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POPULATION AGING AND INTERGENERATIONAL TRANSFERS:
INTRODUCING AGE INTO NATIONAL ACCOUNTS

Andrew Mason
Ronald Lee
An-Chi Tung
Mun-Sim Lai
Tim Miller

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ABSTRACT

In all societies intergenerational transfers are large and have an important influence on inequality and growth. The development of each generation of youth depends on the resources that it receives from productive members of society for health, education, and sustenance. The well-being of the elderly depends on familial support and a variety of social programs. The National Transfer Accounts (NTA) system provides a comprehensive approach to measuring all reallocations of income across age and time at the aggregate level. It encompasses reallocations achieved through capital accumulation and transfers, distinguishing those mediated by public institutions from those relying on private institutions. This paper introduces the methodology and presents preliminary results emphasizing economic support systems in Taiwan and the United States. As the two economies differ in their demographic configuration, their level of development, and their old-age support systems, comparing them will shed light on the economic implications of population aging under alternative institutional arrangements.

Andrew Mason
Department of Economics
University of Hawaii at Manoa,
and Population and Health Studies,
East-West Center
2424 Maile Way, Saunders 542,
Honolulu, HI 96822
amason@hawaii.edu

Mun-Sim Lai
Department of Applied Economics
California State University at Bakersfield
9001 Stockdale Hwy. Bakersfield, CA 93311
munl@hawaii.edu

Ronald Lee
Departments of Demography and Economics
University of California, Berkeley
2232 Piedmont Avenue
Berkeley, CA 94720
and NBER
rlee@demog.berkeley.edu

Tim Miller
Dpartment of Demography
University of California
Berkeley, CA
tmiller@demog.berkeley.edu

An-Chi Tung
Institue of Economics, Academia Sinica
Taipei, Taiwan
actung@econ.sinica.edu.tw

Introduction

In all societies intergenerational transfers are large and potentially have an important influence on inequality and economic growth. The development of each generation of youth depends on the resources that it receives from productive members of society for health, education, and sustenance. The well-being of the elderly depends on social programs that provide health care and income support and also on familial systems that dominate in many developing countries.

The importance of intergenerational transfers has not gone unnoticed by the research community. During the last two decades there have been important advances in measuring, modeling, and assessing the implications of intergenerational transfers at both the micro and the macro level. A comprehensive macro-level intergenerational transfer framework and accounting system, however, has not been developed. In particular, efforts to model and measure familial transfers at the aggregate level have lagged.

One purpose of this paper is to outline key concepts and methods being used to construct National Transfer Accounts (NTA), an accounting system for measuring intergenerational transfers at the aggregate level in a manner consistent with National Income and Product Accounts. NTA provide estimates of economic flows across age groups that arise primarily because children and the elderly consume more than they produce relying on reallocations from the working ages. These flows can be cross-sectional – a transfer from parents to children, for example. Or the flows can be longitudinal – accumulation of wealth during the working years and its dis-accumulation during retirement, for example. For want of a better term, we refer to these flows as “reallocations”. When complete, NTA accounts will distinguish three forms of these flows: as the accumulation of capital, as transfers, and as credit transactions. Here we consider only two: transfers and asset transactions, combining capital and credit transactions.

The accounts distinguish the institutions that mediate the transactions: governments, markets, and families. When complete, NTA accounts will provide estimates with sufficient historical depth to study the evolution of intergenerational transfer systems; the consequences of alternative approaches to age reallocations embodied in public policy with respect to pensions, health care, education and social institutions, e.g., the extended family; and the social, political, and economic implications of population aging.

A second purpose of this paper is to compare the lifecycles and support systems of Taiwan and the United States. The differences between these two countries are particularly interesting because of the relative importance of their familial support systems – strong in Taiwan and weak in the United States. In the US, private inter-household transfers are small and, because few elderly live with their adult children, intra-household transfers are small, as well. In Taiwan, private inter-household transfers are more important and, because many elderly live with their adult children, intra-household transfers are substantial. As a general proposition this is well known. The contribution here is to provide estimates of the economic flows that allow direct comparison of alternative forms of support. Our conclusion is that familial transfers from non-elderly adults to those 65 and older are large – exceeding US public transfers measured as a percentage of consumption by those 65 and older.

There are other features of the reallocation systems in the US and Taiwan that are explored. We show that income from assets is a very important source of income for the elderly in both countries, but particularly in the US. This may come as a surprise given the low saving rates in the US and the relatively high saving rates in Taiwan. Asset income does play an important direct role in old-age support in Taiwan, but also an indirect role by financing transfers from middle-aged adults to elderly parents.

The support systems for children are very similar in the US and Taiwan. Almost all of the financial resources available to those under the age of 20 consist of transfers. In the US about 60 percent and in Taiwan about 75 percent of all transfers to children are familial transfers. The remainder consists largely of public transfers of which support for public education is particularly important.

Background

Research on intergenerational transfers has laid a solid foundation for constructing the NTA system with the historical depth and cross-national perspective envisioned here. Following on the pioneering work of Samuelson (1958) and Willis (1988), a theoretical transfer framework has been developed by Lee and his collaborators (Lee 1994a; Lee 1994b; Bommier and Lee 2003). The Lee transfer framework has been applied to many different settings but often under a restrictive set of assumptions (steady-state equilibrium and golden-rule growth). At the same time, “generational accounting”, has been used to describe forward-looking public longitudinal data in various countries (Auerbach, Gokhale and Kotlikoff 1991; Auerbach, Kotlikoff and Leibfritz 1999).

Progress in modeling private and familial transfers at the aggregate level has been sporadic, but there have been important advances. The increased availability of surveys and micro-level studies has greatly improved our ability to measure familial transfers and to study why they occur (Lillard and Willis 1997; McGarry and Schoeni 1997; Altonji, Hayashi and Kotlikoff 2000; Frankenberg, Lillard and Willis 2002). Progress has been made in estimating and modeling bequests (Attanasio and Hoynes 2000; Poterba 2000; Poterba and Weisbenner 2001; Brown and Weisbenner 2002). There have been important advances in modeling the allocation of resources within households, a step critical to estimating intra-household inter-

generational transfers (Lazear and Michael 1988; Bourguignon and Chiappori 1992; Deaton 1997; Bourguignon 1999). Innovative surveys provide new opportunities for analyzing intergenerational transfers (Chu 2000; Hermalin 2002). Building on the available theoretical framework and the extensive research on familial transfers, and utilizing the extensive household survey data that are available in many countries, makes estimating familial intergenerational transfers and a complete set of National Transfer Accounts a feasible option.

Constructing estimates of familial transfers is important because they play such a key role around the world. Familial transfers are almost universally the primary source of resources for children. Familial transfers to the elderly can have a profound effect on intergenerational equity (Mason and Miller 2000). Outside the industrialized countries of the West, most elderly co-reside with their adult children. In Japan and South Korea, the extent of co-residence has declined very rapidly in the last few decades, but roughly half of the elderly still live with children. In other Asian countries the great majority of elderly live with their children, and there is a surprising degree of stability in these arrangements. The situation in Latin America is less thoroughly documented but data for six Latin American countries show that living in multi-generation households has been the norm there as well (Kinsella 1990).

Extended living arrangements are less important in the West, but in some European countries the elderly are not living exclusively by themselves nor with their spouse. In Greece and Spain roughly 40% of those 65 and older were living in households with three or more persons in the early 1990s. At the other extreme, only about 5% of the elderly of Sweden and Denmark lived in households with two or more persons. France is in an intermediate position, with 16% of the elderly living in households with two or more persons (Kinsella and Velkoff 2001). In the US, the great majority of elderly do not live with their children, but this has not

always been the case. The percentage 65 and older living with children in the US declined from 64% in 1880 to 49% in 1940, 30% in 1960, and 18% in 1980 (Ruggles 1994).

A more comprehensive approach to intergenerational transfers is critical to resolving many important issues. The system of intergenerational transfers bears directly on current research on the demographic dividend. Increases in the share of the working-age population, particularly in East Asia, have contributed to rapid growth in per capita income (Kelley and Schmidt 1995; Bloom and Williamson 1998; Kelley and Schmidt 2001; Mason 2001; Bloom, Canning and Sevilla 2002). The demographic dividend may dissipate, however, as the share of the elderly population rises and the share of the working-age population declines. If capital accumulation rather than familial or public transfer programs dominate the age reallocation systems for supporting the elderly, population aging may yield a second demographic dividend in the form of higher rates of saving and capital intensification of the economy (Mason 2005; Mason and Lee forthcoming). If aging is accompanied by a shift away from transfer systems, either public or private, the effects on capital accumulation may be especially pronounced (Lee, Mason and Miller 2003).

A second area of research concerns an important factual issue – whether or not there are substantial generational inequities and whether or not they are changing over time (Preston 1984; Becker and Murphy 1988). One approach models intergenerational transfers as the outcome of political processes in which the magnitude and direction of transfers reflect the political power of the elderly relative to other demographic groups (Preston 1984; Razin, Sadka and Swagel 2002). An alternative approach argues that intergenerational transfers are the outcome of cooperative private and social implicit contracts that are guided by altruism and efficiency concerns (Barro 1974; Becker and Tomes 1976; Becker and Murphy 1988).

A third area of research addresses the effects of intergenerational transfers on saving, economic growth, and equity (Feldstein 1974; Munnell 1974; Feldstein 1996; Gale 1998). These and similar studies inform efforts to evaluate existing transfer systems, to guide the development of new systems, and to anticipate the implications of alternative reform proposals. Social security reform, in particular, has been the subject of an enormous amount of research (Feldstein 1998; Feldstein and Samwick 2001; Krueger and Kubler 2002; Diamond 2006).

Operating in the background and providing the impetus for research and reform efforts is population aging. Low levels of fertility and continued improvements in life expectancy in many countries are leading to rapid population aging. The advanced industrialized countries – Japan, European countries, and the US – are further along in the aging process. Many less developed countries, however, will soon have much older populations. Three aspects of population aging in the developing world are noteworthy. First, many countries are likely to experience population aging at a relatively low level of development. Not only will they have relatively low levels of income, but they may also have relatively under-developed political and financial institutions that are playing a prominent role in aging industrial societies. Second, familial support systems are more important in many developing societies than in the West. Third, we have found that population aging causes a large increase in the demand for lifecycle wealth relative to GDP. Population aging interacts with the transfer systems either to generate a major increase in the proportional implicit debt and transfer burden on the working population, or to generate a large deepening of the capital stock. Third World countries are at a crucial juncture, and depending on their policy choices, population aging will have one or the other effect. Hence, understanding how familial support systems operate, how they interact with alternative transfer systems, and how they are affected by population aging, is critical.

National Transfer Accounts: An Overview²

The purpose of National Transfer Accounts is to measure at the aggregate level the reallocations across age of economic resources. These reallocations occur because at some ages, individuals consume more than they produce. At other ages individuals produce more than they consume. The reallocation system documents the means by which the young and the old, those with lifecycle deficits, draw on the surplus resources generated during the prime working ages.

