National Transfer Accounts Manual

Draft Version 1.0

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I. Overview of National Transfer Accounts

The purpose of National Transfer Accounts (NTA) is to measure at the aggregate level how those at each age acquire and use economic resources. The work is motivated in large part by a fundamental feature of all societies – the economic lifecycle, i.e., the mismatch between material needs and the ability to satisfy those needs. The economic lifecycle is quantified in National Transfer Accounts by comparing consumption and labor income. The young and the old have a lifecycle deficit because they produce less through their labor than they consume. Working-age adults have a lifecycle surplus because they produce far more through their labor than they consume (Lee, Lee, and Mason 2008; Mason, Lee, Tung, Lai, and Miller forthcoming).

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

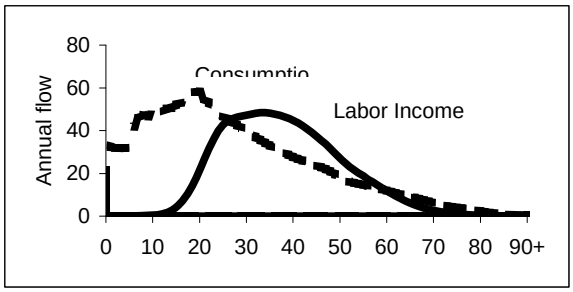
At the aggregate level the economic lifecycle also reflects the population age structure. In young populations, the aggregate economic lifecycle is dominated by the large lifecycle deficit, the economic resource needs, of the young. Over the course of the demographic transition, populations age and the lifecycle deficit of the old becomes increasingly important.

Figure 1 compares the economic lifecycle 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 lifecycles 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 labor income. Those 60 and older in the Philippines and 58 or older in Germany are also consuming more than their labor income.

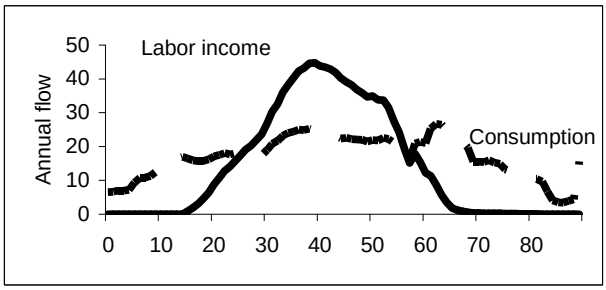
The sheer magnitudes of the lifecycle deficits in both countries warrant emphasis. The combined deficit of the young and old is 65% of total labor income in the Philippines and 52% in Germany. The most striking difference between the two countries is that the child deficit is so large relative to the old-age deficit in the Philippines (almost 15 times larger), while in Germany the old-age deficit is 50 percent 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 labor income for the two countries.

Figure 1. Economic Lifecycle, the Philippines and Germany.

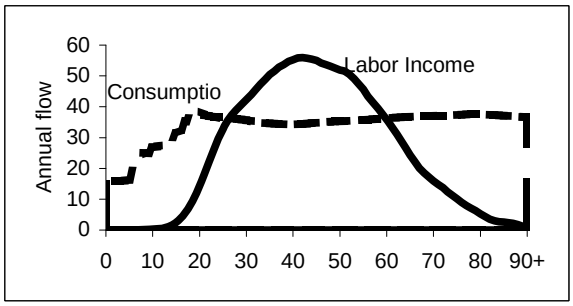
A. Philippines, aggregate flows, billions of pesos.



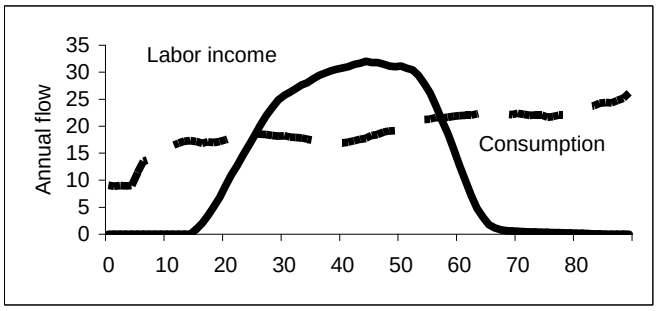
B. Germany, aggregate flows, billions of marks.



C. Philippines, per capita flows, thousands of pesos.



C. Germany, per capita flows, thousands of marks.



The lifecycle deficits and surplus are sustainable only because a complex system of institutions and economic mechanisms enable flows of economic resources from surplus to deficit ages (Lee 1994a; 1994b). Economic flows across age are mediated by both the public sector and the private sector. The public sector reallocates resources relying on social mandates embodied in law and regulation and implemented by local, regional, and national governments. Education, public pensions, and health care programs are important examples of public reallocation programs, 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 are shared by all. Private sector reallocations are governed by voluntary contracts, social conventions, and deeply ingrained behavioral 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 the elderly (Table 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 of money for goods or services. Resources flow from one party to another either voluntarily, in the case of most private transfers, or not, in the case of public transfers. The transfers of interest in NTA are inter-age or intergenerational transfer.

Table 1. A Classification of National Transfer Account Age Reallocations			
	Asset-based reallocations		Transfers
	Capital	Property	
Public	Negligible	Public debt Student loan programs Sovereign wealth funds Currency stabilization funds	Public education Public health care Unfunded pension plans
Private	Housing Consumer durables Corporate profits Partnerships and sole proprietorships	Consumer debt Land Sub-soil minerals	Familial support of children and parents Bequests Charitable contributions
Source: Adapted from Lee 1994.			

Asset-based reallocations realize inter-age flows through inter-temporal exchange. For example, an asset such as gold can be acquired in one period generating an outflow at that age, and disposed of in a subsequent period generating an inflow at an older age. More generally asset-based reallocations involve two kinds of flows – asset income and saving. When individuals accumulate pension funds or personal saving during their working years and rely on asset income and/or dis-saving of those assets during their working years, they are relying on asset-based reallocations. Or when individuals borrow to finance their education, they are relying on asset-based reallocations to shift resources to young ages when they are in need from later in life (older ages).

A complete flow account in highly summarized form is provided in Table 2. The values in the table are calculated by single year of age but aggregated into broader age groups. Much of the detail about the elements in the flow account is not presented here, but the broad outlines of the economic lifecycle and the age reallocation system are documented. Children under the age of 20 in Taiwan in 1998 depended almost entirely on transfers to meet their lifecycle deficit. Of those transfers over 70 percent are private and under 30 percent public. Transfers provided about 60 percent of the lifecycle deficit for the elderly and asset-based reallocations about 40 percent. Public and private transfers were roughly equal in importance. The elderly relied heavily on asset income, but they did not dis-save. Rather they had very modest saving.

Table 2. National Transfer Flow Account, Taiwan, 1998, Aggregate Values, Nominal, (NT$ billion)

		Domestic by age				
	Total	0-19	20-29	30-49	50-64	65+
Lifecycle Deficit	**525**	**1,671**	**-13**	**-1,500**	**-25**	**391**
Consumption	5,855	1,737	1,064	1,939	654	461
Public	1,549	590	246	419	161	133
Private	4,305	1,147	818	1,520	493	328
Less: Labor income	5,330	66	1,076	3,439	678	70
Age Reallocations	**525**	**1,671**	**-13**	**-1,500**	**-25**	**391**
Transfers	-29	1,692	200	-1,862	-290	231
Public	2	436	-15	-463	-77	121
Private	-31	1,256	215	-1,399	-213	111
Asset-based Reallocations	554	-21	-213	362	266	160
Public	-173	1	19	-103	-63	-27
Income on Assets	0	0	-1	-5	3	4
Less: Public Saving	173	-1	-20	97	66	31
Private	727	-22	-232	464	329	187
Income on Assets	2,149	4	182	1,265	490	208
Less: Private Saving	1,422	26	413	800	161	21

The economic flows, which comprise the National Transfer Flow Account, are part of larger conceptual framework that measures the economic flows and the evolution of wealth experienced by cohorts as they advance from childhood, to adulthood, and eventually to the end of life. A complete set of accounts would consist of four sub-accounts: a balance sheet, a flow account, an asset transfer account, and holding gains. Those familiar with the System of National Accounts will recognize the parallels with NTA. The basic accounting identity linking these elements is:

$$W(x,t) = W(x-1,t-1) + F(x,t) + \tau^{A}(x,t) + H(x,t) \qquad (0.1)$$

where $W(x,t)$ is the wealth of those of age *x* at the end of year *t* , *F(x,t)* is net flows for those age *x* during year *t,* $\tau^{A}(x,t)$ is capital transfers during the period for each age, and $H(x,t)$ is holding gains during the period for each age. The flows, measured in the NT Flow Account, consist of the good and services produced and distributed during the current period. These are the same flows that are the most familiar and widely used aggregate economic measures, e.g., GDP, consumption, saving and investment, etc. Transfers in the flow account refer to goods and services produced during the current period and transferred to individuals of a different age. Asset transfers refer to large, previously accumulated wealth that is transferred to individuals of a different age. Examples of asset transfers are bequests, dowry, and other large *inter vivos* gifts. The asset transfer account in NTA is conceptually similar to the capital transfer account in

UNSNA, although SNA only measured inter-sectoral flows. Holding gains include two distinct categories of factors that influence wealth. The first is changes in asset prices. The second category is non-market changes, e.g., losses due to war or natural catastrophe.

The remainder of the manual provides detailed information about the methods for constructing the NT Flow Account. The next section addresses the economic lifecycle. The following section takes up public sector flows and the final section documents methods for constructing estimates of private asset-based reallocations. Further information including spreadsheets and programs are provided in the methods section of the NTA website: http://ntaccounts.org/web/nta/show/Methodology.

II. The Economic Lifecycle

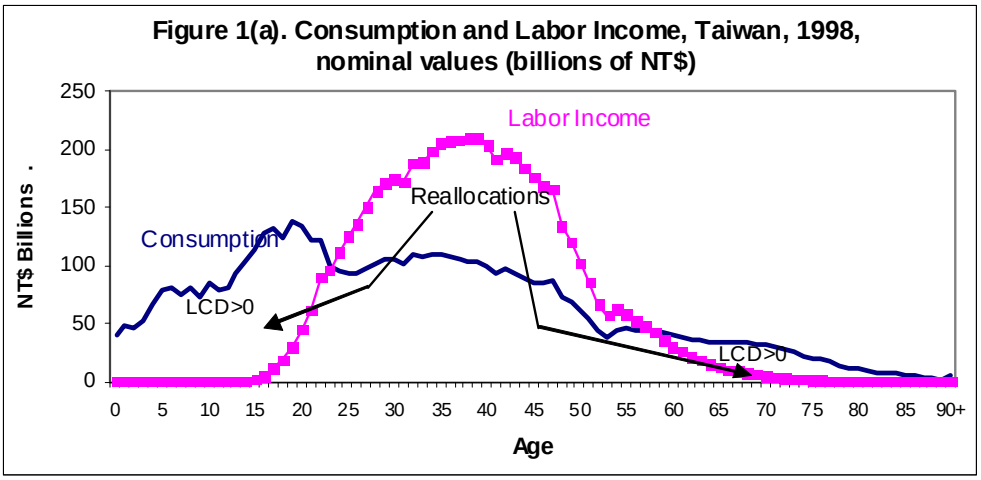
The economic lifecycle can be summarized by the amount consumed, the amount produced through labor at each age, and the lifecycle deficit, i.e., the difference between the two. Age reallocations occur because at some ages individuals consume more than they produce, while at other ages individuals produce more than they consume. The purpose of this document is to describe the methods used to estimate the economic lifecycle in the National Transfer (NT) Flow Accounts. Important additional preparation for the reader would be to read Lee, Lee, and Mason (2008).

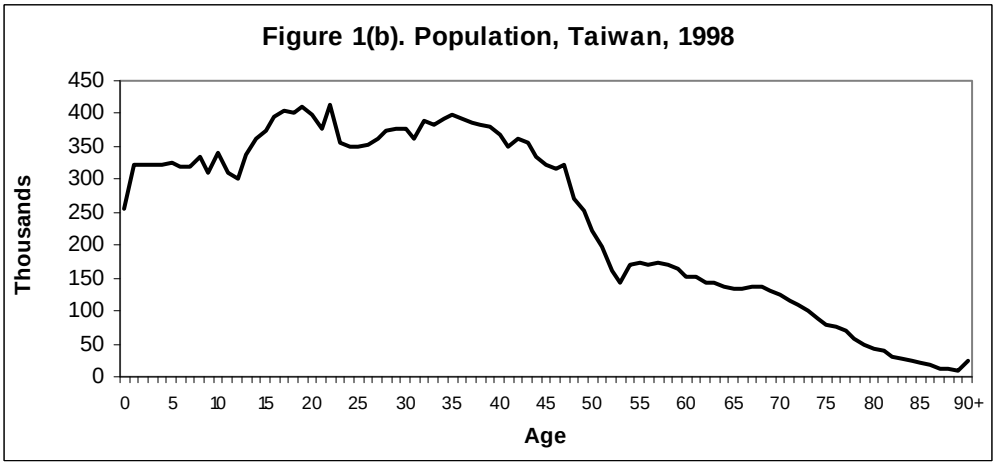
The lifecycle deficit measures the total value of goods and services consumed by members of an age group, $C(a)$ less the value of goods and services produced by members of an age group, $Y^l(a)$. That is:

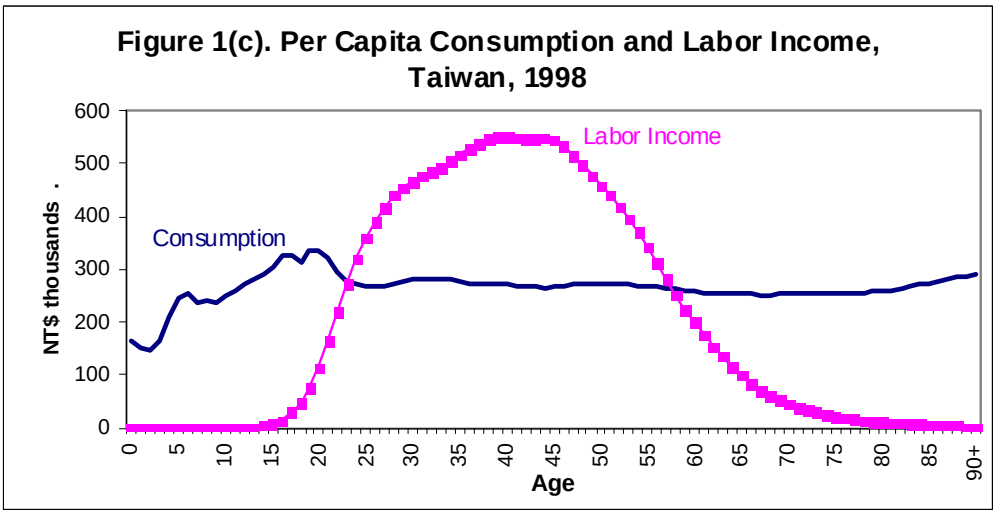
$$LCD(a) = C(a) - Y^l(a)$$
$$C(a) = C^f(a) + C^g(a)$$

where C^f represents private consumption and C^g is public consumption.

Figure 1 shows the case of Taiwan in 1998. Figure 1a presents estimates of aggregate consumption and labor income by single years of age. The age profiles of aggregate consumption and labor income reflect the age distribution of the population (Figure 1b) and per capita variation in labor income and consumption (Figure 1c).







Source: Mason, Lee et al. forthcoming.

Age groups with a lifecycle deficit, *LCD(a)>0*, support their surplus consumption by generating age reallocation inflows. For Taiwan, the net flows to those 24 and younger

amounted to 36% of total labor income in 1998. Total net flows to those who were 56 or older amounted to 11% of total labor income. Thus, reallocations from the working ages to the dependent ages amounted to nearly half of total labor income.

This guideline describes the method used to estimate the economic lifecycle profiles. The public and private age reallocation guidelines are explained elsewhere in this manual.

Aggregate Controls

Consumption, aggregated across all ages in Figure 1a, is the total value of final goods and services consumed in one calendar (or fiscal) year by a country's residents. Likewise, labor income, aggregate across all ages in Figure 1a, is equal to an estimate of the total value of production attributable to the labor of a country's residents. These values are based on National Income and Product Accounts as are many of the components in NTA. The aggregate estimated age profiles shown in Figure 1a and the per capita age profile shown in Figure 1c are estimated from individual/household surveys and administrative records. The age profiles are adjusted proportionately to match aggregate totals reported in NIPA or in some cases estimated using NIPA.

To be explicit about the procedure, let *x(a)* be the per capita age profile, *N(a)* the population, *X* the aggregate control value. The per capita profiles are adjusted using a factor θ:

$$\theta = \sum x(a)N(a) / X$$

Then, the final per capita profile and aggregate profile are given, respectively, by:

$$\tilde{x}(a) = x(a) / \theta$$
$$\tilde{X}(a) = \tilde{x}(a)N(a).$$

The aggregate control variables in the NT Flow Account are in general consistent with the National Income and Product Accounts (NIPA), based primarily on the United Nations 1993 System of National Accounts (UN 1993 SNA). The application of NTA in any particular case may deviate because national accounts in some countries follow the 1968 version of SNA or may differ in other ways from the UN guidelines. Another important source of information is the IMF Government Financial Statistics (GFS). The Appendix in *Public Age Reallocation Guidelines* in this manual discusses the use of GFS to construct public sector account in NTA. Detailed information on UN 1993 SNA is provided in http://unstats.un.org/unsd/sna1993/introduction.asp.

Consumption Aggregate Controls

The macro controls for consumption are based on *Final Uses in GDP*. With adjustments described below total NTA consumption is equal to "Final consumption expenditure", public consumption is equal to "General government final consumption expenditure,"

and private consumption is equal to “Household final consumption expenditure” plus “NPISHs’ final consumption expenditure.”

The aggregate control for private consumption of health (category 6) and education (category 10) are taken from the classification of private consumption by purpose. All other private final consumption expenditure is combined to serve as the macro control for the NTA variable other.

The macro control for public consumption of health, education, and other public consumption are similarly based on the classification of public consumption by purpose.

The following adjustments are required for consumption macro controls.

Reclassification of private health consumption. Private health consumption for which households receive reimbursement from national health insurance programs or other public health programs are reclassified as public health consumption.

Consumer durables. In UN 1993 SNA the consumption of owner-occupied housing is measured as the value of the flow of services. Other consumer durable consumption is measured by expenditure. If a flow of services approach is adopted, other private consumption must be adjusted by adding the value of the flow of services and subtracting expenditure on non-housing consumer durables.

Indirect taxes. Indirect taxes, called “Taxes on Production” under the Standard of National Accounts (SNA) 1993, consist of taxes on products payable on goods and services when they are produced, delivered, sold or transferred, plus taxes on the ownership or use of land, buildings or other assets used in production or on the labor. In NTA, the consumption is measured as pre-tax consumption, and hence, an estimate of indirect taxes on consumption should be subtracted. The *NTA Public Sector Guidelines* discusses taxes and their incidence in more detail.

