A Research Plan for the Macroeconomic Demography of Intergenerational Transfers[1]

by
Ronald Lee and Andrew Mason

National Transfer Accounts Working Paper No. 1

January 26, 2004

A large proportion of output is redistributed from individuals of one age to another, through non-market transfers, both public and private, but these flows are rarely measured or studied in a comprehensive way despite their important consequences. This project will develop new methods for measuring aggregate intergenerational transfers; construct historical estimates and projections of intergenerational transfers in varying social, economic, and policy contexts; analyze the inter-relationships between public policy, familial support systems, and economic conditions; and analyze the macroeconomic and generational effects of public policy. The new National Transfer Account system will represent a significant advance because it measures both familial and public transfers, and because of its historical and international scope. These new data will be used to study the implications of population aging for both familial and public transfers, how changes in familial support systems are influencing the economic circumstances of different generations, the interaction between public and familial transfer systems, and the macroeconomic and generational effects of changes in public policy with regard to pensions, health care, and education. An international team is drawn from the U.S., Europe, Latin America, and Asia. The accounts will be estimated for seven economies, the U.S., France, Brazil, Chile, Japan, Taiwan, and Indonesia, with sufficient historical depth to analyze long-run changes in public policy, economic conditions, and family support systems. The broad historical and cross-cultural perspective will provide important new insights about alternative strategies for redistributing resources across generations.

Parallel proposals with identical text, to be reviewed together, have been submitted by Lee at UC Berkeley and Mason at the East-West Center in Hawaii.

[1] The paper was extracted from parallel proposals submitted to the National Institute on Aging by the East-West Center and the University of California-Berkeley in 2004. The NIA grants R01 xxxx and yyyy provide core funding for the development of National Transfer Accounts.

RESEARCH PLAN

A. Specific Aims

1. Develop and apply a methodology for estimating inter-generational private transfers at the aggregate level. The transfer estimates would provide a comprehensive accounting of inter-age flows both within and across households including bequests and transfers that accompany household fusion. The estimates would be developed with as much historical depth as can be supported by available data and with a cross-national perspective that acknowledges the diversity of practice with regard to familial transfers. Estimates will be constructed for the US, Indonesia, Japan, Taiwan, France, Chile, and Brazil.
2. Measure and describe public transfers using methodologies that have previously been developed by the research team and other researchers, including generational accounting. Apply the methods to the seven participating countries with sufficient historical depth to characterize major policy initiatives since their inception, e.g., the development of public education, the US Social Security and Medicare system, Japan's PAYGO pension system, Chile's PAYGO pension system and its subsequent privatization.
3. Combine public and private transfer estimates to form a complete National Transfer Account (NTA) system that is consistent with and complementary to existing national income and product accounts.
4. Provide new, comprehensive estimates of long-term trends in generational equity in a variety of social and economic contexts.
5. Model and simulate future trends in public and private transfer systems. Use these projections to construct cohort or generational accounts. Construct estimates of public transfer wealth that are similar to but more complete than existing estimates of social security wealth and generational accounts. Provide the first available estimates of familial transfer wealth.
6. Use national transfer account data and other aggregate age data to describe the evolution of intergenerational equity in different social and economic contexts. Use the aggregate data to estimate models of intergenerational transfers and to test hypotheses of various theories of intergenerational transfers, e.g., Becker-Murphy.
7. Synthesize Lee's theoretical transfer system and Mason's theoretical saving model and analyze the inter-relationship between public transfers, familial transfers, and saving.
8. Use national transfer accounts and simulation methods to assess the effects of transitions in public policy and familial support systems.
9. Create a well-documented, readily accessible, web-based system for disseminating national transfer account data for the seven countries included in the project and data compiled for other countries in the future. Place these data and their documentation in the public domain by the end of the grant period.

B. Background and Significance

In all societies intergenerational transfers are large and have an enormous influence on inequality and growth. The development of each generation of youth depends on the resources that productive members of society devote to their 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 magnitude of transfers cannot be precisely documented in the absence of a complete set of transfer accounts, but from previous research we know that they are very large. Transfer wealth, the present value of expected future transfers, for the US in 1987 was 60% of the total capital stock (Lee 1994b). The value of family transfers alone was probably about half of the total material wealth of all residents of Taiwan in 2000 (Lee, Mason et al. 2003).

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. By addressing this gap our study responds to recent recommendations of the National Research Council Panel on a Research Agenda and New Data for an Aging World. The NRC panel recommends: "An aggregate intergenerational accounting framework should be used to measure transfer streams and assess the costs of policy options" and that "The use of cohort analyses and innovative simulation studies should be expanded." As noted by the panel, a comprehensive framework is "necessary to identify the effects of population aging within a country, as well as the costs of alternative policy options." (National Research Council 2001)

Research by our team and others interested in intergenerational transfers has laid a solid foundation for constructing comprehensive national transfer accounts 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 et al. 1991; Auerbach, Kotlikoff et al. 1999).

Progress in modeling private and familial transfers at the aggregate level has been more 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 et al. 2000; Frankenberg, Lillard et al. 2002). Progress has been made in estimating and modeling bequests, a difficult issue (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). New innovative surveys are beginning to shed light on this issue (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.

Pursuing this option is important, because familial transfers are so important 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 currently 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. Japan and South Korea have experienced dramatic declines in extended living arrangements. Taiwan is experiencing a gradual shift away from such arrangements, but in many other Asian countries this is not the case (East-West Center 2002). In Singapore, for example, 85% of those 60 and older lived with children in 1995 as compared with 88% in 1988, despite extraordinary economic and social change in virtually every other dimension of life (Kinsella and Velkoff 2001). 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. 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 that are part of the generational equity debate. The generational equity debate contests factual, behavioral, and policy issues. An important factual issue is whether or not there are substantial generational inequities and whether or not they are changing over time (Preston 1984; Becker and Murphy 1988). A second area of research is concerned with the determinants of intergenerational transfers or explanations of why the patterns we observe evolve. One group of studies 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 et al. 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) and others cited below. 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).

In this study, the national transfer account data will be used to examine these issues at the aggregate level or cohort level using national transfer account data. These data will be used: (1) to provide new, comprehensive estimates of long-term trends in generational equity in a variety of social and economic contexts; (2) to estimate lifetime transfers of education, old age support, and other variables that can be used to test the Becker-Murphy hypothesis and other models in ways not possible with existing household survey data; (3) to assess the interactions between public and private transfer

systems that influence the effect of transfer systems on generational equity and macro-economic variables, e.g., saving; (4) to assess the effect of transitions in public and private transfer systems on the aggregate economy; (5) to evaluate public transfer policy in a more comprehensive fashion than is currently possible with models that neglect familial transfers, and (6) to carry out counterfactual simulations.

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 play a prominent role in aging 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 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.

C. Preliminary Studies

The conceptual framework for this project draws on previous work on intergenerational transfers by Lee (Lee 1994a; Lee 1994b) and related work on population saving by Mason (Mason 1987; Mason 1988). Lee's work on allocation systems, discussed in more detail below, provides both a conceptual and an accounting framework at the macroeconomic level that encompasses all inter-age transfers from all sources: familial, market, and state. The framework distinguishes public transfer sectors or systems (education, health, pensions, welfare, etc.) and provides tools for quantifying the magnitude and direction of transfers. The theoretical properties of the reallocation systems have been derived for economies in long-run steady state equilibrium. Recently, some of these results have been generalized to populations that are not in steady-state, and the earlier golden rule simplifying assumption has been dropped (Bommier and Lee 2003). The model has been applied to industrialized and developing economies and to traditional economies, and it has been used to test Caldwell's hypothesis that fertility decline is a response to changes in the direction of wealth flows (Lee 1994a; Lee 2000).

Mason's saving model has a theoretical structure that is similar to Lee's reallocation model, but is concerned only with reallocations across age or the life cycle that are achieved through saving and dis-saving. This model has been used in empirical research on the effect of changes in interest rates, foreign investment, and age structure on aggregate saving rates (Fry and Mason 1982; Mason 1987; Mason 1988; Kelley and Schmidt 1996; Higgins and Williamson 1997). This project will integrate these two models and provide a more comprehensive model of the inter-relationships between saving, familial transfers, and public transfer programs.

An important objective of the project is to construct what we call national transfer accounts for a diverse group of countries. The public components of transfer accounts are based on the specific policies and programs in place that determine, for example, spending on public education, health care, pension programs, and welfare. We have experience in constructing such accounts for the past, the present, and the future. For the past, Bommier and Lee recently estimated public intergenerational transfers for US education, Medicare, and Social Security from 1870 to 2000 (research in progress), which will be used in this project and will serve as a model for estimating public transfer systems in the other study countries. Lee and his collaborators have also developed estimates of US public transfers for the present (Lee 1994a; Lee 1994b; Lee and Miller 1995; Lee and Miller 1997; Lee and Miller 1998; Lee and Miller 2000). Completing the accounts for living generations requires projections. The research team has done extensive work on projecting public transfers in both deterministic and stochastic contexts. Lee and Miller (2001) projects Medicare expenditure. Lee and Tuljapurkar (1998a; 1998b; 2000) have projected Social Security finances. Lee and Yamagata (2002) develop infinite horizon measures of sustainability for Social Security. Lee and Edwards (2001; 2002) have projected the entire government transfer system (state, local and federal) with considerable program detail for up to a century, contingent on current program structure. This work has extended the approach from Lee and Miller (1997). Lee and Skinner (1999) discuss related issues. Lee, Edwards and Miller (2003) have done the same for the State of California. In addition, Ogawa (Ogawa and Retherford 1993; Ogawa and Retherford 1997; Ogawa, Kondo et al. 2002) has modeled/estimated public transfer systems (health, education, and pension systems) for Japan. Bravo has modeled/estimated public transfer systems for Chile and other Latin American countries (Bravo 2001). Mason and several collaborators are currently working on

estimating the age allocation of public and private health expenditure in the Philippines and Jordan. Turra (2000) has estimated Brazilian public transfer accounts for the mid-90s. Zuber has constructed historical estimates for France.

Estimating familial transfers requires that we estimate the intergenerational flows of resources from bequests and changes in living arrangements (household fusion). Mason and Martin (1982) developed methods for estimating intergenerational links within populations, which have been used to model transitions in extended living arrangements in Japan, Indonesia, and other Asian countries (Mason and Racelis 1992; Mason, Racelis et al. 1996); to model intergenerational family transfers in Taiwan (Mason and Miller 2000); and to model the effect of bequests, living arrangements, and intergenerational income differences on saving in Japan (Mason, Ogawa et al. 2001). Lee, Mason and Miller (2000; 2002) have reconstructed familial transfers for Taiwan over the 20th century. Wolff has written extensively on familial transfers in France and their relation to public transfers, from both a theoretical and empirical point of view (Arrondel and Wolff 1998b; Arrondel and Wolff 1998a; Wolff 1999; Attias-Donfut and Wolff 2000b; Attias-Donfut and Wolff 2000a; Jellal and Wolff 2000; Wolff 2000; Jellal and Wolff 2002b; Jellal and Wolff 2002a; Wolff 2002).

The project will make use of a simulation model for projecting transfers, analyzing the macroeconomic effects of transfers and demographic change, and evaluating the effects of alternative public transfer policies. The simulation model will build on a model that has been used in several previous studies of the effect of demographic trends on saving and wealth (Lee, Mason et al. 2000; Lee, Mason et al. 2001a; Lee, Mason et al. 2001b). More recently it was used to analyze the effects of transitions in family transfers systems in Taiwan and public transfer systems in the U.S. (Lee, Mason et al. 2003).

One of the innovations discussed more extensively below is the manner in which we model the intergenerational transmission of wealth due to changes in living arrangements. To incorporate this work into the simulation model we will use a methodology for projecting the effect on multi-generation living arrangements of changing age structure (Mason and Lee 2003). With collaborators Lee has carried out more highly stylized theoretical work on intergenerational transfers over the course of the demographic transition (Zhang, Zhang, Lee et al. 2001; Zhang, Zhang, Lee et al. 2002). He has also published an article on the importance of intergenerational transfers for the evolution of the life cycle (Lee 2002), as part of an ongoing NIA funded project.

D. Research Design and Methods

The research design and methods section is organized in four parts. First we describe the National Transfer Account (NTA) database. Second, we discuss important issues that will be addressed using the NTA database. The third section describes the theoretical and methodological details of constructing NTAs. The final section discusses organizational issues.

The project will be implemented for seven economies: the US, Japan, France, Taiwan, Indonesia, Brazil, and Chile. These countries have been selected to represent a diverse set of demographic, economic, social, and cultural conditions. The U.S. and Japan have the two largest economies in the world and France is a key member of the European Union. Despite its small size, Taiwan's experience is of great importance because it is one of the Newly Industrializing Countries (NICs). Why the NICS have developed so successfully is an issue that has received an enormous amount of attention. Indonesia and Brazil provide additional diversity. Brazil is Latin America's largest country and has a large and troubled pension program. Indonesia is the largest Islamic country in the world. Its economy is relatively underdeveloped and it is somewhat earlier in its demographic transition. These countries have also been selected with an eye to practical considerations: the quality of data resources, opportunities for establishing strong collaborative relationships that will facilitate both current and future work, and previous experience of the research team.

There will be synergies and public good aspects to the work described below for the seven countries. Policy issues, theories, and some substantive questions will often be similar across countries. Many of the basic methods can be developed once, and then used across all countries with appropriate modification. This has been our experience in working on Taiwan and the United States in the past.

D.1. National Transfer Accounts: What are they?

National Transfer Accounts are aggregate measures of resource flows from members of one age group to another for a prescribed accounting period, typically a calendar or fiscal year. The framework is organized around the individual rather than the household in the sense that the estimated flows are to and from individuals classified by age rather than households classified by the age of one of its members, e.g., the head. In principle, one could estimate a complete matrix of flows by the age of "donor" and the age of recipient but in our systems we estimate only gross outflows, gross inflows, and the difference between the two, net inflows, by age.

NTAs complement National Income and Product Accounts (NIPA). They are constructed in a manner that is consistent with NIPAs. For example, estimates of consumption by age, which are part of NTAs, sum to total consumption from the corresponding NIPA. The NTAs, however, provide intergenerational information that is not contained in NIPAs.

The NTA distinguishes public and private transfers. The public transfer account includes all public revenues (gross inflows) and expenditures (gross outflows). Some sectors, e.g., education, can be allocated by age based on administrative records and survey data. Some programs, while not age-targeted by design, are age-specific and can also be allocated by age. Some sectors, e.g., national defense, fire safety, and roads are not age-specific. But even these non-age-specific expenditures can be allocated among members of the population using simple rules, the simplest being equal per capita sharing. Public sector revenues represent gross outflows for households and are allocated by age and by sector. Table 1 illustrates a public NTA.