Age profiles of consumption, production, and reallocations are viewed from an individual, rather than a household, perspective. In economies where formal sector employment dominates, measuring production (or earnings) for individuals is a relatively straight-forward task. In traditional settings, where employment is informal and production is often organized within a family enterprise, estimating production by age for individuals is difficult. In any setting, allocating consumption to individuals is challenging, because most expenditure data are collected for households rather than individuals. Moreover, some goods are jointly consumed or involve increasing returns to scale so that allocating consumption to individuals inevitably involves arbitrary rules.

From the household perspective, production and consumption are attributes of households, varying with age of the household head. Constructing production and consumption profiles is more straight-forward, but there are tradeoffs involved. The first is that the effects of co-resident children and elderly on household consumption and production profiles must be explicitly modeled or – as is often the case – neglected altogether. Indeed, a large share of all societal income redistribution occurs within households, and would therefore be invisible to accounting

² Detailed methodology and other information can be found at www.ntaccounts.org.

on a household basis. The second is the difficulty of translating changes in population age structure into changes in the age structure of household heads and household membership.

Age reallocations are substantial relative to the economy. Consider the situation in Taiwan as represented in Figure 1a, which shows estimates of aggregate consumption and labor income by age in 1998. Total net reallocations to those 23 and younger, the young age group for which consumption exceeded labor income, amounted to 35% of total labor income. Total net reallocations to those who were 57 or older, the old age group for which consumption exceeded labor income, amounted to 9% of total labor income. Thus, nearly half of all labor income was reallocated from the surplus ages to the dependent ages.³

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). In 1998, Taiwan's population was younger than the US population. Thirty-one percent were under the age of 20 and eight percent were 65 or older. Hence, the reallocations reflect that age structure – with more going to children and less going to seniors than in the US. As will be seen below, Taiwan also has per capita profiles that are distinctive as compared with the US. Taiwan's consumption profile is very flat and its labor income reaches a peak at a relatively young age as compared with the US.

<Figure 1 about here>

Reallocation systems, which bridge the gaps between consumption and labor income, vary along two important dimensions: the governing or mediating institution and the economic form of the reallocation (Lee 1994a; 1994b). 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

³ Calculation details are discussed below.

examples of public reallocation programs. Private sector reallocations are governed by voluntary contracts, social conventions, etc. that are mediated by households, families, charitable organizations, and other private institutions. Important examples of private reallocations are private saving and credit transactions, and familial support to children and the elderly (Table 1).

<Table 1 about here>

In this paper we distinguish two economic forms that reallocations can take: asset-based reallocations and transfers.

Asset-based reallocations: Assets include capital, property, and credit. From the perspective of the individual (or household), these forms are close substitutes as reallocation mechanisms. They can be accumulated and dis-accumulated. They yield income. They are used primarily to reallocate resources from the present to the future. From the perspective of the macro-economy, however, there are important differences between capital, property, and credit.

Capital-based Reallocations: Transactions that increase future consumption by foregoing current consumption. They lead to a change in the stock of reproducible capital, including inventories. Only reallocations from younger ages to older ages are possible. Individuals can accumulate capital when young and dispose of it when old.

Property-based Reallocations: Transactions that involve the trade of a non-reproducible asset, e.g., land. They yield no change in aggregate wealth. Property acquired in one period can yield rental income in future periods or can be sold in future periods to finance consumption at older ages. At any point in time, property-based reallocations net to zero

for all age groups combined. The purchase or rental of property produces an inflow for one individual that is matched by an outflow for another individual.

Credit-based Reallocations: Inter-temporal transactions based solely on a contractual obligation to trade economic resources in one period in return for compensation in one or more future periods. In a closed economy, credit-based reallocations do not lead to a change in aggregate wealth, because an increase in the wealth of one group is always balanced by the decline in wealth of another age group. The use of credit cards to finance consumption by individuals and the use of domestically held public debt, including the printing of money, to finance government programs are examples. Credit transactions can be used to reallocate resources in either direction.

Transfers: Reallocations from one group to another which involve no explicit *quid pro quo*.⁴ Transfers can flow in either direction – from older to younger (parents and taxpayers to children) or from younger to older (adult children and taxpayers to the elderly).

The core of the NTA system consists of two accounts: the flow account and the wealth account. The flow account measures inflows and outflows between age groups that occur during the accounting period in question. The wealth account measures the value of the stock associated with each flow. This paper emphasizes the flow account and the wealth account is not discussed further.

⁴ Of course important models of familial transfers emphasize implicit contracts, e.g., risk sharing (Kotlikoff and Spivak 1981) or the exchange of money for time (Cox 1987).

The National Transfer Flow Account

The *National Transfer Flow Account* measures inter-age flows for a prescribed accounting period, typically a calendar or fiscal year. The NT Flow Account is governed by an accounting identity, which must be satisfied for any individual, household, age group, or economy, stating that for any period inflows are balanced by outflows⁵:

$$Y_L + Y_K + Y_M + \tau_g^+ + \tau_f^+ = C + I_K + I_M + \tau_g^- + \tau_f^- \quad (1)$$

Inflows consist of labor income (Y_l), the returns to capital (Y_K) and land and credit (Y_M) and transfer inflows from the public sector (τ_g^+) and the private sector (τ_f^+). Outflows consist of consumption (C), investment in capital (I_K) or credit and land (I_M), and transfer outflows to the government (τ_g^-) and the private sector (τ_f^-). In this paper, we do not distinguish capital from land and credit. Designating asset income by Y_A , assets by $A=K+M$ and saving by $S = I_K + I_M$, substituting into equation (1), and rearranging terms provides the key elements of the NT Flow Account. The difference between consumption and production, termed the *lifecycle deficit*, must be matched by *age reallocations* consisting of *asset-based reallocations* and *net transfers*:

$$\underbrace{C - Y_l}_{\text{Lifecycle deficit}} = \underbrace{Y_A - S}_{\text{Asset-based reallocations}} + \underbrace{\tau_g^+ - \tau_g^-}_{\text{Net public transfers}} + \underbrace{\tau_f^+ - \tau_f^-}_{\text{Net private transfers}} \quad (2)$$

Age reallocations

⁵ Equations (1) and (2) are written under the assumption that the rate of return to capital and credit and land are identical, but this assumption can be relaxed.

Transfers are further sub-divided into *net public transfers* and *net private transfers*, consisting of bequests and *inter vivos* transfers.

The National Transfer Flow Account for Taiwan in 1998 is shown in summary form as Table 2 to provide a concrete point of reference for further discussion. The totals in the table are based on National Income and Product Account values and thereby insure consistency with NIPA. Briefly, consumption is equal to total final consumption expenditure.⁶ Private and public consumption correspond to private final consumption expenditure and government final consumption expenditure. Labor income has no exact NIPA counterpart, because the income of unincorporated firms includes returns to labor and to capital. We allocate two-thirds of this income to labor and one-third to capital, to obtain estimates of labor income and income on assets. Saving is defined as national saving net of depreciation. In a closed economy, net transfers and each of its components would sum to zero. In an open economy, international financial flows lead to net transfer totals that differ from zero. In Taiwan, for example, private transfers to abroad exceeded those received from abroad by NT\$31 billion. More detailed information about adjustments is available from the authors.

<Table 2 about here>

All aggregates are allocated across age using methods that are described briefly below. The values are cumulated into broad age groups to facilitate presentation and discussion, but the underlying values were estimated by single-year of age with an upper age group of 90+ as shown above in Figure 1.

⁶ Private final consumption is adjusted to exclude indirect taxes that are assumed to be paid indirectly by consumers. In other words, the value of final consumption is calculated used basic prices which exclude indirect taxes.

The upper panel of the NT Flow Account reports, the *lifecycle deficit*, the gaps between labor production and consumption. The lower panel reports the age reallocations and their components. As shown in the budget identity, equation (2), the lifecycle deficits and reallocations must be equal, in total and for each age group.

Lifecycle Deficit

The lifecycle deficit is large and positive for children and the elderly, close to zero for young adults and those aged 50-64, and large and negative only for adults aged 30-49. Taiwan's lifecycle deficit for children was NT\$1.7 trillion, 96% of their total consumption, and the lifecycle deficit for the elderly was NT\$0.4 trillion, 85% of their total consumption. Thirty to forty-nine-year-olds had a lifecycle surplus of \$NT1.5 trillion. That those aged 30-49 had a large lifecycle surplus and that those aged 50-64 did not runs contrary to the conventional wisdom about the economic lifecycle that 50-64 are ages conducive to high rates of saving. Note that the surplus was less than the total lifecycle deficit of the dependent age groups leading to an overall deficit of NT\$525 billion or 9% of total consumption. If the economy were on a golden-rule steady-state growth path, the total lifecycle deficit would have been zero. A positive total lifecycle deficit occurs when consumption exceeds total labor income.⁷

The lifecycle deficit is a residual – calculated as the difference between consumption and labor income. All consumption – both public and private – is included in the NT Flow Account and all is allocated to individuals. Private consumption includes the rental value of owner occupied housing. Public consumption includes goods and services that are consumed directly by individuals, e.g., health care and education. Public consumption also includes the value of all

⁷ Dynamically efficient economies will have zero or positive total lifecycle deficits.

other government consumption such as spending on public safety, foreign diplomacy, public infrastructure, etc.

All consumption is allocated to individuals based on their age using allocation rules that vary with the type of good being allocated and the availability of data. Consider, first, public programs. The consumption of public education is allocated to students using age- and education-level-specific enrollment rates assuming that the cost per student varies across education level (primary, secondary, tertiary) but does not vary by age within the educational level. Age profiles of publicly provided or financed health care in the US (Medicare, Medicaid, and other public programs) are based on age estimates of the U.S. National Health Accounts for 1999 (Keehan, Lazenby, Zezza et al. 2004). Control totals for these programs are taken from U.S. NIPA tables for 2000.^{8 9} In Taiwan, the shape of the age profile of consumption financed through National Health Insurance NHI is estimated using the variable "benefit income of NHI" reported in the FIES. The aggregate control total is reported in Department of Health, 1998. *Health Trends and Vital Statistics Taiwan*. In the US, the value of food stamps and public housing are assigned to members of households who report receipt of these benefits on the basis of equivalence scales. All other public consumption is allocated on a per capita basis.

Private consumption is estimated using household surveys which report the number and age of household members and total household consumption, but not the consumption of individual members. Allocation rules are used to distribute consumption to each household

⁸ <http://www.bea.doc.gov/bea/dn/nipaweb/index.asp>.

⁹ In Taiwan, public consumption of health is very small. A National Health Insurance program has been instituted that provides partial reimbursement of the cost of services of private health providers. This is classified as private health expenditure.

member. Per capita age profiles of consumption are then computed by averaging across the consumption estimates for all individuals of a given age in the survey.¹⁰

Age profiles of labor income are based on individual-level data on compensation and entrepreneurial income. We assume that two-thirds of entrepreneurial income is a return to labor and one-third is a return to capital.