Labor Income Macro Controls

Total labor income is estimated from NIPA. Using the terminology of the 1993 UN System of National Accounts, labor income consists of three components: *compensation of employees*, labor's share of *mixed income*, and labor's share of *taxes on net production and on imports* (known as *indirect taxes*) less *business subsidies*.

The compensation of employees consists of *wages and salaries* and *employers’ social contributions*, including labor income of residents who are working abroad.

Some of the non-resident remittances are in fact compensation. Individual country teams have to decide what would be the most relevant method for their country. For example, for the Philippines, where majority of workers abroad are guest workers, a substantial portion of remittances from ROW needs to be added to the labor income macro controls.

Labor's share of mixed income is not reported in NIPA and must be estimated. In the absence of information to the contrary, we assume that two-thirds of the household mixed income is labor income. This approach is consistent with the best available information. Warning: in some countries, the aggregate control *mixed income* includes the operating surplus (imputed rent) of households. In this instance the operating surplus of households should be subtracted from mixed income before labor's share is estimated.

The following adjustments are required for labor income macro controls.

Indirect taxes. Some taxes on production and on imports are borne by workers in the form of reduced compensation, by owners of assets in the form of reduced asset income, and by consumers in the form of higher prices. In NTA, the labor income is measured as pre-tax labor income. Hence, total labor income should be increased by net taxes on labor, i.e., an estimate of the share of taxes on production and on imports less subsidies borne by labor. See the *NTA Public Sector Guidelines* for the incidence of indirect taxes.

Estimating the Economic Lifecycle

The following steps apply to estimating the age profiles of consumption and labor income.

- Estimate the per capita age-profile for the variable using individual/household survey data or administrative records.
- Use population data to construct a preliminary aggregate age-profile.
- Adjust the per capita profiles to match aggregate controls.

Age profiles are estimates of per capita values by single year of age. We assume that all consumption within the household and that all public consumption can be assigned to individuals. Likewise, we assume that the value of labor income can be assigned to individuals working in firms or in family enterprise. This assumes away pure public goods, economies of scale, and other important features of consumption and production.

The data that are available will vary from country to country and, consequently, the methods employed will vary. In some instances, data on variables of interest are collected for individuals and per capita profiles can be directly tabulated. This is not usually the case, however. Often statistical techniques or simple rules are used to allocate data reported for households to the individuals residing in the household.

Once this is accomplished per capita profiles can be tabulated from the available survey data. Note that appropriate sample weights should be used in all cases. The per capita age profiles are noisy, particularly at ages with relatively few observations, and hence the NTA variables should be smoothed with important exceptions explained below.

The next step is to adjust the per capita age profiles to match the aggregate control as explained above. Population data is needed to construct a preliminary aggregate age-

profile. Then we use the aggregate profile and the per capita profile to match a control total taken from NIPA or some other source.

Consumption

Consumption is equal to private consumption plus public consumption. These are explained in turn.

Private Consumption

Private consumption is the value of goods and services consumed by individuals, households, or NPISHs that are acquired through the private sector. 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.

Private consumption is typically allocated to individuals based on household surveys. The methods described here assume the availability of one or more household surveys which include detailed expenditure data for the household and the number and age of all household members. Ideally the surveys are nationally representative.

Household expenditure surveys usually include all household expenditures or outflows. Although only consumption expenditures are needed to estimate consumption age profiles, other outflows are used to estimate other NTA components. Thus, it is useful to classify all household expenditures or outflows during the year as falling into one of three categories - consumption, transfers, or asset-based reallocations:

Consumption	Transfers	Asset-based Reallocations
Education, health, others	Tax payments	Saving
Rental value of owner occupied housing	Gifts	Interest payments
Flow of services from durables	...	Purchase of durables

NTA methodology distinguishes three components of private consumption: education, health, and other consumption. Education and health are estimated separately because they vary substantially by age.

Private education consumption includes tuition, books and fees, school supplies for all school levels including pre-school and tutoring expenses. The exact definition will vary depending on data availability. In Taiwan, for example, reference materials and self-improvement classes (art classes, music classes, etc.) are also included.

Private health consumption includes out-of-pocket health expenditure and reimbursement to health providers by private health insurance companies. If firms provide medical services directly to their employees and their dependents, the value of these services are also included in private health consumption. It is important to note that there are

differences between NIPA and NTA, and between NIPA and National Health Account. (NHA) (see below).

Housing consumption for owner-occupants is the value of the annual services that home yields typically measured as the amount for which the home could be rented. The purchase of a home is a component of saving and investment. Consumer durables should be treated, in principle, in the same way as housing. Consumption is the value of the services from the durables. The purchase of the durable is then classified as saving. Household expenditure surveys typically report the rental value of owner occupied housing. Whether or not consumption of durables can be measured as a flow rather than a purchase will vary from country to country. If data on durable ownership are not available, the purchase of durables is treated as consumption.

The following items should be classified as transfers and not included in consumption: tax payments, gifts, remittances, donations, and similar items.

The following items are classified as asset-based reallocations and not included in consumption: the purchase of a home; the purchase of consumer durables, the purchase of stocks, bonds, and other securities; investment in a business or farm; increases in cash holdings; interest payments; rent on land. Expenditure surveys will vary in the extent to which these items are reported. Often saving is estimated as a residual, i.e., income plus net transfers less consumption.

Some items require particular attention although they may be unimportant in some countries or data may limit the extent to which they can be treated.

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 portion of premiums collected each year are paid to beneficiaries who have experienced the particular event being insured. These payments are transfers. 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 NIPA and by NTA.

The US NIPA has recently been revised because catastrophic losses, e.g., those produced by Hurricane Katrina, lead to large fluctuations in insurance related components. The new revisions measure the consumption of insurance services using an estimate of normal profits. Catastrophic losses that lead to actual profits that differ from normal profits are treated as a transfer.

Health: In NIPA private health consumption includes the values of all goods and services that are marketed, i.e., goods and services purchased from either private or public

providers. Public health consumption includes only goods and services that are provided as in-kind transfers. Examples are the subsidized portion of public inoculation programs, public sanitation programs, free clinics, family planning programs, etc. Private consumption includes goods and services purchased and reimbursed through public cash transfer programs. Health consumption reimbursed by Medicare and Medicaid in the US and by National Health Insurance in Taiwan are classified as private health consumption in NIPA. However, in NTA, private health consumption that is reimbursed by the public sector is re-classified as public health consumption.

There are also important differences between NIPA and the NHA that should be kept in mind. First, NHA document expenditures rather than consumption. Expenditure is a broader measure that does not distinguish consumption from investment and profits. Private health expenditure, for example, includes the profits of insurance companies. Second, public national health expenditure in NHA includes both in-kind and cash transfers.

Separate procedures are used to allocate education, health, and housing and other consumption to household members. The methods described here are intended as illustrative and should be adapted to the particular circumstances of the country being analyzed and to the particular data that are available. The method of choice is to rely on individual level data for any consumption component, but these are rarely available.

Private Education Consumption

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

$$CFE_j = \sum_a \alpha(a) E_j(a) + \sum_a \beta(a) NE_j(a) + \varepsilon_j$$

where E_j is the number of enrolled members aged a (single age) in household j, and NE_j is the number of not enrolled members aged a in household j. The number of members not enrolled captures educational spending that is not part of the formal educational system. Note that this equation is estimated in homogeneous form (without an intercept) insuring that household consumption is fully allocated.

The survey usually identifies who is enrolled and who is not in each household. If the information is not available, then each country team decides these age groups, based on the country's schooling system. The age groups included varies with the country and with enrollment rates. In Taiwan, the number of enrolled includes those aged 3 to 29, although it varies by year.

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

The regression estimates are used to allocate the education expenditure for each household j to household member i. For example, for those who are enrolled:

$$CFE_{ij}(x) = CFE_j \alpha(x) / \sum_a \alpha(a) E_j(a)$$

where *x* is the age of the i^{th} household member. Education consumption for those not enrolled is calculated in similar fashion. Stata programming code for Taiwan is available at http://www.ntaccounts.org/doc/repository/Education%20Code.txt

Education consumption is intrinsically not smooth and the best approach is often to use the unsmoothed age profile to construct final estimates. Some smoothing at older ages may be warranted, however. Smoothing is discussed below.

Private Health Consumption

The allocation of private health consumption is difficult because of the complex ways in which it is financed. Three sources of finance are important in many countries: private out-of-pocket expense, private insurance, and the public sector. Different age allocation methods may be required for each of these components of health consumption.

National Health Accounts (NHA), available in some countries, provide a useful breakdown by source of finance.

The method used to allocate health varies depending on the availability of data.

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 (CFH_j) is regressed on the number of inpatients and outpatients aged a in each household:

$$CFE_j = \sum_a \alpha(a) IN_j(a) + \sum_a \beta(a) OUT_j(a) + \varepsilon_j$$

Stata programming code for Taiwan is available at
http://www.ntaccounts.org/doc/repository/Health%20Code.txt

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:

$$CFH_j = \sum_a \beta(a) U(a) M_j(a) + \varepsilon_j$$

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 be quadratic in age, for example. In this case, the model to be estimated is:

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

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:

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

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 works by assigning health expenditure equally to each household member and then tabulating the per capita profile. The per capita profile is then used as weights to allocate health expenditure to household members producing a new per capita profile. The procedure can be repeated each time using the newly generated profile to allocate household expenditure. Under some conditions, this approach will converge to the actual underlying profile. Whether it will always do so is unknown at this point. 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 for health differs from the model used for education because there is no variable that capture which individuals are receiving health care services. Hence, household health expenditure is regressed on the number of household members in each age group ($M_j(a)$)

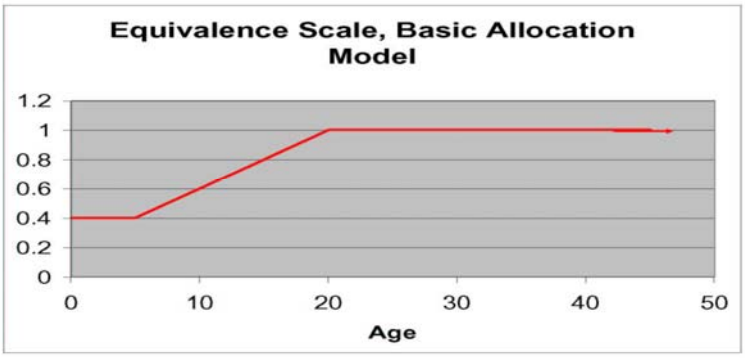
$$CFH_j = \sum_a \beta(a) M_j(a) + \varepsilon_j$$

The age groups can be single year or in broader age groups.

Other Household Consumption

All other household consumption is allocated to individuals using an *ad hoc* allocation rule 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 unreliable and we do not recommend that they be used.

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



A formula for the scale is:

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

where *D(x)* is a dummy variable equal to 1 when condition *x* is met.
Again, this scale is used to allocate the expenditure for each household *j* to household member *i*.

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

where *x* is the age of the i^{th} household member. Stata programming code for Taiwan is available at http://www.ntaccounts.org/doc/repository/Other%20Code.txt

Public Consumption

Public consumption is the value of consumption of goods and services individuals receive through the public sector. Public consumption is allocated to individuals based on administrative records and, in some instances, survey data. Like private consumption, public consumption distinguishes education, health, and other public consumption.

Public education consumption consists of two parts: formal and informal education consumption. Formal education consumption is government spending on primary, secondary and higher education levels. The informal education consumption refers to expenditure on culture, religious studies and other types of education.

Public health consumption consists of health care purchased by individuals and reimbursed through public programs, health care provided directly to individuals by government clinics and hospitals, and collective services, e.g., health education and preventative programs that are provided to the public at large. Health care purchased by individuals and reimbursed through public programs are also included.

Other public consumption consists of public goods and services, such as defense, justice and police, that are not targeted at particular age groups. See Table 8 of Public Age Reallocation Guidelines for NTA sector classification of public accounts.

Public Education Consumption

Public formal education consumption by age $E_g^f(a)$ is estimated by summing unit cost per student per level c_l weighted by the number of students by age in each level $e_l(a)$, i.e. $E_g^f(a) = \sum_l e_l(a)c_l$, where *l* is a school level. Unit cost per student at each level of education c_l is estimated by dividing public spending on education at that level by the reported number of students. Unit cost of education within each level is assumed not to vary by age. The number of students by age in each level $e_l(a)$ available from administrative records or, if necessary, tabulated from a household survey.

In addition to public formal education, public informal education consumption by age $E_g^{nf}(a)$ is estimated by dividing total public informal education consumption by total population by age. Public informal education consumption is not age-targeted, so it is allocated equally to everyone. Public education consumption by age is computed by summing public formal education consumption by age and public informal education consumption by age.

Public Consumption of Health

Health care provided directly by government programs must be allocated using administrative records, e.g., patient information; information about the kinds of health care services being provided (child and maternal health, etc.) Note that health care costs associated with pregnancy and birth are assigned to the mother.

Health care purchased by individuals and reimbursed through public programs are 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.

Other Public Consumption

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.

Treatment of Public Individual Services

In some countries, especially in European countries, public consumption is classified into two main categories, public collective consumption and public individual consumption. By definition, public collective consumption is the part of public consumption that cannot be allocated to individuals due to its nature, and hence, will be allocated equally to all members of the population. Public individual consumption is the part of public

consumption that can be allocated by age. Publicly provided child day-care services in Finland is an example. These services will be allocated to the beneficiaries of the services.

Labor Income

Labor income includes all compensation that is a return to work effort, including labor earnings, employer-provided benefits, taxes paid to the government on behalf of employees, and the portion of entrepreneurial income which is a return to labor.

Compensation of employees includes the value of social benefits provided to workers, including payments to retirees. In principle, compensation should include the imputed value of providing the social benefit to employees. For example, if employees will receive unfunded pension benefits in the future, current compensation should include the imputed value of purchasing an annuity that would provide the future pension. In practice, this is often not possible and the payment of social benefits to current or former workers is counted as current compensation and allocated to current workers.

Compensation also includes compensation to those on paid leave (vacation and sick leave) and hence excluded from labor income calculations. The value of other activities, such as childrearing and other in-home activities, which do not produce market goods or services, is also excluded from labor income calculations.

Labor income includes the portion of entrepreneurial income which is a return to labor. The remaining share of entrepreneurial income is designated as a return to capital, with the share of entrepreneurial income allocated to capital assumed to be the same for each age of worker. In the absence of information to the contrary, we assume that two-thirds of the operating surplus of unincorporated enterprises is labor income. The simple method of allocating two-thirds of mixed income to labor is consistent with the best available evidence on this issue.

Earnings/Fringe Benefits

The age profile of employee compensation is estimated using survey data which reports individual earnings. In general, surveys provide information about wages and salaries, but do not provide information about employers' social contributions. In the absence of information to the contrary, we assume that employers’ social contribution is a constant proportion of wages and salaries.

Labor Income of the Self-Employed

With few exceptions self-employment income is reported for households rather than individuals. Even in cases where values are reported for individuals, such as in Taiwan, a high percentage is assigned to the household head. Often children or the spouse 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 labor income of younger and, perhaps, older household members.

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 *employees.* That is the self-employment income accruing to i^{th} individual in household *j* ($YLS_{ij}(x)$) is,

$$YLS_{ij}(x) = YLS_j \gamma(x)$$

$$\gamma(x) = w(x)SE_j(x) / \sum_a w(a)SE_j(a)$$

where *x* is the age of the i^{th} household member, *SEj(a)* is the number of people in household *j* who are self-employed or unpaid family workers of age *a*, *w(a)* is the average earnings of employees. Thus, $\gamma(a)$ is the share of total household self-employment labor income allocated to each household self-employed or unpaid family member who is age *x*.

In this way the total self-employment labor income generated at age *x* in each household is found, and summing across all households the total self employment labor income generated at age *a* is found. Stata programming code for Taiwan is available at http://www.ntaccounts.org/doc/repository/RevisedYLcode.txt

Smoothing

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:

- The per capita education profile 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,
    - Public health spending may increase dramatically when individuals reach an age threshold, e.g., 65. 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 adults, excluding those younger age group who do not earn income.
    - However, problem arises when some beginning age group may appear to have negative values for these variables. This could be solved by replacing the negative by the unsmoothed values for the beginning age group.

There are a couple of steps to smoothing the per capita profile. The first step is to create a spreadsheet, which contains unsmoothed age profile and the number of observations for

each age. The second step is to use Friedman's SuperSmoother (supsmu function in R) to smooth the per capita profile incorporating the number of observations. The following is the R code to use the command “supsmu”. Suppose “thyl.csv” is the file name (tab delimited excel file format), yl the unsmoothed variable name, and sample is the number of observations for each age in the data. The R programming code is;

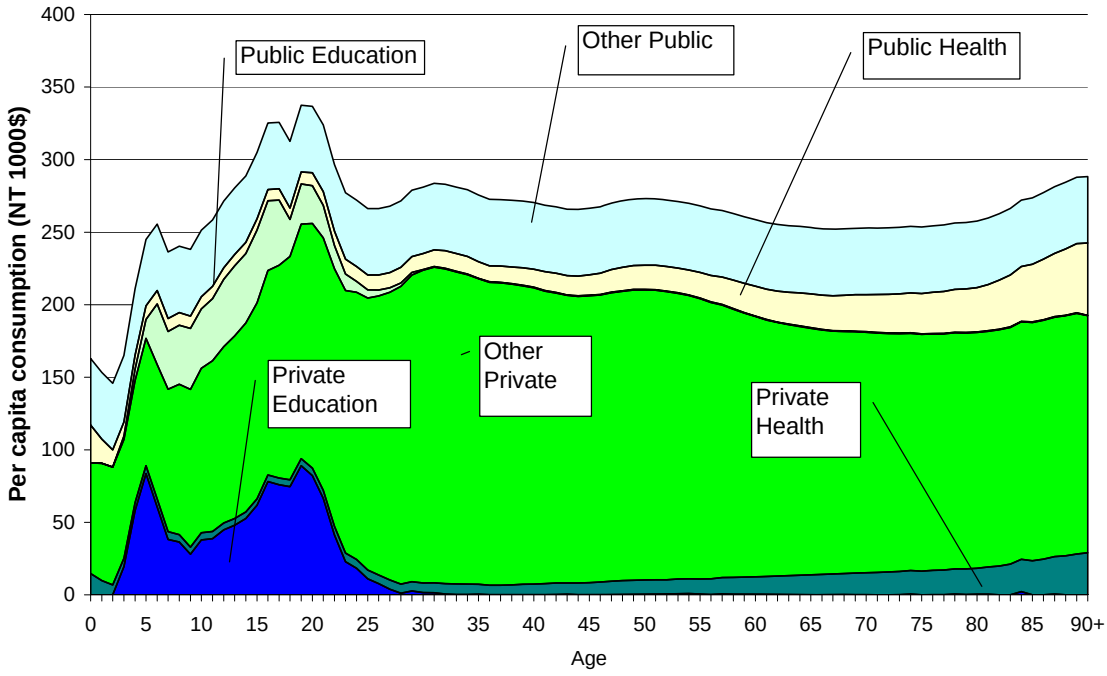
```
nta<- read.csv("thyl.csv",header=T)  *Read in data. Work name is nta
test<- supsmu(nta$age,nta$yl,nta$sample) *Smooth data. Work name is test
write.csv(test,"smoothed_thyl.csv")  *Write out data using name "smoothed_thyl"
```

The alternative smoothing method is “lowess” smoothing. The procedure is found to be unreliable because it does not incorporate sample weights. We recommend that it not be used. However, some researchers may feel more comfortable using the Stata rather than the R program, and would prefer to use the lowess smoothing method. If that is the case, before smoothing the age profile using the lowess command, the survey data are should be adjusted to incorporate the sample weight of each observation. Each observation is duplicated in proportion to its sample weight to produce a representative sample. Then, the lowess command is used to smooth the representative sample.