Table 1. National Transfer Account, Public, US, 1995 (billions of US$)

Age	Total Transfers			Gross inflows				
	Net transfers	Gross inflows	Gross outflows	Education	Health	Pensions	Other age specific	Non age-specific
Total	-378	1,639	2,016	282	334	342	375	303
0-14	319	319	0	182	46	0	24	66
15-64	-1,089	688	1,776	100	69	66	255	198
65+	392	632	240	0	219	277	97	39

Gross and net flows, shown only for total transfers in Table 1, will be disaggregated by sector depending on the data available and the public programs in each country. In every country we expect to distinguish at least between education, health, pensions, and the "other allocable sector". In the U.S. more detailed accounting of public programs is possible than illustrated and most of our past work has distinguished more than 25 programs. The cells in Table 1 are the total values for members of each age group. Broad age groups are used for illustrative purposes only. The fineness of age and time detail will vary. For some purposes we will estimate values for single years of age. More frequently, we will use five-year age-groups. For many purposes, similar tables constructed with per capita measures, will be of greatest interest.

A portion of private transfer accounts are shown in Table 2. Private transfers are distinguished by source (inter-household, intra-household, bequests and household fusion) and by sector. Where practical, private transfers will be disaggregated into gross outflows, gross inflows, and net transfers. Household fusion refers to transfers of assets that are associated with the fusion of households. Estimates for Taiwan for 1998 have not yet been finalized. Preliminary estimates for bequests and household fusion have been calculated using methods described below. One of the objectives of the proposal is to refine the methodology for estimating private transfers. We expect to make less detailed sectoral decompositions of private transfers because of the difficulty of allocating specific expenditures among household members. We will, however, estimate private education transfers so that total education transfers can be estimated. We also intend to explore the possibility of estimating private health transfers. Note the discrepancy between inter-household outflows and inflows. In part, this could be attributable to international transfers, but it is not unusual for reported outflows to exceed inflows in household surveys. This issue will be explored further.

Table 2. Net Private Transfers, Taiwan 1998 (in billions NT$)

Age	Total net transfers	Source			Sector	
		Inter-household	Intra-household	Bequests and household fusion	Education	Other
Total	-152	-152	0	na	0	-152
0-14	698	0	698	na	106	592
15-64	-982	-189	-793	na	-87	-895
65+	132	37	95	na	-20	151

We will also compile and estimate extensive supplementary age-specific data that will be useful in analyzing intergenerational issues. These data will include consumption, saving, capital, labor and non-labor income, population,

survival rates, measures of living arrangements, and estimates of the number and age distribution of surviving offspring and surviving parents.

The completed NTA database will consist of time series with as much historical depth as can be achieved. For most of the countries in the study we anticipate uninterrupted series that extend at least from approximately 1950. Given their rich historical data, coverage of the 20th Century is a realistic objective for Japan, Taiwan, the US, and France. Public transfers for the U.S. beginning in 1850 have already been estimated by Bommier and Lee and similar work is progressing for France. The extent to which reliable historical estimates can be obtained for familial transfers will depend on the stability of key parameters that determine the allocation of resources within families and other issues that can only be finally determined by undertaking the work.

Many of the important macro-level studies of transfers make use of projections of transfers to construct estimates of cohort-specific public transfer wealth. Such projections are central to the construction of public generational accounts (Auerbach, Gokhale et al. 1991; Auerbach, Kotlikoff et al. 1999). Estimates of social security wealth have figured prominently in many studies of aggregate saving discussed in more detail below. This project will also use existing projection methods and newly developed methods (see discussion in preliminary studies) to project public and private transfer accounts and to construct cohort specific estimates of public and private transfer wealth, the survival-weighted net present value of future net transfers.

The NTA database will consist of a massive amount of information. An important consideration is how these data can be summarized and used to address intergenerational issues. One summary measure that has just been described is cohort specific transfer wealth, which equals the expected present value at birth of net transfers from the public sector, from specific public programs, or from family members. The NPV for public transfer wealth is similar to Auerbach-Kotlikoff generational accounts, but applied historically and developed under quite different assumptions for the future. The NTA can be used to calculate generational accounts, and indeed Auerbach has used NTA data provided by Lee for calculating generational accounts. An example of a program-specific measure is social security transfer wealth, which is similar to social security wealth and similar to social security implicit debt.

Figure 1. Net present value of social security as a percentage of lifetime earnings by year of birth, using a 3% discount rate with legislated increases in retirement age and future shortfalls met by tax increases.

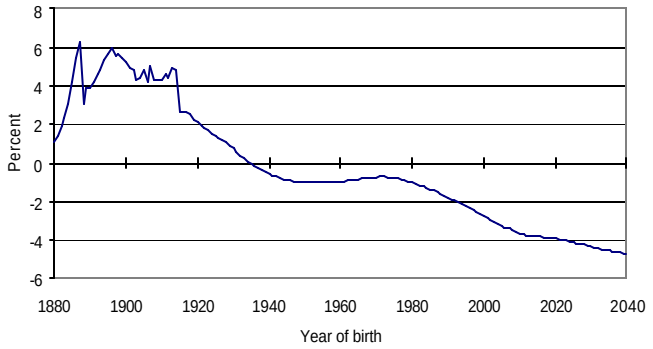
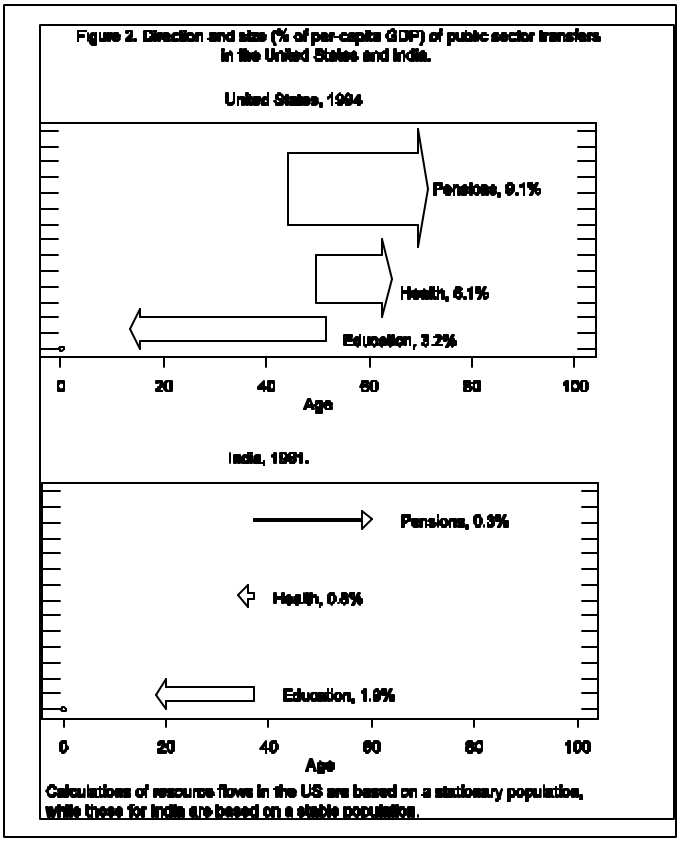


Figure 1 illustrates the concept using estimates for US transfer wealth for social security as a percentage of the present value of expected lifetime earnings for birth cohorts. Similar estimates are available for public education and Medicare. The data used to construct these NPVs took many months to construct and process. The figure documents the very substantial gains achieved by early Social Security program participants at the expense of those born after the mid-1930s. NPVs for public education, which have never before been documented, can be compared to NPVs for Social Security in order to judge the Becker-Murphy (1988) theory that transfers to the elderly through Social Security were compensation for earlier transfers to children through public education.

The arrow diagram shown in Figure 2 illustrates another method for summarizing transfers that has been used extensively by Lee and his collaborators. Each arrow indicates the direction and magnitude of the transfer that arises from a public sector program. The foot of the arrow is placed at the average age of the individual providing the transfers and the point of the arrow is placed at the average age of the individual receiving the transfer, where ages are "dollar-weighted'. Thus, the length of the arrow measures the average age difference between those providing and those receiving transfers. The height of the arrow corresponds to the average annual transfer. Under the special assumption of golden rule steady state (a steady state in which the rate of interest equals the rate of growth of GDP) the area of the arrow, equal to the product of the age difference and the average annual transfer, is equal to aggregate transfer wealth. . Although this assumption is seldom if ever completely appropriate, the arrow diagrams are an effective means of portraying patterns of flows, even without interpreting the area of the arrow as transfer wealth. Transfer wealth at each age and overall can, of course, be calculated directly using actual discount rates. Bommier and Lee (2000) have investigated analytic approximations to transfer wealth and other quantities for non-golden rule steady states as expansions about the golden rule result. Downward transfers, i.e., those from older to younger members of the population, have negative transfer wealth in steady-state. Upward transfers, from younger to older members of the population, have positive transfer wealth. Similar diagrams can be constructed for private transfers (Lee 1994b).

As shown by Figure 2 public transfers are much larger as a fraction of GNP in the US than in India. As we point out above, familial transfers are much more important in developing societies than in Western industrialized countries. Here we see that the public transfer sector is more developed in the U.S. than in a developing country, India.



The objective of many transfers is to increase consumption – perhaps total consumption or perhaps expenditure on a particular good or service – by targeted members of the population. NTAs provide estimates of current consumption by each generation (or cohort). Expected lifetime consumption can be readily calculated for any cohort for which NTA estimates are complete. This provides a simple measure of economic status that, unlike per capita earnings or per capita income, incorporates the influence of net transfers.

The proposed study will pursue two complementary approaches to applications. The National Transfer Account data constitute a set of synthetic panel data for each country. The observations in the data set consist of averages or totals for members of a birth cohort at a given age at a given point in time. Using time series data one can follow the average or aggregate experience of a birth cohort as it ages, subject to the proviso that cohort membership will change due to immigration and mortality. These data can be used for individual countries or pooled and used to estimate regression models as described by Deaton (1985). In recent studies, for example, we have used synthetic panel data consisting of annual data for 1978-98 for 30 single-year age-groups to analyze living arrangements (Mason and Lee 2003) and generational differences in economic growth (Lee and Mason 2004) for Taiwan. The synthetic panel data will be made publicly available through a downloadable, machine-readable, web based system.

The second approach is to use simulation analysis. This is a useful approach for macro-economic analysis that involves detailed age structure, particularly for populations experiencing demographic changes or transitions in support systems resulting from public policy reform or declining family support systems. These are the types of phenomena in which we are interested. Note that the proposed estimation work will complement the simulation modeling by providing parameters for structural relationships.

D.2. Issues Addressed with the NTA accounting system

Three sets of issues will be addressed: the determinants of inter-generational transfers, the effect of transfers on saving and wealth, and the implications of policy reform and normative change in family support arrangements.

Use of NTA to Study Determinants of Transfers

The theoretical models that have guided research on the determinants of transfers reflect the diverse roles of the family. Altruism and efficiency concerns are both at work in economic models of family transfers (Becker and Tomes 1976; Becker and Murphy 1988). Effective altruists allocate resources across the family – investing in human capital, smoothing over the lifecycle and across uncertain states of the world – meeting both efficiency and distributional objectives. Lillard and Willis (1997) provide a succinct summary of competing models. The old age security hypothesis posits that children are the old age security plan for parents. In countries with under-developed capital markets, accumulating financial wealth is not a viable option. As capital markets improve, parents can rely more on saving and less on children (Willis 1980). The parental repayment hypothesis emphasizes constraints on borrowing to invest in human capital rather than deficiencies in capital markets. Efficient investment in human capital is achieved only if children can "borrow" from their parents. Depending on the extent of altruism, an implicit contract may exist that requires children to repay their parents for some portion of the transfers they received (Becker and Tomes 1976). If the family insures members against risk, *inter vivos* transfers will arise when members face bouts of unemployment. Protection against longevity risk will lead to bequests by elderly who die at a young age and support by children for elderly who live longer than expected (Kotlikoff and Spivak 1981).

An alternative or perhaps complementary approach to family transfers emphasizes the exchange motive. Transfers of money between parents and children are implicit payments for services provided. Children may provide personal care to elderly parents with failing health. Grandparents may provide childcare services and receive "compensation" from their children (Cox 1987).

It is empirically difficult to distinguish alternative models of transfers. Motivations underlying transfers vary from one setting to the next, and transfers often fill a multiplicity of purposes. In studies of inter-household transfers in Malaysia and Indonesia, no single model explains transfers. The evidence there points to exchange, insurance, and repayments for educational "loans" as important motives for transfers (Lillard and Willis 1997; Frankenberg, Lillard et al. 2002). Inter-generational transfer arrangements in Taiwan are consistent with a variety of interpretations but not the use of bequests to enforce old age support (Lee, Parish et al. 1994). Altonji et al. (2000) conclude that in the US money transfers respond to income differences and appear to be motivated by altruism rather than by implicit exchange. Time flows from children to parents are not accompanied by money flows from parents to children. However, the very low responsiveness of transfers to inter-generational income differences is at odds with the standard altruism model (Altonji, Hayashi et al. 1992; Altonji, Hayashi et al. 2000).

If familial transfers are governed by a non-market social contract, as conceived by Samuelson, they cannot reflect an exchange motive. Familial exchanges would be closely akin to market-based credit transactions and, as in Samuelson, would suffer the same problems in relation to old age support as do markets for borrowing and lending. Depending on the ages at which children's consumption was subject to parental repayment, the exchange solution might involve high consumption by the young and low consumption by the old. In Samuelson's analysis, the market solution involves strongly negative interest rates, and low lifecycle utility relative to what can be achieved with transfers. Likewise, from the perspective of Becker-Murphy (1988) , familial exchanges should be sharply distinguished from transfers. In some contexts, this is merely a semantic issue. In other contexts it has substantive implications. Ideally, we would group resource flows within the household that are driven by an exchange motive with familial exchange, like market exchange, rather than with transfers.

The empirical literature on intergenerational transfers has been concerned primarily with inter-household transfers, whereas the current study includes intra-household transfers and the transfers that arise when independent households fuse. Co-residence decisions have received less attention in recent research, but the standard model, if there is one, emphasizes the tradeoff between lost "privacy" and the gains, mostly in the form of scale economies, from co-residence, e.g., economies in production of goods and services and gains from the consumption of public goods (Ermisch 2003). A related perspective is that co-residence provides an efficient means for carrying out inter-generational transactions (Ben-Porath 1980). Obviously the transfer of time is facilitated by co-residence. Also, to the extent that shirking, moral hazard, or adverse selection are problems in family exchange, co-residence may facilitate monitoring and increased efficiency. If the transactions are large, frequent, and occur throughout the lifetime, family members may choose to live together throughout their lives. If the transfers tend to be episodic or confined to particular periods during the lifecycle, family members may choose to vary their living arrangements depending on the current circumstances. In Taiwan, for example, there is a clear age pattern with co-residence rising with age for those 60 and older. But as Taiwan's elderly have become wealthier and healthier, the age at which they establish joint families has been delayed (Mason and Lee 2002).

The NTA database will be used as synthetic panel data to estimate the determinants of intergenerational transfers at the aggregate level and to test whether key hypotheses are borne out by aggregate data. With the NTA database it will be possible to estimate the determinants of familial transfers, either combined or separated by source or sector, and to estimate total intergenerational transfers as modeled by Becker and Murphy (1988).