Asset-based Reallocations

Two broad economic forms by which resources are reallocated across age groups are presented in the lower panel of the NT Flow Account: asset-based reallocations and net transfers. Asset-based reallocation is the response to lifecycle problems captured in the classic lifecycle saving model. Suppose individuals relied exclusively on lifecycle saving to reallocate resources from the working years to old-age. Sometime during the working years, individuals would begin to save. This would generate a net outflow in the NT Flow Account. As the individual accumulate assets, he or she would begin to receive asset income, an inflow. The net inflow from asset-based reallocations is measured by asset income less saving ($Y_A - S$). For a classic lifecycle saver, net asset-based reallocations would be negative during lifecycle surplus years. In his or her retirement years, the lifecycle saver generates inflows, positive net asset-based reallocations, sufficient to cover the lifecycle deficit. To do so the individual would rely on asset income (Y_A) and dis-saving ($S < 0$).¹¹

¹⁰ We have experimented with various methods for estimating the equivalence scales. We have found the Engels' and Rothbarth's methods to yield problematic results. At present, we first use regression methods to allocate expenditures on education and health care by age within households, and then allocate the remainder of household expenditures using equivalence scales. The equivalence scale is 0.4 for children under age 5, increasing linearly from 0.5 at age 5 to 1.0 at age 20, remaining constant for those older than 20. See Deaton (1997) for a detailed discussion of allocation rules.

¹¹ A pure lifecycle saver may not dis-save in the initial years of retirement.

The NTA framework does not assume that individuals behave as lifecycle consumers, and other forms of behavior are captured by asset-based reallocations. For example, if young individuals go into debt to finance their education, this would be reflected as a positive asset-based reallocation during school years – as individuals incurred debt beyond necessary debt repayment – and as a negative asset-based reallocation later in life as ex-students repaid their student loans. Alternatively, parents might accumulate assets in anticipation of the high costs of college. This would be reflected as negative asset-based reallocations for parents with pre-college age children and positive asset-based reallocations for parents with college-age children. If asset accumulation is driven by a bequest motive, we would see negative asset-based reallocations during working years and positive reallocations at the time of death.

Although the role of assets as a reallocation tool is most easily explained by describing the behavior of an individual or a cohort over time, the NT Flow Account reports the flows for a particular year for a cross-section of age groups. Asset-based reallocations at all ages may respond to short-term economic fluctuations. The asset income and dis-accumulation of capital at older ages is not tied in any direct way to the accumulation at younger ages as observed in the cross-section.

Assets are not assigned to individual members of the household. Rather, we assume that all assets are held by a single individual – the household head. Thus, results presented here are consistent with other analyses that report assets or saving by the age of the head. The results also suffer from the same difficulties of interpretation, particularly in societies where multi-generation extended households are common. The influence on our results of gender bias in the choice of head will depend on the age difference between husbands and wives. The mean age of

age-profiles tied to the age of the head will be greater if husbands are older than wives and more likely to be chosen as the head of the household.

In Taiwan, estimates of age profiles of net asset income are based on household-level data on entrepreneurial income, dividends, rent, and interest income and expense. For the US, estimates are based on age profiles of assets. In both countries, saving is estimated as a residual.

Transfers

The second form of reallocations is transfers. A transfer as measured by the NTA system is a transaction that transfers a good, service, or cash from an individual belonging to one age group to an individual belonging to another age group with no expectation of compensation or an explicit *quid pro quo* in any form. Transfers received are called inflows ($\tau^+(a)$), transfer payments are called outflows ($\tau^-(a)$), and net transfers are the difference between the two ($\tau(a) = \tau^+(a) - \tau^-(a)$). Public transfers ($\tau_g(a)$) are mediated by governments, which collect taxes from members of one set of age groups ($\tau_g^-(a)$) and make transfers to members of other age groups ($\tau_g^+(a)$). These two sets of age groups may well overlap. Private transfers are mediated by the family and non-profit institutions serving households (NPISHs). Net private transfers are given by $\tau_f(a) = \tau_f^+(a) - \tau_f^-(a)$.

Public transfer inflows can be in the form of cash or in-kind. Cash public transfer inflows are typically targeted and the associated inflows often vary substantially with age. Welfare programs provide cash benefits to children and/or mothers. Unemployment benefits target those in the working ages. Pension benefits target the elderly.

The age pattern of the outflows depends on the mechanisms by which the programs are financed – the age variation of the economic resource being taxed and the age variation in the

rate of taxation. The economic resource being taxed depends on the incidence of the tax. Our approach is to follow the methods employed in generational accounting (GA). With a few exceptions, GA assumes that the incidence of the tax falls on the entity that pays the tax: payroll taxes are paid by workers, sales tax by consumers, property tax by owners of property, and so forth (Auerbach and Kotlikoff 1999).

Private transfers largely consist of familial transfers. In virtually all societies familial transfers are the dominant reallocation system through which children are supported. As noted above, neither capital- nor property-based reallocations can be used to transfer resources in a downward direction, i.e., from the working ages to the childhood ages. Credit plays a limited role for legal and institutional reasons. A few instances can be identified where supporting children is a community or a public responsibility rather than a familial responsibility. Examples include some African societies, the *kibbutz* in Israel, and limited experiments with the collectivization of child care in some Communist economies. But even where familial systems are primarily responsible for supporting children, public transfers can be substantial. In many countries, the public sector plays an important role in education. Also, many low fertility countries have adopted or are considering policies that increase the importance of the public reallocation system vis-à-vis the familial system. These include family allowances, subsidization of child care, tax benefits, etc. Children are also the beneficiaries of a broad set of public goods and services that accrue to members of society at large.

Two forms of private transfers are distinguished in Table 2 above and the results discussed below. *Inter vivos* transfers consist of inter-household transfer (transfers between two existing households) and intra-household transfers (transfers between individuals who belong to the same household). The second form, *bequests*, consists of transfers associated with the

“death” of a household that may arise in several ways: the death of the household head, the merger of two pre-existing households, or the intergenerational transition in headship as captured by a change in the individual designated as the household head.

Inter-household Familial Transfers

Measuring inter-household transfers is a relatively straight-forward empirical task that relies directly on survey data from income and expenditure surveys or more specialized surveys of transfer behavior. Income and expenditure surveys typically report both gifts received and made so that outflows and inflows can be calculated directly from the survey.

The most serious technical difficulty that arises is that transfers received may be seriously under-reported in household surveys. Often reported transfers made exceed reported transfers received. Part of the difference can be explained by remittances to and from abroad, but it is generally believed that differences due to reporting error can be substantial. According to one recent estimate, US households reported giving \$64 billion in 1997. They reported receiving \$47 billion annually, on average, between 1993 and mid-1998 (Brown and Weisbenner 2002). In Taiwan the differences are smaller. In 1998 transfers received were NT\$1.9 billion while transfers given were NT\$ 2.1 billion.

In a closed economy, aggregate outflows and inflows will be equal and should be adjusted to insure aggregate consistency. In an open economy, outflows and inflows will no longer be equal. A further technical difficulty arises if inflows include capital transfers that arise from bequests. Transfers made by households that no longer exist at the time of survey are not captured as outflows but will be captured as inflows.

NT Flow Accounts are estimated based on the assumption that all inter-household transfers are between heads of households. With few exceptions, income and expenditure surveys do not

provide information about transfers to and from individuals within households. One exception is the Taiwan FIES that reports inter-household transfer inflows to individuals and to the collective household. In 1998, 65.6% of the inflows were reported as to the household, 20.5% to the head, 1.0% to the spouse of the head, and only 1.9% to other household members.¹²

Intra-household Familial Transfers

Household members who consume more than their "disposable income" receive intra-household transfers from those who consume 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. In some households, the disposable income of all members combined exceeds the total consumption of all members combined. The surplus is transferred to the household head and saved. In other households, total disposable income is less than total consumption, and they support some part of their consumption using property income or, if necessary, by dis-saving. This portion of the deficit is financed by additional intra-household transfers from the household head to household members.

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, thus, 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 durable consumption.

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.

¹² Calculated by authors.

Moreover, we assume that the household specific tax rate for any sector (education, health, other non-durable consumption) is identical for each household member.

Intra-household transfers are computed at the micro-level and aggregated to construct age profiles. To calculate the intra-household transfers requires estimates for each individual of consumption, labor income, net public cash transfers, and inter-household transfers.

Bequests

Bequests capture all capital transfers that occur because of headship transitions. If a household head dies, if two independent households merge, or if the headship designation within an existing household shifts from one member to another, a capital transfer is generated. The estimates of bequests presented in Table 2 are very preliminary and intended only to suggest magnitudes.

The estimates were obtained in the following way. First, the rate of return to assets was assumed to be independent of age. Thus, wealth by age has the same age distribution as asset income by age. Second, the survival rate of heads is assumed to be independent of age. If wealthy heads have a higher survival rate, a likely possibility, the mean age of bequests would be greater than those reported in Table 2. Preliminary analysis suggests that the covariance between wealth and survival in Taiwan is relatively small, however. Third, we assumed that all capital transfers were to direct descendants, assumed to be 30 years younger than the household head. Thirty years is the mean generation length in Taiwan. If there is a parity bias in bequests, i.e., if older children receive a larger share of bequests, the inflow would be to older individuals on average than assumed here. Given the low fertility and decline in parity bias in Taiwan this is not likely to have a substantial effect. The use of a single age 30, rather than a distribution, also has an effect on the distribution of bequest inflows. In the US, unlike Taiwan, if a decedent was married, the widower/widow is assumed to inherit the estate. Otherwise, the estate is inherited

by the children of the decedent whose ages are estimated using the average age shape of US fertility over the last 40 years. Future efforts will improve these estimates and they are not emphasized here.

Estimation and Data Sources

NT Flow Accounts are estimated relying on a variety of sources of information. National Income and Product Accounts are used to construct aggregate controls on public and private consumption, labor income (compensation of employees plus a portion of household entrepreneurial income), saving, asset income, public and private transfers, and its components.

Aggregates are allocated across age groups relying on a variety of data sources with extensive use made of administrative records and nationally representative income and expenditure surveys. For Taiwan, we make extensive use of the 1998 Family Income and Expenditure Survey of Taiwan (DGBAS various). For the US, we make extensive use of the Current Population Survey (1998,1999, and 2000), the Consumer Expenditure Survey (1998,1999,2000), the Survey of Consumer Finances (1998 and 2001), and the US National Health Accounts (1999). More information about data sources and methods is available on www.ntaccounts.org.

Preliminary Results

The results presented in the remainder of the paper are snapshots – National Transfer Accounts for a single year in Taiwan (1998) and the United States (2000). The full value of the accounts will be realized only when we have constructed estimates for many years. That work is underway, but the estimates will not be available for some time. In the absence of these more extensive data, we cannot track cohorts over time for example. The inability to do so limits the

extent to which we can explain the cross-sectional patterns that we observe. In particular, we often can only speculate about the extent to which the results reflect distinctive features of the years for which the accounts were constructed, possibly substantial cohort effects, or the effects of age. Before discussing the results, it is worthwhile to point out some of the key features of Taiwan and the US that may bear on the results.

First, the fiscal crisis struck East Asia beginning in 1997 and Taiwan's economic growth was atypically slow in 1998. The crisis in Taiwan was much less severe than in many other East Asian countries, however. The year 2000 was an interesting year in the US. The stock market peaked in 2000 and the economy began to slow after an extended period of strong economic growth.