Illustrative Examples

After smoothed, the national population age distribution is used to the age profiles to match the macro control total, as described in Aggregate Controls. Figure 2 shows the per capita consumption profile by component for Taiwan in 1998. Most consumption is private rather than public, and in many important areas, food, housing, and clothing, for example, the private sector dominates. The public sector is also important, particularly in education and health. By and large, however, it is private consumption that shapes the consumption side of the lifecycle equation. The sharp increases among children in Taiwan reflect private spending on education.

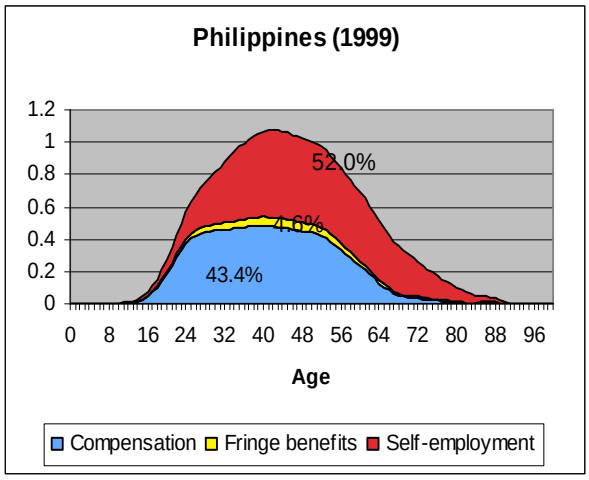
Figure 2. Per Capita Consumption, Private and Public by Sector, Taiwan, 1998

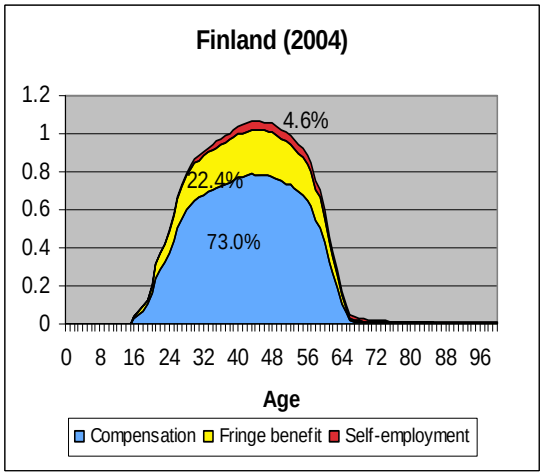


Source: Lee, Lee, and Mason (2008).

Figure 3 presents the per capita labor income profile by component for Finland and the Philippines. Note that, for purposes of comparison, each curve is normalized by dividing it by the unweighted average labor income for ages 30-49. This age range was chosen to exclude younger ages that might be affected by educational enrollments, and older ages that might be affected by retirement. The two labor income profiles are similar, inverse U-shaped. It should come as no surprise that the share of self-employment income is much larger for the Philippines than for Finland. The share of self-employment income is 52% for the Philippines, and 5% for Finland. To the contrary, the share of fringe benefits is much larger for Finland (22%), compared with the Philippines (5%).

Figure 3. Per Capita Labor Income by Sector: The Philippines (1999) vs. Finland (2004)





Source: Authors' calculation.

III. Public Age Reallocation

The purpose of this document is to describe concepts and methods used to estimate public age reallocations in the National Transfer Flow Account. The material presented here presumes that the reader has estimated the complete economic lifecycle. Important additional preparation for the reader would be to read Mason, Lee, et al. (forthcoming). Readers might also find it useful to review public sector lectures available on the NTA website. Several spreadsheets, also available on the NTA website, can be used to assist in the construction of public sector accounts.

Implementing the methods described here requires an extensive amount of data. First, because NTA is constructed in a manner consistent with the UN System of National Accounts, key aggregate estimates are drawn from National Accounts and require, in particular, detailed estimates for the General Government Sector. A useful supplementary source of information is Government Finance Statistics (IMF 2001).

Second, the accounts document which age groups are the beneficiaries of public programs. The ideal source of such information is administrative records that report the benefits provided by the age of the beneficiary. Household surveys provide an alternative source of information although the institutionalized population may be an important group of beneficiaries not captured in household surveys.

Third, the accounts document which age groups are funding public programs. This requires detailed information about the age profile of tax payments which may be available through administrative records of the tax authority or household surveys.

An important point is that methods must be adapted to the circumstances of individual countries. The exact procedures and content of the accounts depends on the institutional setting and the availability of data.

Background

Before discussing the public sector, this section briefly reviews some important general concepts.

The NT Flow Account is governed by the flow identity:

$$\underbrace{Y^l(x) + Y^A(x) + \tau^+(x)}_{\text{Inflows}} = \underbrace{C(x) + S(x) + \tau^-(x)}_{\text{Outflows}} \quad (2)$$

Rearranging terms, the lifecycle deficit, i.e., the difference between consumption and labor income ($C(x) - Y^l(x)$), must equal the inter-age flows or reallocations that come in two forms: net transfers, $\tau(x) = \tau^+(x) - \tau^-(x)$ and asset-based reallocations ($Y^A(x) - S(x)$):

$$\underbrace{C(x) - Y^l(x)}_{\text{Lifecycle Deficit}} = \underbrace{\underbrace{\tau^+(x) - \tau^-(x)}_{\text{Net Transfers}} + \underbrace{Y^A(x) - S(x)}_{\text{Asset-based Reallocations}}}_{\text{Age Reallocations}} \quad (3)$$

The age reallocations can be further disaggregated into public sector and private sector age reallocations.

The flow constraint as written in equation (3) emphasizes the connection between the economic lifecycle and age reallocations. However, no particular motives or behavioral model is assumed. The flow constraint must hold irrespective of the motives or purpose of intergenerational transfers.

Except as noted, the NTA methodology is consistent with and complementary to the 1993 United Nations System of National Accounts (UN 1993). The application of NTA in any particular case may deviate because national accounts in some countries follow the 1968 version of SNA or may differ in other ways from the UN guidelines. Another important source of information is the IMF Government Financial Statistics (GFS). GFS is in almost all respects harmonized with the UN SNA. However, there are some differences that have implications for the construction of NTA. An appendix discusses the use of GFS to construct public sector account in NTA. In general, however, NTA follows the UN SNA.

The NT Flow Account applies only to current income, consumption, transfers, etc. In other words, the Flow Account is concerned with how economic flows generated during the current year are allocated across age groups. Saving as it is used in NTA and in SNA refers to that portion of current income that is devoted to the acquisition or creation of assets. Other economic and non-economic activities also influence how assets change from one period to the next. To be more specific we can describe asset changes for the age group *x* as shown in Table 1.

Table 1. Saving and Other Components of Asset Changes.

Asset(x-1,t-1)	100	Assets at the end of the preceding period
Saving(x,t)	10	Saving net of depreciation during the current

		period (NT Flow Account)
Net asset transfers (x,t)	-5	Net assets transfers received during the current period, e.g., bequests, dowry, transfers of homes and other assets (NT Asset Transfer Account)
Other asset changes (x,t)	7	Changes due to asset price changes; changes in the quantity assets due to non-economic events (wars, natural disasters, etc.)
Assets(x,t)	112	Assets at the end of the current period

The connection between the flow account and the balance sheet is discussed further Appendix B. The main body of the current document describes the Flow Account. The methods for constructing Net Asset Transfers and Other Asset Changes are being developed.

Public Age Reallocations

The government in National Transfer Accounts is an intermediary that mandates or directs the transfer of resources between age groups, receives and pays asset income, and accumulates public assets and liabilities or debt. The NT Flow Account distinguishes two categories of public sector transactions: *public transfers* and *public asset-based reallocations*.

Transfers refer to all economic flows that involve no *quid pro quo.* Transfers refer only to current transfers as distinct from capital transfers. Current transfers consist of in-kind transfers, equal to public consumption, and cash transfers.

Transfers consist of inflows to the beneficiaries of the program and outflows from taxpayers who are funding the program. Net transfers are measured as the sum of inflows (a positive value) and outflows (a negative value). Net transfers must sum to zero in aggregate, but can be positive or negative for any particular age group. This is true for each government function (education, health, etc.) and the public sector taken in total.

Transfer inflows are assigned to the age group of the intended beneficiary of the public programs in question. 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 tax incidence rules that are similar to those followed in Generational Accounting.

Public asset-based reallocations occur because taxpayers, through their government, can save and dis-save and can hold public assets and debt. Public asset-based reallocations are equal to public asset income less public saving. Examples of Public Asset Income are rent (payments for land and royalties for sub-soil minerals and fossil fuels) and net interest. Net interest is interest received on loans by the government to students, farmers, etc. less interest paid on public debt. [1] Asset income is a net inflow for taxpayers if

[1] In the current system of national income accounts, public capital, e.g., public buildings and infrastructure, do not yield asset income by assumption. Other public assets yield asset income.

positive and a net outflow if negative. Public saving if positive generates an outflow from taxpayers while public dis-saving, or the accumulation of public debt, generates an inflow to taxpayers. It is important to understand the difference between saving/dis-saving and lending/borrowing in public accounts. Saving is the difference between income and consumption, while lending/borrowing is the difference between income and expenditure, i.e., consumption plus investment. When governments borrow to invest offsetting asset-based flows are generated – borrowing is an inflow and investing is an outflow. The net flow is zero.

A Simple Illustration

A simple illustrative account illustrates important features of the public flow account, e.g., the connection between public transfers and public asset-based reallocations, and clarifies how the public sector fits into the overall accounts. The illustration emphasizes only selected key concepts and abstracts from other features of the public accounts discussed in more detail below.

In this simple illustration, there is no foreign sector and no capital and, hence, no investment. The government makes cash and in-kind transfers. The government taxes labor income and it can borrow from residents. There are three age groups – children, workers, and elderly. This is a consumption-loan economy similar to the one originally analyzed by Samuelson although there were no children in Samuelson's model.

Table 2. Economic Lifecycle: Aggregate Annual Flows in Billions.

	Total	Children	Workers	Elderly
Lifecycle Deficit	0	20	-30	10
Consumption	100	20	70	10
Private	92	15	70	7
Public	8	5	0	3
Labor Income	100	0	100	0

The economic lifecycle is shown in Table 2. Labor income for workers is 100 billion while children and the elderly have no labor income. Children consume 20, workers consume 70, and the elderly 10 billion with consumption split between public and private consumption as shown in the table. Consumption and labor income are equal in this special case because there is no capital or durables. Thus everything produced by the economy must be consumed in the current year. The economic lifecycle is summarized by the lifecycle deficit. Children and the elderly have deficits of 20 billion and 10 billion, respectively, while workers have a surplus of 30 billion.

Table 3. Current Public Age Reallocations in Billions.

	Total	Children	Workers (Taxpayers)	Elderly
Public Reallocations, Current	5	5	-4	4
Net Public Transfers	**0**	**5**	**-9**	**4**
Public Transfer Inflows	9	5	0	4
In-kind	8	5	0	3
Cash	1	0	0	1

Public Transfer Outflows	-9	0	-9	0
Taxes	-4	0	-4	0
Transfer Surplus(+)/Deficit(-)	-5	0	-5	0
Asset-based Reallocations	**5**	**0**	**5**	**0**
Asset income	-5	0	-5	0
Less: Public saving	-10	0	-10	0

Current public sector reallocations are documented in Table 3. Children and the elderly received 5 billion and 4 billion in public transfers, respectively. The children received 5 billion in in-kind public transfers (education), while the elderly received 3 billion in in-kind transfers (health care) and 1 billion in cash transfers (pensions).

The public transfer inflows were matched by 9 billion in public transfer outflows from worker (taxpayers). Public transfer outflows consisted of 4 billion in taxes levied on labor income, leaving a deficit of 5 billion to be met through public asset-based reallocations. Some countries have positive asset income that can be used to offset a portion or all of the transfer deficit, but this is not the case here. Asset income is negative because the country has substantial debt. Hence, its asset income (interest payments of 5 billion) is negative. Thus, taxpayers borrow 10 billion during the period to cover the deficit in the public transfer sector (- 5 billion) and to pay 5 billion in interest expense.

To complete the picture private sector age reallocations for this simple economy are shown in Table 4. Current private transfers are limited to transfers from parents to their children of 15 billion. The elderly generate 6 billion in inflows through asset-based reallocations – 1 billion in asset income and 5 billion through dis-saving. The elderly sell

Table 4. Current Private Age Reallocations in Billions.

	Total	Children	Workers	Elderly
Private Reallocations	-5	15	-26	6
Net Private Transfers	0	15	-15	0
Private Transfer Inflows	15	15	0	0
Private Transfer Outflows	-15	0	-15	0
Private asset-based reallocations	-5	0	-11	6
Asset Income	5	0	4	1
Less: Private Saving	10	0	15	-5

government securities worth 5 billion to workers. The workers experience an outflow of 11 billion through asset-based reallocations. Their 4 billion in asset income (an inflow) is offset by 15 billion in saving – 5 billion in securities acquired from the elderly and 10 billion in newly issued government securities. An important feature of financial assets is apparent in the flow account. The debt of the public sector is an asset of the private sector. Hence, public asset income of –5 billion is matched by private asset income of +5 billion. Likewise, public saving of –10 billion is matched by private saving of +10 billion.

Public and private reallocations are combined in Table 5. Reallocations at each age are equal to the lifecycle deficit satisfying the flow constraint, equation (3). The lifecycle deficit of children is met through transfers. The lifecycle deficit of the elderly is met in part through transfers and in part through asset-based reallocations. Important features of financial transactions are apparent in Table 5. Financial asset income must sum to zero. One age group's financial asset income inflow is another age group's financial asset income outflow. Likewise, the accumulation of financial assets is always equal to the accumulation of financial liabilities. Hence, one age group can dispose of a financial asset if another age group acquires it. In the more general case, of course, assets can be sold or acquired from the rest of the world.

The following sections provide a more complete and detailed explanation of the public sector accounts.

Table 5. Current Age Reallocations, Public and Private Combined, in Billions.

	Total	Children	Workers	Elderly
Current Reallocations	0	20	-30	10
Net Transfers	0	20	-24	4
Net Public Transfers	0	5	-9	4
Net Private Transfers	0	15	-15	0
Asset-based reallocations	0	0	-6	6
Asset Income	0	0	-1	1
Asset Income, Public	-5	0	-5	0
Asset Income, Private	5	0	4	1
Less: Saving	0	0	5	-5
Saving, Public	-10	0	-10	0
Saving, Private	10	0	15	-5

Aggregate Values and the Structure of Public Flows

The Structure of Public Flow Account (Table 6) provides a quantitative overview of the public sector. In NTA the public sector has two broad functions. First, it mediates transfers to program beneficiaries from taxpayers. This function is summarized under "Public Transfers". Beneficiaries receive *Public Transfer Inflows* which consist of *In-kind Transfers* and *Cash Transfers*. *Public Transfer Outflows* include *Taxes and Grants* which are all payments to the government from residents and the rest of the world. This includes taxes, social contributions, current grants from foreign governments, and a portion of other revenues of the government.

Table 6. Structure of Public Flow Account, Taiwan 1998	NT$ millions	
Public Transfers		
Net Public Transfers		0
Public Transfer Inflows		2,002,664
In-kind Transfer Inflows	1,665,874	
Cash Transfer Inflows	336,790	

Public Transfer Outflows		-2,002,664
Taxes and Grants	-1,888,239	
Transfers Surplus(+)/Deficit(-)	-114,425	
Public Asset-based Flows		
Public Asset-based Reallocations		114,424
Asset Income, net		248,432
Less: Public Saving		134,008
Estimates provided by An-Chi Tung 2008. These and other tables for Taiwan are available on the NTA website.		

Net Public Transfers must sum to zero by definition. The *Transfer Surplus/Deficit*, unique to NTA, is a balancing item that holds because transfer outflows and inflows must be equal. If in deficit, the government must rely on public asset-based flows to generate resources needed to fund its transfer programs. A transfer surplus is matched by asset-based outflows in the form of negative asset income or public saving.

The second function of the public sector is to manage public assets, which produce two flows. The first flow is public asset income. This includes all income from financial asset and liabilities and income from non-financial assets owned by the public sector.

Table 7. Comparison of NTA Public Flows with SNA Counterparts.

NTA Variable	**SNA Counterpart**
Public Transfers	
Pubic Transfer Inflows	
In-kind	Public Consumption Expenditure (Table 9.1. Use of Disposable Income Account, pp 204). Cash transfers to household for health care are counted as public consumption of health care.
Cash	Social benefits other than social transfers in-kind (Table 8.1. Secondary Distribution of Income Account) pp. 184.
Public Transfer Outflows	
Taxes and Grants	Taxes on production and imports (Table 7.2. Allocation of primary income account, pp 159); Current taxes on income and wealth; Social contributions; Other current transfers (Table 7.3 pp. 184)
Transfer Surplus/Deficit	Calculated; no SNA or GFS counterpart
Public Asset-based Flows	
Asset Income	Net operating surplus + Net property income (Table 7.2. Allocation of primary income account, pp. 159.)
Public Saving	Net saving, general government (Table 9.1 Use of Disposable Income Account, pp. 204)

Interest expense on public debt is a component of public asset income – with a negative value. The second asset-based flow is public saving. Public saving must equal the sum of the Transfer Surplus/Deficit and asset income. If taxes and grants exceed public transfer inflows, the transfer surplus and asset income are saved. If taxes and grants fall short of public transfer inflows, the transfer deficit must be financed out of asset income

with the residual saved. If asset income is insufficient, the shortfall is met through public dis-saving.

Public Transfers

Public transfers in NTA are classified by function following the UN Classification of Functions of Government (COFOG). NTA uses a simpler, but consistent, classification that emphasizes functions with large inter-age flows (Table 8).

Public transfers for education, health, and pensions are estimated for all countries, although some countries do not have public pension programs. In some cases, other programs may be important. For example, unemployment benefits may accrue more frequently to young workers. The particular programs for which estimates are constructed will vary with the particular public programs and policies of the country in question.

Table 8. NTA Sector Classification of Public Accounts.

NTA Sector	COFOG (Division Number)
Education	Education (9)
Health	Health (7)
Pensions	Social Protection, Old age (102)
Other Social Protection	Social Protection (10) excluding Old age (102)
Other	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).

