

A Comparative Study of the Economic Lifecycles and Support Systems
of Thailand and Taiwan

Research Paper

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Abstract

The human lifecycle begins and ends with stages of dependency when consumption exceeds labor earnings. This shortage of labor income or lifecycle deficit makes the young and the elderly depend on resources reallocated from the working or lifecycle surplus ages. The economic lifecycles and the reallocation systems are important; however, they are rarely measured. This paper attempts to measure the economic lifecycles, support systems and economic flows within the family in Thailand. This paper uses the National Transfer Flow Accounts methodology. The results for Thailand are compared with the ones in Taiwan, which are estimated by Mason et al. (forthcoming). Children in both countries rely more on familial than public transfers. The most important source of support for the elderly in Thailand is asset-based reallocations, whereas in Taiwan familial transfers dominate. The major difference between the support systems in Thailand and Taiwan is that public transfers in Thailand are much smaller than in Taiwan.

1. Introduction and Motivation

The human lifecycle begins and ends with stages of dependency when consumption exceeds labor earnings. This shortage of labor income, or lifecycle deficit, makes the young and the elderly depend on resources reallocated from the working or lifecycle surplus ages. The economic lifecycles and the reallocation systems are important; however, they are rarely measured. There is also an unresolved research question of how public transfers affect consumption support for the elderly. The results shed light on the discussion of how public policy towards the elderly impacts the old age support systems.

This paper has three major objectives. The first is to estimate the economic lifecycles of individuals – the age profiles of consumption and production (labor income). The economic lifecycles identify which age groups within the population are dependents and the extent of that dependency. The second is to quantify the individuals' economic forms of age reallocations, which describe how dependents support their periods of dependency. The support provided from the working ages consists of transfers and reallocations through assets. Public transfers are particularly analyzed according to how they affect other support systems of the elderly. The third is to estimate the economic flows within the family to describe how much support people in one age group provide to people in another age group. The estimates show if the family provides a broad base of support to its members.

This paper compares the economic lifecycles and support systems of Thailand and Taiwan, which is estimated by Mason et al. (forthcoming). Thailand and Taiwan share interesting similarities, but there are also important differences. Both countries have a long history of extended family relationships and share common values of familial care, particularly towards the elderly. Further, economic development in Taiwan is more advanced than in Thailand. In both countries, governments play a relatively minor role compared to the private sector. In addition, public policy towards the elderly of these two countries is different. In Taiwan, the government provides larger support towards the elderly through the social security system, whereas the social security system in Thailand is not so developed and does not provide much support to the elderly. The social security

system of Thailand is mainly limited to providing health insurance for the working ages (SSF 2003). It was not until 1999 that the social security system included an old-age pension scheme, which extended public assistance to the elderly. The difference in public transfers to the elderly leads to a striking difference in the old age support systems between Thailand and Taiwan.

The methodology, which is used to measure the economic lifecycle and comprehensive support systems, is the National Transfer Flow Account (Mason et al. forthcoming; www.ntaccounts.org). The NT Flow Account is an accounting system for measuring transfers and reallocations through assets at the aggregate level in a manner consistent with National Income and Product Accounts. The NT Flow Account measures economic flows across age groups that occur because children and the elderly consume more than they produce, relying on reallocations from the working ages through both the public and private sectors. The reallocations through the public sector are, for example, public school construction, student loans and public health care provision. The reallocations through the private sector are, for example, factory construction, consumer loans and familial support of children and the elderly parents. These reallocations can be either cross-sectional (transfers from parents to children) or longitudinal (accumulation of wealth during working ages and dis-accumulation during retirement).

This paper is organized into the followings. The next section reviews the literature on the economic lifecycle and reallocation systems. This is followed with a presentation of the methodology that summarizes the estimation of the National Transfer Flow Account of Thailand. Then, the results are presented and discussed. The final section concludes this comparative study.

2. Literature Review

There are two major areas of literature on the lifecycle and individual elements of the support system. One is based on the lifecycle hypothesis of saving by Modigliani and the other is based on the overlapping generations model by Samuelson. Both literatures

emphasize the economic lifecycle, but each discusses different mechanisms that individuals rely on to support consumption during deficit periods.

The lifecycle hypothesis of saving, developed by Modigliani and others (Ando and Modigliani 1963; Modigliani 1988), shows a well-defined linkage between the consumption plans of individuals and their income and income expectations as individuals pass through different stages of the lifecycle. Young adults may have lower income than their consumption during the early years of their lifespan, which requires them to borrow against future income. Middle-aged adults tend to have higher income sufficient enough to save, accumulate wealth and pay off debt. The elderly earn no income during retirement. To make up for the lack of income during retirement, individuals will save some fraction of their income during their working ages and dis-save during retirement.

The overlapping generations model, introduced by Samuelson (1958), presents the relationship between the population growth rate and the amount of transfers that individuals receive from successive generations to support their old age. At any time period the young population, who has excess income, makes transfers to the elderly, who do not earn income. In the next period when the young population becomes old and can no longer work, they receive support provided by the next young generation. Based on some simple demographic assumptions, the overlapping generations model shows the amount the elderly receive from the younger generation depends on the population growth rate, which determines the size of the younger generation.

Both the lifecycle hypothesis of saving and the overlapping generations model look at reallocation systems in isolation. The lifecycle hypothesis of saving emphasizes an individual's responsibility in supporting consumption, while the overlapping generations model relies on the existence of successive generations in providing support. In addition, both literatures are based on highly stylized models with very simple lifecycle assumptions. For example, the lifecycle consists of two broad age groups, workers and retirees, with perfect survival until the end of the second period. Childhood is not

included in the lifecycle, and the lifecycle starts only when individuals enter the labor market. There is only one dependency period rather than two; therefore, it is not possible to fully explain the economic lifecycle and the reallocation systems of individuals at all age groups. There are more realistic models, such as those of Auerbach et al. (1999), Lee (2000; 1994a; 1994b), Stecklov (1999), Mason and Lee (forthcoming) and Lee et al. (2006). Despite some drawbacks of these two literatures, both the lifecycle hypothesis of saving and the overlapping generations model are polar cases that explain how individuals support their consumption over the lifecycle. These two important literatures successfully combine demography and macroeconomics and lay down the fundamental framework for this field of study.

Both the lifecycle hypothesis of saving and the overlapping generations model discuss the importance of the economic lifecycle. The economic lifecycle can be summarized by the amount consumed at each age and by the amount produced through labor at each age. The human lifecycle begins and ends with stages of dependency, when consumption exceeds labor earnings, which leads to the shortage of income or lifecycle deficit. Based on this perspective, old people are considered economically dependent even if they receive other sources of income, such as asset income and transfer income, which are large enough to finance their consumption. Lifecycle deficit ages receive resources reallocated from those who receive higher labor earnings than their consumption, or lifecycle surplus ages, to bridge the gaps between consumption and labor income. Examples of the economic lifecycle of selected countries are presented in Lee et al. (2006).

Combining the importance of saving and transfers, Lee (1994a; 1994b) developed a comprehensive conceptual and empirical framework of the reallocation systems. In Lee's model, people at each age group solve the discrepancy between consumption and labor income by holding wealth in three forms: capital, credit and transfer. Summing the demand for wealth over all ages in a population yields an aggregate demand for wealth. Capital wealth or real wealth is a form of physical or human capital. Credit wealth is the flow of funds received minus the flow of funds paid out through credit transactions.