Second, the current demographic situation in Taiwan and the US are similar in important respects. The total fertility rate is much lower in Taiwan than in the US. Life expectancy is about 1.5-2 years higher in the US than Taiwan. Taiwan's population is younger with 8.6 percent of its population aged 65 or older in 2000 as compared with 12.4 percent in the US. Both countries experienced very substantial demographic change during the post-World War II era. The TFR was much higher and life expectancy at birth was much lower in Taiwan than in the US in the 1950s, but changed very rapidly. The US experienced its baby boom from 1946 to 1964. These experiences may bear in important ways on the behavior of those who are now in their 60s and 70s. Migration patterns are also different between the two countries. The US, of course, has had relatively high rates of net immigration during recent decades. Taiwan has not, but it did experience a huge influx of young adults – heavily male – from the Chinese mainland in 1949/50.

Third, the economies of Taiwan and the US are very different. Taiwan is a middle income country with a per capita GDP of a little less than \$12,600 in 2001. In the US, per capita GDP was \$35,700 in 2001. But in 1960, real GNP per capita was only \$1000 in Taiwan (in 2001 prices) as compared with over \$14,000 in the US. Between 1960 and 2001, Taiwan's real rate of growth of per capita GNP exceeded 6 percent per annum! This implies extraordinary differences between the lifetime earnings of successive generations. Given a mean generation length of 30 years and an annual growth rate of 6 percent, per capita income increases by six-fold each generation. In contrast, real per capita GNP in the US grew at an annual rate of 2.2 percent between 1960 and 2001, yielding roughly a doubling of per capita income growth per generation.

The Lifecycle Deficit

The individual lifecycles in Taiwan and the United States are broadly similar, but with some important differences (Figure 2). In both settings, children and the elderly consume substantially more than they produce. In Taiwan, young adults begin to produce as much as they consume at age 24; in the US at age 26. In Taiwan, adults no longer produce as much as they consume at age 57; in the US at age 59. The span of years during which there is a lifecycle surplus is surprisingly short in both countries – 33 years both in Taiwan and in the US.

The shape of the production (labor income) age profiles for Taiwan and the US are strikingly similar until adults reach their early 40s. To facilitate comparison of the US and Taiwan the profiles in Figure 2 have been scaled by dividing by the simple average of per capita production from ages 30-49. Both the level and slope of the age-profiles are sensitive to the particular scaling factor chosen. However, the percentage change in labor income associated with an additional year of age is unaffected by scaling. In the late teens and early 20s, labor income grows somewhat faster in Taiwan, while between the early 20s and early 40s, labor

income grows somewhat faster in the US. Between the mid-40s and late 50s, however, the income profiles diverge by as much as 5 percent per single year of age. The gap between the US and Taiwan persists into the older ages. The differences in per capita labor income reflect differences in labor force participation – a particularly rapid drop in participation rates with age in Taiwan – due entirely to differences in female participation rates.

<Figure 2 about here>

There are important similarities in the consumption patterns at young ages in Taiwan and the US. Consumption by children *relative to consumption by adults in their thirties and forties* is similar in Taiwan and the US. In both countries consumption by young children is substantially less than consumption by older children and prime age adults. In both settings, consumption by children increases in a large and discrete fashion as children enter school. The subsequent decline is associated with the decline in spending on education as children depart high school in the US and college in Taiwan.

The differences in the consumption profiles for those in their 30s and older are quite striking, however. In the US the consumption profile rises very steadily with age. In Taiwan the consumption profile is relatively flat, but declines gradually with age. The simple average of per capita consumption by those 65-90+ was 134 percent in the US and 96% in Taiwan of per capita consumption of those 20-64. A substantial part of the difference can be attributed to the consumption of health (Figure 3). If we consider just non-health consumption, the elderly and non-elderly adults in the US had virtually identical consumption while Taiwan elderly had non-health consumption equal to about 85% of the non-health consumption of adults between the ages of 20 and 64. Thus, even controlling for health consumption, US elderly were consuming at a much high rate relative to non-elderly adults than were elderly in Taiwan.

The differences in consumption are most pronounced for the elderly, but they are not confined to the elderly. In Taiwan, the average consumption by those 50-64 was 95% of the average consumption of those 20-49 while in the US the figure was 124%.

Why health consumption increased so much more steeply with age in the US than in Taiwan and why non-health consumption declined with age in Taiwan are interesting questions about which we can only speculate at this point. One possibility is that the lower consumption among older ages in Taiwan is a response to their lower relative current labor income. Another possibility is that the lower consumption of the elderly is a response to their relatively low lifetime labor income. Perhaps institutional differences are playing a role with US consumption patterns reflecting greater reliance on public transfer programs and Taiwan's greater reliance on familial transfer programs. Familial transfer programs internalize costs of "excess consumption" to the family.

<Figure 3 about here>

The lifecycle deficits (Figure 4) are closer than their constituent elements – consumption and labor income. Taiwan's surplus is greater for young working age adults, those under the age of 50; the surplus values are similar adults in their 50s and early 60s. The most striking difference between the two series is the substantially larger lifecycle deficit for US elderly. Given the age distribution of the population, the lifecycle reallocation system of the US shifts a larger share of resources to older ages than does the Taiwan reallocation system. That the US population is older than is the Taiwan population only serves to reinforce this feature of the US reallocation system.

<Figure 4 about here>

The Reallocation System

The broad features of the reallocation system are presented in Figure 5 for Taiwan in 1998 and in Figure 6 for the US in 2000. Panel A reports the aggregate flows to and from each age group. Panel B reports the per capita flows. Four economic forms used to reallocate resources are distinguished: asset-based reallocations, public transfers, private transfers, and bequests. Negative values represent outflows and positive values represent inflows. The values are “stacked” in the figures. For example, teenagers in Taiwan received net transfers of about \$NT 100 billion of which about one-fourth was public and three-fourths was private. At many ages there are simultaneously inflows from one system and outflows from another system. In both the US and Taiwan, asset-based reallocations are producing inflows to most working ages while public and private transfers are producing outflows at the same ages. The outflows less the inflows equal the lifecycle deficits for Taiwan and the US.

The reallocation systems that support children are similar in Taiwan and the US. In both, transfers dominate the reallocation system for children, with total transfers nearly equal to total reallocations. Familial transfers are particularly important. Private, intra-household transfers accounted for 74 percent of all transfers in Taiwan and 57 percent in the US.¹³ The importance of familial transfers should not come as any great surprise. We know that asset-based reallocations are used infrequently to support the consumption of children. Of asset-based reallocations, only credit can be used to support consumption by children. Creditors have limited recourse if children default on their debt, limiting the extent to which children can borrow. Thus, transfers dominate the child reallocation system in both Taiwan and the US – and no doubt elsewhere.

¹³ Dependent children do not receive inter-household transfers in the accounting system by assumption.

<Figure 5 about here>

<Figure 6 about here>

Public transfers to children are also quite substantial. In Taiwan, 24 percent of all transfers were public transfers as compared with 38 percent in the US. As can be seen in Figure 3 above a significant portion of these transfers is public education spending. Of roughly equal importance is children's *pro rata* share of pure public goods and other goods that cannot be assigned to specific individuals.

In Taiwan and the US, the old age reallocation systems are very different than the child reallocation systems. The elderly rely both on asset-based reallocations and transfers to generate inflows. The elderly can in principle generate asset-based reallocation inflows in two ways: first, by earning asset income on their accumulated wealth and, second, by dis-saving or liquidating their assets. There are many ways in which this can be accomplished. The elderly can sell off financial assets or a family business or farm, take out a reverse mortgage on a home, or sell their home and rent or buy a less expensive residence.

For US elderly asset reallocations are very important constituting 65.3 percent of lifecycle reallocations. Of this total, 65.1% of total reallocations was net asset income and 0.2% was dis-saving. At first glance this seems to provide strong support for the lifecycle saving hypothesis and runs contrary to previous empirical research that US elderly save. However, the saving reported here includes the dis-saving that occurs because the death of households generates downward transfers of assets. For the cohort, this is dis-saving but is not undertaken for lifecycle purposes. If we confine our attention to surviving households, about half of reallocations were asset reallocations and half were transfers. Income on assets amounted to 65.1% of reallocations as before, but 16.9% of reallocations were saved and the remainder

(48.2%) was devoted to the lifecycle deficit. Thus, our estimates imply that the elderly did save, but they also relied heavily on the income generated by assets accumulated during their working years. This provides support in a different form for the lifecycle hypothesis.

For Taiwan's elderly, asset-based reallocations were also important but less so than in the US. Asset-based reallocations were 40.9% of total reallocations; asset income amounted to 54.2% of total reallocations, but 13.3% of that was saved. Given that bequests were equal to 19.2% of total reallocations, total saving by survivors was 32.5% of total reallocations. Considering only surviving households, asset-based reallocations were 21.7% of total reallocations (54.2% in asset income less 32.5% that was saved). The surviving elderly in Taiwan had less asset income and saved more than their US counterparts. Asset reallocations were thus less important to surviving elderly households in Taiwan than in the US.

Transfers were important components of the reallocations systems for the elderly in both countries but, again, a clear picture requires careful attention to the role of bequests. In the US, public transfers are particularly important. If we ignore bequests, public transfers constituted 37.0% and private transfers 7.3% of total reallocations to the elderly. Transfers are almost as important as asset-based reallocations and public transfers dominate. Private transfers to the elderly are small in the US. Note, however, that private transfers are greater than one would think based solely on inter-household transfers even in the US. Once bequests are taken into account, however, we see that the direction of the private transfer is from the old to the young rather than the reverse. Bequests were more than twice private transfers to the elderly in 2000.

In Taiwan, public transfers were less important than in the US but private transfers far more than compensated for the lower level of public transfers. Public transfers were 31.0% of total reallocations for the elderly; private *inter vivos* transfers were 47.6% of lifecycle

reallocations. Combined transfers excluding bequests were over three-fourths of lifecycle reallocations with private transfers playing a particularly important role. Unlike the US, private transfers are still in an upward direction – from adult children to elderly parents – even after taking bequests into consideration.

In important respects the reallocations for those with lifecycle surpluses are just the counterpart for the reallocations for children and elderly as just described. This is true by definition for transfers because inflows and outflows must match, ignoring the relatively modest amounts of international flows. The large public transfer inflows to US elderly must be matched by large public transfer outflows from those in the working ages. Likewise, the large private transfer inflows to Taiwan elderly must be matched by large private transfer outflows from those in the working ages. Exactly which working ages experience the public sector outflows depends on the tax systems, their incidence, and the age distribution of the economic resources being taxed. Exactly which working ages experience the private sector outflows depends to a great extent on the co-residence patterns that in turn govern intra-household transfers.

In Taiwan, the burden of financing public transfers falls a little more heavily on those aged 30-49, for whom net public transfers are -13.5% of labor income, than on those aged 50-64, for whom net public transfers are -11.4% of labor income. In the US, the opposite is true: the burden falls slightly more heavily on those aged 50-64, for whom net public transfers are -22.7% of labor income, than on those 30-49, for whom net public transfers are -21.6% of labor income. Private transfers in Taiwan, however, are a much heavier burden for those aged 30-49. Their net private transfers are -40.7% of their labor income. *Inter vivos* transfers are -43.3% of labor income. Net private transfers for those aged 50-64 are -31.4% of their labor income and *inter vivos* transfers are only -19.2% of labor income. It is tempting to argue that those below 50

are heavily burdened because they are paying for the high consumption of children. The net transfers from those 30-49 are more or less equal in absolute value to the net transfers to those under age 30. The generation length in Taiwan is about 30 years, however, and it is likely that children are being supported by those over age 50 and the elderly are being supported by those under age 50. In the US net private transfers are smaller than in Taiwan at -24.8% of labor income for those 30-49 and -17.0% for those age 50-64.

