data, which can help you find the source of your country's national accounts estimates.

Box 3.1.
National accounts databases

Researchers should understand how their own country publishes national accounts, but it can be helpful to find data from international sources:

- **United Nations:** http://unstats.un.org/unsd/nationalaccount/
- **Organization for Economic Cooperation and Development (OECD):** select the section on "National Accounts" at http://stats.oecd.org/Index.aspx
- **World Bank:** select "National Accounts" in the "Economic Policy and Debt" section of the World Development Indicator database at http://databank.worldbank.org/ddp/home.do?Step=12&id=4&CNO=2.

Use caution with these sources! The estimates are often collected for the database just once and are never updated, even if a country revises them later. Therefore, if you use international databases, compare some of the main aggregates with an up-to-date national source to make sure that no major revisions have taken place.

2 If your country does not use the SNA for national accounting, you will need to understand how your country's methods and SNA differ so you can get the appropriate quantities from your country's national accounts. Some countries that do not use SNA for their internal national account reporting still produce supplemental estimates following SNA, so that they may be included in international comparative databases.

Once you have located the source for national accounts data, look for estimates of income, consumption, saving, transfers and components. Here are some of the main tables to look for:

- GDP by expenditure approach (includes final consumption expenditures, capital formation and external balance);
- GDP by income approach (includes compensation, operating surplus and mixed income);
- Allocation of primary income account (by sector);
- Secondary distribution of income account (by sector);
- Use of disposable income account (by sector);
- Final consumption expenditures of households;
- Change in net worth (by sector);
- Simplified accounts for general government, households, non-profit institutions serving households (NPISH) and corporations;
- Saving and net lending/borrowing (by sector).

Examples are given in chapter 4. You may not be able to find all of these tables and some of the necessary amounts appear in more than one table so it is not necessary to find every single table. Where tables are listed as "by sector", look for tables by the sectors recognized in the SNA framework: households, general government, corporations (often split into subsectors of financial corporations and non-financial corporations), non-profit institutions serving households (NPISH) and the rest of the world (ROW).

You will also most likely need your government's revenue and expenditure documents for the year you are constructing accounts, and reports from any major public programmes such as pensions, health care or education.

Detailed information about the public sector is often reported in the IMF *Government Finance Statistics (GFS)* publications and online database. The online database requires a subscription, but many libraries subscribe to this database and carry GFS published reports.

Once you have located all of the available national account data for your country, you are ready to begin calculating NTA macro controls by adjusting your national accounts according to NTA methods. Chapter 4 describes the complete flow account macro control calculations.

Household surveys and administrative records

Often, the per-capita age patterns[3] used to make each age profile are estimated from household surveys. For example, income surveys often ask all household members their earnings over some calendar period. If the age of each person in the household is available with the survey microdata, the researcher can calculate the average earnings of each age. Sometimes the survey does not have a monetary indicator for a particular age profile, but may have some indicator of participation which can be used to indicate relative age amounts. For example, the age profile for a government programme to provide free school lunches may be based on a survey item indicating which children received school lunches. The age pattern would be given by the proportion of each age group that participated in that program. The macro control is then assumed to be divided equally among all participating children.

There are several possible types of household survey that provide the basic information needed to construct NTA. The most likely source of information is national family income

3 The term "age pattern" or "age shape" is used to indicate an estimate of the per capita values of an economic flow by age before adjustment to match the relevant macro control. The "age profile" refers to the age shape or age pattern after it is adjusted to be consistent with the macro control.

and expenditure surveys conducted by many countries. Labour force surveys may provide important complementary information. In some countries, labour force and family income and expenditure surveys can be merged. The Living Standards Measurement Study (LSMS), conducted in many countries, can be used to construct NTA estimates. The Health and Retirement Survey (HRS) and similar surveys conducted elsewhere can provide a very useful means of analysing particular issues, but it cannot serve as the core data for constructing NTA because it surveys only older individuals.

We also use age information provided by administrative sources, such as government agencies. For example, the administrative office of a government-run pension programme may produce detailed statistical reports including the amount of benefits paid by the age of the beneficiary. Administrative records may provide quantities of goods or services provided rather than monetary values, but these can also be used. For example, a government education agency may report the proportion of children enrolled in public schools by age, which could be used as the age pattern of public education consumption. In some cases, government agencies will provide custom tabulations by age of public benefits received or taxes paid. In other cases, however, administrative records are not available.

Where there are both survey sources and administrative data on a particular flow, they provide a means of cross-checking data or filling gaps not available in one source.

Most of the age patterns in NTA come from household income and expenditure surveys. Identify the relevant surveys in your country, determine which has the highest quality and most complete data and find out how to obtain the complete micro-level dataset. Household surveys should be:

- Nationally representative;
- With a designated household head or enough data to impute headship by assumption to one and only one individual in the household; and
- Of sufficient sample size to estimate detailed age patterns.

They should contain survey items including the following:

- A roster of household members with their age (preferably in single years to a maximum of 90+ or older), sex and their work/school status;
- Income and other forms of revenue; and
- Consumption and other kinds of expenditure.

All income and other forms of revenue should be classified as falling into one of four exhaustive, mutually exclusive categories:

- Wages and salaries including employee benefits;
- Income from self-employment and other entrepreneurial activities;
- Property income including rent, interest and dividends; and
- Transfers received from either public or private sources.

Wages and salaries and income from self-employment are used to construct labour income, discussed in chapter 5. Property income and transfers received are used to construct age profiles discussed in later chapters.

All household expenditures or outflows fall into one of the following categories:

- Consumption;
- Interest expense; and
- Transfers, such as, gifts made to other households and taxes paid.

When necessary, researchers rely on multiple surveys, e.g., separate urban and rural surveys or separate surveys of consumption and income. For some age shapes, like health care, special surveys are used in combination with a more general survey. For some subpopulations, like the elderly or institutionalized, special surveys are also used if they provide data not available in a general survey, or better data quality than a general survey. In fact, household surveys often include only civilian populations residing in households. If your country has substantial numbers of non-civilians or non-household residents at any age, supplementary data sources and/or assumptions about these non-observed populations will be necessary to make national estimates. We try to use the most accurate and specific data available in a county for each age shape.

The NTA perspective is always based on the average individual so, where data are available at the individual level, we prefer to use that information. Where data are only available for an entire household, we have two different methods to allocate that amount to individuals. For some profiles, we impose an assumption about the age allocation within the household, such as using consumer weights or attributing the entire amount to the household head. For other profiles, we use statistical methods to estimate the allocation within the household, based on the correlation between household amounts and household structure.

Some age shapes are not estimated directly from data, but instead are based on assumptions and other NTA profiles. For example, intra-household transfers are estimated based on household structure and the values of other NTA variables for the individuals in each household. Also, private saving is the balancing item in NTA and, hence, the age profile is constructed directly from other NTA profiles. Errors in the private saving profile will be equal to the sum of errors in the estimation of the other profiles.

3.2. Building a micro-level database

It should be clear by now that constructing NTA for even one time period is a very data-intensive process. A great deal of time must be spent in the data gathering steps before you are even ready to estimate and evaluate any age profiles. Building a micro-level database is a way to combine all necessary data from various sources into one dataset at the individual level (i.e., one observation per person) that will be used to estimate the age profiles. It is an intermediate step between gathering data and calculating age patterns. It is a necessary step for calculating intra-household private transfers. In addition, it is a helpful step in some other types of analysis based on NTA age profiles.

3.2.1. How is it constructed?

Step 1: Identify your main household survey

The core of the micro-level database is your main household survey. Identify the highest quality household survey you have access to, with the widest array of necessary survey items described in the previous sections. It must have data on the age of all persons in the household.

Step 2: Merge household-level items onto individual-level data

Most household surveys come with separate files for data on individuals and data on households. The micro-level database must be at the individual level, but must also include household-level data, so merging is necessary. Start with the person-level file, arranged so that each

observation represents one person (not one household). The record for each individual contains all individual-level information available for that member (age, sex, race/ethnic group, enrollment status, employment status, wages and salaries, etc.). Then merge the household data onto the file for each member (geographic identifiers, household structure variables household income of different types, consumption of different types, and so forth.) The members of a household will have that household's survey items repeated for all household members.

Step 3: Create NTA variables from your main household survey

Once you have the individual-level file with merged household-level items, you can begin to create NTA variables from your survey data. Here are two examples, one where there is probably individual-level data available, and one where a household amount must be assigned to individuals within the household:

- If the survey has an individual-level wage item, take that value to create the NTA labour earnings variable.
- If the survey has a household-level item on interest income received, NTA assumes only the household head receives interest income, so take that household-level value of the survey item as the NTA interest received variable for household heads and recode all non-heads to a value of zero in the NTA variable.

Step 4: Merge data from other sources onto the micro-level database

For those age profiles that do not come from the main micro-level survey, merge those with the survey using as many characteristics as possible. For example, if you have estimates of public health-care consumption by age that come from a government report and the report also has tables by age, sex and race/ethnicity, merge the consumption amounts onto the survey dataset by all three characteristics.

When starting the intra-household transfers calculation, it may be necessary to implement a more complex procedure for the merging of data not included in the main survey. Specifically, if the data for the age profile "other private consumption" or "labour income" is not included in the main survey, see the section 7.4.4. in chapter 7 "Adjustments to the micro-level database when data are from multiple surveys (p. 149).

Step 5: National-level information in the database

National-level population counts by age and sex can be merged onto the database. Macro control data can be merged as well (the variable will have the same value for everyone in the population). This will make it easier to calculate the adjustment to the macro controls.

3.2.2. What do you do with it?

Once you have built your micro-level database, the main purpose is to calculate the NTA age profiles, which will mean computing the age-specific averages of each NTA variable, then smoothing and adjusting to the macro control.

In addition, after NTA age profiles are constructed, the micro-level database can be used to calculate age profiles based on other individual- or household-level variables in the database, such as gender, sub-national geographies, education or other indicators of socioeconomic status. Researchers can also explore variability in age profiles, comparing

age-specific means to medians, for example, or including 20th and 80th percentile bands around a per capita age profile.

A word of caution about cutting too deeply into the micro-level database is warranted however. For some variables that are directly observed in survey data at the individual level, it is possible to examine the age profiles results by any characteristic of interest, data permitting, and the patterns that emerge will contain all of the variability related to the characteristic of interest. For variables that are only observed at the household level, or which are merged onto the database based on a limited number of characteristics, this is not the case. Two examples show what this means. First, say you want to estimate gender-specific consumption profiles. Consumption variables are only observed at the household level, and in NTA we impute consumption to individuals based on an age-based equivalency scale (see chapter 5 for details). Thus, any difference in the resulting age profiles of consumption between men and women only captures differences attributable to different household structures. We are unable to observe differences based on men's and women's differential consumption within the same household. Second, say you want to look at government transfer inflow age profiles by region. If the government transfer inflow data comes from government reports that list the data by age and sex only, you can merge the data onto the micro-level database by age and sex, but then any analysis by region based on that merge would be specious.

3.3. Basic methods

3.3.1. Aspects of an NTA age profile

So far, we have described an age profile as the age-specific per capita pattern of an economic flow, adjusted to match a macro control. It can be either smoothed or unsmoothed. The following discussion gives more details about these aspects.

Smoothed

Most age shapes come from survey data and thus have a great deal of noise from sampling variation and other sources of error or random variation. To deal with this noise, most profiles are smoothed using a cross-validation smoother.

Education is the exception—public and private education should be left unsmoothed because their age patterns have too many or too sharp discontinuities that we know are not random but are the product of specific ages of entering and leaving school. Sharp discontinuities may occur in other profiles when life course changes are highly regular by age, such as age of leaving the parental home, or when public programmes have distinct ages of entry or exit. Researchers should make sure not to smooth through such non-random discontinuities. Instead, smoothing can be done in separate sections above and below the age of a discontinuity, or some portion of the age profile should be smoothed and some unsmoothed.

Here are several additional smoothing guidelines:

- Detailed components should be smoothed, but not the higher-level variables that are made from the components after they are smoothed and adjusted to the macro control. For example, private health consumption and public health consumption profiles should be smoothed, but the sum of the two should not be smoothed. Likewise, the life cycle deficit, the difference between consumption and labour income, should not be smoothed.

- The objective is to reduce sampling variance but not eliminate what may be "real" features of the data. The only way to check for this is for the researcher to look at a plot of each profile, smoothed and unsmoothed together. Visually inspect the plot to check that the smoother is not eliminating significant changes over age which can occur due to sharply age-determined lifestyle transitions or access to public programmes.
- Some age ranges are zeros by definition for some age profiles. These ages should not be included in the smoothing procedure. Instead add the zeros back to the age profile after smoothing. For example, only adults (usually ages 15 and older) receive income, pay income taxes and make or receive inter-household transfers. Thus, when we smooth these age profiles, we include only adults, excluding younger age groups who do not earn income. It is important not to include children with zero values in cases like these because the smoothing process will produce positive values for children and more gradual "take-offs" than are realistic.
- The smoother may create negative values for variables where this should not occur. This can be solved by replacing the negative value by the average of the surrounding non-negative ages.

Details on the smoothing procedure are given in appendix B.

Macro-adjusted

Here that definition is presented algebraically to show exactly how the macro adjustment is done: one scaling factor is found that adjusts the age pattern up or down by the same factor at each age. In mathematical notation:

- a: age a, single years ranging from 0 to ω
- $N(a)$: population count, age a
- X: macro control (i.e. national total, all ages combined)
- $x(a)$: per capita age pattern, age a
- $\bar{x}(a)$: per capita NTA age profile, age a
- $\bar{X}(a)$: aggregate NTA age profile, age a.

Once we have estimates of population, macro controls and age patterns, we calculate a scaling factor θ which is the macro control divided by the unadjusted aggregate value of the flow in the country for that year:

$$\theta = \frac{X}{\sum_{a=0}^{w} x(a)\,N(a)}$$

The age shape is multiplied by the scaling factor to produce the final per capita and aggregate estimates:

$$\bar{x}(a) = \theta x(a)$$

$$\bar{X}(a) = \bar{x}(a)\,N(a)$$

Note that the scaling factor can have important information on the quality of the age shape estimate. It quantifies the extent to which the unadjusted age profile is consistent with aggregate controls. If the age shape is supposed to be a direct estimate of the activity in the macro control for a nationally representative sample, the aggregate age shape should be close to the aggregate control. In this situation, θ substantially less than or greater than one might

indicate that the underlying data on which the age profile is based are seriously under- or overestimated, that important components of the flow are not included in the unadjusted age profile, or that variables are included or excluded that should not be. There are other cases, however, when the adjustment factor will be substantially different from one. For example, if the survey item asks about an amount per month instead of per year, we would expect the adjustment factor to be around 12. Also, if the age pattern comes from an indicator such as programme participation, instead of a direct measure of a monetary flow, then the adjustment factor will also be substantially different from one. Adjustment factors should be evaluated on a case-by-case basis.

A final note on adjustment factors relates to the discussion of the micro-level database. For calculating intra-household transfers, several micro-level profiles are necessary, but these must be adjusted to macro controls. Therefore, adjustment factors should be saved as part of the micro-level database so that they can be included in the intra-household transfer algorithm.

3.3.2. Steps to follow in calculating an age profile

For each account, there is a general outline to get from the three pieces of data discussed in the section on data requirements to a finished account. Specific details for each account will follow in the account chapters.

1. Calculate the macro control[4]
   - a) Identify relevant national account items
   - b) Adjust national account aggregates to match NTA concepts
2. Calculate the per capita age pattern by single year of age from the micro-level database in one of three ways
   - a) From household survey (with survey weights if applicable)
     - i. Use individual-level data if available
     - ii. Otherwise allocate household amount to individuals in the household (different profiles have different methods for this imputation, as will be discussed in Chapters 5-7)
   - b) From administrative records
   - c) On *a priori* grounds (i.e., the age shape is assumed or is the product of other, previously calculated age profiles)
3. Adjust age pattern for any missing populations if necessary (i.e., persons not represented in survey or administrative records)
   - a) By assumption about missing population
   - b) By bringing in supplementary data about missing population
4. Smooth the resulting age shape (except for education)
   - a) Implement smoother over entire age profile or in sections if there are non-random discontinuities
   - b) Evaluate smoother to ensure that no real variation has been eliminated
5. Adjust the smoothed and non-smoothed profiles to macro controls
   - a) Calculate the adjustment factor and multiply by age pattern
   - b) Evaluate adjustment factor to test the validity of the age shape

4 Chapter 4 gives the calculation of all macro controls as the first step before calculating any age profiles, so this step will generally not need to be revisited each time.

To describe these steps as they relate to an actual age profile, take the example of labour earnings. First the macro control is calculated from national accounts. Then the per-capita age pattern is estimated from an income or labour survey based on respondents age 15+ self-reporting their wages during the previous month. Institutionalized persons are not included in the survey, so they are assumed to have zero labour earnings. Thus, the non-institutionalized per capita values divided by the per cent institutionalized represent the value for the total population. The resulting age pattern is smoothed (see appendix B). Upon inspection, the smoother is found to be over-smoothing at the earliest ages of labour market entry and at retirement ages, so smoothing factor is reduced and smoothing is only done for ages 15+. The smoothed and non-smoothed profile adjustment factors are calculated and they are close to 12. This is a reasonable value because the respondents were reporting monthly values, so the factor of 12 makes them represent an annual amount. The per capita age patterns are multiplied by their adjustment factors to finalize the age profiles.

3.3.3. How many age profiles to calculate?

Chapter 2 lists all of the accounts included in NTA which are available for cross-country comparison. However, some of those NTA age profiles may have multiple sub-profiles if the country team feels they are necessary in order to improve the estimates. For example, the age profile of private education consumption may be made up of components for primary, secondary and tertiary education if the data are available to identify different age patterns and macro controls for each level. These would be produced by the country team following the steps in the previous section for each education level. The sum of the three components is the overall private education age profile.

Note that age profiles which are the sum of lower-level, smoothed, macro-adjusted age profiles should not themselves be smoothed again, nor should they need to have another macro control adjustment factor. Because they are the sum of macro-adjusted profiles, their macro controls necessarily equal the sum of the lower-level macro controls.

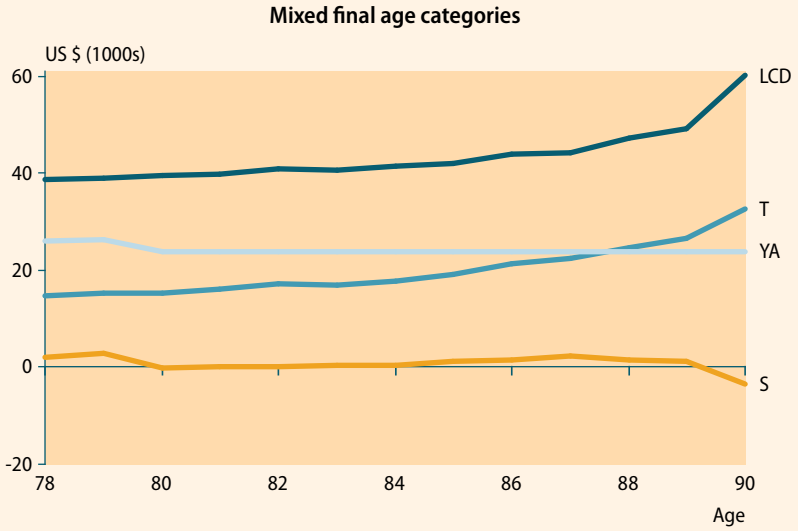
One final aspect of the cumulative nature of age profiles is worth mentioning: because some age profiles are the sum or difference of other age profiles, all of the age profiles for a country must have the same open age interval. In other words, you cannot have all of your consumption age profiles have a final age category of 80+ while using labour income profiles that extend to age 90+. Doing so would create a false trend in the life cycle deficit variable, which is the difference between consumption and labour income. See box 3.2 for an example of the "false trend". If you have data sources with different final age categories, reduce them all to the same final age category by shortening the longer series, computing a new final age category based on population-weighted average. In the consumption and labour income example, then, the consumption age profiles would all have to end at 80+, with the 80+ value being the population-weighted average of the values from 80 to 90+.

Beyond just data availability issues involved in the open age interval, there are reliability concerns as well. The reliability of values inevitably declines at older ages due to small sample sizes. The age at which this becomes critical will depend on the number of observations at older ages. There are no set criteria for selecting a cut off age but, when the confidence interval around the profile becomes too large to obtain reliable estimates of the slope of the age profile, extending the profile to higher ages should be avoided. The value for the open age interval should be the population-weighted average value for all those in the age group.

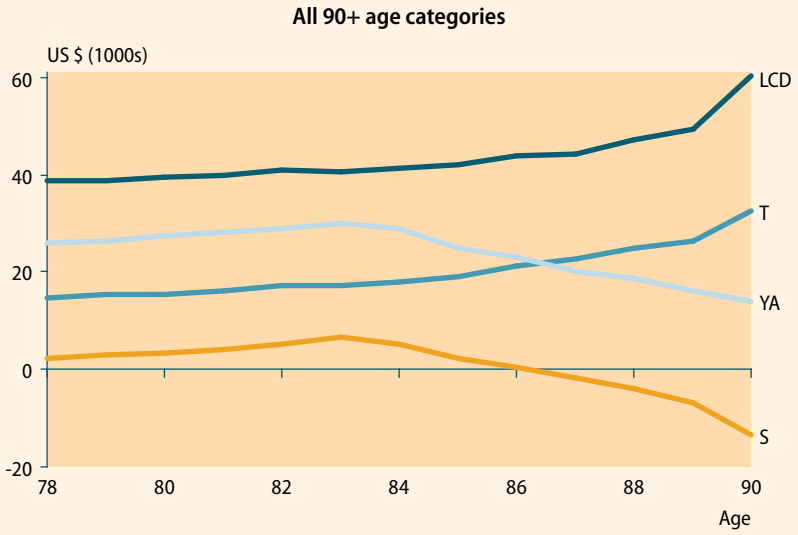
Box 3.2.

Do not combine age profiles with different final age categories

Say you had life cycle deficit (LCD) and transfer (T) profiles with final age categories of 90+, but asset income (YA) profiles with final age categories of 80+. Computing saving (S) as the balancing item (S=YA+T-LCD) would show a false trend:



In the graph above it looks like saving at oldest ages is almost zero. In fact, the actual data shows how the asset income pattern, invisible above, leads to a distinct pattern of saving up to age 86 followed by substantial dissaving:



If the researcher only had the YA age profile to 80+, all of the other profiles should be reduced to 80+ as well.

3.3.4. How to evaluate resulting age profiles

Any empirical work requires careful evaluation and appropriate revision. Errors can readily be introduced because of simple miscalculations or misinterpretation of the methods. There are a number of ways that NTA estimates can be evaluated. Some are quite mechanical and others involve careful consideration by researchers involved.

Once estimates have been constructed, they must be evaluated before finalizing. There are two different types of checking that researchers should do. The first group, called "internal NTA validity checks", assess whether the resulting profile follows the internal NTA "rules". A spreadsheet for carrying out these checks is available online at http://ntaccounts.org. This group of checks also contains comparative NTA evaluation and checking to see whether the profile is an outlier compared to other NTA countries with that profile. The second group, called "external validity checks" compares NTA estimates to relevant quantities observed outside of the NTA.

Internal NTA validity checks

- Macro control: compute the aggregate amount of the profile and verify that it matches the intended control total.
- Smoothing: plot the smoothed and unsmoothed profiles on the same graph. Is there evidence of over- or under-smoothing? Real age discontinuities that may have been smoothed over?
- Subprofile consistency: if this age profile is the sum of lower-level age profiles, do the sums match at each age and in the aggregate?
- NTA comparative: plot the age profile relative to other countries with the same estimates (scale profiles for comparison by dividing each by the average of the labour income profile value for ages 30-49). Is your estimate in the same range as other NTA countries? All countries or just those in your region? If not, why not?
- Positive, negative, zero: if there are ages where the profile should be positive, zero or negative, make sure that they are so. For example, if your survey has no data for labour earnings below age 15, make sure that the age profile has all zeros below age 15.
- Role of children: children should have zero values or close to zero for profiles involving assets (saving, asset income, etc.) and inter-household transfers.
- Balancing flows: are flows that are supposed to balance in the aggregate actually in balance? For example, do total intra-household inflows match total intra-household outflows? Is the life cycle deficit equal to transfers plus asset income minus saving?

External validity checks

- Macro control: if you took your macro control from a national source, does it agree with amounts reported in international databases on national accounts? If not, why not? Are you sure that your macro control is based on the most up-to-date revision of your country's national accounts?
- External research: are there other researchers working on the topic related to the age profile? Have they made estimates of similar quantities that you can compare to? Is your estimate in the same range? If not, why not? It may be impractical to check this for every single profile, but it is worth it for important outcomes such as private saving.

- Plausibility: plot the age profile. Does anything look strange? Does it look reasonable? Are unusual features of the profiles, e.g., peaks or drops at particular ages, consistent with previous research on the country, features of policy, historical events and so forth?

3.3.5. Document and archive estimates

Documenting estimates often receives insufficient attention but is a critical step. The objective should be to insure that other analysts can replicate the work that has been carried out. Documentation and archiving is also very valuable because researchers will use this information for constructing other elements of NTA described below. It will also be very useful to insure that NTA time series estimates are constructed in a consistent manner.

Documenting NTA is no different than documenting other research. Critical elements include:

- Complete references for all sources;
- Definition of all variables and a comprehensive explanation of how each variable has been created;
- Complete explanation of problems encountered and steps followed to deal with the problem; and
- Archiving of all data including micro data, aggregate controls and intermediate and final NTA estimates.

Archiving is a very important step to insure that methods and estimates can be recovered and used in the future. The particular approach to archiving will vary from institution to institution. One method of archiving available to members of the NTA network is to store information in the online database.

3.4. Steps to follow in completing the flow accounts

Because some age profiles are based on other NTA profiles, the calculations must proceed in a particular order. To get started quickly and generate the most interesting results in the shortest amount of time, we suggest following the work flow diagram in figure 3.1.

Figure 3.1.
Suggested work flow for calculating NTA flow account

Chapter 4

NTA and the macro economy

4.1. Introduction

The purpose of this chapter is to explain how NTA aggregate flows can be constructed using data from the System of National Accounts (SNA). This is very important because it insures consistency with SNA, the mainstay for describing the aggregate economy. NTA and SNA have different purposes and conceptual frameworks, however. Some NTA variables, particularly related to private transfers, have no direct counterpart in SNA. Many NTA flows are identical to or can be can be constructed from SNA data.

Age groups are fundamental to NTA and all flows are classified by the age of the residents to whom and from whom they flow. The government is considered an intermediary in NTA and public flows are classified by the age of taxpayers or beneficiaries of public programmes. Private institutions, e.g., households, corporations and non-profit institutions are also treated as intermediaries or agents that represent the interest of residents. In order to construct a complete set of accounts, flows to and from the rest of the world (ROW) are also documented. Unless otherwise indicated, flows refer to flows to or from residents. The aggregate macro controls described in this chapter consist of NTA flows aggregated across all ages.

NTA accounts are naturally divided into three sub-accounts each discussed in detail in subsequent chapters. The three tables presented here provide the aggregate controls and also a very broad overview of the generational economy. The first sub-account is the life cycle account and the aggregate values required to construct NTA are shown in table 4.1 on aggregate life cycle flows.

The life cycle deficit is an NTA variable, equal to consumption less labour income, and it has no counterpart in SNA. Other components of the life cycle flows are constructed directly from SNA data with adjustments described in detail below.

Consumption, public consumption and private consumption are based on final consumption expenditure data in SNA. Labour income is an estimate of the value of the return

Table 4.1.
Aggregate life cycle flows, Mexico, 2004 (*Billions of pesos*)

Life cycle deficit	**2,350**
Consumption	**5,761**
Public consumption	914
Private consumption	4,847
Labour income	**3,411**
Earnings	2,406
Self-employment labour income	1,005

Source: Estimates by Ivan Mejia Guevara from www.ntaccounts.org, accessed 27 January 2013.

to labour and it has no direct counterpart in SNA. Earnings is reported in SNA, although the NTA value requires an adjustment. SNA does not report the value of labour for self-employed and unpaid family workers, but this is estimated from mixed income.

The variables that serve as aggregate controls for public age reallocations, discussed in additional detail in chapter 6, are presented in table 4.2. The high-level aggregations in table 4.2 have no counterpart in SNA, but are calculated from the components provided in the table.

Public transfer inflows consist of transfers received by members of the population that are mediated by the government, including all cash transfer programmes and all public provision of goods and services including both collective and individual consumption. These are calculated directly from SNA. Public transfer outflows refer to outflows from the resident population. When combined with net public transfers from ROW, they must equal public transfer inflows by definition. Public transfer outflows are funded by taxes and other public revenues, available from SNA. The transfer deficit/surplus is a balancing item that measures the shortfall or surplus of public revenues relative to public transfer inflows. This variable is unique to NTA.

All components of *Public asset–based reallocations* are based on SNA data with adjustments required in some cases as described in more detail below.

The aggregate values for private age reallocations are presented in table 4.3. An important point is that some components of private age reallocations, those shaded in table 4.3, are not based on SNA or other available aggregate data. In some countries, private inter-household transfer macro controls may be available, but not in most cases. Private transfer inflows and outflows are estimated using the methods unique to NTA as described in chapter 7. They are reported here only to give a complete accounting of aggregate private age reallocations. The unshaded values in table 4.3 are constructed using methods introduced in this chapter.

Private transfers, private transfer inflows less private transfer outflows, can be estimated using SNA data because it is equal to net private transfer from the rest of the world by definition.

Table 4.2.
Aggregate public age reallocations, Mexico, 2004 (*Billions of pesos*)

Public age reallocations	**99.4**
Public transfers	**–0.2**
Public transfer inflows	**1,236.8**
Public transfers inflows, in-kind	914.0
Public transfers inflows, cash	322.8
Public transfer outflows	**1,236.9**
Taxes and other revenues	1,137.4
Transfer deficit(+)/surplus (-)	99.5
Net public transfers from ROW	**-0.2**
Public asset–based reallocations	**99.5**
Public asset income	**307.7**
Public capital income	0.0
Public property income	307.7
Public property income inflows	495.4
Public property income outflows	187.7
Public saving	**208.2**

Source: Estimates by Ivan Mejia Guevara from www.ntaccounts.org, accessed 27 January 2013.

Table 4.3.
Aggregate private age reallocations, Mexico, 2004 (*Billions of pesos*)

Age reallocations	**2,350**
Private age reallocations	**2,251**
Private transfers	**194**
Private transfer inflows	**2,229**
Private transfer inflows, inter-household	285
Private transfers inflows, intra-household	1,944
Private transfer outflows	**2,035**
Private transfer inflows, inter-household	92
Private transfers inflows, intra-household	1,944
Net private transfers from ROW	**194**
Private asset–based reallocations	**2,057**
Private asset income	**2,833**
Private capital income	3,140
Private property income	–308
Private property income inflows	2,388
Private property income outflows	2,696
Private saving	**775**

Source: Estimates by Ivan Mejia Guevara from www.ntaccounts.org, accessed 27 January 2013.
Note: Values in shaded area are not based on SNA.

The components of private asset-based reallocations are readily constructed from SNA data as is detailed below.

4.2. Relationship between NTA and SNA

The NT flow accounts are based on the identity, equation 2.1 in chapter 2, which emphasizes intergenerational flows. An alternative version that is more closely related to SNA is:

$$Y^l(x)+Y^k(x)+Y^p(x)+\tau(x)=C(x)+S(x) \tag{4.1}$$

The left-hand side is the disposable income of age group *x*. The first three terms, labour income, capital income and property income are very similar to primary income, the income received by persons age *x* because of their involvement in producing goods and services. The final term on the left-hand side is net transfers, $\tau(x)$, equal to transfer inflows less transfer outflows.

Combining all of these left-hand side flows quantifies the resources that members of each age group have at their disposal and can use in two ways. The resources can be consumed in the current period or they can be saved.

The aggregate NTA values for the economy are obtained by summing across age *x*. In NTA, all flows to and from the government, firms, non-profit institutions and households are assigned to individuals. Hence, the aggregate NTA flows are similar to flows for the total economy as reported in the System of National Accounts. Representing the total for all residents of the nation using the variable without the age argument, x, gives us:

$$Y^l+Y^k+Y^p+\tau=C+S \tag{4.2}$$

These components as measured in NTA are very similar to flows measured in the System of National Accounts (SNA). Before proceeding with a detailed discussion of methods for constructing NTA aggregate flows, however, it is important to understand basic differences and similarities between NTA and SNA.

NTA and SNA both provide comprehensive accounts of how income is generated and used by resident units. In SNA, the total economy for which flows are documented consists of five kinds of resident units, households, financial and non-financial firms, government and non-profit institutions serving households (NPISHs), plus flows to non-resident units called the rest of the world.

In NTA, the resident units consist of age groups with all flows classified as inflows to or outflows from an age group or, aggregating across all age groups, the resident population.

An important feature of NTA is that the flows are not limited to flows to and from households. Firms, NPISHs, and governments are treated as agents of the population. The income of a firm is treated as the income of individuals (or age groups) who own that firm. Dividends paid by firms are treated as dividends paid by the individuals who own that firm. Public transfers are treated as transfers from taxpaying age groups to the age groups in which beneficiaries are concentrated, often children and the elderly.

Important economic flows in NTA have no exact counterpart in SNA because the accounts differ in their purpose. The goal of NTA is to provide insights about how the economy operates to satisfy generational objectives. From this perspective, labour income and capital income are fundamental. Labour income is closely related to age, the rise and decline of productivity over the life cycle. Saving and the accumulation of capital provide one of the key economic mechanisms for dealing with the mismatch between labour income and consumption. Labour income and asset income are not defined in SNA, however, but SNA data are used to construct estimates of aggregate labour income and asset income that are key in NTA.

A central feature of generational economics is that all age reallocations are achieved by two exhaustive, mutually exclusive flows—transfers and asset-based reallocations. Transfers are broadly defined in NTA to include all flows between individuals that do not involve explicit exchange, including all final goods and services produced by the government, cash payments by the government, all taxes and social insurance contributions to the government that fund these transfers, private transfers between households, and transfers between individuals living in households. Estimates of some of these flows can be based directly on SNA, some require modification and others, such as intra-household transfers, have no SNA counterpart.

Another important feature of NTA is that public and private age reallocations (transfers and asset-based flows) are distinguished. Public flows are inflows and outflows to age groups that are mediated by the public sector. SNA provides extensive information about flows to and from general government that can be used to construct public NTA flows. For example, taxes received by the government are outflows from age groups while benefits paid by the government are inflows to age groups in NTA. SNA provides information about asset income and saving for both the public and private sectors that is very useful for NTA. Little information about private transfers is available from SNA, however, and other methods must be used to generate these data in NTA.

A potential source of confusion is that the terminology used in NTA and SNA are different in some respects. SNA flows are categorized as *resources* or *uses.* Resources are also referred to as receipts or, in NTA, as inflows. Income is an example of a resource. *Uses* is also referred to as disbursements or, in NTA, as outflows. Consumption and saving are examples of *uses.*

4.3. Calculating macro controls for the NTA flow account

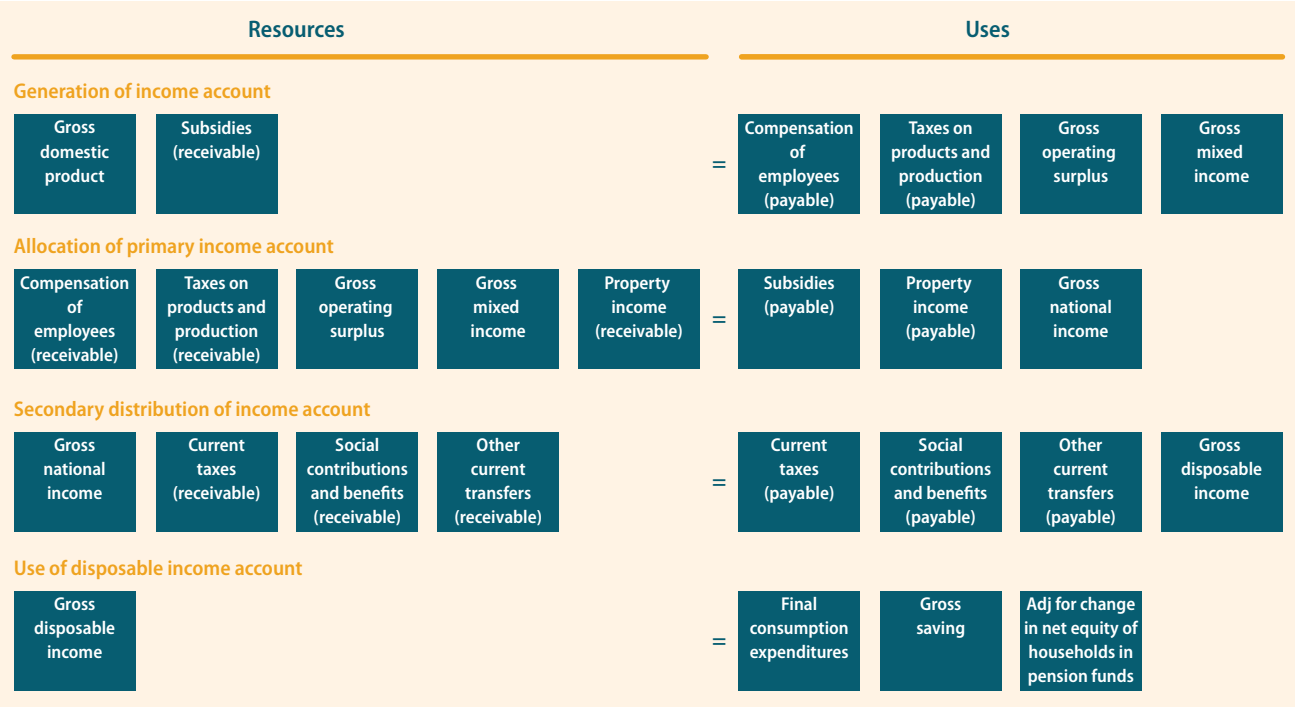
The NTA flow account draws only on current accounts in SNA, which document how income generated in the current accounting period are allocated and used. Four current accounts in SNA provide basic information about current resources and uses: the generation of income account, the allocation of primary income account, the secondary distribution of income account, and the wse of disposable income account. The allocation of primary income account provides the SNA data required to estimate three components of NTA: labour income, asset income, and property income. The secondary distribution of income account provides information useful for estimating NTA transfers. And the use of disposable income account provides data need to calculate consumption and saving in NTA.

4.3.1. Calculating primary income

In NTA, primary income consists of labour income, capital income and property income. In SNA, primary income consists of compensation of employees, operating surplus, mixed income, property income and taxes on products and production less subsidies.

Two adjustments are required to convert the SNA components of primary income into the NTA components of primary income.

Figure 4.1.
Schematic of flow accounts in the System of National Accounts



Note: Accounts are presented on a gross basis. Subtract "consumption of fixed capital", found in the capital accounts, from all gross amounts to get the accounts presented net of depreciation.

- Mixed income. Mixed income in SNA is income from household enterprises, which do not distinguish the returns to capital from the returns to labour. In NTA two thirds of gross mixed income is allocated to labour income and one third to gross capital income. This simple approach is consistent with the best available evidence on this issue (Lee, Lee, et al., 2008).
- Taxes on products and production less subsidies. In NTA, taxes on products and production less subsidies are divided into three components: taxes less subsidies on labour income, taxes less subsidies on capital income, and taxes less subsidies on consumption. Labour income and capital income in NTA are adjusted upward valuing labour and capital income before the assessment of taxes less subsidies on production. Consumption must be adjusted downward to exclude taxes less subsidies on products. Taxes on products and production less subsidies are included in outflows from age groups that, along with other taxes and revenues, fund public transfer outflows.

If the tax is assessed on goods and services when they are produced, delivered, sold or transferred, these are classified in SNA as "taxes on products" and NTA attributes these to consumption. An example is value added tax. In SNA taxes on products are included in final consumption expenditure, but in NTA taxes on products are not counted as consumption. Hence, taxes on products are subtracted from final consumption expenditure. Subsidies on products are treated like negative taxes—instead of subtracting them from final consumption expenditures, they are added.

Taxes assessed on the employment of labour or the ownership or use of land, buildings or other assets used in production are classified with "other taxes on production". NTA adds these taxes to labour income if they are assessed on the employment of labour, or to capital income, if they are assessed on the ownership or use of land, buildings or other assets used in production. "Other subsidies on production" are treated like negative taxes, reducing the amount to labour income or capital income. Whether the tax should be attributed to labour or capital is often not clear from SNA tables. More detailed information about "other taxes on production" may provide insights about how taxes should be allocated between capital and labour. Country teams will need to look for more data to understand the exact nature of "other taxes on production" and decide what is being taxed. In the absence of additional information, taxes on production less subsidies are allocated using the following simple rules:

Share allocated to compensation of employees = compensation of employees/ (compensation of employees + gross operating surplus, corporations and NPISHs + gross mixed income),

Share allocated to self-employed labour income = two thirds of gross mixed income/ (compensation of employees + gross operating surplus, corporations and NPISHs + gross mixed income),

Capital share, corporations and NPISHS = (gross operating surplus, corporations and NPISHs)/(compensation of employees + gross operating surplus, corporations and NPISHs + gross mixed income).