Credit wealth of the whole population must sum up to zero because every credit transaction one household pays is equal to amount the other receives. Transfer wealth is the present value of expected future transfers to be received minus transfers to be made. For example, familial transfer wealth is net support that the elderly expect from their family members, while public sector transfer wealth is healthcare or public pension the elderly expect to receive net of taxes to be paid. When one person makes transfers to another, the amount of transfer made by one person is equal to the amount of transfer received by another person. Thus, in a closed economy the sums of current transfers made and received at every instant must be zero. However, the aggregate transfer wealth may not be zero. Transfer systems can obligate the unborn to make future transfers to the living population who themselves have made corresponding net transfers, such as social security benefits, to the previous generation. The aggregate transfer wealth can be either positive or negative. From the point of view of the individual, real wealth and transfer wealth may be a close substitute. From the point of view of macroeconomy, however, real and transfer wealth have very different properties. Real wealth yields valuable services that increase productivity of labor and per capita income. Transfer wealth, on the other hand, yields no productivity service and has no effect on per capita income. It changes the level and age pattern of lifecycle consumption from a given per capita income. Lee uses this framework to estimate intergenerational transfers in the United States, distinguishing education, health and social security programs, but often under a restrictive set of assumptions (i.e., steady-state equilibrium and golden-rule growth).

Following Lee's framework, the individual's economic lifecycle and reallocation systems of Taiwan are estimated by Mason et al. (forthcoming). Mason et al. establish the framework that measures the reallocation systems in an aggregate level, which is called the National Transfer Flow Account. The methodology being employed in this paper builds on Mason et al.'s framework. Age profiles of consumption and production define the economic lifecycle of Taiwan. The reallocation systems are modified from Lee to include transfers and reallocations through assets, combining capital and credit transactions. Transfers are categorized into public and private transfers.

Mason et al. categorize the reallocation systems into public transfers, private transfers and reallocations through assets. Public transfers to the elderly may have some impacts on private transfers and reallocations through assets, but they are not discussed here. There are two important literatures that discuss how public policy towards the elderly affects old age reallocations. The first one is by Barro, which explains the impacts of public transfers such as pay-as-you-go (PAYG) social security benefits on private transfers, and the other one is by Feldstein, which explains the impacts on saving. Both literatures emphasize the significance of public transfers, but each discusses the impacts on different support systems of the elderly.

Following an overlapping generations model, Barro (1974) predicts that as long as current generations are connected to future generations by a chain of operative intergenerational transfers assuming an interior solution for the amount of bequest or gift across generations, public transfers would be fully offset by the amount of private transfers. An increase in public transfers, such as PAYG social security benefits, to the elderly, which are financed by taxing the adult population, would induce the elderly to maintain their consumption pattern and raise the amount of bequest or downward transfers to offset the amount of tax liability imposed on the working population. Adult children may also reduce upward transfers to their elderly parents because public transfers offset these upward transfers.

Extending the framework from the lifecycle model, Feldstein (1974) finds that an increase in public transfers to support the elderly through a PAYG social security system reduces private saving. Feldstein asserts that there are two contrasting effects of social security benefits on saving. First, an increase in social security benefits invariably reduces private saving because social security substitutes for wealth that supports consumption at old age. Second, social security tends to increase private saving. The elderly who receive social security are induced to reduce labor supply and have a longer period of retirement, which requires additional saving to sustain their well-being during the retirement period. The empirical results support the first effect that social security benefits depress private saving.

Both Barro and Feldstein show that public transfers affect old age reallocation systems; however, they look at the impacts of public transfers in isolation. It is important to take a comprehensive view of transfers and saving in general. Looking at the impact of public transfers on a particular support system may yield to a misleading result.

In addition to public transfers, private transfers are also important reallocation systems for the elderly. There is a large body of literature on the importance of familial support to the elderly (Mason 1992; Martin 1989; Hermalin 2002; Biddlecom et al. 2002). There is also a large area of literature on why people make familial transfers (Becker 1974; Becker and Tomes 1976; Cox 1987; Bernheim et al. 1985; Kotlikoff and Spivak 1981; Frankenberg et al. 2002; Lillard and Willis 1997; Lee et al. 1994; Altonji et al. 1997). However, there are few estimates of the amount of support the elderly receive from younger family members. It is important to understand if the elderly have a broad base of support from different younger age groups, or if the elderly have limited support from just one particular age group. Most studies rely on surveys, which do not provide a comprehensive view of familial transfers. Namely, questions about how much food or clothes the elderly receive from their co-resident children were not asked, which makes it unknown from whom the elderly receive familial support.

In summary, there is a large body of important research on the economic lifecycles and reallocation systems, but most of it describes the importance of reallocation systems in isolation. Public policy towards the elderly leads to a change in saving and private transfers, but the comprehensive view of the impacts of public transfers on both systems is rarely described. The major contributions of this paper are to empirically measure the economic lifecycles and comprehensive reallocation systems of individuals at all age groups. The old age reallocation systems show how public transfers affect private transfers and asset-based reallocations. In addition, familial support is large and important, but it is rarely measured. Economic flows within a family from people in one age group to another show if the elderly receive a broad base of support provided from their family members.

3. Methodology: Estimation of the National Transfer Flow Account¹

The National Transfer Flow Account measures the age pattern of intergenerational flows at the aggregate level. There are two parallel elements of The NT Flow Account: the lifecycle deficits and age reallocations. The lifecycle deficits are the difference between consumption and labor income. Age reallocations show how dependents solve their economic lifecycle problem, or how working ages reallocate economic flows to other age groups through different reallocation systems.

Reallocation systems vary along two important dimensions: the governing or mediating institution and the economic form of the reallocation (Mason et al. forthcoming). Both the public and the private sectors are mediating institutions that facilitate the reallocation of resources among individuals. The public sector reallocates resources relying on social mandates embodied in law and regulation, while the private sector reallocates resources relying on voluntary contracts and social conventions. The public sector of the NT Flow Account of Thailand includes the central government, local governments, and social security funds, while public enterprises are excluded from the public sector and considered to be part of the private sector. The private sector consists of households, unincorporated enterprises, private corporations, public enterprises, non-government organizations (NGOs) and other private institutions.

There are three important economic mechanisms used to reallocate resources: capital and property, credit, and transfers. The reallocations through capital, property and credit are combined into asset-based reallocations as shown in Table 1.

¹ Detailed methodology and other information can be found at Mason et al. (forthcoming), www.ntaccounts.org and Chawla (forthcoming).

Table 1: A Classification of the National Transfer Flow Account Reallocations

	Asset-based Reallocations		Transfers
	Capital and Property Reallocations	Credit Reallocations	
Public	Public infrastructure	Public debt Student loan programs Money	Public education Public health care Unfunded pension plans
Private	Housing Consumer durables Factories Farms Land	Consumer credit	Familial support of children and parents Bequests Charitable contributions

Source: Mason et al. (forthcoming)

Assets can be accumulated and dis-accumulated. They provide income to individuals. They are used primarily to reallocate resources from the present to the future. Even though people perceive reallocations through capital as close substitutes for reallocations through property and credit, from the perspective of the macroeconomy, there are important differences between capital, property, and credit.

Capital reallocations are transactions that increase future consumption by foregoing current consumption. Individuals can reduce current consumption when they are young so as to increase the stock of reproducible capital in the present and the future, which subsequently increases the aggregate productive potential of the economy. Capital can be used to reallocate resources from younger to older ages only.

Reallocations through property and credit are similar to capital reallocations because they involve an exchange of economic resources in the current period in return for compensation in one or more future periods. However, property and credit reallocations do not yield a higher aggregate wealth in the future because an increase in the wealth of one group is always balanced by the decline in wealth of another age group. Therefore, the net payments must cancel when summed over the whole population. Property and credit transactions are distinct. First, credit transactions allow one group of individuals to

reduce current consumption and another group of individuals to increase current consumption. The use of credit cards to finance consumption by individuals and the use of public debt, including the printing of money, to finance government programs are examples. Credit transactions can be used to reallocate resources in either direction. Second, the exchange of land and other non-reproducible assets allows one group of individuals to increase or reduce consumption by acquiring or disposing of a non-reproducible asset. Individuals can acquire non-reproducible assets when young and dispose of them when old. Thus, the exchange of land and other non-reproducible assets can be used only to reallocate resources from younger to older ages.

