

# National Transfer Accounts Project

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## Flow Account Methods

This page provides general documentation of the methods for constructing the National Transfer Flow Account.

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## General guidelines

Each NT Flow Account variable consists of an age profile of aggregate values, e.g., the total consumption of all persons aged 15 or pension benefits received from all persons aged 73. In most instances the values are estimated using three pieces of information: the population by age, a per capita age profile for the variable being estimate, and an aggregate control variable drawn from National Income and Product Accounts or other reliable public statistical sources.

The relationship between these variables is very simple as is their use to calculate values in the flow account table. If  $x(a)$  is the per capita age profile,  $N(a)$  is the population,  $X$  is the aggregate control value, and  $X(a)$  the total value of  $X$  for all persons aged  $a$  then:

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

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

The value  $\theta$  is a proportional adjustment factor calculated from the first equation and

then used to adjust the per capita profile proportionately to insure consistency with the aggregate control.

The NTA data base distinguishes these types of variables using *VarType*. A *VarType* of *NTA* refers to the aggregate values of a variable; a *VarType* of *Mean* refers to the per capita values adjusted to conform to the aggregate control value. In most instances the *NTA* values are constructed using a smoothed per capita profile ([Smoothing](#)). The *VarType* of *Smoothed Mean* is the smoothed per capita variable also adjusted to conform to the aggregate control variables.

Examples of these variables can be found by using [Browse database](#).

Most of the methodological section is devoted to estimating the per capita age profile. There are also more limited sections discussing population estimates and aggregate control variables for the accounts.

The basic accounting identity for the flow accounts insure that total inflows to the household must equal the sum of consumption and total outflows from the household. The same holds for individuals.

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## LifeCycle Deficit

Lifecycle Deficit (LCD)

The Lifecycle Deficit is equal to consumption less labor income.

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## Consumption

Consumption (C)

Consumption is equal to public consumption plus private consumption.

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## Public Consumption

### Comments about the Public Consumption methodology:

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## Private Consumption

Author(s): A Mason  
Last Revised: December 13, 2005

- Private Consumption (CF)  
Private Education Consumption (CFE)  
Private Health Consumption (CFH)  
Private Capital Consumption (CFK)  
Private Consumption Other (CFX)

## Issues

- Adjustment of private consumption to exclude indirect taxes.
- Should private consumption that is heavily or totally subsidized by taxpayers be classified as public consumption. Examples are Medicare and Medicaid in the US and National Health Insurance in Taiwan.

### Defining and measuring private consumption

Private consumption consists of household consumption and consumption by non-profit institutions serving households (NPISH). Three adjustments to NIPA values are necessary.

1. NIPA counts expenditures on consumer durables as current consumption. The preferred NTA approach is to count expenditures on consumer durables as investment and the flow of services over the useful life of the durable as current consumption. Hence, expenditures on consumer durables should be subtracted from NIPA consumption and an estimate of the flow of services from consumer durables should be added to NIPA consumption. Note that NIPA and NTA both treat the purchase of housing as investment and the flow of services as consumption. The flow of services from durables and from owner-occupied housing is *Private Capital Consumption (CFK)*.
2. NIPA consumption includes indirect taxes on consumption, e.g., taxes on retail sales. NIPA consumption should be reduced by the value of indirect taxes on consumption. The public sector methodology discusses taxes and their incidence in more detail.
3. NIPA defines public consumption as the values of goods and services purchased by general government. If individuals purchase goods and services and are reimbursed by the government, the values of those goods and services are classified as private consumption by NIPA. A proposal to reclassify health expenditures reimbursed through government programs as public consumption is being considered.

Four components of private consumption are distinguished:

- Private education consumption (CFE) 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, reference materials and self-improvement classes (art classes, music classes, etc.) are also included.
- Private health consumption (CFH) 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. Whether health consumption reimbursed by public cash transfers is to be counted as public or private health consumption is under discussion.
- Private capital consumption (CFK) is equal to the imputed rental value of owner-occupied housing and the flow of services from consumer durables.
- Other private consumption (CFX) is the value of all consumption otherwise not estimated.

We need a paragraph here explaining where we get the macro controls for each of these components and how each component is adjusted

The tasks involved in the analysis are:

1. Construct measures of household consumption that conform to the consumption components identified above.
2. Assign consumption values to each individual using allocation rules described below. All consumption is allocated to individual members.