Capital share, mixed income = (1/3 gross mixed income)/(compensation of employees + gross operating surplus, corporations and NPISHs + gross mixed income).

Table 4.4 summarizes this discussion, showing the detail on taxes on products and production less subsidies that country teams are likely to find in their SNA tables and the NTA attribution of these taxes.

Table 4.4.
Adjusting for taxes on products and production less subsidies

SNA flow	NTA adjustment
Taxes on products	Tax on consumption; consumption reduced.
Other taxes on production	Allocated to labour in proportion to share of labour income.
	Allocated to capital in proportion to share of gross capital income.
Subsidies on products	Tax on consumption; consumption reduced.
Other subsidies on production	Allocated to labour in proportion to share of labour income.
	Allocated to capital in proportion to share of gross capital income.

A third adjustment is required to convert gross capital income to net capital income which is used in NTA.

Net capital income. Net capital income is calculated as gross capital income less capital consumption. Capital consumption is available in the allocation of primary income account, as an addendum to one of the other flow accounts, or as part of the capital accounts. If these data are not available, there are methods available for estimating consumption of capital.

4.3.2. Calculating consumption and saving

Consumption, as defined in NTA, is very similar to consumption as defined in SNA and reported in the use of disposable income account. Private and public consumption are distinguished in NTA. Private values are obtained by aggregating values for financial and non-financial corporation, households, and NPISHs. Public values are based on consumption and saving of general government as reported in SNA.

Two adjustments for consumption may be necessary to obtain NTA values:

- Taxes on products and production less subsidies. The treatment of taxes on products and production less subsidies is described in detail in the preceding section. Consumption must be adjusted downward to exclude taxes less subsidies on products.
- Reclassification of public and private consumption. In some cases, private consumption is reclassified as public consumption. This adjustment is discussed in chapter 5.

Saving in NTA is equivalent to disposable income less consumption as defined in SNA and reported in the use of disposable income account. No adjustment is made for changes in pension entitlements which will lead to a difference between SNA and NTA values of saving only if changes in pension entitlements are non-zero for ROW. Private saving is defined as the sum of financial and non-financial corporations, households and NPISHs. Public saving is defined as the sum of saving of general government.

Calculating macro controls for primary income, consumption and saving provide all values required to construct a full set of life cycle controls (table 4.1) and all values required to construct public and private asset–based reallocations as reported in tables 4.2 and 4.3, respectively.

4.3.3. Calculating public and private transfers

Constructing NTA transfers relies heavily on SNA flows reported in the secondary distribution of income account. There are important differences between the NTA concepts of public and private transfers and the concepts used in SNA. In NTA, a public transfer refers to a flow

between the private sector and the public sector or a flow between the ROW and the public sector. Private transfers refer to flows within the private sector and flows between the private sector and ROW. Flows between government units do not directly lead to age reallocations and are not included in NTA. In order to construct NTA flows, it is necessary to classify flows in the SNA secondary distribution of income into the four groups: public/private, public/ROW, private/private and private/ROW.

The second difference between NTA transfers and SNA flows is that current transfers in NTA are more inclusive than in SNA. First, all taxes including taxes less subsidies on products and production are classified as a public transfer outflow in NTA. (It is an outflow because NTA values are always reported from the perspective of the in NTA.) Second, a broad definition of in-kind public transfer inflows is employed in NTA that include all public consumption, both individual and collective consumption. Residents receive in-kind public transfer which, in turn, they consume.

SNA provides limited information that can be used to estimate aggregate controls for private transfers. Transfers between households are not generally included in the SNA secondary distribution of income account. Intra-household transfers values are not available in SNA or from other statistical sources. Intra-household transfers are estimated indirectly using methods described in chapter 7.

SNA data can be used to construct an estimate of net private transfers from ROW. This is very useful because it is equal to private transfers for residents. Combining private transfers with private asset–based reallocations yields an estimate of private age reallocation.

Important details about constructing public and private transfer flows are best discussed in the context of a specific example taken up in the next section.

4.4. An example of calculating macro controls

This section provides a complete example of constructing macro controls based on SNA model data for in 2008.[1]

4.4.1. Calculating primary income

The SNA allocation of primary income account is presented in simplified form in table 4.5. The accounts have been reduced to two sectors: private, which is the sum of flows for corporations, households, and NPISHs, and general government. Resources and uses are presented for each flow. Many detailed flows are not reported as they are not needed for our purpose.

Although flows to and from households are not required for most purposes, there are two exceptions. The net operating surplus of households serves as the macro control for imputed asset income from owner-occupied housing and is reported under private operating surplus. Interest paid by households is also distinguished in NTA and this value is reported in the note to table 4.5.

Table 4.6 on NTA primary income is presented below and is intended only as a bridge between SNA and standard NTA aggregate control tables. Primary income consists of only two components in NTA: labour income, consisting of compensation and self-employment labour income, and asset income, consisting of capital income and property income. NTA net national income (1,509) is less than SNA net national income (1,642) because taxes less subsidies on products (taxes on consumption) are not included in NTA net national income.

1 The SNA data were provided by Jan von Tongeren.

Table 4.5.
SNA Allocation of Primary Income Account, UNSNA, 2008

	Private		General government		Total economy		ROW		Total	
	Resources	Uses	Resources	Uses	Resources	Uses	Resources	Uses	Resources	Uses
Operating surplus, gross	425		27		452				452	
Operating surplus of corporations and NPISHs, gross	341				341				341	
Operationg surplus of households, gross	84				84				84	
Mixed income, gross	61				61				61	
Operating surplus, net	238				238					
Operating surplus, net, corporations, NPISHs	169				169					
Operating surplus, net, households	69				69					
Mixed income, net	53				53					
Compensation of employees	1154				1154		2	6	1156	6
Taxes on production and imports			235		235				235	
Subsidies			-44		-44				-44	
Property income	375	349	22	42	397	391	38	44	435	435
National Income, net	**1471**		**171**		**1642**					

Note: Interest paid by households:14

Table 4.6.
Allocation of NTA Primary Income, UNSNA, 2008

	Private		Public		Total economy		ROW		Total	
	Inflows	Outflows	Inflows	Outflows	Inflows	Outflows	Inflows	Outflows	Inflows	Outflows
Labour income	1236				1236		2	6	1238	6
Compensation of employees	1195				1195					
Self-employment labour income	42				42					
Asset income	642	349	22	42	664	391	38	44	702	435
Capital income (net)	267				267				267	
Capital income, corporations and NPISHs	184				184				184	
Capital income, owner-occupied housing	69				69				69	
Capital income from mixed income	13									
Property income	375	349	22	42	397	391	38	44	435	435
Interest on consumer credit	14	14			14	14			14	14
Other property income	361	335	22	42	383	377	38	44	421	421
NTA national income, net	1529				1509					
Downward adjustment of consumption					133					
SNA national income, net					1642					

Converting the SNA representation of primary income (table 4.5) to the NTA representation (table 4.6) involves several adjustments. The first adjustment is to allocate gross mixed income to self-employment labour income and capital's share of mixed income. Two thirds is allocated to labour and one third to capital income (table 4.7).

The second adjustment is to reclassify taxes and subsidies on products and production. A portion is classified as taxes on labour income, separately for compensation of employees and self-employment labour income, and as taxes on labour income capital income. Labour income and capital income are adjusted upward, setting them at the pre-tax level of income. Taxes and subsidies on products are allocated to consumption. Taxes and subsidies and production are allocated to compensation of employees, self-employment labour income and capital income in proportion to the income of each productive factor using gross capital income of corporations and households as discussed above. The result is shown in table 4.8.

NTA compensation of employees is calculated as the SNA value of 1,154 plus taxes less subsidies on production (41) giving a total of 1,195 as shown in table 4.6 above. NTA self-employment labour income is equal to labour income's share of mixed income (41) plus taxes less subsidies on self-employment income (1) giving a total value of 42.

Constructing NTA capital income involves several calculations shown in table 4.9. Capital share of mixed income and taxes less subsidies on capital income are added to the gross operating surplus of corporations to compute gross capital income. The components of capital income are also adjusted to include taxes on products and production less subsidies. They are allocated to capital income of corporations and NPISHs and to capital income from mixed income in proportion to the gross values of each component. None is allocated to the capital income from owner-occupied housing. Consumption of fixed capital is subtracted to calculate net capital income for each of the three components.

Net capital income and its three components are entered from the corresponding private and public sector values in table 4.6.

NTA property income inflows and outflows for public and private in table 4.6 are identical to SNA property income resources and uses. NTA also distinguishes interest on consumer credit. The NTA outflow is set equal to interest uses by households reported in SNA. There is no need to distinguish NTA private inflows separately for consumer credit and other forms of property income.

Table 4.7.

Allocation of mixed income

Note: Values have not been adjusted for taxes and subsidies on products and production.

Item	Total	Self-employment labour income	Capital share of mixed income
Mixed income, gross	61	41	20

Table 4.8.

Allocation of taxes and subsidies on products and production

Note: Taxes and subsidies on production assumed to be assessed only on the private sector.

	Total	Compensation of employees	Self-employment labour income	Capital income	Consumption
Taxes on products	141				141
Subsidies on products	–8				–8
Taxes on production	94	66	2	26	
Subsidies on production	–36	–25	–1	–10	
Total	**191**	**41**	**1**	**16**	**133**

Table 4.9.
Calculation of capital income, net

	Private	Public
Operating surplus, corporations, NPISHs, gross	341	27
Operating surplus, gross, households	84	
Capital share of mixed income	20	
Taxes less subsidies on capital income	16	
Capital income, gross	461.5	27
For corporations and NPISHs	356.3	
For owner-occupied housing	84	
For mixed income	21.2	
Consumption of fixed capital	195	27
Corporations and NPISHs	172	
Owner-occupied housing	15	
Mixed income	8	
Capital income, net	266.5	0
Capital income, corporations and NPISHs	184.3	
Capital income, owner-occupied housing	69	
Capital income from mixed income, net	13	

4.4.2. Calculating consumption and saving

Calculating NTA consumption and saving are taken up at this point because once this step is completed the complete NTA life cycle account can be constructed, as well as, public and private asset–based reallocations. Transfers are taken up in the next section.

The SNA use of disposable income, net for UNSNA 2008 is presented in table 4.10. Again the values for corporations, households and NPISHs are combined and classified as private flows.

The value of SNA final consumption expenditure includes taxes less taxes on products. These are excluded from NTA consumption as explained above. Taxes less subsidies on consumption as calculated in table 4.8 is 133 for private consumption and 0 for public consumption. Hence, NTA private consumption is reduced by 133 from 1,047 to 914 while public consumption is unaffected and remains 352. The adjusted consumption values are combined with the labour income values from table 4.6 to construct the NTA aggregate life cycle flows (table 4.11). The life cycle deficit is calculated as consumption less labour income.

Table 4.10.
SNA Use of Disposable Income, Net

	Private		General government		Total economy		ROW		Total	
	Resources	Uses	Resources	Uses	Resources	Uses	Resources	Uses	Resources	Uses
Disposable income, net	1314		290		1604				1604	
Final consumption expenditure		1047		352		1399				1399
Adjustment for the change in pension entitlements	11	11			11	11	0	0	11	11
Saving, net		267		-62		205				205

Table 4.11.
Aggregate life cycle flows, UNSNA, 2008

Life cycle deficit	**29.5**
Consumption	**1,266.0**
Public consumption	352.0
Private consumption	914.0
Labour income	**1,236.5**
Earnings	1,194.8
Self-employment labour income	41.7

In addition, tables 4.6 and 4.10 provide the information required to compile public and private asset–based reallocations. Asset-based reallocations consist of asset income, detailed in table 4.6, and saving reported in table 4.10. The adjustment of consumption does not influence saving, because disposable income is also reduced by the same amount. SNA saving in table 4.10 is adjusted to account for changes in pension entitlements. In this particular example, the adjustment affects only household and corporate saving, but these are combined in NTA into private saving. Private saving could be affected, however, if the change in pension entitlements involved the rest of the world. NTA does not adjust for changes in pension entitlements, and saving is defined as net disposable income less consumption.

Public asset–based reallocations are reported in table 4.12. Public asset income and its components are taken directly from the public sector flows in table 4.6. Public capital income is net of depreciation. Public property income is public property income inflows less outflows. Public asset income is public capital income plus property income. Public saving is taken from table 4.10, SNA use of disposable income. Public asset–based reallocations are equal to public asset income less public saving.

Private asset–based reallocations are reported in table 4.13. The components of private asset income are based on private sector values reported in table 4.6. Private capital income is equal to capital income generated by businesses and capital income generated by owner occupied housing. Private property income outflows are equal to consumer credit (interest paid by households) and all other property income outflows. Private property income is equal to property income inflows less outflows. Private asset–based reallocations are equal to private asset income less private saving.

4.4.3. Calculating transfers

The key source of information for constructing estimates of NTA transfers is the secondary distribution of income account in the System of National Accounts presented in simplified

Table 4.12.
Aggregate public asset–based reallocations

Public asset–based reallocations	**42**
Public asset income	**–20**
Public capital income	0
Public property income	–20
Public property income inflows	22
Public property income outflows	42
Public saving	**–62**

Table 4.13.
Aggregate private asset–based reallocations

Private asset–based reallocations	**26**
Private asset income	**293**
Private capital income	267
Private capital income, business and non-profits	198
Private capital income, owner occupied housing	69
Private property income	26
Private property income inflows	375
Private property income outflows	349
Consumer credit	14
Other private property income outflows	335
Private saving	**267**

form in table 4.14. As previously, private flows include all flows to financial and non-financial corporations, households and NPISHs.

SNA data can be used to construct complete aggregate controls for public transfers. Information about private transfers is more limited, but still useful.

The treatment of transfers in NTA differs from SNA in several important regards. First, public transfers in NTA are more broadly defined that in SNA. NTA public transfers include taxes on products and production less subsidies. Also, all public consumption is classified as an in-kind public transfer.

A second distinction is that in NTA transfers are classified based on intersectoral features of the flows. Public transfers refer to flows between the private and the public sectors or between the public sector and ROW. Private flows refer to transfers within the private sector and transfers between the private sector and the ROW. The remaining flows, those within the public sector, involve no age reallocations and are not included in NTA.

Table 4.15 is constructed as an intermediate step to constructing aggregate transfers. It follows the same structure as SNA secondary distribution of income, it includes all flows defined as transfers in NTA and it classifies all transfers into four categories: transfers between public and private, public and ROW, private and ROW, and within private. Transfers within government are noted and used to check consistency with the SNA secondary distribution of income account.

Table 4.14.
SNA Secondary Distribution of Income, UNSNA, 2008

	Private		General government		Total economy		ROW		Total	
	Resources	Uses	Resources	Uses	Resources	Uses	Resources	Uses	Resources	Uses
National income, net	1471		171		1642				1642	
Current transfers	807	964	367	248	1174	1212	55	17	1229	1229
Current taxes on income, wealth, etc.		212	213	0	213	212		1	213	213
Net social contributions	283	333	50		333	333	0	0	333	333
Social benefits other than social transfers in kind	384	272		112	384	384	0	0	384	384
Other current transfers	140	147	104	136	244	283	55	16	299	299
Disposable income, net	1314		290		1604					

Table 4.15.
Secondary Distribution of Income Reclassified, excludes transfers within governments and includes taxes less subsidies on products and production

	Private		General government		Total economy		ROW		Total	
	Resources	Uses	Resources	Uses	Resources	Uses	Resources	Uses	Resources	Uses
Transfers between public and private	**471**	**459**	**459**	**471**	**930**	**930**			**930**	**930**
Taxes less subsidies on products and production		191	191		191	191			191	191
Current taxes on income, wealth, etc.		212	212		212	212			212	212
Net social contributions, public/private		50	50		50	50			50	50
Public transfers, in-kind	353			352	352	352			352	352
Social benefits other than social transfers in-kind, public/private	112			112	112	112			112	112
Other current transfers, public/private	7	6	6	7	13	13			13	13
Transfers between public and ROW			**3**	**32**	**3**	**32**	**32**	**3**	**35**	**35**
Taxes less subsidies on products and production			0		0	0		0	0	0
Current taxes on income, wealth, etc.			1		1	0		1	1	1
Net social contributions, public/ROW			0		0	0		0	0	0
Social benefits other than social transfers in-kind, public/ROW				0	0	0			0	0
Other current transfers, public/ROW			2	32	2	32		2	34	34
Transactions within private	**673**	**673**			**673**	**673**			**673**	**673**
Net social contributions, private/private	283	283			283	283			283	283
Social benefits other than social transfers in-kind, private/private	272	272			272	272			272	272
Other current transfers, private/private	118	118			118	118			118	118
Transfers between private and ROW	**14**	**23**			**14**	**23**	**23**	**14**	**37**	**37**
Other current transfers, private/ROW	14	23			14	23	23	14	37	37
Transactions within government					**96**	**96**			**96**	**96**
Total on current transfers (check)	**1159**	**1155**	**558**	**600**	**1717**	**1755**	**55**	**17**	**1772**	**1772**
Equals additional transfers included in NTA	**352**	**191**	**191**	**352**	**543**	**543**	**0**	**0**	**543**	**543**

Taxes less subsidies on products and production are classified as a use of resources for the private sector and a resource for general government in much the same way as other taxes. These flows could include transfers from the ROW to general government, but in the case of UNSNA all taxes fall on residents. Thus, the flows are entered as transfers between public and private and not transfers between public and ROW. Current taxes on income, wealth, etc. are taken directly from the SNA secondary distribution of income account. Of the resources of general government reported in SNA (213), 212 can be classified as a public/private transfer based on the private uses entry and 1 can be classified as public/ROW based on the ROW uses entry.

Net social contributions include public/private flows of 50 and private/private flows of 283. The classification is based on the SNA entry of 50 for resources of general government and 283 for resources of the private sector. Public transfers, in-kind are an NTA entry equal to public consumption adjusted to exclude taxes less subsidies on products as explained above. This is classified as a use for general government and a resource for the private sector and is entered as a public/private transfer.

Other current transfers involve a variety of flows and classifying them involves more detailed calculations. A more detailed set of components of other current transfer is useful for carrying out the necessary steps (see table 4.16). Two components of other current transfers can be directly classified. Current transfers within government (96) are classified as within public transfers and entered in table 4.15 as "transactions within government". These are only used as a check. Current international cooperation are classified as public/ROW transfers and a portion of "other current transfers public/ROW".

In the absence of additional information about the other flows included in other current transfers an approximation method is used to estimate the intersectoral flows. Other current transfers excluding current transfers with government and current international cooperation are arranged in table 4.17. The total inflows and outflows are 171 with the sectoral distribution as reported. ROW/ROW is shaded as transactions external to the economy are not included in national accounts. The ROW/private and ROW/public flows are calculated using a simple procedure. The outflows from ROW (15) are assumed to be proportional to the inflows to the private and public sectors. Likewise, the inflows to ROW (24) are assumed to be proportional the outflows from the private and government sectors.

Table 4.16.
SNA Other current transfers, UNSNA, 2008

	Private		General government		Total economy		ROW		Total	
	Resources	Uses	Resources	Uses	Resources	Uses	Resources	Uses	Resources	Uses
Other current transfers	**140**	**147**	**104**	**136**	**244**	**283**	**55**	**16**	**299**	**299**
Net non-life insurance premiums	47	52	0	4	47	56	11	2	58	58
Non-life insurance claims	56	48	1	0	57	48	3	12	60	60
Current transfers within government	0	0	96	96	96	96	0	0	96	96
Current international cooperation	0	0	1	31	1	31	31	1	32	32
Miscellaneous current transfers	37	47	6	5	43	52	10	1	53	53

Table 4.17.
Other current transfers excluding current transfers within government and current international cooperation

		Outflows from			
		Private	Public	ROW	Total
Inflows to		**147**	**9**	**15**	**171**
Private	140			14.3	
Public	7			0.7	
ROW	24	22.6	1.4		
Total	171				

The 2 x 2 intersectoral flow matrix for private/public other current transfers is estimated by assuming that the elements of the matrix are proportional to the total flows. The estimates obtained are reported in table 4.18. The value for private/private (118) is entered in the transactions within private group in table 4.15. The value for public/public (0.4) is included in transactions within government. The two public/private flows (7.3 and 5.9) are entered in transfers between public and private values for other current transfers. The ROW flows are included in transfers between public and ROW and transfers between private and ROW.

Aggregate controls for public and private transfers are reported in table 4.19. Values are drawn from table 4.15 or calculated from values within the table. The table meets several important properties of NTA. The first is that public transfer inflows and outflow must be equal if net transfers to ROW are included. Public transfers of –29.7 refer to the net transfers of the resident population. Their public transfers are negative because net transfers from ROW are negative.

Table 4.18.
Other current transfers excluding current transfers within government and current international cooperation

		Outflows from			
		Private	Public	ROW	Total
Inflows to		**147.0**	**9.0**	**15.0**	**171**
Private	140.0	118.5	7.3	14.3	
Public	7.0	5.9	0.4	0.7	
ROW	24.0	22.6	1.4		
Total	**171**				

Table 4.19.
NTA Public and private transfers, UNSNA, 2008

Item	Value	Source
Public transfers	**-29.7**	**Net public transfers from ROW***
Public transfers inflows	**471.3**	**Public transfer inflows, in-kind plus public transfer inflows cash***
Public transfer inflows, in-kind	352.0	Transfers between public and private, Private resources**
Public transfer inflows, cash	119.3	Transfers between public and ROW, ROW resources**
Public transfers outflows	**500.9**	**Public transfer inflows less net public transfers from ROW***
Taxes and other revenues	458.9	Transfers between public and private, private uses**
Transfer deficit(+)/surplus(-)	42.0	Public transfer outflows less taxes and other revenues*
Net public transfers from ROW	**-29.7**	**Transfers between public and ROW: ROW uses (3) less resources (32)****
Private transfers	**-8.3**	**Net private transfers from ROW***
Net Private transfers from ROW	**-8.3**	**Transfers between private and ROW: ROW uses (14) less resources (23)****

* Calculated from values within this table.

** Calculated from values in Secondary distribution of income reclassified

Another important feature of public transfers is the transfer deficit(+)/surplus(–). This is a balancing item that is equal to the gap between public transfer inflows and public taxes and revenues. In the case of the UNSNA in 2008 revenues were insufficient to cover public transfer inflows of 471.3 and net transfers from ROW of –29.7 (i.e., net transfers to ROW of 29.7).

Private transfer values from SNA are quite limited. The key transfers in NTA are inter-household transfers and intra-household transfers. Unfortunately, neither of these is compiled as part of SNA. One very important piece of information, however, is Net private transfers from ROW. By definition, this will equal Private transfers for all resident combined. This piece of information when combined with private asset–based reallocations allows us to estimate private age reallocations. Other means, taken up in chapters 6 and 7, are required to estimate the importance of inter- and intra-household transfers.

4.4.4. Age reallocations

Aggregate controls for age reallocations can now be completed using the asset-based reallocations reported for public and private asset–based reallocations reported in tables 4.12 and 4.13, respectively, and public and private transfers reported in table 4.19. Public age reallocations are shown in table 4.20 and private age reallocations are reported in table 4.21.

4.5. NTA identities and evaluating results

For each set of aggregate controls a set of identities holds that can be useful for evaluating results.

The following identities hold for aggregate life cycle flows:

- Life cycle deficit = Consumption – Labour income
- Consumption = Public consumption + Private consumption
- Labour income = Earnings + Self-employment labour income.

Table 4.20.
Aggregate public age reallocations, UNSNA, 2008

Public age reallocations	**12.3**
Public transfers	**–29.7**
Public transfer inflows	471.3
Public transfer inflows, in-kind	352.0
Public transfer inflows, cash	119.3
Public transfer outflows	500.9
Taxes and other revenues	458.9
Transfer deficit(+)/surplus(-)	42.0
Net public transfers from ROW	–29.7
Public asset–based reallocations	**42.0**
Public asset income	**–20.0**
Public capital income	0.0
Public property income	–20.0
Public property income inflows	22.0
Public property income outflows	42.0
Public saving	–62.0

Table 4.21.
Aggregate private age reallocations, UNSNA, 2008

Age reallocations	**29.5**
Private age reallocations	**17.2**
Private transfers	**–8.3**
Private transfer inflows	**na**
Private transfer inflows, inter-household	na
Private transfers inflows, intra-household	na
Private transfer outflows	**na**
Private transfer inflows, inter-household	na
Private transfers inflows, intra-household	na
Net private transfers from ROW	**–8.3**
Private asset–based reallocations	**25.5**
Private asset income	**292.5**
Private capital income	266.5
Private capital income, corporations and NPISHS	184.3
Private capital income, owner occupied housing	69.0
Private capital income from mixed income	13.2
Private property income	26.0
Private property income inflows	375.0
Private property income outflows	349.0
Consumer credit	14.0
Other private property income outflows	335.0
Private saving	**267.0**

Note: na = Values cannot be obtained from SNA.

The following identities hold for public age reallocations:

- Public age reallocations = Public transfers + Public asset-based reallocations
- Public transfers = Public transfer inflows – Public transfer outflows
- Public transfer inflows = Public transfer inflows, in-kind + Public transfer inflows, cash
- Public transfer outflows = Public transfer inflows – Net public transfers from ROW
- Transfer deficit/surplus = Public transfer outflows – Taxes and other revenues
- Public asset-based reallocations = Public asset income – Public saving
- Public asset income = public capital income + public property income
- Public property income = Public property income inflows – Public property income outflows.

The following identity holds for private age reallocations:

- Private age reallocations = Private transfers + Private asset–based reallocations
- Private transfers = Net private transfers from ROW
- Private asset–based reallocations = Private asset income – Private saving
- Private asset income = Private capital income + Private property income
- Private capital income = Private capital income, business and non-profits + Private capital income, owner occupied housing
- Private property income = Private property income inflows – Private property income outflows.

Several additional identities hold for private age reallocations that can be confirmed only after private transfers by age have been constructed:

- Private transfers = Private transfer inflows – Private transfer outflows
- Private transfer inflows = Private transfer inflows, inter-household + Private transfer inflows, intra-household
- Private transfer outflows = Private transfer outflows, inter-household + Private transfer outflows, intra-household.

Two important identities apply across the aggregate sub-accounts:

- Age reallocations = Public age reallocations + Private age reallocations
- Life cycle deficit = Age reallocation.

Chapter 5

The economic life cycle

5.1. Introduction

This chapter describes the methods for constructing National Transfer Accounts (NTA) variables that comprise the *economic life cycle account:* consumption, labour income and the life cycle deficit/surplus. Public and private consumption are distinguished as well as three purposes of consumption for each: education, health, and consumption other than education and health. Labour income is broadly measured consisting of earnings of employees including benefits and the labour income of self-employed persons including unpaid family workers.

The per capita and aggregate components of the economic life cycle for selected ages are shown in table 5.1. Complete NTA accounts are available on line: www.ntaccounts.org.

The per capita and aggregate life cycle variables by age are presented in graphic form in chapter 2 (figure 2.2 to 2.14).

Five steps are followed to construct the life cycle accounts with details provided later in this chapter:

1. The macro controls for labour income and consumption, estimated in chapter 4, are subdivided into their components.
2. Household surveys and administrative data are used to build the micro-level database of NTA flows and to estimate per capita values by age for each NTA series.
3. Age profiles are finalized by smoothing and scaling to match macro controls.
4. Estimates are evaluated and revised as needed.
5. Methods and sources are documented and intermediate and final estimates are archived.

The final section in this chapter describes methods for calculating summary measures related to the economic life cycle.

5.2. Constructing aggregate controls

Consumption

Total NTA consumption is divided into private and public consumption. Private consumption in NTA is equal to final consumption expenditures for the household and NPISH (non-profit institutions serving households) sectors, minus taxes less subsidies on products. Public consumption is equal to SNA final consumption expenditures for the general government sector.

Public and private consumption are both distinguished by *use* or *purpose* relying on three categories: education, health and all other consumption. Within the private other category, we also estimate consumption of owner-occupied housing. The values are not reported

Table 5.1.
Consumption and labour income for selected ages, Nigeria, 2004

	Selected ages					
	0	1	15	40	65	90+
Per capita values (Naira)						
Life cycle deficit	**28,141**	**28,077**	**62,418**	**-45,281**	**22,785**	**77,674**
Consumption	**28,141**	**28,077**	**63,102**	**88,404**	**89,692**	**78,431**
Public consumption	**5,015**	**5,015**	**6,297**	**5,347**	**5,553**	**5,563**
Public consumption, education	0	0	1,153	104	0	0
Public consumption, health	237	237	366	465	775	785
Public consumption, other	4,778	4,778	4,778	4,778	4,778	4,778
Private consumption	**23,126**	**23,061**	**56,805**	**83,056**	**84,139**	**72,868**
Private consumption, education	0	0	7,952	268	0	0
Private consumption, health	5,221	5,156	7,581	13,491	13,115	10,483
Private consumption, other	17,905	17,905	41,271	69,296	71,023	62,385
Labour income	**0**	**0**	**684**	**133,685**	**66,907**	**757**
Earnings	**0**	**0**	**231**	**30,727**	**15,438**	**0**
Self-employment labour income	**0**	**0**	**453**	**102,958**	**51,468**	**757**
Aggregate values (Naira billions)						
Deficit	**145**	**139**	**202**	**-55**	**9**	**2**
Consumption	**145**	**139**	**204**	**107**	**36**	**2**
Public consumption	**26**	**25**	**20**	**6**	**2**	**0**
Public consumption, education	0	0	4	0	0	0
Public consumption, health	1	1	1	1	0	0
Public consumption, other	25	24	15	6	2	0
Private consumption	**119**	**114**	**184**	**100**	**34**	**2**
Private consumption, education	0	0	26	0	0	0
Private consumption, health	27	25	25	16	5	0
Private consumption, other	92	88	133	84	28	1
Labour income	**0**	**0**	**2**	**162**	**27**	**0**
Earnings	**0**	**0**	**1**	**37**	**6**	**0**
Self-employment labour income	**0**	**0**	**1**	**124**	**21**	**0**

Source: Soyibo, Olaniyan, et al. (2011) and www.ntaccounts.org accessed 23 July 2012.

in standard accounts, but are used in the calculation of private transfers as explained in chapter 7. The consumption of owner-occupied housing is the value of the flow of housing services, not the expenditure on owner-occupied housing.

If consumption by purpose (or function) is reported in SNA or in Government Finance Statistics (GFS), in the case of public consumption, this can be used to construct aggregate controls for NTA. Standard classification systems distinguish consumption of health and education. Consumption other than health and education consists of all consumption not included in health or education. Consumption of owner-occupied housing may be equal to the operating surplus of the household sector.

Two additional adjustments may be required to finalize consumption by purpose:

- Reclassifying government-provided health care from private to public consumption. Some ambiguity exists about whether health-care consumption should be classified as public or private consumption when those services are provided by the private sector and reimbursed by the public sector. In SNA, the health portion of private final consumption expenditures includes the value of all goods and services that are mar-

keted. For example, health consumption reimbursed by Medicare and Medicaid in the United States and by national health insurance in many countries is classified as private health consumption in SNA. In NTA, however, private health consumption that is reimbursed by the public sector is re-classified as public health consumption. Teams must determine whether their country's public health insurance payments are part of private final consumption expenditures in SNA. If they are, those flows are added to public consumption and subtracted from private.

- Subtracting taxes less subsidies on products. This adjustment applies to private consumption, and should be made to the subcategory that is being taxed. For example, if the taxes on products come from sales taxes on goods and services but health care and education are not taxed, subtract the total amount from the total for private other consumption (excluding owner-occupied housing). If all goods and services are taxed except health care, divide the taxes on products less subsidies between private health and private other (excluding owner-occupied housing) based on their shares of private final consumption.

Table 5.2 shows these two adjustments in an illustrative example where taxes less subsidies on products are equal to 11 units, levied on private education and other expenditures, and there is a portion of the health-care system in which 9 units of care are delivered by private institutions with reimbursement by a government health insurance programme. The 11 units of taxes less subsidies on products are divided between private education and other based on their shares of final consumption expenditure. The 9 units paid for by government health insurance are moved from private to public health consumption.

Labour income

Labour income is divided into two subcategories: labour earnings (including fringe benefits) and self-employment income. The macro control for self-employment income is two-thirds of

Table 5.2.
Illustrative example of macro controls for consumption

	SNA final consumption expenditure (A)	Adjustment for taxes less subsidies on products (B)	Reclassification of health consumption (C)	NTA consumption macro controls (A+B+C)
Total consumption	**112**	**-11**	**-**	**101**
Public	**40**	**-**	**9**	**49**
Education	14	-	-	14
Health	8	-	9	17
Other than education and health	18	-	-	18
Private	**72**	**-11**	**-9**	**52**
Education	5	-1	-	4
Health	12	-	-9	3
Other than education and health	55	-10	-	45
Owner-occupied housing	5	-	-	5
Other than education, health, and owner-occupied housing	50	-10	-	40

Note: A) Data from SNA table on final consumption expenditures by purpose.
B) Taxes less subsidies on products are subtracted from categories of private consumption that are taxed, based on shares of final consumption expenditure.
C) Part of health consumption that is classified as private in SNA is reclassified as public in NTA.

SNA gross mixed income. The macro control for labour earnings is based on the SNA value for compensation of employees, adjusted to include taxes less subsidies on other production allocated to labour. Compensation of employees is defined in the United Nations System of National Accounts as:

a) Wages and salaries payable in cash or in kind;
b) The value of the social contributions payable by employers: these may be actual social contributions payable by employers to social security schemes or to private funded social insurance schemes to secure social benefits for their employees; or imputed social contributions by employers providing unfunded social benefits (UN 1993 p. 205).

The age profile of fringe benefits may be substantially different from the age profile of wages and salaries. If fringe are relatively large, it is advisable to estimate them separately from wages and salaries. The estimates can then be combined to obtain an estimate of labour income. Fringe benefits should include part (b) above, as well as any compensation in kind included in part (a), such as company cars, child care, housing, etc. Then the labour share of taxes less subsidies on other production is added to labour earnings and fringe benefits based on their shares of compensation of employees. In practice, there is often not enough information to break fringe benefits into a separate category.

An important aspect of labour income is that compensation of both public and private workers includes the actual or imputed value of contributions to pensions that accrue at the time of employment. Payment of these pensions to public-sector retirees is not a public transfer.

Note that the value of work, such as childrearing and other in-home activities, that does not produce market goods or services is excluded from labour income calculations. Chapter 2, however, discusses research on developing a more comprehensive measure of labour income that includes home production that is not conventionally included in SNA.

Table 5.3 shows the labour income calculation in an illustrative example where the labour income portion of taxes less subsidies on other production is equal to 10 units.

5.3. Building the micro-level database

Estimating the age pattern of all NTA economic flows relies on a variety of data sources and methods as discussed in chapter 3. This chapter emphasizes applications to consumption and labour income, but many methods have general use and are applied to other economic series as described in later chapters.

Table 5.3.
Illustrative example of macro controls for labour income

	SNA compensation of employees (A)	Two thirds of SNA gross mixed income (B)	Adjustment for labour income portion of taxes less subsidies on other production (C)	NTA labour income macro controls (A+B+C)
Labour income	**100**	**20**	**15**	**135**
Labour earnings	100	-	15	115
Self-employment income	-	20	-	20

Note: A) Data from SNA table on allocation of primary income.
B) Data from SNA table on allocation of primary income, multiplied by assumed labour share (two thirds).
C) Any labour share of taxes less subsidies on other production are added to labour earnings.

The first step is to identify the household survey that will serve as the micro-level database. Most countries have a survey that provides information on the components of private (household) consumption and labour income. In other cases, one survey collects household consumption data and a separate labour force survey collects labour income information. These surveys will often also include information necessary for age profiles discussed in later chapters, such as transfers and saving. However, some economic flows of interest are not reported in household surveys. Respondents in household surveys could not provide reliable information about the value of public goods and services that they received, for example, although they could provide reliable estimates about public cash transfers received. To estimate an age profile for in-kind public consumption requires information from a government agency about the age characteristics of beneficiaries or, in the absence of such information, a suitable proxy.

5.3.1. Selecting and preparing the household survey data

Preparing the main household survey is discussed in chapter 3. Constructing NTA relies on household survey data that is reliable, nationally representative and contains the variables of interest. The discussion here emphasizes topics that are specific to NTA while more general issues related to evaluating and cleaning data are not discussed in detail.

From a comprehensive income and expenditure survey the following information is used to construct the life cycle account:

- A roster of household members with their age, sex, relationship to head, school enrollment statues, employment status, indicators of health-care utilization if available;
- Consumption and other kinds of expenditure:
  - Consumption of education;
  - Consumption of health;
  - Consumption of owner-occupied housing;
  - All other consumption;
  - Gifts and other in-kind transfers made;
  - Cash transfers given;
  - Taxes paid;
  - Other expenditures.
- Income and other forms of revenue:
  - Wages and salaries including employee benefits;
  - Income from self-employment and other entrepreneurial activities;
  - Property income (interest income, dividends, rent and royalties);
  - Private transfers received;
  - Public transfers received.

The proper classification of expenditure and revenue is a critical issue. In general, consumption should include only goods and services that are purchased and consumed by members of the household in the current period. Gifts or, more generally, any expenditure on goods and services for members of other households should be included as in-kind transfers and not as consumption by household members. Likewise, any remittances or cash payments, e.g., tax payments, should be included in public and private cash transfers.

With most inflows and outflows, the appropriate classification is very clear. There are several important flows, however, that may be misunderstood.

Insurance. Some insurance premiums (whole life insurance) are a form of saving. Consumers pay a premium and their policy accrues value that can be cashed in at a later date or

borrowed against. This is saving. Other forms of insurance provide consumers with a way of pooling risk. Term life insurance and property and casualty insurance are examples of these forms of insurance. Some premiums collected each year are paid to beneficiaries who have experienced the particular event being insured. These payments are transfers and not consumption. Although they may produce inter-age reallocations, we assume that premiums are assessed in an actuarially fair way and, hence, produce only intra-age reallocations. Hence, they are not included in NTA. The remaining portion of premiums paid by consumers for the administrative costs and profits of insurance companies represents the cost and value of the risk-pooling services provided by insurance. It is classified as consumption by SNA and by NTA. It is not possible to determine what portion of insurance premiums should be classified as a transfer and what portion as consumption and we recommend they be excluded altogether.

Owner-occupied housing. The purchase of a home is not consumption. For those who live in a home that they own, the value of the flow of services from that home is classified as consumption. This value is often estimated using the rental price of similar rental property (also called "imputed rent"). Most consumer expenditure surveys provide an appropriate estimate of the flow of services from owner-occupied housing that can be used directly in calculations of the consumption profile. Note that the flow of services from owner-occupied housing must also be incorporated into the estimate of the asset income of the household.

Labour income consists of two elements. The first, wages and salaries of employees including the value of fringe benefits, is reported in household surveys. The second, labour income for self-employed workers, must be estimated using income from entrepreneurial activities in which the household is engaged. Household surveys typically report other kinds of revenue that should not be included in labour income but will be used to construct other elements of NTA. These include all forms of property income (interest, dividends, rent and royalties) and public and private transfers received.

Populating the micro-level database

As explained in chapter 3, estimating the age patterns of NTA components relies on a micro-level database that must be populated with the variables needed to complete the estimation. Each record in the micro-level database corresponds to an individual in the core survey. The structure and basic information required for the data base are described in chapter 3. The micro-level database is built up by creating variables for NTA age profile flows at the individual level. Here we will discuss in more specific terms the information required to construct the life cycle account which includes consumption (private and public) and labour income.

Private consumption for individuals is rarely available in household surveys. Instead, household-level amounts are reported and these are appended to each individual record in the micro-level database as discussed in chapter 3. Consumption for individuals is estimated by using sharing rules to allocate reported household consumption among the household members. The sharing rules are based on demographic information about the individual and household and are different for different types of flows. Subsequent sections discuss the sharing rules for each type of age profile.

Public consumption is rarely available from household surveys and must be found in government reports or reports from research organizations. These variables are included in the database by assigning estimates of age specific mean values to individuals based on their age and possibly other characteristics, such as, gender and place of residence. In other words, reported average values are merged onto the household survey using age and any other characteristics available in both the database and report from which estimates are drawn.