Transfer Inflows

Public transfer inflows can be usefully summarized as in Table 9. 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 transfers 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 scholarship is a cash transfer. An exception to this approach is health. National health insurance payments and similar reimbursement programs, e.g., Medicare and Medicaid in the US, are classified as in-kind transfer inflows (and as public consumption). This approach is intended to facilitate comparisons across countries, but also because the provision of health care and health care prices are so widely regulated. Note that in-kind public transfers and public consumption as calculated in NTA are equivalent. The Rest of the World receives some public transfer inflows, e.g., public pension payments to individuals who are foreign residents.

Table 9. Public Transfer Inflows Classified by Function, Taiwan 1998, NT$ millions.

	Total Inflows	Domestic	Rest of

Sector		Total Domestic	In-kind Transfer Inflows	Cash Transfer Inflows	the World
Total	2,002,664	2,000,991	1,665,874	335,117	1,673
Education	249,667	249,667	249,667		
Health	289,729	289,729	289,729		
Pensions	99,218	99,218		99,218	
Other Social Protection	235,899	235,899		235,899	
Other	1,128,151	1,126,478	1,126,478	0	1,673
Estimates provided by An-Chi Tung 2008.					

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 program. The value of school lunch programs, 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 could be assigned to the mother, the newborn child, or split. In the case of a US transfer program called 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 are being equally assigned to all household members, but alternatives could be considered. Many public transfers do not accrue to individuals at all. These inflows are assumed to be divided equally among all members of the population.

Methods for constructing age profiles of public consumption and, hence, in-kind public transfer inflows are discussed in detail in the section on the economic lifecycle and are not repeated here. Cash transfers are estimated using administrative records or household surveys with information about the amount of public cash transfers and characteristics of the recipients. Some public transfer inflows accrue to the Rest of the World. For example, public pension benefits may be paid to former residents who have emigrated.

An issue that sometimes arises is the treatment of payments to public employment retirees from employment-based pensions programs. These payments are not public transfers. They are essentially deferred compensation and discussed above in the Economic Lifecycle section on labor income.

Transfer Outflows

Transfer outflows must equal current transfer inflows and, hence, their total value for each function is determined by the methods described in the preceding section. Public Transfer Outflows are equal by definition to *Public Transfer Inflows* and also equal to *Taxes and Grants* plus the *Transfer Surplus(+)/Deficit(-)* (Table 6). In the transfer deficit case, taxes and grants are less than public transfer outflows. Additional outflows can be generated in two ways through asset-based reallocations. One possibility is that public asset income is positive generating an inflow to taxpayers, captured in asset-based reallocations. Of course, public income is not distributed to taxpayers. To the extent that it is used to finance public transfer programs the asset income inflow is balanced by a transfer outflow. In essence, the asset income is taxed to finance public transfers. If public asset income is insufficient to offset the transfer outflow deficit, transfer programs must be financed partly through the acquisition of public debt. Public borrowing creates

an inflow to taxpayers, an asset-based transaction, and a public transfer outflow as the funds are used to finance public transfer programs.

In the surplus case, taxes and grants exceed public transfer outflows. The surplus is saved as well as public asset income.

The important issue to be addressed is the age profile of the transfer outflow. To estimate the age profile we first identify the outflow source(s) for each public sector (function) and, second, estimate the age profile of each type of outflow source. This information is then used to estimate the age profile of public transfer outflows for each public transfer sector.

Transfer Outflow Sources

Transfer outflows in NTA are classified based on the economic resource, transaction, or activity being taxed. The categories are very similar to those used in Generational Accounts, but are different from those used in the UNSNA 1993 or the IMF GFSM 2001. Constructing NTA requires that taxes and grants be reclassified using the NTA system.

Eight transfer outflow sources (tax sources) are distinguished in NTA:

- Labor income
- Asset income
- Consumption
- Asset holding
- Asset transactions
- Other
- Transfer deficit
- Rest of the world

In this classification, taxes and social contributions are not distinguished.[2] The principle that is applied in classifying taxes in NTA (and GA) is that second order and general equilibrium effects are not considered. Taxes are classified depending on the party assessed. Taxes on wages and earnings are paid out of labor income, taxes on profits out of profits, taxes on consumption out of consumption, etc.

Suggestions for mapping from the UN SNA to the NTA classifications are provided in Table 10. Mapping from GFS to NTA is discussed in an appendix to this document. Note that in many cases the mapping will differ from the suggested categories depending on the details of the tax system in question.

Estimating the age profiles of some public transfer outflows may require additional detail about some categories. For example, the age profile for taxes on tobacco and alcohol will differ from the age profile of taxes on general consumption.

[2] Generational Accounts separately classifies social contributions for public pensions, health, unemployment, and workers' compensation.

For more detailed information about the taxes on production and imports and subsidies see UN SNA 1993 VII.C and VII.D (pp 169-174) and for current taxes and social contributions see UN SNA 1993 VIII (pp. 191-202).

Public Transfer Outflows by Function

In the simplest case, all public revenues are pooled into a general fund used to support all public programs. In this case, the relative age profiles of public transfer outflows will be the same for all functions, but they will vary in their magnitude. In many cases, however, the funding sources vary across public programs. This may occur because programs have earmarked or committed sources of funding. Pension programs are often funded through payroll taxes. Grants from foreign governments may target health or education programs.

Table 10. Mapping of UN SNA Taxes and Grants to NTA Public Transfer Outflows.

UN SNA Classification	Suggested NTA Classification
Taxes on production and imports	
Taxes on products	
Value added type taxes (VAT)	Consumption
Taxes and duties on imports excluding VAT	Consumption
Export Taxes	Labor and asset income (1)
Taxes on products except VAT, import and export taxes	
Monopoly revenues and excise and stamp taxes from tobacco and alcohol	Consumption (of alcohol and/or tobacco)
Taxes on financial transactions	Asset transactions (proxy by asset holdings)
Other	Consumption
Other taxes on production	Labor and asset income (1)
Subsidies	
Subsidies on products	
Import subsidies	Consumption
Export subsidies	Labor and asset income (1)
Other subsidies on products	Consumption
Other subsidies on production	Labor and asset income (1)
Current taxes on income, wealth, etc.	
Taxes on income	
Individual income tax	Labor and asset income (1)
Corporate income tax	Asset income
Other current taxes	Various
Social contributions	
Employers' actual social contributions	Labor income
Employees' actual social contributions	Labor income
Social contributions by self- and non-employed persons	Labor income
Imputed social contributions	Labor income
Other current transfer outflows	
Other current transfers, domestic	Net domestic transfers within general government are zero

Other current transfers, rest of the world	Rest of the world
(1) In the absence of additional information, taxes are allocated in proportion to the shares of labor and asset income.	

A second reason that the source of outflows may vary by function is that different levels of government, each with their own taxing authority, may be responsible for different government programs. Education may be funded at the local level from property taxes while national defense is funded at the central level out of VAT, for example. A third reason is that some public programs may be run in a quasi-autonomous manner in the sense that deficits and surpluses do not become part of the government's general fund.

The procedure for handling earmarks is straightforward (Table 11). First, the source of funding for earmarks is identified. The inflow for independent programs is entered. Otherwise, inflows are set to the total of earmark outflows. Second, public transfer outflows from general funds by source are calculated as the difference between public transfer outflows and public transfer outflows by source. General fund outflows are distributed using the distribution by source for all general funding sources.

The transfer surplus/deficit is calculated separately for each function distinguishing earmarked and general fund support. The transfer deficit is assumed to have the same funding source distribution as the funded portion of each function. The logic behind this is that the alternative to the deficit is an increase in taxes. The counterfactual employed here is that had taxes been increased to cover the deficit, the existing function-specific tax structure would have persisted (Table 12).

In a federal system central, state, and local governments have independent authority to tax and spend. In this case public transfer outflows by source and purpose are calculated separately for each level of government. Likewise, if there are quasi-autonomous programs, e.g., public pension programs or national health insurance programs, public transfer outflows by source and purpose should be calculated separately for each of these programs. Note that this is accomplished in Table 12 by including National Health Insurance and Pensions as programs with earmarked funding sources.

Tax Incidence and Age Profiles of Public Transfer Outflows

The age profile of any public transfer outflows depends on the tax incidence – the age of the individual who bears the tax (Table 10). The profile of the public transfer outflow will depend on the age distribution of the economic resource being taxed and the age-profile of the tax rate. Some of the economic resources being taxed are components of NTA and, hence, their age profiles are available. The age profiles of earnings, asset income, and consumption are examples. Additional analysis will be required in other cases. For example, consumption of alcohol and tobacco are often taxed at a higher rate than other goods and they have a distinctive age profile. Note that some surveys have direct information on the amount of different types of taxes paid, so knowing tax rates and ownership is unnecessary.

Some tax rates do not vary by age. For example, sales tax rates and VAT rates do not depend on characteristics of the consumer. Taxes paid by each age group depend only on

how much they consume of each type of good and service. Other tax rates vary by age for a variety of reasons: explicit provisions that favor age groups, e.g., exemptions for older individuals; ceilings on the value of the resource subject to taxation; taxes imposed only on resources above a floor; the use of graduated tax schedules; etc. Two general approaches can be used to estimate age-specific variation in tax rates. Administrative records may provide information about the age of those who paid taxes. Or household surveys may contain information about tax payments by households. If so, methods for allocating household variables to individual members may be used to estimate age-specific taxes and tax rates. Tax payments by employers on behalf of employees may be proportional to tax payments by employees. If tax rates vary by income level, one

Table 11. Earmarked and General Public Transfer Outflows by Source and Function, Taiwan, 1998. NT$ Million.

Function	Total Inflow (A)	Transfer Surplus /Deficit = -(A)-(B)-(C)	Total Domestic (B)	Source						
				Labor income	Asset income	Consump-tion	Asset holding	Asset transac-tions	Other	ROW (C)
Total	**2,002,664**	**-114,425**	**-1,884,760**	**-606,442**	**-297,169**	**-639,886**	**-225,526**	**-115,737**	**0**	**-3,479**
Earmarked										
Total Earmarked	**364,565**	**49,324**	**-413,889**	**-413,889**	**0**	**0**	**0**	**0**	**0**	**0**
Education			0							
Health	265,347	-1,559	-263,788	-263,788						
Natl Health Insurance	265,347	-1,559	-263,788	-263,788						
Other Health	0									
Pensions	99,218	50,883	-150,101	-150,101						
Other Social Protection			0							
Other			0							
General funding										
Total General Funding	**1,638,099**	**-166,186**	**-1,470,871**	**-192,553**	**-297,169**	**-639,886**	**-225,526**	**-115,737**	**0**	**-3,479**
Education	249,667	-24,957	-224,179	-29,347	-45,292	-97,527	-34,373	-17,640	0	-530
Health	24,382	-2,437	-21,893	-2,866	-4,423	-9,524	-3,357	-1,723	0	-52
Natl Health Insurance	0	0	0	0	0	0	0	0	0	0
Other Health	24,382	-2,437	-21,893	-2,866	-4,423	-9,524	-3,357	-1,723	0	-52
Pensions	0	0	0	0	0	0	0	0	0	0
Other Social Protection	235,899	-23,581	-211,817	-27,729	-42,795	-92,149	-32,477	-16,667	0	-501
Other	1,128,151	-112,773	-1,012,982	-132,610	-204,659	-440,686	-155,319	-79,708	0	-2,396

Estimates provided by An-Chi Tung 2008.

Table 12. Combined Public Transfer Outflows by Source and Function, Taiwan 1998, NT$ millions

Function	Total	Transfer surplus/ deficit	Total Domestic	Source						
				Labor income	Asset income	Consumption	Asset holding	Asset transac-tions	Other	Rest of the world
Earmarked and non-earmarked combined										
Total	**-2,002,664**	**-114,425**	**-1,884,760**	**-606,442**	**-297,169**	**-639,886**	**-225,526**	**-115,737**	**0**	**-3,479**
Education	-249,667	-24,957	-224,179	-29,347	-45,292	-97,527	-34,373	-17,640	0	-530
Health	-314,111	-3,997	-285,681	-266,654	-4,423	-9,524	-3,357	-1,723	0	-52
Natl Health Insurance	-289,729	-1,559	-263,788	-263,788	0	0	0	0	0	0
Other Health	-24,382	-2,437	-21,893	-2,866	-4,423	-9,524	-3,357	-1,723	0	-52
Pensions	-99,218	50,883	-150,101	-150,101	0	0	0	0	0	0
Other Social Protection	-235,899	-23,581	-211,817	-27,729	-42,795	-92,149	-32,477	-16,667	0	-501
Other	-1,128,151	-112,773	-1,012,982	-132,610	-204,659	-440,686	-155,319	-79,708	0	-2,396

Estimates provided by An-Chi Tung 2008.

approach is to estimate separate age profiles of income for different income classes, apply appropriate tax rates to each income class, and aggregate up to a combined income tax schedule. This method has been employed in some Latin American countries.

In some instances direct information about the age profile of the resource may not be available. In this case it may be necessary to use a proxy. For example, the asset profile may serve as a reasonable proxy for asset transactions.

Illustrative results are available at www.ntaccounts.org.

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 (or loss) and public saving. Public asset income (if positive) is an inflow for "taxpayers" while public saving (if positive) is an outflow for "taxpayers". Thus, public asset-based reallocations is calculated as public asset income less public saving.

Public asset-based reallocations can play a role that is very similar to private asset-based reallocations. A public pension program is an obvious example. The needs of future retirees can be met through transfers as in PAYGO systems. Or governments can fund pension programs by accumulating public assets by taxing workers, for example, and purchasing securities. In subsequent periods income from the assets or dis-saving of the assets can be used to fund pensions of retirees. Fully-funded public pension programs are unusual, but many countries have partially-funded public pension programs.[3] Some public pension programs maintain individual accounts and, hence, the assets can be readily assigned to individuals and to ages. Chile and Singapore's Central Provident Fund (CPF) are examples. Most public asset-based reallocation systems do not share this feature. Rather, public assets are collectively owned. Whether the assets of public pension programs are held in individual accounts or collectively, they provide an economic mechanism for reallocating resources across age, as well as, over time. If the social contributions or taxes of workers exceed current benefit payments (transfers), the surplus is accumulated as an asset. In subsequent periods, retirees can be supported, for example, using income earned on the asset and by drawing down the public fund.

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. Norway and UAE, for example, both have large SWFs funded from oil revenues. A few countries are running

[3] Estimates of publicly-managed pension asset pools for 23 countries range from 0.2 percent to 69.6 percent of GDP as reported by Mitchell, Olivia S., John Piggott, and Cagri Kumru. 2008. "Managing Public Investment Funds: Best Practices and New Challenges." *NBER Working Paper* 14078.

fiscal surpluses and accumulating funds as a response to anticipated future fiscal needs of aging populations. Australia's Future Fund is an example.

Public debt is another important example of an asset involved in asset-based reallocations. Increasing pubic debt, i.e., dis-saving, generates an inflow to current taxpayers. Existing public debt generates an outflow, interest expense, from current taxpayers. Some countries have large publicly-owned natural resources that generate substantial public asset income. By convention, public capital does not yield asset income.

In NTA public asset-based flows are assigned to age groups in proportion to each age group's general (non-earmarked) tax payments. The basis for this approach is relatively clear for public asset-based outflows: interest expense and the acquisition of public assets. Public interest expense is paid by taxpayers and allocated across age groups using the same procedures followed for allocating public transfer outflows. Likewise the acquisition of public assets is 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 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 that they pay. Note that the asset-based inflow is balanced in the accounts by an asset-based outflow or a public transfer outflow. For example, the inflow public asset income may lead to an outflow public saving. Or, the inflow public borrowing may be lead to an outflow – the deficit in public transfer outflows.

Social security funds are often classified as separate institutional units within general government. If funds are significant in size it may be advisable to calculate asset-based reallocations separately from other units of general government. In these cases the age profile of taxes used to fund the independent program provides the basis for determining age profile of asset income or program surpluses or deficits.

Public Asset Income

Two primary sources of revenues for the government are National Income Accounts and Government Financial Statistics. Following the UN System of National Accounts, *Public Asset Income* is equivalent to the Net Operating Surplus plus Property Income of the Government which are reported in the *Allocation of primary income account.* The net operating surplus for the government is generally quite small because public capital does not generate an operating surplus.

In UNSNA property income consists of five components:

- Interest
- Distributed income of corporations
- Reinvested earnings on direct foreign investment
- Property income attributed to insurance policy holders

- Rent

The exact components of property income will vary from country to country. Note that in SNA *rent* refers to the return to land and sub-soil assets. For more detailed information about each of these components the reader is referred to the UNSNA Manual (UN 1993) pp 176-182.

Public capital used in the production of public goods and services does not generate income in the System of National Accounts. The reason is that public goods and services are not sold and, hence, they are valued at the cost of production. Consequently, there is no profit and no measured capital income generated.[4]

Public asset income is allocated to age groups in proportion to the age profile of taxes as explained above.

Public Saving

Public saving in SNA is reported in the *Use of disposable income account* as net saving by general government (UNSNA 1993 Table 9.1, pp 204) or in the *Capital account* UNSNA 1993 Table 10.1, pp 220). The age profile of public saving is equal to the age profile of general taxes or earmarked taxes in the case of quasi-independent programs.

Public Asset-based Reallocations can be produced using the spreadsheet RA.xls that is available on the website (http://www.schemearts.com/proj/nta/web/nta/repository/RA).

[4] An additional potential source of public asset income is commercial activities undertaken by the government. To the extent that these activities are undertaken by public corporations or quasi-corporations, the asset income they generate is a component of property income. Some public revenues are generated by commercial activities that are not undertaken by public corporations or quasi-corporations. The revenues from these activities are classified as "Sales of goods and services" – a component of other revenue. Asset income from these activities should be measured as the difference between revenues and expenses. Unless expenses can be reliably estimated, we assume that the profit from commercial activities is zero and no asset income is generated.

Appendix A: Using Government Financial Statistics to Construct NTA

Government Financial Statistics maintained by the IMF and the UN System of National Accounts draw on the same data and are harmonized, but they rely on different classification schemes and there are some important differences that need to be understood. Each offers their advantage and disadvantage and in some cases researchers may not have access to both sources of information.

An important point is that the SNA provides a complete system of accounts that encompass both the public and the private sector. 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.

Public Transfers

Public transfer outflows in NTA consist primarily, but not exclusively of *Revenue* classified into four broad categories in GFS:

- Taxes
- Social contributions
- Grants
- Other revenue

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 labor income to their pre-tax values. Social contributions are also essentially identical in GFS and SNA. GFS and SNA use different sub-categories to classify taxes and social contributions. These sub-categories 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 are somewhat closer.

In Table A.1. NTA public transfer outflows and their GFS counterparts are identified. The suggested NTA classification is suggestive rather than definitive. In some case, 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 (labor 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 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.

Table A.1. Mapping of IMF Government Financial Statistics to NTA Public Transfer Outflows.

UN SNA Classification	Suggested NTA Classification
Taxes	
Taxes on income, profit, and capital gains	
Payable by individuals	Labor and asset income (1)
Payable by corporations and other enterprise	Asset income
Taxes on payroll and workforce	Labor income
Taxes on property	Asset holding
Taxes on goods and services	Consumption
Taxes on international trade and transactions	Various
Other Taxes	Various
Social Contributions	Labor 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 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

(1) In the absence of additional information, taxes are allocated in proportion to the shares of labor and asset income.