Transfers are the reallocations from one group to another which involve no explicit *quid pro quo*². Transfers can flow in either direction; for example, transfers from older to younger in terms of childrearing and educational transfers or from younger to older by providing old age support and health care for the elderly.

The NT Flow Account is governed by an accounting identity stating that inflows to each age group must equal outflows from each age group. The flow identity is

$$\underbrace{Y^l(a) + Y^A(a) + \tau^+(a)}_{\text{Inflows}} = \underbrace{C(a) + S(a) + \tau^-(a)}_{\text{outflows}} \quad . \quad \mathbf{1}$$

There are three major components of the stream of inflows, which are labor income $Y^l(a)$, asset income $Y^A(a)$ and transfer income $\tau^+(a)$. Asset income is the combination of the return to capital, land and credit. Outflows consist of consumption $C(a)$, saving $S(a)$, and transfer expenditure $\tau^-(a)$.

² There are important models of private transfers, which emphasize that people make transfers in order to exchange goods and services (Cox 1987; Bernheim et al. 1985; Kotlikoff and Spivak 1981). These types of transfers can be made in different forms. For example, parents may give money to their children to purchase services (e.g. personal care) from their children. Parents may finance human capital investment in their children in order to receive old age support from their children (Lillard and Willis 1997). These are not transfers but rather some sort of non-market transaction or intertemporal exchange that involves a *quid pro quo*. Practically, it is difficult to distinguish familial transfers from familial exchange.

The difference between consumption and production, termed the lifecycle deficit, must be matched by age reallocations consisting of asset-based reallocations and transfers. The flow identity from each age group can be rearranged as:

$$\underbrace{C(a) - Y^l(a)}_{\text{Lifecycle deficit}} = \underbrace{Y^A(a) - S(a)}_{\text{Asset-based reallocations}} + \underbrace{\tau^+(a) - \tau^-(a)}_{\text{Net transfers}} . \quad 2$$

Age reallocations

The National Transfer Flow Account of Thailand for 1996 estimated in this paper is shown in Table 2. The total column in Table 2 are control values estimated using data from the National Income of Thailand (NESDB 2001), compiled by the National Accounts Division of the Office of National Economic Development Board (NESDB). The age-specific values are presented in broad age groups to facilitate discussion, but the underlying values are estimated by single-year of age.

Table 2: The National Transfer Flow Account of Thailand 1996, Aggregate, Billion Baht

	Total	Domestic by age				
		0-19	20-29	30-49	50-64	65+
Lifecycle Deficit	552	820	85	-427	-34	108
Consumption	2,949	893	672	927	318	140
Public	470	252	76	90	34	18
Private	2,480	641	596	837	284	122
Less: Labor income	2,397	73	587	1,354	352	31
Age Reallocations	552	820	85	-427	-34	108
Asset-based Reallocations	532	17	102	245	108	60
Income on Assets	1,558	6	181	848	426	97
Less: Saving	1,026	-11	79	604	318	37
Transfers	21	802	-17	-671	-141	48
Public	2	248	-24	-174	-53	5
Private	18	554	7	-497	-88	44
Inter-household Transfers	18	2	4	-3	8	7
Intra-household Transfers	0	551	3	-495	-96	37

Public and private consumption are consumption expenditures of general government and the private sector. Labor income is measured as the compensation of employees plus an estimate of the share of labor income from unincorporated enterprises, not explicitly reported in the National Income Account. Asset income equals operating surplus less an estimate of the share of labor income from unincorporated enterprises. Saving is net saving of general government and the private sector. The aggregates of public and private transfers are net transfers from abroad, such as foreign grants or donations.

Age profiles of the NT Flow Account are estimated, relying on information in the household socio-economic survey (SES). The SES is conducted every two years under the direction of the National Statistical Office Field Division. The survey provides information at the household level, such as household expenditures and income, and at the individual level, such as the characteristics of household members. Estimates by the United Nations (UN 2003) are used to measure population by single-year of age. More details are provided below.

The Lifecycle Deficit

Thailand's lifecycle deficit was large for children (0-19) and for the elderly (65+). The lifecycle deficit for children was 820 billion baht, 92 percent of their total consumption, and the lifecycle deficit for the elderly was 108 billion baht, 78 percent of their total consumption³. The lifecycle deficit was small and negative for those ages 50-64, and large and negative only for adults ages 30-49. However, the lifecycle surplus generated by the working ages was not large enough to compensate total lifecycle deficit of the dependent age groups, which results in an overall deficit of 552 billion baht or 19 percent of total consumption.

Individual's consumption includes both public and private consumption, distinguishing education, health, and other consumption. Public education consumption is allocated to students by using age- and education-level specific enrollment rates, assuming that the cost per student varies across primary, secondary, or tertiary education levels, but does not vary by age within the education level. Public sector health consumption consists of expenditure of public hospitals for inpatients and outpatients and various public health programs, based on the National Health Accounts (NHA) of Thailand (Pongpanitch et al. 2005). Age profiles of inpatient and outpatient health consumption of the public sector are estimated separately. There is no information on the age profiles of inpatients and outpatients of public hospitals in 1996. The out-of-pocket health expenditures are used as proxies for the public inpatient and outpatient health expenditures assuming that the age

³ The average exchange rate of Thailand in 1996 was about 25 baht per 1 USD.

profiles of public inpatient and outpatient health expenditure are the same as the age profiles of out-of-pocket inpatient and outpatient health expenditure. There is no information on the per capita out-of-pocket health expenditures in the SES 1996. Per capita out-of-pocket health expenditures of inpatients and outpatients are tabulated from the special module on private individual health expenditure survey included in the SES 2002 assuming that age profiles of these health expenditures in 2002 are the same as in 1996. Other public sector health consumption and public consumption of other goods and services are allocated on a per capita basis.

Per capita private consumption is estimated from the household survey. The SES reports consumption only at the household level. Individual consumption is estimated by using allocation rules and information on age and number of household members in the survey. Per capita private education consumption is estimated using a regression model. The household consumption of education is regressed on the number of household members in each age group enrolled in school. The coefficients from the regression equation are used as weights to allocate household education consumption to enrolled members. Per capita private health consumption in 1996 is estimated relying on information on per capita private health consumption in 2002. Household health consumption in 1996 is regressed on the per capita private health consumption in 2002 weighted by the number of household members in each age group, allowing that there is the systematic relationship between age and health expenditure by age in a polynomial model. Per capita private consumption of other goods is estimated assuming that children consume less than adults and the consumption is allocated to individuals in the household by using an equivalence scale that gives more weight to adults than children⁴.

Age profiles of labor income are based on individual-level data from the SES of compensation of employees and income from unincorporated enterprises. Following Mason et al. (forthcoming), two-thirds of income from unincorporated enterprises is classified as a return to labor and one-third is a return to capital. Age profiles of income

⁴ For more detail of the estimation of private consumption of other goods and services please refer to <http://www.schemearts.com/proj/nta/web/nta/show/Documents/Flow%20Account%20Methods#H-84r1w3>

from farm and non-farms enterprises are used to allocate the two-thirds of income from unincorporated enterprises to individuals across age groups.

Age Reallocations: Assets

Asset income equals operating surplus less two-thirds of income from unincorporated enterprises. Property income profile, which consists of incomes from rent, interest, and dividend, is used to allocate operating surplus. Following Mason et al. (forthcoming), only the household head⁵ receives asset income.

Saving by age is estimated as a residual. Based on equation 2, saving is computed from income from asset $Y^A(a)$ plus transfer received $\tau^+(a)$ less transfer payments $\tau^-(a)$ plus labor income $Y^l(a)$ less consumption $C(a)$. Similar to private asset income, only the household head saves.