To estimate labour income requires data on wages for those employed. For those who are self-employed income from household economic activity is required. Wages and earnings are usually reported at the individual level in household surveys. Income from household economic activity, like operating a farm or a family business, is more likely to be reported at the household level and must be assigned to the household members. The sharing rules here are based on employment status or other survey indicators of participation in any family businesses.

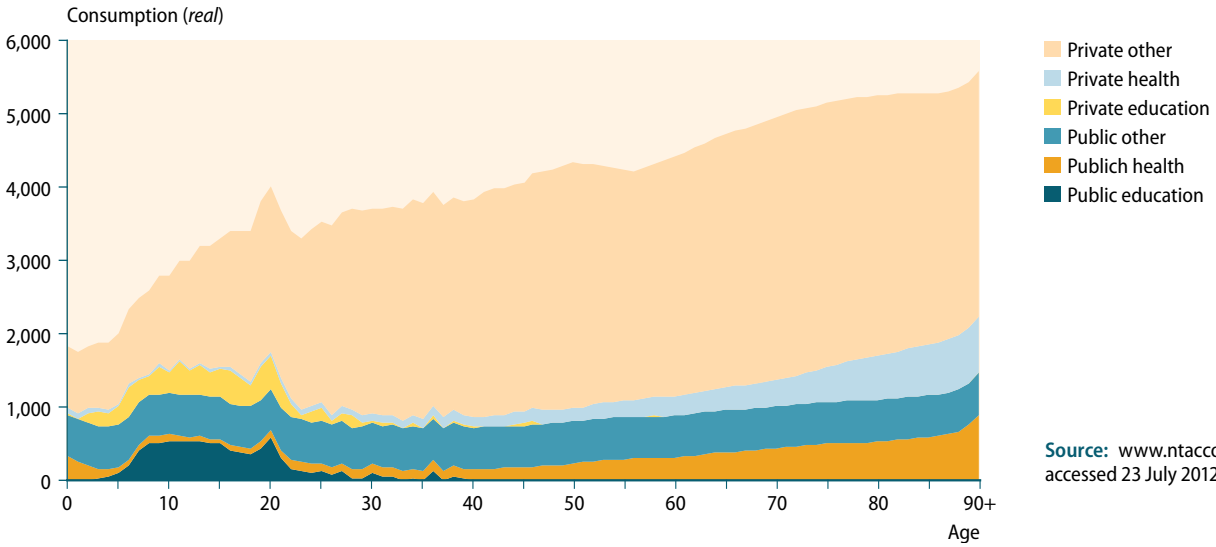
5.3.2. Creating individual-level consumption variables

This section describes the methods for estimating the age profile of consumption distinguishing public from private and three purposes: education, health and consumption other than education and health. Private consumption is the value of goods and services consumed by households and non-profit institutions serving households that are acquired through the private sector. If acquired through the public sector, it is public consumption. We assume that all consumption can be assigned to individuals. This assumes away pure public goods, economies of scale and other important features of consumption and production. For most private consumption, individual-level data comes from applying sharing rules to household-level survey data. For most public consumption, individual-level data is an average amount for a type of individual obtained from administrative records. For public consumption in particular, estimating age profiles requires a clear understanding of the important public programmes, the amount spent on goods and services provided by these programmes, and the beneficiaries of these programmes, as discussed in the public portion of the macro inventory in chapter 4.

The profiles estimated in this section will be smoothed and adjusted to conform to aggregate controls, as described in section 5.4. The age profile for Brazil in 1996 is shown in figure 5.1.

The methods described here are intended as illustrative and must be adapted to the particular circumstances of the country being analysed and to the particular data that are

Figure 5.1.
Per capita consumption by sector, Brazil, 1996



Source: www.ntaccounts.org, accessed 23 July 2012.

available. The method of choice is to rely on individual level data for any consumption component, but these are rarely available.

Private education consumption

Private education consumption is measured broadly using survey data on tuition, books and fees, school supplies for all school levels including pre-school, and tutoring expenses. Also spending on reference materials and self-improvement classes (art classes, music classes, etc.) are included.

Education is typically allocated using a regression model. The household consumption of education (CFE_j) is,

$$CFE_j = \sum_a \alpha(a) E_j(a) + \sum_a \beta(a) NE_j(a) + \varepsilon_j \tag{5.1}$$

where *Ej* is the number of enrolled household members aged *a* in household *j,* and *NEj* is the number of not enrolled household members aged *a* in household *j*. Enrolled household members should be distinguished by single year of age. Not enrolled members can be estimated in broader age groups. The number of members not enrolled captures educational spending accruing to those not in school. Note that this equation is estimated in homogeneous form (without an intercept) insuring that household consumption is fully allocated.

Household expenditure surveys usually identify who is enrolled in each household. If the information is not available, then expenditure can be regressed on the number of household members in each school-age group. The values of coefficients can be restricted depending on features of the country's schooling system. For example, all those of primary school age can be assumed to have the same impact on expenditure. A further refinement is to weight the members of each age using age-specific enrollment rates.

The regression method may yield negative coefficients for some age groups with very low or no enrolments. If so, the negative coefficients should be replaced with zero to avoid negative expenditure.

The regression model is used to allocate the education expenditure for each household *j,* CFE_j to household member *i.* The private education expenditure for each member of household j, CFE_{ij}, is proportional to the predicted value for that member ($\hat{x}_{ij}$) calculated as:

$$\begin{aligned} \hat{x}_{ij} &= \sum_a \tilde{\alpha}(a) D_{ij}[a, E] + \sum_a \tilde{\beta}(a) D_{ij}[a, NE] \\ CFE_{ij} &= CFE_j \left(\hat{x}_{ij} \Big/ \sum_i \hat{x}_{ij} \right) \end{aligned} \tag{5.2}$$

Where $D_{ij}[a, E]$ is a dummy variable that equals 1 for an enrolled household member of age *a* and zero otherwise and $D_{ij}[a, NE]$ is a dummy variable that equals 1 for a not-enrolled household member of age *a* and zero otherwise.

Private health consumption

Estimating the shape of the age profile of private health consumption is difficult because of the complex ways in which private health-care spending is financed relying on a combination of out-of-pocket spending by households and reimbursement to health providers by health insurance companies. Private health insurance premiums will be correlated with reimbursement and consumption of health care if health insurance premiums are based on the age of

individuals being covered. But in many instances, health insurance premiums do not reflect the age of those being covered and, hence, the age profile of premiums will be a poor proxy for the age profile of health-care consumption financed by health insurance. It may also be the case that health-care premiums are fully or partially paid by employers. If this is the case, employer provided premiums should be counted in compensation and as health insurance expenditure, but such information may not be reliably collected.

The best approach to capturing the age profile of consumption will vary from country to country depending on the ways in which health-care spending is financed and depending on the completeness of the household survey. Different age allocation methods may be required for each of the components of private health consumption.

The method used to allocate health varies depending on the availability of data, but a number of approaches are possible.

Health expenditure surveys. In a few countries, medical expenditures by age are available in specialized surveys. If this is the case, the per capita profile can be constructed directly by tabulating health spending by age from the health expenditure survey. Or the health expenditure survey can be used to construct scales used to allocate health spending in an income and expenditure survey. An important note is that a complete accounting of health consumption would usually only be available from a survey of health-care providers. A household survey can provide out-of-pocket spending but not a full accounting of consumption.

Age profile of individual utilization measures. In some cases, the expenditure survey may include utilization measures for household members. In this case, a model similar to the model employed for education can be used. For example, household health expenditure can be regressed on the number of members using outpatient services in each age group and the number of members using inpatient services in each age group. That is, the household consumption of health (CFH_j) is regressed on the number of inpatients and outpatients aged a in each household:

$$CFH_j = \sum_a \alpha(a) IN_j(a) + \sum_a \beta(a) OUT_j(a) + \varepsilon_j \tag{5.3}$$

Age profile of utilization from alternative source. In some countries, such as Japan, per capita utilization by age is available from alternative sources. The household health consumption estimated is:

$$CFH_j = \sum_a \beta(a) U(a) M_j(a) + \varepsilon_j \tag{5.4}$$

where $U(a)$ represents a single utilization measure for each age, and $M_j(a)$ is the number of household members aged a in household j. The estimated parameters $\beta(a)$ are interpreted as the unit cost for each age. In some cases it may be reasonable to assume that the unit cost is independent of age, but this is probably an unattractive option for health services. Thus, the unit cost may be assumed to follow a particular functional form, such as a quadratic in age. In this case, the model to be estimated is:

$$CFH_j = \sum_a \beta_0 U(a) M_j(a) + \sum_a \beta_1 a U(a) M_j(a) + \sum_a \beta_2 a^2 U(a) M_j(a) + \varepsilon_j \tag{5.5}$$

As with the education method presented above, the estimated model is used to "predict" health expenditure for persons aged a. In this case, the predicted cost would be:

$$\hat{\beta}_0 U(a) + \hat{\beta}_1 a U(a) + \hat{\beta}_2 a^2 U(a) \tag{5.6}$$

The predicted costs are used to allocate the observed health expenditure in each household to individual members. Then the health expenditures are tabulated to construct the per capita profile.

Iterative method. This approach is an alternative to standard regression approaches. The method works by initially allocating health expenditure equally to each household member. The per capita profile is tabulated determining average consumption at each age. The per capita profile is then used as a revised equivalence scale, providing the shares to allocate health expenditure to household members, thus producing a new per capita profile. The procedure is repeated each time using the newly generated profile to allocate household expenditure. Under some conditions, this approach will converge to the actual underlying profile. The robustness of this method has not been fully established, however. An attractive feature of this method is that negative values will not be generated.

Simple regression approach. This approach is not recommended unless absolutely nothing else is possible. The regression approach used here for health differs from other possible models because there is no variable that captures or proxies for which individuals are receiving health-care services. Household health expenditure is regressed on the number of household members in each age group ($M_j(a)$):

$$CFH_j = \sum_a \beta(a) U(a) M_j(a) + \varepsilon_j \tag{5.7}$$

The age groups can be single year or in broader age groups. Using broader age groups can be a simple but effective way to reduce noise and to eliminate negative values that can be produced by regression methods. As with other methods, the predicted coefficients are used as weights to allocate the observed health-care spending of each household to the members of that household.

Private consumption other than education and health

All other household consumption is allocated to individuals using an equivalence scale based on an extensive review of the literature on household consumption. Evaluation of other methods, e.g., Engel's method and the Rothbarth method, has shown them to be insufficiently robust to use for constructing NTA estimates and we recommend that they not be used (Lee, Lee, et al., 2008).

Consumption of individuals living within any household j is assumed to be proportional to an equivalence scale that is constant at 0.4 for those age 4 or younger, increases linearly from age 4 to age 20, and is equal to 1 for adults age 20 and older (figure 5.2).

A formula for the scale is:

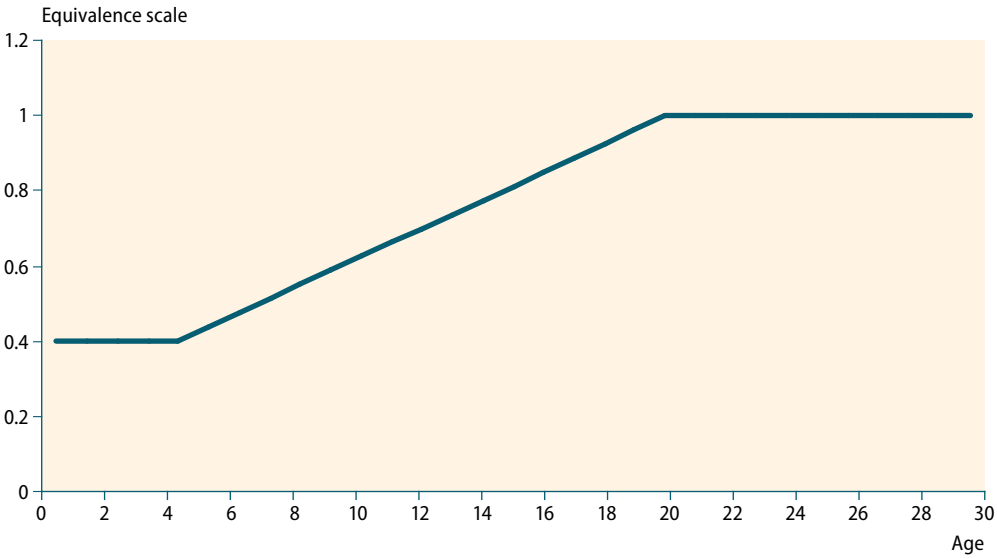
$$\alpha(a) = 1 - 0.6 * D(4 < a < 20) * ((20 - a)/16 - 0.6 * D(a \leq 4) \tag{5.8}$$

where $D(x)$ is a dummy variable equal to 1 when condition x is met and otherwise zero.

Again, this scale is used to allocate the expenditure for each household j to household member i.

$$CFX_{ij}(x) = CFX_j \alpha(x) \Big/ \sum_a \alpha(a) M_j(a) \tag{5.9}$$

Figure 5.2.
Equivalence scale for allocating private consumption other than education and health



Where $CFX_{ij}(x)$ is private consumption other than education and health by household member i in household j, CFX_j is total private consumption other than education and health for household j, and $M_j(a)$ is the number of members of age a in household j.

The estimated age profile of consumption produced by this procedure does not reflect household-level decisions about allocating consumption within the household. The same sharing rule is used for all households (and countries). The age profile of consumption will vary by age, however, because "per capita" household consumption is affected by household membership, total household consumption and the interaction between household membership and household consumption. Consumption will be low for children or the elderly, for example, if they are concentrated in households with low consumption.

Public education consumption

Public education consumption consists of two parts: formal and informal education consumption. Formal education consumption is government spending on education for children and young adults attending school. Estimates are constructed separately by school level with the exact school structure varying from country to country. Generally, all systems have primary, secondary and tertiary education levels. But spending on pre-primary school may be important and in some cases particular tracks may be distinguished. Both cost and enrollment data must be available for each level of schooling identified. Informal education consumption refers to spending on cultural and other types of general and adult education. These are not targeted at particular age groups.

The following steps are followed to estimate public formal education consumption by age:

1. Unit cost per student for each level of schooling is estimated as shown in table 5.4. The example shows the calculation for three levels of schooling, but more detail may be available. Private spending for public schools, e.g., tuition or fees, school uniforms, books paid by parents, is not included.

Table 5.4.
Calculation of unit costs for education sector, illustrative values

	Primary	Secondary	Tertiary	Source
Public spending for public schools (billions)	50	100	75	Administrative records
Enrollment in public schools (millions)	25	40	10	Administrative records or household surveys
Unit cost (spending per student)	2,000	2,500	7,500	Calculated as spending divided by enrollment

2. Public school enrollment rates by age and by level are calculated using administrative records from the appropriate department or ministry. The enrollment rate is calculated as the number of students enrolled in each level divided by the population of each age. Household surveys that report school enrollment in public and private schools can be used instead, creating a variable in the micro-level database by multiplying the unit cost in step 1 by an indicator variable for enrollment in that particular level of schooling.
3. Per capita spending for each age is calculated separately as the enrolment rate times the unit cost. The calculation of age-specific enrollment rates and per capita consumption for primary school is illustrated in table 5.5.
4. Per capita consumption of public education at each age is calculated by summing across the levels of education—primary, secondary and tertiary.

Note that the calculation is based on the assumption that the unit cost of public education within each level does not vary by age. Consumption of public education does not include public cash transfers to parents or students who are attending private school. Those flows are included in cash public transfers while the value of public education is an in-kind public transfer.

Public informal education consumption is not age targeted, so it is allocated equally to everyone. Total public education consumption by age is computed by summing public formal education consumption by age and public informal education consumption by age.

Table 5.5.
Calculation of public consumption of primary school education, illustrative values

Age	Public primary school enrollment (millions)	Population (millions)	Public school enrollment rate	Consumption of public primary school per person
5	1.20	4.00	0.30	600
6	3.18	4.08	0.78	1,560
7	3.26	4.12	0.79	1,580
8	3.29	4.16	0.79	1,580
9	3.32	4.20	0.79	1,580
10	3.35	4.25	0.79	1,580
11	3.39	4.29	0.79	1,580
12	2.38	4.33	0.55	1,100
13	0.87	4.37	0.20	400
Total	**24.25**	**40**	--	--

Note: Unit cost is 2,000.

Publicly funded health consumption

Publicly funded health consumption consists of health care purchased by individuals and reimbursed through public programmes, health care provided directly to individuals by government clinics and hospitals, and collective services, e.g., health education and preventive programmes that are provided to the public at large.

Health care provided directly by government programmes must be allocated using administrative records, e.g., patient information and information about the kinds of health-care services being provided (child and maternal health, etc.). Note that health-care spending associated with pregnancy and birth is assigned to the mother. In the absence of administrative data, analysts must rely on proxies, e.g., utilization of in-patient and out-patient care by age.

Health care purchased by individuals and reimbursed through public programmes is captured in household expenditure surveys and, hence, these age profiles can be estimated using the methods described in the section on private health spending.

Collective health services are allocated on a per capita basis assuming that each individual consumes the same amount of these services.

Public consumption other than education and health

Health and education are two components of public consumption that are emphasized in NTA because they vary so substantially by age. The detail with which other components of public consumption are treated will vary depending on the availability of data and the kinds of public programmes that exist in each country. In most NTA estimates to date, consumption other than education and health has been combined into one variable. The per capita age profile of other public consumption is assumed to be constant, i.e., these goods and services are allocated equally to all members of the population.

If other consumption is to be treated in more detailed fashion, public consumption can be classified as falling into two broad categories: public collective consumption and public individual consumption. By definition, public collective consumption is the part of public consumption that due to its nature cannot be allocated to individuals. There are many examples, e.g., national defense, justice and public administration. These forms of consumption are allocated equally to all members of the population: the age pattern is a horizontal line, the same level at all ages and its level is determined only by the macro control. Public individual consumption is the part of public consumption that can be allocated by age. Publicly provided non-education child day-care services provided in Finland or Japan is a good example of public individual consumption that can be allocated to the beneficiaries of the goods and services provided.

5.3.3. Creating labour income variables

As explained above, labour income consists of compensation and the return to labour from mixed income. Separate age profiles are estimated for these two components.

The age profile of compensation is usually estimated using survey data. Unlike consumption, most income and expenditure surveys report compensation separately for each of the household members which greatly facilitates the construction of the age profile of compensation or wages and salaries. Most surveys provide information about wages and salaries, but may not provide information about the social contributions by employers. In the absence of information to the contrary, we assume that social contribution by employers is a constant proportion of wages and salaries. In this case, the age profile can be calculated directly by

tabulating wages and salaries by age. When the age profile is adjusted to match the aggregate control, as described below, the age profile of labour income will be adjusted upward to include employer provided benefits that have been included in the aggregate control total.

With few exceptions self-employment income is reported for households rather than individuals. Even in rare cases where values are reported for individuals, a high percentage is often assigned to the household head, whether this is accurate or not. Often children, the spouse or parents of the household head are reported as receiving no income and are classified as unpaid family workers. This may lead to under-reporting of the labour income of younger and, perhaps, older age groups.

To correct for this problem, self-employment income is allocated to family members who are reported as self-employed or as unpaid family workers. The self-employment income of the household is allocated to the members using the age profile of the mean earnings of all *employees.* That is, the self-employment income accruing to i^{th} individual in household j ($YLS_{ij}(x)$) is,

$$\begin{aligned} YLS_{ij}(x) &= YLS_j \gamma_{ij}(x) \\ \gamma_{ij}(x) &= w(x) D_{ij}[SE, x] \Big/ \sum_a w(a) SE_j(a) \end{aligned} \tag{5.10}$$

where x is the age of the i^{th} household member, $D_{ij}[SE, x]$ is a dummy variable that equals 1 if household member i is self-employed and age x, $SE_j(x)$ is the number of people in household j who are self-employed or unpaid family workers of age x, $w(x)$ is the average earnings of employees. Thus, $\gamma(x)$ is the share of total household self-employment labour income allocated to each household self-employed or unpaid family member who is age x.

In this way the total self-employment labour income generated at age x in each household is estimated, and summing across all members of the population the total self-employment labour income generated at each age is obtained.

The age profiles of labour income for two countries are presented in figure 5.3.

One final note pertains to employment-based pensions. Retirees often receive employment-based pension payments. These payments are distributions of assets that consist of two components. The first is contributions at the time of employment, which is classified as part of the labour income earned by the individual at that time. The second part is reinvested earnings on pension fund accumulations, which is classified as asset income. The distribution of pension funds should not be included in current labour income. A clear distinction must be drawn between employment-based pensions, including those of public sector retirees, and public pensions. Public pensions are transfers to the recipients from the tax payers who fund those systems.

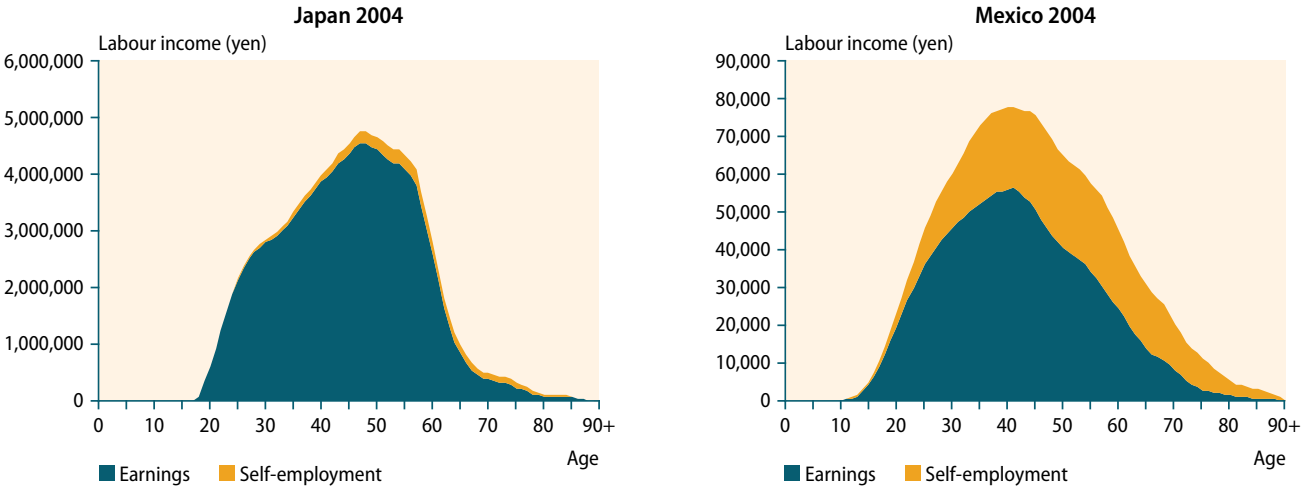
5.4. Finalizing age profiles

The general steps to evaluate and finalize age profiles described in chapter 3 should be followed with all life cycle variables.

5.4.1. Estimate per capita values

Once the micro-level database has been constructed with variables to indicate the age pattern of each NTA age profile, take the average of those variables by age.

Figure 5.3.
Per Capital labour income by type of employment, Japan, 2004, and Mexico, 2004



Source: www.ntaccounts.org, accessed 23 July 2012.

5.4.2. Smoothing per capita values

In addition to the general concerns raised in chapter 3, there are several smoothing concerns that are especially relevant to the life cycle age profiles:

- The per capita education profile should not be smoothed or should be smoothed only for informal education spending. Formal education is subject to very significant age fluctuations associated with particular grades which a smoother will most likely smooth out.
- Public health spending may increase dramatically when individuals reach an age threshold that affects eligibility requirements. This kind of feature of the data should not be smoothed away.
- Due to unusual high health consumption by newborns, do not smooth health consumption at age 0. Use the unsmoothed value for those age 0 and smoothed values for those 1 and older.
- Labour income and consumption may both change abruptly at mandatory retirement ages or ages where the incentives for retirement change substantially. This kind of feature of the data should also not be smoothed away.

5.4.3. Adjustment to macro controls

The smoothed and unsmoothed per capita age profiles will generally be inconsistent with aggregate controls. This is the case for a number of reasons. For example, households may under-report their consumption and income. The per capita values in NTA are scaled as described in chapter 3 to ensure that they are consistent with the aggregate controls.

5.5. Computing higher-level age profiles

After finalizing the components of consumption and labour income by smoothing and adjusting to macro controls, compute total consumption, total public consumption, total private

consumption and labour income by adding those finalized components. Build smooth versions by adding up smoothed components and do not smooth the sum.

Compute the life cycle deficit/surplus by subtracting finalized profiles for labour income from consumption at each age. This profile is an important measure of the economic life cycle in National Transfer Accounts. Deficits occur at young and old ages when children and the elderly are producing less through their labour than they are consuming. An important point is that a life cycle deficit does not necessarily imply economic dependency because the elderly may fund deficits relying on assets acquired during their working years. And the young may fund their deficit by relying on debt that they will repay later in life. The life cycle surplus refers to the surplus of labour income over consumption during the prime working ages.

5.6. Evaluation

One of the most important tools for evaluating results is to inspect graphs of the results carefully. A list of general evaluation steps is presented in chapter 3. Specific points relating to life cycle accounts are presented here.

Completeness

- Have all components of consumption, education, health and consumption other than education and health been estimated for both public and private?
- Have components been aggregated to obtain estimates of total public and private consumption by age and their sum? Per capita consumption by age?
- Have all components of labour income been estimated? Wages and salaries? Self-employment labour income?
- Has the life cycle deficit been estimated?
- Have all aggregate controls been estimated?
- Have aggregate age profiles been constructed for each variable?

Consistency

- Do all flows have the appropriate sign? Consumption and labour income and the components should be positive for all ages.
- Do components add up? Total consumption equals private consumption plus public consumption at every age. Public (private) consumption equals the sum of the components distinguished by purpose: education, health and consumption other than education and health. Labour income equals wages and salaries plus self-employment labour income.
- Do aggregate values summed over all ages equal the control totals for public and private consumption and each component? For labour income and its components?
- Do smoothed profiles represent the unsmoothed data? Have important features of the profiles been preserved?

External validity

- Are estimates broadly consistent with estimates for similar countries?
- Are distinctive features consistent with previous research or can they be explained by policies, historical events or other country-specific characteristics?

5.7. Documenting and archiving estimates

This topic is addressed in chapter 3. No particular concerns relative to life cycle variables arise.

5.8. Comparing, summarizing and applying the economic life cycle account

Economic life cycle accounts are used for a variety of applications a number of which are described in chapter 1. This section provides specific instructions for calculation measures for comparing NTA estimates across countries or over time and for summarizing the account in ways that are useful for understanding how demographic factors interact with the economic life cycle to influence the economy.

Normalizing profiles

Comparing NTA estimates across countries and over time is quite important to understanding the significance of the patterns found for any country. Values will vary differently across countries depending on differences in the levels of income or productivity, exchange rates and many other factors.

A variety of methods can be used to facilitate comparison, but a standard method adopted for NTA profiles is to normalize values on the per capita labour income of persons 30-49. For this purpose a simple average of the single-year labour income values is used so that the normalization is not affected by the age distribution of the population. The age group 30-49 is used because it will not be influenced by decisions about leaving school and entering the labour force or decisions about retirement. It will be influenced by differences in female employment and wages, however, and this should be kept in mind.

The interpretation of the normalized values is straightforward. For the labour income profile values for a single age year of age x is the labour income at that age relative to that of what might be called a prime-age adult, an adult 30-49. The normalized consumption value can be interpreted in the same fashion or it tells us the share or a prime age adults labour income required to support the consumption of a person of age x.

Normalized values of labour income and consumption are used to compare the economic life cycles found in different regions of the world in figure 5.4 using simple averages of the normalized profiles for countries for which NTA estimates are available.

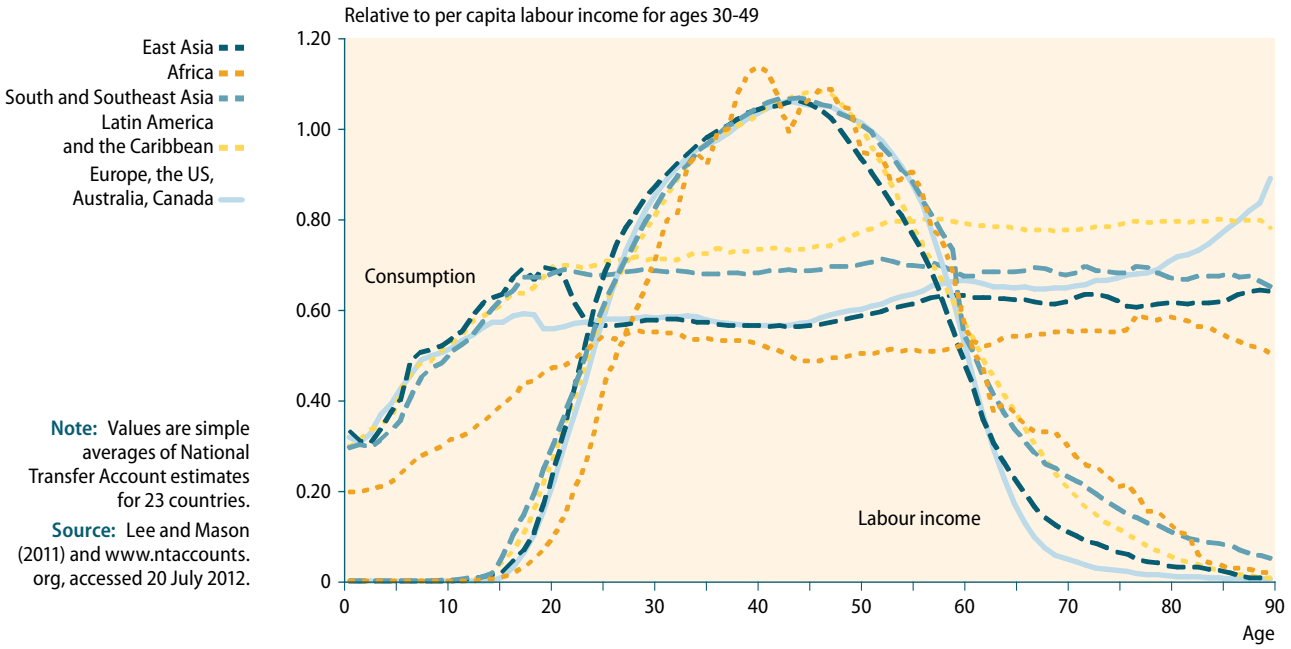
Synthetic cohort values

Synthetic cohort values are calculated by cumulating age-specific per capita values over a specified range of ages. The values can be survival weighted or not depending on how they are to be interpreted and used. Synthetic cohort values have a ready interpretation as illustrated by their use shown in chapter 1 to quantify spending on health and education (figure 1.4). Per child spending on health was summarizing by summing the per capita spending at each age from 0 to 17. This gives the value of spending on health over the childhood up to an including age 17 of a child who survived to his or her 18th birthday given per capita spending on health in the period in question.

Survival-weighted synthetic cohort measures provide a measure of the expected flow over the age interval in question taking into account that some portion of the synthetic cohort dies at each age. Survival-weighted synthetic cohort measures are particularly attractive for summarizing flows for older age groups where death rates are particularly high. Expected years lived at each age from a life table should be used for survival weights.

An important advantage of synthetic cohort values is that they provide a summary measure of the level of the flow that is independent of the population age distribution.

Figure 5.4.
Normalized per capita consumption and labour income by age, regions of the world



Note: Values are simple averages of National Transfer Account estimates for 23 countries.

Source: Lee and Mason (2011) and www.ntaccounts.org, accessed 20 July 2012.

Timing and mean ages

An inherent feature of age profiles is that they capture the timing as well as the level of a flow over the life cycle. Some flows occur only at a particular time in life—during childhood or old-age or in the prime of life. The timing of an age flow is summarized in a single number by its mean age. The mean age can be constructed for a per capita profile as:

$$\mu(v) = \sum_{x=0}^{\omega} xL(x)v(x) \Big/ \sum_{x=0}^{\omega} L(x)v(x) \tag{5.11}$$

where $L(x)$ is person-years lived at age x, a standard life table value, $v(x)$ is the per capita age profile of flow v, and $\mu(v)$ is the mean age of the per capita flow. Note that the midpoint of the age interval must be used for age x, i.e., 0.5, 1.5, 2.5, …

The mean age of an aggregate flow depends on the age distribution of the population as well as the age profile of the flow in question. The average age of aggregate flow is constructed as:

$$A(v) = \sum_{x=0}^{\omega} xN(x)v(x) \Big/ \sum_{x=0}^{\omega} N(x)v(x) \tag{5.12}$$

where N(x) is the population of age x.

The average age of a flow for a stable population is calculated by:

$$A(v) = \sum_{x=0}^{\omega} x(1+n)^{-x} L(x)v(x) \Big/ \sum_{x=0}^{\omega} (1+n)^{-x} L(x)v(x) \tag{5.13}$$

where n is the population growth rate. If the population is stationary, as well, in other words stable and a population growth of zero, the mean age of the per capita flow and the aggregate flow are identical.

Support ratio

The support ratio and applications are discussed in chapter 1 and the support ratio for China for 1950-2050 is shown in figure 1.3. The support ratio is the ratio of the effective number of producers to the effective number of consumers. The effective number of producers is a measure calculated to incorporate age-variation in labour force participation, hours worked, unemployment and productivity by using the estimated labour income profile. Individuals age 30-49 are counted, on average, as one effective worker. Those at each single-year-of-age are counted as one, less than one, or more than one effective worker depending on the average labour income at that age relative to the average labour income of persons 30-49.

A similar approach is used to calculate the effective number of consumers using the per capita consumption profile to construct a consumer equivalence scale. On average, those in the 30-49 age group are counted as one effective consumer. Those in each single-year age group are counted as one, less than one, or more than one effective consumer depending on per capita consumption at that age relative to average consumption by the 30-49 age group.

The labour income and consumer weights are calculated for a base year and used in conjunction with population by age, historical estimates and projections to calculate the effective number of consumers and producers in each year. The ratio of effective producers to consumers is the support ratio.

Values used to calculate the support ratio for China are shown in table 5.6. Per capita values of consumption and labour income in 2002 for selected ages are shown in the first two rows of the table. The equivalence scales for consumption and production are shown in the next two columns. The upper age interval for the population projection is 100+ and so the equivalence scale for 90+ are used for ages 91 to 100+. The product of the equivalence scale and the population at each age yields the effective number of consumers and producers at that age. Summing yields the total for China in year 2025: 1.40 billion effective consumers and 0.73 billion effective producers. The support ratio is 0.52 for 2025, very close to one effective producer for every two effective consumers.

Life cycle wealth and the direction of flows

Life cycle wealth is defined as the present value of consumption anticipated over the remaining years of life less the present value of labour income anticipated over the remaining years of life. It is the wealth required to fund anticipated consumption given anticipated labour

Table 5.6.
Calculation of support ratio for China

		Selected ages					
Variable	**Total**	**0**	**1**	**20**	**40**	**60**	**80**
Per capita consumption, 2002		2,422	2,298	5,435	3,980	4,434	4,043
Per capita labour income, 2002		0	0	2,580	10,644	3,897	803
Consumption equivalence scale		0.615	0.584	1.381	1.011	1.127	1.027
Production equivalence scale		0.000	0.000	0.262	1.082	0.396	0.082
Population (thousands), 2025	1,395,256	13,292	13,348	16,228	21,422	19,693	4657
Effective consumers (thousands), 2025	1,398,872	8,179	7,796	22,413	21,665	22,185	4784
Effective producers (thousands), 2025	726,007	0	0	4,256	23,180	7,802	380
Support ratio, 2025	0.519						

Note: For 30-49-year-olds average consumption is 3,936 and average labour income is 9,837. These values are used to calculate equivalence scales.
Source: Calculated by authors (see text) using estimates for China from www.ntaccounts.org, accessed 23 July 2012.

income. It consists of both the assets and net transfers that would fund expected lifetime consumption. It excludes the value of net bequests, i.e., bequests made less bequests received.

Life cycle wealth can be defined and constructed for an individual, an age group or a population by cumulating over all of the members of the group. Applications of life cycle wealth are discussed in chapter 1. This section is only concerned with the calculation of life cycle wealth.

Life cycle wealth in general can be defined as the present value of the difference between anticipated consumption and anticipated labour income. Designating the wealth of age group x at year t by $W(x,t)$, life cycle wealth is defined by:

$$W(x,t) = \sum_{z=0}^{\omega-x} (1+d)^{-z} \tilde{N}(x+z,t+z)\left(\tilde{c}(x+z,t+z) - \tilde{y}_l(x+z,t+z)\right) \quad (5.14)$$

where d is the discount rate and the tildes indicate the anticipated population (N), per capita consumption (c) and per capita labour income ($\tilde{y}_l$) in each subsequent period over the remainder of the cohort's existence ($\omega - x$) for the cohort age x in year t. Life cycle wealth for the population in year t is calculated by summing over all ages (x).

To apply this definition of life cycle wealth or to compute life cycle wealth requires a set of assumptions about the economy or how individuals at time t expect each of these economic components to change in the future. Applications of NTA described in chapter 1 have modeled the economy in a variety of ways. A complete model of the economy is very useful to insure internal consistency. Among the issues to be addressed are the relative importance of transfer wealth and assets (capital) in life cycle wealth and possible feedbacks from capital accumulation to labour income and rates of return to capital. Some applications have used relatively simple approaches that abstract from many potentially important feedbacks. Other applications have used partial or general equilibrium models to model how labour income, consumption, interest rates and, hence, the discount rate are influenced by changes in population and its age structure. All applications of NTA to date have taken population change as exogenous.

In one important case, golden rule growth, life cycle wealth depends only on age profiles of consumption and labour income and demographic variables—the age distribution of the population and the rate of population growth. This special case applies to economies/populations that are in steady-state equilibrium. Age-specific fertility and mortality rates are constant and the population age structure has converged to an unchanging equilibrium. The population growth rate (n) is constant. The saving rate and the capital-labour ratio are equal to the values that support the highest possible path of consumption for successive generations—hence the term golden rule. The level of labour income is determined by the constant capital-labour ratio, but shifts upward each period by an exogenously given rate of technological change (λ). Under these conditions, golden rule growth implies that all labour income is consumed while all saving is used to replace depreciated capital and to provide capital for additional workers. The interest rate and discount rate are equal to the rate of growth of total income—the rate of population growth plus the rate of exogenous technological change (n+λ).

Golden rule growth is a highly stylized representation of the economy. It is important, however, because it represents the highest material standard of living that can be realized given the prevailing economic life cycle and demographic conditions. The golden rule case quantifies the possible.

Given golden rule, total life cycle wealth, W, is equal to (Lee 1994a and 1994b):

$$W = \left(A(C) - A(Y_l)\right) Y_l \tag{5.15}$$

Or the ratio of wealth to labour income is equal to the mean age of consumption less the mean age of labour income:

$$W/Y_l = A(C) - A(Y_l) \tag{5.16}$$

The methods for calculating the mean ages are explained above.

Life cycle wealth depends on the direction of life cycle flows. If the average age of consumption is greater than the average age of labour income, resources in the economy are being shifted from younger to older ages. In other words, the flows are upward. On average, members of the population are holding positive wealth. The amount of wealth varies in direct proportion to the lag between when goods and services are produced by workers and when they are consumed.

Life cycle wealth is negative when the population is consuming goods and services at a younger age than it is producing them. In this case, life cycle reallocations must be downward from older individuals to younger individuals. This case is possible because transfer wealth can be negative.

Chapter 6

Public reallocations

6.1. Introduction

This chapter describes methods for constructing public age reallocation accounts and covers the following topics:

1. Review concepts related to public reallocations;
2. Estimate macro controls;
3. Build up the micro-level database with age pattern indicators for all age profiles;
4. Finalize estimates by calculating per capita age patterns, adjusting to macro controls, and smoothing;
5. Evaluate and document results.

Public age reallocations refer to the flows of current resources across age that are mediated by the government. Two economic mechanisms can be used to shift resources across age groups: transfers and asset-based reallocations. By definition, public age reallocations = public transfers + public asset-based reallocations.

Transfers refer to all economic flows that involve no explicit quid pro quo although implicit obligations may be involved. Transfers in the flow account refer only to current transfers, i.e., transfers out of current income. Bequests and other capital transfers are not included in the current NTA flow account but will be incorporated into wealth accounts to be developed in the future. Transfers are classified as public transfers if the country's government serves as the intermediary.

Public transfer inflows refer to flows received by the beneficiaries of all public programmes, broadly measured to include cash transfers and all in-kind transfers defined to be equivalent to public consumption. In-kind transfers include both public goods and services that are readily assignable to individuals, e.g., public school or publicly provided health care, and collective goods and services including government administration, public safety and national defense.

Public transfer outflows are defined as the current flows from each age group (or the rest of the world) that fund public transfer inflows. By definition, transfers inflows and outflows must be equal for public transfers, as a whole, and for each type of public programme. Public transfer outflows are funded by taxes, social contributions, and grants to the government. If these are insufficient, a balancing item, the transfer deficit funds the shortfall. If taxes, social contributions and grants exceed transfer inflows, a transfer surplus is generated.