3. Tabulate the data using survey weights to obtain per capita age profiles of each consumption component.
4. Smooth per capita profiles to eliminate noise.
5. Multiply per capita profiles by final population estimates to obtain aggregate age profiles for each consumption component.
6. Adjust the aggregate age profiles and the unsmoothed and smoothed per capita profiles proportionately to match the aggregate control total.
7. Upload the unsmoothed per capita age profiles, the smoothed per capita age profiles, and the aggregate age profiles to the NTA database.

Each component of consumption is analyzed separately and then aggregated to determine total consumption.

### Constructing Age Profiles

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 age reallocations. 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 reallocations:

Consumption	Transfers	Asset R.
Food, clothing, house rent, etc.	Tax payments	Residual
Rental value of owner occupied housing	Gifts	Interest payments
Flow of services from durables	...	...

Several important points should be noted. First, housing consumption for a household residing in a home that it owns 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. Second, 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 also 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. Estimation details for the US are provided in Tim, do you have something here?

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 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; land rent. 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 their risks. 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 interage reallocations, we assume that premiums are assessed in an actuarially fair way and, hence, produce only intra-age reallocations. The remaining portion of premiums paid by consumers defer administrative costs and profits of insurance companies. This amount 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 have recently been revised because catastrophic losses, e.g., those produced by Hurricane Katrina, lead to large fluctuations in insurance related components. The new revisions will 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. More details of the US revision are described in [http://www.bea.gov/bea/faq/national/insurance\\_services\\_gdp.htm](http://www.bea.gov/bea/faq/national/insurance_services_gdp.htm)

The key issue for estimating NTA consumption is using household survey data to define consumption in a way that is comparable to NIPA consumption and its components. Household consumption expenditure would include a portion of insurance premium expenditure with that portion determined by the share of insurance in NIPA consumption.

*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.

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. Recent estimates for the US and a detailed discussion of the methodology employed for construction NHA in the US are available at:

<http://www.cms.hhs.gov/statistics/nhe/definitions-sources-methods/>

There are important differences between NHA and NIPA 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 are intended as illustrative and should be adopted 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.

### *Allocating Education*

Education is allocated using a regression model. The household consumption of education ( $C_{FEj}$ ) is regressed on the number of household members in each age

group enrolled in school ( $E_j(a)$ ) and the number of household members not enrolled ( $NE_j(a)$ ):

$$CFE_j = \sum a(a) E_j(a) + \sum \beta(a) NE_j(a)$$

Note that this equation is estimated in homogeneous form (without an intercept) insuring that household consumption is fully allocated. The age groups included will vary with the country and its enrollment rates. In Taiwan, the number of enrolled members includes those aged 6 to 29. The number of not enrolled members includes those aged 3-7 and 30+. The number of members not enrolled captures educational spending that is not part of the formal educational system.

### *Allocating Health*

The method used to allocate health varies depending on the availability of data. In Taiwan, health is also allocated using a regression model. The model is simpler than 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 ( $M_j(a)$ ):

$$CFH_j = \sum \beta(a) M_j(a)$$

Again, the model is estimated in homogeneous form (with the intercept suppressed). The age groups can be single year or in broader age groups. For some age groups, out of pocket health spending might be very small and estimated coefficients may be negative. Health spending on these age groups can be constrained to zero.

The regression estimates are used to allocate the health expenditure for each household  $j$  to household member  $i$  using:

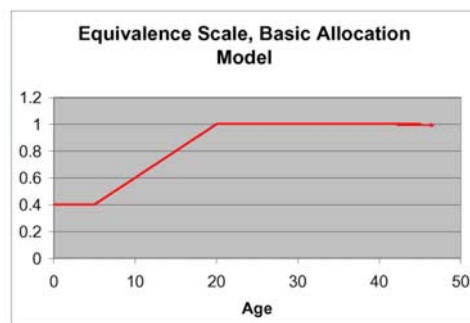
$$CFH_{ij} = CFH_j \beta(x) / \sum \beta(a) M_j(a)$$

where  $x$  is the age of the  $i$ th household member.

### *Allocating Owner-occupied Housing Consumption and Other Household Consumption*

Other household consumption is allocated to individuals using an *ad hoc* allocation rule based on an extensive review of the literature and other estimation methods, e.g., Engel's method and the Rothbarth method.

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.



[\[info\]](#)

A formula for the scale:

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

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

where  $x$  is the age of the  $i$ th household member.

## Smoothing

Methods and guidelines for smoothing are described in [Smoothing](#). **Important point:** Education consumption is intrinsically not smooth and the best approach is often to use the unsmoothed age profile to construct final estimates. It may be advisable to smooth at older ages, however.