Age Reallocations: Transfers

There are two kinds of transfers: public and private transfers. Private transfers are categorized into two forms: inter-household transfers (transfers between two households) and intra-household transfers (transfers between individuals who belong to the same household). In all cases net transfers is computed as the difference between two profiles, which are transfers received, called inflows, and transfer payments, called outflows.

Public transfer inflows are benefits that people receive from the public sector, such as public in-kind transfers and public cash transfers. Public in-kind transfer inflows are equal to government consumption expenditure. Estimation method of the age profile of government consumption is described in the lifecycle deficit section above. Public cash transfer inflows are social security benefits and other public cash transfer. The social security system in Thailand primarily provides health insurance for workers, with little or no benefits targeted to children and the elderly. Thus, individuals' social security benefit

⁵ Household head defined here is the economic head who is the principal earner in the household or the person who owns the most income combined from wage, entrepreneurial income and property income. The definition of economic head is used rather than administrative or self-reported head in order to compare the results with Taiwan, which uses the concept of economic head.

is estimated using the per capita private health consumption profile of workers. Other public cash transfer inflow is allocated equally to everyone.

Public transfer outflows are tax payments and social security contributions. There are three general types of taxes: personal income tax, corporate income tax, and indirect tax. In addition to taxes, surplus generated by government enterprises, service fees and other similar activities are treated as public transfer outflows in the NT Flow Account of Thailand. Following the approaches used to construct the NT Flow Account of Taiwan by Mason et al. (forthcoming) and Generational Accounts (Auerbach et al. 1999), the age profiles of tax payments are estimated based on the assumption that the incidence of the tax falls on the entity that pays the tax. The age profile of personal income tax is estimated using income from wage, income from unincorporated enterprises and property income. The age profile of corporate income tax is estimated using wage income because in a small open economy the capital tax incidence is on labor (Kakwani and Krongkaew 1999). Indirect taxes consist of value-added tax, sales taxes and import taxes. Assuming that all indirect taxes are borne by owners of factors of production, namely labor and capital but not on consumers, indirect taxes are allocated to individuals proportionally to their labor and non-labor income.

Inter-household transfers can be tabulated directly from the survey data. Inter-household transfer inflow is the amount of gifts or transfers received from other households. Inter-household transfer outflow is the amount of gifts or transfers given to other households. Inter-household transfers are assumed to flow between household heads.

For intra-household transfers, household members who consume more than their “disposable income” receive intra-household transfers from those who consume less than their “disposable income”. Disposable income is defined as labor income plus net public cash transfers (cash inflows less taxes) plus net inter-household transfers. If a household has total disposable income of all members combined more than total private consumption of all members combined, the surplus is transferred to the household head and saved. On the other hand, if a household has total disposable income less than total

private consumption, the household head makes additional intra-household transfers to finance this deficit by using asset income, dis-saving or by acquiring debt. Intra-household transfers to support consumption are financed by imposing a household specific flat-rate tax on each member's surplus income. Within the household, each member is taxed at the same rate. The tax rate does not vary by age. Please refer to Mason et al. (forthcoming) and www.ntaccounts.org for more details.

The components of the NT Flow Account estimated in the described methods are divided by population by age to present per capita values. All age profiles presented in the next section are smoothed using "the super smooth method" or the *supsmu* command in "The R Project for Statistical Computing" (<http://www.r-project.org>; Friedman 1984).

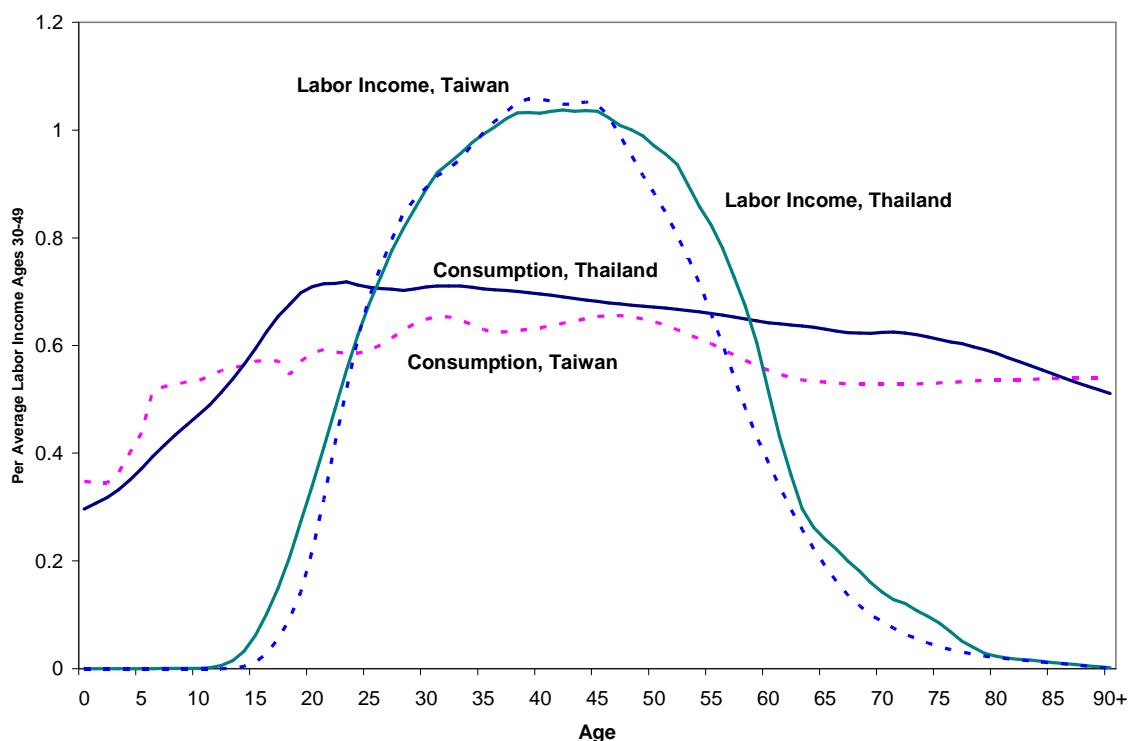
4. Results and Discussion

This section is presented in three parts: the lifecycle deficit (the economic lifecycle), the reallocation systems, and the economic flows within a family. The results of Thailand in 1996 are compared with those of Taiwan in 1998, which are estimated by Mason et al. (forthcoming).

4.1. The Lifecycle Deficit

The lifecycle deficit (or the economic lifecycle) of Thailand and Taiwan is defined by the production (labor income) and consumption age profiles shown in Figure 1. To facilitate comparison, all the age profiles are scaled by dividing by the simple average of per capita labor income from ages 30-49. Children and the elderly of both countries consume more than they produce, resulting in large lifecycle deficits. The working age groups produce more than they consume, generating a lifecycle surplus.