The transfer deficit/surplus is an NTA variable that embodies the principle that transfer outflows and transfer inflows must be equal. Transfers received by one group of individuals must be paid by another group of individuals. The obligation to pay may be met

through taxes, but taxes may not be sufficient. In this case, the transfer deficit embodies the implicit taxes that must be borne in some other form by taxpayers.

Public transfers are equal to public transfer inflows less public transfer outflows including the public transfer flows to and from the rest of the world. Total public transfers of residents must equal net public transfers from the rest of the world. This property also holds for all transfers classified by purpose (education, health, pensions, etc.). For any age group, public transfers will be positive for net beneficiaries—children and often the elderly—or negative, usually for prime-age adults.

Transfer inflows for many public programmes are assigned to the age group of the beneficiary of the public programme in question using techniques described below. The inflows from public collective goods, e.g., national defense or diplomacy, are assigned on a per capita basis. Public transfer outflows are assigned to taxpayers based on rules that are similar to those followed in generational accounting.

Asset-based reallocations arise because governments own assets and debt. Inflows occur when governments earn public asset income or borrow. Outflows occur when governments have property income outflows, paying interest on public debt, for example, or when governments save. By definition, public asset–based reallocations are equal to public asset income less public saving.

In NTA, because governments are intermediaries only, public asset-based reallocations are not flows to or from the government, but rather to or from individuals on whose behalf the government is acting. The individuals paying for public programs are the taxpayers, so the age pattern of many public accounts comes from the age pattern of tax payments that fund the program in question.

The public accounts must balance. Any aggregate public transfer deficit/surplus is matched by aggregate asset-based reallocations.

Example of the public age–reallocation account

Tables 6.1 to 6.3 show public age–reallocations account examples that emphasize different features of the accounts. Table 6.1 provides a summary of the public age-reallocation accounts. Only values for selected ages and only per capita values are presented.

Table 6.1.
Public age–reallocations, summary, per capita (*thousands of yen*)**, Japan, 2004, for selected age groups**

	0	1	2	15	45	70	90+
Public age reallocations	**611**	**472**	**473**	**1,339**	**–1,028**	**1,635**	**2,826**
Public transfers	**592**	**453**	**453**	**1,304**	**–1,316**	**1,489**	**2,767**
Public transfer inflows	**722**	**581**	**584**	**1,536**	**587**	**2,458**	**3,160**
Public transfer inflows, in-kind	584	446	448	1,334	444	836	2,248
Public transfer inflows, cash	138	136	136	203	143	1622	912
Public transfer outflows	**126**	**123**	**126**	**228**	**1,899**	**965**	**388**
Taxes, social contributions, and grants	107	105	107	193	1,611	818	329
Transfer deficit(+)/surplus(–)	19	19	19	35	288	146	59
Public asset–based reallocations	**19**	**19**	**19**	**35**	**288**	**146**	**59**
Public asset income	–5	–4	–5	–8	–69	–35	–14
Public saving	–24	–23	–24	–43	–357	–181	–73

Important properties of public age reallocations can be seen by reviewing table 6.1. Public age reallocations equal public transfers plus public asset–based reallocations. Public transfers equal inflows less outflows. Transfer inflows and outflows must equal their components. Public asset–based reallocations must equal public asset income less public saving. In practice, slight variation from these principles may occur due to rounding and aggregation issues.

Table 6.2 reports public transfers by their purpose. For each purpose, public transfers equal public transfer inflows less public transfer outflows. Public transfers are disaggregated into five major purposes or functions: education, health, pensions, other cash and other in-kind. In-kind transfers are goods and services provided directly by the government using mostly public employees and public facilities, or goods and services provided by the private sector but funded using a publicly provided voucher. A "voucher" is a government payment for a pre-determined good or service. This is in contrast to pension benefits and other cash transfers where the beneficiary receives a payment from the government that can be used for any purpose.

Table 6.2.
Public transfers by purpose, per capita (*thousands of yen*)**, Japan, 2004, for selected age groups**

	0	1	2	15	45	70	90+
Public tansfers	**596**	**458**	**458**	**1309**	**-1311**	**1494**	**2772**
Public transfers, inflows	722	581	584	1536	587	2458	3160
Public transfers, outflows	126	123	126	228	1899	965	388
Public transfers, education	**-14**	**-14**	**-14**	**938**	**-213**	**-108**	**-44**
Public transfers, education, inflows	0	0	0	1032	0	0	0
Public transfers, education, outflows	15	15	15	27	228	116	47
Public transfers, health care	**246**	**106**	**108**	**5**	**-286**	**318**	**1871**
Public transfers, health care, inflows	274	133	135	55	131	529	1956
Public transfers, health care, outflows	28	27	28	50	417	212	85
Public transfers, pensions	**-35**	**-34**	**-35**	**-63**	**-521**	**1212**	**647**
Public transfers, pensions, inflows	0	0	0	0	8	1480	755
Public transfers, pensions, outflows	35	34	35	63	529	269	108
Public transfers, other in-kind	**281**	**282**	**281**	**254**	**-194**	**56**	**211**
Public transfers, other in-kind, inflows	315	315	315	315	315	315	315
Public transfers, other in-kind, outflows	34	33	34	61	510	259	104
Public transfers, other cash	**119**	**119**	**119**	**107**	**-82**	**24**	**89**
Public transfers, other cash, inflows	133	133	133	133	133	133	133
Public transfers, other cash, outflows	14	14	14	26	215	109	44

Table 6.3 provides information about public transfer outflows that are distinguished by the source of funding. For Japan, four sources are distinguished: taxes less subsidies on products and production, personal income tax, corporate income tax, and social security contributions. The sources vary depending on the features of a country's tax system. The transfer deficit/surplus is positive in Japan meaning that tax revenues collected from individuals were insufficient to fund public services/transfers provided to the population.

Table 6.3.
Public transfer outflows by source, per capita (*thousands of yen*)**, Japan, 2004, for selected age groups**

	0	1	2	15	45	70	90+
Public transfer outflows	126	123	126	228	1,899	965	388
Taxes, social contributions, and grants	107	105	107	193	1,611	818	329
Taxes less subsidies on products and production	107	105	107	193	289	370	263
Personal income tax	0	0	0	0	371	14	0
Corporate income tax	0	0	0	0	70	355	64
Social security contribution	0	0	0	0	881	80	3
Transfer deficit(+)/surplus(-)	19	19	19	35	288	146	59

6.2. Constructing macro controls

6.2.1. Overview

Macro controls for the NTA flow account are discussed in considerable detail in chapter 4. Here we briefly review the macro control account for the public sector presented in chapter 4 and discuss some important details that were deferred.

While the main structure of NTA macro controls is based on the SNA, as discussed in earlier chapters, another important source of information for the public accounts is Government Financial Statistics (IMF, 1981). Government Financial Statistics (GFS) is in almost all respects harmonized with the United Nations SNA. However, there are some differences that have implications for the construction of NTA. In addition to standard national income and product account estimates, national health accounts are a useful source of information.

Table 6.4.
Aggregate public age reallocations, UNSNA 2008

	Residents	ROW	Total
Public age reallocations	**12.3**		
Public transfers	**–29.7**	**29.7**	**0.0**
Public transfer inflows	**471.3**	**32.4**	**503.6**
Public transfer inflows, in-kind	352.0		352
Public transfer inflows, cash	119.3	32.4	151.6
Public transfer outflows	**500.9**	**2.7**	**503.6**
Taxes and other revenues	458.9	2.7	461.6
Transfer deficit(+)/surplus(-)	42.0	0.0	42.0
Public asset–based reallocations	**42.0**		
Public asset income	**–20.0**		
Public capital income	0.0		
Public property income	–20.0		
Public property income inflows	22.0		
Public property income outflows	42.0		
Public saving	–62.0		

Source: Table 4.20.

Table 6.4 provides an overview of the NTA public flow account and key aggregate controls presented in chapter 4 (table 4.20). The upper panel summarizes public transfers consisting of public transfer inflows and public transfer outflows to residents and to ROW. By definition, public transfer inflows equal public transfer outflows when public transfers to and from the rest of the world are included. The equality is maintained via the balancing item, public transfer deficit/surplus. The bottom panel reports key components of public asset–based reallocations. The methods used to construct the aggregate controls presented in table 6.4 are fully explained in chapter 4.

NTA and SNA distinguish public and private consumption in slightly different ways discussed in section 5.2. NTA reclassifies private consumption that is purchased through a government voucher programme as public consumption. This arises with national health insurance programmes. These items must be excluded from cash transfers as they are included in in-kind transfers. Note that NTA public in-kind transfer inflows are equal to NTA public consumption discussed in chapter 5, both in their aggregate macro controls and their age patterns.

A feature of NTA not addressed in chapter 4 is the classification of public transfer outflows by purpose: education, health, pensions and other public programmes. NTA follows the United Nations Classification of Functions of Government (COFOG), simplified to emphasize large inter-age transfers (table 6.5). Distinguishing the purpose of inflows is important for constructing age profiles and for using NTA for policy analysis.

Table 6.5.
NTA classification of public transfers by purpose

NTA purpose	COFOG (Division number)
Education	Education (9)
Health	Health (7)
Pensions	Social protection, old age (102)
Other	Social protection (10) excluding old age (102), general public services (1), defense (2), public order and safety (3), economic affairs (4), environmental protection (5), housing and community amenities (6), recreation, culture, and religion (8).

6.2.2. Constructing a public sector inventory

In appendix D, a template for an "inventory" of the public sector is introduced. That concept is reviewed here in greater detail and teams should complete the inventory for their own country as part of constructing macro controls. The details of the public sector inventory will vary from country to country depending on the specific programmes that are in place.

First, as many programmes as can be distinguished by age should be identified. It is important to identify major programmes and to distinguish programmes that have distinctive age profiles and thus lead to significant age reallocations. Education, health care and public pensions are particularly important but other programmes may have important age features.

Second, the researcher must determine the aggregate amount of benefits (public sector inflows) associated with these programmes. The benefits are further distinguished by whether they are cash or in-kind. In most instances there is no ambiguity as to whether inflows should be classified as in-kind or as cash. In general, in-kind public transfer inflows are goods and services received directly from government agencies as opposed to goods and services that are purchased with the benefit of a publicly provided cash subsidy. Hence, public schooling is an in-kind transfer whereas a cash scholarship paid directly to the recipient is a cash transfer. An

exception to this approach is health. National health insurance payments and similar reimbursement programs, where the service is provided in the private sector but the government reimburses providers or patients, are classified as in-kind public transfer inflows in NTA (and as public consumption). But they may be included in private consumption in SNA. Reclassifying these flows from the private to the public sector is intended to facilitate comparisons across countries, but is also important because the provision of health care and health-care prices are so widely regulated. As noted above, NTA in-kind public transfers (including in-kind transfers for health, education and other) are the same as NTA total public consumption.

When public transfer inflows are measured, those to residents should be distinguished from flows to non-residents, i.e., the rest of the world. Pensions paid to those who worked in the country when young but retired to another country should be estimated, for example. This is only relevant for cash benefits, as in-kind benefits flow only to residents.

Third, the beneficiaries of each programme should be identified in such a way that is helpful for constructing age profiles. For example, elementary school benefits will flow only to children in a particular age range.

Fourth, the sources of revenue on which the government relies to fund these programmes must be identified. Is the programme in question funded by a tax on earning? Is it funded by local or state government with a different source of revenue than the central government? This information is very important for estimating public transfer outflows.

Fifth, the key features of public assets must be identified. Does the government have a sovereign wealth fund or a currency stabilization fund? Does the government own natural resources, e.g., oil reserves, from which it receives royalties. Are there separate funds maintained for public pension and/or health-care systems?

6.2.3. Aggregate inflows by purpose

To complete the public sector inventory requires that total values for cash and in-kind public transfers obtained in chapter 4 must be divided into subtotals for different public programs, grouped into the four purposes: health, education, pension and other.[1]

The sources of information available with this level of detail are highly varied. Data on public sector spending may be available in government expenditure reports,[2] or from agencies responsible for administering each programme, from the national statistical office or from international sources, e.g., the UN DESA, IMF and the World Bank. Much of these data may be online, but more detailed information may be available only from the responsible agencies.

No matter what programme-specific information is used, any estimates must be reconciled with the overall totals from the System of National Accounts estimates that are the primary source of data being used to insure consistency. This means that even if the overall totals from a non-SNA source for money spent do not match up with the SNA total, the non-SNA data source can be used to get the proportions spent by a programme. These proportions can be applied to higher-level amounts from SNA to break these amounts into subtotals by different programmes.

1 Often cash and in-kind transfers are not distinguished for health and education, which are dominated by in-kind transfers, and for pensions, dominated by cash transfers. Other in-kind and other cash are usually distinguished.

2 Note that actual expenditures may differ significantly from proposed budgets, so it is important to identify reports of actual expenditures instead of proposed plans which may have been altered significantly in the actual functioning of government.

The Government Financial Statistics (GFS) database, maintained by the IMF, is an alternate source for details on government programmes. Given that NTA encompasses both the private and public sectors of the economy, the SNA provides a comprehensive and consistent framework for the development and construction of NTA. So, as with agency expenditure reports, information on particular programmes in GFS may only be useful to calculate programmes by proportion. Then those proportions can be used to divide higher-level amounts from SNA.

Public transfer inflows are reported in GFS as expenses and are classified in two ways: the economic classification of expense (GFSM 2001, table 6.1) or by the purpose of government (GFSM 2001, table 6.2). The cross-classification of expense by purpose and economic classification (GFSM 2001, table 6.3) is required to construct NTA from GFS. The classification of purpose in GFS follows the UN COFOG (Classification of Functions of Government) System as described above.

The economic classification in GFS can be used to separate in-kind transfers from cash transfers. Recall that in-kind transfers are equivalent to public consumption in NTA and, hence, the same values must be used for constructing the economic life cycle and public transfers. In addition, in-kind social benefits are classified as in-kind transfers and public consumption in NTA. Cash transfers inflows consist of grants (current only), social benefits (in cash), and miscellaneous other expense (current only). One final note on public transfer inflows: an issue that sometimes arises is the treatment of payments to public employment retirees from employment-based pension programmes. These payments are not public transfers. They are essentially deferred compensation and discussed in chapter 5 on the economic life cycle, in the section on labour income.

Box 6.1.

Taxes versus public transfer outflows in NTA

Macro level

In NTA, public transfers sector inflows are the benefits received by resident through public programmes. Public transfer inflows equal in-kind transfers, or public consumption, plus public cash transfer inflows. All public transfer inflows are matched or balanced by public sector outflows. Outflows consist primarily of taxes and social contributions. If taxes, social contributions and other current revenues are just sufficient to fund all public transfer inflows, the public transfer system is fully balanced. This does not occur in practice, however, resulting in a transfers surplus or deficit.

Transfer deficit: If public benefits are greater than taxes, then aggregate public transfer outflows are equal to taxes plus the transfer deficit. The deficit measures the portion of benefits that are not being paid for out of the resources that are currently being produced.

Transfer surplus: If the benefits paid by the government are less than taxes that are being collected, then the transfer system has a surplus. More resources are being generated than are being used.

Age profiles

The macro control for NTA public transfer outflows is public transfer inflows, because aggregate inflows must match aggregate outflows.

The NTA age pattern of public sector outflows is based on the age patterns of the taxes that are used to pay for each type of inflow. The tax profiles must be adjusted to the national aggregate taxes as reported in national accounts.

6.2.4. Aggregate public transfer outflows by purpose and source

In NTA, public transfer outflows are distinguished by purpose (table 6.2) and by source (table 6.3). Public transfer outflows including outflows from ROW must equal public transfer inflows including inflows to ROW for each purpose. Hence, the aggregate controls for public transfer outflows by purpose are obtained by setting the outflows to the inflows estimated using methods described in the previous section.

Source refers to the resource or activity that is being taxed, including the public transfer deficit/surplus. Chapter 4 explains the method for estimating public transfer outflows for four broad sources: taxes less subsidies on products and production; taxes on income, wealth, etc.; social contributions; and other current transfers (table 4.15). A more detailed classification that emphasizes the resources or activities being taxed is helpful, however, because it facilitates estimating the age profile of taxes and, hence, public transfer outflows. SNA provides much more detailed information about taxes that can be used for this purpose. The IMF Government Financial Statistics uses the following classification which is recommended:

- Taxes
  - Taxes on income, profits and capital gains
    - Payable by individuals (income taxes and capital gains taxes)
    - Payable by corporations (corporate taxes)
  - Taxes on payroll and workforce
  - Taxes on property
  - Taxes on goods and services
  - Taxes on international trade and transactions
  - Other Taxes
- Social contributions
  - Pensions
  - Other social protection
- Grants
  - From foreign governments
  - From international organizations
- Other current transfers.

NTA also requires public transfer outflows from residents and from the rest of the world. Note that taxes paid by firms, households and NPISHs are deemed to be paid by residents in NTA.

6.2.5. Public asset–based reallocations

Public asset–based reallocations summarize the inflows to and outflows from age groups that are a consequence of public asset transactions. Asset-based reallocations consist of two distinct flows—public asset income and public saving. Public asset income consists of capital income and property income. Public capital income is equal to the operating surplus of government, as explained in chapter 4. Typically public capital income is zero or very small.

Public property income is defined as property income inflows less property income outflows. Property income inflows include interest income and dividends and royalties earned from natural resources. Property income inflows can be substantial for countries that have large currency stabilization funds or sovereign wealth funds or countries with large publicly owned deposits of natural resources. Property income outflows consist primarily of interest payments on public debt.

Public asset–based reallocations shift resources across age groups and over time. A funded public pension programme is an obvious example. The needs of future retirees can be met through transfers from workers as in PAYGO systems. Or governments can fund pension programmes by accumulating public assets by taxing or imposing a mandatory contribution on workers, for example, and investing the proceeds. In subsequent periods, income from the assets or dissaving of the assets can be used to fund pensions of retirees. Fully funded public pension programmes are unusual, but many countries have partially funded public pension programmes.[3]

Two other important forms of public financial assets are currency stabilization funds and sovereign wealth funds. Currency stabilization funds do not have an explicit intergenerational or age reallocation rationale. Rather these funds are maintained to smooth exchange rate fluctuations. Sovereign wealth funds, on the other hand, are often used by countries with substantial revenues generated by the depletion of natural resources with an explicit intergenerational equity objective: to share those resources with future generations. Norway and the United Arab Emirates, for example, both have large SWFs funded from oil revenues. Countries may run fiscal surpluses and accumulate funds as a response to anticipated future fiscal needs of aging populations. This is relatively rare, however.

Public debt is another important example of an asset (a liability or negative asset, in this case) involved in asset-based reallocations. Increasing public debt, i.e., dissaving, generates a public inflow to current taxpayers and a liability or burden for future generations.[4]

Instructions for constructing macro controls for public asset–based reallocations based on SNA data are provided in chapter 4, section 4. Results are reported in table 4.2 for Mexico and table 4.12 for UNSNA 2008. An alternative source of information is Government Financial Statistics (GFS). There is no GFS counterpart of Operating surplus. Property income subcategories in GFS are essentially equivalent to those used in SNA. In NTA asset income is a net measure. For example, interest income is interest revenue less interest expense. Hence, net property income is equal to Property income less property expense as reported in GFS. Property expense in GFS is classified as Interest (item 24) plus Property expense other than interest (item 281) in table 6.1: Economic classification of expense (p. 63).

Public saving in NTA is equivalent to the SNA concept. There is no exact counterpart in GFS, because saving does not include net capital transfers. Public saving can be calculated from GFS as the Net operating balance less Net capital transfers receivable (table 4.1 Statement of government operations, GFSM 2001).

3 Estimates of publicly managed pension asset pools for 23 countries range from 0.2 per cent to 69.6 per cent of GDP as reported by Olivia S. Mitchell, John Piggott, and Cagri Kumru. "Managing public investment funds: best practices and new challenges". *NBER Working Paper* 14078 (2008).

4 Borrowing generates an inflow to taxpayers and an outflow from the individuals or age groups that extend the credit. Age reallocations occur to the extent that the age profile of taxpayers is different from the age profile of creditors. Age reallocations also occur if credit is extended by the rest of the world.

6.3. Building the micro-level database

As with the life cycle variables in chapter 5, constructing age profiles relies primarily on two sources of information: administrative records and household surveys. Administrative records of government agencies may provide very useful information about the age of the beneficiaries of their programmes. General household surveys may provide detailed income data including the public transfer benefits, e.g., public pensions, unemployment benefits, etc., and may also include information on taxes paid. Special purpose surveys may also provide very useful information. Health expenditure surveys are an important example.

6.3.1. Selecting and preparing the data

Data on public sector flows are used to build directly on the micro-level database constructed for the life cycle variables in chapter 5. Income and expenditure surveys often have data on cash received from government programs, taxes paid and indicators of participation in government programmes such as public schooling. Some of these data are reported for individuals in the households, but many are reported for the household. Individual-level indicators can be used directly as age-specific indicators in the micro-level database. Where household amounts only are available, an allocation rule must be applied to distribute the household flow among the individuals living in the household.

Also, for many government programmes, the agencies administering those programmes or tasked with reporting on them to the public produce reports detailing benefits paid. It is sometimes possible to request special tabulations from these agencies with sufficient age detail to be useful for estimating age patterns. These administrative records should be merged onto the micro-level database by as many characteristics as are available.

6.3.2. Creating public transfer inflows

The principle followed for estimating the age profile of inflows is that the inflow is assigned to the age groups of the intended beneficiaries of the public programme. The value of school lunch programmes, for example, is assigned to students. Pre-natal health care is assigned to the mother. Some cases are difficult to assign, e.g., maternity benefits, which could be argued to benefit the mother, the newborn child or both. In NTA, we divide these evenly between the mother and child. In the case of a United States transfer programme called Temporary Assistance to Needy Families (TANF), you only qualify if you have children but the amount you receive is based on family size including any adults. In this case benefits have been assigned to household members using equivalent adult consumer weights as defined in chapter 5.

Many public transfers do not accrue to individuals at all. Public benefits such as national defense, public administration, law enforcement and public safety programmes, to name a few examples, benefit everyone and are assumed to be divided equally among all members of the population. See box 6.2 for a discussion of these public benefits allocated on a per capita basis.

The age shapes of in-kind transfers and public consumption are identical and explained in chapter 5. Methods for estimating per capita cash transfer inflows are explained in this section. Two possible data sources can be used to construct age profiles: administrative records may identify the beneficiaries of cash public transfers or, alternatively, cash transfer inflows may be reported in household surveys.

Box 6.2.
In-kind public transfer inflows allocated on a per-capita basis

These collective benefits include things like national defense, public administration and other programmes whose cost may be loosely connected to the size of the population. This is in contrast to an individual public benefit where an amount is paid per person, so more people means a larger programme.

Therefore, when using NTA public transfer inflows to project government outflows under scenarios of future population change, researchers may want to treat collective and individual benefits differently. Specifically, researchers may want to hold the aggregate amount constant for collective benefits while holding the per capita amounts constant for individual benefits.

By "administrative records" we mean publicly available reports of benefits by age. The administrative agencies for some public programmes produce a report of their activities each year or from time to time. These reports may give the ages of beneficiaries, especially for heavily age determined benefits like education or pensions. Some countries may have research organizations that gather data on benefit flows by age and produce reports regularly or intermittently. Researchers should look online for a website from the public program and see if reports are available there, or contact the administrative agency for the program and ask what reports on program activities are produced and how to access them.

Surveys may ask respondents how much income their household received from a particular public benefit program. If this is the case, a common problem is that only the household amount is given but the particular recipient or recipients of the inflow are not identified. This is a general problem that must often be confronted in constructing NTA. A number of methods can be used to allocate benefits to the appropriate individuals within each household as discussed in chapter 5. It may be possible to exclude or to include particular members based on the purpose or eligibility criteria. For example, an amount received for education scholarships can be allocated to household members enrolled in higher education. Or it may be possible to use proxies or indicators to construct "equivalence scales" that can be used to allocate transfer inflows among household members. Regression techniques described in chapter 5 may also be helpful.

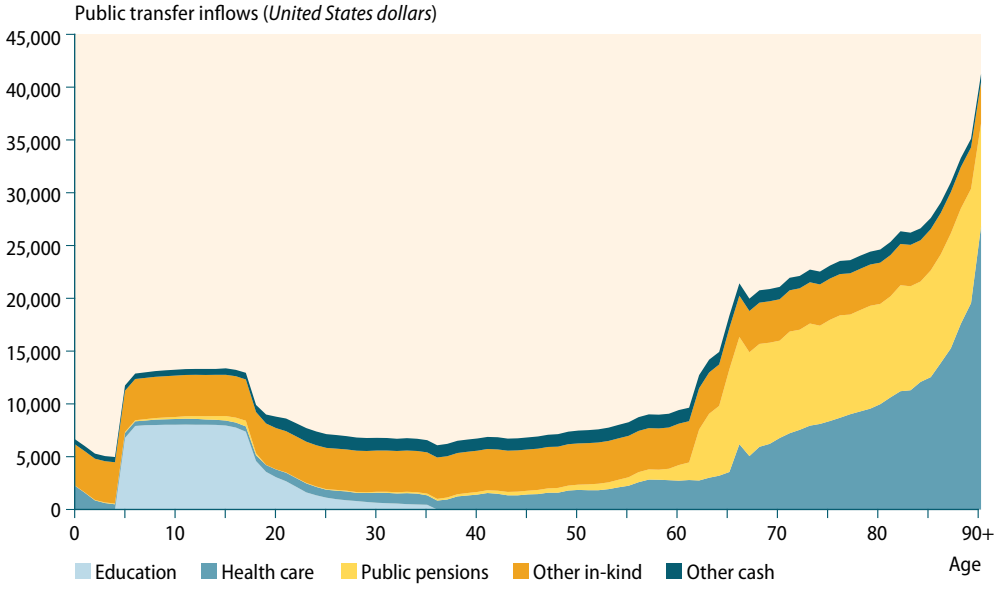
An example of public transfer inflows by age and purpose is shown in figure 6.1. The large public education inflows are evident from ages 4 up to the early 1920s. The large increase in transfers for health care and pensions begin for adults in the early 1960s.

6.3.3. Creating taxes and public transfer outflows

One purpose behind estimating the age profiles of public transfer outflows separately for each purpose (education, health, pensions and other) is to study age structure influences on the fiscal sustainability of programmes both on the expenditure and the revenue side. For some programmes revenue generation may rely heavily on younger taxpayers and for others on older taxpayers. Tax profiles vary across programs or by purpose because the sources of funding vary. One programme may rely heavily on earnings taxes and another on consumption taxes which have very different age profiles.

The age profiles of public transfer outflows are constructed in two steps. First, age profiles of taxes and social contributions are constructed. Second, these age profiles are combined with information about how each type of government programme is funded (the "source") to construct age profiles of public transfer outflows by purpose. This section discusses the age

Figure 6.1.
Per capita public transfer inflows by age and purpose, United States, 2003



patterns of taxes and social contributions only. Combining these into public transfer outflow profiles will be discussed in the section on finalizing the accounts.

Total flows for each tax and social contribution are estimated as explained above. The age patterns of taxes and social contributions may come from surveys, administrative records or the age profile of an economic flow or activity being taxed. Information will be available at different levels of detail for different surveys or types of tax, requiring different treatment:

1. Household survey
   - a) Survey has information on different types of taxes paid
     - I. If survey information is at the individual level, use allocation from survey.
     - Ii. If survey information is at the household level only, use other survey information or previously calculated NTA age profile amounts to allocate the amount to individuals. For example, if the survey has information on earnings taxes paid by the household and information on the earnings of each individual, use the individual-level earnings proportions to allocate to household-level tax to individuals. Table 6.5 lists the NTA age profiles that can be used to allocate taxes. If the tax is levied on assets or property, assign the household amount to the household head because the head in NTA is assumed to own all assets.
   - b) Survey does not have tax flow but does have information on the flows that are taxed
     - I. Combine this information with information on tax rates to produce an estimated household-level of tax paid. This household amount can be allocated as in 1.a.ii above. For example, if income tax is assessed on total household income, with different tax rates applying to different levels of income, researchers can apply those tax rules to the income from the household survey to estimate the total household income tax bill.

2. Administrative records: if a government source has sufficient age detail on average taxes to estimate the age pattern, use those average amounts.
3. Assumptions based on other NTA profiles: if another NTA age profile is an indicator of the flow being taxed and you can reasonably assume that the tax rate does not vary by age, use the other NTA age profile to give the age pattern of the taxation profile. Table 6.6 summarizes which age profiles to use for which taxes, in the absence of survey data or administrative data on those taxes. For example, taxes on income and payrolls can be assumed to have the same age pattern as labour income; taxes on assets can be assumed to have the same age pattern as private asset income; taxes on consumption such as value added taxes (VAT) or sales taxes can be assumed to have the same age pattern as total private consumption or components of private consumption that depend on the details of the tax systems, e.g., treatment of consumption and education.

One exception to this straightforward approach is for property taxes. While technically property taxes are paid for by the owners of property, we know that those owners pass some of the charges for property taxes on to their renters. So, the age pattern of property taxes should reflect a division of half of property taxes paid by the owners of property and half paid by renters. To do this, first adjust the age pattern of property taxes paid to half of the macro control, then adjust the age pattern of rent paid to half of the macro control, and then combine the two adjusted flows for the age pattern of total property taxes. This age pattern will not need to be macro adjusted again.

Table 6.6.
Mapping of SNA taxes to tax source (*NTA classification*)

Tax source	SNA classification
Consumption	Value added type taxes (VAT)
	Taxes and duties on imports excluding VAT
	Less: import subsidies
	Other taxes on production and imports
	Less: Other subsidies on products
Consumption of alcohol and/or tobacco	Monopoly revenues and excise and stamp taxes from tobacco and alcohol
Labour income	Export taxes*
	Less: export subsidies*
	Other taxes on production*
	Less: other taxes on production*
	Employers' actual social contributions
	Employees' actual social contributions
	Social contributions by self- and non-employed persons
	Imputed social contributions
Asset income	Export taxes*
	Less: export subsidies*
	Other taxes on production*
	Less: other taxes on production*
	Individual income tax*
	Corporate income tax
Income	Individual income tax
Various	Other current taxes

* Taxes are allocated in proportion to the shares of labour and asset income.

If you are using the IMF Government Financial Statistics database as a source for tax macro controls, the GFS classification and its relation to NTA are somewhat different than that given in table 6.6. For GFS mappings, see table 6.7. Note that the mapping for any particular country will differ from the suggested categories depending on the details of the tax system in question.

Taxes are defined in essentially identical ways in GFS and SNA. An important distinction is drawn between direct taxes and taxes on products and production (indirect taxes) in SNA, but not in GFS. For NTA, taxes on products and production are required to adjust consumption and labour income to their pre-tax values. Social contributions are also essentially identical in GFS and SNA. GFS and SNA use different subcategories to classify taxes and social contributions. These subcategories are useful for reclassifying taxes and social contributions by source for NTA public transfer outflows. The GFS classification system places more emphasis on the source of revenue in its classification system and, hence, the correspondence between the GFS and SNA classification systems

Table 6.7.
Mapping of IMF Government Financial Statistics to NTA public transfer outflows

GFS classification	Suggested NTA tax source
Taxes	
Taxes on income, profit, and capital gains	
Payable by individuals	Labour and asset income*
Payable by corporations and other enterprise	Asset income
Taxes on payroll and workforce	Labour income
Taxes on property	Asset holding
Taxes on goods and services	Consumption
Taxes on international trade and transactions	Various
Other taxes	Various
Social contributions	**Labour income**
Subsidies	
To public corporations	Various
To private enterprises	Various
Grants	
From foreign governments	
Current	Rest of the world
Capital	Exclude from NTA flow account
From other general government units	Zero for general government
Other revenue	
Property income	Not a public transfer (Asset income)
Sales of goods and services	Other
Fines, penalties, and forfeits	Other
Voluntary transfers other than grants	
Current	Other
Capital	Exclude from NTA flow account
Miscellaneous and unidentified revenue	Other

* In the absence of additional information, taxes are allocated in proportion to the shares of labour and asset income.

are somewhat closer. The suggested NTA classification is suggestive rather than definitive. In some cases, the classification will depend on more details on taxes than provided in the broad classification. For example, taxes on international trade and transactions may include taxes on producers of exports (labour and asset income), consumers of imported goods (consumption), and/or consumers of exported goods (ROW). NTA public transfer outflows are reported as revenue in GFSM 2001 (table 5.1: Classification of revenue, p. 49) except for subsidies which are reported as expenditure in GFSM 2001 (table 6.1: Economic Classification of expense, p. 63).

Grants in GFS refer to transfers between governments and international organizations. Grants are further distinguished as current and capital transfers. The flow account in SNA includes only current transfers. As in SNA, NTA capital transfers are reported in a separate account (asset transfer account in NTA and capital account in SNA). Thus, public revenues from capital transfer must not be included in, public transfer outflows. The same principle applies to voluntary transfers other than grants, capital. These must be excluded from the flow account, and included in the asset transfer account.

6.3.4. Public transfer outflows

In addition to taxes, social contributions and other current transfers, the transfer surplus/deficit is a source of public transfer outflows. The age pattern for the transfer surplus/deficit is the age pattern of the general tax profile, the tax profile for all tax revenues that are not earmarked for particular programmes. Further details are explained below.

The age pattern of public transfer outflows by purpose is determined by the age pattern of the public transfer outflow sources used to fund the programmes in question. If pensions were funded entirely by earnings taxes, for example, the age profile for public transfer outflow for pensions would be proportional to the age profile for earnings taxes. We will discuss how tax profiles are used to construct public transfer outflows by purpose in further detail in the section on "Adjusting to macro controls".

6.3.5. Public asset–based reallocations

In NTA, public asset–based flows are assigned to age groups in proportion to each age group's general (non-earmarked) tax payments. The conceptual basis for this approach is clear for public asset–based outflows, including interest payments and public saving. Public interest is paid by taxpayers and allocated across age groups using the same procedures followed for allocating public transfer outflows. Likewise public saving involves the acquisition of assets or repayment of debt funded from taxes that are assigned to age groups using the same procedures as used to assign public transfer outflows.

The conceptual foundation for treating public asset income and public borrowing (dissaving) in this way relies on a counterfactual. In the absence of public asset income or public borrowing, general tax revenues would have been greater (given public spending). Thus, the asset-based inflow is allocated to age groups in proportion to the general taxes paid by those age groups.

The age pattern of public saving is also equal to the age pattern of general taxes.

The age pattern for general tax age profile comes from combining parts of separate tax flows. This is included in the next section as it is part of finalizing the tax and benefit age profiles.

6.4. Finalizing age profiles

6.4.1. Overview

Before public age reallocations can be finalized using the procedures described in this section, the work described above must be completed:

- Macro controls for public age reallocations and all components shown in table 6.4
- Public transfer inflows by purpose (education, health, pensions, other in-kind and other cash)
- Taxes, social contributions and grants by source.

Age patterns must be estimated and incorporated into the micro-level database for:

- Public transfer inflows by purpose
- Taxes, social contributions, and other current revenues by source.

To finalize the age profiles, we must:

- Estimate per capita age patterns by age for all variables using the micro-level database
- Smooth the age patterns generated by the database
- Adjust the age profiles for public transfer inflows by purpose to their macro controls
- Adjust the age profiles for public transfer outflows by source to their macro controls
- Calculate the age profiles for public transfer outflows by purpose.

6.4.2. Estimating per capita patterns for each series

Public transfer inflows by purpose and public transfer outflows by purpose are elements of the micro-level database. They are tabulated by age to obtain the average per capita value at each age. The tabulation should incorporate individual-level sampling weights to ensure that the results are based on a representative sample of the national resident population.

6.4.3. Smoothing per capita values

The same principles are followed here as for smoothing other flows, and they are only briefly recapitulated. Detailed methods are described in chapter 3 and appendix B. All smoothing is conducted at the most detailed level of estimation. Hence, neither the sums of smoothed profiles nor differences between smoothed profiles should be smoothed. Tax profiles for some tax series are constructed using profiles of an economic resource or activity that has already been subject to smoothing. These should not be subject to further smoothing. In-kind transfers are equal to public consumption and should not be smoothed again. (Public consumption, itself, is the sum of components and is not subject to further smoothing.) Similarly for public transfer outflows—they are constructed from smoothed tax profiles and should not be smoothed again.

It is important to allow for age discontinuities in a consistent and comprehensive manner. Mandatory age at retirement may lead to discontinuities in several age profiles (consumption, public transfers and private saving, for example.)

6.4.4. Adjusting to the macro control

The same general method introduced in chapter 3 is followed here: the per capita age pattern is scaled (multiplied by a constant) so that the aggregate value matches the macro control. Applying these methods will create final estimates of the age profiles for public transfer inflows by purpose and source. Adjusting public transfer inflows by source and age and asset-based reallocations to match the aggregate controls are straightforward and follow the standard procedures to scale age patterns to obtain the final age profiles.

Finalizing the age profiles for public transfer outflows is somewhat more complicated and this is discussed in more detail here with procedures illustrated in section 6.5. The finalized age profiles for public transfer outflows and asset-based reallocations are constructed using the appropriate profiles.

The starting point for organizing the transformation of tax profiles into public transfer outflow profiles is determining the funding method for each outflow programme. See the "How is expenditure financed" column in the public sector inventory example in appendix D.

In the simplest case, the funding method is "general tax revenues" for all programmes. In this case, no taxes are dedicated to a particular programme and all public revenues are pooled into a "common pot" or general fund used to support all public programmes. In this case, the relative age profiles of public transfer outflows will be the same irrespective of purpose. There will be only one age pattern—the general tax revenue pattern—but the level will vary in magnitude depending on the macro control of each public transfer outflow.

In many cases, however, the funding sources vary across public programmes. This may occur because programmes have earmarked or committed sources of funding. For example, pension programmes are often funded through payroll taxes. Another reason that the source of outflows may vary by purpose is that different levels of government, each with their own taxing authority, may be responsible for different government programmes. Education may be funded at the local level from property taxes while national defense is funded at the central level out of value added tax, for example.

Steps to estimate public transfer outflows by purpose that are consistent with macro controls are as follows:

1. For each outflow purpose (or programme) determine the funding sources distinguishing earmarked taxes. The gap between outflows and earmarked taxes, if any, is equal to outflows funded by general taxes and the transfer deficit/surplus.
2. For each outflow purpose (or programme) estimate the age profile for earmarked taxes, if any, by scaling the appropriate tax profile to match the aggregate earmarked tax for that purpose.
3. Calculate the general tax age profile by subtracting the earmarked flows for all purposes combined from the age profile of all taxes.
4. Calculate the age profile for the transfer deficit/surplus by scaling the general tax profile to match the aggregate transfer deficit/surplus.
5. For each outflow purpose, calculate the age profile of general taxes and the transfer deficit/surplus by scaling the general tax profile to match the control total for each purpose (public transfer outflows less earmarked taxes).
6. For each purpose, calculate the age profile of public transfer outflows as the sum of the earmarked tax profile and the tax profile for general taxes and the transfer deficit/surplus.

Section 6.5 provides illustrative calculations.

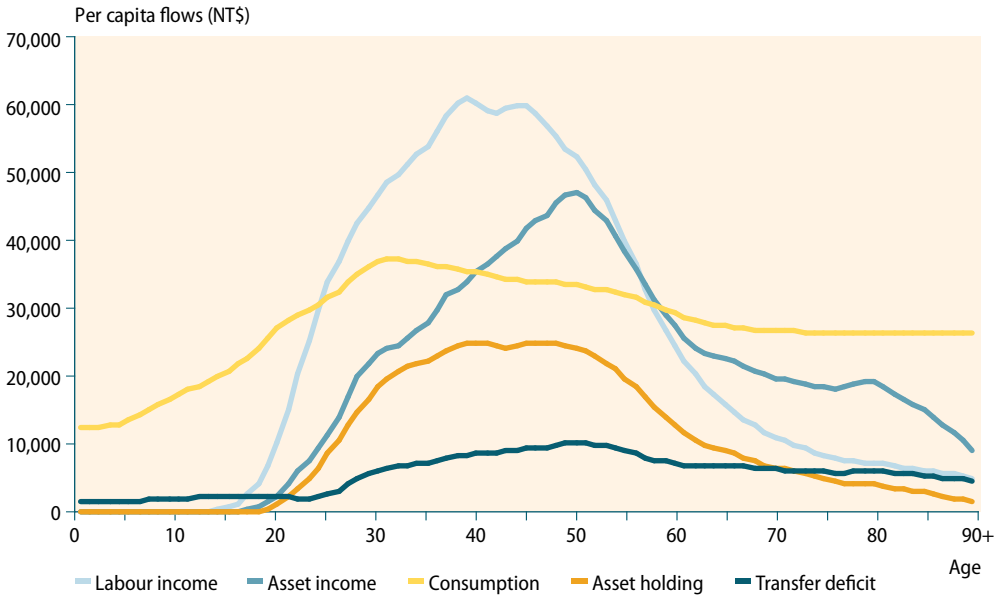
Figures 6.2 and 6.3 shows public transfer outflows classified in two different ways. In figure 6.2 outflows are classified by the outflow Source: taxes on labour income, asset income, asset holdings, and consumption and the transfer deficit. On the other hand, figure 6.3 presents public transfer outflows classified by purpose: education, health care, pensions, other in-kind and other cash. The outflows by purpose are constructed based on the outflows by source. Pensions, for example, are funded by earnings taxes and, hence, the age profile of outflows for labour income and pensions are similar.[5] The profiles for "Other in-kind" and "Other cash" have the same age pattern, but have been adjusted to different macro controls. This age pattern is the general tax profile, indicating that both of these "Other" categories are financed by general revenues and no earmarked taxes.