The aggregate data can be used to test several hypotheses. In Becker and Tomes (1976) altruistic model, they hypothesize that an increase in "autonomous" economic growth, i.e., economic growth not attributable to human capital investment, should lead to an increase in net transfers from children to parents (or a decline in net transfers from parents to children). This hypothesis can be tested by estimating, across cohorts and countries, the impact of intergenerational differences in lifetime earnings on transfers controlling for investment in education.

For some countries the NTA accounts will provide a time series of sufficient length to test directly the "payback" hypothesis. If the payback hypothesis is correct, cohorts that invest more in the education of their children will receive greater old-age transfers. Evidence supporting this effect for family transfers has been found in Malaysia (Lillard and Willis 1997) and Indonesia (Frankenberg, Lillard et al. 2002), although panel survey data are of insufficient duration to follow cohorts from the age at which they make investments in their children's education to the ages at which they might receive repayment from those children. The synthetic panel data can be used to test the "payback" hypothesis of familial

transfers and the "payback" hypothesis of public transfers, i.e., that the increase in social security wealth in the U.S. is lagged compensation for increased spending on public education (Becker and Murphy 1988).

Many studies have considered the implications of the availability of family members for transfers (Chevan and Korson 1975; Kobrin 1976; Bachrach 1980; Michael, Fuchs et al. 1980; Soldo 1981; Wister and Burch 1983; Freedman, Wolf et al. 1991; Macunovich, Easterlin et al. 1995; Wolf 1995). This issue is obviously important in light of the decline in childbearing and the increased longevity of seniors. Traditional household surveys provide no information about non-coresident family members, but specialized surveys have provided estimates of the impact of the availability of family members. The NTA database will include estimates of the availability of family members (non-coresident and coresident) that can be used to estimate the effects of aging on intergenerational transfers.

The models that can be estimated with aggregate data are parsimonious and inappropriate for studying some of the finer details of intergenerational exchange. Macro-level estimates are not a substitute for micro-level studies based on innovative household surveys. A macro approach is well-suited, however, to studying macro-level changes and macro-micro interactions. This approach is essential to developing richer aggregate models, including the simulation model developed in this project, and to policy analyses that incorporate the full range of possible transfer system responses.

Application to Saving, Demographic Change, and Transfer Wealth

A sizable literature investigates the effect of demographic variables (age structure and life expectancy) on national saving rates. An entirely different literature investigates the effect of unfunded pension systems on national savings rates. We know of no literature that considers the effects of both public and familial transfer systems on savings behavior. We believe that all of these matters can be usefully investigated in a unified and coherent framework that integrates previous theoretical work on saving by Mason (Mason 1987) and on transfer systems by Willis (1988) and Lee (1994b). National Transfer Accounts will provide the empirical content required to investigate important issues related to saving within the framework.

The proposed study will consider two aspects of the determinants of aggregate saving. The first issue is the effect of demographic change, including changes in age structure and life expectancy, on aggregate saving rates. The second issue is the effect of transfers, both public and private, on saving. As described in the section on preliminary studies, we have demonstrated that transitions in transfer systems combined with demographic change can have an important influence on aggregate saving (Lee, Mason et al. 2002) They can produce, for example, large swings in saving rates similar to those observed in East Asia between 1960 and 1990 (Higgins and Williamson 1997; Deaton and Paxson 2000). The objective in this application is to address similar issues using simulation and regression analysis combined with realistic and comprehensive measures of current transfers and transfer wealth

The literature on the effects of demographic change on aggregate saving relies exclusively on variants of the life-cycle model (Modigliani and Brumberg 1954). That is not to say that current work excludes the possibility of a bequest motive, but models do assume that consumption is constrained by a lifetime budget – determined by current assets, anticipated future earnings and, perhaps, public transfers. Furthermore households plan consumption over their remaining lifetime, taking into account interest rates, uncertainty, variations in the demographic composition of their household, and other factors. A central feature of the lifecycle model is the lifetime planning horizon that governs household behavior. This is to be distinguished from alternative models, e.g., the buffer-stock model (Deaton 1991; Carroll 1992), which assumes a much shorter planning horizon, or altruistic models, e.g., the Barro model (Barro 1974), where the planning horizon extends into the indefinite future. Despite its limitations, the lifecycle model provides a useful framework for estimating the effects of demographic change and changes in transfer systems on aggregate saving rates and for testing some of the key implications of the lifecycle model.

In the standard lifecycle model, the household's consumption is constrained by its lifetime labor earnings. Abstracting from bequests and assuming perfect annuity markets, the household chooses an optimal consumption path subject to the constraint that the present value of lifetime consumption cannot exceed the present value of lifetime earning. Even if every household consumes all of its labor income during its lifetime, aggregate saving is positive in a growing economy if there is a lag between the average age at which households earn their income and the average age at which they consume it. Demographic variables influence saving by affecting age structure – the relative numbers of saving and dis-saving households – and by influencing the timing of earning and consuming by the average household (Mason 1987; Mason 1988). Recent empirical work has confirmed the importance to aggregate saving of demographic variables (Kelley and Schmidt 1996; Higgins and Williamson 1997; Deaton and Paxson 2000).

An important elaboration on the lifecycle saving model hypothesizes that an increase in social security transfer wealth depresses aggregate saving (Feldstein 1974; Munnell 1974). For purposes of achieving lifecycle objectives, social security wealth is a close substitute for personal wealth. Thus, increases in aggregate social security wealth should be

matched dollar for dollar by reductions in aggregate saving. The effect of social security on saving has been the subject of extensive research but no clear consensus has yet been reached about the magnitude of the effects (Holzmann 1997; Gale 1998; Coronado 2002).

Willis (1988) and Lee (1994) offer a more general model of the lifecycle showing that the demand for consumption smoothing life cycle wealth can be met in a closed economy either by holdings of physical capital, K, or by holdings of transfer wealth, T. Two important issues can be addressed using their model. The first is the Feldstein-Barro debate. Whereas Feldstein argues that social security wealth substitutes for lifecycle saving, Barro hypothesizes that social security and other forms of transfer wealth, e.g., public debt, substitute for private (familial) transfer wealth. The NTA data base will provide complete measures of transfer wealth making it possible to analyze the extent to which they are substitutes. The second issue is the endogeneity of transfer systems. Estimates of social security wealth are often based on the assumption that current programs will remain in place even when it is widely appreciated that programs are not sustainable in the face of population aging. Private transfer systems are subject to the same demographic pressures. Thus, the effects of demographic variables on saving depend on the response of both public and private transfer systems. Again, the NTA data base will provide the information necessary to address this issue.

Two empirical strategies for analyzing aggregate saving will be pursued. The first is regression analysis, using the synthetic panel data drawn from the NTA database. These data can be used to estimate the effects on cohort-specific saving rates of variations in life expectancy, the number of surviving offspring and parents, public and private transfer wealth, and other aggregate variables. Another possibility is direct analysis of the mean age of household consumption, a cohort-specific variable that can readily be calculated from NTA data. A related approach would look at transfer wealth, which is a stock, in relation to the stock of physical capital in our data set. The implicit debt of unfunded public pension programs is just one form of transfer wealth, but it would also be interesting to examine its relation to the stock of capital in our data set and perhaps in a broader cross-section of nations. The second strategy relies on simulation analysis using the more complete and refined model described below. The strength of this approach is that it can incorporate the complex and dynamic changes that characterize a particular demographic and policy setting.

The effect of transfer system reform on saving is important for two reasons. If increases in transfer wealth crowd out actual saving, capital accumulation and economic growth are undermined. Moreover, if increases in transfer wealth crowd out actual saving, their positive impact on the economic status of the elderly is reduced.

Application to Policy Reform

Current policy research focuses primarily on social security reform, but many of the issues are more general and relate to any intergenerational public transfer program and to familial transfers as well. The limited scope of the current policy debate is regrettable for two reasons. First, in some countries, e.g., Japan and Taiwan, family support systems are eroding, and other countries may soon face similar trends. Second, familial transfers and public transfers are inter-related – in some respects they are substitutes for each other. Thus, the effects of changes in public transfer policy depend in part on the response of familial transfers, as Barro emphasized. The possibility that public support for the elderly might merely supplant family support has long been appreciated.

The development of Generational Accounts has provided a valuable tool for analyzing the fiscal effects of intergenerational transfer programs. Here, too, analysis is limited to the state and the important role of the family is neglected altogether. Policy analysis using National Transfer Accounts will emphasize the additional insights gained by considering both familial and public transfers in an integrated fashion.

Countries differ in the extent to which they have relied on public and familial transfer systems. They also differ in their approaches to public policy, in the form of familial transfer systems, and in the priority accorded to specific intergenerational issues. Many countries have mature pension systems and are concerned with reform, whereas others, e.g., Indonesia and Taiwan are in the early stages of pension development. Countries differ in their approaches to health care and to education. The breadth of policy issue is illustrated by the brief description of important policies adopted by countries participating in this study (Table 3).

As part of the project, we will emphasize two aspects of policy reform: further development and application of generational accounts and social security or public pension reform.

Generational Accounts. Generational accounts were developed to provide a more reliable measure of the fiscal stance of public policies that include intergenerational transfers (Auerbach, Gokhale et al. 1991; Auerbach, Kotlikoff et al. 1999). The presence of Auerbach on the research team will ensure that this project takes advantage of the extensive experience in theory, method, and empirics developed in the large literature on generational accounts. They can be viewed as a subset of the NTA. The methodology has been applied in the US, Europe, Japan, and several other countries (Auerbach, Kotlikoff et al. 1999; European Commission 1999). In a series of studies Auerbach, Kotlikoff, and others have shown that the standard measure of fiscal policy, the budget deficit, is incomplete, arbitrary, and subject to political manipulation

(Kotlikoff 1999; Bonin 2001). Of particular concern is that the budget deficit does not include implicit debt inherent in programs that create current wealth by obligating future generations to higher taxes, and that often these implicit debts are many times larger than the explicit debt.

Table 3. Important Policy Developments.

Country	Education	Health	Pensions
Brazil	Compulsory primary school in 1946. Autonomy for public universities promoted in 1996. Targeted cash grants tied to schooling became a national program in 2001.	National Institute of Public Health established in 1920. Universal health care system established in1988. The National Agency for Supplementary Health, responsible for regulating private insurance programs, established in 2000.	Social insurance for rail workers (1923) national (1966). Retirement age reduce from 65 to 60 (men) and 55 (women) in 1988. Benefits extended to rural workers. Reform in 1999.
Chile	Vouchers were introduced in 1981, but only since 1996 private school could charge tuition	Dual insurance system since 1981: public (FONASA) and private (ISAPRE)	Workers insurance since 1952, private sector involvement since 1981
France	Compulsory attendance established in 1882 (ages 6-13); extended to age 14 (1936) then 16 (1967).	Public health provision for poor people (1893). Health insurance for workers (1945), extended in 1947, 1949,1950, 1951,1961and 1966.	Programs for low-wage workers established in 1910, 1928, and 1930. Replaced by Social Security in 1945; extended in 1948.
Indonesia	Compulsory primary school education established in 1984, starting age 7; extended to secondary level in 1994.	Community Health Centers (Puskesmas) in 1971. Maternal and child health in 1970s, expansion since 1991. Integrated Family Planning and Health Services (Posyandu) in 1984. State Health Insurance (ASKES) in 1968.	Mandatory worker insurance (ASTEK) in 1977; social security for private employees (Jamsostek) in 1992. TASPEN for public and ASABRI for military personnel.
Japan	Compulsory education introduced in 1872; extended to 6 years In 1907and 9 years in 1947.	Universal medical insurance in 1961. Long-term care insurance for the elderly since 2000	Employees' Pension Insurance Scheme (EPIS) in 1941, National Pension Insurance Scheme (NPIS) in 1959. EPIS and NPIS integrated in 1961.
Taiwan	Compulsory education of 6 years since 1950; 9 years since 1967.	Government Employee Insurance (GEI) since 1958; Labor Insurance (LI) since 1956; Servicemen's Insurance (SI) since 1953; Farmer's Health Insurance since 1985; National Health Insurance in 1995, replacing all the above programs.	GEI since 1958; LI since 1950, SI since 1953; Old Farmer's Welfare Allowance Program since 1995, Senior Citizen Welfare Living Allowance Program and Senior Indigent's Welfare Living Allowance Program since 2002; No national pension yet established.
United States	Compulsory school attendance laws passed by states, 1848 to 1918. Starting age 5, 6 or 7. Ending age 16, 17, or 18.	Medicare established in 1965 to provide national health insurance to those 65 and older. Medicaid established in 1965 to provide health benefits to the poor.	Social Security Act 1935 provides retirement benefits. Amended 1939 to pay dependent and survivor benefits. Amended 1954 to pay disability benefits to workers.

Generational accounts for a given year consist of estimates of the present value of future taxes net of transfers for all living cohorts (similar to the sum of the NPVs for education, Medicare and Social Security discussed with reference to Figure 1 for the birth cohort of 2000, but including other taxes) and a combined measure for all future cohorts. The fiscal stance of current policy is judged by comparing the average lifetime taxes or the average lifetime tax rate that the new-born cohort would pay given a continuation of current policy with the average tax rate that future generations must pay to finance the deficit and meet other obligations implicit in current policy.

Of the 17 countries for which generational accounts were constructed in a recent international comparative project, all but Canada, New Zealand, Sweden, and Thailand faced serious imbalances (Auerbach, Kotlikoff et al. 1999). The large deficits faced by the US, Japan, and many countries in Europe and Latin America reflect large public debt in

some countries, due to rapid population aging and commitments to pension and health programs that provide substantial transfers to the elderly. Japan's problems are among the most serious. In the absence of reform lifetime net tax rates for future generations of Japanese will be about 3 to 4 times the rates newborns can expect to pay (Takayama, Kitamura et al. 1999).

Public sector transfer wealth constructed under the National Transfer Account System is essentially the flip-side of generational accounts. The Generational Account for each cohort is the present value of future taxes paid less transfers received. Public transfer wealth, as constructed under national transfer accounts, is the present value of transfers received less taxes paid. Thus, the generational account is the negative of public transfer wealth. There are, however, important differences between Generational Accounts and National Transfer Accounts as discussed below.

The complementarity in the approaches offers advantages. First, several conceptual and methodological issues relevant to NTA, e.g., the choice of discount rates and methods for calculating tax incidence, have been extensively discussed as part of the Generational Accounts literature. This will help in the development of National Transfer Accounts and, by relying on lessons learned in developing Generational Accounts, the comparability of the two methods will be enhanced. Auerbach's role in the present project will ensure consistency across the two methods. Second, data sharing between our project and researchers involved in constructing Generational Accounts will facilitate the further development of both approaches. Generational Accounts have been constructed for recent years for the countries in our study, with the exception of Taiwan. Third, Generational Accounts have been constructed for many countries but not with any historical depth. National Transfer Accounts can be used to construct historical series of Generational Accounts useful for analyzing their determinants and effects.