Figure 1: Per Capita Consumption and Labor Income of Thailand 1996 and Taiwan 1998



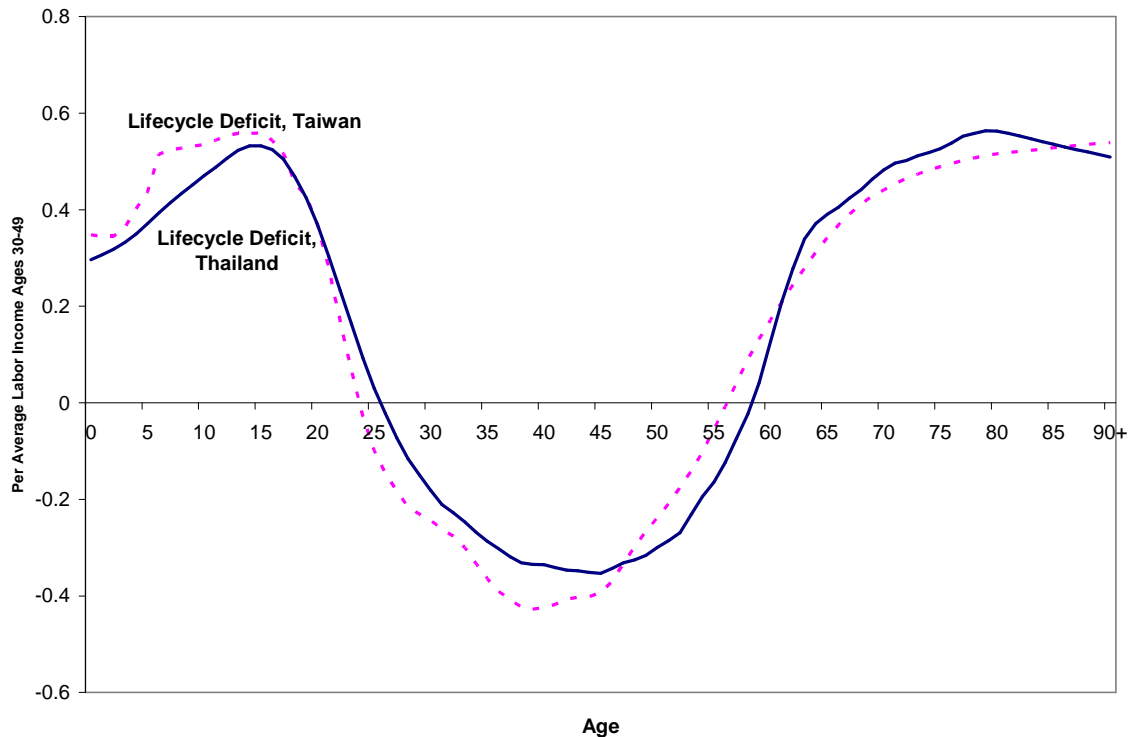
Source: Age profiles of Taiwan are reproduced from Mason et al. (forthcoming)

The labor income age profiles of Thailand and Taiwan have a similar inverse U-shape. The labor income profiles of young workers increase with age in both countries. The labor income profile among young workers (ages 13-24) of Thailand is higher than in Taiwan, indicating that the earnings of young workers relative to prime age adults (ages 30-49) in Thailand are higher than in Taiwan. The labor income profiles of both Thailand and Taiwan reach a peak at around the ages of late thirties to mid forties. The labor income profiles of old workers decline in both countries, but the decline starts at a younger age in Taiwan than in Thailand. The major difference in the labor income profiles between these two countries is that labor income profile for old workers in Thailand is much higher, indicating that the earnings of old workers relative to prime age adults in Thailand is larger than in Taiwan.

In both countries, the consumption profiles are low among children. Per capita consumption of young children (younger than 14) in Taiwan, expressed relative to average labor income for adults 30-49, is slightly higher than in Thailand. Then, consumption profile of Thailand increases steeply and exceeds the profile of Taiwan. Consumption profile of Thailand after age 14 is higher than Taiwan, indicating that people in Thailand consume, relative to labor income of ages 30-49, at higher levels than in Taiwan. Consumption in Thailand reaches a peak at around age 19-24, which is younger than the one in Taiwan at around age 44-49. After reaching a peak, consumption in both Thailand and Taiwan steadily declines. In both countries, consumption by the elderly (ages 65 and older) is lower than consumption by working ages. There is a major difference in consumption by the elderly between Thailand and Taiwan. In Thailand, the elderly continually consume less when they are older, particularly among those older than 80. On the other hand, consumption by the elderly in Taiwan is rather stable. Details of the components of consumption are beyond the objectives of this paper and will not be discussed here.

The lifecycle deficits of Thailand and Taiwan are shown in Figure 2. The age at which individuals produce more than they consume or become net producers is surprisingly late. In Thailand, young adults begin to produce more than they consume at age 26; in Taiwan at age 24. The age at which individuals are no longer net producers comes surprisingly early. In Thailand, adults no longer produce as much as they consume at age 59; in Taiwan at age 57. The span of years during which there is a lifecycle surplus is surprisingly the same in both Thailand and Taiwan at 33 years.

Figure 2: Per Capita Lifecycle Deficit of Thailand 1996 and Taiwan 1998



Source: Age profiles of Taiwan are reproduced from Mason et al. (forthcoming)

The lifecycle deficits of young children in both countries increase with age and reach a peak at around age 15. The lifecycle deficit of young children in Taiwan is larger than in Thailand, primarily due to greater consumption by children in Taiwan. The lifecycle deficits start to decline when young adults begin to earn labor income and partially support their consumption. Owing to a steeper increase in labor income of young workers in Taiwan, the lifecycle deficits of Taiwan turn to be a lifecycle surplus at a younger age than in Thailand. The lifecycle surplus is primarily generated by younger workers in Taiwan and older workers in Thailand. The lifecycle surplus ages in Taiwan reach a peak at around ages of late-thirties, which is younger than in Thailand at around ages mid-forties. After reaching a peak, a lifecycle surplus of both Thailand and Taiwan continually declines. Owing to a decline in labor income at a younger age in Taiwan than in Thailand, a lifecycle surplus turns to a lifecycle deficit at a younger age in Taiwan (57) than in Thailand (59). The lifecycle deficits of the elderly continually increase. The lifecycle deficits of the elderly in Thailand are slightly higher than the ones in Taiwan.