## Sample Code

The code used to estimate private consumption profiles for Taiwan using Stata are contained in the following files: [Education Code](#)[\[info\]](#), [Health Code](#)[\[info\]](#), and [Other Code](#)[\[info\]](#).

## Comments about the Private Consumption methodology:

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## Labor Income

Labor Income (YL)  
Earnings (YLE)  
Fringe Benefits (YLF)  
Self-Employment Income (labor component) (YLS)

- [Overview](#)
- [Aggregate Control for Labor Income](#)
- [Earnings and Fringe Benefits](#)
- [Self-employment Income](#)
- [Additional Topics](#)

## Overview



Total labor income is estimated from NIPA and the age profile is estimated using individual and household surveys. The methods outlined in this section assume that survey data on employee compensation are available, ideally from a nationally representative survey. Estimating the labor income of the self-employed is difficult for two reasons. First, entrepreneurial income or the "profits" of a family business or farm must be allocated between returns to labor and returns to capital. Second, the return to labor must be allocated among family members who often do not explicitly receive compensation including unpaid family workers.

### Defining labor income

Labor income is defined as 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. 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.

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.

Labor income includes compensation to those on paid leave (vacation and sick leave) and no adjustment is required. 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.

### Aggregate Control for Labor Income

Total labor income is estimated from National Income. Using the terminology of the 1993 UN System of National Accounts, labor income consists of three components:

- the *compensation of employees*
- labor's share of the *operating surplus of unincorporated enterprises* (also known as *mixed income* or *entrepreneurial income* or *proprietors' income*)
- labor's share of *taxes on net production and on imports* (also known as *indirect taxes*) less *business subsidies*

The compensation of employees consists of *wages and salaries* and *employers' social contributions*.

In the absence of information to the contrary, we assume that two-thirds of the operating surplus of unincorporated enterprises is labor income.

Net taxes on net production and on imports is 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. Net taxes means taxes net of business subsidies. Total labor income is increased by labor's share of net taxes on production and on imports. (In the NT Flow Account, the higher labor income of each age group will be matched by higher net taxes, i.e., net transfers from workers to the government.)

### Earnings and 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.

### Self-employment Income

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**.

$$YLS(a,j) = \gamma(a)YLS(j)$$

$$\gamma(a) = w(a)N(a,j) / \sum_x w(x)N(x,j)$$

where  $YLS(j)$  is the self-employment portion of labor income for household  $j$ ,  $YLS(a,j)$  is the self-employment portion accruing to all individuals in household  $j$  who are age  $a$ ,  $w(x)$  is the average earnings of employees of age  $x$  and  $N(x,j)$  is the number of persons in household  $j$  who are self-employed or unpaid family workers, and  $\gamma(a)$  is the share of total household self-employment labor income allocated to each household self-employed or unpaid family member who is age  $a$ .

In this way the total self-employment labor income generated at age  $a$  in each household is found, and summing across all households the total self employment labor income generated at age  $a$  is found. Dividing this by the total number of surveyed individuals age  $a$  gives the age profile of **per capita** self employment income. Then using the national population age distribution this age profile is adjusted to match the national control total.

[Stata Code](#)

[Discussion](#)

### Additional Topics

#### **Smoothing**

Smoothing methods tend to greatly over-estimate labor income at young ages. The most reliable method is to exclude children who have not yet reached working age. This may be determined empirically as the first age for which a positive value is estimated or on a priori grounds based on the survey instrument, e.g., all those under age 15 or under age 12. We then smoothed the labor income for those who had reached working age using Supsmu with a relatively small bandwidth, e.g., 0.05 or 0.10. To assess the results it is a good idea to calculate the smoothed relative to the unsmoothed value to judge the percentage error.

#### **Social benefits for public workers**

## Cohort data

Age profiles can be converted to cohort data. An example using labor income profiles for Taiwan, [Labor income by cohort](#)<sup>[info]</sup>. For further information on converting cross-sectional data to cohort, refer to the Methods page on [Cohort Data](#).

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Additional Reading: R. Lee, S.H. Lee, and A. Mason (2005; revised 2007). Working Paper No. 8. ([LLM2005](#)<sup>[info]</sup>)

## Comments about the labor income methodology:

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Author: Comfort Sumida  
Revisions: A Mason  
Last Revised: September 4, 2007

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## Reallocations

Reallocations are equal to asset reallocations plus transfers.