Unlike transfers, asset-based reallocations need not balance.¹⁴ In both Taiwan and the US, total asset income substantially exceeded total saving. As can be seen in Figures 5 and 6 asset-based reallocations are positive at most adult ages, not just at old age. In Taiwan, we see some negative asset-based reallocations at young adult ages, but these are small. We see even less negative asset-based reallocations for the US.

This is a puzzling pattern and not what we would expect to see if workers are accumulating pension assets. Suppose workers contributed a fixed percentage of their income to a pension fund during their working years and any interest generated by the fund was allowed to accumulate within the fund – a normal practice. Saving by the workers would exceed interest income by the portion of labor income that was contributed to the fund each year. Asset-based reallocations would be negative during the working years and would turn positive only after retirement. Even under very general conditions, as cohorts begin to accumulate wealth saving must exceed asset income. Judging from the substantial asset income of older cohorts, it is clear that they enter old-age with a substantial amount of wealth. The key question is “Why is saving so much less than asset income among working adults?”

¹⁴ In golden-rule steady-state growth all asset income is saved and total net asset-based reallocations are equal to zero.

First, these are cross-sectional data and not longitudinal data. There may be particular features of the years in question – 1998 in Taiwan and 2000 in the US – that led to high consumption and low saving during the working ages. The financial crisis hit East Asia beginning in 1997. Taiwan was influenced less than many other East Asian countries, but economic growth did slow in 1998. The US experienced an enormous run-up in the stock market that peaked in 2000. Housing prices also increased very substantially in the US. Perhaps working-age Americans responded to the significant increases in their real wealth by increasing their consumption and reducing their saving.¹⁵

Second, the cross-sectional patterns may reflect longer run trends. In Taiwan, saving rates declined substantially between the late 1980s and the late 1990s. The US has experienced a long-run secular decline in saving rates over the last three to four decades. It may be that in both countries asset-based reallocations are becoming less important than they were in the past. Hence, we observe relatively little saving at young, but relatively large asset-based reallocation inflows at older ages.

A third point to consider is that the asset-based age reallocations are serving a lifecycle purpose other than the accumulation of pension wealth as envisioned in the standard lifecycle saving model. We think it is plausibly the case in Taiwan where asset-based reallocation inflows are substantial for those in their 40s and early 50s. At these ages people in Taiwan are doubly burdened by dependent children and dependent elderly. This is reflected in the very substantial *inter vivos* transfer outflows at these ages. In a sense, lifecycle saving is indirectly financing the consumption of the elderly by financing transfers from middle-aged adults to their elderly parents.

¹⁵ Net saving rates increased during the 1990s in the US, but whether this is true at all ages is unknown.

A final point is that the asset-based reallocation pattern will vary depending on the importance of bequests and behavior regarding bequests.

Sources of Support

Sources of income are a standard and useful descriptive measure in reports on the economics of aging. The NTA system yields a more complete measure of the sources of support for the dependent populations by including familial, intra-household transfers and dis-saving. In Figures 7 and 8 we compare the sources of support, i.e., the methods by which consumption were financed, in Taiwan and the US.

The methods by which the consumption of dependent children, defined as those under the age of 20, are financed are very similar in Taiwan and the US. In both countries earnings by children are relatively unimportant. Virtually all consumption is financed by transfers. Private transfers dominate totaling 57% of consumption in the US and 72% of consumption in Taiwan. The remainder consists of public transfers.

The finance of consumption by the elderly is very different in Taiwan and the US. Work plays a similar role in both – contributing about 15% of consumption in both the US and Taiwan. Asset-based reallocations and public transfers are more important in the US. Private, familial transfers are more important in Taiwan. The greater importance of public transfers in the US and private transfers in Taiwan are consistent with what relatively casual observers might expect. The greater importance of asset-based reallocations in the US may come as a surprise – perhaps to many. Saving rates are not as high in Taiwan as in other East Asian countries. Moreover, the current consumption by elderly in Taiwan is very high relative to lifetime earnings. In an economy characterized by such rapid economic growth, the relatively flat consumption profile

shown in Figure 1 would almost certainly be possible only if the reallocation system relied more on transfers and less on assets.

<Figure 7 about here>

<Figure 8 about here>

Conclusions

The reallocation of resources across age groups is an important feature of any economy yet it goes largely unmeasured at the aggregate level. The objective of the research described here is to rectify that situation. By doing so we should increase our understanding of generational differences in the command over resources, the institutional mechanisms by which resources are redistributed across generations, and how population aging is likely to influence economic performance.

The research reported here is in an early stage, however. The estimates are preliminary and many of the methodologies are still being refined. Moreover, there are a number of difficult issues that cannot be addressed in an entirely satisfactory way given the data and analytic techniques that are currently available. None the less, we believe that the development of the National Transfer Account system will prove useful in the same way that National Income and Product Accounts are useful despite their flaws. The value will be enhanced in particular as estimates for additional years allow us to follow cohorts over their lifecycles.

The results reported here provide information about support systems that has not been previously available. We provide detailed information about the asset accumulation process and how it relates to variation in lifecycle needs. In both countries asset income is important to those who are currently retired, but dis-saving is not. In Taiwan asset income indirectly supports the

elderly by financing transfers from middle-aged adults to elderly parents. Somewhat surprisingly the accumulation of assets by working age adults is modest in both countries. Why this is so and whether it is a persistent or transitory feature is a question that cannot be answered with a single year of data.

One of the most important objectives of this research is to quantify both public and private transfers in a way that allows comparison and analysis. We find that private, familial transfers from adult children to their elderly parents are very important in Taiwan – similar in magnitude to public support to the elderly in the US. Familial transfers are almost entirely intra-household transfers.

Public transfers are also important in Taiwan and, although not documented here, known to be growing. Further analysis will hopefully shed light on whether or not the growth of public transfers has served to crowd out private transfers or whether the elderly have gained in terms of consumption by being able to rely on a mix of assets, public programs, and familial transfers.

One of the most striking differences between Taiwan and the US is the age pattern of consumption. In Taiwan, consumption appears to vary little by age. In the US, however, consumption by the elderly is very high. A large portion of the extra consumption – but by no means all – is due to high consumption of health care goods and services. This will clearly have important implications for how population aging will influence the economies of Taiwan and the United States.

References

- Altonji, J. G., F. Hayashi and L. Kotlikoff (2000). The Effects of Income and Wealth on Time and Money Transfers between Parents and Children. Sharing the Wealth: Demographic Change and Economic Transfers between Generations. A. Mason and G. Tapinos. Oxford, Oxford University Press: 306-357.
- Attanasio, O. P. and H. W. Hoynes (2000). "Differential Mortality and Wealth Accumulation." Journal of Human Resources **35**: 1-29.
- Auerbach, A. J., J. Gokhale and L. J. Kotlikoff (1991). Generational Accounts: A Meaningful Alternative to Deficit Accounting. Tax Policy and the Economy. D. Bradford. Cambridge, MA., MIT Press for the National Bureau of Economic Research: 55-110.
- Auerbach, A. J. and L. J. Kotlikoff (1999). The Methodology of Generational Accounting. Generational Accounting Around the World. A. J. Auerbach, L. J. Kotlikoff and W. Leibfritz. Chicago, University of Chicago Press: 31-41.
- Auerbach, A. J., L. J. Kotlikoff and W. Leibfritz, Eds. (1999). Generational Accounting Around the World. Chicago, University of Chicago Press.
- Barro, R. J. (1974). "Are Government Bonds Net Worth?" Journal of Political Economy **82**(6): 1095-117.
- Becker, G. S. and K. M. Murphy (1988). "The Family and the State." Journal of Law & Economics **XXXI**(April): 1-18.
- Becker, G. S. and N. Tomes (1976). "Child Endowments and the Quantity and Quality of Children." Journal of Political Economy **84**(4 pt. 2): S143-62.
- Bloom, D. E., D. Canning and J. Sevilla (2002). The Demographic Dividend: A New Perspective on the Economic Consequences of Population Change. Santa Monica, CA, RAND.

- Bloom, D. E. and J. G. Williamson (1998). "Demographic Transitions and Economic Miracles in Emerging Asia." World Bank Economic Review **12**(3): 419-56.
- Bommier, A. and R. D. Lee (2003). "Overlapping generations models with realistic demography." Journal of Population Economics **16**: 135-160.
- Bourguignon, F. (1999). "The cost of children: May the collective approach to household behavior help?" Journal of Population Economics **12**: 503-521.
- Bourguignon, F. and P.-A. Chiappori (1992). "Collective Models of Household Behavior: An Introduction." European Economic Review **36**: 355-64.
- Brown, J. R. and S. J. Weisbenner (2002). "Is a bird in hand worth more than a bird in the bush? Intergenerational transfers and savings behavior." NBER Working Papers **8753**.
- Chu, C. Y. C. (2000). Panel Study of Family Dynamics. Taipei, Taiwan, Academia Sinica.
- Cox, D. (1987). "Motives for Private Income Transfers." Journal of Political Economy **95**: 508-46.
- Deaton, A. (1997). The Analysis of Household Surveys: A Microeconometric Approach to Development Policy. Baltimore and London, World Bank.
- Diamond, P. (2006). "Pensions for an Aging Society." NBER Working Paper **W11875**.
- Feldstein, M. (1974). "Social Security, Induced Retirement, and Aggregate Capital Accumulation." Journal of Political Economy **82**(5): 905-26.
- Feldstein, M. (1996). "The Missing Piece in Policy Analysis: Social Security Reform." American Economic Review **86**(2): 1-14.
- Feldstein, M. and A. Samwick (2001). "Potential Paths of Social Security Reform." NBER Working Papers **8592**.

- Feldstein, M. e. (1998). Privatizing social security. Chicago and London, University of Chicago Press.
- Frankenberg, E., L. A. Lillard and R. J. Willis (2002). "Patterns of Intergenerational Transfers in Southeast Asia." Journal of Marriage and the Family **64**(August): 627-41.
- Gale, W. G. (1998). "The Effects of Pensions on Household Wealth: A Reevaluation of Theory and Evidence." Journal of Political Economy **106**(4): 706-23.
- Hermalin, A. I., Ed. (2002). The Well-Being of the Elderly in Asia: A Four-Country Comparative Study. Ann Arbor, MI, University of Michigan Press.
- Keehan, S. P., H. C. Lazenby, M. A. Zezza and A. C. Catlin (2004). "Age Estimates in the National Health Accounts." Health Care Financing Review **1**(1): 1-16.
- Kelley, A. C. and R. M. Schmidt (1995). "Aggregate Population and Economic Growth Correlations: The Role of the Components of Demographic Change." Demography **32**(4): 543-55.
- Kelley, A. C. and R. M. Schmidt (2001). Economic and Demographic Change: A Synthesis of Models, Findings, and Perspectives. Population Matters: Demographic Change, Economic Growth, and Poverty in the Developing World. N. Birdsall, A. C. Kelley and S. W. Sinding. Oxford, Oxford University Press: 67-105.
- Kinsella, K. (1990). Living Arrangements of the Elderly and Social Policy: A Cross-national Perspective. US Census Bureau/CIR Staff Paper No. 52. Washington, D.C.
- Kinsella, K. and V. A. Velkoff (2001). An Aging World: 2001, International Population Reports. Washington, D.C., US Census Bureau.
- Kotlikoff, L. J. and A. Spivak (1981). "The Family as an Incomplete Annuities Market." Journal of Political Economy **89**(2): 372-91.