4.2. The Reallocation Systems

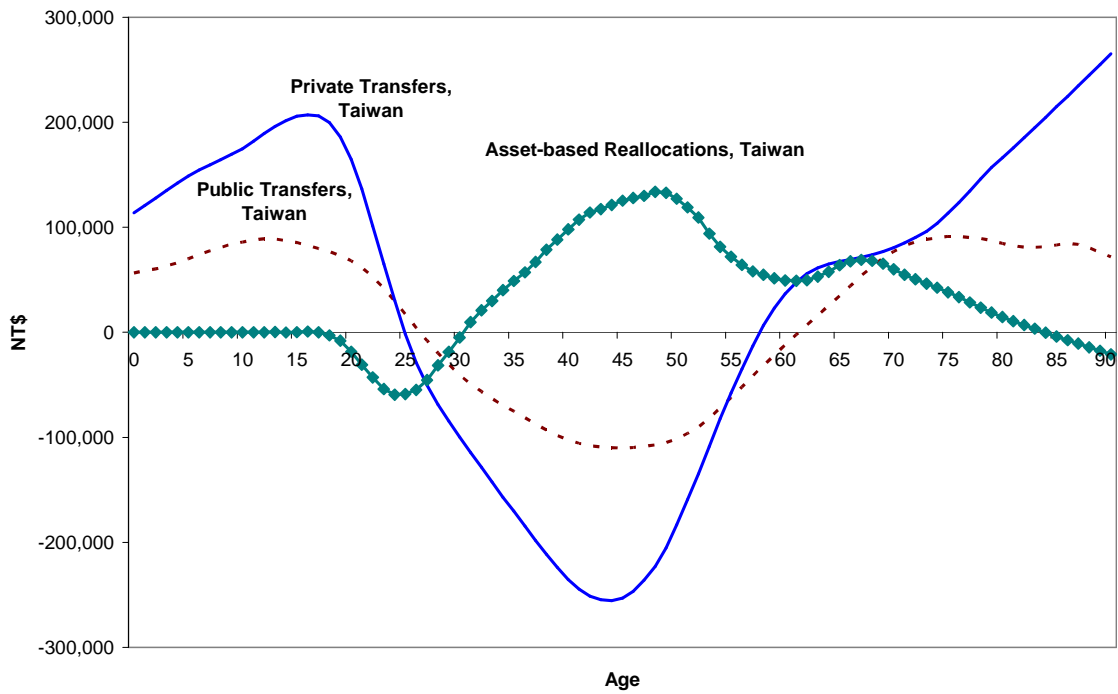
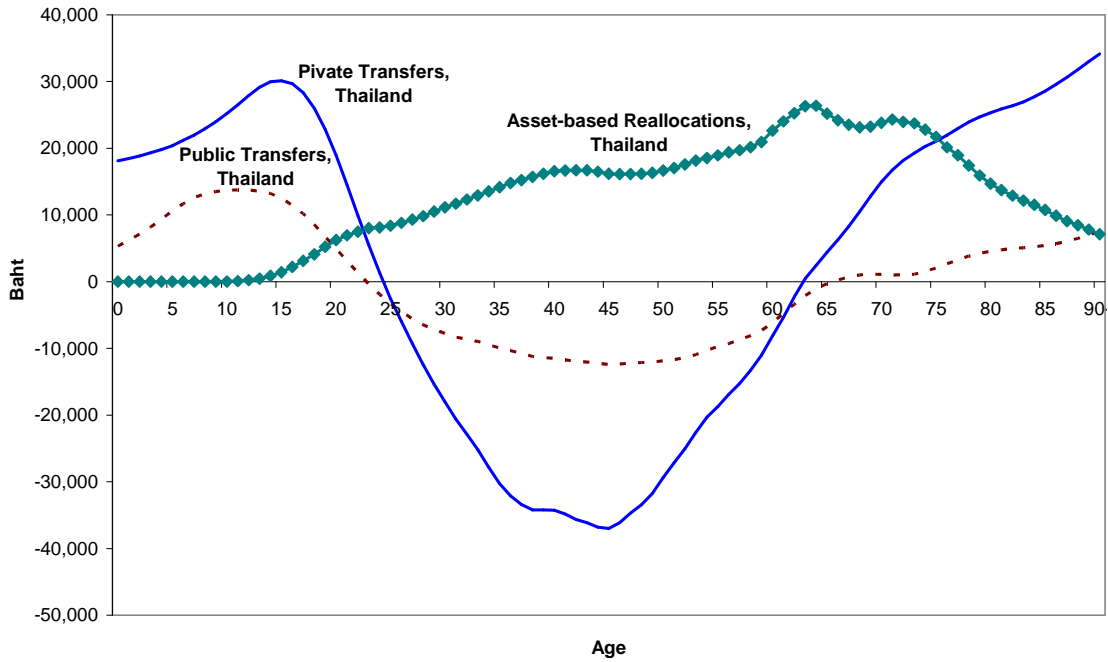
The reallocation systems in terms of per capita flows of Thailand and Taiwan are shown in Figure 3. There are three economic forms used to reallocate resources, which are asset-based reallocations (asset income minus saving)⁶, public transfers and private transfers. Positive values are inflows to age groups and negative values are outflows. Child reallocation systems are presented first, followed by old age reallocation systems. Then, the relationship between public transfers and other old age reallocations are presented last.

4.2.1. Child Reallocation Systems

The reallocation systems for children (0-19) are similar in Thailand and Taiwan. In both countries, transfers dominate the reallocation systems for children. Familial transfers in both Thailand and Taiwan are larger than public transfers. Familial transfers to children in Thailand and Taiwan account for 70 percent of child reallocations, whereas public transfers account for 30 percent. It is not surprising that young children (younger than 15) in both countries do not rely on assets. Young children do not earn asset income. They also have limited access to the credit market; hence they cannot finance their consumption by acquiring debt. It seems that the reallocation systems for young children in both Thailand and Taiwan do not support the lifecycle hypothesis of saving. On the contrary, transfers are more important, which confirms Lee's model (Lee 1994a; Lee 1994b) that includes children in the economic lifecycle.

⁶ Public and private asset-based reallocations are combined. Bequests are not considered here.

Figure 3: Per Capita Age Reallocations of Thailand 1996 and Taiwan 1998



Source: Age profiles of Taiwan are reproduced from Mason et al. (forthcoming)

Note: The average exchange rate of Thailand in 1996 was about 25 Baht per 1 USD and the rate of Taiwan in 1998 was about 32 NT\$ per 1 USD.

The main distinction of the child reallocation systems in Thailand and Taiwan is more obvious for people in the age group 15-19. People in this age group in Thailand but not in Taiwan rely more on asset-based reallocations, particularly through acquiring debt. In Thailand, some household heads in this age group make intra-household transfer outflows to deficit members more than they receive intra-household transfers from surplus members. They need to rely on asset-based reallocations to finance the excess intra-household transfer outflows. However, asset income by people of this age group is not large enough. People in this age group may either dis-accumulate assets transferred from older household members or borrow money from the credit market. The dis-accumulation of assets or acquisition of debt results in an upward sloping age profile of asset-based reallocations by people in this age group in Thailand. It is surprising that people in this young age group could borrow from the credit market. Student loans program in Thailand is also small and limited to poor children.

4.2.2. Old Age Reallocation Systems

The major source of support for the elderly in Thailand is from asset-based reallocations, whereas in Taiwan it is familial transfers. Asset-based reallocations account for about 55 percent of all old age reallocations in Thailand, much larger than those in Taiwan where the figure is about 22 percent. Familial transfers are also an important source of support for the elderly in both Thailand and Taiwan. The elderly in Thailand rely less on private transfers than they do in Taiwan. Private transfers account for about 40 percent of all old age reallocations in Thailand, compared to 45 percent in Taiwan. The major difference in the old age reallocations between Thailand and Taiwan is the importance of public transfers. Public transfers to the elderly in Thailand are substantially lower than in Taiwan. The percentage of net public transfers to all old age reallocations is about 4 percent in Thailand, as compared to about 33 percent in Taiwan.

Age profiles of asset-based reallocations in Thailand and Taiwan differ greatly. In Thailand asset-based reallocations increase with age and reach a peak at the early-sixties. Consumption by people in this age group is almost entirely financed by asset-based reallocations, which confirms the lifecycle hypothesis of saving. The elderly between the

age group of mid-sixties and mid-seventies in Thailand also receive large asset-based reallocations, which are their most important source of support. After reaching the mid-seventies, the elderly receive lower asset-based reallocations. In Taiwan asset-based reallocations are high among adults in the age group 40-54. Then, asset-based reallocations decline with age, excepting for the slight increase among those in the age group 62-67. The elderly in Taiwan do not rely much on asset-based reallocations as compared to familial and public transfers. In summary, the elderly in both Thailand and Taiwan receive lower asset-based reallocations with age and they cannot use asset-based reallocations to entirely finance consumption. The lifecycle hypothesis of saving is more important to explain the consumption finance mechanisms for the elderly in Thailand than in Taiwan⁷.

There are many possibilities that lead to a decline in asset-based reallocations of the elderly. One of them is from the expectation that the elderly live longer than they have planned, so they might have partially liquidated some of their assets in order to finance consumption in early periods. Apart from income generated from assets, the elderly in Thailand have limited source of income. For example, social security system in Thailand is not so developed to provide old age support, similar to an annuity market that allows the elderly to receive a constant flow of income until death. Thus, a steep decline in asset-based reallocations would affect how the elderly support their consumption. Despite a steep decline in asset-based reallocations of the elderly, consumption by the elderly in both Thailand and Taiwan does not decline so much. This finding is in contrast to Hansen and Imrohoroglu (2006), claiming that in an absence of annuity market that allows individuals to receive a constant flow of income until death, consumption by the elderly will decline steeply as the elderly get older. Consumption by the elderly declines because the elderly have lower asset income to finance their consumption. In both countries, consumption by the elderly does not decline much with asset-based reallocations because the elderly receive larger support from their family when they are older.

⁷ Bequests are not estimated separately and they include in saving. The results will be different if bequests are taken into consideration.