Finally, figure 6.4 shows an example of public asset based reallocation age profiles: public asset income and public saving.

6.5. Simplified example of public reallocation calculations

This section discusses in detail the steps to take to complete the calculations described in this chapter. Simple illustrative values are used so that it is easier to observe the exact nature of each calculation. None of the values are intended to be realistic of the population age structure or particular flow profiles. Six age groups, ages 0-5, are used. Three types of taxes are used, tax A, tax B and tax C.

Figure 6.2.
Per capita public transfer outflows by age and purpose, Taiwan Common of China 1998 (*NT$*)



5 They are not identical because social security contributions, as they are called in the United States, as a proportion of labour income, varies with age because of complexities in the tax system.

Figure 6.3.
Per capita public transfer outflows by age and purpose, per capita, United States, 2003
(*United States dollars*)

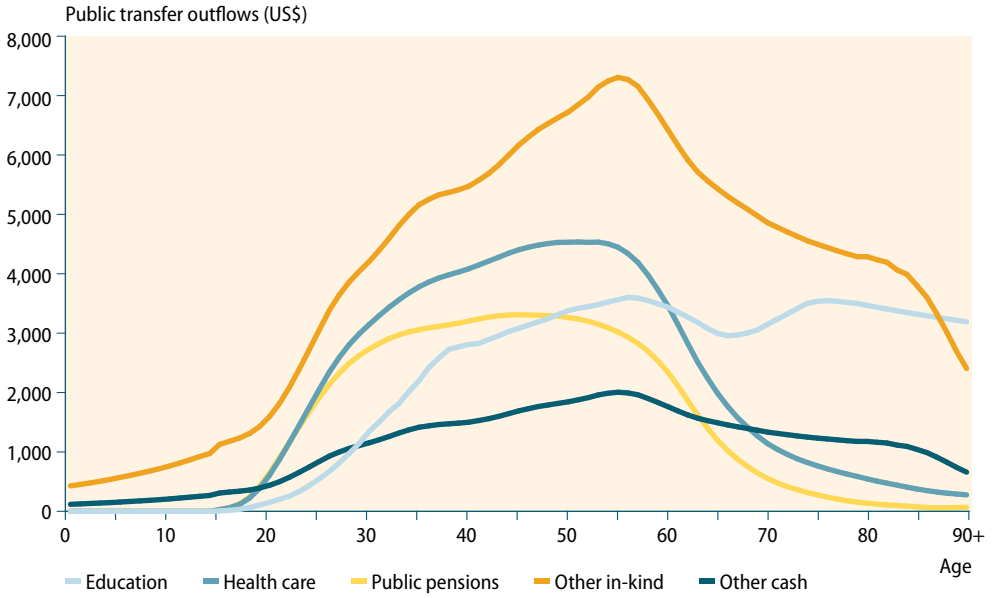
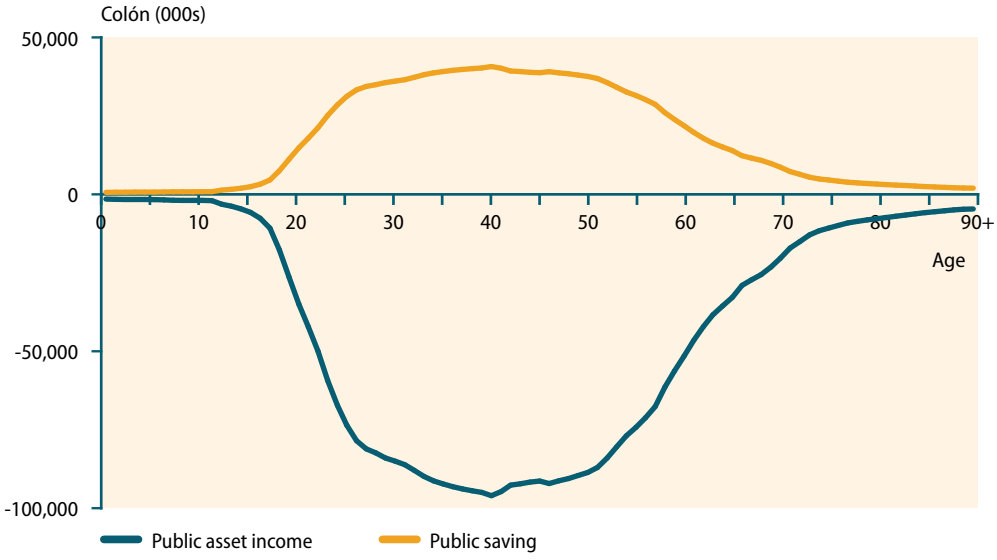


Figure 6.4.
Per capita public asset–based reallocations by age, per capita, Costa Rica, 2004
(*thousands of colon*)



6.5.1. Public transfer inflows

Public transfer inflows by purpose and age are presented in table 6.8. The age profiles have been finalized following the procedures described above and conform to the aggregate values by purpose for all residents as reported in the table.

Table 6.8.
Public transfer inflows by age and purpose, illustrative values

Age	Population	Public transfer inflows by purpose					
		Education	Health	Pensions	Other in-kind	Other cash	Total
		Per capita values					
0	432	23	56	79	4	213	**375**
1	35	63	65	7	23	13	**171**
2	43	654	65	76	21	31	**847**
3	43	54	65	76	34	342	**571**
4	4	23	57	67	34	34	**215**
5	213	35	456	67	34	435	**1,027**
		Aggregate values					
	Residents	50,132	129,413	55,448	12,276	201,301	**448,570**
	Rest of the world	--	--	--	--	500	**500**

6.5.2. Public outflow funding system

The first step in calculating public outflows is to compile data about the taxes that are used to fund public transfer outflows (table 6.9). We assume three kinds of taxes, namely, Taxes A, B and C, fund the transfer system. In addition, some portions of these taxes are earmarked for specific programmes or purposes. In the illustrative example shown, education is funded entirely by tax A and pensions are funded entirely by tax C. The residual, which is taxes not earmarked, is general revenues. As presented in the last row of the table, a small portion of tax A, all of tax B, and a large portion of tax C are general revenues.

The public transfer outflows are equal to the public transfer inflows for residents plus ROW because by NTA definition transfer inflows and outflows must be equal for each type of public programme. If taxes are insufficient to cover the program expenditure, it will be shown as a balancing item as transfer deficit. Column V of table 6.9 presents the transfer outflows, which is equal to the transfer inflows demonstrated earlier in table 6.8. The last column illustrates the balance between transfer outflows (column V) and total earmarked taxes (column I). That is, transfer outflows less earmarks must be funded from either general revenues or transfer deficit.

Table 6.9.
Public transfer outflows by purpose and by source

	I	II	III	IV	V	VI
			Earmarks			
Purpose	Total II+III+IV	Tax A	Tax B	Tax C	Transfer outflows matched with inflows in table 6.8	Funded by general revenues and transfer deficit - V-I
Total taxes	**237,065**	**51,994**	**44,795**	**140,276**	**449,070**	
Total earmarked taxes	**94,927**	**50,132**		**44,795**		
Education	50,132	50,132			50,132	
Health					129,413	129,413
Pensions	44,795			44,795	55,448	10,653
Other in-kind					12,276	12,276
Other cash					201,801	201,801
General revenues	**142,138**	**1,862**	**44,795**	**95,481**		

Table 6.10 presents the age profiles of each of the taxes A, B and C that have been calculated and finalized. These per capita values of tax profiles have been scaled so that they match the aggregate controls.

Table 6.10.
Tax outflows by age and source, illustrative values

		Tax outflows by source			
Age	Population	Tax A	Tax B	Tax C	Total VII
		Per capita values			
0	432	34	4	65	**103**
1	35	43	21	76	**140**
2	43	46	352	768	**1,166**
3	43	745	568	78	**1,391**
4	4	234	54	78	**366**
5	213	4	12	342	**358**
		Aggregate values			
	Residents	51,994	44,795	140,276	**237,065**
	Rest of the world	--	--	0	**0**

6.5.3. Public transfer outflows by age and purpose

Public transfer outflows by age and purpose are constructed in several steps. First, the public transfer outflows that are funded by taxes allocated specifically for a purpose (e,g. pension) or name as earmarks are estimated by age and purpose. Second , the public transfer outflows that are funded by general taxes or tax deficits are then computed by age and purpose. Third, add both of the above profiles together to get the total public transfer outflows by age and purpose.

The earmarked outflows by purpose and age are reported in table 6.11. Following the assumptions made in table 6.9, only education and pensions have committed funding sources while the values for other purposes such as health, other in-kind and other cash are zero. The final age profiles are calculated in the conventional fashion. Table 6.9 provides the total earmark for each tax and purpose. Using these total values, table 6.10 provides the age pattern for each tax. That is to say, the age values in table 6.10 are scaled downward to match the total tax. For example, the per capita profile of education is scaled downward to yield the per capita amount of tax A devoted to education.

Table 6.11.
Earmarked public transfer outflows by purpose and age, illustrative values

		Earmarked outflows					
Age	Population	Education	Health	Pensions	Other In-kind	Other cash	Total VIII
			Per capita values				
0	432	33		4			**37**
1	35	41		21			**62**
2	43	44		352			**396**
3	43	718		568			**1,286**
4	4	226		54			**280**
5	213	4		12			**16**
			Aggregate values				
	Earmarked	50,132		44,795			**94,927**

Table 6.12 shows the steps required to calculate the age profile of general taxes and the public transfer deficit/surplus. First, the age profile for general taxes is calculated by subtracting earmarked taxes (column VII of table 6.11,) from total taxes (column VIII of table 6.10). Second, the age profile of the public transfer deficit/surplus is calculated using the aggregate control for the public transfer deficit/surplus (212,005) and the age pattern of General taxes. Such age profile is reported in the "Public transfer deficit/surplus" column or column XI. Third, public transfer outflows by age are the sum of earmarked taxes (column IX), general taxes (column X) and public transfer deficit/surplus (column XI).

Table 6.12.
Age profile for general taxes, the public transfer deficit/surplus and public transfer outflows

Age	Population	Taxes	IX	X	XI	Public transfer outflows IX+X+XI
			Earmarked taxes	General taxes VII-VIII	Public transfer deficit/surplus	
			Per capita values			
0	432	103	37	66	99	202
1	35	140	62	78	116	256
2	43	1,166	396	770	1,148	2,314
3	43	1,391	1,286	105	156	1,547
4	4	366	280	86	129	495
5	213	358	16	342	510	868
			Aggregate values			
	Residents	237,065	94,927	142,138	212,005*	449,070

* This aggregate value of 212,005 is derived from total value from column VI of table 6.9 (354,143) minus aggregate value of general taxes 142,138.

Now, we will compute the age profiles of public transfer outflows that are funded by general taxes and the transfer deficit/surplus by purpose and age. Referring to the assumptions we made in table 6.9 column VI, health, pensions, other in-kind and other cash are funded by such taxes. We calculate the age profiles by using the age pattern of general taxes shown in column X in table 6.12 and the aggregate controls of each purpose obtained from column VI in table 6.9. The results are shown in table 6.13. The per capita outflow of each purpose is calculated by applying the standard scaling procedure to match the age profiles to the aggregate outflows (macro controls).

Table 6.13.
Public transfer outflows funded by general taxes and transfer deficit/surplus by purpose

Age	Population	Purpose					
		Education	Health	Pensions	Other in-kind	Other cash	Total
			Per capita values				
0	432	0	60	5	6	94	**165**
1	35	0	71	6	7	110	**193**
2	43	0	701	58	66	1,093	**1,918**
3	43	0	95	8	9	149	**261**
4	4	0	79	6	7	123	**215**
5	213	0	312	26	30	486	**852**
			Aggregate values				
	Residents	--	129,413	10,653	12,276	201,801	**354,143**

By now, we have computed public transfer outflows by age and purpose in two different tables. One table, table 6.11, contains age profiles that are funded by earmarked taxes. Another table, table 6.13, shows age profiles that are funded by general taxes and tax deficits/surpluses. Adding these age profiles from these two tables yields the total public transfer outflows by age and purpose, which is reported in table 6.14.

Table 6.14.
Public transfer outflows by age and purpose

		Purpose					
Age	Population	Education	Health	Pensions	Other in-kind	Other cash	Total
				Per capita values			
0	432	33	60	9	6	94	**202**
1	35	41	71	27	7	110	**256**
2	43	44	701	410	66	1,093	**2,314**
3	43	718	95	576	9	149	**1,547**
4	4	226	79	60	7	123	**495**
5	213	4	312	38	30	486	**868**
				Aggregate values			
	Residents	50,132	129,413	55,448	12,276	201,801	**449,070**
	Rest of the world	--	--	--	--	--	**--**

6.5.4. Public asset–based reallocations

This example does not include the calculation of asset-based reallocations and its components. The age profiles of all public asset–based reallocations are obtained by scaling the age profile of general taxes to match the aggregate values for public capital income, public property income inflows and public property income outflows and public saving. Public asset income is calculated as public capital income plus public property income inflows less public property income outflows. Asset-based reallocations are then calculated as public asset income less public saving.

6.6. Computing higher-level age profiles

The components of public transfer inflows and outflows and public asset–based reallocations are aggregated to obtain public transfer inflows and outflows and public transfers equal to inflows less outflows. Public asset income is calculated as public capital income plus public property income inflows less public property outflows. Do not smooth or macro-adjust higher-level profiles.

Aggregate values by age are calculated as the product of per capita flows and population by age.

6.7. Evaluation

Chapter 3 describes many types of checks that are necessary for all age profiles. Verify all relevant points from that list, as well as these items particular to the public reallocation profiles:

- Per capita and aggregate in-kind transfer inflows equal public consumption at every age.
- Per capita and aggregate components of in-kind transfer inflows and cash transfer inflows sum to total in-kind and cash transfer inflows.
- Public transfer inflows equal public transfer outflows plus net public transfers to the rest of the world.
- Per capita and aggregate public transfer outflows by source sum to public transfer outflows by age and in total.
- Per capita and aggregate asset-based reallocations equal asset income less saving.
- Aggregate values by age summed over age match their corresponding control totals.

6.8. Comparing, summarizing and applying public reallocation accounts

Many of the summary methods discussed in the last section of chapter 5 can be applied to public reallocation age profiles as well. For example, the support ratio calculation was discussed in chapter 5. There it was used to compare the effective number of workers to the effective number of consumers, using NTA age profiles of labour income and consumption to construct weights to represent the relative impact of workers and consumers by age. The exact same calculation can be done to evaluate the fiscal support ratio, using the NTA age profile of taxes and social contributions to construct weights that measure the extent to which individuals at each age are benefiting from or contributing to public programmes (Miller, 2011). This is used to indicate how changes in age structure influence the size of resources available to the government relative to the demand for benefits. More sophisticated scenarios can be projected which incorporate rules of budget balancing or which treat the non-age-allocated portion of public consumption differently than age-allocated taxes and benefits.

The mean age calculation in chapter 5 can also be applied to any public reallocation age profile. In particular, calculating the difference in mean ages of a public transfer inflow and its paired public transfer outflow indicates the extent to which a public programme is transferring resources upward in age or downward in age. Making this comparison for the total public inflow and outflow profiles indicates whether, overall, the government is shifting resources from older to younger or the opposite (Lee and Mason, 2011a).

Finally, as fiscal support ratios and mean ages can be constructed for public reallocations in the image of the calculations for life cycle variables discussed in chapter 5, so can public life cycle wealth be calculated in the image of total life cycle wealth discussed in chapter 5. Instead of basing the calculation on consumption minus labour income, the public version would be based on public transfer inflows minus taxes or public transfer outflows (depending on the nature of the research question).

Chapter 7

Private age reallocations

7.1. Introduction

This chapter describes the methods for constructing private reallocation accounts, consisting of private transfers and private asset-based reallocations. Estimating private reallocations is the last step in constructing NTA building on life cycle and public reallocation accounts.

Private transfers are composed of inter-household flows between households or between households and the rest of the world and intra-household transfers, flows between members living in the same household. The flow account includes current transfers or the disposition of current income. Capital transfers, e.g., bequests, dowry and other large transfers, are not included in the flow account.

The steps for estimating inter-household transfers are similar to those used for constructing the life cycle and public reallocation accounts. Individual-level indicators are added to the micro-level database from survey data and adjusted to a macro control based on population and data from the System of National Accounts. The macro controls available for inter-household transfers are usually very limited, however, and the magnitudes of inflows and outflows are based primarily on survey estimates rather than SNA data.

A different approach is used to estimate intra-household transfers. Intra-household transfers are not part of national accounts and are not observed in large-scale household surveys. While a survey respondent may have a good idea of how much she earned in a year, she would probably have a very hard time estimating the support provided to her children. This situation is similar to that of other private consumption where direct observation of individual-level consumption is not possible in a household survey, so we use equivalent adult consumer weights to estimate how the household-level amount is consumed by individuals. Similarly, instead of asking people about intra-household transfers directly, we use a model with simple rules about how resources are shared within the household. Given estimates of how much each person consumes and disposable income, we can infer the transfers received and given within the household. The assumptions or sharing rules required to estimate these flows are discussed in detail below.

Private asset-based reallocations, asset income and saving provide the second private economic mechanism for shifting economic resources across age. Young adults may generate resources by acquiring debt. In some countries this is a common way college students pay for part of their education. Working-age adults may save to buy a house, to pay for the education of their children and to fund their retirement. Older adults may depend on pension funds and personal saving to fund their retirement needs. Each of these is an example of using asset-based reallocations to deal with a basic feature of the life cycle, namely, that the path of individual labour income does not conform with the preferred path of individual consumption.

In NTA two kinds of asset income are distinguished: capital income and property income. Capital income is the return to capital held by corporations and households, although from the NTA perspective corporations are intermediaries only with all corporate gains and losses assigned to the individual owners. Capital income of households consists of the imputed return to owner-occupied housing and capital income from household enterprise estimated as a share of "mixed income". In SNA "mixed income" is composed of the returns to capital and labour inputs. In NTA, we allocate a portion of mixed income to capital income and a portion to labour income.

Property income arises primarily through the existence of financial assets, e.g., debt instruments and corporate shares. Important forms of property income are interest, dividend and rent (payments to owners of land, fossil fuels and other subsoil minerals). For any form of property income, inflows and outflows must always balance. Interest paid by debtors must equal interest received by creditors, dividends paid by corporations must equal dividends received by shareholders and so forth. When any of these flows involve persons living abroad, there will be some net flow to the rest of the world (ROW). In NTA property income flows from one age group to another. Some of these flows are intergenerational in nature, but there are also large flows within age groups that arise, for example, because of transactions between firms.

The second major component of asset-based reallocations is saving. Individuals can accumulate debt or dispose of existing assets to generate inflows. Or individuals can dispose of debt or acquire assets generating outflows.

The age profiles of private asset income are estimated in the usual fashion, using age shapes based on different types of asset return flows and macro controls from SNA. Private saving is estimated using a different method. It is the final balancing item in NTA equal to net transfers plus asset income minus the life cycle deficit. If the reallocations from other sources exceed the life cycle deficit, the difference is saved. If the reallocations from other sources are insufficient to fund the life cycle deficit, the age group must generate additional resources by dissaving, either by selling assets or going into debt.

The private age reallocation account for the United States in 2003 (table 7.1) illustrates many of the properties that characterize the accounts. Values for selected ages are shown from childhood, the prime ages and old age. Private reallocations to children and to the elderly are positive and large in the United States, while they are negative for prime age adults. For children, the large private inflows are almost exclusively a consequence of intra-household transfers. For elderly, the large private inflows are a consequence of asset-based reallocations. The elderly have substantial asset income in excess of saving at age 65. For 90 and older, asset income and dissaving are both important mechanisms for generating resources.

Prime-age adults have large negative private transfers. At age 30, their asset-based reallocations are also negative with saving in excess of asset income. At age 45, however, their asset-based reallocations are positive with asset income in excess of saving.

Some of the important properties of private reallocations are evident in table 7.1.

- Private age reallocations equal private transfers plus asset-based reallocations;
- Intra-household transfers must always balance with inflows equal to outflows;
- Inter-household transfers for residents must equal net transfers from ROW as shown in the aggregate flows;
- Private asset–based reallocations equal private asset income less private saving.

In practice, the age-specific amounts may have small differences from these principles because of smoothing or rounding, but generally the national aggregates should balance exactly.

Table 7.1.
Private reallocations for selected age groups, annual per capita flows and aggregate value flows, United States, 2003

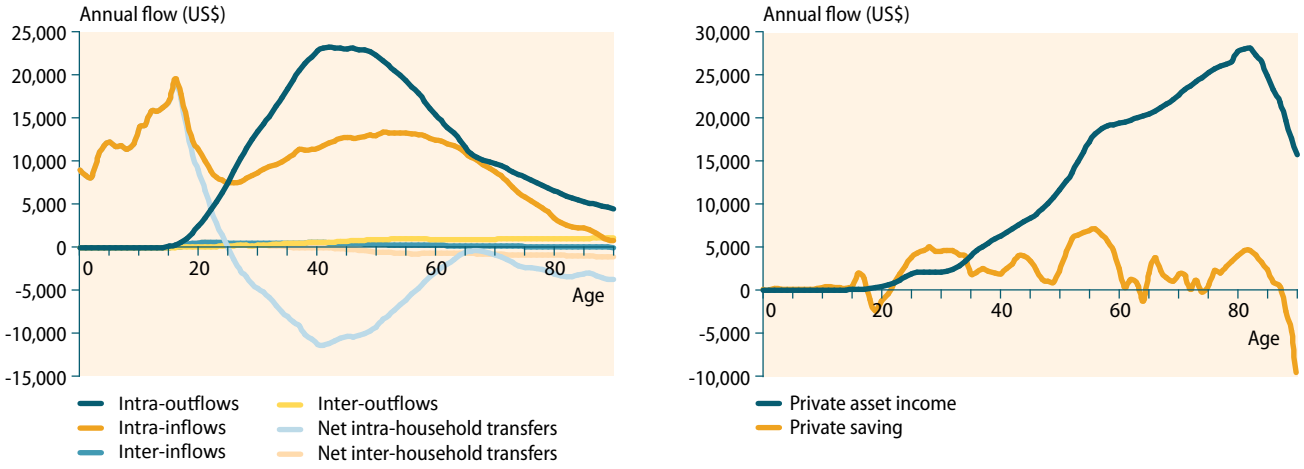
Variables	All Ages	Age (selected only)						ROW
		0	15	30	45	65	90+	
Per capita values (us$ 000's)								
Private reallocations	**5.4**	**9.0**	**16.6**	**(7.1)**	**(5.4)**	**17.2**	**22.3**	**Na**
Transfers	**(0.2)**	**9.0**	**17.1**	**(4.6)**	**(10.6)**	**(1.3)**	**(4.9)**	**Na**
Inter-household transfers	(0.2)	-	-	0.2	(0.2)	(0.7)	(1.1)	Na
Inflows	0.3	-	-	0.5	0.5	0.2	-	Na
Less: outflows	0.5	-	-	0.2	0.7	0.9	1.1	Na
Intra-household transfers	-	9.0	17.1	(4.8)	(10.3)	(0.6)	(3.8)	Na
Inflows	11.2	9.0	17.2	8.7	12.8	11.0	0.7	Na
Less: outflows	11.2	-	0.2	13.5	23.1	11.6	4.5	Na
Asset-based reallocations	**5.6**	**(0.1)**	**(0.5)**	**(2.5)**	**5.1**	**18.6**	**27.2**	**Na**
Asset income	7.7	-	0.1	2.1	8.4	20.6	15.8	Na
Capital income	6.8	-	0.0	3.9	9.7	14.4	10.0	Na
Property income	0.9	-	0.0	(1.8)	(1.3)	6.1	5.8	Na
Less: saving	2.1	0.1	0.5	4.5	3.3	2.0	(11.4)	Na
Aggregate values (us$ billions)								
Private reallocations	**1,568**	**36**	**68**	**(27)**	**(25)**	**36**	**38**	
Transfers	**(51)**	**36**	**70**	**(18)**	**(48)**	**(3)**	**(8)**	**51**
Inter-household transfers	(51)	-	-	1	(1)	(2)	(2)	51
Inflows	81	-	-	2	2	0	-	---
Less: outflows	132	-	-	1	3	2	2	---
Intra-household transfers	-	36	70	(19)	(47)	(1)	(6)	---
Inflows	3,237	36	71	33	58	23	1	---
Less: outflows	3,237	-	1	52	105	25	8	---
Asset-based reallocations	**1,619**	**(0)**	**(2)**	**(9)**	**23**	**39**	**46**	**---**
Asset income	2,235	-	0	8	38	43	27	---
Capital income	1,971	-	0	15	44	30	17	---
Property income	265	-	0	(7)	(6)	13	10	---
Less: saving	616	0	2	17	15	4	(19)	---

Selected private flows are shown graphically for the United States in 2003 in figure 7.1.

The details for constructing the private asset-based reallocation account are organized as follows:

1. Macro controls are reviewed and revised if necessary.
2. Household surveys are used to build the micro-level database for inter-household transfers and private asset income.
3. Age profiles for inter-household transfers and private asset income are finalized.
4. Micro-level data are prepared for estimating intra-household transfers.
5. The algorithm for estimating intra-household transfers is applied.
6. Age profiles for intra-household transfers are finalized.
7. Private saving is calculated as the final balancing age profile.
8. Estimates are evaluated and revised as needed.
9. Methods and sources are documented and estimates are archived.

Figure 7.1.
Selected private reallocation flows, per capita values, United States, 2003



7.2. Constructing macro controls

Detailed instructions for constructing macro controls are presented in chapter 4. The results of these procedures are shown in table 7.2. These components are discussed briefly here.

Table 7.2.
Aggregate private age reallocations, UNSNA, 2008

Age reallocations	29.5
Private age reallocations	**17.2**
Private transfers	**–8.3**
Private transfer inflows	**na**
Private transfer inflows, inter-household	na
Private transfers inflows, intra-household	na
Private transfer outflows	**na**
Private transfer inflows, inter-household	na
Private transfers inflows, intra-household	na
Net private transfers from ROW	**–8.3**
Private asset–based reallocations	**25.5**
Private asset income	**292.5**
Private capital income	266.5
Private capital income, corporations and NPISHS	184.3
Private capital income, owner-occupied housing	69.0
Private capital income from mixed income	13.2
Private property income	26.0
Private property income inflows	375.0
Private property income outflows	349.0
Consumer credit	14.0
Other private property income outflows	335.0
Private saving	267.0

Source: Table 6.21.

7.2.1. Private transfers

Private transfers consist of inter-household transfers and intra-household transfers. Inter-household transfers consist of transfers between resident households, including transfers mediated by non-profit institutions serving households (NPISHs). Inter-household transfers also include transfers from households to the rest of the world (ROW) and transfers to households from ROW irrespective of the ROW institution involved. NTA assumes that all inter-household transfer inflows are to the household head and outflows are from the household head. Intra-household transfers are transfers between individuals living in the same household.

As discussed in chapter 4, SNA data on inter-household transfers are quite limited. In general, only private transfers to and from ROW are available. NTA makes use of SNA data to estimate net private transfers from ROW, i.e., inter-household transfer inflows from ROW less inter-household transfer outflows to ROW. Total inter-household outflows and inflows must be estimated from survey data and adjusted to match net private transfers from ROW, thereby maintaining consistency between SNA and NTA. The adjustment procedures are described in section 7.3.3.

One of the most important sources of private transfers may be transfers from family members working abroad. If the family member is working abroad temporarily, however, he or she is considered a resident of the country of origin not the country in which he or she is working. Thus, the remittances are classified as labour income of the country of residence and not as a transfer from ROW. Remittances from seasonal workers or guest workers with contracts of one year or less are generally classified as labour income. Exact definitions, however, vary from country to country.

7.2.2. Private asset income

The calculation of macro controls for private asset income is straightforward and can be derived directly from SNA as described in chapter 4. Private asset income consists of private capital income and private property income. Three forms of private capital income are distinguished:

1. Private capital income of corporations and NPISHs consists of the net operating surplus of corporations and NPISHS including adjustments for taxes on production attributed to operating surplus of corporations and NPISHs.
2. Private capital income on owner-occupied housing is the net operating surplus for households.
3. Private capital income from mixed income is capital's share of gross mixed income less capital consumption plus taxes on production attributed to mixed income.

Private property income arises as one party pays for the use of an asset owned by another party. The main forms are interest, dividends and rent. Interest is a payment on a loan from the debtor to the creditor including credit extended through informal and formal credit markets. Dividends are payments from corporations to their investors. Rent is a payment for land, subsoil minerals and fossil fuels. Property income always has a counterpart—a property income inflow is matched by a property income outflow.

Property income outflows in NTA are classified as private if the outflows are from private institutions (households, corporations and NPISHs) to any institution including the government or to ROW. Property income inflows in NTA are classified as private if the inflows are received by private institutions from any institutions including government or rest of the world. Hence, public debt that is held by private creditors generates a public property

income outflow matched by a private property income inflow. Public and private property income outflows to residents and to the ROW combined must equal public and private property income inflows to residents and to the ROW combined.

Financial assets and the associated property income can produce important age reallocations. These flows are captured primarily by consumer credit. Young people, for example, may rely on student loans to pay for their education or credit card debt to fund consumption in excess of their disposable income. If this is the case, young people generate inflows by accumulating debt (dissaving). Over subsequent years, they experience outflows as they pay interest (property income outflow) and repay the debt (saving). The aggregate amount of property income outflows for consumer credit is measured by interest income outflows from households.

Most property income flows are between corporations or in NTA between the owners of those corporations. These flows have no discernible implications for the allocation of resources across age unless the age distribution of the owners of corporations that extend credit is different from the age distribution of the owners of corporations that demand credit. We know of no evidence that this is the case and, hence, we assume that the age profile of property income inflows and outflows between corporations are identical except for interest expense paid by households.

The detailed methods for calculating private asset–based reallocations aggregate controls (private asset income and private saving) are presented in chapter 4.

7.3. Constructing age profiles: private inter-household transfers and private asset income

7.3.1. Building the micro-level database

The process here is similar to that described in section 5.3.1. Ideally, the main household survey used to build the database includes all type of inflows, including components of private asset income and private inter-household transfer inflows. Expenditure items in the household survey should include gifts, charitable donations and other items that should be classified as private inter-household transfer outflows.

Household data rather than individual level data are required for inter-household transfers and private asset income, because all flows are assigned to the household head. The household head is assumed to own all household assets. All property inflows and outflows are assigned to the age group of the household head. Saving is also assigned to the head's age group. It is essential that every household have one individual who is designated as the household head.

The age patterns of transfer outflows are based on reported cash and in-kind payments, gifts and donations to persons outside the household. Examples include, but are not limited to,

- Congratulatory gifts
- Obituary money
- Farewell presents
- Regular/irregular donations
- Remittances[1]

1 Care should be taken to include only remittances that are transfers and to exclude remittances from residents temporarily working abroad. One approach would be to compare aggregate remittances with macro controls. If they exceed net transfers from the rest of the world, they should be scaled downward.

- Alimony and child support
- Tuition payments or other educational support for non-coresident children.[2]

The age pattern of transfer inflows is estimated using similar variables that capture cash and in-kind gifts and payments received by the household. The exact variables will differ from country to country.

Surveys usually report a value for the household that should be assigned to the household head. All non-heads are given a value of zero.

Private asset income age profiles are also based on household level data that are assigned to the household head while all non-heads are assigned a value of zero. Four variables are used:

1. Household property income (interest income, dividends and rent (income)). If available, separate values for each component should be included in the database. Values assigned to the head, with zero assigned to non-heads.
2. Household self-employment income. This is the same variable as used to construct the age profile for self-employment labour income, but the value for the household must be assigned to the head with zero assigned to all non-heads.
3. Household imputed rent. This is the rental value of owner-occupied housing for the household. It is assigned to the head with zero for all non-heads.
4. Household interest expense, including interest expense for mortgages, credit cards and loans to household-owned businesses. Value assigned to household head, all non-heads have a value of zero.

7.3.2. Constructing preliminary profiles for private inter-household transfers and private asset income

Preliminary age profiles for each of the inter-household transfer and asset income series are constructed by calculating the average value, using sample weights, for single-years of age.

The age profiles are smoothed using methods discussed extensively in chapter 3 and appendix B. A few points that are particular to inter-household transfers and private asset income are noted here.

Inter-household transfers are often very small in household surveys so outliers may have too much impact on the smoothed series. If so, outliers should be deleted.

Only household heads have non-zero values for inter-household transfers and private asset income. Do not include young ages with no household heads in the smoothing procedure. Ages with no heads should have a zero value.

7.3.3. Finalizing age profiles for inter-household transfers

In most instances aggregate controls for private inter-household transfer inflows and outflows cannot be constructed using SNA data. Private inter-household transfers equal to inflows less outflows must equal net private transfers from the rest of the world, however. Hence, the age profiles for inflows and outflows must be adjusted to insure that they conform to the macro control that private inter-household transfers equal net transfers from the rest of the world.

2 If children live in an independent household but receive support from parents for their education, NTA considers this an inter-household transfer. These payments can be difficult to detect in household surveys so, if higher education costs are large in your country, look for other sources of information about parental support for children's higher education.

The adjustment is carried out by using population data with the survey estimates of per capita inflows and outflows to calculate aggregate estimates of inflows ($TFBI_s$) and outflows ($TFBO_s$). Total private transfers based on survey estimates are given by $TF_s=TFBI_s-TFBO_s$ where the subscript s is used to indicate values based on the survey (or micro-level database). Four methods can be used to adjust the inflows and outflows to insure that the difference equals net transfers from the rest of the world TF:

1. Proportional adjustment: Adjusts inflows and outflows using the same scaling factor. Can only be used if TF and TF_s have the same sign.
2. "Split the difference" between inflows and outflows, adjusting one up and the other down by equal amounts.
3. Adjust inflows only.
4. Adjust outflows only.

The adjustment factors for each of the methods are reported in table 7.3.

Table 7.3.
Adjustment factors for private inter-household transfer inflows and outflows, four methods

	Proportional*	Split the difference	Inflows only	Outflows only
Inflows	$\frac{TF}{TF_s}$	$1+\frac{TF-TF_s}{2TFBI_s}$	$\frac{TF+TFBO_s}{TFBI_s}$	1
Outflows	$\frac{TF}{TF_s}$	$1-\frac{TF-TF_s}{2TFBO_s}$	1	$\frac{TFBI_s-TF}{TFBO_s}$

* The proportional method is valid only if TF and TF_s have the same sign.

The results from the alternative methods are demonstrated using illustrative values in tables 7.4 which show the input data, aggregate inflows and outflows based on the survey data and the aggregate controls on private transfers, net private transfers to ROW.

Table 7.4.
Unadjusted aggregate private inter-household transfers

	Survey	Control
Inflows (*TFBI*)	160	
Outflows (*TFBO*)	200	
Net flows from ROW (*TF*)	–40	–20

The adjustment factors and aggregate inflows and outflows, estimated using each of the four methods are reported in table 7.5.

The decision on which method to use should be based on the team's knowledge of data quality and whether the inflow or outflow side is suspected to be over- or underestimated. Private transfer control totals can be compared to outside estimates of remittance flows for guidance on making a reasonable adjustment.

The methods described can result in very different outcomes if the difference between TF and TF_s is large. Thus, care should be exercised in selecting a method. If one of these methods yields a negative adjustment factor, then a different method must be used. If there is no outside information to indicate that one strategy of adjustment is the best choice, then the adjustment method that results in the smallest total adjustment is preferred.

Table 7.5
Adjusted aggregate private inter-household transfers

	Proportional	Split the difference	Inflows only	Outflows only
Adjustment factors				
Inflows	0.5	1.0625	1.125	1
Outflows	0.5	0.95	1	0.9
Adjusted aggregate private inter-household transfers				
Inflows (TFBI)	80	170	180	160
Outflows (TFBO)	100	190	200	180
Net flows from ROW (TF)	–20	–20	–20	–20

Given a final decision about adjustment approach, the adjustment factor is used to compute the final age profiles for private inter-household transfer inflows and outflows. Private inter-household transfers are calculated as private inter-household transfer inflows less private inter-household transfer outflows for each age. Aggregate age specific flows are calculated as the product of the population and the per capita flow for each age.

7.3.4. Private asset income

Private asset income consists of capital income and property income. In NTA, capital income is net of capital consumption and includes taxes on products attributed to capital income. Three kinds of capital income are distinguished, in part because they have different age profiles as reported in table 7.6. Capital income of corporations is assigned to age based on the age profile of property income (dividends, interest income and rent). The private income that accrues to owners of the home in which they reside are assigned using imputed rent by age of head. The final component is the share of mixed income attributed to capital which is allocated using the age profile of self-employment income by age of the household head.

Table 7.6.
NTA profiles and age profile indicators for private asset income

NTA profile and macro control	Age profile indicator
Private capital income	**na**
Private capital income, corporations and NPISHs	Dividends, interest and rent
Private capital income, owner-occupied housing	Household imputed rent
Private capital income, share of mixed income	Household self-employment income
Private property income	**Na**
Private property income inflows	Dividends, interest and rent
Private property income outflows	Na
Consumer credit	Household interest expense
Other private property income outflows	Dividends, interest and rent

Note: na = not applicable; age profile is constructed from its components.

Property income inflows are allocated using the pattern of dividends, interest income and rent. Two kinds of private property income are distinguished. Consumer credit outflows are allocated by age using interest expense of the household including mortgage interest. Other property income outflows are allocated by age using dividends, interest income and rent.

The choice of profiles requires some explanation. Other than inflows and outflows associated with consumer credit, property income inflows and outflows are dominated by flows between firms, not between firms and consumers. The appropriate age pattern for these commercial flows is the age profile of dividends, interest and rent used as a proxy for credit and equity interests held in corporations by residents of the country. The implication of this approach can be seen in the case where all capital income of corporations is distributed to the individuals who own shares or who have extended credit to the corporate sector. The property income outflows from the owners or the corporation and the property income inflows are identical and lead to no intergenerational reallocations. The age groups of owners of firms do receive the capital income of corporations and this may be an important asset-based reallocation. The age pattern of interest payments by households may be very different than the age pattern of owners of firms who extend credit to consumers. Consumer credit will include interest payments on credit card debt, home mortgages and other debt incurred by households.

Private asset income components are finalized using the standard method of scaling the age profile indicator so that the aggregate flow matches the macro control.

Higher-level aggregations are calculated as follows:

- Private capital income is the sum of its components;
- Private property income outflows equals consumer credit plus other private property income outflows;
- Private property income equals private property income inflows less private property income outflows;
- Private asset income equals private capital income plus private property income.

7.4. Constructing age profiles: private intra-household transfers

7.4.1. The sharing model

Intra-household transfers are imputed using estimates of what each member needs to support his or her consumption and the resources that each member has to meet those needs. Members who have resources insufficient to meet their needs must rely on other household members with more than enough to satisfy their own needs. Implementation requires detailed sharing rules including rules about the treatment of asset-based reallocations.

By assumption, as explained earlier, all assets are owned by the household head and all asset-based reallocations flow to and from the household head. This has a number of implications for intra-household transfers. Among them is the treatment of flows from owner-occupied housing. The asset income associated with that flow accrues to the household head. The household head makes an intra-household transfer to other household members equal to the value of their consumption of owner-occupied housing.

For private consumption excluding the consumption of owned housing, intra-household transfers are estimated as the balancing item between private consumption excluding owned housing and disposable income (labour income plus net private inter-household

transfers plus public cash transfer inflows less taxes paid).[3] Household members with a deficit (disposable income less than private consumption excluding owned housing) receive transfers from household members with a surplus (disposable income greater than private consumption excluding owned housing). If disposable income is insufficient to fund the consumption, the household head makes additional intra-household transfers, funded by asset income or, if asset income is insufficient, by dissaving. If disposable income is more than sufficient to fund household consumption, the surplus of non-head members is transferred to the household head and saved.