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## Asset-based Reallocations

### General Principles

The distinguishing feature of an asset-based reallocation is that it involves inter-temporal "exchange". Assets acquired in one period yield income or can be disposed of in future periods allowing individuals to shift resources from one age to a different age. Assets take the form either of capital or of credit. From the point of view of the macro economy, these have fundamentally different characteristics, but from the point of the view of the individual, they may be close substitutes as stores of wealth. For the macro economy, the collection of all the capital assets is the aggregate capital stock. Capital is productive, and it is generally a complement to labor, raising its marginal productivity. In aggregate, however, credit largely cancels out between creditors and debtors. The exception arises from credit or debt held by the foreign sector. For the individual, capital and credit may differ mainly in the certainty and level of the rate of return that they yield. However, it is also important that credit may be positive or negative (debt), and consequently credit can be used to reallocate resources backward in time - from the future to the present - and from older ages to younger ages. Through credit one can consume before producing. Negative capital does not exist, so capital can be used only to postpone the consumption of resources to a later date.

The creation of capital takes the form of an exchange with nature, as when I build a productive asset today, for example a house, converting current labor into a flow of services in the future. Capital also serves as a store of value. It can be acquired in one period and disposed of in a subsequent period. This form of investment and dis-investment allows an individual to shift resources from the present to the future.

Credit can take the form of a loan to one's child who is expected to repay it when older; this would be familial credit. It can take the form of credit card debt or a home

mortgage, when young adults finance their consumption by borrowing from older, more financially established adults. It can take the form of a government bond when taxpayers borrow from investors to finance public programs.

A cohort acquires an asset by saving. This generates an outflow at the age at which the asset is acquired. By holding the asset a cohort receives, in future periods, at older ages, inflows in the form of asset income. Or, the cohort may sell the asset, thereby, dis-saving and generating an inflow.

A cohort may receive an asset directly as a transfer. For example, an elderly parent may transfer her home to a daughter. This is treated as a transfer (an inflow equal to the value of the asset) and as saving (an outflow equal to the value of the asset).

A cohort acquires capital by investing. The accumulation of credit is equal to saving less investment.

Aggregate saving is equal to the change in aggregate wealth; aggregate investment is equal to the change in aggregate capital. Likewise, for any cohort or age group, saving is equal to the change in wealth of that cohort and investment is equal to the change in capital. (Saving and investment are assumed to be net of depreciation unless otherwise indicated.) Saving and investment by one age group does not lead to aggregate investment if it is matched by dis-investment by another age group.

Asset-based reallocations consist of two flows: asset income and saving. Asset income is an inflow. Saving is an outflow. The NTA budget identity is:

$$LCD(a) = R(a) = YA(a) - S(a) + T(a)$$

where  $LCD(a)$  is the lifecycle deficit at age  $a$ ,  $R(a)$  is reallocations at age  $a$ ,  $YA(a)$  is asset income at age  $a$ ,  $S(a)$  is saving at age  $a$ , and  $T(a)$  is net transfers at age  $a$ .

Asset-based reallocations are given by:

$$RA(a) = YA(a) - S(a)$$

Note that  $S(a)$  is net saving, i.e., saving net of depreciation.

National Transfer Accounts distinguish public and private asset-based reallocations and two forms of assets: capital and credit (Table RA1).

**Table RA1. NTA Classification of Asset Reallocations**

Sector	Capital	Credit
Public	Roads, ports, parks, other public infrastructure	National debt, student loans, World Bank loans
Private	Residential and non-residential buildings, businesses, vehicles, factories, land, subsoil assets	Consumer credit, foreign debt

The distinction between public and private is discussed in the overview and will not be repeated here.

The current NT Flow Account methodology does not distinguish between capital and other non-financial assets, such as, land. Thus, the accumulation of any non-financial asset is included in investment and all non-financial asset income is included in capital income.

Non-financial assets as defined by the 1993 UN SNA consists of produced assets and

non-produced assets. "There are three main types of produced assets: fixed assets, inventories, and valuables. Fixed assets are defined as produced assets that are themselves used repeatedly, or continuously, in processes of production for more than one year." (1993 UNSNA Para 10.7). Inventories are stocks of outputs held by the units that produced them or stocks of intermediate inputs that will be used in future production processes. Valuables are stores of value that are not used primarily in production processes.