Age profiles of private transfers show that the elderly in both Thailand and Taiwan receive larger support from their family when they are older. However, there are some differences between these age profiles. Net private transfers turn positive at an older age in Thailand (63) than in Taiwan (58). The elderly in Thailand receive more support from asset-based reallocations, allowing them to rely less on their family. In addition, private transfers to the elderly in Thailand increase continually with age, whereas private transfers in Taiwan increase steadily between age group 65-74 before rising steeply for the age group 75 and older.

The difference in the public policy towards the elderly (i.e. the social security system) leads to smaller public transfers in Thailand than in Taiwan. The social security system in Thailand was not so much developed and did not target the elderly, which is in contrast to Taiwan. Age profile of public transfers in Thailand is also different from the one in Taiwan. Net public transfers in Thailand turn positive at older age in Thailand (66) than in Taiwan (62). The elderly in Thailand are required to pay more taxes (public transfer outflows) until older age, but they do not receive so many benefits (public transfer inflows) as compared to the elderly in Taiwan.

4.2.3. Impacts of Public Policy on Old Age Reallocation Systems

The purpose of this part is to explain how a change in public transfers to the elderly affects old age reallocations in both Thailand and Taiwan. Figure 3 shows that when the elderly in both countries are older, they receive different amount of public transfers. In Thailand public transfers to the elderly increase with age. In contrast, public transfers in Taiwan increase with age up to at age 74 before remaining stable. A change in public transfers to the elderly when the elderly get older may affect how the elderly in both Thailand and Taiwan rely on private transfers and assets.

Public transfers to the elderly affect private transfers in Thailand and Taiwan similarly. The results show that when the elderly ages 65 and older in Thailand and ages 65-74 in Taiwan are older, they receive higher public transfers together with private transfers. However, when the elderly in the age group 75 and older in Taiwan are older, they

receive rather stable public transfers together with higher private transfers. Public transfers to the elderly ages 75 and older in Taiwan do not have any impact on private transfers. Private transfers from adult children to their elderly parents in both Thailand and Taiwan do not crowd out public transfers. Overall, there is no evidence of the negative relationship between public and private transfers to the elderly in both Thailand and Taiwan. Thus, the results do not support the prediction by Barro, which states that public transfers to the elderly would fully offset private transfers.

Asset-based reallocations respond to a change in public transfers to the elderly differently in Thailand than in Taiwan. The results show that when the elderly ages 65 and older in Thailand and ages 65-74 in Taiwan are older, they receive higher public transfers but lower asset-based reallocations. The elderly in both Thailand and Taiwan may reduce their asset holdings if they realize that they would receive higher public transfers in the future. The elderly in these age groups in both countries may also view public transfers as a substitute for wealth that supports consumption at old age. Since public transfers simultaneously increase with a decline in asset-based reallocations, which lead to little change in wealth, an increase in public transfers would induce the elderly in these age groups to reduce their capital accumulation. However, when the elderly in the age group 75 and older in Taiwan are older and receive rather stable public transfers, they receive lower asset-based reallocations. Public transfers to the elderly in the age group 75 and older in Taiwan are rather stable and would not have any impact on the decline in asset-based reallocations. Overall, there is the negative relationship between public transfers and asset-based reallocations in Thailand, which supports the claim by Feldstein that public transfers depress saving. However, there is no strong evidence to support the claim by Feldstein in Taiwan. Public transfers to the elderly in the age group 75 and older in Taiwan do not have negative effect on how the elderly rely on asset accumulation.

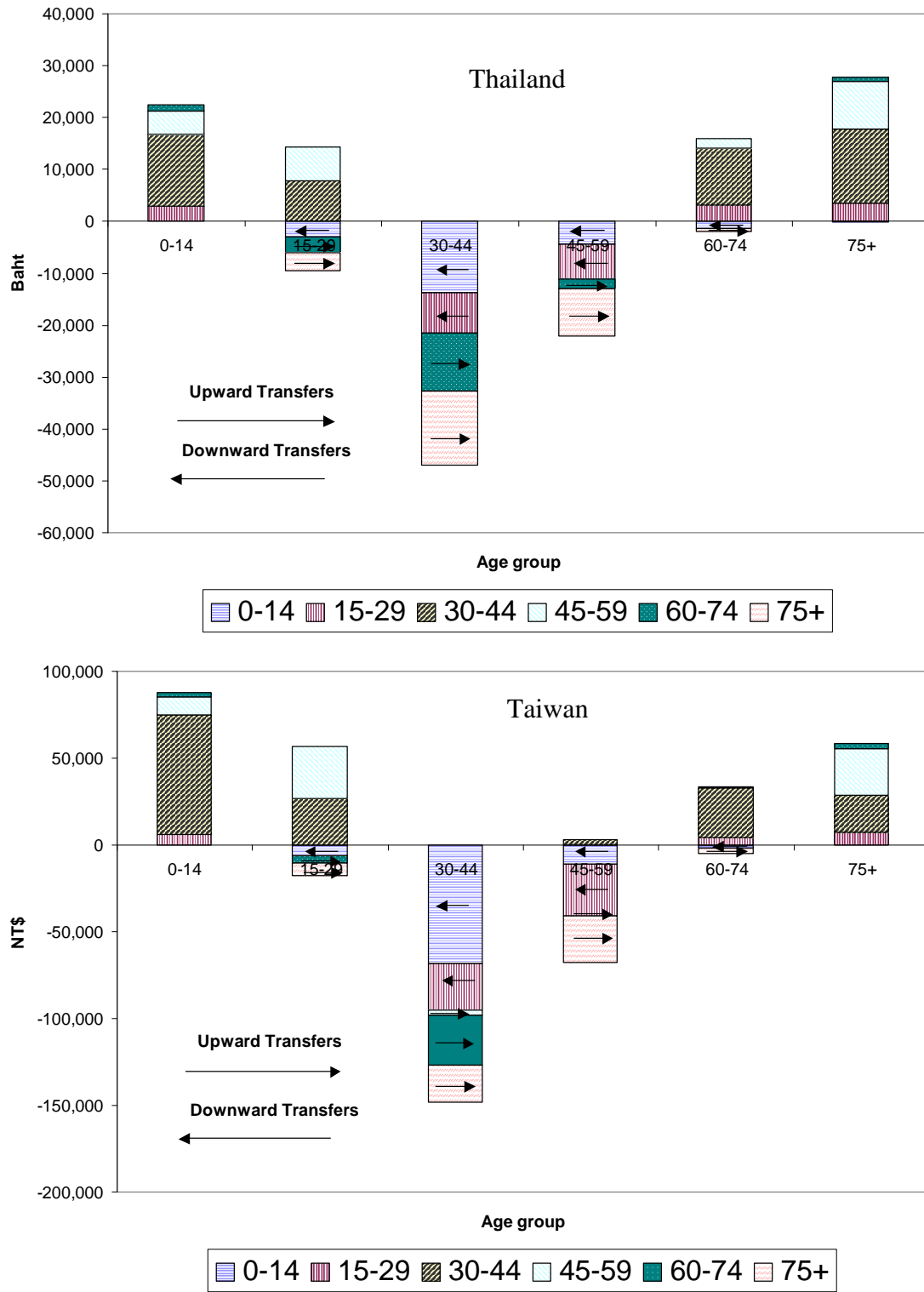
4.3. The Anatomy of Economic Flows within a Family

The economic flows within a family in supporting children and the elderly prove to be large and important in both Thailand and Taiwan. People in one age group may both receive transfers and simultaneously provide transfers to people in different age groups.

However, to what extent people in one age group support people in another age group remains unknown. The main purpose of estimating the economic flows within a family is to determine if the family provides a broad base of support to its members. For example, even though children in both Thailand and Taiwan receive the largest share of support from their parent's age group, they also rely on support provided from other generations. It is important to measure if children and the elderly are able to diversify their sources of support within a family. In this part the age profiles of those who receive and make intra-household transfers to other age groups in Thailand are compared with Taiwan.