Net intra-household transfer estimates are only as accurate as the estimates from which they are constructed—private consumption and the components of disposable income. Moreover, assigning assets and asset income to the household head has important implications for the calculation of net transfers. Non-head members with a deficit draw on the assets of the head to support current needs. Non-head members with a surplus cannot save, but rather transfer their surplus to the head to be saved. The methods described here allow us to construct separate estimates of these flows which are useful for judging their potential importance.

The methods described here make additional assumptions to allow more detailed estimates than required for the construction of net inter-household transfers. First, intra-household transfer inflows and outflows are constructed by assuming that no individual within the household has both inflows and outflows with one exception: a household member may have current transfer outflows and a transfer inflow from the household head for the consumption of owned housing, because the head is assumed to own the home. To the extent that household members actually have both current transfer inflows and outflows, the estimates produced by these methods will understate gross inflows and outflows, but not net flows.

Second, we construct estimates of intra-household transfers by function, based on what sector of consumption is being funded: education, health, or other. To do so, we assume that the size of the sector-specific intra-household transfer inflow is proportional to sector-specific consumption by the individual receiving the transfer. Hence, in these calculations we do not incorporate the possibility that intra-household transfers are targeted by particular individuals at particular sectors. For example, there is no scenario where father pays for education consumption out of his income while mother pays for health-care consumption out of her income. They pay for all needs proportionally.

Third, we construct estimates of joint age distribution of inter-household flows by assuming that the proportion of flows received from any age group depends only on the contribution of that age group to the total flow. In other words, there is no age targeting within the household. There is no scenario in which a grandparent would receive transfers only from his adult children while a child in the household would receive transfers only from his older working siblings. Instead, all those with surplus pay for all needs proportionally.

7.4.2. Preparing the micro-level database

If the micro-level database incorporates life cycle, public age reallocations and inter-household transfer variables, no additional data preparation is needed to calculate intra-household transfers. Before implementing the intra-household transfer calculation algorithms, though, verify that these requirements are met in the micro-level database:

3 The use of the term "disposable income" here is only meant as the sum of the NTA flows mentioned. Surveys or national accounts use the term to mean different flows.

1. Each household has one and only one household head.
2. Consumption values are all positive.[4]
3. The following unsmoothed individual-level input variables are available and have been adjusted to match aggregate controls: labour income, private consumption by purpose (owner-occupied housing, education, health and other), public cash transfer inflows, taxes including taxes on products and production, and private inter-household transfers.[5]

7.4.3. Creating individual-level private intra-household transfer inflows and outflows

The algorithm for calculating intra-household flows is complex. It is described in this section in detail. It is also presented in mathematical notation in appendix F. Stata code for implementing the algorithm appears in the Stata code appendix (appendix D, section 2.3). That code gives calculations for the inflow and outflow age profiles. Appendix F also includes Stata code to implement an extended algorithm to calculate the complete matrix of intra-household transfers to one age group from another. In aggregate form, the NTA age profiles for intra-household inflows and outflows are the marginal totals of this matrix. Theoretically, all transfer inflows and outflows have a complete to age/from age matrix, but we do not have data detailed enough to calculate the matrix through observation. It is only in the case of intra-household transfers that we have a model of sharing that allows for the calculation of the full matrix.

Transfers for consumption of owner-occupied housing

Transfers for the flow of services from owner-occupied housing are an outflow from the household head and an inflow to non-heads. The inflows to non-heads are equal to the consumption by each non-head of owner-occupied housing; for non-heads, no outflows arise from owner-occupied housing. The outflow for the household head is equal to the total consumption of owner-occupied housing by non-head members.

Transfers for private consumption excluding owner-occupied housing

Computing transfers for this type of consumption proceeds in four steps. First, compute the current surplus or deficit for each household member, including the household head, and for all members combined. A household member has a current surplus if his or her disposable income is higher than private consumption excluding consumption of owner-occupied housing; otherwise a deficit. Disposable income is defined as labour income plus net private inter-household transfers plus public cash transfer inflows less taxes paid including taxes on products and production (indirect taxes). The household surplus is equal to the sum of the individual surpluses; the household deficit is the sum of the individual deficits. A shortfall exists for a household if the total deficit exceeds the total surplus. If there is a shortfall, the household head must fund it using asset income or, if asset income is insufficient, by dissaving.

4 Negative values can arise when model-based estimation is used.

5 This should NOT include the public transfer surplus/deficit, however.

Second, calculate a household specific "tax rate". This flat-rate tax is imposed on the surplus income of each member and the taxed surplus is transferred to support current consumption of members with a deficit. By assumption, the tax rate varies across households but is identical for all members of a household with a surplus. A flat-rate tax for household *j* is calculated as min(1,household deficit/household surplus).

Third, calculate intra-household outflows for current consumption. The current intra-household transfer outflow for non-heads is equal to the tax rate times the surplus. For heads the outflow is the tax rate times the surplus plus any shortfall that the head must fund using asset-based reallocations.

Fourth, calculate the intra-household inflows and outflows for current consumption by function (i.e., education, health, other). The current intra-household transfer inflows to non-heads for each current consumption function are proportional to that individual's current consumption of that function. For heads, the calculation is similar except that the head may have to finance his or her own deficit through dissaving or asset income, which would not be recorded as a transfer. For example, education transfer inflows for a household head are calculated by a formula, (education consumption/total current consumption) times max (0, deficit of head – shortfall of household). Current transfer outflows from individual *i* for each current consumption function are proportional to the total household inflows to each sector.

Transfers of remaining surplus to household head

Any surplus held by non-heads that is not taxed for consumption transfers is transferred to the head to be saved. The head receives any surplus that is not transferred to other household members.

Once the transfer variables have been constructed, a check on the calculations is that total intra-household transfer inflows must equal total outflows for each sector for each household and in aggregate. After all checks have been completed, tabulate by age to construct the age shape.

7.4.4. Adjustments to the micro-level database when data are from multiple surveys

The methodology for intra-household transfers just presented in section 7.6.3 gives accurate estimates of the inflows and outflows when all profile information comes from one survey. In many cases, however, different data sources for different items are necessary and the micro-level database is built up by merging the macro-adjusted age means from the alternate source onto the micro-level database. Using the intra-household transfer algorithm in this case biases the inflows and outflows toward zero, but not the net flows. The bias is not large if the variables merged onto the micro-level database are small compared to the variables in the core survey. For example, if net private inter-household transfers is the only missing variable from the main survey that the micro-level database is built from, the effect on the estimates of using imputed age mean values will be quite small. If labour income is missing, however, this bias towards zero can be large, and result in large sections of the inflow and outflow profiles equaling zero. One way to deal with this is to identify a proxy variable in the main survey that is related to the missing variable. This proxy variable is adjusted so that its age-specific mean and variance is the same as the

age-specific mean and variance of the missing variable. Then the intra-household transfer algorithm uses this adjusted proxy variable instead of just imputed age means.

For example, perhaps complete labour income data is missing from the main survey that the micro-level database is built on (call this survey dataset "M" for main survey), but it does have a variable called "wages" which has somewhat reasonable data, but is known to be of poor quality. Instead of using the poor quality wages data for the labour income profile, labour income is estimated using a better income survey (call this survey "A" for age-specific). If I merge the age-specific, control-total-adjusted means from survey A onto survey M and calculate intra-household transfers, it is likely that it will look like there are small, if any, transfers between spouses. This is because spouses tend to be close in age, and will be assigned similar levels of labour income and it will look like each spouse has plenty of income to cover his or her consumption needs. Instead, use "wages" as a proxy variable in survey M to make the labour income profile from survey A vary by something other than age:

- Calculate the age profile of labour income from survey A and adjust it to the proper control total. This age profile is referred to here as $E(a_x)$ where x is for age and a indicates it is the age profile from survey A. Save the adjustment factor.
- Go back to the individual-level data from survey A and apply the control total adjustment for labour income to the labour income variable. Calculate the age-specific standard deviation at each age. This standard deviation profile is referred to $SD(a_x)$.
- Go to the micro-level database and calculate age-specific mean and standard deviation at age x for the proxy variable from survey M, $E(m_x)$ and $SD(m_x)$ respectively. (The $E(x)$ notation is from the concept of the mean as the expected value.)
- Then, adjust the labour income proxy ("wages") from survey M in the micro-level database—refer to this as $m_{j,x}$ where m is the proxy variable for person j who is age x—as follows:

$$\hat{m}_{j,x} = \frac{SD(a_x)}{SD(m_x)}\left(m_{j,x} - E(m_x)\right) + E(a_x) \tag{7.1}$$

The adjusted $\hat{m}_{j,x}$ data will have age-specific mean and standard deviation equal to $E(a_x)$ and $SD(a_x)$ but is at the micro-level of dataset M.

One additional modification to $\hat{m}_{j,x}$ is necessary. If any $SD(m_x)$ is zero or even very small, then there is either very little variance at that age group, or the proxy is not very good at estimating variability within that particular age group. If $SD(m_x)$ is zero or small for all age groups, then the variable is not a good proxy for any age group. If it is true for just some age groups, then for those age groups let $\hat{m}_{j,x} = E(a_x)$. What constitutes a very small $SD(m_x)$ will vary depending on the units of mj,x so some data exploration of the $SD(m_x)$ will be necessary. After this last correction, the $\hat{m}_{j,x}$ data can be used in the intra-household transfer calculation because it varies by age and represents the labour income distribution within the household.

One word of caution: estimates that come from mixing different surveys cannot be used to calculate profiles for sub-types of households where the original profiles might be different by subtype. For example, if we wanted intra-household transfer profiles by education of household head, we could not just apply the overall average profiles to different households. There is probably an interaction between education and the shape of the original profiles that would not be incorporated into the estimates, yielding inaccurate results.

7.4.5. Finalizing age profiles for intra-household inflows and outflows

The matrices of inter-household transfers are most naturally expressed using aggregate rather than per capita values because the flows involve two age groups—those of the sending population (with outflows) and those of the receiving population (with inflows). The aggregate intra-household transfer matrix for Japan in 2004 is shown in table 7.7 using very broad age groups. The matrix is available by single-year of age. These values combine transfers for all purposes. In addition, the transfer matrix can be constructed by purpose: transfers for education, health, other consumption and transfers to the head for saving.

Table 7.7.
Aggregate intra-household transfers for broad age groups, Japan, 2004 (*trillions of yen*)

Outflows from residents in age group	Inflows to residents in age group: 0-24	25-59	60+	All ages	Per capita outflows
0-24	0.5	0.3	0.1	0.9	28.1
25-59	53.5	51.1	11.2	115.8	1,869.9
60+	2.6	17.6	26.8	47.0	1,402.4
All ages	56.6	69.0	38.1	163.7	1,282.4
Per capita inflows	1,756.6	1,114.8	1,136.3	1,282.4	

Note: Per capita values are thousands of yen.

Inflows from all ages and outflows to all ages are the series reported in the basic NTA accounts shown in chapter 2. The aggregate from 0-24 year olds is recorded in the "All ages" column and the aggregate values in the "Per capita outflows" column calculated by dividing the values in the "All ages" column by the population in that age group. Similarly, the aggregate and per capita inflows are by age received from all household members are reported in the final two rows of table 7.7.

7.4.6. Smoothing per capita values

Smoothing is covered extensively in chapter 3 and appendix B. A few points that are particular to intra-household transfers are noted here.

For intra-household transfers, be careful about abrupt "elbows" related to life transitions that the smoother may smooth through. For example, if home-leaving by the young is concentrated at a particular age, intra-household inflows for young people may peak right before this age and decline steeply for the next age. These patterns should not be smoothed away. You can verify a change by examining the household structure of persons in the ages right around the abrupt change. If the sharp change coincides with a sharp change in household structure, keep it in your smoothed profile by smoothing in sections, split at the peak change age.

Also, if there are ages in the "ingredient" profiles that go into the intra-household calculation that received special smoothing treatment, that treatment should be carried through in the smoothing of the intra-household transfer profiles. For example, we usually do not smooth education consumption. Therefore, the intra-household transfers that pay for private education consumption should not be smoothed either. Similarly, if there is an abrupt elbow of increasing labour income at the end of schooling ages, the intra-household outflow profiles should not feature much smoothing for the "elbow" ages. See appendix B for details and examples.

7.4.7. Adjusting to the macro control

The intra-household methodology results in net aggregate intra-household transfers of zero, both overall and for transfers classified by purpose or function. Everything balances in the survey population—total inflows equal total outflows for each type of flow and for all flows combined. However, the national population will often have a slightly different age distribution than the survey population. If this is the case, in applying the total population to transfer profiles, the aggregate inflow/outflow balance is lost. Smoothing will also alter the exact inflow and outflow balance. While the differences caused should not be large, we do need inflows and outflows to balance exactly for the entire population. So, we apply a final small multiplicative adjustment to intra-household gross flow components. While there are several ways to do this, the most straightforward way is to adjust only the outflows to match the inflows. That is, the multiplicative adjustment factor on outflows is the ratio of aggregate inflow to the aggregate outflow, times negative one. Mathematically, if O_{agg} is aggregate outflows for some type of transfer profile and I_{agg} is the inflow, the multiplicative adjustment factor on outflows, O_{adj}, is calculated as follows:

$$O_{adj} = \frac{I_{agg}}{O_{agg}} \tag{7.2}$$

This way our accounting identities are preserved and all flows balance. As mentioned previously, this adjustment should be very small. Note that you must adjust the lowest-level profiles first, and then sum those adjusted profiles to higher-level profiles.

If the difference does turn out to be very large, there may be a problem with the implementation of the methodology or the survey. If the adjustment factors are larger than 1 to 2 per cent, check whether you are implementing the methodology correctly and whether your survey population is a good representation of the national population.

7.5. Constructing age profiles: private saving

Private saving is the final balancing item in NTA. The calculation follows directly from the basic flow identity used in NTA. Saving and private saving can be calculated directly by:

- Saving = labour income + asset income + transfers – consumption;
- Private saving = saving – public saving.

These identities hold for the economy as a whole and at each age both for aggregate and per capita values. The calculation is done using profiles adjusted to match macro controls. Unsmoothed saving is produced if unsmoothed profiles are used, and a smoothed saving profile is generated by using smoothed profiles in the calculation. No further smoothing is appropriate nor should it be necessary to adjust the profiles to match the aggregate controls. If aggregate private saving does not closely match its macro control calculated from SNA (see chapter 4), there has been an error in implementation.

7.6. Final evaluation

Evaluation of private reallocation age profiles share many facets with the evaluation of other age profiles discussed in chapters 5 and 6. Here we include checks specific to private reallocations.

7.6.1. Consistency

- Are aggregate net intra-household transfers zero?
- Are aggregate net inter-household transfers equal to total private transfers?
- Does the flow identity (consumption – labour income = transfers + asset income – saving) hold in the aggregate and for all age groups?

7.6.2. NTA values for children

One excellent way to evaluate private reallocation calculations is to examine the results for young children. Children who are too young to be a household head should not have flows that are limited to household heads by assumption. Hence, private inter-household transfers, private asset income and private saving should be close to zero. Because of the accumulation of estimation errors, though, it is very common for the private saving profile for children to have small values of saving or dissaving. Check this amount against their total consumption. It should be relatively small, less than 1 or 2 per cent. Labour income should also be zero for young children and, because their asset income is also zero, their consumption is covered exclusively through public and private transfers. For children too young for school, private transfers from parents should be large relative to public transfers. This can be a very good check on whether the implementation of the private transfer algorithm is correct.

7.6.3. Are the estimates reasonable?

Check the following aggregate measures against other countries in the NTA database:

- Aggregate transfers relative to national income
- Aggregate asset income relative to national income
- Aggregate asset income of different types relative to total asset income
- Aggregate inter-household transfers relative to intra-household transfers.

Being an outlier does not necessarily mean that the values are incorrect. However, it is critical to understand how special features of the public and private institutions in a country account for any distinctive features. If there are no major institutional differences, being an outlier on one of these measures may indicate a problem with the calculations.

7.6.4. External validity checks

Where possible, confirm aspects of the inter-household transfer profiles with outside research. For example, in countries with specialized surveys on older persons, there is often literature on the size and frequency of transfers to or from the elderly. Check any published work to see if the NTA profiles find transfers in roughly the same annual amounts. A critical distinction between NTA and many other studies is that NTA values are averages and can be very different that the results of surveys that may emphasize the typical person or household.

Note also that the saving profiles of NTA are private saving profiles and not profiles of household saving which are much more widely reported in the literature. In order to compare these, it is necessary to construct household saving for NTA.

7.6.5. Private saving estimates and the accumulation of all prior errors

The private saving profiles should be carefully scrutinized. Do they suggest errors in prior age profile estimates, such as bumps from a smoothing mistake, or excessive saving or dissaving by children? If so, underlying calculations may have errors.

It is particularly important to evaluate the smoothing of all of the lowest-level age profiles to make sure that no over- or under-smoothing is obvious. Inconsistent smoothing can also generate peculiar trends in the saving profile. If, for example, income components are not smoothed near retirement age, but consumption is smoothed, the saving profile may exhibit discontinuities unrelated to the observed data. Careful visual inspection is critical as there is no mathematical algorithm that can incorporate every age-specific phenomenon in NTA.

Appendices

Appendix A

Population data

A.1. The role of population data in NTA

While most NTA calculations focus on estimating age patterns and adjusting national accounts into NTA macro controls, population data is crucial to final age profiles. They allow us to compute accurate aggregate profiles, and thus make the right macro adjustment. For this reason, it is important that our population data be accurate. Researchers should get the most recent vintage of estimates from the time period they are estimating NTA, either from their country's statistical office or from the United Nations World Population Prospects estimates (see chapter 3 for the United Nations online data location). Do not use population counts or age distributions calculated from survey respondents or survey weights, as these will have sampling noise and may not be representative of the entire population.

A.2. Evaluating population data

First of all, check that the total population matches closely with some other estimate of the total population of the country. If the total is not close to other estimates, you may be using population data for only part of the country or for a subpopulation, or you may have data for a different time period than you intended.

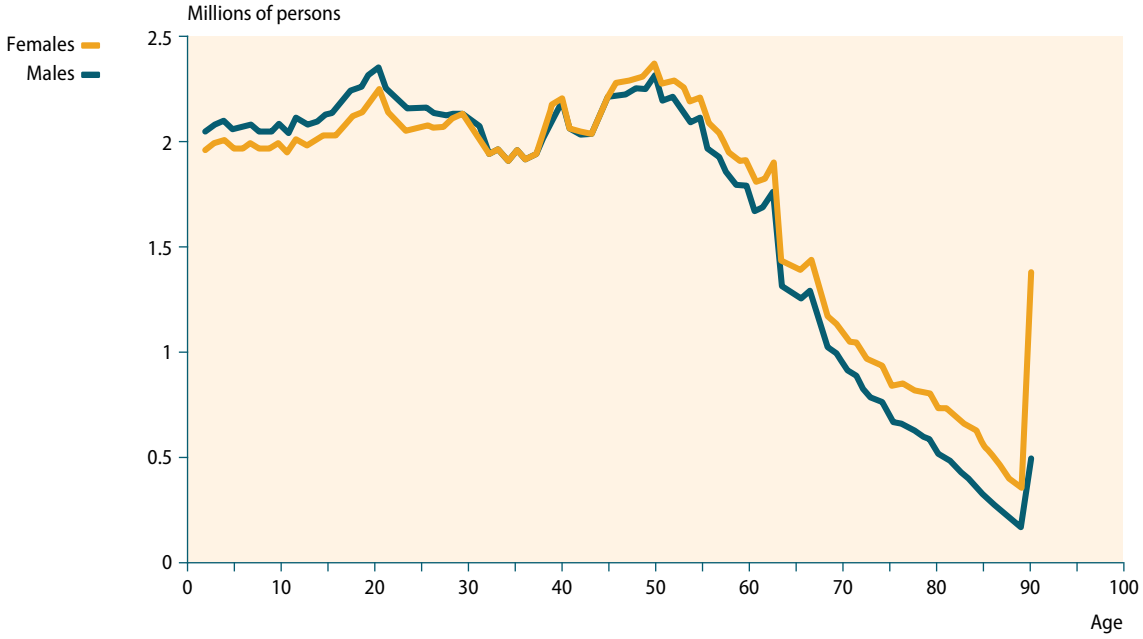
Next, visual inspection of plots by age and sex are the easiest way to determine if your population data has any problems. If you have a Stata file called "pop.dta" with population counts for men and women in variables called "males" and "females" by the variable "age", for example, the following Stata command produces the desired plot:

- Use pop, clear
- Replace females=females/1000000
- Replace males=males/1000000
- Twoway line males age || line females age, title("Population by Age and Sex") xtitle("Age")ytitle("Millions of Persons") legend(label (1 Males) label (2 Females))
- Graph export pop.png, replace

The resulting graph looks like figure A.1., here shown for the United States in 2009.

A few things appear here which are common for a contemporary low mortality population. At youngest ages, there are more males than females, while at oldest ages this pattern is reversed. There are sharp peaks and valleys along the age distributions, there is no obvious evidence of age heaping—the tendency of people to report ages as a round number, resulting in "heaps" at ages ending in 0 or 5—except possibly at age 60. These population counts have an open ended age category of 90+, which does help a bit with the age heaping, as it is more common the higher you go in the age range. There are methods to correct for the age mis-

Figure A.1
Population by age and sex, United States, 2009



reporting that causes age heaping, but, for NTA purposes, it is preferred that the researcher substitute United Nations estimates which have implemented some of these methods.

So, in evaluating population data, researchers should ask the following questions:

1. Is the population total in the range of other estimates?
2. Does the age distribution look plausible, without evidence of systematic age heaping?
3. Are the sex ratios in my population consistent with the sex differences in mortality, i.e., if mortality rates are higher at older ages for men than women, do I observed more women than men at oldest ages?

If the answer to all of these questions is yes, then the population data in question is reasonably accurate. If not, you should probably use data from the United Nations World Population Prospects database instead.

Finally, when the team gets to the point of estimating multiple cross-sections, then evaluation of the population should be made not examining age at one time, but also plotting the cohort size over its life course and the age group over repeated cross sections in time. Any irregular patterns could indicate that the population data from one or more of the time points is faulty.

Appendix B

Smoothing

B.1. Review of the role and rules of smoothing in NTA

The per capita age profiles are noisy, particularly at ages with relatively few observations, and, except as noted below, should be smoothed. The following guidelines should be followed:

- Education profiles should not be smoothed.
- Basic components should be smoothed, but not aggregations. For example, private health consumption and public health consumption profiles should be smoothed, but the sum of the two should not be smoothed.
- The objective is to reduce sampling variance but not eliminate what may be "real" features of the data. For example,
  - Some flows may change dramatically when individuals reach an age to qualify for a government programme, e.g., those age 65 and over qualify for government pensions or health benefits. This kind of feature of the data should not be smoothed away.
  - Due to unusual high health consumption by newborns, we tend not to smooth health consumption by age 0. This could be done by including estimated unsmoothed health consumption by newborns to the age profile of smoothed private health consumption by other age groups.
  - Only adults (usually ages 15 and older) receive income, pay income taxes and make familial transfer outflows. Thus, when we smooth these age profiles, we begin smoothing from the adult ages, excluding those younger age groups who do not earn income.
- Problems arise when some age group may appear to have negative values for a variable that is not supposed to be zero. This could be solved by replacing the negative by the unsmoothed values for the beginning age group. Alternately, the smoothing procedure could be done on the log of the data and then exponentiated after smoothing, which would produce a smoothed curve with no negative values, but you must make sure no zero values are included before taking the logs.

B.2. Preferred smoothing method—Friedman's SuperSmoother in R

Many software packages are available for smoothing and we have found these to vary considerably in their reliability. We recommend using Friedman's SuperSmoother (supsmu function in R) to smooth the sample-weighted per capita profile, incorporating the num-

ber of observations as weights. This solves the problem of two types of weights: we need sample weights to get accurate averages from our survey, and we want the smoothing procedure to give a greater weight to age-averages based on more observations and a lesser weight to age-averages that are based on just a few observations. The R procedure described below incorporates both of these weights in a straightforward way, so that is the procedure preferred by NTA. An alternative but less preferred method is discussed below.

The procedure for using the SuperSmoother is as follows:

1. Create a delimited text file with three columns: [1] age, [2] the unsmoothed profile average value for each age[1] and [3] the number of observations for each age average. This can be done by making a spreadsheet that looks like this, for the profile "cfx",[2] as an example:

age	cfx	obs
0	4,303	403
1	4,602	398
2	5,079	403
3	4,867	387
4	5,107	383
5	5,756	384
6	6,463	386
7	6,508	395
8	6,441	401
9	6,885	405
10	7,781	413
.	.	.
.	.	.
.	.	.
90	13,244	169

   Save this spreadsheet in comma-delimited format (the ".csv" file extension).

2. The second step is to write and run an R program containing the "supsmu" command. R is free and publicly available. It can be downloaded from the R project (http://www.r-project.org/).[3] Suppose that "cfx_unsmoothed.csv" is the file name you gave to the file created in step 1. Then the R programming code, with comments denoted by "#" and the assignment operator "<-", is:

   ```
   #Read in data and save in object called "nta":
   nta<- read.csv("cfx_unsmoothed.csv",header=T)
   ```

1 These should be computed using survey weights, if they are provided with your survey.

2 The age profile CFX is for private consumption other than health or education.

3 The information here is enough to let you perform the smoothing tasks without knowing any more about R. However, if you are interested in learning more about R, there are excellent resources online to help you. Try the "Class notes" link on this page: http://www.ats.ucla.edu/stat/R/. Here are presentation slides discussing R and comparing R syntax directly to Stata: http://dss.princeton.edu/training/RStata.pdf.

```
#Smooth data using the default span "cv" (cross-validation), save results in
      object called "test":
test<- supsmu(nta$age,nta$cfx,nta$obs,span="cv")
#Write data to a text file called "cfx_smoothed.csv":
write.csv(test,"cfx_smoothed.csv")
#Evaluate smoothing by plotting smoothed and unsmoothed values:
plot(nta$age,nta$yl)
lines(nta$age,test$y)
```

3. Evaluate the plot and adjust the smoothing. Is the smoothed series adequately representing both the key features and important details in the unsmoothed series? Is it over-smoothing some real patterns? (The default "cv" smoother setting produces very smooth patterns and is unlikely to be under-smoothing, so over-smoothing is more of a concern. If there is a problem with smoothing, it can be addressed in different ways depending on the nature of the problem:
   a) Over-smoothing through an elbow-shaped bend at the youngest or oldest ages? Then exclude those ages from the smoothing routine.
   b) Over-smoothing through real discontinuities in a small number of adjacent age groups?[4] Then replace over-smoothed values with unsmoothed values for problem ages. (This can be done in Stata when the R results are read back into Stata). Or smooth in separate age ranges, before and after discontinuity.
   c) Over-smoothing through overall patterns: change the default span value from "cv" to something numeric. This shrinks the span over which the smoother works and produces less smoothed curves. Start with 0.3 and reduce as necessary, reviewing the plot after each change until the smoothing looks correct.

   Each of these cases is discussed, with examples, below.

This three-step procedure can be done after estimating each profile, or done in batches with a group of profiles at a time. There is code in appendix D that shows how to automate the smoothing in R from within a Stata program, if you can run "shell" commands from within Stata.

B.3. When to change the default smoothing procedure

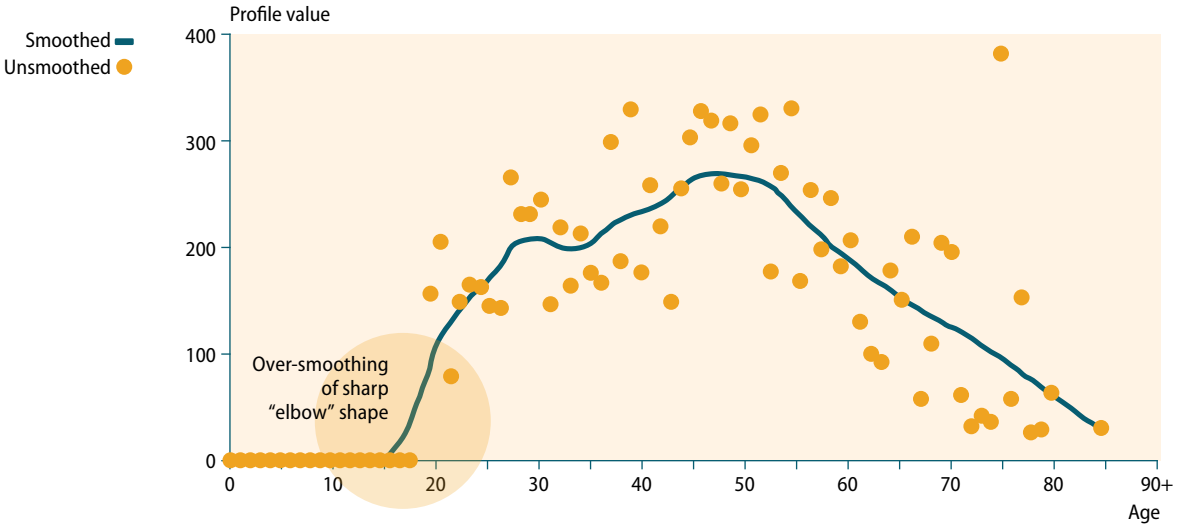
This section shows several examples of times when visual inspection and understanding of the institutional setting of the country would lead you to alter the smoothing procedure. All examples are from the United States and profiles are not adjusted to macro controls or annualized.

Over-smoothing through elbows

This first plot shows the unsmoothed and smoothed age means for the consumption of tobacco, with the default span "cv" and smoothing over all ages:

4 There are many examples of this: high health consumption for newborns; large changes at initial ages of qualifying for a government programme; changes based on age-concentrated life transitions like leaving the parental home.

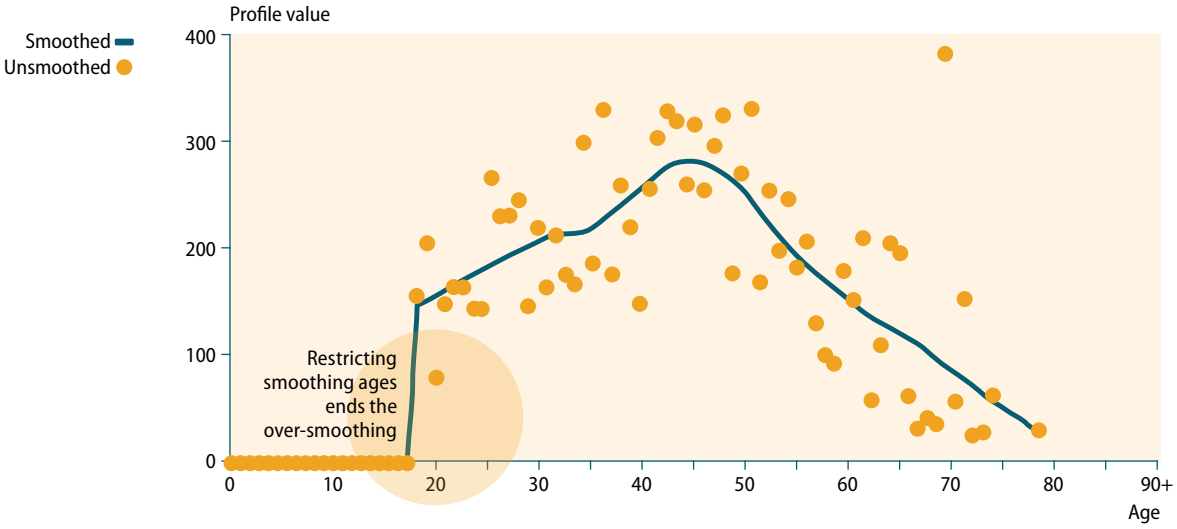
Figure B.1
All ages included, span=cv



With this variable, the allocation was to ages 20+ only, creating all of the zeros in the unsmoothed age profile below age 20. If the zeros are included in the smoother, the "elbow" from ages below 20 to 20+ is smoothed over, creating non-zero values where there should be zero values.

Instead, change the smoothing procedure so that it only includes the unsmoothed means for ages 20+:

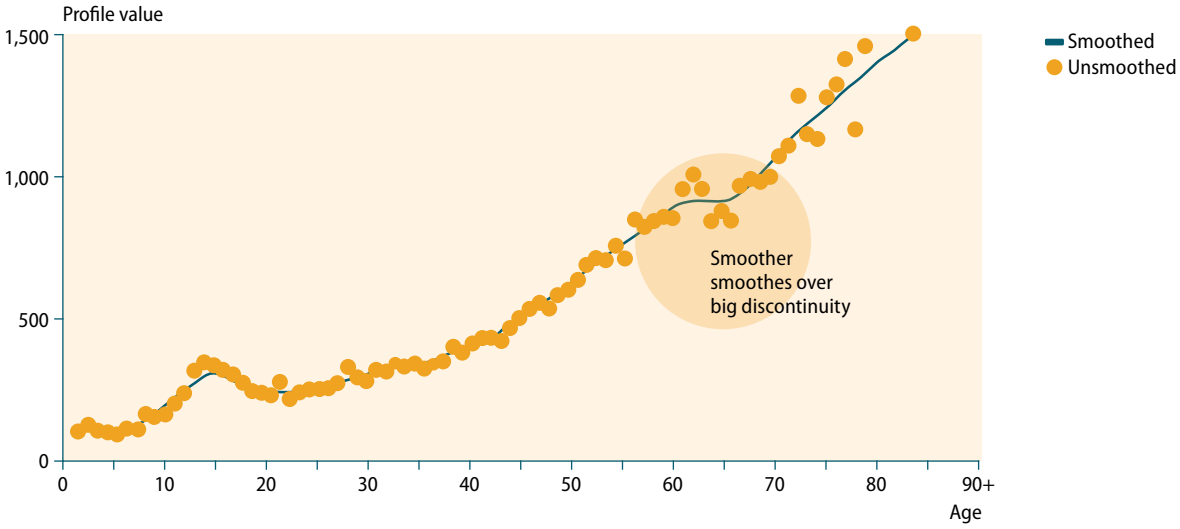
Figure B.2
Smoothed over ages 20+ only, span=cv



Over-smoothing through real age discontinuities

This first plot shows the unsmoothed and smoothed age means for the consumption of health care (excluding nursing homes) paid out of pocket, i.e., not by health insurance or the government. It has the default span "cv" and smoothing over all ages:

Figure B.3
All smoothed values, span=cv

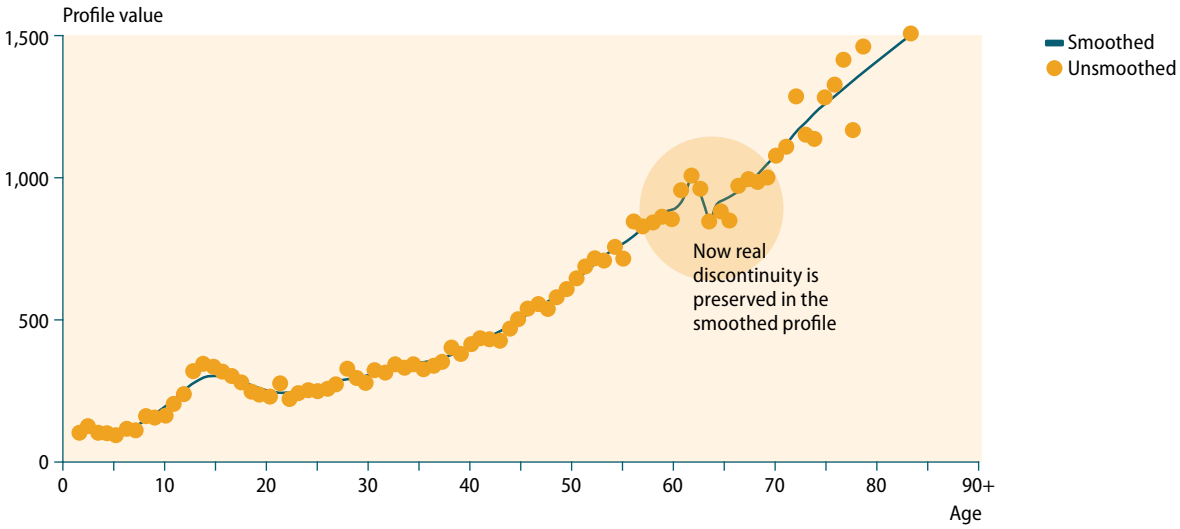


The smoother here is smoothing out a real pattern. In the United States, older persons become eligible for Medicare health insurance coverage at age 65. In advance of age 65, out of pocket costs tend to spike because people are becoming older and sicker, but they also try to delay treatment until they are eligible for Medicare. This can sometimes lead to minor health situations turning into costly emergencies. After turning 65, many of these costs are assumed by the Medicare programme, so the out of pocket amounts drop steeply. (They continue to climb thereafter, with aging.)

Here is the same plot with the unsmoothed values at ages 64-66 substituted for the smoothed values:

In the example above, the discontinuity problem was solved by replacing smoothed with unsmoothed values for a few ages. An alternative to this method is to smooth in sec-

Figure B.4
Unsmoothed values for ages 64-66, span=cv

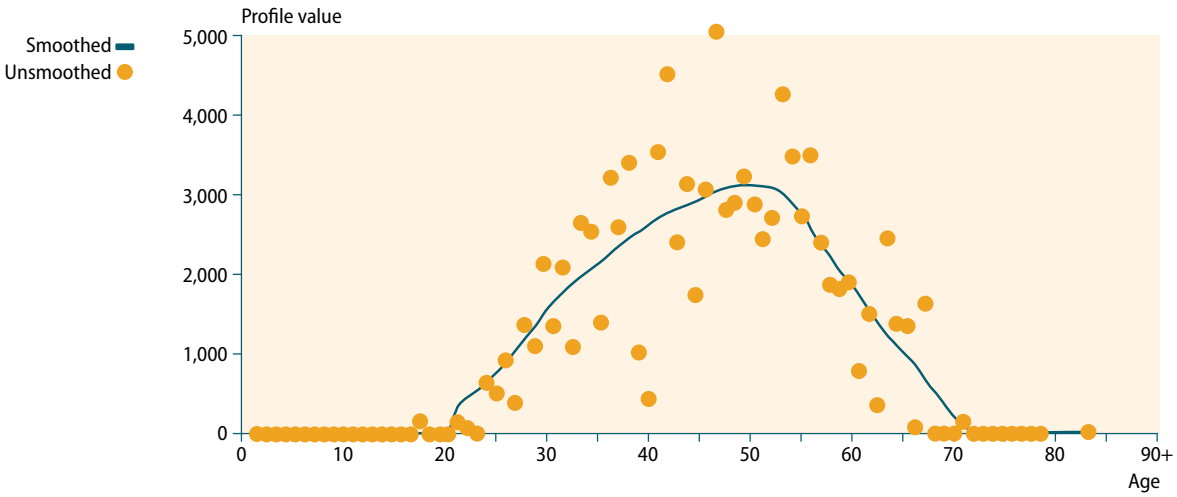


tions: one smoothing procedure is used for ages 0-65 and another for ages 65+. Then the two smoothed series can be joined at age 65 by taking the average of the two smoothed values.

Over-smoothing through larger patterns

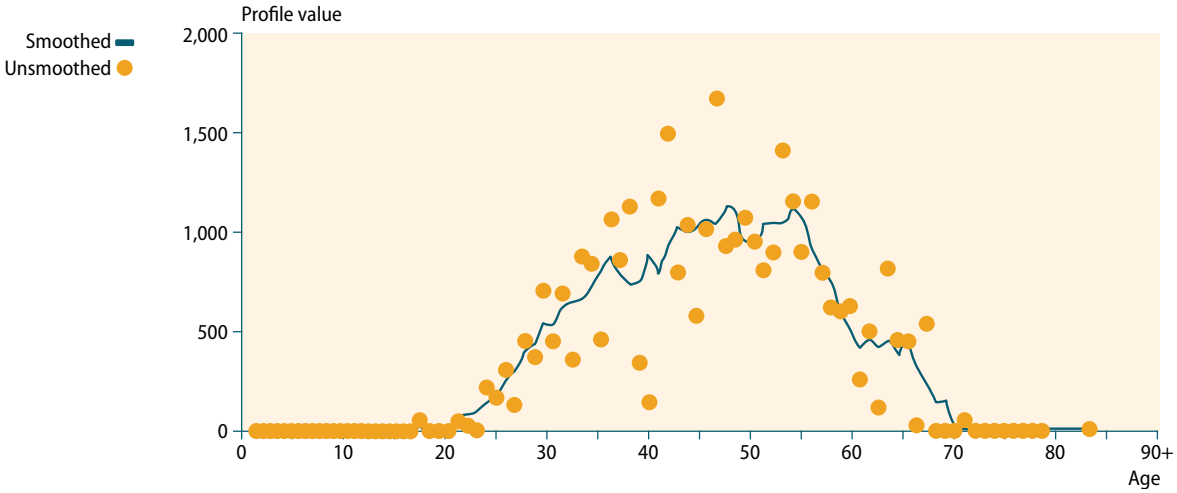
This first plot shows the unsmoothed and smoothed age means for employer pension contributions, with the default smoothing settings:

Figure B.5
Default span=cv



Based on visual inspection, the smoothed curve seems to lean more toward the right than the unsmoothed series would indicate. If we change the smoother to have a narrower span, we get a bumpier profile, but one that seems to track better with higher values for ages in the 30s and lower ones around age 60.