Non-produced assets "consist of assets that are needed for production but have not themselves been produced. They include naturally occurring assets such as land and certain uncultivated forests and deposits of minerals." (1993 UNSNA Para 10.8). The current version of NTA follows NIPA by including only natural resources that are owned or effectively controlled by an economic unit - primarily land and sub-soil assets, e.g., coal, oil, and minerals. An important extension to the NTA methodology would be to include non-owned natural resources, e.g., environmental resources.

Credit is a financial resource that can be exchanged to generate age reallocations. Some age groups have a positive credit balance and other age groups have a negative credit balance, but positive and negative balances must be equal in total. Aggregate net credit, in a closed economy, is always zero.

That aggregate net credit must equal zero is true of both public and private credit in the NTA system. When the public sector incurs debt, it creates positive balances for investors who, for example, buy government bonds and negative credit balances for taxpayers who are responsible for paying interest and possibly repaying national debt. A distinguishing feature of public debt is that, over time, it can be transferred to future generations. Public asset reallocations are discussed much more extensively in the [public sector flow account methods section](#).

In modern economies many private assets are owned indirectly through financial intermediaries. In part this reflects the extensive reliance on credit to finance investment. This adds complexity to defining and to estimating which age groups are investing, which are accumulating credit and debt, and which are accumulating and dis-accumulating land. When a thirty-year-old man builds a new home, for example, is he creating capital? Or is it the fifty-year-old woman who lent him the money probably through a financial intermediary?

The practice in the NT Flow Account is, in principle, to classify net saving by individuals by the ultimate use of the funds. Thus, when debt is used to finance consumption this is classified as a credit transaction. Credit transactions refer exclusively to loans that are used to finance consumption, not to finance the acquisition of new or existing capital or the acquisition of existing land.

When debt is used to finance investment this is classified as a capital transaction, i.e., the lender is accumulating capital. The interest income subsequently received is counted as a return to capital, i.e., as capital income. To answer the question posed above - the fifty-year-old woman who lends the money required to build the new home is investing in capital; the thirty-year-old "owner" of the house is investing in capital only as he pays off the loan and builds equity in his residence.

Asset income consists of the income received as a return to capital and credit. The return to capital is called *capital income* and the return to credit is called *interest*.

An issue to be addressed is the treatment of international capital flows.

### Estimating Private Asset-based Reallocations

The detail with which the asset reallocation system is estimated will depend on the availability of data. Public asset reallocations are described in the [public sector flow](#)

[account methodology section](#). Here the discussion is limited to estimating private asset-based reallocations. First, we consider private asset income. Below, we turn to private saving.

## Estimating Private Asset Income

Private asset income consists of capital income and interest. Interest is the return to consumer credit, i.e., loans that finance consumption only. Rent, the return to land and sub-soil assets, is included with capital income. Capital income is generally a large portion of asset income and is treated with more detail. Distinguishing components of capital income is useful because they have distinctive age profiles than can be estimated using income data that are often available.

### Components of Capital Income:

1. Mixed income, net (capital share): return to capital invested in individual proprietorships and other unincorporated businesses including farms.
2. Operating surplus, net: return to capital invested in corporations.
3. Net imputed rent of owner-occupied housing, owner's share: return to capital invested by an owner in an owner-occupied dwelling unit.
4. Net imputed rent of owner-occupied housing, lender's share: return to capital invested by a lender in an owner-occupied dwelling unit.

The net imputed rent of owner-occupied housing is equal to imputed rent less the costs of maintenance and repair and depreciation. The owner's share is net imputed rent less interest expense for housing loans. The lender's share is the interest income from housing loans.

Following standard NTA practice, asset income by age is estimated by constructing an aggregate control based on NIPA and other available aggregate data. The aggregate value is distributed by age using age-specific population data and a per capita profile estimated using survey data.

## Aggregate Controls

Source and methods for estimating aggregate controls for asset income are described in Table RA2.

**Table RA2. Estimating aggregate asset income.**

Component of asset income	Source and notes
Capital income: Capital's share of mixed income, net	A portion of mixed income accruing to households - a component of national income less net imputed rent to owner-occupied housing. Current estimates assume that one-third is a return to capital and two-thirds is a return to labor. Value must be adjusted upward to include indirect taxes net of business subsidies on capital invested in unincorporated businesses.
Capital income: Operating surplus, net	The return to capital of corporations - a component of national income.