The differences between National Transfer Accounts and Generational Accounts also offer valuable research opportunities. The public transfer wealth of a cohort differs from its generational account in two important ways. First, public transfer wealth includes both taxes paid and benefits received from the government. Generational Accounts measure net taxes or taxes paid less monetary transfers received. In recent applications, some non-monetary transfers received are also included in the calculation of generational accounts. The NTA approach is useful for a country in which the general level of government services is increasing (or declining). An increase in future taxes matched by future benefits (government consumption unallocated under the GA method) leaves transfer wealth intact, while the Generational Account will rise.

The Generational Account and public transfer wealth also differ in their approach to modeling the future. Generational Accounting assumes that current policy continues for all living cohorts including newborns. Future cohorts as a group are saddled with the debt created by current generations with no distinction drawn between those born in year $t+1$ and those born in the distant future. This is unrealistic in the sense that cohorts that are alive in the same future period are subject to different policies. Public transfer wealth is constructed for both living cohorts and for cohorts not yet born subjecting all cohorts to the same set of policies in force at that time. This provides a realistic comparison of living and individual future cohorts. The point here is not that public transfer wealth is superior to the generational account. There are advantages and disadvantages to both approaches and gains from having both measures available.

A valuable feature of the NTA method is that it offers a more general approach to transfers by including both public and familial transfers. Transfer wealth and implicit debt can be created by both familial support systems and by the state. Thus, Generational Accounts and public transfer wealth quantify only one aspect of the "fiscal imbalance", more broadly conceived. Moreover, because familial transfer systems and state sponsored transfer systems represent alternative approaches to financing old-age consumption, countries which have favorable Generational Accounts may simply be relying on alternative transfer systems subject to the same pressures inherent in population aging. This is exactly the situation for Thailand, one of the few countries with favorable Generational Accounts (Kakwani and Krongkaew 1999). This is an issue that we discuss in more detail with respect to social security reform.

Social Security Reform. The debate on social security reform deals with wide-ranging issues that could be addressed by this project. At this point, however, we wish to emphasize two issues related to transfer policy. The first issue, discussed in the preceding section, is the effect of social security reform on saving. The second issue is the distribution of the benefits and costs from changes in social security, other transfer programs, and familial transfer programs. While it may seem unusual to describe family transfer programs as a policy variable, many Asian governments are interested in maintaining and strengthening the family support system. Some countries have pursued explicit policies. Singapore, for example, has recently established legal responsibilities of adult children for their parents. Under these circumstances it is as important to consider the implications of reform to familial support systems as to public support systems.

Many of the current reform schemes for public pensions propose a phase-out of PAYGO social security and replacement with funded, privatized schemes. A contentious issue has been the extent to which establishing PAYGO systems or phasing them out benefits some generations at the expense of others. Some researchers have a quite optimistic

take on this issue (Feldstein and Samwick 2001; Krueger and Kubler 2002), while our own view is that redistribution is inherent in these transfer programs. Transfer systems for old-age support generate large transfer wealth and corresponding implicit debts. The wealth is held by those who are currently alive and either is compensation for support provided to previous generations of retirees, or else is an obligation incurred by the system during the start-up phase. The debt is owed by future generations.

The size of the implicit debt is large. For the US in the year 2000, the implicit debt (discounting at 3%) generated by Social Security (OASI) amounted to 1.7 times GDP or 17 trillion dollars, which is 46% of the total demand for wealth. Feldstein (1997:9) estimates an implicit debt that is slightly lower than ours, after adjustment for the five-year difference in reference year. Many Latin American public pension programs also have large implicit debts. Bravo (2001) estimates implicit debt to GDP ratios arising from public pension programs circa 1990 of 1 for Costa Rica, about 1.5 for Chile, Panama and Cuba, about 2 for Brazil, and about 3 for Uruguay and Argentina. Familial transfer programs may also have large implicit debts. For Taiwan in the year 1960, the implicit debt generated by the family transfer system (as we have modeled it) was about 0.9 times GDP (Lee, Mason et al. 2003).

If the obligations implicit in transfer systems are not honored, the costs of transition are borne entirely by those who are currently alive and would fall most heavily on those who have already retired. If obligations are honored the implicit debts must be repaid during a transition toward individual responsibility, prolonging the effects of the transfer system past the system's dissolution. Generations responsible for repaying the implicit debt face a double task: to make payments out of current income to honor past obligations (repaying the implicit debt) and to save out of their current income to pre-fund their own retirements. Under a policy shift to a notional defined contribution system, as in Sweden, Italy and Latvia, the implicit debt is not repaid and the system remains PAYGO, while demographic risk (aggregate uncertainty about longevity and fertility) is shifted from the system to the individual, and individual labor supply and retirement incentives are made actuarially fair. It will be of interest to contrast the intergenerational implications for this kind of policy transition to that of a move to a privatized pre-funded system.

Two aspects of our preliminary work on the U.S. and Taiwan are of interest here. The first is that the size of the implicit debt varies considerably over the demographic transition and is strongly affected by the final stage of population aging. The implicit debt in a fully functional family transfer system would have increased about four-fold relative to GDP between 1960 and 2050 in Taiwan. If the US maintains its current Social Security System the implicit debt relative to GDP will double between 2000 and 2100 due to population aging (Lee, Mason et al. 2003). The cost of delaying reform would be substantial. The effect of population aging on implicit debt (or transfer wealth) relative to GDP is not generally recognized, per se, although the effect of population aging on the finances of unfunded pension systems (which is a completely separate issue, theoretically) is of course well known. Its effect – raising the demand for wealth relative to GDP – is likewise unrecognized.

The second issue - who bears the burden of reform - depends on the specifics of the reform plan. The costs can be born by current generations, more or less by those who are currently working or those who are currently retired. Alternatively, they can be shifted on to future generations, prolonged into the indefinite future if so chosen. Policy analysis does not provide help about choosing among theses alternative, but it does clarify how the burden of alternative reform programs is distributed across current and future generations.

Although current debates emphasize social security reform, other public policies are of interest and will be explored as part of this study. An example is an analysis of alternative forms of financing education. The U.S. has experienced substantial changes in the extent to which tuition at public institutions is subsidized, the extent to which student loans are made available, and the extent to which those loans are subsidized. In recent years students are increasingly financing their own education by accumulating debt with potentially important implications for generational equity. There are also non-obvious implications for capital accumulation. When education is funded by downward transfers to children from parents or the government, savings and capital accumulation will be greater than when education is funded by loans to children. For the steady state case, we can see this from the identity that the aggregate demand for wealth must equal transfer wealth plus capital stock. Downward transfers generate negative transfer wealth (upward transfers like Social Security generate positive transfer wealth), so total transfer wealth is reduced, and the demand for life cycle wealth is met by increased holding of capital. Dropping the steady state assumption, we will investigate the size of this effect through simulation.

D.3. National Transfer Account Methodology

In our framework, the economy consists of two economic sectors: the government and households/individuals. Government activities are limited to: (1) collecting taxes from households/individuals; (2) giving money, goods and services to households; (3) engaging in credit transactions with households/individuals, i.e., accumulating and servicing

public debt. Households/individuals engage in the following activities: (1) producing goods and services, which are sold to the government or to other households/individuals; (2) consuming goods and services; (3) saving and investing and holding the physical capital thus created; (4) making and receiving transfers. These transfers include tax payments to the government and money, goods and services received from the government; inter- and intra-household transfers including gifts and bequests; and, credit transactions including borrowing, lending, and interest payments within the household sector or between the household sector and the public sector.

Firms and their activities are subsumed within the household sector. All firms are owned by households/individuals and all of the activities of firms are carried out on behalf of the households/individuals that own those firms. Tax payments by firms are treated as tax payments by the households/individuals who own those firms. In a similar way, eleemosynary institutions are treated as intermediaries between households/individuals.

Our framework uses the individual rather than the household as the principal organizing unit for the private sector. Some economic variables, e.g., labor income and many forms of public transfers, are intrinsically individual in nature and measured that way. But for other key variables, the natural unit of observation is the household. This reflects practical realities of data collection, collective ownership of assets, and the public good nature of some household goods. Allocation rules are used to distribute some household variables, such as consumption, to individuals using methods described in more detail below. Other household variables, such as household saving, are assigned to one household member.

A member in each household serves as the agent. The agent "owns" all household assets and any income from those assets accrues to the agent. The agent pays any taxes levied on property or property income. If an agent dies or is supplanted by another individual, the assets pass to the agent of the heirs' household. In general, *public* transfers are allocated directly to and from individuals based, for example, on the demographic group targeted by each public program. The agent, however, serves as a clearing-house for all *familial* transfers. Inter-household familial transfers are between agents. Intra-household transfers are between agents and non-agent household members. Any non-agent whose labor income plus net public transfers exceeds consumption, transfers the surplus to the agent. The agent then reallocates resources within the household, supporting the consumption of members in deficit, i.e., whose chosen (in some hypothetical maximization process) consumption exceeds their labor income plus net public transfers. The agent balances the household's account through active saving or dis-saving. At this point, we are not assigning any special decision-making role to the agent. Rather we are establishing a conceptual approach and an accounting convention for dealing with the household-individual problem.

Over the life of individuals their ability to produce and their desire to consume diverge. In part this occurs because of extended periods – childhood and old age – during which productivity and/or labor effort are low. There are other reasons, however, why individuals may consume less than they produce. They may want to accumulate wealth to pass on to heirs, or to protect against uncertainties about the future, or to use as a bargaining chip in dealing with their family members, or for the pure joy of being wealthy. Irrespective of the motives, each individual and each cohort is subject to the following age-specific budget constraint at every point in time.

$$C(a) - Y^l(a) \equiv t(a) - S^*(a) \text{ where}$$
$$S^*(a) = S(a) - rK(a) \qquad (1)$$

The left-hand side measures the gap between what individuals are consuming and what they are producing during the current period. The right-hand side distinguishes the two ways in which the lifecycle gap can be "financed" at deficit ages or employed at surplus ages. The gap must equal the difference between net transfers and active saving. Active saving refers to saving beyond the return to capital held by cohort members. A person engages in active saving, for example, when they contribute to a pension fund out of current labor earnings and to active dis-saving when they consume out of property income or draw down assets. Lee (1994a) distinguishes between physical capital and credit in the balancing equations for flows and stocks; for simplicity, K includes both material wealth and credit.

Constraints on indebtedness limit the manner in which the lifecycle deficit of the young can be financed. Imposing a strict constraint that $K(a) \geq 0$ for all a, implies that, during the period of child-dependency, consumption needs are met entirely by transfers. During the period of old-age dependency consumption needs are met either by transfers or by net dis-saving of wealth accumulated at earlier ages. By relaxing constraints on indebtedness, national transfer accounts can accommodate net indebtedness among teenagers or young adults, for example, due to credit card debt.

The evolution of capital for an individual or a cohort can be described by:

$$K(0) = K(D) = 0$$
$$K(a+1) = (1+r)K(a) + S^*(a). \qquad (2)$$

Initial capital is zero as is capital at the time of death, *D*. That capital is zero at death implies only that "you can't take it with you." Any bequeatheable assets held at the time of death become transfers, passed on to heirs or taxed.

Wealth consists of transfer wealth, *T(a)*, as well as capital, *K(a)*. Transfer wealth is prospective – equal to the expected net present value of all future transfers:

$$T(a,t) = \sum_{x=0}^{w-a} (1+r)^{-x} \frac{l(a+x,t+x)}{l(a,t)} t(a,t+x)dx \qquad (3)$$

where $\frac{l(a+x,t+x)}{l(a,t)}$ is the probability that a person aged *a* in year *t* will survive to year *t+x* and $t(a,t+x)$ is the (expected) net transfer that will be received in year *t+x* by a person aged *a* in year *t*. Because transfer wealth is prospective, its calculation requires historical series or projections of the other transfer account components. A more detailed exposition of the accounting framework and it equations of motion for the stocks can be found in Lee (1994a: 22-27).

Methodological Details

National transfer accounts and its components are calculated relying primarily on household surveys, national income and product accounts (NIPA), and administrative records maintained by government agencies. The completeness, accuracy, and detail of the accounts will vary from country to country depending on the detail and quality of the statistical base. Likewise the methodological details will vary from country to country. The methods described here have been developed and tested using data from the US and Taiwan. The other countries included in this study have relatively rich data resources described in more detail below, but one of the objectives of the project is to develop methodologies that allow construction of transfer accounts for economies where data resources are more limited than they are in the US or Taiwan.

Labor income: $Y^l(a)$. The age profiles of labor income are estimated from income and/or wage surveys and should be for total pre-tax compensation including benefits, e.g., the contributions of employers to health insurance and public and private pension programs. They should include the labor component of self-employment income, and the labor share of production for own consumption in agriculture. The age-specific estimates are adjusted proportionately so as to total to the NIPA estimates.

Consumption: C(a). Consumption by age consists of household consumption and the consumption of goods and services provided directly to individuals by the public sector, including public education, housing assistance, health care, food stamps, and so on. Household consumption should include imputed services flowing from household physical capital such as owned housing, consumer durables, automobiles, etc. Purchases of these capital goods should not themselves be counted as consumption, but rather as investment. Survey data on household expenditures and the demographic composition of the household are used to allocate household consumption among the household's members and to estimate the shape of age profiles of consumption. Administrative records in combination with household survey data are used to allocate goods provided by the public sector. The profiles are adjusted to conform with NIPA estimates of aggregate consumption. Household expenditure on education and possibly health care can be estimated to complement estimates of public spending on these important sub-sectors. Household consumption is allocated among members using allocation rules, e.g., equivalent adult consumer units. If *N(a,j)* is the number of persons aged *a* in household *j* then average consumption share out of total household consumption by a person aged *a* in household *j* is estimated as $a(a)N(a,j)/\sum_x a(x)N(x,j)$. Estimating allocation rules is a difficult task in part because of the existence of household public goods, consumption externalities within the household, and other problems discussed at length by Deaton (1997) and by Lazear and Michael (1988). Implicitly, many economic measures, e.g., per capita income or per capita consumption, use allocation rules that distribute income or consumption equally among all members. All available evidence indicates that an equal distribution overstates the consumption of the young and understates the consumption of adults.

The most frequently used methods for allocating consumption across household members are Engel's method and the Rothbarth method. The theoretical basis for estimating allocation models has been strengthened due to a series of studies by Bourguignon (Bourguignon 1999), Chiappori (1988; 1992), Bourguignon and Chiappori (1992), and Browning et al (1996).

Engel's method is one widely used procedure for estimating allocation rules (Deaton and Muellbauer 1986; Tsakloglou 1991; Bradbury 1994). The approach uses the share of household consumption devoted to food as a measure of welfare. The cost of an additional child (or any other member) is then the compensating income required to maintain

the food share of the household as compared with a household with one fewer child. The method is implemented by estimating the effect of income, household size and composition, and control variables on food share using one or more household expenditure surveys. Household consumption is distributed among the members of interviewed households using results from the estimated model. Average consumption by age, thus, reflects both the allocation rules and any co-variance between household membership and total household consumption.