Public transfer inflows are reported in GFS as *Expense* classified in two ways: the economic classification of expense (GFSM 2001 Table 6.1) or by the function of government (GFSM 2001 Table 6.2). The cross-classification of Expense by function and economic classification (GFSM 2001 Table 6.3) is required to construct NTA from GFS. The classification of function 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 lifecycle and public transfers. In-kind transfers include *compensation of employees* (21), *use of goods and services* (22), *consumption of fixed capital* (23). 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).*

Asset-based Reallocations

In NTA the age profile of asset income does not depend on its components. Hence, only total asset income is required to construct the accounts. Of course, researchers may be interested in the components of asset income as a means of understanding the public sector and its role in inter-age transfers. Asset income consists of the *Operating surplus of general government* and *Property income* in the SNA classification.

There is no GFS counterpart of *Operating surplus.* Property income sub-categories 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).

Appendix B: Public Capital Transfers and the Public Balance Sheet

The complete NTA system as briefly described above describes the connections between flows and stocks. The relationship between assets and saving is given by:

$$A_g(t) = A_g(t-1) + \tau_g^A(t) + S_g(t) + X_g(t) \quad (4)$$

where $A_g(t)$ is the value of public assets at the end of period t, $S_g(t)$ is *net public saving* during the period, $\tau_g^A(t)$ is public asset transfers during the period and $X_g(t)$ is *other economic flows* during the period. Public asset transfers include foreign aid received for the purpose of acquiring or building capital, forgiveness of debts, taxes on private capital transfers, e.g., inheritance taxes. Other economic flows consist of *holding gains*, which arise because of changes in prices and exchange rates, and *other volume changes* due to exceptional events, e.g., natural disasters and wars; normal events such as the discovery of a subsoil asset or changes in the liability of a defined benefit pension plan resulting from a change in the benefits covered; and reclassifications of units to exclude or include them as part of general government (Government Finance Statistics Manual 2001 Chapter 4, Section G).

How public asset should be handled in NTA is under active discussion and no conclusion has been reached at this point. One possibility is to treat public assets as though they are collectively owned and not construct an age-specific public asset balance sheet. Another possibility is to use a simple method for allocating public assets, e.g., a per capita allocation rule, by age. Another possibility, that will be briefly discussed here, is to assign public assets to age groups based on the general tax schedule. If $Tax(x,t)$ is the per capita general tax payment by persons of age *x* in year *t,* then public assets of age group *x* is:

$$A_g(x,t) = Taxshare(x,t)A_g(t) \quad (5)$$

where $Taxshare(x,t) = Tax(x,t)N(x,t)/Tax(t)N(t)$ and $N(x,t)$ is the population age *x* in year *t.*

The relationship between assets and flows for age groups is similar to that for the economy as a whole but must incorporate capital transfers across age groups. Thus, the evolution of assets over time is:

$$A_g(x,t) = A_g(x-1,t-1) + S_g(x,t) + \tau_g^A(x,t) + X_g(x,t) \qquad (6)$$

The variables are defined as in equation (4).

Public Asset Transfers and Other Economic Flows

The value of public assets of any cohort rises or falls as its share of tax revenues increases or declines. A variety of factors can cause this to occur. A cohort's share of the population will change over time and eventually disappear as the cohort members die. The taxed economic resources held by a cohort will change over time as members enter and leave the workforce, accumulate and dis-accumulate wealth, and so on. Changes in laws or administrative procedures will influence the rate at which resources are taxed. Each of these changes will lead to a change in a cohort's share of tax revenues. If public assets are assigned to age groups on the basis of tax revenues, then each of these changes will lead to a public asset transfer. Newborns will receive a public asset transfer to the extent that they pay general taxes. As cohorts enter the labor force and assume a larger share of the tax burden, they inherit public assets and liabilities. Finally, as the taxes of cohort decline due to lower earnings, assets, and numbers, they transfer public assets and liabilities to the new generation of taxpayers.

A second important issue to be explored in the future is broadening the public balance sheet to include public transfer wealth. The issues to be addressed are how to calculate public transfer wealth and how to measure and classify the flows that are associated with changes in public transfer wealth over time. One possibility is Generational Accounts but there are other possibilities that may be considered. These topics are left for the future.

Additional public sector topics and suggested readings:

Projecting public transfers:

Edwards, Ryan, 2003 "Budget Forecasting Methods" June 27, *mimeo.*

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IV. Private Age Reallocation Guidelines

The purpose of this section is to describe concepts and methods used to estimate private age reallocations in the National Transfer Flow Account. The material presented here presumes that the reader has estimated the complete economic lifecycle and is familiar with the public reallocation guidelines. Important additional preparation for the reader would be to read Lee, Lee, and Mason (2008) Mason, Lee, et al. (forthcoming) and to review the private sector lectures available on the NTA website. Several spreadsheets, also available on the NTA website, can be used to assist in the construction of private sector accounts.

The Structure of Private Flows

The Structure of Private Flow Account (Table 1) provides a quantitative overview of the private sector and two broad economic mechanisms by which resources can be shifted across age groups in this sector. The first mechanism is private transfers that are mediated by families (or households) and non-profit institutions. Beneficiaries receive *Private Transfer Inflows* which consist of *Inter-household Transfers* and *Intra-household Transfers.* The flow account does not include *Capital Transfers*, e.g., bequests, dowry, and other large transfers. The flow account is limited to the disposition of current income. Capital transfers are accounted for separately following the approach in National Income Accounts.

Table 1. Structure of Private Flow Account, Japan 2004, billions of yen.

	Private Transfers	
Net Private Transfers		0
Private Transfer Inflows		138,004
Intra-household Transfer Inflows	137,476	
Inter-household Transfer Inflows	528	

Private Transfer Outflows		-138,044
Intra-household Transfer Outflows	-137,476	
Inter-household Transfer Outflows	-568	
Net Private Transfers to ROW		41
Private Asset-based Flows		
Private Asset-based Reallocations		46,555
Private Asset Income		98,228
Less: Private Saving		51,673

Naohiro Ogawa, Andrew Mason, Amonthep Chawla, and Rikiya Matsukura (2008) "Japan's Unprecedented Aging and Changing Intergenerational Transfers". NTA Working Paper. Additional data at http://www.ntaccounts.org.

Private Transfer Outflows are the counterpart of private transfer inflows and also consist of inter-household and intra-household transfers. Intra-household transfers must always balance. In a closed economy, inter-household transfer inflows and outflows would also balance. If residents are net recipients of transfers from the rest of the world (ROW), their inter-household transfer inflows will exceed their inter-household transfer outflows. If residents are net givers of transfers to ROW their inter-household transfer outflows will exceed their inflows. Net private transfers including transfers to and from the rest of the world (ROW) must always balance, i.e., sum to zero.

The second mechanism by which the private sector reallocates resources is through private asset-based reallocations. Private asset income is an inflow. Private saving is an outflow. Private asset-based reallocations equal private asset income less private saving. Private asset income includes only asset income of residents, while private saving is net saving by residents. It is equal to net private saving in the system of national accounts (SNA).

The Structure of Public Flow Account can be constructed using values available from NIPA or from GFS. This is not the case for the Structure of Private Flow Account, because there are no available aggregate controls for private transfers with the exception of net private transfers to ROW. Private asset-based flows are available from NIPA. The Structure of Private Flow Account is constructed after estimates of private transfers have been constructed and is used to summarize private flows in a manner similar to public flows.

Private Transfers

Private transfers are estimated after the researcher has estimated the economic lifecycle, public transfers, and public asset-based reallocations. The NT Flow Account includes current transfers, e.g., the transfer of current income across households or from households to non-profit institutions and the transfer of current income within households. Capital transfers such as bequests, dowry, and similar large transfers are not current transfers and are not included in the Flow Account.

Table 2 illustrates the private transfer accounts using estimates for Japan 2004 (Ogawa et. al) with broad age groups. The total private transfer inflow was 138 trillion yen. The total private transfer outflow was slightly more, leaving 41 billion yen of net outflow, which must match total net transfer to ROW. While all age groups recorded substantial inflows, the outflows were concentrated on certain age groups. The transfer outflow was largest for the 30-44 and 45-59 groups. The outflow of these groups is 170% of their transfer inflow. In contrast, the outflow for 0-19 group is less than 1% of their inflow. The 75+ age group's private transfer outflow is 63% of its private transfer inflow. Net private flows were from those in the 30-74 groups to those in the 0-29 and the 75+ age group. Another important feature of the private transfers is that the inter-household transfers are much smaller than the intra-household transfers.

Table 2. Private Transfers, Aggregate Values, Japan 2004, Billions of yen.

	Total	0-19	20-29	30-44	45-59	60-74	75+
Net Private Transfers	-41	28,498	10,847	-14,531	-23,933	-5,036	4,113
Private Transfer Inflows	138,004	28,757	20,344	23,906	30,204	23,742	11,050
Intra-household Transfer Inflows	137,476	28,755	20,332	23,769	29,908	23,687	11,025
Inter-household Transfer Inflows	528	2	12	137	297	55	25
Private Transfer Outflows	-138,044	-259	-9,497	-38,437	-54,137	-28,777	-6,937
Intra-household Transfer Outflows	-137,476	-259	-9,486	-38,382	-53,837	-28,627	-6,886
Inter-household Transfer Outflows	-568	0	-11	-55	-300	-151	-51

The following sections provide a more detailed explanation of private transfers.

Inter-household Transfers

Inter-household transfers consist of direct transfers between households, transfers mediated by NPISHs, and transfers to and from ROW. Inflows are current economic transfers received by resident households and ROW. Outflows are donations and gifts given to households, to NPISHs and to the ROW. Inter-household transfers are assigned to the household head.

Aggregate Controls

Interhousehold Transfers

In principle UNSNA reports transfers between households and between households and other private institutions, but in practice NIPA estimates of inter-household transfers are not reliable. As a consequence, NTA values are based on survey estimates of private transfers received and given. More information about estimating transfer inflows and outflows from survey data is provided below. In general, inflow estimates will be inconsistent with outflows estimates. In a closed economy they would sum to zero, but in an open economy private inter-household transfer inflows plus net private transfers to ROW will equal inter-household private transfer outflows. Inflows and/or outflows must be adjusted to insure that consistency with estimates of net flows to ROW.

Remittances are classified as either compensation, i.e., labor income, or as current transfers from ROW using the information from Balance of Payments (BOP). In the Philippines, for example, many workers abroad are guest workers, considered to be residents of the Philippines, and their remittances are classified as labor income. In contrast, Mexicans working in the United States are typically not guest workers and their remittances are classified as current transfers.

Three methods for adjusting inflows and/or outflows are discussed in detail in Appendix A. Country teams will have to decide which method is most appropriate for their case based on the team's knowledge of data quality and whether the inflow or outflow side is suspected to be over- or under-estimated. In some countries specialized surveys which emphasize inter-generational transfers may provide more accurate estimates of aggregate inter-household transfers.

Intra-household Transfers

No aggregate controls are available for intra-household transfers. Intra-household transfers to and from ROW are by definition zero. Domestic net transfers must sum to zero. Total inflows and outflows are constructed from household survey data using methods described below.

Age Profile of Private Transfers
The age profiles of private transfer inflows and outflows are estimated using a nationally representative income and expenditure survey. The age profile of transfer outflows is estimated using reported cash and in-kind gifts and donations. Examples include, but are not limited to,

- Congratulatory gifts
- Obituary money
- Farewell presents
- Regular/irregular donations
- Remittances

The age profile of transfer inflows is estimated using similar variables that capture cash and in-kind gifts received by the household. The exact variables will differ from country to country.

Inter-household transfers are classified by the age of the household head in the receiving or the giving household. Each household must have only one person designated as the household head. Stata programming code for the case of Taiwan is available at http://www.ntaccounts.org/doc/repository/Other%20Code.txt.

Estimating Intra-household Transfers by Age

While inter-household transfers are estimated directly by survey data, intra-household transfers are estimated indirectly as the balancing item between private consumption and

disposable income (labor income plus net private transfers plus public cash transfer inflows less taxes paid). Household members with a deficit (disposable income less than current private consumption) receive transfers from household members with a surplus (disposable income greater than current private consumption). If disposable income is insufficient to fund household consumption, the household head makes additional intra-household transfers out of asset income and if necessary by dis-saving. If disposable income is more than sufficient to fund household consumption, the residual is transferred to the household head and saved.

The consumption of durables, including the services from owner-occupied housing, are treated in a distinct fashion because, by assumption, the household head owns all household assets and all income generated by those assets flows to the head. The consumption of durables by any non-head household member is *funded* by an intra-household transfer from the head to the member equal to the value of member's durable consumption.

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-heads members with a deficit draw on the assets of the head, not their own assets, 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 associated with the consumption of durable services. To the extent that household members actually have both current transfer inflows and outflows, the estimates produced by these methods will understate inflows and outflows, but not net inflows.

Second, we construct estimates of intra-household transfers by purpose or sector, e.g. education, health, etc. 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 at particular sectors.

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. The estimates do not allow for a possibility that might occur

within a three generation household: children depending more on siblings while co-resident elderly are receiving more of their support from their adult children.

The methods for allocating intra-household transfers rely on the following procedures, which are explained in turn. For mathematical presentation, see Appendix B.

- Data preparation
- Transfers for current consumption
- Transfers of remaining surplus to household head
- Transfers for housing and other durable consumption
- Aggregate control for intra-household transfers

There are three data preparation considerations that come up in the intra-household transfer methodology. First, each household must have one and only one person designated as the household head. Second, consumption values must be non-negative. Negative consumption values can arise when model-based estimation is used. Third, all *unsmoothed* input variables, adjusted to match aggregate controls, should be available. The necessary input variables are age profiles of labor income, sector-specific current and durable consumption, public cash transfer inflows, and taxes paid including indirect taxes on consumption (or equivalently public transfer outflows and public asset income and saving).

The best case is that all these variables come from one survey, which is not always possible. However, if more than one survey is used to estimate input variables, two additional steps are needed before the methodology can be applied. First, select one survey to provide the household composition information (and other estimated inputs based on that survey). It must identify the household head and provide the age of all members of the household. Second, assign control total-adjusted profile values to each individual based on age. These profiles can come from whichever survey the country team thinks provides the most accurate data. Then apply the following intra-household transfer methodology using the assigned profile values instead of adjusted survey responses.

It should be noted, however, that the multi-survey method cannot be used to calculate profiles for any sub-types of households where the original profiles might be different by the sub-types. 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 we would be missing, giving inaccurate results. A second limitation of this approach is that the inflow and outflow estimates, although not the net flows, will be substantially biased towards zero.

Computing transfer for current consumption proceeds in four steps. First, compute the current surplus or deficit for each household member, including the household head, and for the household. A household member has a current surplus if his or her disposable income is higher than current private consumption; otherwise a deficit. Disposable

income is defined as labor income plus net private inter-household transfers plus public cash transfer inflows less taxes paid including taxes on products and production (indirect taxes). Current private consumption is private consumption less the services from owner-occupied housing and other consumer durables.[5] 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 household *j* if the total deficit exceeds the total surplus. If there is a shortfall, the household must fund the consumption of some members relying on asset-based reallocations.

Second, calculate a household specific "tax rate". By assumption the tax rate on each individual's surplus varies across households but is independent of the age of the individual within the household. A flat-rate tax for household *j* is calculated as $\min\left(1, \text{household deficit}/\text{household surplus}\right)$. This flat-rate tax is imposed on each member's surplus income and the taxed surplus is transferred to support current consumption of members with a deficit.

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 sector. The current intra-household transfer inflows to non-heads in each current consumption sector are proportional to that individual's current consumption in that sector. For heads, the calculation is similar except that the head may have to finance his or her own deficit through dis-saving or asset sales, which would not be recorded as a transfer. For example, education transfer inflows for head is calculated by a formula, (education consumption / total current consumption) times max (0, deficit of head – shortfall of household). Current transfer outflows from individual *i* in each current consumption sector are proportional to the total household inflows to each sector.

Any surplus held by non-heads that is not taxed for current consumption transfers is transferred to the head to be saved. The head receives all surplus that is not transferred to other household members.

Transfers of the services from owner occupied housing and other durable goods are calculated separately. Both transfers are outflows from the head and inflow to non-heads. The inflows to non-heads are equal to the consumption by each non-head of services from durables; for non-heads no outflows arise from durables. The durable service outflow for the head is equal to the total consumption of durable services by non-head members, and the head receives no inflow.

[5] If consumption of consumer durables is measured by expenditure rather than by the flow of services from durable assets, then these expenditures are included with other current consumption.

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 profiles. Smoothing should be accomplished in the same way that we smooth all other profiles.
www.ntaccounts.org/web/nta/show/Documents/Private%20Transfers shows a spreadsheet example of the transfer methodology described above for one household with current consumption sectors, education, health and other current consumption, housing, and other durable consumption. Stata programming code for the case of Taiwan is available at www.ntaccounts.org/doc/repository/IntraHHCode.do. The intra-household methodology results in net aggregate intra-household transfers of zero, both overall and by each type of transfer. Everything balances in the survey population – total inflows equal total outflows for each type of flow and for all flows combined. However, the total 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. The difference should not be large if the survey is nationally representative. We need inflows and outflows to balance for each individual and to balance for the entire population. While there are several ways to solve this problem, the best answer 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. This way our accounting identities are preserved and all flows balance. The downside is that the adjustment comes out of private saving because that is estimated as a residual. As mentioned previously, though, this adjustment should be very small. Note that we 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 1-2%, check whether you are implementing the methodology correctly and whether your survey population is a good representation of the national population.

Private Asset-based Reallocations

The final component of the NT Flow Account to be estimated is private asset-based reallocations. These estimates cannot be completed if transfers and public asset-based reallocations have not been estimated. The methods described here conform to the asset reallocation spreadsheet (RA.xls) that can be used to estimate both public and private asset-based reallocations.

The existence of assets provides an important mechanism for shifting economic resources across age. Young adults may generate resources by acquiring debt. In some countries this is a common means by which 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 lifecycle, namely, that the path of individual labor income does not conform with the preferred path of individual consumption.

Individuals may accumulate, acquire, and hold assets for other reasons. Some may accumulate wealth to protect themselves from unforeseen events, to leave a bequest to their children, to support charitable activities, or for other reasons. Some individuals may receive inheritances by pure chance. Although the motives that lead to the accumulation of assets are an important research issue, the methods for measuring the flows in NTA are entirely independent of motive.

Asset-based reallocations are the composite of two flows: asset income and saving. 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. All capital income accrues to domestic sectors and with minor exceptions to private domestic sectors (corporations and households). Public enterprise is considered to be part of the private (or enterprise) sector as in National Income Accounts.

Property income arises because of 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.