Capital income: Net imputed rent from owner-occupied housing (owner's share)	Net imputed rent of owner-occupied housing is a component of mixed income, which is, in turn, a component of national income. Owner's share is calculated by subtracting interest paid on housing loans, which may be available from an expenditure survey or elsewhere. Estimated from income and expenditure survey or is their an alternative?
Capital income: Net imputed rent from owner-occupied housing (creditor's share)	The value of interest on loans for owner-occupied housing is estimated from expenditure surveys or ????
Rent	A return to land and sub-soil minerals; a component of national income.
Interest	Survey data may provide an estimate of interest payments by households for non-housing loans.

Note. Revised on 11/21/06 to reflect changes in treatment of indirect taxes.

### Per capita age profile

In principle, two kinds of data can be used to allocate private asset income by age: income data and asset data. Using income data is generally preferable because income data are usually more reliable than asset data and because, to the extent that rates of return vary by age, the age profiles of asset income will differ from the age profile of assets.

By assumption all assets are held by the household head and all asset income flows to the household head. Hence, neither asset incomes nor assets, if they are being used, are allocated among household members. They are assigned to the household head. All other members are assigned a value of zero.

Some components of asset income accrue directly to households and the age profile of that income can be estimated directly from income and expenditure surveys. Other components of asset income accrue indirectly to households. These forms of asset income are allocated using proxy age profiles.

For each component of asset income, a per capita age profile is constructed in the following way.

1. The appropriate measure of income from the household income and expenditure survey is assigned to the household head;
2. All other household members are assigned a value of zero;
3. The variable is tabulated by age using sample weights to obtain the per capita age profile. IMPORTANT. The age profile is per capita not per household head.
4. The per capita profiles are smoothed.
5. The smoothed per capita profiles are multiplied by the population, cumulated, and compared to the aggregate control totals. The per capita and aggregate profiles are adjusted proportionately to match the control total.
6. The unsmoothed, smoothed, and aggregate age profiles are uploaded to the data base with documentation.

The survey variable used to construct the per capita income profile for each component of asset income is described in Table RA3.



**Table RA3. Variables used to estimate the per capita age profiles of capital income.**

Component of capital income	Variable from income and expenditure survey
Capital's share of mixed income	Entrepreneurial income
Operating surplus	Property income (dividends, interest, rent)
Imputed rent from owner occupied housing (owner's share)	Imputed rent less interest payments on housing loans
Imputed rent from owner occupied housing (creditor's share)	Property income (dividends, interest, rent)
Rent: Inflow	Property income
Credit income: Inflow	Property income
Credit income: Outflow	Interest expense on non-housing loans

Notes: In all cases per capita age profiles are estimated from household income and expenditure surveys. Credit income has two age profiles: one for inflows received by creditors and one for outflows for debtors.

## Saving

Saving by age is estimated as a residual:

$$S(a) = YA(a) + T(a) - LCD(a)$$

As a check it should equal net national saving?

## Comments about the Asset Reallocation methodology:

### Comments:

tmiller: (Tue Aug 22 08:02:17 2006 )

I'm worried about our treatment of Credit Market Transactions. Credit Market inflows are the receipt of loans, while credit market outflows are the repayment of loans (interest + principal). If we are not accounting for both of these flows, then they will end up in our residual calculation of savings,  $S(a)$ .

amazon: (Tue Feb 6 18:22:34 2007 )

The credit market transactions consist of both saving and asset income. A loan payment often involves both transactions. The interest is credit income (negative for the person paying the interest and positive for the person receiving it). The payment of principal is saving for the person repaying the loan and dis-saving for the person who is being paid.

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Author: A Mason

Last Revised: January 5, 2006

## Transfers

Transfers are equal to public transfers plus private transfers.



**Comments:**

amason: (Wed Nov 22 17:44:36 2006 )

Ron, Tim, Sang-Hyop, Nicole, An-Chi, One of the few remaining issues in the Boulders paper has to do with terminology (and concepts). These are issues we have discussed in the past, but never fully resolved. In the current version of the paper we are using the terms bequests and inter vivos transfers to distinguish two forms of transfers. There are two questions that need to be resolved and I would appreciate your thinking about this.

Question 1. How do we distinguish these transfers, i.e., define the categories?

One form of transfers arises because of changes in the membership to the sub-population of asset holders. These transfers are also distinctive because they are not between two existing households. Also, I think that the transfers always involve existing capital that is reclassified.

In the case of private households, assets are held by household heads. An individual may leave the sub-population because: (a) the head dies; or (b) the head becomes a household member either within the household or in a new households. A similar event which might be included in this category is (c) the head emigrates.