The Rothbarth method uses expenditure on adult goods, e.g., tobacco, alcohol, and adult clothing, rather than food share as a measure of welfare. The key attraction of the Rothbarth method is that children may have only an income effect on adult goods because they do not consume them. This offers an advantage over Engel's method. If children are intensive in the consumption of food as compared to adults, Engel's method will overestimate the cost of children. Deaton (1997) suggests that estimates from the Engels and Rothbarth methods should bracket the true values of the consumption shares.

The Rothbarth and Engel methods have been used to estimate allocation rules in both developed and developing countries. The results are broadly consistent with other methods less firmly grounded in consumer theory. For the US, for example, analysis based on the Rothbarth method of the 1960-61 and the 1972-72 CES yields estimates that consumption by a child under the age of 15 is about 40% of consumption by an adult (Lazear and Michael 1988). Analyses by Deaton and his colleagues yield similar results for developing countries (Deaton 1997). In preliminary work using the 1998 Taiwan FIES, the application of Engel's method yields estimates that consumption by a child under age 15 averaged 61% and an adult 60 or older averaged 74% of consumption by an adult aged 30-44.

In some cases, we will use Rothbarth and/or Engel methods to estimate allocation rules. When possible, however, we will borrow existing estimates based on a survey of the literature. Often the weights are estimated only for broad age groups, such as under age fifteen, which is coarser than we would like. However, there are some estimates that that have fine age detail. We will often superimpose the age detail from these estimates (which might, for example, be based on the Engel approach) on the Rothbarth estimate for a broad age group. The Rothbarth estimates are often too erratic if made in fine age detail. Moreover, the Rothbarth method cannot be used to allocate consumption among adults of different ages.

A third empirical strategy has been used to allocate expenditures on specific goods such as education or health. An expenditure system is estimated in which the budget share of each expenditure type is regressed on income, demographic variables, and other variables. Expenditures on education, for example, can be regressed on the number of household members in each age group enrolled in school. These results can be used directly to construct estimates of expenditures for each household member. These methods will be useful for constructing a complete set of transfer accounts for the education sector and possibly the health sector.

Transfers: $t(a)$. Total net transfers consist of public transfers and private transfers: $t(a) = t^{g}(a) + t^{f}(a)$. Where possible we will also estimate gross outflows and gross inflows in addition to net transfers. Private non-familial transfers are relatively small in most countries and are not distinguished from familial transfers

Transfers, public: $t^{g}(a)$. The public sector and public transfers are discussed only briefly because public transfers have been extensively modeled by members of the project team, by generational accountants, and by others (Auerbach, Gokhale et al. 1991; Auerbach, Kotlikoff et al. 1999; Bonin 2001; Lee and Miller 2001; Lee and Edwards 2002). Thus, the methodologies are well-established. The public sector provides goods and services or direct monetary transfers to members of the population and services the national debt. It finances these activities by borrowing and by levying taxes on property, labor income, non-labor income, consumption, and bequests. Initially we will assume that all public debt is held by domestic individuals, but we intend to relax this assumption allowing for international capital flows during the course of the project.

The age profiles of tax payments (gross outflows from individuals) depend on the tax incidence and the tax rates. Following procedures employed for Generational Accounts, we typically will assume that the incidence falls on the individuals paying the tax. Taxes on earnings are paid by workers, taxes on consumption by consumers, taxes on property by property owners, etc. (Auerbach and Kotlikoff 1999: 33-37). The tax rate for some taxes is identical for all individuals (age groups). This is often the case with taxes on consumption. In this case, the age distribution of taxes paid is identical to the age distribution of the economic resource being taxed. In other cases, the tax rates vary across individuals and may vary systematically with age. The progressive income tax in the US, for example, imposes a higher average tax rate on age groups with higher average taxable income. In the US, Taiwan, and other countries household survey data can be used to estimate some tax rates by age.

The age profiles of benefits from public programs (gross inflows to individuals) depend on the target group for each program: school-age children for education programs; the elderly for pension programs; etc. The age of

beneficiaries of public programs can often be identified from administrative records collected and published by the agency responsible for implementation of the program. Age-specific primary, secondary, and tertiary school enrollment data can be used to identify the beneficiaries of public education programs. Household surveys often collect data on financial transfers from public programs. More detailed information about data sources that can be used to estimate public transfers for countries participating in the study are provided below.

The public sector consists of sub-sectors that engage in substantial age reallocations and a general sector that does not. The sub-sectors to be distinguished can vary depending on the institutional setting, but will include the education sector, the health sector, the pension sector, and a residual sector for public goods and services that can be allocated by age. Goods that cannot be allocated by age compose the final sector and we assume that all individuals share equally in the value of the services provided by this sector.

Transfers, private: $t^{f}(a)$. Estimates of private transfers rely heavily on household survey data. The methods described here have been developed using the Taiwan Family Income and Expenditure Survey. The details of construction will vary depending on the survey.

Private transfers consist of intra-household transfers, i.e., transfers between co-resident family members, $t^{fr}(a)$, and inter-household transfers, $t^{fx}(a)$. By construction non-agent household members do not directly engage in saving or dis-saving nor do they receive transfers from or make transfers to non-coresident family members. It follows from the household budget constraint, equation (1), that for non-agent household member *i* belonging to household *j*:

$$\begin{aligned} t^{fx}_{\sim h}(i,j) &= 0 \\ t^{f}_{\sim h}(i,j) = t^{fr}_{\sim h}(i,j) &= c_{\sim h}(i,j) - y^{l}_{\sim h}(i,j) - t^{g}_{\sim h}(i,j). \end{aligned} \tag{4}$$

where the subscript *h* identifies agents and *~h* identifies non-agents.

Because intra-household transfers must sum to zero for any household *j*, intra-household transfers for any agent *j* are given by:

$$t^{fr}_{h}(j) = -\sum_{i=1}^{N_j - 1} t^{fr}_{\sim h}(i,j) \tag{5}$$

where N_j is the number of household members in household *j*.

Inter-household private transfers come in two forms – as inter-household transfers between two existing households (*inter vivos* transfers) and as "bequests" that arise with the dissolution of a household. In our framework a household would be dissolved if the agent died, if two households merged, or if the agent designation was transferred from one household member to another household member.

Inter-household transfers are typically reported in income and expenditure surveys. Both transfers made and transfers received are reported. One technical difficulty that arises in modeling transfers is that transfers made typically exceed 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 several countries, the US, Indonesia, and Taiwan, more detailed surveys of inter-household familial transfers identified below can be used to estimate the extent and direction of reporting errors in income and expenditure surveys. Such analysis will provide guidance about the appropriate adjustments to be made.

Modigliani (1988) describes three methods that can be employed to estimate bequests: relying on surveys in which respondents are asked the amount of any inheritance; construction of estimates using information on the distribution of wealth and death rates by age; and, the use of probate records. These methods have been employed to obtain estimates of wealth in the US and can be relied on to varying degrees to obtain estimates in other countries.

In those countries where direct measurement of bequests is undertaken, we will make use of it. In many countries, however, we anticipate relying heavily on modeling the accumulation and transmission of wealth through bequests. Bequests are determined by an age-specific wealth survival schedule l^{k}_{at} for each cohort of agents. If the probability of surviving and the probability of maintaining an independent household were independent of wealth, then the wealth survival schedule would be determined by the survival rate of members of the cohort and the survival rate of agents conditional on their being alive. The available evidence indicates that both survival rates for individuals and for

households increase with wealth. Hence the survival schedule for wealth lies above the survival schedule for agents. Put another way, the life expectancy of wealth exceeds the life expectancy of agents. More formally, it can be shown that

$$l_{at}^{k} = l_{at}^{h} + r_{kl} CV_k \sqrt{l_{at}^{h}(1 - l_{at}^{h})} \qquad (6)$$

where l_{at}^{k} is the survival rate for capital, l_{at}^{h} is the survival rate for households (agents), r_{kl} is the correlation between the survival of a household and its capital, and CV_k is the coefficient of variation of capital.

The interdependence of wealth and mortality has been addressed in several recent studies of the US. One approach has been to use the mortality experience of participants in annuity markets rather than the general population (Poterba 2000; Poterba 2001; Brown and Weisbenner 2002) A second approach (Attanasio and Hoynes 2000) uses the 1984 and 1987 SIPP to estimate mortality rates by wealth quartiles and finds substantially higher mortality rates particularly among those in the bottom quartile. Both approaches yield similar estimates for the U.S. – that annual bequests are reduced by about one-third by the correlation between wealth and mortality. Preliminary analysis for Taiwan suggests a much smaller effect with an estimated correlation between capital and survival of about 0.1. Building on this earlier work, our model will incorporate the wealth-mortality correlation using separate wealth and population mortality schedules.

Modeling the inter-age flows of bequests requires rules that govern the division of estates. The first division is between heirs as a group and the state. In the absence of any information to the contrary, we will assume that the estate tax is independent of the age of the recipient and the age of the decedent. The second division is among competing heirs and that division will be determined by socially and legally defined rules that govern the division of estates between the surviving spouse, if any, surviving offspring, and other persons. Given our focus on intergenerational transfers, the critical issue is the extent to which resources are retained by the generation of the decedent or transferred to the next. Consequently, we will use a bequest rule that will vary depending on the practices of the country being modeled. An unpublished working paper (Bommier, Lee et al. 1998) uses formal analysis and SOCSIM, a well-known and highly developed micro-demographic simulation model developed by Wachter and Hammel (Hammel, Hutchinson et al. 1976), to explore strategies for estimating bequest wealth and other forms of wealth from observed flows. This research takes into account mortality-wealth correlations and spousal mortality correlations. Use of SOCSIM to test procedures may be useful in other contexts as well.

Inter-age transfers may also be influenced by varying practices regarding the rights of surviving offspring. In the U.S., there is a strong preference for bequeathing to a surviving spouse and then for equal division of estates among offspring. Under these conditions bequests to children can be approximated by the age distribution of surviving offspring. In traditional patrilineal societies, e.g., Japan or Taiwan, the eldest son receives a larger share of his parents' estate than other siblings. The gender bias has no direct implications for constructing estimates of inter-age transfers, but the parity bias does have an effect. The preference towards eldest son has eroded in Japan and Taiwan over time, in part due to statutory changes regarding inheritance. In addition, as the average number of births has declined, the age difference between the eldest son and the average offspring has declined. Even so, the implications of alternative rules could be explored. For example, in the case of Japan, parity- and age-specific fertility data make it possible to construct estimates of the joint age-distributions of eldest sons. Methods for estimating the age-distribution of surviving offspring have been developed and used extensively in previous studies (Mason and Martin 1982; Mason, Teh et al. 1994; Mason and Miller 2000).

Active saving: $S^{*}(a)$. Active saving involves two components of saving: household saving and employer contributions to public or private pension plans. The procedures for estimating household saving are well-established and pose no difficult technical problems. Total household saving can be estimated from family income and expenditure surveys as total receipts less total expenditure. Active household saving is household saving less net non-labor income (non-labor income less interest expense).

Family Income and Expenditure Surveys typically can be used to estimate measures of household saving that include the contributions to and withdrawals from public or private pension plans by household members. The contributions of employers or the government, however, must be estimated from other sources. The importance of these contributions will vary depending on the institutional setting. Employer contributions to pensions have become very important in the US, but they are much less important in many other countries. In the US, firms are required to file Form 5500 providing detailed information about private pension plans. Specialized surveys, e.g., the EBRI/ICI Participant-Directed Retirement Plan Data Collection Project, provide detailed information about pension assets held by US residents (Holden and VanDerhei 2001).

Among the countries included in the current project, only Chile has a funded public pension program. Contributions by individuals or employers to Chile's pension program are prescribed by law and can be documented

through administrative records. Contributions are based on earnings and, hence, administrative records can be combined with earnings information from household surveys to estimate the active saving through public pension programs in Chile or other countries with funded public pension systems. Although most of the countries included in this study have PAYGO public pension programs, the accumulation and dis-accumulation of trust funds in these and other programs must be included in active saving. Trust fund accumulations are allocated to individuals using the same principals for allocating taxes.

Historical and Projections Analysis: The Simulation Model

We will further develop an existing macro-simulation model (Lee, Mason and Miller, 2003) that incorporates earnings, consumption, savings, familial and public transfers, and tracks the accumulation of stocks such as capital. This will permit us to integrate the estimated accounts, ensure their internal and intertemporal consistency, fill in missing data, make projections, simulate the effects of different policies, and incorporate varying behavioral assumptions including life cycle savings behavior as desired. When life cycle savings behavior is incorporated, it will reflect familial and public transfers. Differing assumptions about changes in familial transfers and in public transfer programs can be made, which enables us to assess their effects on other variables and on intergenerational equity.

As noted, this simulation model will have several uses. First, the model is useful for constructing historical estimates in the presence of incomplete data. For example, census data may provide good estimates of population age-structure and household composition. Aggregate consumption data may be available from National Income and Product Accounts, but no household survey may be available to allocate consumption across age groups. The simulation model will incorporate allocation rules estimated from more recent surveys and can then be used to "estimate" consumption by age in the historical period.

For some periods it will be possible to estimate incomplete transfer accounts. In the absence of any direct information, for example, it might be acceptable to assume that there are no inter-household transfers other than bequests. Then our analysis of familial transfers would be restricted to bequests plus intra-household transfers. Measures of intra-household transfers to elders would depend strongly on the prevalence of elder co-residence with their adult children. This information is widely available from population censuses. In many countries expenditure surveys are not conducted every year. Indonesia, for example, conducts its expenditure surveys every third year. Reliable population data are available on a decennial or quinquennial basis. The simulation model will be used to interpolate values needed to construct a continuous historical transfer account record.

Second, the simulation model will be used to project transfer accounts. This will be useful for analyzing the implications of alternative demographic and economic trends and for evaluating public policy, as described in the application section.

The current version of the model has been used in several recent studies (Lee, Mason et al. 2000; 2001a; 2001b; 2003). Fertility and mortality rates are exogenous, modeled using Lee-Carter (1992) methods, and determine the population and its age structure, measured in single years of age. The current model is closed to migration (but note that Lee and Miller (1997; 1998; 2000) have incorporated public transfer flows to and from migrants in macro simulations). The shape of the cross-sectional age-earnings profile is fixed and shifts over time depending on an exogenously specified rate of technological progress (the fixed shape could, of course, be allowed to vary endogenously, with capital growth and technical change, or in response to educational change, or exogenously across periods). Capital income at each age is determined by the capital stock held by the age group and the world rate of interest (assuming a small, open economy such as Taiwan's). Consumption is governed by a lifecycle saving model with no bequests. Public transfers are exogenously determined and have been incorporated into the model in detail. Familial transfers are also exogenously specified and have been treated in a highly stylized manner in the current model.

The simulation model will be enhanced in the following ways. The demographics of the model will be improved by allowing for immigration, initially determined by exogenously specified immigration policy. The strict lifecycle saving model will be replaced with a more general model that is consistent with the specification described in the preceding section and that allows for bequests. The model will be estimated using the synthetic panel data from the NTAs as discussed in the applications section. It is possible to make wages and interest rates endogenous in a closed economy, and we have begun to do this with simple assumptions about expectations. We will not attempt to construct a model with rational expectations.