- Krueger, D. and F. Kubler (2002). "Pareto Improving Social Security Reform When Financial Markets are Incomplete!?" NBER Working Papers **9410**.
- Lazear, E. P. and R. T. Michael (1988). Allocation of Income within the Household. Chicago and London, University of Chicago Press.
- Lee, R., A. Mason and T. Miller (2003). "From Transfers to Individual Responsibility: Implications for Savings and Capital Accumulation in Taiwan and the United States." Scandinavian Journal of Economics **105**(3): 339-357.
- Lee, R. D. (1994a). The Formal Demography of Population Aging, Transfers, and the Economic Life Cycle. Demography of Aging. L. G. Martin and S. H. Preston. Washington, D.C., National Academy Press: 8-49.
- Lee, R. D. (1994b). Population, Age Structure, Intergenerational Transfers, and Wealth: A New Approach, with Applications to the US. The Family and Intergenerational Relations, Journal of Human Resources. P. Gertler. **XXIX**: 1027-1063.
- Lillard, L. A. and R. J. Willis (1997). "Motives for Intergenerational Transfers: Evidence from Malaysia." Demography **34**(1): 115-34.
- Mason, A. (2001). Population Change and Economic Development in East Asia: Challenges Met, Opportunities Seized. Stanford, Stanford University Press.
- Mason, A. (2005). Demographic Transition and Demographic Dividends in Developed and Developing Countries. United Nations Expert Group Meeting on Social and Economic Implications of Changing Population Age Structures, Mexico City.
- Mason, A. and R. Lee (forthcoming). "Reform and Support Systems for the Elderly in Developing Countries: Capturing the Second Demographic Dividend." GENUS.

- Mason, A. and T. Miller (2000). Dynasties, Intergenerational Transfers, and Life-Cycle Income: A Case Study of Taiwan. Sharing the Wealth: Demographic Change and Economic Transfers between Generations. A. Mason and G. Tapinos. Oxford, Oxford University Press: 57-84.
- McGarry, K. and R. Schoeni (1997). "Transfer Behavior Within the Family: Results from the Asset and Health Dynamics (AHEAD) Study." Journals of Gerontology Series B: Psychological and Social Sciences **52B**(special issue): 82-92.
- Munnell, A. H. (1974). The Effect of Social Security on Personal Savings. Cambridge, MA, Ballinger.
- Poterba, J. (2000). The Estate Tax and After-Tax Investment Returns. Does Atlas Shrug? The Economic Consequences of Taxing the Rich. J. Slemrod. Cambridge, Harvard University Press: 333-353.
- Poterba, J. and S. J. Weisbenner (2001). The Distributional Burden of Taxing Estates and Unrealized Capital Gains at the Time of Death. Rethinking Estate and Gift Taxation. W. G. Gale and J. Slemrod. Washington, D.C., Brookings Institution.
- Preston, S. H. (1984). "Children and the Elderly: Divergent Paths for America's Dependents." Demography **21**(4): 435-457.
- Razin, A., E. Sadka and P. Swagel (2002). "The Aging Population and the Size of the Welfare State." Journal of Political Economy **110**(4): 900-918.
- Ruggles, S. (1994). "The Transformation of American Family Structure." American Historical Review **99**(1): 103-28.
- Samuelson, P. (1958). "An Exact Consumption Loan Model of Interest with or without the Social Contrivance of Money." Journal of Political Economy **66**: 467-82.

Willis, R. J. (1988). Life cycles, institutions and population growth: A theory of the equilibrium interest rate in an overlapping-generations model. Economics of Changing Age Distributions in Developed Countries. R. D. Lee, W. B. Arthur and G. Rodgers. Oxford, Oxford University Press. **106-38**.

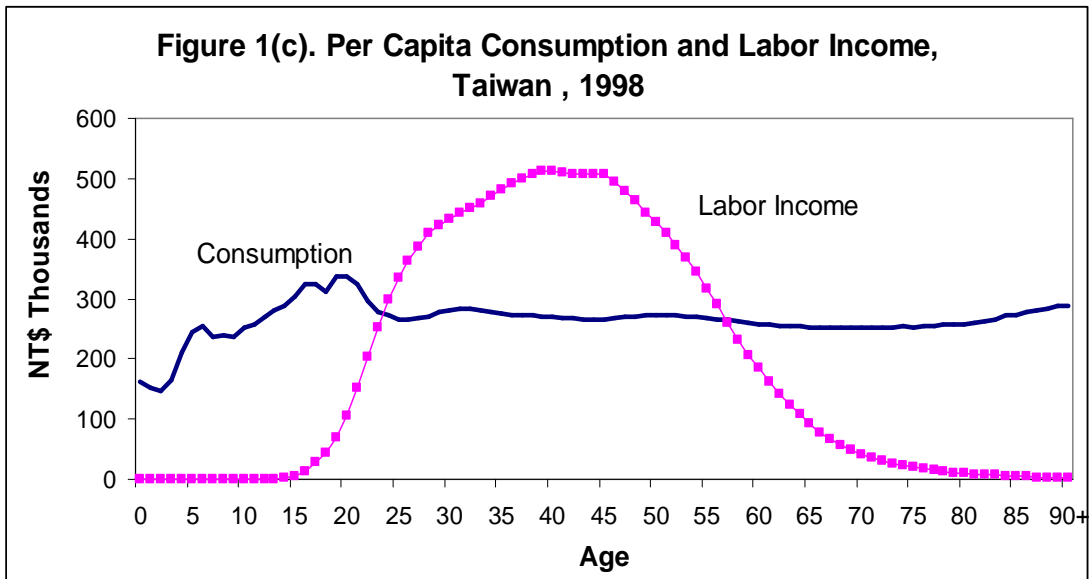
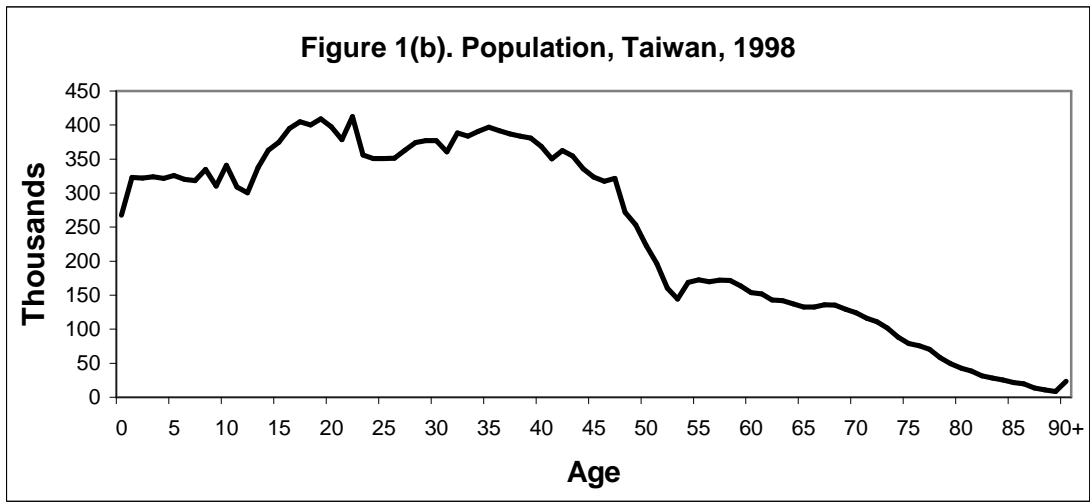
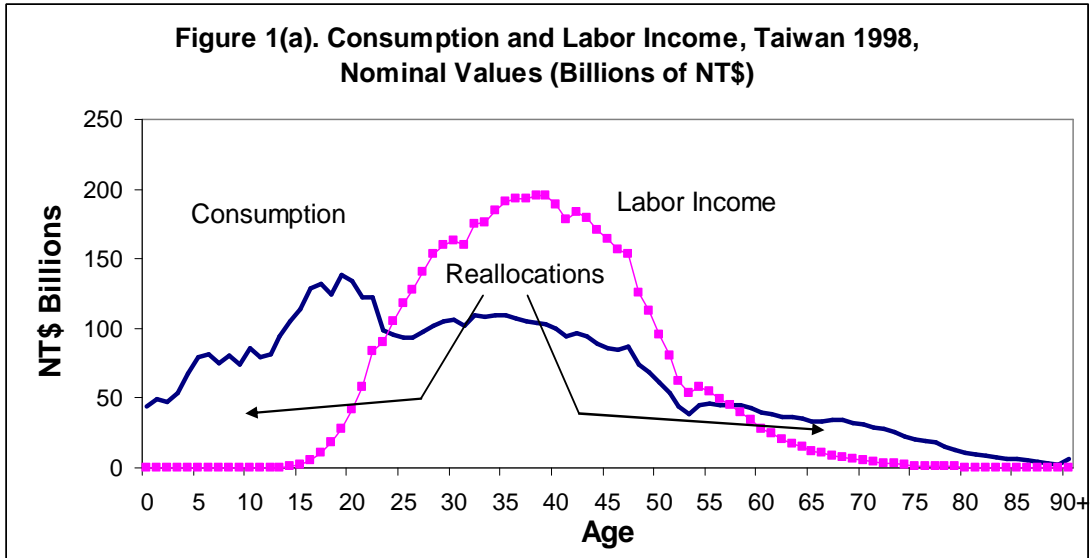


Figure 2. Lifecycle of Production and Consumption, Per Capita, US 2000 and Taiwan 1998

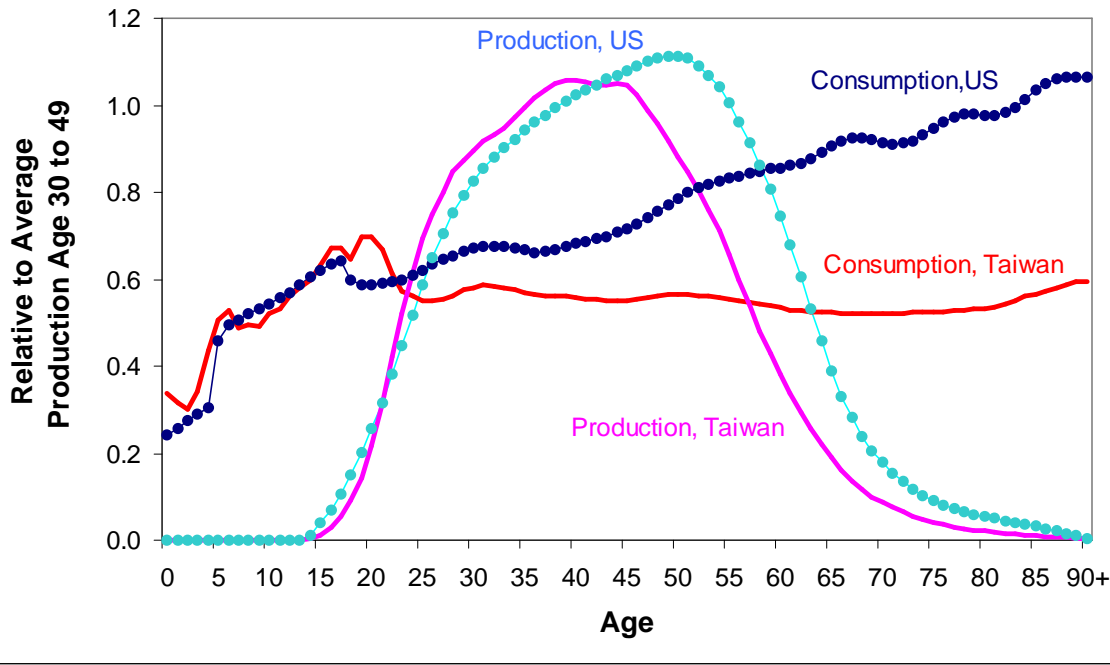


Figure 3. Consumption by Age and Components, USA (2000) and Taiwan (1998)