We emphasize transfers precipitated by leaving the sub-population, but transfers may also be generated by entry into the population. One example is a change in the designation of the household head. This creates a transfer from the age group of the departing head to the age group of the entering head. Immigration would create a similar event, where the entry of a household head from abroad creates a transfer from abroad of the total wealth of the head entering the country. Another important event to be considered is the creation of a new household when an individual leaves home and establishes a new household. The individual may take assets with him or her that previously were held by the household in which the individual was a member.

In the case of the public sector, assets (and public debt) are transferred from one generation to the next as membership to the sub-population of asset holders changes. The sub-population is defined differently in the public sector. Assets are held by the beneficiaries of those assets. Many assets would be held by the population in general, but some assets, e.g., schools, are owned by school children. Public debt is held by taxpayers in proportion to the taxes they pay on servicing the debt. Public assets and debt are transferred over time as a result of entry to and departure from the sub-population.

Question 2. What terminology do we use to describe these assets?

One possibility is "Capital transfers". What would we describe the complement? "Current transfers" seems like one possibility, but perhaps not a very good one. We could stick with inter vivos transfers, which isn't quite right either but perhaps more suggestive of what is distinctive about these transfers, i.e., the are between two existing households.

A related terminology question is describing saving. We have two forms of aggregate saving going on. An age group may be saving or dis-saving because existing members are saving or dis-saving or because there are net additions to or subtractions from the sub-population of asset holders.

Any thoughts would be greatly appreciated.

Andy

amason: (Wed Nov 22 18:24:43 2006 )

Sang-Hyop points out that is should be "asset transfers" of which "capital transfers" and "credit transfers" would be components.

Sang-Hyop also points out that we are not including public asset transfers in our calculation of total transfers.

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**Public Transfers**

**Comments about the Public Transfers methodology:**

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**Private Transfers**

*Intrahousehold transfers*

(Updated by Gretchen 10/23/2008)

Households shift resources among their members. Those who are consuming more than their disposable income are receiving intra-household transfers from those who are consuming less than their disposable income. Disposable income is defined as labor income plus net public cash transfers (cash inflows less taxes) plus net inter-household transfers. If the disposable income of all household members combined exceeds the total consumption of all members combined, the surplus is transferred to the household head and saved. If total disposable income is less than total consumption, however, the household head supports the excess consumption using property income or by dis-saving.

We assume that intra-household transfers to support current consumption (non-durable consumption) are "financed" by imposing a household specific flat-rate tax on each member's surplus income. Within the household each member is taxed at the same rate. The tax rate does not vary by age. Moreover, we assume that the household specific tax rate for any sector is identical for each household member.

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 "financed" by an intra-household transfer from the head to the member equal to the value of member's durable consumption.

Once the current and durable consumption transfers are calculated at the individual level, profiles are constructed by aggregating by age group.

The following explanation of the methodology proceeds in five steps: A. Preparation of Data, B. Transfers for Current Consumption, C. Transfers of Unconsumed Surplus to Head, D. Transfers for Durable Consumption, and E. Construction of Age Profiles. A section at the very bottom discusses aspects of finalizing the profiles, such as smoothing and adjustment to control totals.

#### A. Preparation of Data

To calculate the intra-household variables, begin with unsmoothed variables adjusted to control totals. The necessary NTA variables, using indexes for person  $i$  in household  $j$  with consumption divided into sectors  $x$ , are as follows:

$YI(i,j)$ : labor income  
 $TGCash(i,j)$ : public cash transfer inflows  
 $TGTar(i,j)$ : taxes paid  
 $TFB(i,j)$ : inter-household transfers  
 $CC(i,j,x)$ : sector-specific current consumption  
 $CD(i,j,x)$ : sector-specific durable consumption

In addition, household id and household head identifier variables are necessary.

There are three data cleaning considerations that come up in the intra-household transfer methodology. First, each household must have only one person designated as the household head (referred to here as  $i=1$ ). Second, consumption values must be non-negative. Negative consumption values can arise when model-based estimation is used. Finally, although the best case is when all of the input variables listed above come from one survey, this is not always possible. If you need different surveys for

different variables, additional steps are necessary to calculate intra-household transfers. See the section on "FINALIZING DATA" at the end of the Private Transfers methodology section for instructions.

In the notation used here, any variable written without all  $i$ ,  $j$ , and  $x$  indices refers to a summation over the missing index. For example, total current consumption for individual  $i$  in household  $j$  is written as follows:

$$CC(i,j) = \sum_x CC(i,j,x)$$

## B. Transfers for Current Consumption

B.1. Compute the current surplus or deficit for each household member and for the household.