For all countries, it will be necessary to project public expenditures, tax policy, and public debt for the future. As described in Preliminary Studies, we have considerable experience in this area and we will also draw on Auerbach's experience in constructing Generational Accounts. There are, however, quite different approaches that one might take. Our previous research has started by projecting conditional on current program structure, except as modified by current legislation (e.g. rising "normal age at retirement" in the US Social Security system is reflected in the projections). Such

projections may be useful for policy makers, and it will be of interest to see the generational and other implications of such projections. These projections and related transfer accounts may inform policy formation. It is also useful, however, to make unconditional projections, particularly since current program rules may lead to massive deficits and rapidly rising debt to GDP ratios that seem impossible in practice. One approach is to set a limit on the debt to GDP ratio, and assume a simple rule (e.g. raise taxes, or reduce benefit levels, or do both) for maintaining fiscal balance (as done in Lee and Miller (1997) in their study of fiscal impacts of immigration in the US. Another approach is illustrated by Gruber and Wise (2001), who estimate the response of different public transfer programs to variations in the proportion elderly in a pooled cross-section time series study of OECD countries over recent decades. They find an elasticity of expenditure on the elderly with respect to their numbers of about .5, indicating that aging populations experience falling expenditures per old person, but rising expenditures on the elderly over all. Such results in the literature provide a basis for incorporating plausible program changes in the projections. Razin and Sadka (2002)) reach an opposite answer to a similar question, and their results also could be used. We have already done some work in which alternative policies for Social Security reform in the US are considered. For example, Lee, Mason and Miller (2003) simulated a partial privatization policy based on the Gramlich proposal. We would then have a range of possible future public expenditure trajectories, and we could analyze the implications of each of these. In addition to analyzing the future implications of new policy proposals, the simulation model will also be used to analyze the historical effects of policies that have been adopted in the past. The simulation model will allow counter-factual analysis through which we consider the possible course of the economy in the absence of any policy reform.

D.4. Data Sources

The quality and extent of data vary considerably among the countries involved in this project, although in all cases we believe that constructing accounts for the second half of the Twentieth Century is an achievable goal. For several of the countries, complete accounts or partial accounts can be extended to a much earlier point. For Japan and Taiwan, data series may be extended back to around 1900, and for the US and France series beginning in the 19th Century can be constructed. Even for Indonesia there is fragmentary information available during the Dutch colonial period that may be exploited to construct early estimates. The major sources of data are identified in Table 4 and complete citations for data sources are provided in the references section. Historical estimates are not emphasized in the compilation in Table 4.

Extensive demographic data are readily available and for some countries have been compiled by team members as part of previous research projects (US, France, Japan, Taiwan). Comprehensive population, fertility, and mortality estimates for Japan and Taiwan are available dating from around 1900 and earlier in the US and France. Population data for Indonesia are available from the late 19th Century and fragmentary data on birth and death rates are available from 1900-1950. For all countries population, fertility, and mortality estimates are available from standard sources from 1950.

National Income and Product Accounts are available for all countries beginning in 1950 and earlier. Estimates of gross domestic product and other economic aggregates have been constructed for the France, Indonesia, Japan, Taiwan, and the US for about 1900 or, in some cases, earlier. The most extensive data are available for France, Japan, and the US.

A critical source of data for this project is household income and expenditure surveys and labor force surveys. These provide data on the age profiles of income and consumption, data necessary to estimate consumption allocation rules, data on inter-household transfers, data on the demographic composition of households and living arrangements, and in some cases information about home ownership, financial assets, and consumer durables. The availability of these data varies widely from country to country.

In Brazil, age profiles of labor earnings will be constructed using data from the *Pesquisa Nacional por Amostra de Domicilios* (PNAD) from 1976 to 2001. The first nationally representative survey of household expenditures was the *Estudo Nacional de Despesa Familiar* (ENDEF), collected in 1974-1975. The *Pesquisa de Orcamento Familiares* (POF) was conducted twice: 1987-1988 and 1996-1997. The *Pesquisa sobre Padroes de Vida* (PPV) was carried out in 1996-1997 by the Brazilian Census Bureau in a joint project with the World Bank. Earnings and expenditure data are more limited for Chile. High quality surveys are available only beginning during the 1980s.

Expenditure surveys are conducted at five-year intervals in France and are available after 1945. We have not yet identified any micro-study of household consumption or saving for pre-World War II, but historical aggregate data from 1820 or 1850 are quite extensive and sometimes detailed.

Prior to 1981, Indonesia's statistics bureau (BPS) collected household income and expenditure survey data annually and, beginning in 1981, on a 3-year cycle. The data are currently available through 1999. Members of the project team have analyzed these data in the past and all available rounds – dating from the mid-1970s – are in our data archives. The Indonesian Family Life Survey (IFLS), a panel survey conducted in 1993, 1997, and 2000, provides a rich source of data

on both money and time transfers and included information on both co-resident and non-coresident family members. The first two rounds of IFLS are currently available and IFLS-3 should be released soon.

Table 4. Major Sources of Data.

Country	**Population by age and sex**	**Life tables**	**Population Censuses**	**NIPA**	**Consumer expenditure surveys**	**Labor Force Surveys**	**Special Surveys**
Brazil	1940-1970 [10]; 1980-2000[5]	CEDEPLAR 1930-1970 [10], 1970-2000[5]	1970, 1980,1991, 2000	1948-2002	ENDEF 1974; POF 1987, 1995	PNAD, 1978, 1979, 1981-1990, 1991-1993, 1995-1999, 2001	PPV 1996
Chile	1950-2000 [5]	1950-2000 [5]	1952, 1960, 1970, 1982, **1992, 2002**	1950-2002	**INE 1987/88, 1996/97**	**ENE, 1986-present**	**CASEN surveys, selected years since 1987**
France	1899-1998	1899-1998	1801-1911 [5], 1914-1999 [various]	1938, 1949-2002, historical estimates available	**EBF 1978/79, 1984/85, 1988/89, 1994/95, 2000/01**	**Enquête Emploi : 1968-2002**	
Indonesia	1955-2000 [5]	1961, 1964/65, 1971, 1996	1961, 1971, 1980-2000 [10]; ICS 1964, 1976, 1985, 1995	1900-2002	**SUSENAS, 1981-2002 [3]**	**Sakernas 1976-1978, 1986-1994, 1996-2001**	**IFLS, 1993, 1997, 1998, 2000**
Japan	1920-2002	1891-2002	1920-1940, 1950-2000 [5]	1888-2002	NSFIE, 1974-1979 [5]; **NSFIE, 1984-99 [5]**	**LFS 1973-2002, ESS 1979-2002 [5]**	**LSA 1999, 2001, 2003**
Taiwan	1905-2002	1905-2002	1905-1945 [5]; 1956, 1966, 1970, 1975, 1980, 1990, 2000	1952-2002	**FIES, 1976-2002**	**LFS, 1976-2001**	**PSFD, 1999-2002; SHLS, 1989, 1993, 1996**
United States	1850-2003	NCHS, 1959-1999. SSA 1900-2003.	1790 - 2000 [10]. **Microdata, 1850-2000 [10].**	BEA, 1930-2003.	CLS, 1888-1890, 1917-1919, 1935-36. **CES, 1960/61, 1972/73, 1980-2002.**	CPS, 1940-2003, **Microdata:1964-2003.**	**PSID, 1968-1999. SIPP, 1983-1996. HRS/AHEAD, 1993 - . Medicare CBS, 1991-1993. NHIS, 1969-2000.**

Notes: Bracketed values indicate survey cycle, i.e., [n] indicates data collected at *n* year intervals. Otherwise surveys are conducted annually. Bold face indicates that individual records are available in machine-readable form. For sources see references section.

The best source of income and expenditure data in Japan is the National Survey of Family Income and Expenditure conducted at five-year intervals. Access to these data is restricted and all analysis must be carried out at the Statistics Bureau in Tokyo. Our team has permission to use the data available in machine-readable form – surveys for 1984, 1989, 1994, and 1999 surveys. Detailed published data are available beginning in the 1950s.

Analysis of Taiwan income and expenditure is based on their annual survey of income and expenditure for 1976-2002. We have used this survey extensively in previous research. Two other recent surveys, both with panel designs, are

available. The Survey of Health and Living Status of the Elderly is a survey of those 60 and older conducted in 1989 with major follow-ups in 1993 and 1996. These data are maintained in the Data Archive of the Population Studies Center at the University of Michigan and are currently available. The first two waves (1999 and 2000) of the Panel Study of Family Dynamics (PSFD) are currently available and the third wave (2002) should be available shortly. Ron Lee is a member of the PSFD International Advisory Board and has permission to use these data and an opportunity to provide input for future rounds of the survey. Both surveys collect extensive information about family members, including non-coresident family members, inter-generational transfers, family decision-making and other features of family relationships.

Earnings data for the US are available from a wide variety of sources including the Census, the Current Population Survey, and the Consumer Expenditure Survey. Consumption data are only available from the Consumer Expenditure Survey. The Current Population Survey is available annually since 1964 in consistent format, and for earlier years for some purposes and for the Consumer Expenditure Survey since 1984. There are also expenditure surveys from 1888-90, 1917-19, 1935-36, 1960-61, 1970-71, 1980-81, and 1982-84.

Developing estimates of public sector accounts depends on two kinds of data: aggregate data on revenues and expenditures by sector and data that can be used to estimate the age profiles of public revenues and expenditure. In general, revenue and expenditure data are widely available. Data on age profiles can often be inferred based on the purposes of the program and information about users. School enrollment rates by age, for example, can be used to estimate expenditures by age.

Turra (2000) has estimated a complete set of public transfer accounts for 1996. These estimates can be readily extended to earlier years. Series of total public sector expenditures are available from official sources at least since 1980 (Medici 1996; Medici and Maciel 1996). The Brazilian Social Security Administration Office has published information about the age distribution of social security beneficiaries since 1991. The data, available in the *Anuario Estatistico da Previdencia Social*, are limited to private sector workers. Age profiles for publicly provided health care can be estimated by combining two data sources: i) the official data (DATASUS) for the age distribution of inpatient benefits, available since 1990; and ii) the self-reported outpatient services available from the household expenditure surveys. Finally, public education can be allocated by age using information on age-specific enrollment rates for the last ten years, provided by the Brazilian Secretary of Education. Official publications from the Secretary of Treasury provide information about total taxes collected in Brazil since 1980.

French historical estimates of public spending are drawn primarily from A. Carry, "Le compte satellite rétrospectif de la France (1820-1996)", in Economies et Sociétés, série HEQ, n° 2-3/1999. Data for pensions are found in A. Reimat, "Histoire quantitative de la prise en charge de la vieillesse en France, XIXe et XXe siècles", in Economies et Sociétés, série HEQ, n°7-8/2001). These studies, in turn, are based on administrative sources such as the Annuaires Statistiques de la France, the Annuaires de l'Enseignement Primaire and the Annuaires de l'Enseignement Secondaire (published at the end of the 19th century.) Anne Reimat also uses the accounts of private or firm pension systems.

In Japan, Professor Ogawa has compiled extensive data on pension, education, and health care systems for the post-war era as part of his on-going analysis of the impact of demography on Japan's economy. In Chile and Indonesia, work has not yet begun on constructing public accounts but data sources appear to be sufficient. Indeed in Indonesia public expenditure and revenue estimates are available for Java beginning in 1816 from estimates compiled by W.M.F. Mansvelt and P. Creutzberg based on Dutch administrative records.

Preliminary work on Taiwan's public sector has begun and is progressing relatively quickly. An-Chi Tung and Paul Liu have constructed estimates of public education to 1950 based on administrative and survey data. Administrative records are sufficient to document Taiwan's health insurance programs during the post-World War II era. Taiwan has not yet adopted a national public pension program.

The most extensive data collection effort for public accounts has taken place for the United States. We derive annual program expenditures from published government statistics (at the federal level, the Office of the President's *Budget of the United States Government* and at the state and local levels combined, the Bureau of the Census's *Annual Survey of Government Finances*). These expenditures are assigned to individuals based on age using survey data such as the Current Population Survey, which provides information on 25 transfer programs. Individuals report either dollar amounts received or program participation. Aggregate totals taken from these surveys are usually 80-90% of the budget totals from government statistics. This is due both to underreporting in surveys and the fact that programs consist both of benefits and administrative costs. We inflate the estimate age profiles derived from the survey by a given percentage so as to match the government's budget totals.

Program participation rates are used for receipt of non-cash benefits like public education, public housing, food stamps, or medical care. For most non-cash benefits, we assume that program participants receive equal amounts of benefits. Therefore, program expenditures are distributed equally among all participants. For example, public high

school expenditures are divided equally among all public high school students. In cases in which a single household member (for example, the mother) receives benefits on behalf of all household members (herself and her children), the entire benefit is allocated to the recipient.

Public sector medical care benefits require special attention. We value these transfers based on actual usage rather than on their medical insurance value. The CPS indicates whether an individual is eligible for Medicare or Medicaid benefits, but it does not indicate whether benefits were received, and if so, their costs. We assign the average level of benefits to all those eligible, conditional on age using published Medicare data. Where such data are not available, we have found that hospitalization rates by age (in the case of Medicare's Hospital Insurance expenditures) or institutionalization rates by age (in the case of Medicaid's nursing home care expenditures) are useful proxies.

The Current Population Survey includes estimates of income, payroll, and homeowner property taxes. Property taxes born by renters were assigned to individuals based on their rents. Sales tax is assigned based on household income levels. Corporate taxes and excise taxes are assigned to individuals according to their dividend and interest earnings. Use taxes such as Medicare's Supplementary Medical Insurance contributions are assigned to individuals based on their participation in the program. Other taxes were assigned based on income tax payments.

Census data are available decennially since 1850. We have been able to create a long time series for the main transfer programs in the U.S.: public education, Social Security, and Medicare. Age profiles of taxation and benefits for public education from 1850 onward were constructed using data on enrollment rates, income and property taxes from the Census combined with published statistics on government budgets. We have also been able to derive age profiles of taxation and benefits for both Social Security and Medicare programs since their inception using administrative data. For the earlier periods, tax payments are generally inferred from census data on home ownership or renter status (the incidence of property tax is assumed to fall on renters). Age profiles of labor earning may be borrowed from later sources, and then adjusted so as to balance with National Accounts for labor income, for example. Data on enrollment by age are available, along with data on costs per pupil. Estimation of the transfer accounts is not straightforward, and it does require assumptions, but we believe that the results are quite solid. For earlier years of the Medicare program, we will build on data compiled by David Cutler and generously shared with us.

Problems we foresee in carrying out this project

We foresee many problems, large and small, in carrying out this project. However, there have been massive changes in transfers over time and there are massive differences between countries. We believe that the real changes and differences will dominate estimation errors. We will assess this view through sensitivity analyses, in which we experiment with alternative assumptions and examine the variations in the outputs.