Figure B.6
span=cv



This is quite subjective but, through visual inspection, researchers may find examples much more obviously in need of adjustment from the default.

B.4. Alternatives to Friedman's SuperSmoother

An alternative smoothing method is "lowess" smoothing, but the procedure is less reliable because it does not incorporate sample weights. We recommend that it not be used. However, some researchers may feel more comfortable using the lowess routines in Stata, for example, rather than the R program which provides SuperSmoother. If that is the case, before smoothing the age profile using the lowess command, each observation should be duplicated in proportion to its sample weight to produce a representative sample. Then, the lowess command is used to smooth the expanded, representative sample. The drawback to this method is that it can make the dataset very large, making the lowess take a lot of computing time to accomplish.

Another way to implement lowess smoothing in Stata, incorporating both survey weights and number of observations into the smoothing routine, is:

- After saving the microdata, use the "collapse" command to compute the age-specific average profile values using survey weights. Save this file.
- Load in the microdata file that you saved in step 1. Merge the age-specific average profile values by age.
- Perform the lowess command, smoothing the age-specific averages but in the microdata file, so that the number of observations in the microdata is indirectly weighting the lowess regressions at each age.

Finally, recent versions of Stata have a command called LPOLY which allows the use of observation weights. It is a kernel-weighted local polynomial regression smoother which can take weights. Here is the command:

lpoly yvar xvar [if] [in] [weight] [, options]

For "yvar", we use the age means, calculated from the micro-level database using survey weights. For "xvar", we use the age variable. When calculating the age means, make a variable with the number of observations that went into the calculation of each age mean to use as the weight variable. There are many different options to control the smoothing, but the main ones are:

kernel(kernel) specify kernel function (there are several different kernel options)

bwidth(#|varname) specify the kernel half bandwidth

degree(#) specify degree of the polynomial smooth

After some experimentation, the kernel choice "gaussian" works well, with 2nd degree polynomials. Degree 1 gets you a more lowess-like smooth. The "bwidth" or bandwidth values in the range of 2 to 6 seem to work well, but notice the option "varname" here—you can specify different bandwidth smoothers for different ages. You can specify more smoothing in some age ranges but less or none in others. Researchers will have to implement the smoother and use visual inspection to adjust the settings for a good smoothed fit.

Appendix C

Compiling the NTA through SNA[1]

Contents

C.1. Introduction

The main NTA concepts are closely related to the SNA (System of National Accounts[2]); this refers especially to the SNA concepts of final consumption; labour income, including compensation of employees and mixed income, current transfers, property income and operating surplus; and, of course, saving. Specialized NTA concepts such as the life cycle deficit and surplus, the transfer deficit and surplus, and asset-based reallocations can be defined in terms of SNA concepts. It is therefore suggested in this appendix that the NTA be compiled as an NTA satellite to SNA, using SNA concepts and NTA adjustments to

1 The present appendix was written by Jan W. van Tongeren, as consultant to the United Nations Population Division, in close consultation with Mr. Ruud Picavet, Specialist in Development Economics of Tilburg University, who provided many helpful comments.

2 United Nations, European Commission, International Monetary Fund, Organisation for Economic Co-operation and Development and World Bank (1993). System of National Accounts, 1993, United Nations publication, Sales No. E.94.XVII.4 and (2008) Sales No. E.08.XVII.29.

those, and following SNA compilation procedures. This is alternative to the approach suggested in the main part of the manual, in which NTA concepts are measured directly, without interference of SNA compilation procedures. How this NTA compilation through SNA takes place is the purpose of the present appendix.

The information in this appendix is important when NTA specialists seek support from national accountants in the development of NTA through SNA, and in particular when national accounts have a limited scope (generally GDP and its breakdowns only) and need to be extended, using additional non-SNA data in order to serve as a basis for conversion to NTA. In this conversion we are conscious of the fact that NTA has another analytical objective than SNA. Following the SNA compilation procedure in NTA has the advantage of being able to draw on the extensive national accounts compilation expertise that has been developed over decades. Furthermore, if an SNA compilation procedure is used, a much larger number of restrictions applies for the NTA estimates[3] than if a direct NTA compilation is carried out. As a result, SNA-NTA estimates would be much more reliable than direct NTA estimates, in which SNA compilation plays only a minor role.

C.2. NTA compiled as satellite to SNA

Compilation of NTA through SNA may include three steps:

1. Firstly, an NTA framework is defined, in which the NTA analysis orientation and the NTA variables playing a role therein, are made explicit, and which differ from the SNA framework, analysis and variables. Prototype SNA and NTA frameworks are presented respectively in tables C.1 and C.2 and discussed in sections 3.2 and 3.3. Tables C.1 and C.2 use the same sectors and transactions as in SNA, but NTA table C.2, in addition, makes a distinction between the public and private sectors, and limits the flows to SNA transaction concepts that are relevant to NTA.
2. Secondly, a detailed conceptual conversion is defined between SNA and NTA variables. This is done in section 4 for a selection of SNA and NTA variables. In this section, detailed SNA variables are converted from the double bookkeeping system of SNA to the single entry system of NTA.
3. Thirdly, estimates are compiled on the basis of the SNA framework, either directly based on SNA estimates that are available in much SNA detail, or based on a limited set of SNA estimates that are supplemented by additional non-SNA data and assumed SNA relations between those data and estimates. This SNA compilation of NTA estimates is dealt with in section 5. Extending the estimates within an SNA framework is alternative to the approach followed in the NTA manual, in which additional estimates are made within an NTA context and thus implicitly compiled within an NTA framework. Developing the estimates in the SNA framework leads to more reliable estimates, as they are made consistent not only with the limited set of mainly income and expenditure estimates of an NTA

3 The term estimates as distinct from data is used in the larger part of this appendix. The reason is the following: data are information that is obtained from surveys and administrative data sources. Data are generally not complete and not consistent. Therefore data are adjusted and extended, resulting in figures that are not obtained from the basic data sources. This applies to SNA and therefore figures for SNA items are referred to as SNA estimates. The same applies to NTA, which is partly based on SNA estimates and partly on data from HH and public administration sources. As the latter are adjusted in the process of compiling NTA, they are also referred to as NTA estimates (see section 4).

Table C.1.

SNA Framework of Integrated Economic Accounts (*IEA*)

		Total economy		Rest of World		Non/financial corporations		Financial corporations		General government		Households		Non/Profit Institutions	
		Resources	Uses	Resources	Uses	Resources	Uses	Resources	Uses	Resources	Uses	Resources	Uses	Resources	Uses
Goods and services and production account															
Imports of goods and services	**1**			**499**											
Imports of goods	2			392											
Imports of services	3			107											
Exports of goods and services	**4**				**540**										
Exports of goods	5				462										
Exports of services	6				78										
Output	**7**	**3,604**				**2,808**		**146**		**348**		**270**		**32**	
Market output	8	3,077				2,808		146				123			
Imputed banking output	9														
Own account capital formation	10														
Output for own final use	11	147										147			
Non-market output	12	380								348				32	
Product taxes less subsidies	**13**		**133**												
Taxes on products	14		141												
Subsidies on products	15		8												
Intermediate consumption	**16**		**1,883**				**1,477**		**52**		**222**		**115**		**17**
Value added, gross / Gross domestic product	**17**		**1,721**				**1,331**		**94**		**126**		**155**		**15**
VAT not transferred to GOV	18														
GDP	**19**		**1,854**												
Income generation account															
Compensation of employees	**20**	**1,154**	**1,150**	**2**	**6**		**986**		**44**		**98**	**1,154**	**11**		**11**
Wages and salaries	21	954	950	2	6		841		29		63	954	11		6
Employers' social contributions	22	200	200				145		15		35	200			5
Taxes on production and imports	**23**	**235**	**235**				**88**		**4**	**235**	**1**				**1**
Taxes on products	24	141	141							141					
Other taxes on production	25	94	94				88		4	94	1				1
Subsidies	**26**	**44**	**44**				**35**			**44**			**1**		
Subsidies on products	27	8	8							8					
Other subsidies on production	28	36	36				35			36			1		
Consumption of fixed capital	**29**		**222**				**157**		**12**		**27**		**23**		**3**
Mixed income, net	**30**		**53**										**53**		
Operating surplus, net	**31**		**238**				**135**		**34**				**69**		
Primary and secondary distribution of income account															
Property income	**32**	**397**	**391**	**38**	**44**	**96**	**134**	**149**	**168**	**22**	**42**	**123**	**41**	**7**	**6**
Interest	33	209	217	21	13	33	56	106	106	14	35	49	14	7	6
Dividends	34	53	54	14	13	10	39	25	15	5		13			
Withdrawals from income of quasi-corporations	35	9	8	3	4		8			2		7			
Reinvested earnings on foreign direct investment	36	14			14	4		7				3			
Investment income disbursements	37	47	47			8		8	47	1		30			
Rent	38	65	65			41	31	3			7	21	27		
Current taxes on income, wealth, etc.	**39**	**213**	**212**		**1**		**24**		**10**	**213**			**178**		
Taxes on income	40	204	203		1		20		7	204			176		
Other current taxes	41	9	9				4		3	9			2		
Net social contributions	**42**	**333**	**333**			**66**		**213**		**50**			**333**	**4**	
Social security contributions	43	111	111			54		8		46			111	3	
Employers' actual pension contributions	44	204	204					204					204		
Other social contributions	45														
Employers' imputed social contributions	46	18	18			12		1		4			18	1	
Social benefits other than social transfers in kind	**47**	**384**	**384**				**62**		**205**		**112**	**384**			**5**
Social security benefits in cash	48	110	110				49				58	110			3
Social assistance benefits in cash	49	52	52								52	52			
Other social insurance pension benefits	50	193	193						193			193			
Other private social benefits	51														
Other social insurance non-pension benefits	52	29	29				13		12		2	29			2
Other current transfers	**53**	**244**	**283**	**55**	**16**	**6**	**12**	**62**	**62**	**104**	**136**	**36**	**71**	**36**	**2**
Net non-life insurance premiums	54	47	56	11	2		8	47	13		4		31		
Non-life insurance claims	55	57	48	3	12	6		15	48	1		35			
Miscellaneous current transfers	56	140	179	41	2		4		1	103	132	1	40	36	2
Primary/National Income	**57**		**1,642**				**97**		**15**		**171**		**1,358**		**1**
Disposable income, net	**58**		**1,604**				**71**		**13**		**290**		**1,196**		**34**
Use of income account															
Final consumption expenditure	**59**		**1,399**								**352**		**1,015**		**32**
Collective consumption expenditure	60		169								168				1
Individual consumption expenditure	61		1,230								184		1,015		31
Adjustment for the change in pension entitlements	**62**							**-11**				**11**			
Saving, net	**63**		**205**		**-13**		**71**		**2**		**-62**		**192**		**2**
Capital account															
Consumption of fixed capital	**64**		**222**				**157**		**12**		**27**		**23**		**3**
Capital transfers	**65**	**62**	**65**	**4**	**1**	**33**	**16**		**7**	**6**	**34**	**23**	**5**		**3**
Investment grants	66	23	27	4		23					27				
Capital taxes	67	2	2							2			2		
Other capital transfers	68	37	36		1	10	16		7	4	7	23	3		3
Imputed capital transfers	69														
Gross capital formation	**70**		**414**				**308**		**8**		**38**		**55**		**5**
Gross fixed capital formation	71		376				280		8		35		48		5
Changes in inventories	72		28				26						2		
Acquisitions less disposals of valuables	73		10				2				3		5		
Acquisitions less disposals of non-produced assets	74						-7				2		4		1
Net lending (+) / net borrowing (–)	**75**		**10**		**-10**		**-56**		**-1**		**-103**		**174**		**-4**

Source: UN 2008 SNA figures.

Table C.2.

NTA Framework

		Non-financial corporations PRIVATE		Financial corporations PRIVATE		General government PUBLIC		Households PRIVATE		NPISHs PRIVATE		Total economy		Rest of the world	
		Receipts	Disburse-ments	Receipts	Disburse-ments	Receipts	Disburse-ments	Receipts	Disburse-ments	Receipts	Disburse-ments	Receipts	Disburse-ments	Receipts	Disburse-ments
Life cycle account															
Final consumption expenditure	**1**						**352**		**1,015**		**32**		**1,399**		
Labour income	**2**		**986**		**44**		**98**	**1,207**	**64**		**11**	**1,207**	**1,203**	**2**	**6**
Compensation of employees	3		986		44		98	1,154	11		11	1,154	1,150	2	6
Wages and salaries	4		841		29		63	954	11		6	954	950	2	6
Employers' social contributions	5		145		15		35	200			5	200	200		
Mixed income, net	6							53				53			
Life cycle surplus (+)/ deficit (-)	**7**						**-352**		**192**		**-32**		**-192**		
Transfer account															
Taxes less subsidies on products	**8**					**133**						**133**	**133**		
Taxes on products	9					141						141	141		
VAT charged, but not transferred to GOV	10														
Subsidies on products	11					-8						-8	-8		
Other taxes less subsidies on production & imports	**12**		**53**		**4**	**58**	**1**		**-1**		**1**	**58**	**58**		
Other taxes on production & imports	13		88		4	94	1				1	94	94		
Other subsidies on production & imports	14		-35			-36			-1			-36	-36		
Current taxes on income, wealth, etc.	**15**		**24**		**10**	**213**			**178**			**213**	**212**		**1**
Taxes on income	16		20		7	204			176			204	203		1
Other current taxes	17		4		3	9			2			9	9		
Net social contributions	**18**	**66**		**213**		**50**			**333**	**4**		**333**	**333**		
Actual social contributions, pensions	19			204					204	0		204	204		
Actual social contributions, public pensions	20	54		8		46			111	3		111	111		
Imputed social contributions (unfunded pension funds)	21	12		1		4			18	1		18	18		
Social benefits other than social transfers in kind	**22**		**62**		**205**		**112**	**384**			**5**	**384**	**384**		
Social benefits, pensions	23				193			193				193	193		
Social benefits, pensions and non-pensions	24		62		12		112	191			5	191	191		
Social transfers in kind	**25**														
Other current transfers	**26**	**6**	**12**	**62**	**62**	**104**	**136**	**36**	**71**	**36**	**2**	**244**	**283**	**55**	**16**
Net non-life insurance premiums	27		8	47	13		4		31			47	56	11	2
Non-life insurance claims	28	6		15	48	1		35				57	48	3	12
Miscellaneous current transfers	29		4		1	103	132	1	40	36	2	140	179	41	2
Transfer surplus/deficit	**30**		**-26**		**-2**		**310**		**-162**		**33**		**153**		**38**
Account for asset based reallocations															
Operating surplus, net	**31**	**135**		**34**		**0**		**69**		**0**		**238**			
Property income	**32**	**96**	**134**	**149**	**168**	**22**	**42**	**123**	**41**	**7**	**6**	**397**	**391**	**38**	**44**
Interest	33	33	56	106	106	14	35	49	14	7	6	209	217	21	13
Dividends	34	10	39	25	15	5		13				53	54	14	13
Withdrawals from income of quasi-corporations	35		8			2		7				9	8	3	4
Reinvested earnings on foreign direct investment	36	4		7				3				14			14
Investment income attributable to insurance policy holders	37	8		8	47	1		30				47	47		
Rent	38	41	31	3			7	21	27			65	65		
Net Asset Based Revenu	**39**		**26**		**13**		**42**		**-41**		**-1**		**39**		**7**
SNA adjustment and balancing items															
Adjustment for the change in pension entitlements	**40**			**-11**				**11**							
Depreciation	**41**		**157**		**12**		**27**		**23**		**3**		**222**		
Value added, net	**42**		**1,174**		**82**		**99**		**132**		**12**		**1,499**		
GDP	**43**												**1,854**		
External balance of goods and services (imports - exports)	**44**														**-41**
Primary/ National Income	**45**		**97**		**15**		**171**		**1,358**		**1**		**1,642**		
Disposable Income, net (NTA)	**46**		**71**		**2**		**290**		**1,207**		**34**		**1,604**		
Disposable income, net (SNA)	**47**		**71**		**13**		**290**		**1,196**		**34**		**1,604**		
Saving, net (SNA)	**48**		**71**		**2**		**-62**		**192**		**2**		**205**		**-13**

Source: UN 2008 SNA figures.

framework, but also with production estimates that are the main ingredients of an SNA framework. Once a full set of SNA estimates is available, they are converted to NTA estimates in line with the framework features of NTA in table C.2 and the detailed SNA-NTA conversions dealt with in section 4.

Not included in the three steps is the attachment of age profiles to the flows identified in the detailed NTA-SNA table C.2; this is described in much detail in other sections (e.g., 4.3-4.4 and 5.3-5.4) of the NTA manual.[4] The age profiles may be applied to flows that are more detailed than the SNA detail used in this appendix. How to arrive at this further detail is also not described in the present appendix, but in other sections of the NTA manual, in particular in the sections that deal with the two main data sources of NTA, i.e., GOV administrative records (NTA manual, section 5.2) and HH surveys (NTA manual, section 4.3.1). Instead of GOV administrative data records, the NTA manual also frequently relies on the IMF Government Finance Statistics (GFS), which is compatible with SNA. And finally, also excluded from this appendix is a description of the extension of NTA flows to include flows between and within HHs, called in the NTA, respectively, inter-HH and intra-HH flows. The reason is that intra-HH flows are conceptually not included in SNA, while inter-HH flows are generally excluded from SNA estimates due to data limitations in the estimation of those flows. The reader is referred to subsections 6.1 and 6.2 of the NTA manual, where more detailed descriptions are available on how to cover those flows, which are essential to NTA analysis.

C.3. SNA and NTA frameworks

The NTA manual makes reference in various sections to a framework that is used to define and compile the SNA and NTA variables. The format of the framework, which is implicit in the concepts and practices introduced in the manual, is made explicit in this appendix. The closest the manual comes to defining a framework is in tables 6.2 and 6.4, where a selection is made of SNA variables on transfers, taxes, property income, operating surplus and mixed income that are used in the NTA and for which age structures are developed in support of intergenerational analysis. The concepts and accounts used in those tables will be reflected in the NTA satellite framework presented below.

C.3.1. What is a framework

Before developing a framework for SNA and NTA, we will first give some brief comments on what a framework is. In Van Tongeren, 2011, (p. 10) frameworks are described in generic terms "… as a series of matrices (such as the SUT and IEA matrices) and vectors of variables, between which ratio and identity relations are defined. Basic data are only available for a limited number of the variables, and this lack of information is compensated by ratio values and definitions of ratio and identity relations" and "… prior reliabilities are defined for data and ratio values, which allow for adjustment of these values, so that conflicts are avoided. The identities serve as criteria in arriving at final estimates that are consistent". The variables included in the frameworks are selected such that they are able to support, quantitatively when measured, an analytical objective for which the framework was designed. The

4 References to the NTA manual are based on the August 2012 version that was available to the author at the time of a meeting on NTA in Bangkok.

SNA is one of the first examples of explicitly defined frameworks, which include mainly economic variables (concepts) and many identities and ratios that are defined in the SNA framework between those concepts. The SNA framework with its economic variables or concepts was designed to describe and analyse the working of an economy of a country.

SNA satellite accounts, which are designed to serve specific types of analyses, are defined as frameworks with an alternative set of variables. Those variables may either be elaborations of SNA variables or may introduce new analytical concepts, including environmental accounts[5] and tourism accounts.[6] Environmental accounts studying the interaction between the economy and the environment of a region include in addition to monetary (economic) variables also variables describing the quality and quantity of environmental conditions in physical terms. Tourism accounts elaborate in much detail a specific activity of the economy, i.e., tourism services. They include monetary variables on tourist expenditures, value added of tourist activities and may also include non-monetary variables on the number of tourists visiting tourism sites.

The NTA satellite framework may also be considered as a framework in this sense, as it is defined in terms of matrices and tables and includes demographic data on the number of individuals per age groups, on consumption, labour income, transfers, asset income and saving per age group, and thus relations can be defined among demographic variables and the economic variables of SNA. The NTA satellite framework thus includes not only concepts that are "borrowed" from the SNA, such as saving, consumption and labour income, but also new concepts, such as the life cycle surplus/deficit, the transfer surplus/deficit and the age profiles that serve the specific NTA analysis. The NTA is the first attempt to relate in a comprehensive manner demographic and economic variables and analyses.

C.3.2. SNA framework

The basic structure of the SNA is embedded in its accounting framework. The accounts used for the conversion of NTA are those that are included in the so-called integrated economic accounts (IEA) of the system. They are organized in such a manner that they serve optimally the distribution between sectors and within sectors of the economy, of income generated (value added) and received (disposable income), use of income (final consumption), saving and investments, and also the financial implications of those. The sectors that are analysed in this manner include the non-financial corporate (NFC) sector (non-financial enterprises), the financial corporate (FC) sector (banks and insurance schemes and pension funds), the government (GOV) sector, the household (HH) sector and the non-profit institutions (NPI) sector. The sum of NFC, FC, GOV, HH and NPI sectors is called the total (or national) economy and the counterpart of the national economy is the rest of the world (ROW). They are the same sectors as presented in tables 6.2 and 6.4 of the NTA manual. Each SNA account identifies one or more balancing items that are not measured directly, but are defined and derived in SNA as a means of summarizing in an

5 European Commission, Food and Agriculture Organization of the United Nations, International Monetary Fund, Organisation for Economic Co-operation and Development, United Nations, World Bank, "System of environmental-economic accounting, central framework" (White cover publication, pre-edited text subject to official editing), 2012.

6 Commission of the European Communities, Organisation for Economic Co-operation and Development, World Tourism Organization, United Nations, "Tourism satellite account: recommended methodological framework", 2008.

analytical manner the information that is contained in the data that are directly measured. The data in each account that are directly measured with help of available statistics are represented by—and what are called in SNA—transaction items.

The SNA accounts are presented in table C.1 below, with United Nations SNA figures as they appear in the 2008 SNA. The table includes accounts, balancing items and transaction items of the 2008 SNA. The main accounts of SNA are identified in the headings on the left-hand side of the table; in order to keep the presentation simple, not all accounts are included, but only those that are relevant for explaining the relation between SNA and NTA. Balancing items in each account are presented in bold in the table. The order in which the accounts are presented is the one that is compatible with the 2008 SNA. The SNA sectors are presented as column headings with resources (= receipts) and uses (= expenditures). The figures presented in the accounts are derived from the United Nations SNA 2008 table of integrated economic accounts (tables 16.4 and 16.5 in the 2008 SNA). By presenting this table, an overall background is provided for the same figures that are used in NTA tables in chapter 4 of the manual, and also in the next section 4, which discusses the conversion from SNA to NTA for selected concepts.

The SNA accounts, balancing items presented and corresponding analyses reflected in the table are the following:

1. The goods and services account juxtaposes the origins of products—i.e., output and imports—and the destination of products—i.e., intermediate consumption, final consumption, capital formation (investments) and exports. For the total economy, this so-called supply-use identity is reflected in the supply figures for output (lines 7-12) and imports (lines 1-3) and in the use figures for intermediate consumption (line 16), final consumption (lines 59-61), capital formation (lines 70-74) and exports (lines 4-6). As the supply figures are in basic prices and the use figures in market prices (respectively excluding and including product taxes less subsidies), the identity between both sides can only be obtained by adding to supply the product taxes less subsidies (lines 13-15). Thus, for the total economy (3,604+499)+133=(1,883+1,399+414+540). The supply-use identity can only be established for the total economy and not for sectors, as the taxes less subsidies on products are not distributed by sector in the SNA.
2. The production account includes data on output (lines 7-12) and intermediate consumption (line 16) and derive as balancing item value added (line 21) as the difference between those for each sector, and GDP for the economy as a whole. For each sector value added can be derived, e.g., for the NFC sector, the derivation of value added is 1,331=2,808–1,477. Value added could be presented gross, i.e., before deduction of depreciation (line 29), or net, i.e., after deduction of depreciation. The above figure for the NFC sector is gross, and the net figure of 1,174=1,331–157, is derived from the gross concept by deducting depreciation. Gross and net concepts can be derived for all balancing items, dealt with below. Generally NTA uses the net concepts. GDP is always a gross concept. It is defined only for the total economy, and is the sum of value added for sectors. However, as output is in basic prices and intermediate consumption in market prices, product taxes less subsidies (lines 13-15) for the total economy should be added. Thus GDP is 1,854=1,721+133.
3. The generation of income account includes the components of value added (lines 20-31), i.e., compensation of employees, mixed income and operating surplus, as well as taxes other than taxes on production. The components are presented in this

account as payments by producing sectors. Operating surplus is the balancing item of this account; it is not measured directly, but derived indirectly as a part of national accounting. Thus operating surplus (line 31), net of the NFC sector, is the difference between value added, gross on the one hand and the sum of compensation of employees paid (line 20), other taxes less subsidies on production paid (lines 23-26) and depreciation (line 29), i.e., 135=1,331–986–(88–35)–157. For the HH sector, the same derivation applies, but, instead of operating surplus, mixed income is derived in this manner (53 in line 30).

4. The allocation of primary income account is an account that deals with flows to and from production factors. The account starts with operating surplus or mixed income, net (line 31 or 30) from the generation of income account, and furthermore includes compensation of employees (line 20) and production taxes less subsidies (line 23) as receipts (payments were already taken into account in the derivation of operating surplus), and the receipts and payments of property income (lines 32-38). This account includes as balancing item the balance of primary income for each sector and the sum of these for all sectors is national income for the total economy. The balance of primary income for the GOV sector is 171=(235–44)+(22–42). National income, net, is the sum of primary incomes of sectors 1,642=97+15+171+1,358+1.
5. Secondary distribution of income account covers all current transfer flows, including receipts and payments of social contributions and benefits (lines 42-52), receipts and payments of current taxes (lines 39-41) and other current transfers including insurance premiums and claims (lines 53-56). The social contributions include pension premiums and benefits of unfunded schemes, and also premiums and benefits of funded schemes as explained in subsection 4.1. The account includes only current transfers in cash. Transfers in-kind, as based on SNA, are not included in this account, but identified in another account that is explained in table C.3b of section 4.2. The balancing item of the secondary distribution of income account is disposable income; it is derived from the receipts and expenditures of various transaction items in this account, and starting from the balance of primary income of the previous account. Thus, disposable income net of the HH sector (line 58) is 1,196=1,358–178+(384–333)+(36–71), and disposable for the total economy is the sum of sector's disposable incomes, i.e., 1,604=71+13+290+1,196+34.
6. The use of disposable income account includes only final consumption of HHs, GOV and NPIs (lines 59-61) and also an adjustment item for the change in pension entitlements (line 62), which will be explained in section 4.1 below. The balancing item of this account is net saving (line 63), which is an important concept in NTA. Net saving is derived as the difference between disposable income net and final consumption, plus the adjustment for the change in pension entitlements. Thus, for the HH sector this is 192=1,196–1,015+11 and for the total economy 205=71+2–62+192+2.
7. The capital account includes gross capital formation (lines 70-73) in fixed assets such as roads, buildings and other structures, changes in inventories and valuables, and also acquisition of other non-produced assets (line 74), such as land, mineral, water and other natural resources, as well as capital transfers (lines 65-69) as well as depreciation or consumption of fixed capital (line 64). The capital account juxtaposes for each sector saving, capital transfers received less paid and depreciation on the one hand and capital formation and acquisition of other non-produced assets on the other, and thus derives an important balancing item of SNA, i.e., net lending (line 75). For each sector it measures the need for obtaining financial resources from other

sectors and the rest of the world (if minus –), as saving is not sufficient to cover all payments for gross capital formation and acquisition of other non-produced assets, or availability of such resources for other sectors (if plus +). For the total economy, net lending represents the financial resources that the country has available for lending to the ROW (if plus +) or needs (if minus –) from the ROW in order to finance its capital formation and acquisition of non-produced assets. For the NFC sector net lending is equal to –56=71+(33–16)+157–(308–7), and for the total economy it is equal to 10=–56–1–103+174-4. The latter is the same with opposite sign as net lending of the ROW.

8. The financial account shows how net lending derived from the capital account of each sector and also for the total economy is financed with (if minus –) or invested in (if plus +) shares, bonds, loans, and other financial instruments. The financial account is not presented in table C.1, as none of the transaction items of this account plays at present a role in NTA.

C.3.3. NTA framework

While SNA framework and analysis focus on income, consumption, investment and financial issues, the analytical objective of NTA is quite different. The objective of NTA is to measure transfers of resources between generations in order to finance their consumption. As a consequence, the framework of SNA and NTA differ considerably, even though they make use, at least partly, of the same concepts. These differences between SNA and NTA analyses are embedded in different accounting structures of SNA in table C.1 and of NTA in table C.2. Not all SNA accounts and concepts are used in NTA, the NTA accounts organize those concepts differently, and also the balancing items of the two systems differ.

These differences of NTA as compared with SNA are reflected in table C.2. No NTA adjustments have been made yet to the SNA concepts (see section 4), so that the same transaction items are used in the NTA framework as in SNA, and therefore the figures used in table C.2 are the same UN 2008 SNA figures as used in table C.1. The two tables can be used in conjunction with each other and also as background of the tables in chapter 4 of the manual.

Table C.2 includes the same sectors as are used in SNA. However, in NTA only two main groups are distinguished, i.e., the PUBLIC sector, which only refers to the GOV sector in SNA, and the PRIVATE sector, which includes all other national sectors, i.e. NFC, FC, HH, and NPI sectors. In the development of NTA tables, as is done in chapter 4, the distinction between PUBLIC and PRIVATE sectors and corresponding public and private flows is made explicit. This is not done in the present appendix.

The NTA framework of table C.2 distinguishes between three accounts[7] and corresponding balancing items, reflecting NTA analysis, for example:

The life cycle account juxtaposes labour income (lines 2-6), consisting of compensation of employees and mixed income, with final consumption (line 1). The life cycle surplus/deficit (line 7) is the difference between both. It is calculated for each sector in table C.2, but is only meaningful for the total economy. In the latter case it is equal to –192=(1,154+53)–1,399.

7 The three accounts are not explicitly identified in NTA, but are used here in order to clarify the differences between the SNA and NTA frameworks.

In the transfer account the transfer surplus/deficit (line 30) is derived for each sector. The NTA only distinguishes between public transfer surpluses/deficits for the GOV sector and private surpluses/deficits for the sum of NFC, FC, HH and NPI sectors. In the table the transfer surplus for the public (= GOV) sector is equal to the sum of receipts of taxes on production and imports (lines 8-14), receipts of current taxes on income (lines 15-17), receipts of social contributions received less social benefits paid (lines 18-24), receipts less disbursements of other current transfers (lines 26-29), i.e., 310=(133+58+213)+(50–112)+(104–136). For the total economy the transfers surplus/deficit is derived in a similar manner, i.e., 153=(133+58)+(213–212)+((333–333)–(384–384))+(244–283). In the derivation for the total economy, both receipts and payments of current taxes are taken into account, but for taxes less subsidies on production and imports only the receipts are included, as the disbursements have already been taken into account when deriving operating surplus and the use thereof in the life cycle deficit/surplus.

The account for asset-based reallocations includes as transaction items operating surplus (line 31), property income (lines 32-38) and also net saving of SNA (line 48). The balancing item of this account is net asset-based revenue, which can be derived for each sector as the sum of operating surplus plus receipts less disbursements of property income less net saving according to SNA. Thus for the PUBLIC (= GOV) sector net asset-Based Reallocations is 42=0+(22-42)-(-62), and for the total economy 39=238+(397–391)–205.

The overall balance for the NTA holds that the sum of the life cycle surplus/deficit plus the transfer surplus/deficit plus the net asset-based reallocations is equal to zero (0), because, as is explained in the NTA manual, the life cycle deficit is financed through a transfer surplus and net asset-based reallocations. This identity holds in the table for each sector, but is only relevant for the total economy, as only for this total the life cycle deficit can be derived. When using the figures in the table for the three surpluses/deficits, the following identity holds for the total economy: –192+153+39=0.

In addition to the NTA balancing items mentioned, table C.2 also includes the SNA balancing items as reference, at the end of table (lines 40-48). However, as not all transaction items of SNA are used in the NTA framework, it is not possible to derive those in the same manner as was described in section 3.2 for table C.1. This affects in particular value added (line 42), which cannot be derived as in table C.1 as the difference between output and intermediate consumption, as these items are not included in table C.2. Instead, value added net is derived for each sector and for the total economy as the sum of value added components, i.e., compensation of employees (line 3), mixed income (line 6), taxes less subsidies on production (line 12) and operating surplus net (line 31). Thus, value added of the NFC sector is 1,174=986+0+53+135 and of the total economy is 1,499=1,150+53+58+238. Once value added is derived in this manner, GDP and all other balancing items are derived in the same manner as was described for table C.1.

C.4. A review of major concepts used in SNA and NTA

The NTA framework of table C.2 has an accounting structure that is different from the SNA. However, the table uses SNA concepts and therefore the figures in table C.2 are not different from those in table C.1 of the SNA. Table C.2, however, does not take into account that the NTA also makes adjustments to SNA concepts. These adjustments are taken into account in the review of NTA and SNA concepts in the present section, which uses the figures of table C.2 to explain the differences between the concepts of the SNA and NTA, and also indicates why they differ due to different objectives of analysis.

C.4.1. Pension premiums and benefits

In SNA, a distinction is made between pensions without funding and those with funding. For those without funding, premiums and claims are treated as social transfers, and for those with funding premiums and claims are treated alternatively as current transfers and as saving/dissaving. Thus disposable income of HHs is derived by deducting all premiums and adding all benefit payments of pensions, and saving of HHs only reflect the premiums and benefits only based on non-funded schemes. The two alternative treatments are linked in the same HH sector accounts, by adding the item "Adjustment for the change in pension entitlements" (SNA 2008, section 9.A.4), which is the difference between premiums and benefits of pension schemes that are funded. The adjustment item effectively calculates HH saving before deduction of premiums and before addition of claims of funded pension schemes. The reason for including these alternative treatments in the SNA HH sector accounts is that in income distribution analysis all pensions, whether funded or not, should be reflected. At the same time, in financial analysis, starting with saving, the premiums of funded schemes should be treated as savings of HHs and the benefit payments should be treated as dissaving by HHs. How this is done in accounting terms is shown in table C.3a below. The figures in the table are the same as those in the corresponding lines of table C.2.

The table presents SNA practices on the left-hand side and NTA treatments on the right-hand side, reflecting differences and similarities in treatments between SNA and NTA of social contributions and benefits of funded and unfunded schemes. The contributions of the funded pension schemes are presented in the table in the line of "social contributions, pensions" and the benefits of these schemes are presented in the line "social benefits, pensions". The contributions (204) are payments by HHs to the FC sector and the benefits are payments (193) by the FC sector to the HH sector. The contributions and benefits of non-pension schemes are included in the table as the remaining lines (categories) of "social contributions and benefits in cash". The contributions include actual as well as imputed contributions.

Table C.3.a.

Pension premiums and claims

	SNA												NTA											
	NFC		FC		GOV		HH		NPI		ROW		NFC		FC		GOV		HH		NPI		ROW	
	Receipts	Disburse-ments	Receipts	Disburse-ments	Receipts	Disburse-ments	Receipts	Disburse-ments	Receipts	Disburse-ments	Receipts	Disburse-ments	Receipts	Disburse-ments	Receipts	Disburse-ments	Receipts	Disburse-ments	Receipts	Disburse-ments	Receipts	Disburse-ments	Receipts	Disburse-ments
Social contributions and benefits in cash																								
Net social contributions	66		213		50			333	4				66		9		50			129	4			
Actual social contributions, pensions			204					204																
Actual social contributions, non-pensions	54		8		46			111	3				54		8		46			111	3			
Imputed social contributions	12		1		4			18	1				12		1		4			18	1			
Social benefits other than social transfers in kind		62		205		112	384			5				62		12		112	191			5		
Social benefits, pensions		0		193			193																	
Social benefits, non-pensions		62		12		112	191			5				62		12		112	191			5		
Disposable income, net		**71**		**13**		**290**		**1,196**		**34**				**71**		**2**		**290**		**1,207**		**34**		
Adjustment for the change in pension entitlements			-11				11																	
Final consumption						352		1,015		32								352		1015		32		
Saving, net		**71**		**2**		**-62**		**192**		**2**		**-13**		**71**		**2**		**-62**		**192**		**2**		**-13**

Source: UN 2008 SNA figures.

In the SNA, on the left-hand side of the table, all social contributions (333=204+111+18) reduce and all social benefits (384=193+191) increase disposable income of the HH sector (1,196). The counterparts of these social flows are in the sectors that receive contributions and pay benefits of funded schemes (only FC sector) and unfunded schemes (all sectors). At the same time, SNA treats contributions and benefits of funded schemes as saving and dissaving. It does this by adding the difference between payments and receipts of funded pension scheme contributions and benefits as an "Adjustment for the change in pension entitlements" to disposable income, in order to derive saving. Thus, for the HH sector the "Adjustment for the change in pension entitlements" is equal to the difference between contributions and benefits of pension funds (11=204–193) and for the FC sector, it is the same value with an opposite sign (–11=193–204), as this sector includes the funded pension schemes. Thus saving of the HH sector is derived by adding the adjustment item and deducting final consumption from disposable income (192=1,196+11–1015).

In NTA, only the saving/dissaving treatment is followed for contributions and benefits of funded pension schemes. Thus contributions are not deducted and benefits not added, when calculating HH disposable income. In the present example therefore HH disposable income in NTA is equal to HH disposable income in SNA plus the "Adjustment for the change in pension entitlements" (1,207=1,196+11). HH saving in NTA is obtained by deducting from HH disposable income only HH final consumption (1,015) and this is the same as HH saving in SNA. Similar relations with opposite signs hold for the FC sector, where contributions of funded pension schemes are receipts and benefits are disbursements.

C.4.2. HH final consumption and social transfers in-kind

Public transfers in-kind are included among the transfer inflows of the NTA. They are presented in several tables of the NTA manual (NTA tables in 2.4.1, NTA tables 5.1, 5.2, 5.6). They differ from the SNA concept of transfers in-kind. The differences between the NTA and SNA concepts are reflected in the two sides of table C.3b below, and are illustrated there with help of UN 2008 SNA figures.

The social transfers in-kind in SNA (left-hand side of table C.3b below) are closely related to the final consumption concepts that are defined in that system. SNA distinguishes between two types of final consumption concepts: the first one is final consumption *expenditure*, which includes individual and collective final consumption. A second concept is *actual* final consumption, in which all individual final consumption expenditure of GOV and NPI sectors is transferred to the HH sector. Thus actual final consumption of HHs (1,230=184+1,015+31) is higher than final consumption expenditure (1,115) of HHs, and actual final consumption of GOV (168=352-184) and NPI (1=32-31) is lower than final consumption expenditures of these sectors (352 and 32), including only collective final consumption expenditure. The distinction between collective and individual final consumption expenditure in the GOV sector is based on selected categories of COFOG (Classification Of Functions Of Government), mainly covering expenditures on education and health, which can be assigned to individuals, as they are beneficiaries of these expenditures. Collective final consumption expenditures are those that benefit the society as a whole and cannot be assigned to particular individuals; these include defense and police expenditures, as well as collective expenditures on the maintenance of roads and other infrastructure, management of buildings and also the general expenditures of GOV ministries, including those general expenditures of the ministries of education and health. The transfer of individual final consumption expenditure from the GOV and NPI sectors is accompanied by supporting transfers in-kind of the

same amount between the sectors (105,547=100,392+5,155). To reflect these social transfers in kind, SNA introduces a concept of "Adjusted disposable income", which is equal to disposable income plus social transfers in-kind. For the HH sector, this is 1,411=1,196+215. Saving with or without using the concept of actual final consumption and adjusted disposable income does not change. Concepts of SNA saving and disposable income are the same as in table C.3a and also the same as in the NTA framework of table C.2; HH saving therefore reflects the "Adjustment for the change in pension entitlements", as was explained in the previous section (4.1) and presented in table C.3a.