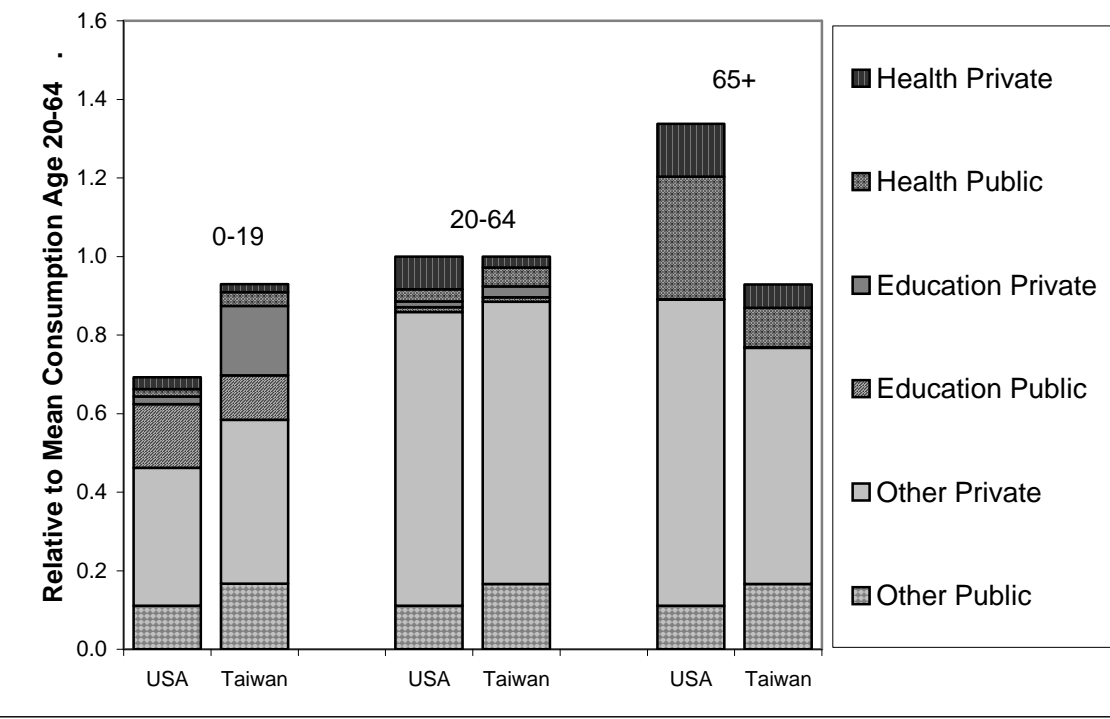
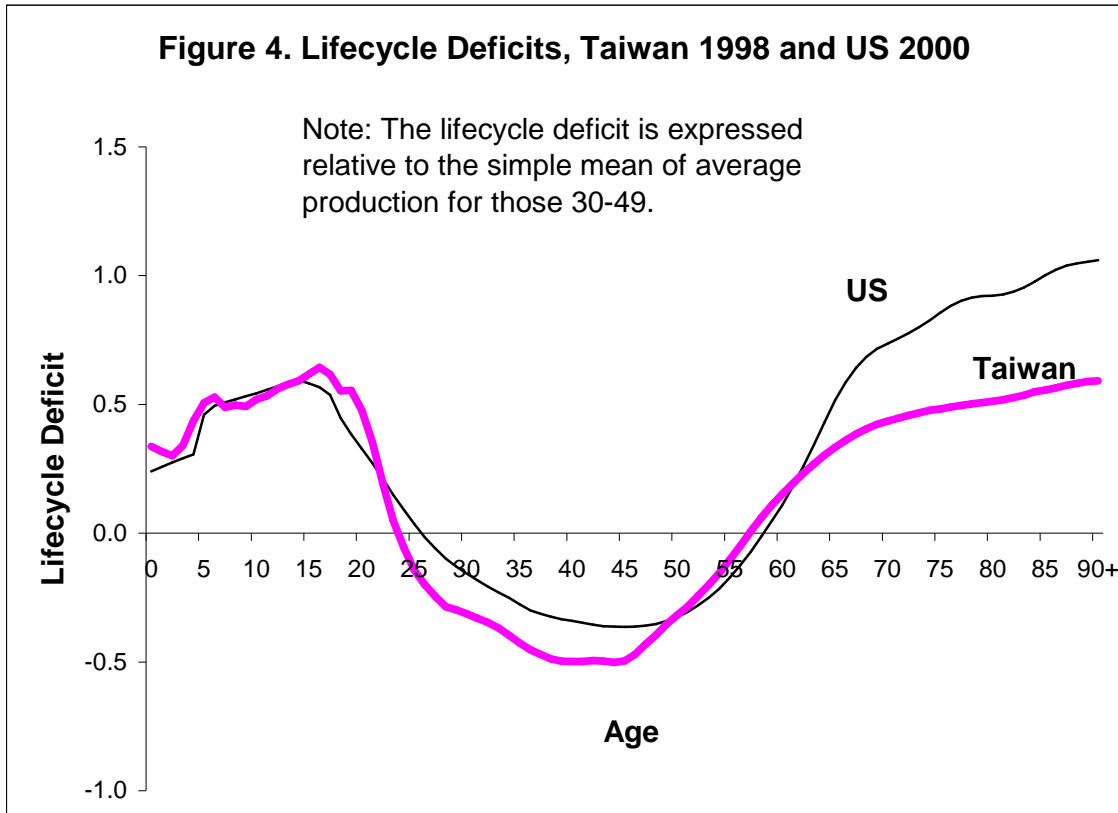
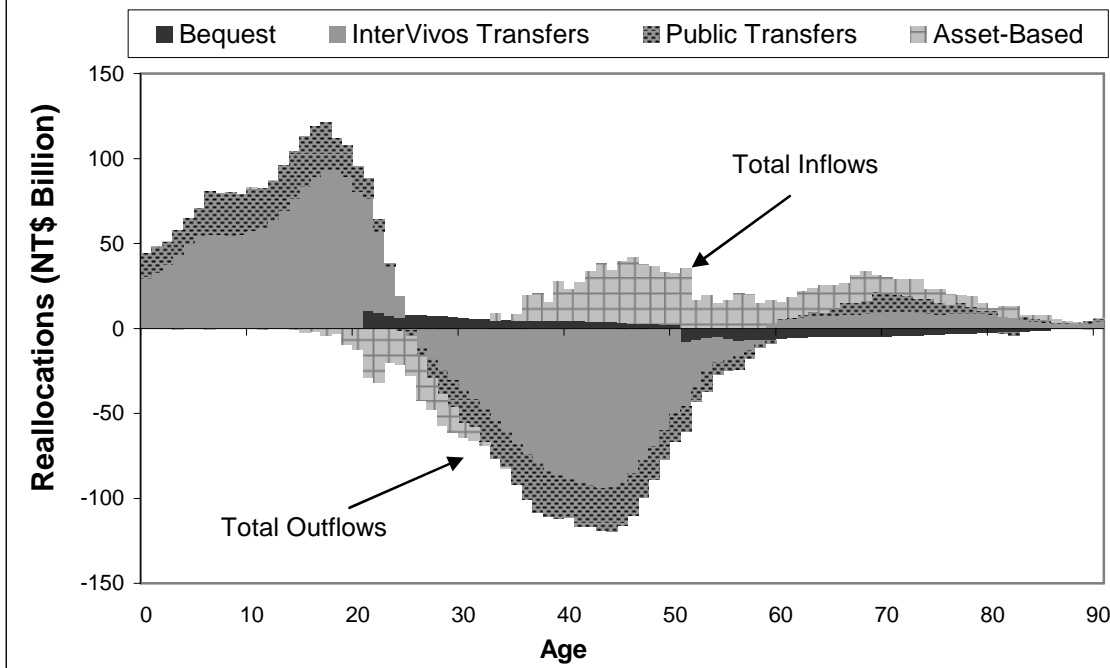