1. We do not know the most appropriate model of savings behavior. For the measurement of the past, this will arguably not matter. However, for "what if" experiments (including projections), we need to model how individual consumption and saving behavior responds to public transfers, for example, in order to complete the familial accounts. We will experiment with different assumptions and rely on empirical estimates to the extent possible.
2. We are not dealing with transfers of time and, therefore, we will miss an important dimension of transfers. We will attempt to address this problem in subsequent work, following the approach used in Lee and Lapkoff (1988). We will not have the time or resources to incorporate time into this project.
3. Many operational problems arise because there are two sexes. Our population projections are generally female dominant, but two-sexed (meaning that female fertility schedules are used, and no marriage market interactions are modeled). Issues arise when thinking of bequests (transmission to children typically occurs after death of the second spouse). Issues arise when couples divorce and remarry.
4. For various reasons, it is necessary to project into the future, which involves many assumptions. We do not know how public transfer programs and other public expenditures will evolve. We have described, in the body of the proposal, three alternative assumptions about responses to population aging. There are also great uncertainties about the future evolution of health costs (see Lee and Miller, 2002). We do not think it would be helpful to do stochastic projections, although we are equipped to do so.
5. The theory presented in this proposal ignores international capital flows. We will model these in the current project. They do not appear to present any deep problems.
6. Asset prices vary. There are booms and collapses of housing prices and equities. There are unintentional but dramatic changes in the financial status of the general population. These can be handled in a descriptive way. It may be of interest to see how the accounts are affected by such changes.
7. For the historical reconstruction of accounts, we will often have to build data based on pieces of information and assumptions. We have considerable past experience in this approach.

8. The absence of survey data on inter-household transfers for historical periods is a problem that will be addressed in ways discussed above.
9. There are important dimensions of heterogeneity, such as gender, race/ethnicity, immigrant status, and socioeconomic status. These are interesting questions to address for each of these, and in other work Lee has analyzed transfers by immigrant status, education, and race/ethnicity. We believe that we must begin with age and that these other dimensions can be explored later.

D.4. Implementation and Organizational Details

Implementation in each economy will be a collaborative effort. The East-West Center and Andy Mason will take primary responsibility for the collaborative projects in Asia (Japan, Taiwan, and Indonesia). UC-Berkeley and Ron Lee will assume primary responsibility for the US, France, Chile, and Brazil. Alan Auerbach will be a consultant for the project as a whole, drawing on his international experience with generational accounting, and his expertise in public finance. For each economy a leader will be designated who will have the primary operational responsibility for carrying out the work. The East-West Center and UC-Berkeley will be heavily involved in all aspects of the analysis, including in some cases statistical analysis of household surveys. Tim Miller is expected to be involved in the computation and analysis and will ensure comparability across countries. There will be intensive collaboration facilitated by workshops in each year, other meetings of opportunity (professional meetings, etc.), and frequent communications. In several cases, the collection and analysis of the data will be primarily the responsibility of graduate students. For France, Stephane Zuber will be working closely with Antoine Bommier, François-Charles Wolff and Ron Lee. For Indonesia, Turro Wongkaren and Maliki will be working closely with Sri Harijati Hatmadji and Andy Mason. For Brazil, Cassio Turra expects to complete his dissertation by the start time for the project. He and Bernardo Lorenzo Queiroz will be supervised by Ron Lee. For Taiwan, Mun-Sim Lai will be working with An-Chi Tung, Paul Liu, and Andy Mason. Based on their prior experience and the quality of their previous work, we anticipate important original contributions from the graduate students involved in the project. Their participation at this formative stage in their careers will further ensure the continued development and application of these methods in later years.

The individuals collaborating on the project are members of well-established research/academic institutions in their home countries. This facilitates implementation of the project and dissemination of the results in both policy and academic circles. The institutions are the Statistics Bureau and the Nihon University Population Research Institute (NUPRI) in Japan, University of Toulouse in France, ECLAC and CELADE – Population Division of the UN Economic Commission for Latin American and the Caribbean, the Institute of Economics, Academia Sinica in Taiwan, and Lembaga Demografi, University of Indonesia along with the East-West Center and UC-Berkeley.

The project will be implemented in a phased manner. The methodologies for constructing public transfer accounts have been developed using the US as a test case. Private transfer accounts are being developed using Taiwan and, to a lesser extent, Indonesia as test cases. Using seed funds provided by CEDA and the EWC, a workshop was held at Berkeley in January 2004 at which researchers from each of the seven countries discussed problems and progress. A second meeting will be held in June 2004 as part of the Summer Seminar on Population to continue development of and preliminary application of the methodologies for estimating historical accounts. That meeting will also be attended by researchers from China, India, and New Zealand, who have expressed an interest in participating in the project. We hope that they can be included, but would expect them to raise the financial resources required. Future work to be carried out under the project is detailed in Table 5.

First, we will finalize the methodologies for constructing historical transfer account estimates. By the Year 1 workshop, to be held toward the end of the year, we expect each country to construct and to document a full set of historical estimates. These will be presented at the workshop and thoroughly discussed. Any remaining difficulties will be addressed and historical estimates will be finalized during year 2. The development of the core simulation model will be completed by the Year 1 workshop. Testing and parameters will be based on the US and Taiwan. During Year 2, the simulation model will be adapted to other countries as needed. The model will be used to construct transfer account projections that will be presented at the Year 2 Workshop. Documentation of the simulation model and the transfer account projections will also be completed by the end of Year 2. In Year 3, a comparative volume similar to Generational Accounting Around the World or Social Security and Retirement Around the World will be completed.

Applications and policy analysis described in detail above will be concentrated in the third and fourth year of the project, although in the US and Taiwan this work will begin earlier. The focus of this work will be the publication of articles in scholarly outlets. We will also write policy briefs intended for a broader audience that will appear in East-West Center publications, e.g., *Asia-Pacific Population and Policy* and *Asia-Pacific Issues*. An electronic working paper series is also being established to facilitate documentation and discussion of work in progress.

Table 5. Timeline for The Economic Demography of Intergenerational Transfers

Activity	Year 1	2	3	4
Meetings of working group	A	A	A	A
Development of methodology				
Familial transfers	A			
Bequests	A			
Open economy	A			
Construction of historical accounts				
Data collection and cleaning	BCFIJ			
Preparation of preliminary estimates	BCFIJ			
Final estimates	TU	BCFIJ		
Documentation of historical estimates	TU	BCFIJ		
Projection of accounts				
Preliminary projections	TU	BCFIJ		
Finalized projections		TU	BCFIJ	
Preparation of final projections		TU	BCFIJ	
Development of simulation model				
Completion of core model	TU			
Adaptation to all countries		BCFIJ		
Documentation	TU	BCFIJ		
Policy Analysis and Applications	TU	TU	A	A
Design of website and data system				
Documentation standards	A	A		
Full implementation		TU	BCFIJ	
Website development & maintenance	A	A	A	A
Products				
Comparative volume			A	
Research papers	TU	TU	A	A
Policy briefs			A	A

All countries [A], Brazil [B], Chile [C], France [F], Indonesia [I], Japan [J], Taiwan [T], United States [U]

Public Release of Data

Because this project involves the coordinated efforts of seven research teams, we have detailed plans for documenting our procedures and methods throughout the project, so that researchers can all use identical methods for their core estimates and analyses. This will be maintained on a well-organized web site. Likewise, the data generated by individual subprojects will be maintained on this web site, where it can be accessed by other project members and by the public at the completion of the project. The step of making the fully documented data sets publicly available toward the end of the fourth year of the project will be simple and straightforward. All restrictions on accessing the website will be eliminated at that time.

Altonji, J. G., F. Hayashi, et al. (1992). "Is the Extended Family Altruistically Linked? Direct Evidence Using Micro Data." American Economic Review **82**(5): 1177-98.
Altonji, J. G., F. Hayashi, et al. (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.
Arrondel, L. and F. C. Wolff (1998a). "Aides et Dons au Sein de la Famille: Faits et Perspectives Theoriques." Retraite et Societe(24): 29-53.
Arrondel, L. and F. C. Wolff (1998b). "La Nature des Transferts inter vivos en France: Investissements Humains, Aides Financieres et Transmission du Patrimoine." Economie et Prevision(135): 1-27.
Attanasio, O. P. and H. W. Hoynes (2000). "Differential Mortality and Wealth Accumulation." Journal of Human Resources **35**: 1-29.
Attias-Donfut, C. and F. C. Wolff (2000a). Complementarity between Private and Public Transfers. The Myth of Generational Conflict. The Family and State in Ageing Societies. S. Arber and C. Attias-Donfut. London, Routledge**:** 47-68.
Attias-Donfut, C. and F. C. Wolff (2000b). The Redistributive Effects of Generational Transfers. The Myth of Generational Conflict. The Family and State in Ageing Societies. S. Arber and C. Attias-Donfut. London, Routledge**:** 22-46.
Auerbach, A. J., J. Gokhale, et al. (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, et al., Eds. (1999). Generational Accounting Around the World. Chicago, University of Chicago Press.
Bachrach, C. A. (1980). "Childlessness and social isolation among the elderly." Journal of Marriage and the Family **42**: 627-36.
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.
Ben-Porath, Y. (1980). "The F-Connection: Families, Friends, and Firms and the Organization of Exchange." Population and Development Review **6**(1): 1-30.
Bommier, A. and R. Lee (2000). Transfers, Life Cycle Planning and Capital Stocks. PAA Economic Demography Meeting, Los Angeles.
Bommier, A., R. Lee, et al. (1998). Wealth from Flows. Department of Demography Working Papers, University of California - Berkeley.
Bommier, A. and R. D. Lee (2003). "Overlapping generations models with realistic demography." Journal of Population Economics **16**: 135-160.
Bonin, H. (2001). Generational Accounting: Theory and Application. Berlin, Springer.
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.
Bradbury, B. (1994). Measuring the Cost of Children. University of New South Wales.
Bravo, J. (2001). Vieillessement de la Population et Systemes de Retraite: L'Amerique Latin dans une Perspective Internationale, Les Dossier du CEPED No. 62. Paris, France.
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**.
Browning, M. J., F. Bourguignon, et al. (1996). "Household saving: Micro theories and macro facts." Journal of Economic Literature **34**: 1797-1855.

Carroll, C. D. (1992). "The Buffer-Stock Theory of Saving: Some Macroeconomic Evidence." Brookings Papers on Economic Activity **CXII**(1): 1-56.
Chevan, A. and J. H. Korson (1975). "The Widowed who live alone: An examination of social and demogrpahic forces." Social Forces **51**: 45-53.
Chiappori, P.-A. (1988). "Rational household labor supply." Econometrica **52**: 865-72.
Chiappori, P.-A. (1992). "Collective labor supply and welfare." Journal of Political Economy **100**: 437-67.
Chu, C. Y. C. (2000). Panel Study of Family Dynamics. Taipei, Taiwan, Academia Sinica.
Coronado, J. L. (2002). "The Effects of Social Security Privatization on Household Saving: Evidence from Chile." Contributions to Eocnomic Analysis & Policy **1**(1): Article 7.
Cox, D. (1987). "Motives for Private Income Transfers." Journal of Political Economy **95**: 508-46.
Deaton, A. (1985). "Panel data from time series of cross-sections." Journal of Econometrics **30**: 109-26.
Deaton, A. (1991). "Saving and Liquidity Constraints." Econometirca **59**: 1221-1248.
Deaton, A. (1997). The Analysis of Household Surveys: A Microeconometric Approach to Development Policy. Baltimore and London, World Bank.
Deaton, A. and J. Muellbauer (1986). "On Measuring Child Costs: With Applications to Poor Countries." Journal of Political Economy **94**(4): 720-44.
Deaton, A. and C. H. Paxson (2000). Growth, Demographic Structure, and National Saving in Taiwan. Population and Economic Change in East Asia, A Supplement to Population and Development Review. R. Lee and C. Y. C. Chu. New York, Population Council. **26:** 141-173.
East-West Center (2002). The Future of Asia's Population. Honolulu, East-West Center.
Ermisch, J. F. (2003). An Economic Analysis of the Family. Princeton, Princeton University Press.
European Commission (1999). European Economy (6): Generational Accounting in Europe. Belgium, European Commission.
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. (1997). "Transition to a Fully-Funded Pension System: Five Economic Issues." NBER Working Paper **6149**.
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, et al. (2002). "Patterns of Intergenerational Transfers in Southeast Asia." Journal of Marriage and the Family **64**(August): 627-41.
Freedman, V. A., D. A. Wolf, et al. (1991). "Intergenerational Transfers: A question of perspective." The Gerontologist **31**(5): 640-47.
Fry, M. and A. Mason (1982). "The Variable Rate-of-Growth Effect in the Life-cycle Saving Model." Economic Enquiry **XX**: 426-43.
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.
Gruber, J. and D. Wise (2001). "An International Perspective on Policies for an Aging Society." NBER Working Papers **W8103**.
Hammel, E. A., D. Hutchinson, et al. (1976). The SOCSIM Demographic-Sociological Microsimulation Program Operating Manual. Institute of International Studies Research Monograph No. 27, University of California at Berkeley.
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.
Higgins, M. and J. G. Williamson (1997). "Age Structure Dynamics in Asia and Dependence on Foreign Capital." Population and Development Review **23**(2): 261-93.
Holden, S. and J. VanDerhei (2001). "401(K) Plan Asset Allocation, Account Balances, and Loan Activity in 2000." EBRI Issue Brief(239).
Holzmann, R. (1997). "Pension Reform, Financial Market Development, and Economic Growth: Preliminary Evidence from Chile." International Monetary Fund Staff Papers **44**(2): 149-78.
Jellal, M. and F. C. Wolff (2000). "Shaping Intergenerational Relationships: The Demonstration Effect." Economics Letters **68**(3): 255-261.
Jellal, M. and F. C. Wolff (2002a). "Aides aux Parents Ages et Allocation Intra-familiale." Revue Economique **53**(4): 863-885.