Financial assets and property income play several important roles in age reallocations and in NTA. First, consumers may rely on private credit to fund their lifecycle deficits generating private interest income and expense. Second, individuals and governments may engage in credit transactions leading to private interest flows with public counterpart interest flows. Government debt, for example, generates private interest inflows and public interest outflows. Third, private institutions and foreign institutions may engage in financial transactions. ROW may extend credit to domestic parties or may own shares in domestic corporations generating interest flows or dividends.

Many financial assets and the associated flows do not lead to age reallocations in NTA. A transactions between domestic firms is an example. If a bank extends credit to a corporation, for example, no net age reallocations are generated. The associated age-specific inflows and outflows balance.

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.

Asset-based reallocations are illustrated in Table 3 using estimates for Japan 2004 (Ogawa et al. 2008). Total private asset income amounted to 98.2 trillion yen and total net private saving was 51.7 trillion yen. The difference, 46.6 trillion yen, is equal to total

asset-based reallocations. The values are reported for broad age groups here, based on estimates for single years of age with 90+ the upper age category. Because all asset income and saving are classified by age of the household head, the values for children are zero and for late teens are very small. In Japan asset-based reallocations are largest for the 60-74 and 75+ age groups. Private asset income for the 45-59 age group is substantial, but saving is 80% of asset income. In contrast, for the 60-74 age group saving is 37% of asset income and for the 75+ age group saving is 47% of asset income. There are many additional interesting features of the private asset-based reallocations in Japan not explored here.

Table 3. Private Asset-based Reallocations, Aggregate Values, Japan 2004, billions of yen.

		Domestic by age							
Variables	Total	Total	0-19	20-29	30-44	45-59	60-74	75+	Foreign
Private asset-based reallocations	55,889	46,555	84	1,462	3,392	5,816	26,827	8,975	9,333
Private asset income	88,943	98,228	5	332	9,015	29,479	42,459	16,937	-9,285
Capital income	83,263	83,263	8	745	9,616	26,705	33,313	12,876	0
Private Interest, net	5,795	12,914	-3	-423	-717	2,201	8,197	3,659	-7,118
Other property income, net	-115	2,052	0	10	117	574	949	402	-2,167
Less: Private saving <a>	33,054	51,673	-79	-1,130	5,624	23,664	15,632	7,962	-18,619

<a> Value for ROW (Foreign) is current external balance rather than saving.

Private Asset Income

Private asset income consists of capital income plus net property income for households, corporations, and non-profit institutions serving households (NPISHs), all sectors distinguished in national income accounts (financial and non-financial corporations are also often distinguished). Capital income is the return to private sector capital and includes the operating surplus of corporations, public enterprise, and NPISHs, the operating surplus of the household sector, and the portion of mixed income of the household sector that is estimated to be a return to capital. NTA estimates are based on the assumption that 1/3 of mixed income is a return to capital and 2/3 is a return to labor. The operating surplus of the corporate sectors is measured as the difference between revenues and operating costs. The operating surplus of the household sector is the capital income that arises from owner-occupied housing. Capital income is computed inclusive of taxes on production less subsidies.

Only a portion of the capital income that flows to institutions within the economy are retained by those institutions. Capital income is distributed to institutions and individuals that have provided the capital. Corporations, for example, distribute earnings to its share holders by paying dividends, to its creditors by paying interest, and to owners of land,

fossil fuels, and sub-soil minerals by paying rent. These distributions are components of property income.

Property income consists of dividends, interest, and rent or variations on these economic forms. Property income does not consist only of capital income distributions. Households also accumulate consumer debt, and interest inflows and outflows that arise as a consequence are property income. Private property income also includes interest income on public debt, a public asset income outflow, paid to the private sector, a private asset income inflow. And private property income includes flows from the ROW that will be positive if residents are net owners of foreign assets or negative if foreigners are net owners of domestic assets.

The flows of asset income are illustrated in Table 4 using values based on the Allocation of Primary Income Account in UNSNA (1993). Values for the "Other Private" sector are computed by combining the flows for financial and non-financial corporations and NPISHs. About two-thirds of capital income accrued directly to households and about one-third accrued directly to "Other private", predominantly corporations. The capital income of government is relatively minor and not of concern here. By definition, capital income for ROW is zero.

Asset income of the household sector is substantially greater than its capital income primarily because corporations are paying dividends, interest, and rent to the household sector and because the government is paying interest either directly to the household sector or indirectly to the household sector through corporations. A significant portion of asset income may not be distributed to the household sector, because it is retained by corporations.

Table 4. Asset income extracted from the UNSNA Allocation of primary income account.

	Total	Households	Other Private	Government	ROW
Capital Income	629.00	409.14	201.04	18.81	0.00
Property income	0.00	109.00	-74.00	-10.00	-25.00
Asset Income	629.00	518.14	127.04	8.81	-25.00

Source: UNSNA (1993) Table 7.2 (p 159).

Additional detail about asset income, again extracted from the UNSNA Allocation of Primary Income Account, is shown in Table 5. The components of capital income – operating surplus net of depreciation, capital's share of mixed income net of depreciation, and taxes on production net of subsidies – are reported. Capital income in NTA is the pre-tax value. The method for estimating the share of taxes on production net of subsidies born by capital is discussed elsewhere.

Property income is reported separately as interest and other property income in Table 5. In UNSNA property income consists of interest; distributed income of corporations; reinvested earnings on direct foreign investment; property income attributed to insurance policy holders; and rent. The components of property income can be treated separately, but the same methods are used to allocate each of these components except interest income. Here, we distinguish only interest income and other property income.

Table 5. Asset income extracted from the UNSNA Allocation of primary income account.

	Total	Households	Other Private	Government	ROW
Capital Income	629.00	409.14	201.04	18.81	
Operating surplus, net	279.85	60.00	201.04	18.81	
Mixed income, net (capital's share)	349.14	349.14			
Property income	0.00	109.00	-74.00	-10.00	-25.00
Interest, net	0.00	35.00	-22.00	-21.00	8.00
Inflows	230.00	49.00	146.00	14.00	21.00
Outflows	-230.00	-14.00	-168.00	-35.00	-13.00
Other Property Income	0.00	57.00	-56.00	18.00	-19.00
Inflows	224.00	101.00	88.00	18.00	17.00
Outflows	-224.00	-27.00	-140.00	-7.00	-50.00
Asset Income	629.00	518.14	127.04	8.81	-25.00

Source: UNSNA (1993) Table 7.2 (p 159).

The calculation of interest inflows makes an important distinction between different forms of credit. One form of interest arises because of *consumer credit* which, in principle, consists of loans undertaken by households to fund consumption. Interest on consumer credit has no exact counterpart in SNA, and hence NTA employs a broader measure of interest outflows – interest paid by households. This measure is a composite that includes interest paid on consumer goods, home mortgages, and debt incurred by family businesses.

Property income, interest or other property income, leads to age reallocations because of financial transactions between the public sector and the private sector. The public sector may extend credit to private individuals who, for example, participate in student loan programs or farm loan programs. If so, the result will be a private interest outflow. The private sector may extend credit to governments to finance public debt. If so, the result will be a private interest inflow. Public ownership of firms, land, and sub-soil minerals will also lead to flows in the form of property income which influence the age distribution of income.

In a similar fashion, financial transactions between private domestic units and the rest of the world (ROW) will lead to property income flows which influence the age distribution of asset income. For example, individuals may shift resources from younger to older ages through foreign investment leading to an outflow at young ages and inflows in the form of property income and/or dis-saving at older ages.

Financial transactions between firms do not have any clear effects on the age profile of asset income. If, for example, businesses extend credit to other businesses, property income outflows and property income inflows will be larger at each age, but the net flow of asset income will be zero. It is assumed that the age profile of the owners of corporations with property income inflows and the age profile of the owners of corporations with property income outflows are identical in shape. Note that property

income flows between corporations will be non-zero to the extent that the flows are between corporation and the government or ROW.

A complete accounting of inter-sectoral interest flows may be available for some countries. In many cases, however, this information is unavailable. In these instances, estimates of inter-sectoral flows are made using methods described in detail in Appendix C.

Allocating asset income by age

The methods for allocating asset income by age require a comprehensive income and expenditure survey with the following information:

- Property income (interest income, dividends, and rent);
- Mixed income (income from a business, farm, self-employment income, etc.)
- Imputed rent from owner-occupied housing;
- Interest expense;
- Household roster with the age of the head.

In NTA assets and asset income are assigned to the age group of the household head. Except in rare cases data are not available on individual ownership of assets or asset income within the household. In the absence of such information, assigning assets or asset income to individuals is impractical.

Private capital income consists of three components identified above: (1) the net operating surplus of households; (2) capital's share of mixed income of households; and (3) the net operating surplus of corporations and NPISHs.

The net operating surplus of households is the return to capital on owner-occupied housing. Its age profile is estimated by the age profile of imputed rent from owner-occupied housing.

The age profile of capital's share of net mixed income of households is estimated by the mixed income of the household. The split of mixed income between capital and labor is thus assumed to be independent of the age of the household head.

The age profile of the net operating surplus of corporations and NPISHs is assumed to be proportional to the age profile of property income of the household. Thus, the undistributed operating surplus of corporations is assumed to have the same age profile as the distributed operating surplus of corporations (Table 6).

Table 6. Age Profiles for Asset Income

Component of Asset Income	Age Profile Employed*
Net operating surplus of households	Imputed rent from owner-occupied housing

Capital's share of net mixed income	Self-employment income, farm income, business income, etc.
Net operating surplus of corporations and NPISHs	Property income (interest income, dividends, and rental income)
Interest outflows, households	Interest expense
Interest outflows, other private	Property income (interest income, dividends, and rental income)
Other property income outflows	Property income (interest income, dividends, and rental income)
Property income inflows	Property income (interest income, dividends, and rental income)

*Age profile is constructed from a representative household income and expenditure survey.

The age profile of interest outflows for households is estimated by the age profile of interest expense.

The age profiles of *Other private interest outflows, Other property income outflows,* and *Property income inflows* are assumed to be proportional to the age profile of property income. This requires some explanation. These outflows are dominated by flows from firms, not from consumers, such as interest and dividend payments by corporations. Thus, the appropriate age profile for these flows is the age profile of property income used as a proxy for credit and equity interests held in corporations. 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 capital income of corporations, the property income outflows from those corporations, and the property income inflows to households (individuals) would all have the age profile of property income. The net flow to individuals would be the property income inflows which would be identical to the capital income of the corporate sector.

Interest inflows are assumed to have the same profiles as other property income. Hence, credit extended to the household sector results in age reallocations. For example, if young adults accumulate consumer debt, the age profile of interest outflows will be younger than the age profile of interest inflows for household credit. In contrast interest flows within the corporate sector do not result in age reallocations.

Private Saving

Private saving is the final balancing item in National Transfer Accounts. At each age, reallocations must equal the lifecycle deficit. Age reallocations in turn must equal net transfers plus public asset-based reallocations plus private asset-based reallocations. Private asset-based reallocations are equal to private asset income less private saving. Hence,

Private saving = Lifecycle deficit – transfers – public asset-based reallocations – private asset income.

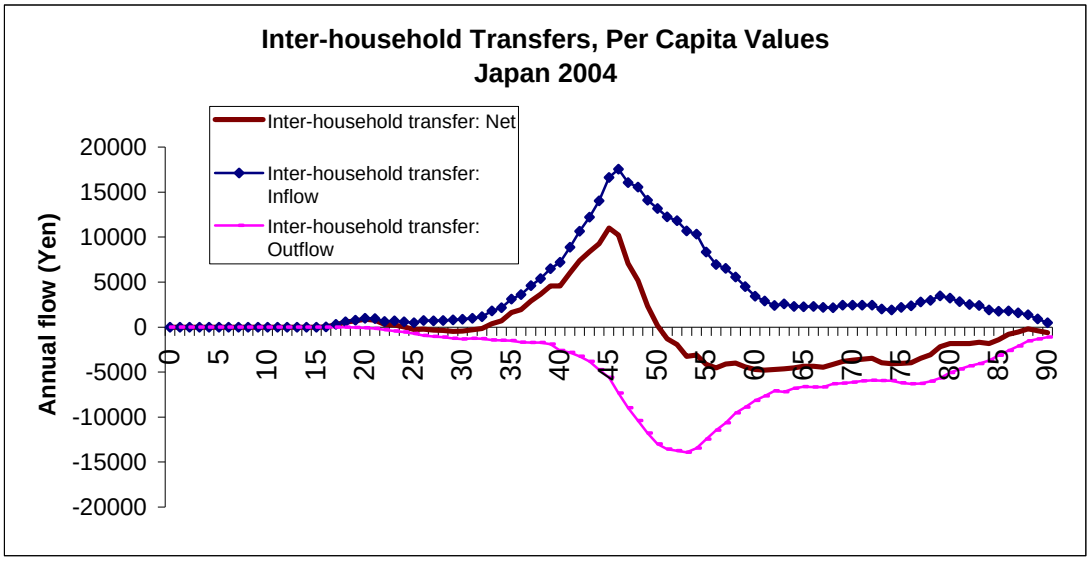
This identity holds at each age. Total private saving, thus calculated, must equal net private saving as calculated in NIPA.

Illustrative Values

The illustrative values presented here should not be taken as a standard or model to which other countries conform. Values may vary widely from country to country. These estimates were constructed by the research team at Nihon University Population Research Institute (Ogawa et al. 2008). The estimates are preliminary and subject to revision. The most recent estimates are available on the NTA website.

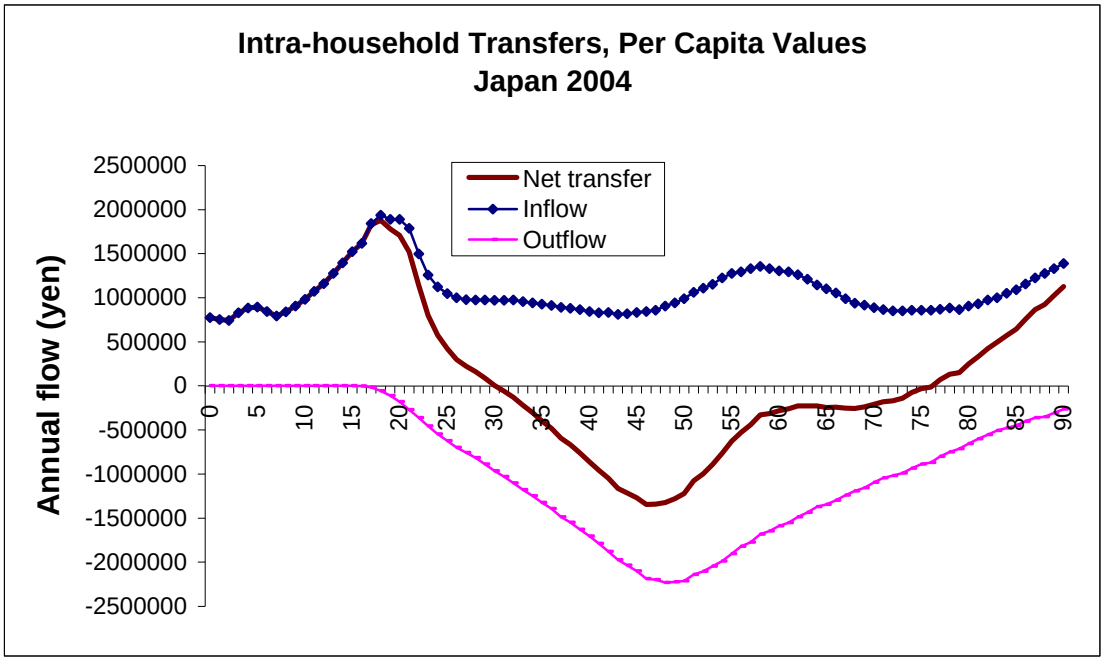
Private Transfers

Inter-household transfers are gifts and donations received and given either directly to another household or to a NPISH. Note that inter-household transfers are modest in Japan – the peak inflow is about 15,000 yen or roughly US$150. Most inter-household transfers are to and from prime age adults while net flows to older adults are relatively modest. Inter-household inflows may indirectly benefit the young and old to the extent that they are received by household heads who, in turn, provide support to dependent family members.



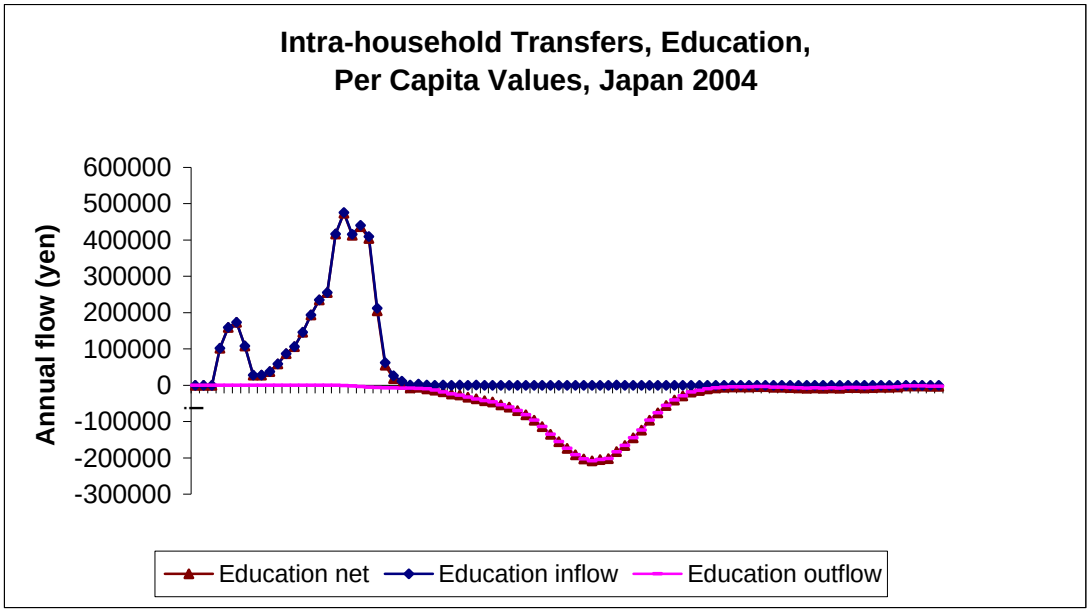
The following figure presents per capita intra-household transfers in Japan. Inflows peak at around age 20, when the costs of children are high, and again to those in their late 50s. The inflow also increases with age for those for 80 and older. Outflows rise from the late teens, peak in the late 40s, and then decline gradually. Net intra-household transfers are positive approximately for those below age 30 and those above age 75. They are negative for those between 30 and 75, approximately. An interesting feature of Japan is that the net intra-household transfers are negative for those in their late sixties and early

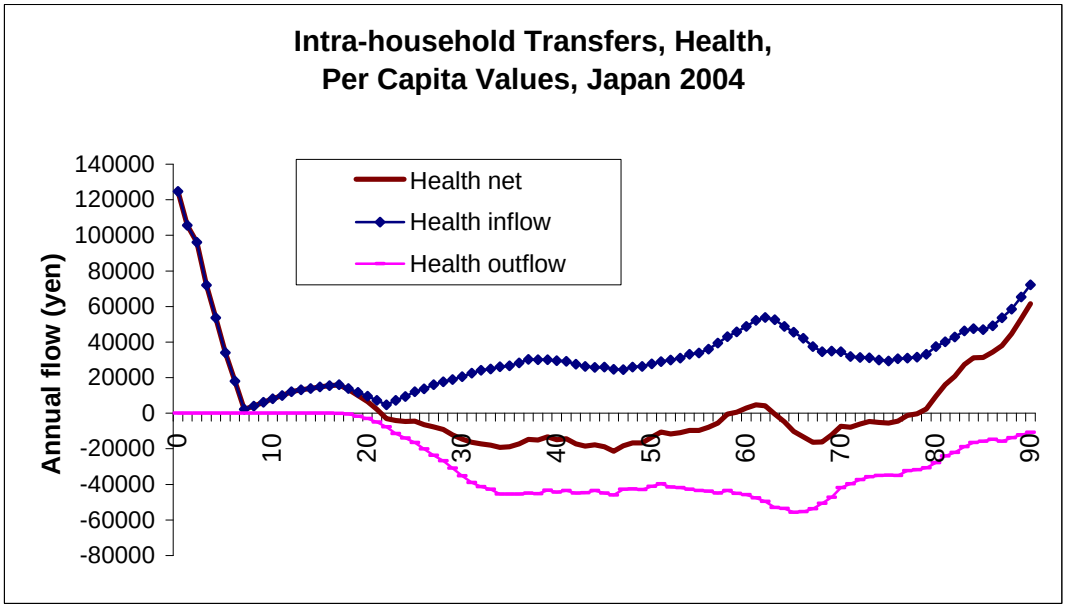
70s. Perhaps they are supporting both their adult children and their parents, but determining this based on the results presented in this graph is not possible.