Figure 4. Lifecycle Deficits, Taiwan 1998 and US 2000



**Figure 5a. Component of Age Reallocations
Aggregate Values, Taiwan 1998**



**Figure 5b. Component of Age Reallocations
Per Capita Values, Taiwan 1998**

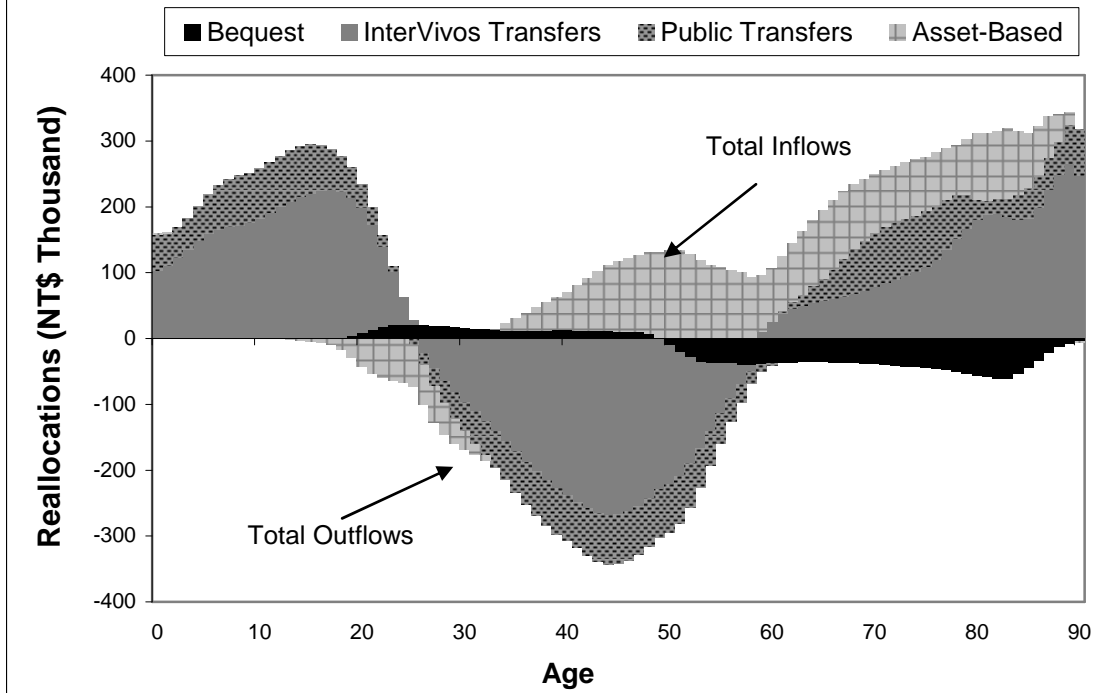


Figure 6a. Components of Age Reallocations, Aggregate Values, US, 2000

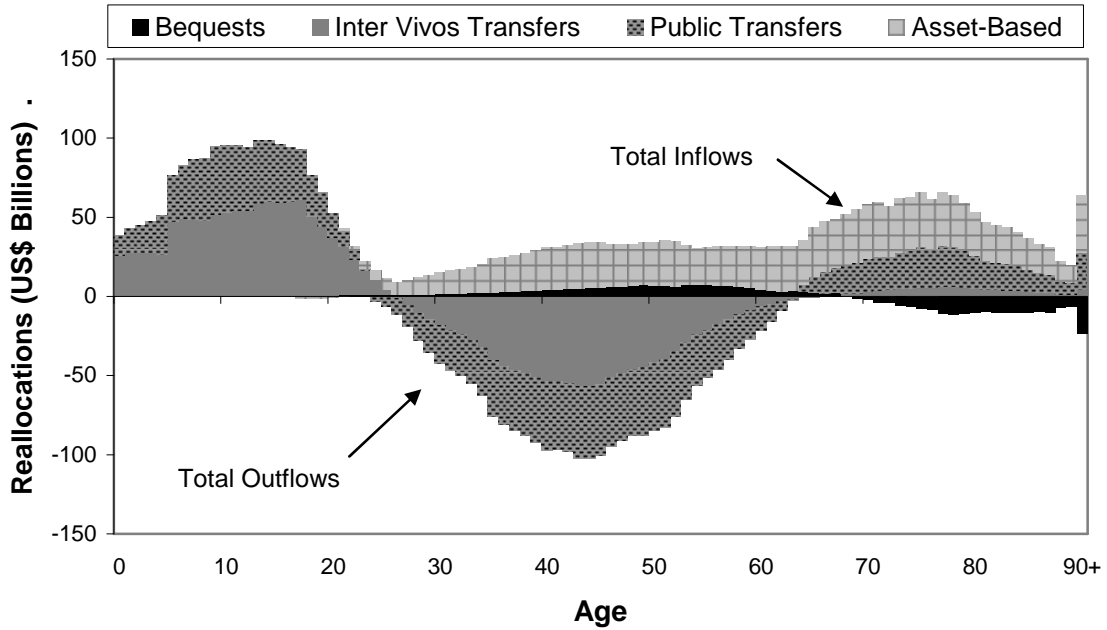
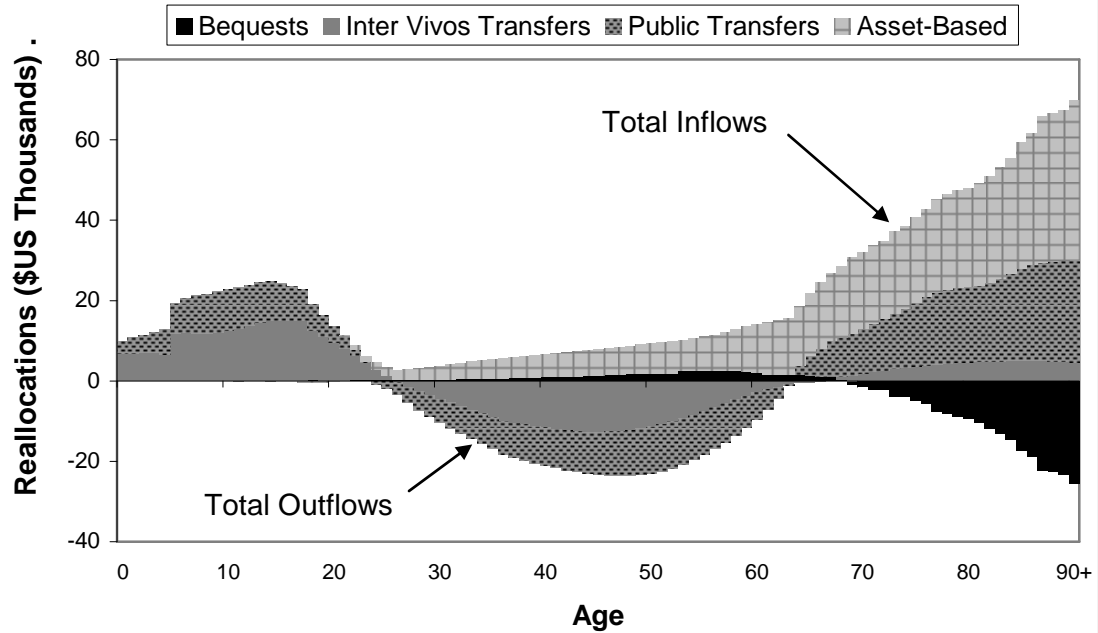
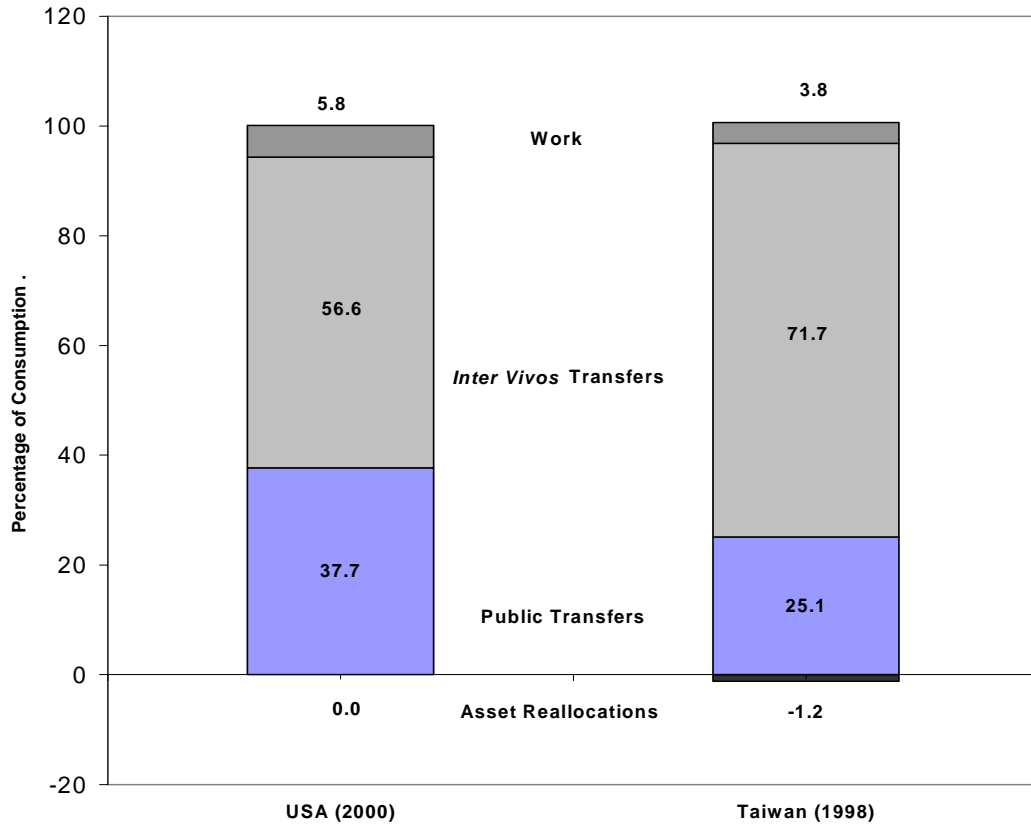


Figure 6b. Components of Age Reallocations, Per Capita Values, US, 2000



**Figure 7. Finance of Consumption, Young Dependents
Age 0-19**



**Figure 8. Finance of Consumption, Old Dependents
Age 65+**

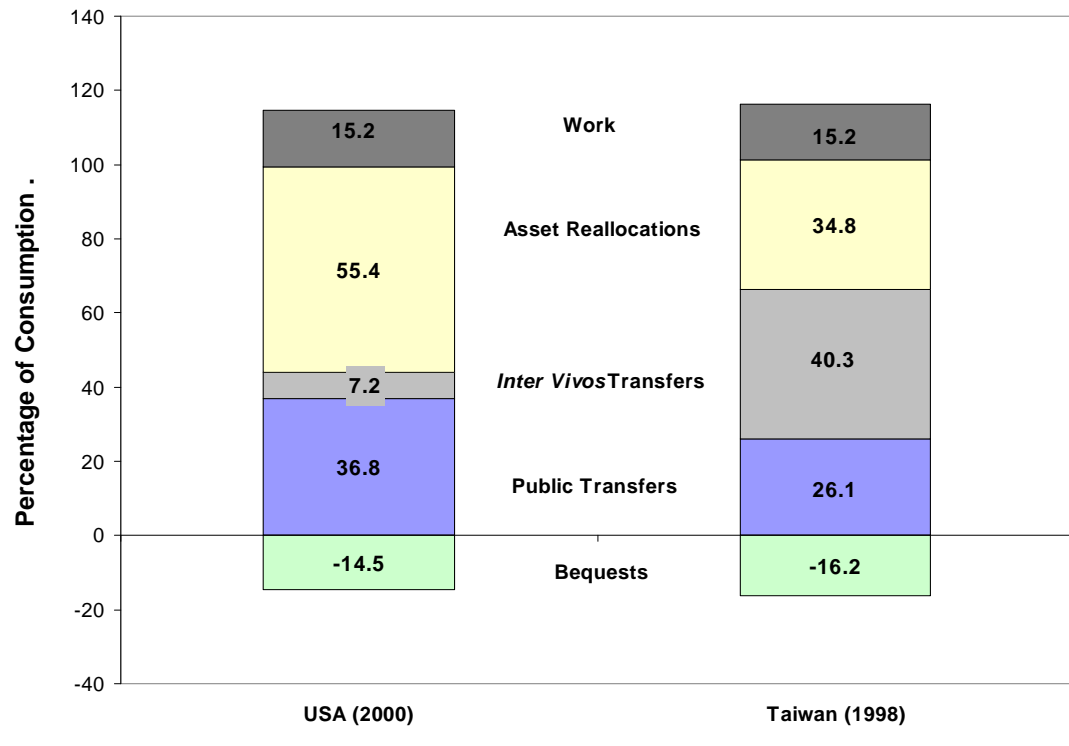


Table 1. A Classification of National Transfer Account Reallocations.			
	Asset-based reallocations		Transfers
	Capital and property	Credit	
Public	Public infrastructure	Public debt Student loan programs Money	Public education Public health care Unfunded pension plans
Private	Housing Consumer durables Factories, farms Inventories Land	Consumer credit	Familial support of children and parents Bequests Charitable contributions

Source: Adapted from Lee 1994.

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

	Total	Domestic by age				
		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
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
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
<i>Inter Vivos</i> Transfers	-31	1,256	146	-1,489	-130	186
Bequests	0	0	69	90	-84	-75