The NTA concept of transfers in-kind, illustrated on the right-hand side of table C.3b, is wider than the SNA concept. It does not only reflect the individual consumption that is transferred from the GOV and NPI sectors to the HH sector, but also the transfer of collective consumption from GOV to HHs. As a consequence, social transfers in-kind to HHs are higher, i.e., 384 (=352+32). (Adjusted) disposable income of HHs is also higher than in SNA, i.e., 1,591=1,207+384 versus 1,411 in SNA, but GOV (adjusted) disposable income is lower (–62=290–352) than what it is in SNA (106). NTA saving, however, remains the same as in SNA for all three sectors.

C.4.3. Global SNA and NTA balances

The SNA and NTA each have their global balances. In the SNA, they are the identities between GDP based on production, income and expenditure approaches, and in the NTA there is the balance between the identities of the life cycle surplus/deficit, transfer surplus/deficit and the net asset-based reallocations. Each of those balances was already reviewed in sections 3.2 and 3.3, where tables C.1 and C.2 were described. In tables C.3d and C.3e below is shown how those balances are affected by changes in NTA concepts.

Table C.3.b.
HH final Consumption and Social Transfers in kind

	SNA						NTA					
	GOV		HH		NPI		GOV		HH		NPI	
	Receipts	Disburse-ments	Receipts	Disburse-ments	Receipts	Disburse-ments	Receipts	Disburse-ments	Receipts	Disburse-ments	Receipts	Disburse-ments
Disposable income, net	290		1,196		34		290		1,207		34	
Final consumption expenditure		352		1,015		32		352		1,015		32
Individual consumption expenditure		184		1,015		31						
Collective consumption expenditure		168				1						
Adjustment for the change in pension entitlements			11									
SNA saving, net		-62		192		2		-62		192		2
Social transfers in kind		184	215			31		352	384			32
Adjusted disposable income, net	106		1,411		3		-62		1,591		2	
Actual final consumption		168		1,230		1				1,399		
Adjustment for the change in pension entitlements			11									
SNA saving, net		-62		192		2		-62		192		2

Source: UN 2008 SNA figures.

Table C.3.c.

HH durables, other non-market output and mixed income

	SNA		NTA	
	HH		HH	
	Receipts	Disbursements	Receipts	Disbursements
Disposable income, net	**1,196**		**1,215**	
Mixed income, total	53		61	
Mixed income from owner-occupied dwelling services	20		20	
Mixed income from services of HH durables			8	
Mixed income from other non-market products	20		20	
Mixed income from market output	13		13	
Other disposable income	1,143		1,154	
Final consumption expenditure		**1,015**		**1,007**
Consumption of non-market products		147		139
Consumption of owner-occupied dwelling services		20		20
Consumption of services of HH durables				8
Minus: consumption of HH durables				-16
Consumption of other non-market products		127		127
Consumption of market products		868		868
Adjustment for the change in pension entitlements	**11**			
Saving net		**192**		**208**

Source: UN 2008 SNA figures.

Table C.3.d.

SNA GDP identity

Labour component of mixed income, 66.67%	**SNA**	**NTA**	
Labour component of production taxes less subsidies, 81.30%		**NTA change to SNA**	
		HH final consumption excl. product taxes less subsidies	**NTA estimates**
Value added, net	**1,499**		**1,499**
Compensation of employees, paid	1,150		1,150
Taxes less subsidies on production, paid	58		58
Mixed income, net	53		53
Operating surplus, net	238		238
Depreciation	**222**		**222**
Taxes less subsidies on products, paid	**133**	**-133**	**0**
GDP	**1,854**	**-133**	**1,721**
Final consumption	**1,399**	**-133**	**1,266**
HH final consumption	1,015	-133	882
GOV final consumption	352		352
NPI final consumption	32		32
Gross capital formation	**414**		**414**
Exports	**540**		**540**
less: Imports	**499**		**499**

Source: UN 2008 SNA figures.

Table C.3.e.
NTA life cycle, transfer and asset based identities

	SNA	NTA		
		NTA changes to SNA		
	Total Economy	Mixed income shifted to operating surplus	Production taxes less subsidies distributed between labour and capital income	Total Economy
Life cycle surplus/deficit	**-192**			**-30**
Labour income, received	**1,207**			**1,236**
Compensation of employees, received	1,154		47	1,201
Mixed income	53	-18		35
Final consumption	**1,399**			**1,266**
Transfer surplus	**153**			**-38**
Transfer inflows	**1,556**			**1,043**
Taxes less subsidies on production and imports, received by GOV	191			133
Taxes less subsidies on products	133			133
Taxes less subsidies on production	58		-58	0
Current taxes, received by GOV	213			213
Social contributions, received by NFC, FC, GOV, HH, NPI	333			129
Social benefits, received by HH	384			191
Other current transfers, received	244			244
Transfer outflows	**1,212**			**948**
Taxes less subsidies on products, paid				133
Current taxes, paid by NFC, FC, HH, NPI	212			212
Social contributions, paid by HH	333			129
Social benefits, paid by NFC, FC, GOV, HH, NPI	384			191
Other current transfers, paid	283			283
Adjustment for the change in pension entitlements	**0**			
Net asset based revenues	**39**			**68**
Operating surplus, net	238	18	11	267
Property income, receipts less expenditures	6			6
less: Saving net	-205			-205

Source: UN 2008 SNA figures.

The main identity of SNA is the GDP identity, which includes three approaches to GDP, i.e., deriving GDP as (i) the difference between output and value added (production approach), (ii) the sum of final expenditures (expenditure approach), and (iii) the sum of value added components (income approach). The production approach can only be based on the SNA framework of table C.1, in which estimates are included on output and intermediate consumption. In the NTA framework of table C.2 this information is not available. The two other approaches can be based on the NTA framework of table C.2 and the resulting figures are presented in the first column of table C.3d above. GDP (1,854) is included in the middle of the table. The elements of the income approach are in the upper segment of the table. Thus value added net for the total economy is equal to the sum of compensation of employees paid, taxes less subsidies on production paid, mixed income, net, operating surplus net, i.e., 1,499=1,150+58+53+238, and GDP is equal to the sum of value added net of the total economy plus depreciation, and taxes less subsidies on products paid, or

1,854=1,499+222+133. The expenditure approach is reflected in the lower part of table C.3d. There GDP is the sum of final consumption, gross capital formation, exports, less imports, or 1,854=1,399+414+540−499.

The NTA identity is represented by the figures in the first column of table C.3e. In this column only SNA figures are used and no adjustments have been made to SNA concepts, as they were described in section 4. The figures included in this column are fully based on the figures for the total economy in table C.2.

It should be noted here that some of the common items between tables C.3d and C.3e have different figures: final consumption (tables C.3d and C.3e: 1,399), compensation of employees (table C.3d: 1,150 and table C.3e: 1,154), mixed income (tables C.3d and C.3e: 53), Taxes less subsidies on production (table C.3d: 58 and table C.3e: 58), taxes less subsidies on products (table C.3d: 133 and table C.3e: 133). The only common items between the two presentations with the same figure are final consumption (1,399) and mixed income (53). All other figures differ between the two tables: taxes less subsidies on products in table C.3d refer to outlays (133), while in table C.3e under transfer inflows (133) they refer to GOV revenues and in table C.3e transfer outflows to outlays on these taxes (133); the figures are the same, though, as outlays and revenues are equal because there are no amounts for these taxes in the ROW. Taxes less subsidies on production in table C.3d also refer to outlays (58) and in table C.3e under the heading transfer inflows to GOV revenues; also for these taxes revenues and outlays are the same, as there are no transactions with the ROW. Compensation of employees also differs between the two tables: in table C.3d they refer to outlays (1,150) and in table C.3e to revenues by HHs, while the difference refers to compensation of employees of migrant workers (ROW).

The figures after adjustment to NTA are presented in the last column of both tables. Three of the SNA-NTA adjustments affect the NTA values in the last columns of both identities and tables:

1. Mixed income is separated between labour and capital income in table C.3e, where the NTA balances are derived. It is assumed here that of mixed income (53), 66.67 per cent (35) is labour income and 33.3 per cent (18) is capital income. This increases the life cycle deficit as labour income is reduced and increase the net asset-based reallocations (operating surplus).
3. Production taxes less subsidies, received by the GOV sector (58) are also distributed in table C.3e between labour income and capital income. It has been assumed here that 81.3 per cent is labour income (47) and 18.7 per cent is capital income. This reduces the life cycle deficit, as labour income is reduced, and also increases the net asset-based reallocations. The transfer surplus is accordingly reduced, as the elimination of these taxes reduces the transfer inflows.
4. A last change introduced in the NTA is the change of the market price valuation of HH final consumption to a valuation in basic prices: taxes on products (133) are deducted therefore in table C.3d from HH final consumption and this then decreases from 1,399 to 1,266. This decreases for the same amount GDP from 1,854 to 1,721, also from market price valuation to a valuation in basic prices.

C.5. SNA and NTA compilation

When compiling NTA through SNA, there are three options—which of those options to use, depends on data availability and time and expertise available for the compilation.

C.5.1. Three SNA-NTA compilation options

The three options to compile NTA through SNA are the following:

1. The first option, which can only be carried out if comprehensive SNA estimates are available, is to convert SNA to NTA, as described in the previous sections of the appendix. As comprehensive availability of estimates may not necessarily be identical to what is described above, it may be necessary to adjust the framework to the comprehensive availability of SNA estimates in each country. For some variables, more detailed estimates may be available than was described in the SNA framework of table C.1 above, and for other variables fewer estimates may be available. The reader should be reminded that in the SNA-NTA conversion described above, not all SNA detail was used. In practice therefore more detail may be used in the conversion of SNA and this would result in a revised framework, for SNA-NTA conversion. Once SNA estimates have been converted to NTA, age profiles may be applied to the converted variables, and micro totals based on detailed age profiles may be adjusted to the levels of the NTA estimates based on SNA, as is described in many sections (e.g., section 4.3-4.4 for private flows, and 5.3-5.4 for public flows) of the NTA manual.
2. The second option applies when only limited SNA estimates are available, generally restricted in many countries to GDP and its breakdowns. It will be shown below how this set of SNA estimates can be made more complete with the help of structural coefficients between estimates, generally based on previous year's SNA estimates that were more comprehensive, HH survey data, and other studies. This option assumes that not only GDP estimates are available, but that they are supplemented by GOV administrative records and balance–of-payments data for the ROW. In the compilation of this second option much use is made of the SNA identities that are described in subsection 3.2. Once a complete set of SNA estimates is available, they will be converted to NTA format as in table C.2 and thereafter NTA adjustments will be applied, as described in the previous section (4).
3. The third option is to re-compile SNA, taking into account the micro HH sector data that are used in NTA and that are not taken into account in conventional SNA compilation. For instance, NTA uses HH surveys more extensively (see section 4.3.1 of the NTA manual), deriving HH data on homes, consumer durables and pensions, and specifications by age profiles of HH flows. The NTA compilation would thus result in some additional estimates of HH flows, which need to be incorporated in the SNA type compilation. This would then require a re-compilation and possibly revision of the SNA estimates, as the conventional SNA estimates did not take these micro data into account. Once the SNA is re-compiled and has resulted in comprehensive SNA estimates, these can be converted to NTA format, as described in the previous sections of this appendix. When pursuing this option, SNA estimates, in particular, of HH sector accounts may be revised in the light of the new information on HH variables. The re-compilation option is generally only applicable if comprehensive or near-comprehensive SNA estimates are available and thus inconsistencies are generated with existing SNA estimates, when NTA specialists introduce additional micro data mainly based on HH surveys. The re-compilation is not an option if very limited data are available (option 2 above) and thus very few inconsistencies are generated between available esti-

mates and new data. Re-compilation of SNA is a labour intensive option, which may only be applied, with much support of national accountants, and may only be worthwhile if a sufficient number of additional data have become available.

Only the second option with limited SNA estimates will be described in the next section. The first option is already described in detail in the previous sections of this appendix.

C.5.2. NTA compilation based on limited SNA estimates and other data

Compiling the NTA with a limited SNA set of estimates may take as a point of departure three limited sets of SNA estimates of GDP and its breakdowns:

1. The most limited set of SNA estimates only includes estimates of GDP by economic activities (i.e., ISIC categories and subcategories on agriculture, mining, manufacturing, trade and transport, financial public administration and other services). The countries compiling these estimates use the production approach to GDP, by collecting data on output and assuming that the relation between output and value added does not change alternatively in constant prices or current prices. As GDP is in market prices and value added of each activity is in basic prices, there is generally available an estimate for product taxes less subsidies, which is one of the elements of NTA.
2. The second more extended GDP estimates includes in addition to the activity breakdown also a breakdown of GDP by expenditures, i.e., showing separate figures for final consumption, capital formation and exports less imports. In the expenditure approach, national accountants incorporate estimates of imports and exports based on foreign trade statistics and balance-of-payments figures, and identify in detail the elements of products destined for capital formation that are included in imports (most capital goods are imported in many countries) and in output (mainly output of construction). Private final consumption in market prices is an element that is used in NTA. It is derived in SNA either or not as a residual between GDP based on the production approach and the expenditure elements of exports minus imports and capital formation that are estimated separately.
3. In the third most extensive compilation of GDP is used a combination of the previous production, and expenditure approaches with an income approach to GDP. The income approach estimates the income components of GDP, i.e., compensation of employees, other taxes on production less subsidies and operating surplus. It should be noted that in most countries following this extended approach to GDP, mixed income is not separated from operating surplus and operating surplus is gross without deducting depreciation. These are two limitations which need to be resolved when using these extended GDP figures in NTA.

To arrive from the limited GDP estimates to the elements needed in NTA, four steps are needed. Some of those steps may require intensive cooperation between NTA and SNA specialists. The four steps are:

1. First GOV sector estimates should be compiled as reflected in the GOV sector column of table C.1. They should be based on GOV administrative records or on GFS data, as is explained in section 5.2 of the NTA manual. This information supports the PUBLIC sector variables in the GOV sector column of table C.1. Intensive cooperation between SNA and NTA specialists is needed to accomplish this compilation.

2. Secondly, balance–of-payments data, available for most countries, should be converted to the ROW accounts in table C.1. Detailed instructions on how to do this are contained in the IMF *Balance of Payments Manual*.[8] However, intensive cooperation between SNA and NTA specialists may be needed to convert the BOP figures to SNA. This data source is not identified in the NTA manual.
3. Thirdly, HH survey data should be used, as is described in section 4.3.1 of the NTA manual. This data source may generate in particular data on HH final consumption and on compensation of employees, which would not be available if only the production approach to GDP is used. If the very extensive GDP approach is used as described above, separate estimates of compensation of employees and HH final consumption are already available from the SNA estimates, and the HH survey would only provide the age profile of these estimates.
4. The fourth step would be to estimate the remaining SNA elements that are needed for NTA with the help of assumed relations between available SNA estimates and those that need to be estimated additionally. These so-called "structural relations" could be obtained from (i) SNA estimates in the past, when very detailed benchmark estimates were compiled by national accountants, or from (ii) special ad hoc studies.

Below are indicated which estimates of variables are available through steps 1-3 above, and which need to be estimated in step 4. In the case of variables estimated in step 4, it is indicated what types of assumptions about coefficients and other relationship structures, as well as SNA and NTA identities, could be used in the compilation of these variables:

1. The starting point of the SNA-NTA compilation when only limited SNA estimates are used is in most cases GDP and the sum of value added. As in most countries at least the production approach is followed, it is almost always possible to arrive not only at GDP, but also at the total of value added. The latter is the value before adding product taxes less subsidies and before deducting an imputed bank service charges made in SNA (called FISIM). The latter is defined as the difference between interest received and paid by banks, and which simulates output of banks, for which payments take place through interest charges, and thus increases operating surplus of banks. For the purposes of NTA, product taxes less subsidies should be added, even though GDP and value added are not explicitly included in NTA. However, as one of the GDP expenditure counterparts of final consumption is included in NTA in market prices, the starting point of NTA compilation based on limited GDP data should be GDP including the product taxes less subsidies. FISIM, as explained in subsection 4.3, should be deducted to arrive at GDP, if the country follows the earlier SNA treatment; if the 2008 SNA is followed by the country, NTA may use the revised SNA concepts of value added and interest received by banks, as asset based income is not affected, as was explained in the earlier subsection. Furthermore, all income concepts in NTA should be net of depreciation. Thus, when starting from GDP, first an estimate should be made of depreciation, which is deducted from GDP.
2. Labour income in NTA includes compensation of employees and part of SNA mixed income. Compensation of employees would be available if the income approach to GDP is used in national accounting. If only the production and expenditure approaches are used, this information will not be generated by national accounting.

8 See in particular appendix I of International Monetary Fund, *Balance of Payments Manual*, fifth edition, (English edition, November 2005), ISBN 1-55775-365-2.

In that case HH survey data may be used to construct this item. The HH survey data include data on employment of employees as well as data on average remuneration of employees. This information may then be used, either or not in cooperation with national accountants, to make estimates of compensation of employees. If past SNA estimates are available on the value added components, the structural breakdown of value added may be used to construct the required estimates of compensation of employees, either or not in combination with HH survey data. The structural information on value added components in the UN SNA 2008 figures is reflected in table C.4a. In this case compensation of employees is 76.72 per cent of value added, and this percentage may be applied to total value added (i.e., GDP minus product taxes less subsidies), which results from the production approach to GDP.

Table C.4.a.
Value added components

Compensation of employees	Other taxes less subsidies	Mixed income	Operating surplus, net
76.72%	3.87%	3.54%	15.88%
		18.21%	81.79%

3. Operating surplus, including mixed income, is generally available from an income approach to GDP. In such an approach mixed income is not separated, as there is no information on what part of operating surplus, including mixed income, is generated in small HH sector enterprises. Such information generally is only available if full sector accounts are developed in SNA. If the income approach to GDP is not followed in national accounting, the two elements need to be estimated in the context of NTA. The most obvious method would be to apply, based on past benchmark or other national accounts compilations, the value added coefficients of operating surplus and mixed income, as presented in table C.4a above, to the sum of value added (before addition of product taxes less subsidies) obtained from a production approach to GDP. This would result in SNA mixed income and value added, which then needs to be adapted for NTA purposes to arrive at adjusted versions of mixed income and operating surplus, as was explained above in subsection 4.3. There is hardly any alternative approach, as it is very difficult to get reliable data on mixed income from HH surveys. In some countries, small-scale production surveys may have been held, which might provide information on mixed income.
4. The two elements of production taxes less subsidies are fully measured, when using GOV administrative records in the compilation of GOV sector accounts, as suggested above. In table C.1, they refer to the receipts by GOV of product taxes less subsidies, which are levied on the value or volume of output and imports of products (goods and services) and to other production taxes, which are levied on the output establishments that produce goods and services.
5. For current taxes on income and wealth, both receipts and expenditures are needed. Data on the receipt of current taxes on income, wealth, etc. can be obtained from GOV administrative records. The payments of these taxes by sectors can be derived from the receipts, based on GOV administrative records, by deducting the disbursements of these taxes by the ROW and adding the receipts of those taxes by the ROW. No other breakdown of these flows is needed.

6. The remaining SNA flows are estimated, using the type of transaction matrices referred to in chapter 4 of the NTA manual, corresponding to social contributions and benefits, non-life insurance premiums and claims, miscellaneous current transfers and also property income. How the transaction matrices for these flows are used, when limited data and estimates are available, may be illustrated for one of the flows, i.e., miscellaneous current transfers. The transfer matrix for this flow is reproduced in matrix 4b. In the matrix, inflows and outflows are available as column and row totals for the PUBLIC (= GOV) sector and for the ROW. No estimates are available for the PRIVATE row and column totals; and also internal cells are empty. Estimates need to be made for all totals and internal cells and this was done, using the percentage of distributions of row and column totals, which may have been derived from a benchmark or other previous year SNA compilation. For example, the PRIVATE row and column totals could be derived by using the percentage of distribution corresponding to the totals of the missing row/column in relation to the percentage of distribution of the columns for which column totals are available. If (132+2) is (72.93 per cent+1.10 per cent) of the total of inflows in the last column, the total inflow is 181 (=(132+2)/ (72.93 per cent+1.10 per cent)) and thus the total private inflows are 47 (=181–132–2). As the total inflow is also equal to the total of outflows in the last row, the total of private outflows is 37 (=181–103–41). Thus all row and column totals are estimated, and values in the internal cells can be derived in the same manner as this was described in chapter 4 of the NTA manual. The same can be achieved for the other flows mentioned above. It should be noted here, though, that some of the flows could be based directly on actual administrative records or other actual data. This may apply to the social contributions and premiums paid to and received from non-GOV institutions dealing with social security and pension systems, which generally are few and maintain public information systems. The same may hold for non-life premiums and claims, on which information may be obtained from a few insurance companies which deal with this type of insurance; their number is also small and they may have good administrative records. The flows that cause more difficulties are miscellaneous transfers and property income, on which less systematic information is available.

Table C.4.b.
Transfer matrices for selected flows, limited information

Miscellaneous current transfers					
	TO pub	**TO priv**	**TO row**	**Total**	
FROM pub				**132**	72.93%
FROM priv					25.97%
FROM row			-	**2**	1.10%
Total	**103**		**41**		**100.00%**
	56.91%	20.44%	22.65%	**100.00%**	

Appendix D

A macro inventory

This section asks researchers to think about their country's macro economy in general terms, before beginning the detailed work of constructing age profiles. By thinking about the macro controls and the institutional and cultural arrangements surrounding them, researchers will be able to focus on the most important aspects of the economy when they begin to calculate age profiles. The questions that constitute the macro inventory are answered below for the United States. A spreadsheet template of these questions is available at www.ntaccounts.org.

D.1. Life cycle deficit

D.1.1. Labour income

For the labour income inventory, a series of general questions are presented that explore the nature of the national labour market and examine several features that may have important age implications.

1. How many workers are employed in the formal versus informal sector?
2. How important is informal agricultural production (i.e., family farms) to the economy? Do all household members, including children, help with family farms?
3. How important are household-owned businesses (e.g., small shops) to the economy? Do all household members, including children, help in these enterprises?
4. When do people typically enter the labour force? Is it usually after a long period of formal education? Are there apprenticeship programmes in which students participate?
5. Are fringe benefits an important part of employee compensation? Is there a lot of employer-provided childcare, or health insurance or contributions to retirement plans?

D.1.2. Consumption

For the consumption accounts, these questions pertain to private consumption only, as public consumption is also part of the transfer accounts.

1. What proportion of people are owners versus renters? (This relates to the portion of private consumption that is the flow of services of owner-occupied housing.)
2. Do parents spend a significant amount of money on private schooling for young children? Do many families pay for supplementary private education services, like private tutors, even if children attend a public school?
3. Do many young people attend private universities or is the higher education system mostly financed by the government?
4. Do people have to pay much out-of-pocket for health care, or is health care mostly provided by the government? If care is provided by the government, is it just for certain age groups, like the very young or very old?

5. When people grow very old and rates of disability rise, how are the elderly cared for? In private homes, in public institutions, or through care in private homes subsidized by the government?

D.1.3. Public reallocations

Public reallocations include public transfers and public asset income. To understand the public sector thoroughly, it is helpful to fill out a public sector inventory, detailing all government revenue sources and expenditures. An example is shown in figure 4.4 for the United States in 2009. The dollar amounts are filled in with their macro controls, although the full calculation steps are not given until later chapters. At this point, it is sufficient to use this inventory as a template to note the major government programmes and sources of revenue used to pay for them, whether that represents taxes, the surplus of government-owned resources, such as oil or mineral wealth or public enterprises, or sale of assets to debt. As you progress in calculating the accounts, you can add the exact macro controls and information on data sources for the per capita age patterns. In this example for the United States, those sources include various types of administrative records, particular surveys with the survey data variable containing the relevant information, or information on the assumed age pattern.

D.1.4. Private reallocations

Private reallocations include private transfers and private assets. Private transfers have a close connection to household structure, as transfers are more likely to flow between those sharing a household than those living apart in most contexts.

Questions relating to private transfers:

1. What is the household structure like? Is there a great deal of multigenerational family coresidence? Or do family members tend to live in separate households but in the same area? Are there many households of persons living alone?
2. Do elderly relatives tend to move in with their adult children as they age, or do they maintain a separate residence, or do adult children move into the home of the elderly parent?
3. Are there cultural expectations that adult children will support elderly parents?
4. Are there cultural expectations that parents will support adult children?
5. Do children tend to leave the parental home for higher education or remain in the parental home?

Questions relating to private assets:

1. Is home ownership common? Is home buying financed by mortgage lending or do buyers have to have the cash before the purchase?
2. If a household operates a small farm, do they likely own the land or rent a plot?
3. Do people use consumer debt instruments such as credit cards or home equity loans?
4. Do many people save for their own retirement or do they mostly rely on public pensions?
5. Is it likely that households own stocks or bonds of corporations? (In the context of inequality, it is possible that few households own any of these assets, but the "average" household does because the average is skewed by a few high earners.)
6. Do many people finance their education by taking out student loans?

Table D.1.

Public sector inventory for the United States, 2009 (*billions of United States dollars*). Survey abbreviations in last column are for the Current Population Survey (CPS), Consumer Expenditure Survey (CEX), National Nursing Home Survey (NNHS) and the Medical Expenditure Panel Survey (MEPS)

	Transfers						
	In-kind	Cash	Asset-based	Total	Description	How is expenditure financed? How is tax paid?	Sources of information for per capita age pattern
Public programmes							
Education							
Operating public schools	677.2			677.2	Publicly operated schools.	Mostly through property taxes	Administrative records (enrollment)
Scholarships and other cash transfers		58.1		58.1	Direct student aid, mostly for higher education.	General funds	CPS (variable: inceduc)
Health							
Medicare	493.8			493.8	Health insurance for those age 65+	Earmarked payroll taxes, and gen'l funds	MEPS, NNHS
Medicaid	374.1			374.1	Health insurance for poor, and long-term care.	General funds	MEPS, NNHS
Other health	125.9			125.9	Public health, other health insurance for poor.	General funds	MEPS, NNHS
Pensions							
Social Security (OASDI, includes disability)		664.5		664.5	Pay as you go pension program.	Specifically earmarked payroll taxes	CPS (variable: incss)
Other social insurance programmes							
Unemployment		130.6		130.6	Federal and state unemployment insurance.	Payroll taxes and some general funds	CPS (variable: incunemp)
Programmes for the poor		204.1		204.1	Includes tax rebates, food aid, welfare payments.	General funds	CPS (variables: incssi, mwelf, mstampval, eitcred)
Programmes for veterans and their families		50.0		50.0	Includes health care, some pensions, readjustment payments.	General funds	CPS (variable: incvet)
Other		124.7		124.7		General funds	CPS (various)
Other in-kind programmes	**1609.1**			**1609.1**	**General government. Defense is largest item.**	**General funds**	**allocated on per-capita basis**
Rest-of-world transactions							
Social benefits		**16.1**		**16.1**	**Mostly social security for overseas beneficiaries.**	**Specifically earmarked payroll taxes**	
Other transfers (NET)		**53.3**		**53.3**	**Mix of government and business transfers.**	**General funds**	
Asset-based expenditures							
Interest on the national debt			**358.6**	**358.6**	**Paid to domestic and international debt holders**	**General funds**	
Total expenditures				**4940.1**			
Indirect taxes less subsidies							
Sales taxes		519.0		519.0	Mostly state-level sales taxes.	Mostly levied at point of sale	CEX (uses same age shape as private non-education, non-health care consumption)
Property taxes		419.8		419.8	Mostly state-level property taxes.	Paid based on value of property	CEX (variables: pproptax, ohtax)
Other		79.0		79.0			
LESS subsidies		-59.7		-59.7	Mostly agricultural and manufacturing subsidies.		
Current taxes							
Income taxes		1113.2		1113.2	Taxes paid by individuals on income.	Paid by employees and employers	CPS (variables: fedtax, statetax)
Corporate taxes		249.1		249.1	Taxes paid by corporations on earnings.	Paid by owners of corporations	CPS (variables: incdivid, incint)
Other		28.2		28.2	Mostly license fees	Paid by licensees	
Contributions for government social insurance							
For Social Security		653.0		653.0	Taxes for Social Security (called FICA taxes)	Paid by employees and employers	CPS (variable: fica)
For Medicare		239.3		239.3	Taxes specifically for Medicare (part of FICA)	Paid by employees and employers	CPS (variable: fica)
Other		71.8		71.8	Mostly taxes for unemployment insurance		
Rest-of-world transactions							
Government social contributions from ROW		4.9		4.9	Mostly social security taxes		
Taxes from ROW		14.7		14.7	Mostly income taxes on overseas workers		
Income on assets			**141.4**	**141.4**			
Surplus of government enterprises			**-14.9**	**-14.9**	**Mostly losses from post office, other**		
Current transfer receipts		**185.2**		**185.2**	**Transfers among business, individuals and gov't**		
Total receipts				**3644.0**			
Receipts less expenditures (net government saving)				**-1296.1**			

Note: Codes: Current Population Survey (CPS); Consumer Expenditure Survey (CEX); National Nursing Home Survey (NNHS); Medical Expenditure Panel Survey (MEPS).

Appendix E

Intra-household transfer supplementary materials

G.1. Intra-household calculation algorithm in mathematical notation

The following explication describes in notation the steps discussed in chapter 7.

1. Gather data (individual-level variables, adjusted to macro controls, for person i in household j):
   - $yl(i, j)$: labour income
   - $tgxci(i, j)$: public cash transfer inflows
   - $tg_{tax}(i, j)$: taxes paid (does not include public transfers surplus/deficit amounts)
   - $tfb(i, j)$: net inter-household transfers
   - $cc(i, j, x)$: current consumption, sector x (x could be any number of sectors but is usually health, education, other less owned housing; when no x is specified, it is total current consumption)
   - $ohc(i, j)$: owned housing consumption

2. Calculate intra-household transfer outflows for health, education and other combined (TFWOc):

   a) Calculate current surplus or deficit for each person i in household j:

$$X(i, j) = yl(i, j) + tgxci(i, j) - tg_{tax}(i, j) + tfb(i, j) - cc(i, j, x)$$

$$Surplus(i, j) = \max[0, X(i, j)]$$

$$Deficit(i, j) = -\min[0, X(i, j)]$$

b) Calculate the internal "tax rate" on each household member's surplus:

$$hh_{tax}(j) = min\left[1, \frac{Deficit(j)}{Surplus(j)}\right] if\ Surplus(j) > 0$$

$$hh_{tax}(j) = 0\ if\ Surplus(j) = 0$$

where $Surplus(j) = \sum_i Surplus(i, j)$ and $Deficit(j) = \sum_i Deficit(i, j)$

c) Apply the internal "tax rate" to surpluses to calculate outflows and make up any household shortfalls using assets of the household head (let i=1 indicate the household head):

$$Shortfall(j) = \max[0, Deficit(j) - Surplus(j)]$$

$$TFWO_C(i, j) = hh_{tax}(j)\, Surplus(i, j) \text{ for } i \neq 1$$

$$TFWO_C(i, j) = max\left[0, hh_{tax}(j)\, Surplus(i, j) + Shortfall(j) - Deficit(i, j)\right]$$
$$\text{for } i = 1$$

3. Calculate sector-specific inflows and outflows:

a) Inflows:

$$TFWI_c(i, j, x) = \frac{cc(i, j, x)}{cc(i, j)} Deficit(i, j) \text{ for } i \neq 1$$

$$TFWI_c(i, j, x) = \frac{cc(i, j, x)}{cc(i, j)} \max[0, Deficit(i, j) - Shortfall(j)]_{\text{for } i = 1}$$

b) Outflows:

$$TFWO_c(i, j, x) = \frac{TFWI_c(j, x)}{TFWI_c(j)} TFWO_c(i, j)\ if\ TFWI_c(j) \neq 0$$

$$TFWO_c(i, j, x) = 0\ if\ TFWI_c(j) = 0$$

4. Transfer any remaining surplus that is not taxed for current consumption from non-heads to head of household:

a) Outflows:

$$TFWSO(i, j) = Surplus(i, j) - TFWO_c(i, j) \text{ for } i \neq 1$$

$$TFWSO(i, j) = 0 \text{ for } i = 1$$

b) Inflows:

$$TFWSI(i, j) = 0 \text{ for } i \neq 1$$

$$TFWSI(i, j) = \sum_{i} TFWSO(i, j) \text{ for } i = 1$$

5. Transfers for consumption of owned housing (*TFWOoh, TFWIoh*):

a) Outflows:

$$TFWO_{oh}(i, j) = 0 \text{ for } i \neq 1$$

$$TFWO_{oh}(i, j) = ohc(i, j) - ohc(j) \text{ for } i = 1$$

b) Inflows:

$$TFWI_{oh}(i, j) = ohc(i, j) \text{ for } i \neq 1$$

$$TFWI_{oh}(i, j) = 0 \text{ for } i = 1$$

6. Construction of age profiles of total intra-household inflows and outflows:

$$TFWO(i, j) = TFWO_{oh}(i, j) + TFWSO(i, j) + \sum_{x} TFWO_{c}(i, j, x)$$

$$TFWI(i, j) = TFWI_{oh}(i, j) + TFWSI(i, j) + \sum_{x} TFWI_{c}(i, j, x)$$

Glossary

Age pattern An age schedule showing how relative levels of an economic flow vary by age.

Age profile In NTA, an economic flow by age in a particular year for a country which is consistent at the national level with the value of that flow as measured in that country's national accounts. Expressed in per capita or aggregate terms.

Age reallocations Economic flows that shift resources from one age to another. Age reallocations are either transfers or asset-based reallocations.

Age shape See age pattern.

Aggregate control See macro control.

Asset income The return to assets, including the operating surplus of corporations, estimates of the return to capital from unincorporated firms, the value of in-kind services flowing from owner-occupied housing and net property income.

Asset income, private The operating surplus of corporations, a portion of the income of unincorporated enterprises, the value of in-kind services flowing from owner-occupied housing and net property income from financial assets owned by the private sector.

Asset income, public Net income on publicly owned financial assets, including interest paid and received on public debt.

Asset- based reallocation The net flows to an age group associated with assets, calculated as asset income less saving. Borrowing is a positive asset-based flow and repayment of debt is a negative asset-based flow.

Assets Value of capital, land and subsoil resources, and financial assets and liabilities.

Asset transfers Bequests and other large transfers, e.g., dowries.

Bequests End-of-life transfers to descendants and other beneficiaries. Bequests are not included in NTA flow accounts but will be part of wealth accounts, still to be estimated.

Capital Assets that are produced and serve as a store of value or a factor for producing goods and services.

Capital Income Returns to capital held by corporations and households.

Cohort All members of a population born in the same year (birth cohort); those experiencing some other designated event, such as marriage or immigration, in the same year.

Consumption Goods and services that satisfy the needs and wants of residents.

Consumption, private Goods and services provided by the private sector (corporations, households and non-profit institutions serving households).

Consumption, public Goods and services provided by the public sector, such as publicly provided education and health care. Purely public and quasi-public goods are included.

Control total See macro control.

Deficit, lifecycle See life cycle deficit.

Deficit, transfer surplus/ See transfer surplus/deficit.

Dissaving Spending down of assets or the accumulation of debt that occurs when consumption exceeds disposable income.

Earmarked Taxes that are used to pay for a specific public programme are "earmarked" for that specific public programme, as opposed to general taxes which are part of the governments general funds and can be used for any public expenditure.

Economic life cycle The age pattern of consumption and labour income. In principle the concept is longitudinal, but in NTA it is sometimes used to refer to a cross-sectional age pattern.

Fiscal support ratio Ratio of the number of taxpayers, weighted by age-specific per capita public transfer outflows, to the number of beneficiaries, weighted by age-specific per capita public transfer inflows.

Flow account The complete system of accounting for flows in the System of National Accounts current flows, in a way that is relevant for NTA research purposes.

Generational accounts Estimation method to assess the sustainability of government programmes.

Generational economy (1) The social institutions and economic mechanisms used by each generation or age group to produce, consume, share and save resources; (2) the economic flows across generations or age groups that characterize the generational economy; (3) explicit and implicit contracts that govern intergenerational flows; and (4) the intergenerational distribution of income or consumption that results from these flows.

Household A unit of economic organization within which resources such as a shared dwelling and the income of household members are shared. Often a household will be occupied by one family group, but there can be non-family members included or a household may be made up of all non-relatives.

Household head In NTA, the household member who is assumed to own all household assets and to owe any household debt. Surveys use various definitions to designate a household head.

Indirect taxes Taxes levied on products and production, as opposed to taxes on income or assets.

Income See property income, capital income, labour income or asset income.

Inflows Flows received by individuals or age groups, including labour income; cash and in- kind transfers received; asset income, including the value of earnings retained by corporations and services derived from an owner-occupied home and consumer durables; and dissaving.

Intergenerational transfers Transfers between different age groups.

Labour income The value of the work effort of employees, the self-employed and unpaid family workers. Labour income is measured by earnings, the value of employer-provided benefits and an estimate of labour's share of income from unincorporated business. It also includes a portion of indirect taxes less subsidies, and so reflects basic prices instead of market prices.

Life cycle deficit The value of consumption minus labour income.

Life cycle surplus The value of labour income minus consumption.

Macro control A value from national accounts indicating the annual national total for a particular type of economic flow, used to adjust estimated age patterns so that NTA age profiles are consistent in the aggregate with national accounts.

Mean age of consumption, labour income or transfers The average age at which any economic consumption, labour or other flow occurs in a population. The mean ages are used to summarize the age patterns of consumption, production, transfer inflows and transfer outflows. The mean age depends both on the per capita age profiles of inflows or outflows and on the age distribution of the population.

Mixed income Income from household-owned enterprises where it is unclear how much of the income was generated by labour inputs and how much by capital inputs.

National accounts Accounting techniques for measuring the total amount of various types of economic activity at the national level.

National Transfer Accounts (NTA) A system of macroeconomic accounts that measures current economic flows by age in a manner consistent with the United Nations System of National Accounts. NTA measures age- specific labour income, asset income, consumption, transfers and saving, accounting for flows within households, between households, through the public sector and with the rest of the world.

National Transfer Accounts Project A network of research teams working in universities, international organizations and private and government research institutes in more than 40 countries. The Center for the Economics and Demography of Aging at the University of California at Berkeley and the East-West Center in Honolulu serve as the lead institutions.

Normalization To facilitate comparisons across countries with different currencies and standards of living, per capita values for a country are frequently expressed relative to the per capita labour income of persons 30-49 years of age in that country.

Outflows Payments or expenditures by individuals or households, including consumption, cash and in-kind transfers made, and interest payments, taxes and saving.

Primary income Labour income plus asset income.

Private sector Individuals, households and non-profit institutions that serve households and state-owned enterprises.

Private asset–based reallocations Private asset income less private saving.

Private saving Private disposable income less private final consumption expenditure.

Property income Income from financial assets, e.g., interest income and expense, dividends paid and received, rent paid and received.

Public sector All levels and all sectors of government, including public education, pensions, publicly funded health care and all other cash and in-kind transfers. The state-owned enterprise sector is considered part of the private sector.

Public asset–based reallocations Public asset income less public saving.

Public saving Net public asset income minus net public transfers.

Rent Rent paid and received on land plus royalties paid and received on subsoil assets.

Rest of the world (ROW) All non-resident institutional units that enter into transactions with resident units.

Saving The portion of current income used to accumulate assets, calculated as primary income plus net transfers less consumption.

Support ratio The ratio of the number of workers, weighted to incorporate age-variation in labour income, to the number of consumers, weighted to incorporate age-variation in consumption.

Synthetic cohort A cumulative measure of a flow for an estimated hypothetical population over part or all of its lifetime, subject to age-specific flows estimated for a period of time, i.e., based on cross-sectional estimates. Age-specific values may or may not be weighted by age-specific survival.

Taxes Compulsory, unrequited payments, in cash or in kind, made by the private sector to the public sector, including social contributions.

System of National Accounts (SNA) An international statistical standard for estimating national accounts adopted by the United Nations.

Total fertility rate A synthetic cohort measure of childbearing that gives the average number of children born over the reproductive lifespan of a woman, given age-specific fertility rates at a given time.

Transfer inflows Transfers received by individuals or age groups.

Transfer outflows Transfers made by individuals or age groups.

Transfer surplus/deficit The difference between public transfer inflows (benefits) and revenue from taxes and grants.

Transfer wealth The present value of expected net transfers received in current and future time periods. Transfer wealth may either refer to a particular individual or age group, or it may be an aggregate for the whole economy, calculated as the population-weighted average of the age-specific per capita values.

Transfers Cash and in-kind flows to and from individuals or age groups that involve no explicit quid pro quo.

Transfers, net Transfer inflows minus transfer outflows.

Transfers, private Transfers between co-resident household members, between households whether direct or through private institutions, and between households and the rest of the world whether direct or mediated by private institutions. These involve no explicit quid pro quo exchange.

Transfers, public Transfers between individuals or households that are mediated by government, including public pensions, public education, publicly funded health programmes and compulsory national health insurance, and all other public spending on goods and services.

Wealth Assets plus transfer wealth.

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