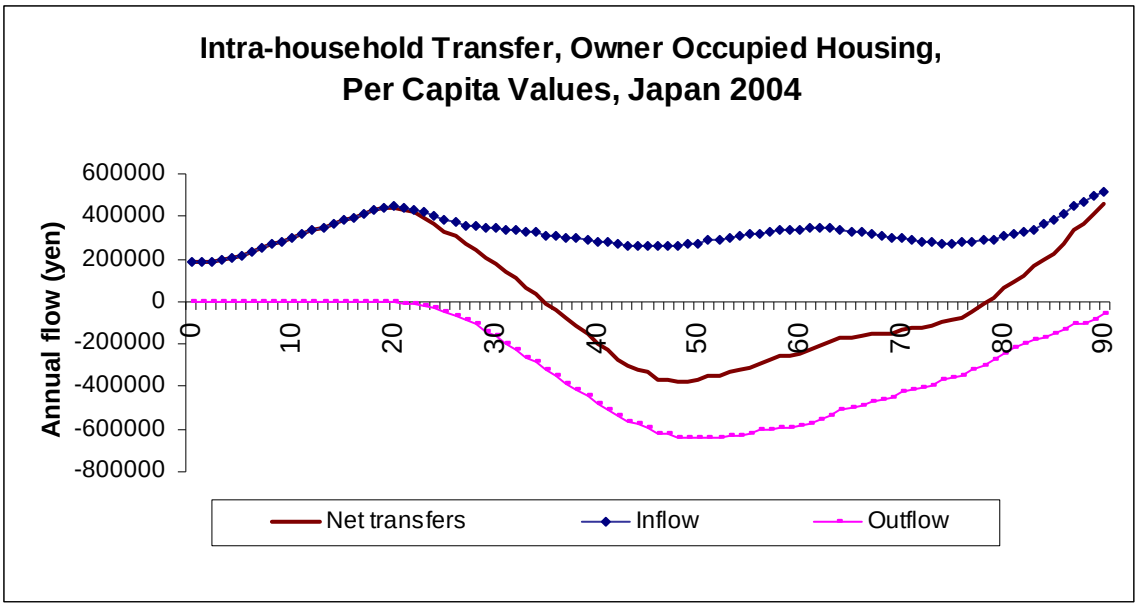
The next two figures report intra-household transfers for consumption of education and health, respectively. Intra-household transfer inflow for education is quite similar to education consumption profile because in Japan those attending school do not rely to any significant degree on their own labor income or students loans to fund their education. Rather their schooling is funded almost entirely by transfers from family members. The peak in education transfer outflows occur at about age 50, which is essentially one-generation length above the age of the peak inflow. Few of the outflows are from those over the age of 60. The pattern is consistent with education transfers flowing primarily from parents to children. There is little evidence of education transfers from grandparents.

Health spending in Japan has a strong age gradient, as elsewhere, with consumption high among the very young and the very old. Japan has an expansive public health care system, although private spending is far from negligible. The most significant net inflows are to the young and to the very old.



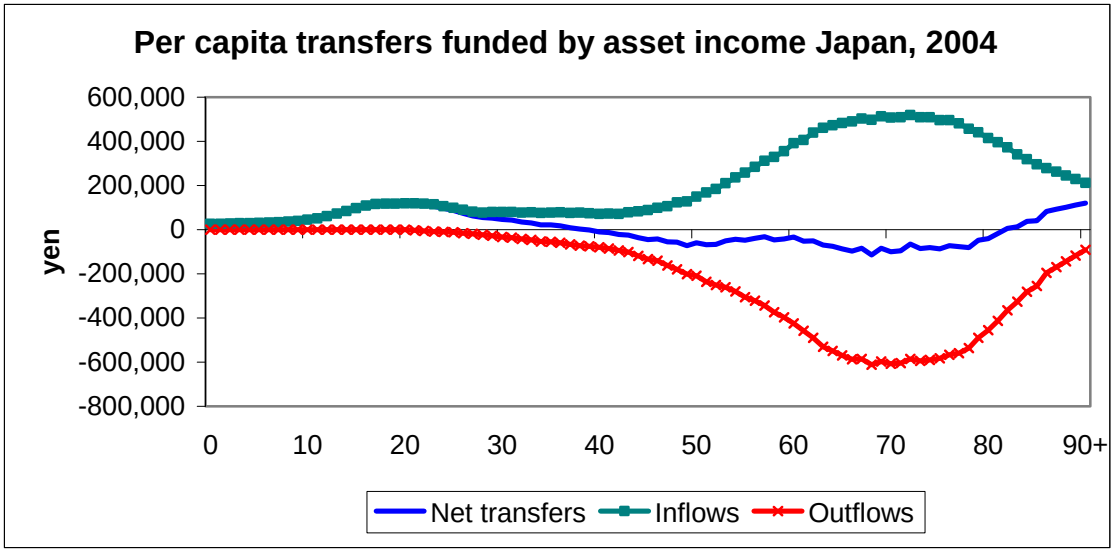


Transfers for owner occupied housing are shown in the next two figures. The inflows to non-heads are equal to the consumption of each non-head in that sector. The inflows for housing are not concentrated on any particular age group, but flow to all ages. Young children have somewhat lower inflows reflecting their lower consumption of housing. The outflow reflects age variation in ownership of owner-occupied housing as reflected in the age of the household head. Thus, outflows begin to rise in the early 20s, peak at around age 50, and then decline. The net flows are positive for those in their mid-thirties and younger and those 80 and older. Otherwise, the net flows are negative.

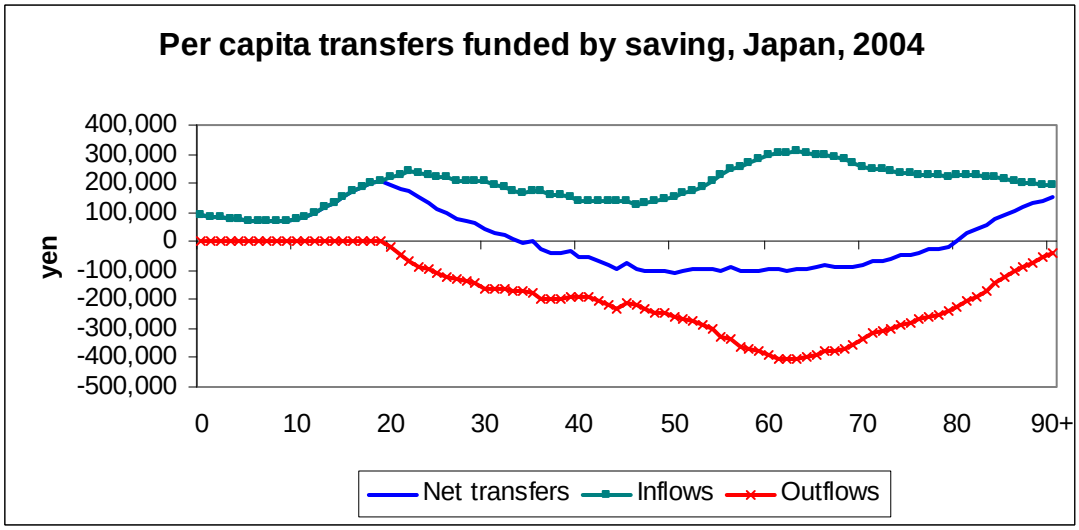


A complex and important objective is to understand the connections within the household between transfers and asset-based reallocations. These arise in several ways. First, asset income and dis-saving are identified with the age group of a particular individual (or age group). However, asset-based reallocations arise when the household consumption exceeds labor income plus net public and private cash transfers. Thus, households rely on asset income or dis-saving to fund their consumption because one or more of their members have large lifecycle deficits. In a similar vein, household saving occurs when the sum of labor income, asset income, and net public and private cash transfers exceeds private consumption. In some households, all of the saving may be a consequence of the surplus of the household head, but in some households non-head household members have labor income more than sufficient to cover their own needs and that of dependent household members. The value of this surplus is counted as a transfer from the household member in question to the household head. The outflows and inflows of these transfers sheds light on the relationship between individual measures of income and consumption and household measures of saving.

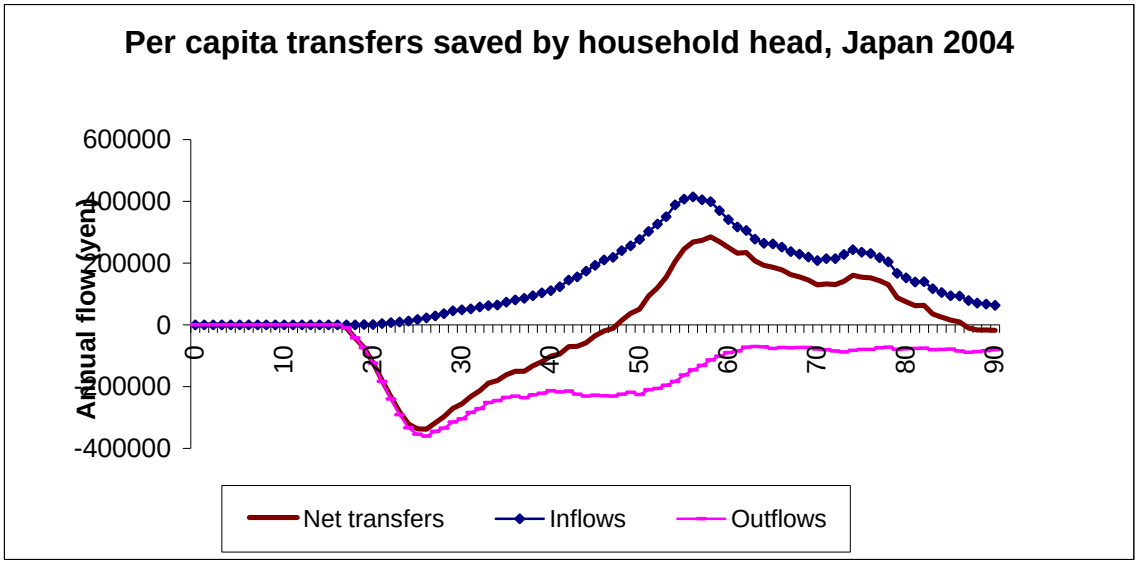
Per capita transfers funded by asset income are shown in the figure below. Both the inflows and outflows are concentrated among those in their sixties, seventies, and eighties in Japan. These are predominantly intragenerational transfers between the head and the spouse. Children and the very old, i.e., those in their mid-eighties and older, are net recipients of transfers funded by asset income. The net values are small relative to the gross flows, but they are far from negligible. Those in their late teens and early twenties have net transfer in excess of yen 100,000 ($US 1000), for example.



Per capita transfers funded by saving are similar in some respects to per capita transfers funded by asset income. The largest inflows and outflows occur in the late 50, 60s and early 70s. Again, many of these transfers are intra-generational, from heads to spouses. The net transfers identify more clearly the inter-generational flows and these are similar to those funded by asset income. Children, young adults, and those in their eights are net recipients of transfers funded by dis-saving on the part of those between the ages of 35 and 80.

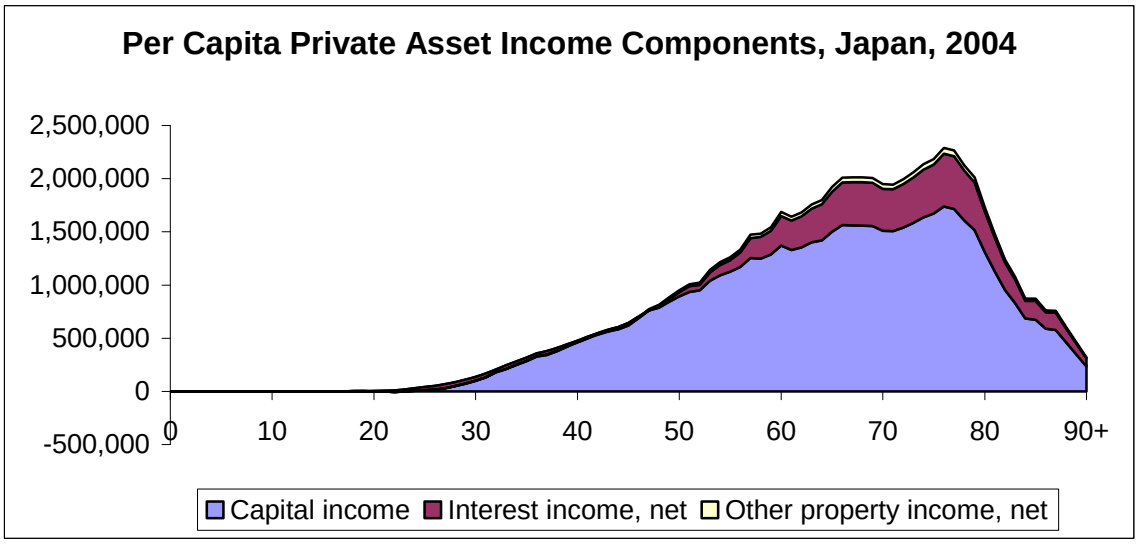


The final figure in this section presents the age profiles of saving transfers, i.e., the intra-household transfer surplus. Any surplus held by non-heads that is not devoted to current consumption transfers is transferred to the household head and saved. In Japan, the surpluses of those in their 20s and 30s are substantial as are the inflows of those in their 50s and older.



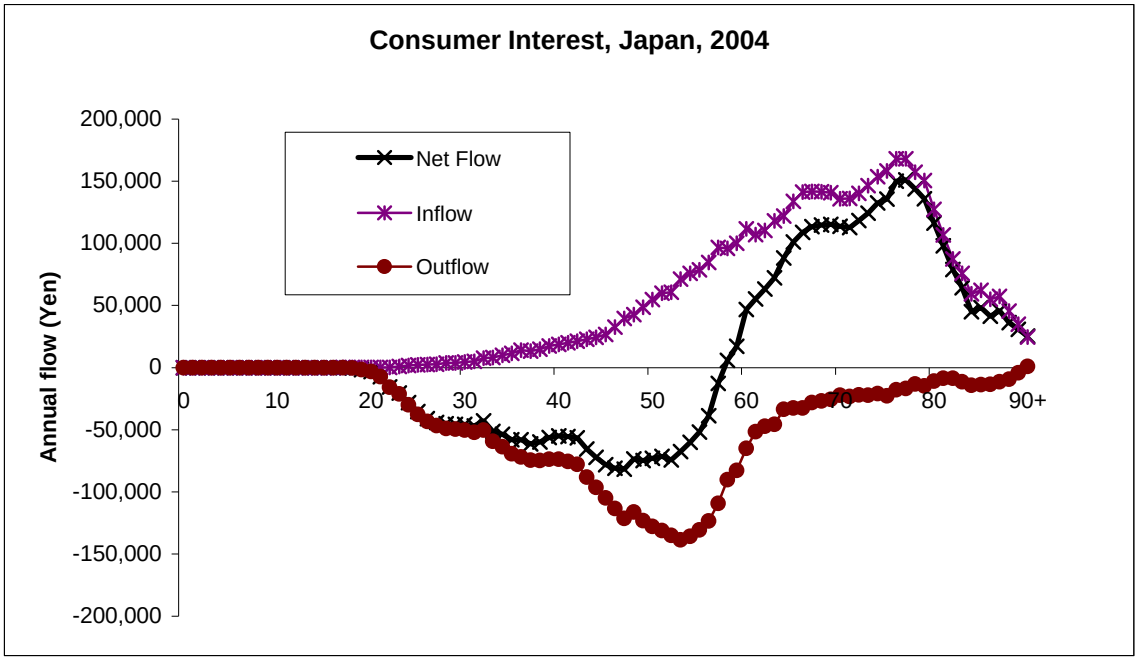
Private Asset-based Reallocations: Private Asset Income

Private asset income consists of capital income plus property income. In Japan, asset income increases steadily with age and peaks in the late 70s. Capital income is the most important component of asset income. Net private interest income is also quite important in Japan, while net property income other than interest is quite small.