Jellal, M. and F. C. Wolff (2002b). "Cultural Evolutionary Altruism: Theory and Evidence." European Journal of Political Economy **18**(2): 241-262.
Kakwani, N. and M. Krongkaew (1999). Thailand's Generational Accounts. Generational Accounting Around the World. A. Auerbach, L. Kotlikoff and W. Leibfritz. Chicago, University of Chicago Press**:** 413-446.
Kelley, A. C. and R. M. Schmidt (1996). "Saving, Dependency and Development." Journal of Population Economics **9**(4): 365-86.
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.
Kobrin, F. (1976). "The fall in household size and the rise of the primary individual in the United States." Demography **13**: 127-38.
Kotlikoff, L. (1999). From Deficit Delusion to the Fiscal Balance Rule: Looking for an Economically Meaningful Way to Assess Fiscal Policy. Generational Accounting Around the World. A. Auerbach, L. Kotlikoff and W. Leibfritz. Chicago, University of Chicago Press.
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. (2002). "Intergenerational Transfers and the Evolution of Aging." under review.
Lee, R. and R. Edwards (2001). The Fiscal Impact of Population Change. Seismic Shifts: The Economic Impact of Demographic Change. J. S. Little and R. K. Triest, Federal Reserve Bank of Boston Conference Series. **46**.
Lee, R. and R. Edwards (2002). The Fiscal Effects of Population Aging in the US: Assessing the Uncertainties. Tax Policy and Economy. J. Poterba. NBER, MIT Press. **16:** 141-181.
Lee, R., A. Mason, et al. (2000). "Life Cycle Saving and the Demographic Transition in East Asia." Population and Development Review **26**(Supplement).
Lee, R., A. Mason, et al. (2002). Saving, Wealth, and the Transition from Transfers to Individual Responsibility: The Cases of Taiwan and the United States. under review.
Lee, R., A. Mason, et al. (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. and T. Miller (1995). Interage Resource Flows in the US: A Descriptive Account. Population Association of America, San Francisco.
Lee, R. and T. Miller (1997). The Lifetime Fiscal Impacts of Immigrants and their Descendants, Draft of Chapter 7 for *The New Americans,* National Academy Press: 297-362.
Lee, R. and T. Miller (1998). The Current Fiscal Impact of Immigrants: Beyond the Immigrant Household. The Immigration Debate. J. P. Smith and B. Edmonston. Washington, D.C., National Academy Press**:** 183-205.
Lee, R. and T. Miller (2000). "Immigration, Social Security, and Broader Fiscal Impacts." American Economic Review: Papers and Proceedings **90**(2): 350-54.
Lee, R. and T. Miller (2001). "An Approach to Forecasting Health Expenditures, with Application to the US Medicare System." Health Services Research(in press).
Lee, R., T. Miller, et al. (2003). The Growth and Aging of California's Population: Demographic and Fiscal Projections, Characteristics and Service Needs, California Policy Research Center, Special Report.
Lee, R. and J. Skinner (1999). "Will Aging Baby Boomers Bust the Federal Budget? Longevity, Health Status, and Medical Costs in the Next Century." Journal of Economic Perspectives **13**(1): 117-40.
Lee, R. and S. Tuljapurkar (1998a). Stochastic Forecasts for Social Security. Frontiers in the Economics of Aging. D. Wise. Chicago, University of Chicago Press**:** 393-420.
Lee, R. and S. Tuljapurkar (1998b). "Uncertain Demographic Futures and Social Security Finances." American Economic Review: Papers and Proceedings(May): 237-241.
Lee, R. and S. Tuljapurkar (2000). Population Forecasting for Fiscal Planning: Issues and Innovations. Demography and Fiscal Policy. A. Auerbach and R. Lee. Cambridge, Cambridge University Press.
Lee, R. and H. Yamagata (2002). "Sustainable Social Security: What Would it Cost?" National Tax Journal **forthcoming**.

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.
Lee, R. D. (2000). Intergenerational Transfers and the Economic Life Cycle: A Cross-cultural Perspective. Sharing the Wealth: Demographic Change and Economic Transfers between Generations. A. Mason and G. Tapinos. Oxford, Oxford University Press**:** 17-56.
Lee, R. D. and S. Lapkoff (1988). "Intergenerational flows of time and goods; Consequences of slowing population growth." Journal of Political Economy **96**(3): 618-51.
Lee, R. D., A. Mason, et al. (2001a). Saving, Wealth, and Population. Population Does Matter: Demography, Poverty, and Economic Growth. N. Birdsall, A. C. Kelley and S. W. Sinding. Oxford, Oxford University Press**:** 137-164.
Lee, R. D., A. Mason, et al. (2001b). Saving, Wealth, and the Demographic Transition in East Asia. Population Change and Economic Development in East Asia: Challenges Met, Opportunities Seized. A. Mason. Stanford, Stanford University Press**:** 155-184.
Lee, Y.-J., W. L. Parish, et al. (1994). "Sons, Daughters, and Intergenerational Support in Taiwan." American Journal of Sociology **99**(4): 1010-41.
Lillard, L. A. and Y. Weiss (1997). "Uncertain Health and Survival: Effects on End-of-Life Consumption." Journal of Business and Economic Statistics **15**(2): 254-68.
Lillard, L. A. and R. J. Willis (1997). "Motives for Intergenerational Transfers: Evidence from Malaysia." Demography **34**(1): 115-34.
Macunovich, D., R. A. Easterlin, et al. (1995). "Echoes of the baby boom and bust: Recent and prospective changes in intergenerational living arrangements of elderly widows in the United States." Demography **32**: 17-28.
Mason, A. (1987). National Saving Rates and Population Growth: A New Model and New Evidence. Population growth and economic development: Issues and evidence. D. G. Johnson and R. D. Lee. Social Demography series, Madison, Wis., University of Wisconsin Press**:** 523-60.
Mason, A. (1988). "Saving, Economic Growth, and Demographic Change." Population and Development Review **14**(1): 113-44.
Mason, A. and S.-H. Lee (2002). Is the Demographic Transition Causing an Increase in Income Inequality? Evidence from Taiwan. under review.
Mason, A. and S.-H. Lee (2003). "Population Aging and the Extended Family in Taiwan: A New Model for Analyzing and Projecting Living Arrangements." Demographic Research.
Mason, A. and L. G. Martin (1982). The Intergenerational Distribution of Income: An Analysis of Japan. Income Distribution and the Family, a supplement to Population and Development Review. Y. Ben-Porath. **8:** 179-191.
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.
Mason, A., N. Ogawa, et al. (2001). Aging, Intergenerational Transfers, and Saving in Japan. Conference on Population Aging in the Industrialized Countries: Challenges and Responses, Tokyo, Japan, under review.
Mason, A. and R. Racelis (1992). "A Comparison of Four Methods for Projecting Households." International Journal of Forecasting **8**(3): 509-27.
Mason, A., R. Racelis, et al. (1996). The Japan HOMES Model: Household Projections, 1990-2025. Tokyo, Japan Statistical Association.
Mason, A., Y.-Y. Teh, et al. (1994). The Intergenerational Distribution of Resources and Income in Japan. The family, the market and the state in ageing societies. J. Ermisch and N. Ogawa. Oxford and New York, Oxford University Press**:** 158-97.
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.
Medici, A. C. (1996). Decentralizacao e Gastos em Saude no Brasil. Federalismo no Brasil. R. Affonso and P. Silva. Sao Paulo, Fundap**:** 297-373.

Medici, A. C. and M. C. Maciel (1996). A Dinamica do Gasto Social nas Tres Esferas de Governo: 1980-92. Federalismo no Brasil. R. Affonso and P. Silva. Sao Paulo, Fundap**:** 41-106.
Michael, R. T., V. R. Fuchs, et al. (1980). "Changes in the Propensity to Live Alone: 1950-1976." Demography **17**(1): 39-56.
Modigliani, F. (1988). Measuring the Contribution of Intergenerational Transfers to Total Wealth: Conceptual Issues and Empirical Findings. Modelling the Accumulation and Distribution of Wealth. D. Kessler and A. Masson. Oxford, Oxford University Press**:** 21-52.
Modigliani, F. and R. Brumberg (1954). Utility Analysis and the Consumption Function: An Interpretation of Cross-Section Data. Post-Keynesian Economics. K. K. Kurihara. New Brunswick, N.J., Rutgers University Press.
Munnell, A. H. (1974). The Effect of Social Security on Personal Savings. Cambridge, MA, Ballinger.
National Research Council (2001). Preparing for an Aging World: The Case for Cross-National Research. Washington, D.C., National Academy Press.
Ogawa, N., M. Kondo, et al. (2002). Long-term perspectives for Japan: An analysis based on a macroeconomic-demographic-social security model with emphasis on human capital. Tokyo, Japan, Nihon University Population Research Institute.
Ogawa, N. and R. D. Retherford (1993). "Care of the Elderly in Japan: Changing Norms and Expectations." Journal of Marriage and the Famiily **55**(3): 585-97.
Ogawa, N. and R. D. Retherford (1997). "Shifting Costs of Caring for the Elderly: Back to Families in Japan." Population and Development Review **23**(1): 59-94.
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. (2001). "Demographic Structure and Asset Returns." The Review of Economics and Statistics **83**(4): 565-584.
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, et al. (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.
Soldo, B. J. (1981). The living arrangements of the elderly in the near future. Aging: Social Change. S. G. Keisler, J. N. Morgan and V. K. Oppenheimer. New York, Academic Press.
Takayama, N., Y. Kitamura, et al. (1999). Generational Accounting in Japan. Generational Accounting Around the World. A. J. Auerbach, L. J. Kotlikoff and W. Leibfritz. Chicago, University of Chicago Press.
Tsakloglou, P. (1991). "Estimation and Comparison of Two Simple Models of Equivalence
Scales for the Cost of Children." The Economic Journal **101**: 343-357.
Turra, C. M. (2000). Contabilidade das Geracoes: requeza, sistemas de transferencias e consequencias de mudancas no padrao demografico brasileiro, CEDEPLAR-UFMG.
Willis, R. J. (1980). The Old Age Security Hypothesis and Population Growth. Demographic Behavior: Interdisciplinary Perspectives on Decision-making. T. Burch. Boulder, Westview Press**:** 43-69.
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**.
Wister, A. V. and T. K. Burch (1983). "Living arrangement choices among the elderly." Canadian Journal on Aging **4**(127-44).
Wolf, D. A. (1995). "Changes in the Living Arrangements of Older Women: An International Study." The Gerontologist **35**(6): 724-31.
Wolff, E. N. (2002). Retirement Insecurity. Washington, D.C., Economic Policy Institute.
Wolff, F. C. (1999). "Altruisme et Coresidence en France." Cahiers Economiques de Bruxelles(164): 457-488.
Wolff, F. C. (2000). "Transferts Monetaires inter vivo et cycle de vie." Revue Economique **51**(6): 1419-1452.
Zhang, J., J. Zhang, et al. (2001). "Mortality Decline and Long Run Economic Growth." Journal of Public Economics **80**(3): 485-507.

Zhang, J., J. Zhang, et al. (2002). "Rising Longevity, Unintended Bequests, and Endogenous Growth." Journal of Development Economics **forthcoming**.

Data references for Brazil

Carvalho, JAM. 1978. *Fecundidade e Mortalidade no Brasil. 1960/1970*. Belo Horizonte UFMG/Cedeplar, 1978. 102p.
Carvalho, JAM. 1988. *O Tamanho da População Brasileira e sua Distribuição Etária: uma Visão Prospectiva*. In: Encontro Nacional de Estudos Populationais. São Paulo: ABEP. p.37-66
Fundação Instituto Brasileiro de Geografia e Estatística. 1981. *Estudo Nacional de Despesa Familiar*. Microdados. 1974-1975. Rio de Janeiro, RJ.
____. 1998. *Pesquisa sobre Padrões de Vida*. Microdados. 1996. Rio de Janeiro, RJ.
____. 1990. *Pesquisa Nacional por Amostra de Domicílios (PNAD)*. Rio de Janeiro, IBGE.
____. 2003a. *Estatísticas do Século XX*. CD-ROM. Rio de Janeiro, RJ.
____. 2003b. *Pesquisa de Orçamentos Familiares*. Microdados. 1987-1988. Rio de Janeiro, RJ.
____. 2003c. *Pesquisa de Orçamentos Familiares*. Microdados. 1995-1996. Rio de Janeiro, RJ.

Data References for Chile

Central Bank of Chile. 2004. *Economic Data Base*. http://si2.bcentral.cl/basededatoseconomicos/900base.asp?usuidioma=i
CELADE. 2002. Estimaciones y Proyecciones de Poblacion. 1950-2050. Boletin Demografico No.69. America Latina y Caribe. Santiago, Chile.
MIDEPLAN. 1998. Encuesta de caracterizacion socioeconomica nacional CASEN: modulo demografia Division Social. Santiago, Chile.
Instituto Nacional de Estadísticas. Various years. *Encuesta Nacional de Empleo.* Santiago, Chile.
____. Various years. *Informe demografico de Chile, segun resultados del censo.* Santiago, Chile.

Data References for France

Institute National de la Statistique et des Etudes Economiques. Various years. *Annuaire statistique de la France*. Paris.
____. Various years. *Enquete Budget des Familles*. Paris.
____. Various years. *Enquete Emploi*. Paris.

Data References for Indonesia

Boomgaard, P., and A . J. Gooszen. 1975. *Changing economy in Indonesia : a selection of statistical source material from the early 19th century up to 1940 . Population trends, 1795-1942*. The Hague : M. Nijhoff.
Central Bureau of Statistics. Various years. *Expenditure for Consumption of Indonesia*. Jakarta.
____. Various years. *National Income of Indonesia*. Jakarta.
____. Various years. *Population of Indonesia. Result of the Population Census*. Jakarta.
____. Various years. *Statistical Yearbook of Indonesia*. Jakarta.
Rand Corp. 2003. *Indonesia Family Life Survey*. www.rand.org/labor/FLS/IFLS/
van der Eng, Pierre. 2002. "Indonesia's Growth Performance in the Twentieth Century," in The Asian Economies in the Twentieth Century, edited by Angus Maddison, D.S. Prasada Rao, and William F. Shepherd. Northampton, MA: Edward Elgar Publishing.

Data References for Japan

Statistics Bureau, Ministry of Public Management, Home Affairs, Post, and Telecommunications. Various years. *Japan Statistical Yearbook*. Tokyo.
____. Various years. *Labor Force Survey*. Tokyo.
____. Various years. *National Survey of Family Income and Expenditure*. Tokyo.
Nihon University. Various years. *Japan Longitudinal Survey of Aging*. Tokyo.

Data References for Taiwan

Directorate-General of Budget, Accounting & Statistics, Executive Yuan the Republic of China. Various years. *Statistical Yearbook of the Republic of China*. Taipei.
____. Various years. *Report on the Survey of Personal Income Distribution in Taiwan Area Republic of China*. Taipei.
Institute of Economics, Institute of Sociology and Office of Survey Research of Academia Sinica. 1999. *Panel Survey of Family Dynamic*. Taipei.
Ministry of the Interior, Republic of China. Various years. *Taiwan-Fukien Demographic Fact Book Republic of China*. Taipei.

Data References for the United States

Centers for Disease Control and Prevention. Various years. *National Health Interview Survey (NHIS).* Hyattsville, MD.
Centers for Medicare & Medicaid Services. Various years. *Medicare Current Beneficiary Survey*. Baltimore, MD.
National Center for Health Statistics. Various years. *Vital Statistics of the United States*.
Social Security Administration. Various years. *Suplemental Security Income (SSI) Annual Statistical Report*. Baltimore, MD.
University of Michigan. Institute of Social Research. 2004. *Panel Study Income Dynamic*. http://psidonline.isr.umich.edu.
____. Various years. *Health and Retirement Survey*. Ann Arbor, MI.
____. Various years. *Health Dynamic among the Oldest Old*. Ann Arbor, MI.
US Bureau of Economic Analysis. 2001. *National income and product accounts of the United States, 1929-2000*. Washington, DC.
US Census Bureau. Various years. *Current Population Surveys*. Washington, DC.
____. Various years. Survey of Income and Program Participation. http://www.sipp.census.gov/sipp/