A household member has a current surplus if his disposable income is higher than his current private consumption, where current private consumption excludes the services from housing and other consumer durables. A household member has a current deficit if his disposable income is less than his total current private consumption:

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

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

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

The total surplus and deficit for the household are calculated as:

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

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

B.2. Calculate the 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. Thus, the rate at which the surplus is taxed in household  $j$  is equal to:

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

If  $Surplus(j) = 0$ , then  $tax(j) = 0$ .

B.3. Calculate intra-household outflows for current consumption.

The current intra-household transfer outflow ( $TFWO_c(i,j)$ ) for person  $i$  in household  $j$ ) for non-heads is equal to the tax rate times the surplus. For heads the outflow is the tax rate times the surplus, and any household shortfall that the head must finance through asset sales or dis-saving, but not including the head's own deficit, if any.

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

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

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

B.4. Calculate the intra-household inflows and outflows for current consumption by sector.

Current transfer inflows to non-head  $i$  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. Thus for current consumption sector  $x$ :

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

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

If  $CC(i, j) = 0$ , then  $TFW_{xxx}I_c(i, j, x) = 0$ . If the only current consumption sectors being calculated are Education, Health and Other, then the "xxx" above will stand for E, H, or X, respectively.

Current transfer outflows from individual  $i$  in each current consumption sector are proportional to the total household inflows to each sector:

$$TFW_{xxx}O_c(i, j, x) = \frac{TFW_{xxx}I_c(j, x)}{TFWI_c(j)} TFWO_c(i, j)$$

If  $TFWI_c(j) = 0$ , then  $TFW_{xxx}O_c(i, j, x) = 0$ .

#### C. Transfers of Remaining Surplus to Head

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

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

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

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

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

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

#### D. Transfers for Durable Consumption

All transfers for durable consumption (i.e. asset consumption) come from the head and flow to non-heads. The inflows to non-heads by durable sector are equal to the consumption of each non-head in that sector, and non-heads have no outflows in that

sector. The sector outflow for the head is equal to the total non-head sector consumption, and there is no inflow to the head for durable consumption:

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

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

$$TFW_{xxx}I_d(i,j,x) = 0 \text{ for } i=1$$

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

If the only durable consumption sectors being calculated are Housing and Other, then the "xxx" above will stand for R or D, respectively.

### E. Construction of Age Profiles

Once all current and durable consumption sector-specific inflow and outflow variables are constructed, total intra-household inflows and outflows are the sum of these sector-specific inflows and outflows, and the transfers of surplus to the head for saving:

$$TFWO(i,j) = \sum_{xxx} TFW_{xxx}O_c(i,j) + \sum_{xxx} TFW_{xxx}O_d(i,j) + TFWSO(i,j)$$

$$TFWI(i,j) = \sum_{xxx} TFW_{xxx}I_c(i,j) + \sum_{xxx} TFW_{xxx}I_d(i,j) + TFWSI(i,j)$$

Once the transfer variables have been constructed, a check on the calculations is that total inflows must equal total outflows for each sector, by household and in aggregate. After all checks have been performed, aggregate by age to construct the age profiles.

The file below shows a spreadsheet example of the transfer methodology described above for one household with current consumption sectors Education, Health and Other and durable consumption sectors Housing and Other Durable:

[IntraHHEXample](#)[\[info\]](#)

The next file contains STATA code to create the transfer variables and perform checks on unweighted micro-data.

[IntraHHCode](#)[\[info\]](#)

### FINALIZING ESTIMATES

This section discusses several specific issues in finalizing estimates:

- Smoothing
- Adjusting to control totals
- Calculating intra-household profiles from several surveys (the "two survey problem").

Smoothing should be accomplished in the same way that you smooth all other profile. (The preferred NTA method is to use a local regression, or "lowess," smoother. See [Smoothing](#).) Note however that transfers for education spending should be smoothed very little if at all, just as we use minimal or no smoothing on the education consumption profile to deal with the very choppy age-shape of education consumption.

For a discussion of control total adjustment (for inter- and intra-household transfers) and the two survey problem, see this document:

[Private\\_Transfer\\_Notes](#)<sup>[info]</sup>

[Inter-hh\\_Transfers\\_Mexico\\_pdf](#)<sup>[info]</sup>

[Inter-hh\\_Transfers\\_Mexico\\_xls](#)<sup>[info]</sup>

### Comments about the Private Transfers methodology:

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For an earlier version of intra-household private transfer methods see [Method Archives](#).

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