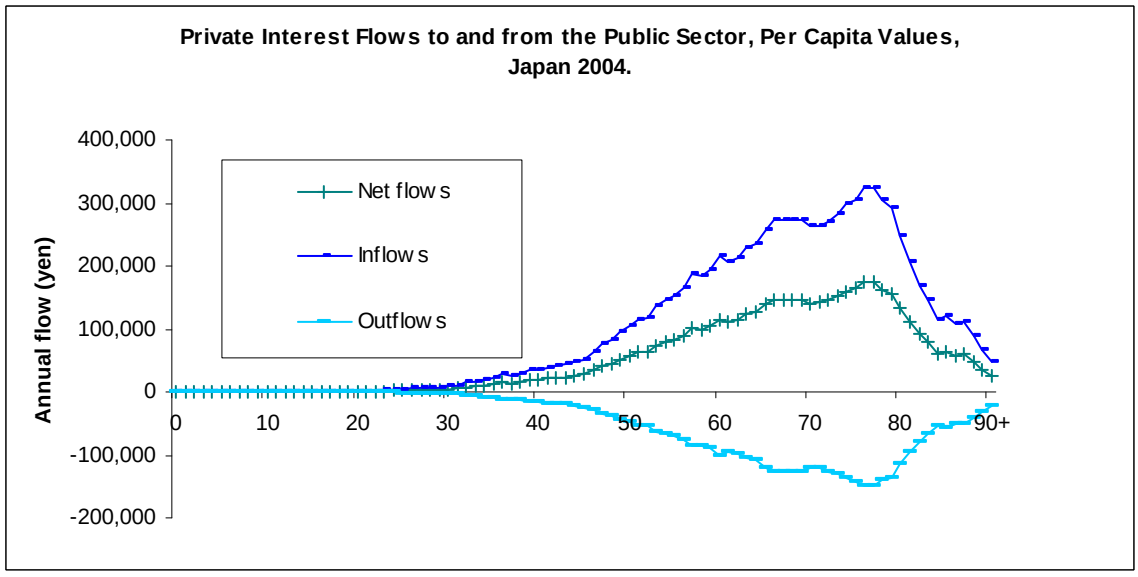


Interest

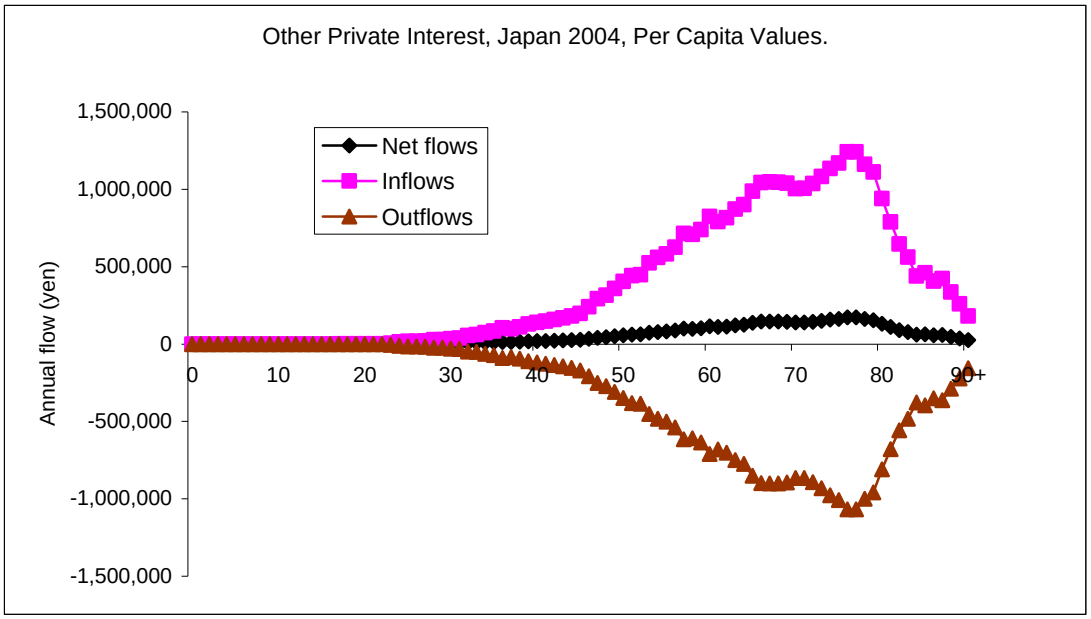
"Consumer interest" as it is used here is interest paid by households and encompasses interest on all household debt including consumer debt, housing debt, or business debt. The flows in Japan are strongly upward. Interest outflows peak for those in their 50s and are quite small for those in their 60s. Interest inflows follow the property income profile for Japan which is heavily concentrated at older ages.



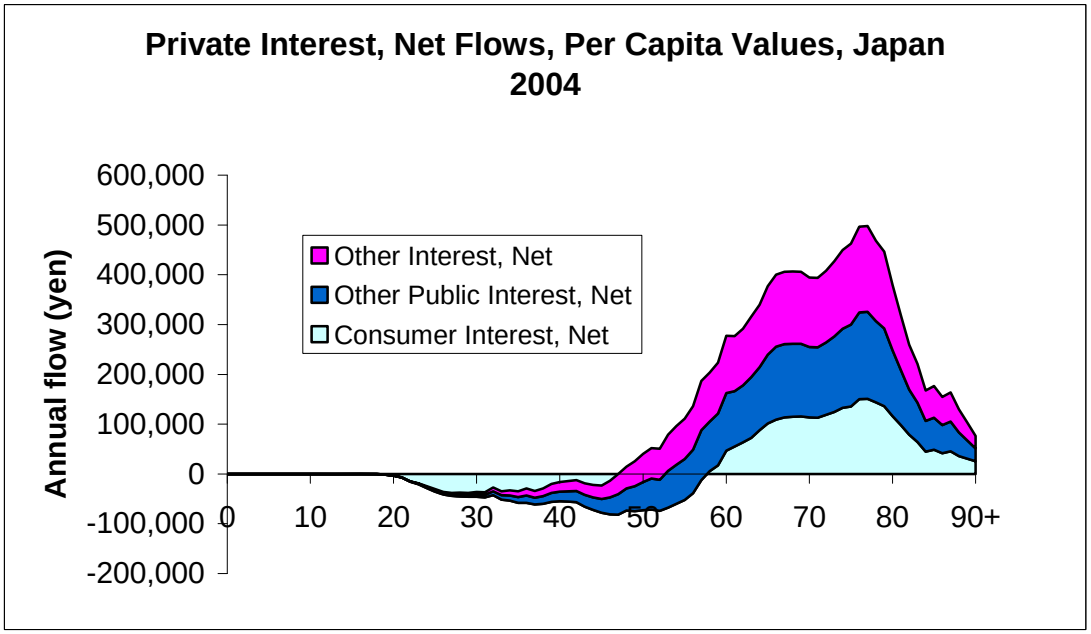
Private interest flows to and from the public sector are shown in the next figure. The shape of the age profile of the inflows and the outflows are identical. The inflows to the private sector exceed the outflows (Japan has a large public debt), thus net private flows are positive and accrue to older Japanese.



The final component of private interest is composed of flows between private institutions and between private institutions and ROW excluding consumer credit. In a closed economy these flows would net to zero both in aggregate and for each age because the age profiles for the outflows and the inflows are identical. In the case of Japan, the interest inflows exceed interest outflows because interest inflows from ROW exceed interest outflows to ROW. The result is a net inflow primarily to older Japanese.



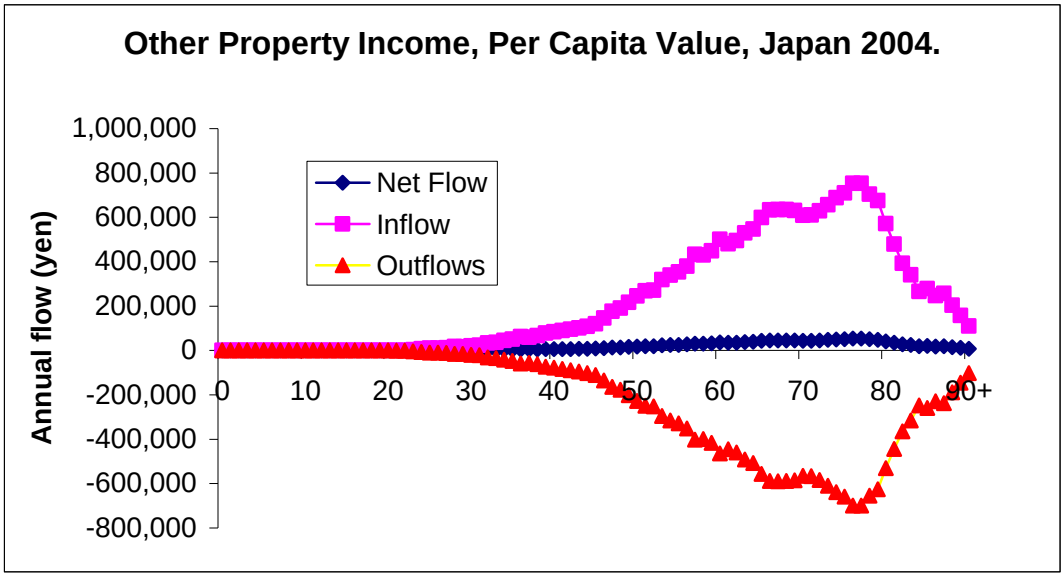
Net private interest flows are combined below. The net combined inflows turn positive in the late 40s and are very large at older ages. No single source dominates: consumer credit, net interest from the public sector, and net interest from ROW all play a role.



Property income other than interest

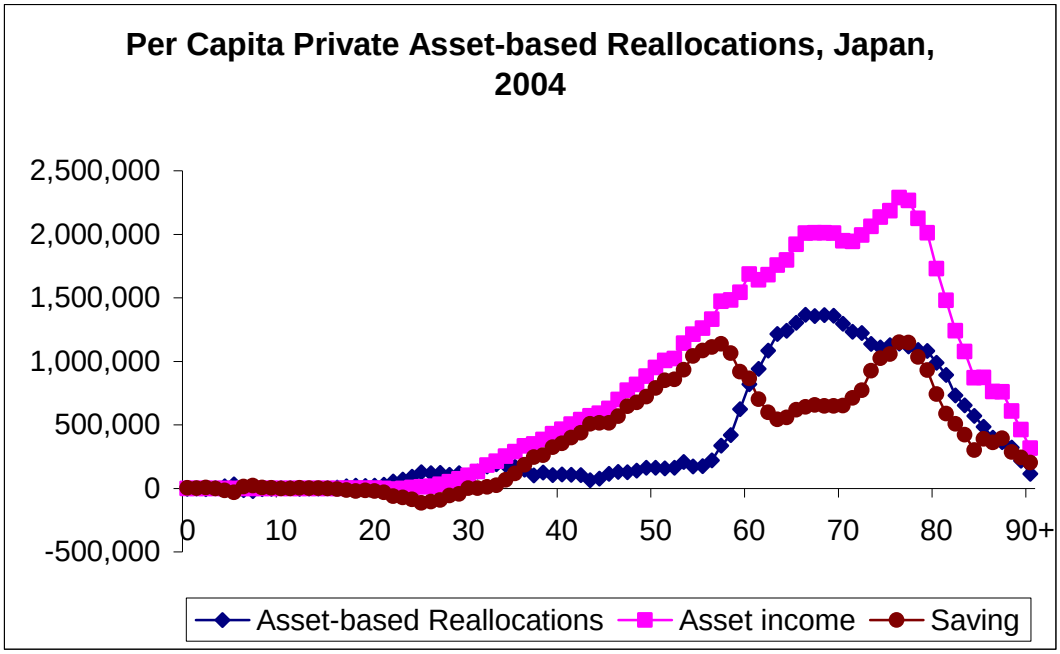
Property income other than interest includes dividends, rent, and similar financial flows. The age profile of property income for the household is used to represent all of these flows. The net flows arise because of flows between the private and public sector and

between the private sector and ROW. Net private property income other than interest is very small in Japan as compared with other forms of asset income.



Per Capita Private Asset-based Reallocations

Young adults in Japan are dis-saving and saving does not turn positive until around age 30 (in the cross-section). Asset income exceeds saving at these ages. Saving and asset income both rise steeply for those between their mid-thirties and late fifties. Over this age range, almost all asset income is saved but nothing more. Private asset-based reallocations are never negative, but they are small until the late 50s. There is a striking dip in saving and a corresponding increase in asset-based reallocations for those in their 60s and early 70s. Saving, asset income, and asset-based reallocations all decline beginning in the late 70s and continuing through the 80s.


Per Capita Private Asset-based Reallocations, Japan, 2004
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
-500,000
0
10
20
30
40
50
60
70
80
90+
Asset-based Reallocations
Asset income
Saving

Appendix A. Adjustment Factor in Inter-household Transfers

There are three possible ways to adjust for the inter-household transfer inflows and outflows:

1. If we let *TF* be the control total for net private transfers and $TFBI_{agg}$ the total aggregate inter-household inflows and $TFBO_{agg}$ the total aggregate inter-household outflows, the multiplicative adjustment factor for *TFBO* and *TFBI* is:

$$TFB_{adj} = \frac{TF}{TFBO_{agg} + TFBI_{agg}}$$

2. The following adjustment factors for inflows $TFBI_{adj}$ and for outflows $TFBO_{adj}$ can also be used if one adjustment factor, computed above, is not sufficient.

$$TFBO_{adj} = 1 + \frac{TF - TFBI_{agg} - TFBO_{agg}}{2 \cdot TFBO_{agg}}$$

$$TFBI_{adj} = 1 + \frac{TF - TFBI_{agg} - TFBO_{agg}}{2 \cdot TFBI_{agg}}$$

3. The last method is if adjustment is to be made to either inflow or outflow but not both, the multiplicative adjustment factors $TFBO_{only\_adj}$ or $TFBI_{only\_adj}$ are computed as follows:

$$TFBO_{only\_adj} = \frac{TF - TFBI_{agg}}{TFBO_{agg}}$$

$$TFBI_{only\_adj} = \frac{TF - TFBO_{agg}}{TFBI_{agg}}$$

The abovementioned computations may result in very different outcomes if the difference between *TF* and $TFBI_{agg} + TFBO_{agg}$ is at all large. Country teams should be very careful in deciding which method makes the most sense for them and then should check the results to make sure they are reasonable.

Appendix B. Mathematical Presentation for Intra-household Transfers

1. Intra-household Transfer Outflows

   a. Preparation of Data

   $Yl(i, j)$: labor income

   $TGCash(i, j)$: public cash transfer inflows

   $TGTax(i, j)$: taxes paid

   $TFB(i, j)$: inter-household transfers

   $CC(i, j, x)$: sector-specific current consumption

   $CD(i, j, x)$: sector-specific durable consumption

   b. Current surplus or deficit for each member (i) and for the household (j)

   $$X(i, j) = Yl(i, j) + TGCash(i, j) - TGTax(i, j) + TFB(i, j) - CC(i, j)$$

   $$Surplus(i, j) = \max[0, X(i, j)]$$

   $$Deficit((i, j) = \min[0, X(i, j)]$$

   c. Calculate the tax rate

   $$tax(j) = \min[1, Deficit(j) / Surplus(j)]$$

   where:

   $$Surplus(j) = \sum_i Surplus(i, j)$$

   $$Deficit(j) = \sum_i Deficit(i, j)$$

   d. Intra-household transfer outflow

   $$Shortfall(j) = \max[0, Deficit(j) - Surplus(j)]$$

   $$TFWO_c(i, j) = tax(j)Surplus(i, j) \text{ for } i \neq 1$$

   $$TFWO_c(i, j) = \min[0, -tax(j)Surplus(i, j) - Shortfall(j) + Deficit(i, j)] \text{ for } i \neq 1$$

2. Inflows and Outflows by sector

a. Sector Inflows

$$TFW_{xxx}I_c(i,j,x) = \frac{CC(i,j,x)}{CC(i,j)} Deficit(i,j) \text{ for } i \neq 1$$

$$TFW_{xxx}I_c(i,j,x) = \frac{CC(i,j,x)}{CC(i,j)} \max[0, Deficit(i,j) - Shortfall(j)] \text{ for } i = 1$$

b. Sector Outflows

$$TFWxxxO_c(i,j,x) = \frac{TFWxxxI_c(j,x)}{TFWI_c(j)} TFWO_c(i,j)$$

where:

xxx = can be Education or Health or Other Consumption

3. Saving

a. Any surplus held by non-heads that is not taxed for current consumption transfers is transferred to the head to be saved:

$$TFWSO(i,j) = -Surplus(i,j) - TFWO_c(\text{i,j}) \text{ for } i \neq 1$$

$$TFWSO(i,j) = 0 \text{ for } i = 1$$

b. The head receives all of this excess surplus as an inflow:

$$TFWSI(i,j) = 0 \text{ for } i \neq 1$$

$$TFWSI(i,j) = -\sum_i TFWSO(i,j) \text{ for } i = 1$$

4. Transfers for Durable Consumption

$$TFWxxxO_d(i, j, x) = CD(i, j, x) - CD(j, x) \text{ for } i = 1$$

$$TFWxxxO_d(i, j, x) = 0 \text{ for } i \neq 1$$

$$TFWxxxI_d(i, j, x) = 0 \text{ for } i = 1$$

$$TFWxxxI_d(i, j, x) = CD(i, j, x) \text{ for } i \neq 1$$

where:

xxx = Housing or Other Durable Consumption

5. Construction of Age Profiles of Total Intra-household Inflows and Outflows

$$TFWO(i, j) = \sum_{xxx} TFWxxxO_c(i, j) + \sum_{xxx} TFWxxxO_d(i, j)$$

$$TFWI(i, j) = \sum_{xxx} TFWxxxI_c(i, j) + \sum_{xxx} TFWxxxI_d(i, j)$$

Appendix C. Calculation of Public and Private Interest.

The interest flow matrix is presented in Table C.1. Inflows and outflows for each sector are known (the row and column totals), but the flows between sectors are not known. Here and in the tables below outflows are reported as positive values. The methods are illustrated using values for Japan 2004 (Ogawa et al. 2008).

Table C.1. Aggregate Interest, Japan, 2004. Yen billions.				
	Inflows to:			
Outflows from:	Public	Private	ROW	Total
Public				12,558.0
Private				52,448.9
ROW				8,782.5
Total	6762.5	65,362.5	1,664.4	73789.4

Household interest outflows are reported in Table C.2. The total outflow is known from SNA. Outflows from households must be matched by inflows to public, private, or ROW sectors. Interest payments by households to governments are assumed to be available from administrative records. Here it has been assumed that interest payments by Japanese households to the government are 0. The remainder is allocated between private and ROW in proportion to total inflows reported in Table C.1.

Table C.2. Aggregate Interest Outflows, Households, Japan, 2004. Yen billions.				
	Inflows to:			
Outflows from:	Public	Private	ROW	Total
Public Private ROW	0.0	6333.6	161.3	6,494.9
Total	0.0	6333.6	161.3	6,494.9

Interest flows excluding interest outflows from households are reported in Table C.3.

Table C.3. Aggregate Interest Flows Excluding Outflows from Households, Japan 2004. Billions of yen.				
	Inflows to:			
Outflows from:	Public	Private	ROW	Total
Public				12558
Private				45954
ROW				8782.5
Total	6762.5	59028.9	1503.1	67294.5

Table C.2 considers only interest flows from households to the public sector. Other interest flows involving the public sector are treated in Table C.4. Public interest outflows are allocated between private and ROW in proportion to the inflows to those sectors in Table C.3. Likewise public interest inflows not treated in Table C.2 are allocated to the private and ROW sectors in proportion to the outflows from those sectors reported in Table C.3.

Table C.4. Aggregate Other Public Interest, Japan, 2004. Billions of yen.				
	Inflows to:			
Outflows from:	Public	Private	ROW	Total
Public		12246.2	311.8	12558
Private	5677.5			5677.5
ROW	1085.0			1085.0
Total	6762.5	12246.2	311.8	19320.5

The final private interest flows are treated in Table C.5. These flows consist of interest paid by the private sector to other private institutions and ROW and interest received by private institutions from private institutions and ROW. The values in Table C.5 are calculated as residuals.

Table C.5. Aggregate Private and ROW Interest, Japan, 2004, Billions of yen.				
	Inflows to:			
Outflows from:	Public	Private	ROW	Total
Public				0.0
Private		39085.3	1191.3	40276.5
ROW		7697.5	-	7697.5
Total	0.0	46782.7	1191.3	47974.0

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