Figure 4 presents net intra-household transfer received grouped in 15 year age intervals. Net intra-household transfer received from other age groups is positive if people in a given age group receive more than they make transfers to other age groups. On the other hand, net intra-household transfer received from other age groups is negative if people in a give age group make more than they receive transfers to other age groups. There is no net intra-household transfer received within the same age group because the amount of transfer received is equal to transfers made to its own age group.

Figure 4: Per Capita Net Intra-household Transfer Received of Thailand 1996 and Taiwan 1998



Source: Age profiles of Taiwan are reproduced from Lai (2006)

The values compiled in the first bar are the imputed flows from people in other age groups to people in the age group 0-14. The values in the first bar are all positive, which means that people in all other age groups have net transfers to people in age group 0-14. The values vary greatly within the bar. The age profiles of those who make transfers to the age group 0-14 in Thailand are similar to Taiwan with the largest transfers from those ages 30-44, which is their parent's age group; the generation length in both countries is about 30 years. It is clear that children in Taiwan rely on transfers from those ages 30-44 more than children in Thailand. In other words, children in Thailand have broader base of support from other age groups. About four-fifths of per capita transfers to children in Taiwan are from the age group 30-44, compared with three-fifths in Thailand. Children in Thailand rely more on their older relatives in the age group 45-59.

Older children and young adults in the age group 15-29 both receive net transfers from individuals in some age groups and make small net transfers to others. People in this age group receive transfers from their parents or older relatives age group 30-44 and age group 45-59. In Thailand, people in the age group 15-29 are more likely to receive transfers from the age group 30-44, while in Taiwan they are more likely to receive from the age group 45-59. People in the age group 15-29 make transfers to three other age groups: 0-14, 65-74 and 75 and older. In both countries, people in the age group 15-29 make larger transfers to the elderly than to children.

People in the age groups 30-44 and 45-59 make net transfers to children and the elderly. There are large gross transfers between age groups 30-44 and 45-59, but they almost offset each other, resulting in a small amount of net intra-household transfer received by the age group 30-44 in Thailand and by the age group 45-59 in Taiwan.

There are some differences in the age groups who receive transfers from the lifecycle surplus ages. People ages 30-59 in Thailand are more likely to make larger transfers to the elderly. On the other hand, the lifecycle surplus ages in Taiwan make larger transfers to the younger age groups. Overall, both countries have downward intra-household transfers. The mean age of intra-household transfers received in Taiwan is 28.4 years old,

which is younger than in Thailand at 31.3 years old. Both countries have about the same mean ages of intra-household transfer outflows, which are 41.3 in Taiwan and 41.1 in Thailand.

Familial support to the elderly in Thailand is similar to Taiwan. The elderly in both age groups receive transfers from their adult children, and they simultaneously provide support to their grandchildren (0-14). The elderly ages 75 and older also receive support from those 60-74, which could be their younger spouse, younger siblings or children. The young elderly (60-74) receive support transfers for the first time from their children and young relatives in the age group 15-29 with an average receiving 3,043 baht (or \$122 U.S. Dollars) in Thailand and NT\$ 4,440 (or \$138 U.S. Dollars) in Taiwan from the average young adult. The amount of transfers increases when both the elderly and adult children are older. Surprisingly, in both countries people in the age group 60-74 do not receive much support from the age group 45-59 as they receive from the younger age group 30-44. The age skipping or the small amount of transfers between the age group 60-74 and the age group 45-59 is partly because the old adults in the age group 60-74 lack a broad base of support, and they extensively rely on support from their children. Given the generation length of 30 years, people in the age group 60-74 are more likely to receive support from the age group 30-44, which is their children's age group. The elderly receive the largest transfers when they are 75 and older from adults ages 30-44 in Thailand and from those ages 45-59 in Taiwan.

5. Conclusions

The economic lifecycle begins and ends with the stage of dependence. The age at which people begin to produce more than they consume or become net producers in Thailand is 26, older than at age 24 in Taiwan. The age at which people no longer produce more than they consume is 59 in Thailand, older than at age 57 in Taiwan. The span of years during which there is a lifecycle surplus is the same in both countries at 33 years.

Children and the elderly have different mechanisms to support their economic lifecycle. In both countries, children mainly rely on transfers from their family members more than

the public sector. The major findings of this study are on the differences in the support systems for the elderly. The most important source of support for the elderly in Thailand is asset-based reallocations, whereas for those in Taiwan it is familial transfers. In addition, the main difference in old age reallocations between Thailand and Taiwan is the importance of public transfers. The elderly in Thailand do not receive large net public transfers, unlike those in Taiwan.

Public transfers may have some impacts on private transfers as well as asset-based reallocations. The results show that public transfers in Thailand are not offset by private transfers. There exists a positive relationship between public transfers and private transfers in Thailand, which does not support the prediction by Barro. Similarly to Thailand, the elderly in the age group 65-74 in Taiwan receive higher public transfers together with private transfers. However, the elderly in the age group 75 and older receive higher private transfers, but their public transfers are rather stable. The relationship between private transfers and public transfers in Taiwan does not support Barro, either. In addition, there is a negative relationship between public transfers and asset-based reallocations in Thailand, which confirms claims by Feldstein. In the contrary, public transfers in Taiwan have no negative effects on asset-based reallocations. The difference in public policy towards the elderly leads to the difference in public transfers.

Both Thailand and Taiwan have downward intra-household transfers. Children and the elderly receive more transfer than they make, whereas the working ages make more transfers than they receive. The mean age of transfers received in Taiwan (28.4) is younger than in Thailand (31.3), which shows the more importance of transfers to children in Taiwan. The difference in the living arrangements in these two countries may contribute to the difference in the pattern of familial transfers and requires further investigation.

References

- Altonji, J., F. Hayashi, et al. (1997). "Parental Altruism and Inter Vivos Transfers; Theory and Evidence." Journal of Political Economy **105**(6): 1121-1166.
- Ando, A. and F. Modigliani (1963). "The "Life Cycle" Hypothesis of Saving: Aggregate Implications and Tests." American Economic Review **53**(part 1): 55-84.
- Barro, R. J. (1974). "Are Government Bonds Net Worth?" Journal of Political Economy **82**(6): 1095-1117.
- Becker, G. S. (1974). "A Theory of Social Interactions." Journal of Political Economy **82**(6): 1063-93.
- 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.
- Bernheim, B. D., A. Shleifer, et al. (1985). "The Strategic Bequest Motive." Journal of Political Economy **93**(6): 1045-1076.
- Biddlecom, A., N. Chayovan, et al. (2002). Intergenerational Support and Transfers. The Well-Being of the Elderly in Asia. A. Hermalin. Ann Arbor, The University of Michigan Press.
- Chawla, A. (forthcoming). National Transfer Account Estimates for Thailand 1996.
- Cox, D. (1987). "Motives for Private Income Transfers." Journal of Political Economy **95**: 508-46.
- Feldstein, M. (1974). "Social Security, Induced Retirement, and Aggregate Capital Accumulation." Journal of Political Economy **82**(5): 905-926.
- 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.
- Friedman, J. H. (1984). "SMART User's Guide." Laboratory for Computational Statistics **Stanford University Technical Report No.1**.
- Hansen, G. D. and S. Imrohoroglu (2006). "Consumption over the life cycle: the role of annuities." NBER Working Papers **12341**.
- Hermalin, A., Ed. (2002). The Well-Being of the Elderly in Asia. Ann Arbor, The University of Michigan Press.
- 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.
- Kotlikoff, L. and A. Spivak (1981). "The Family as an Incomplete Annuities Market." Journal of Political Economy **89**(2): 372-91.
- Lai, M. (2006). "National Transfer Account Estimates for Taiwan."
- Lee, Y.-J., W. L. Parish, et al. (1994). "Sons, Daughters, and Intergenerational Support in Taiwan." The American Journal of Sociology **99**(4): 1010-1041.
- 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., S.-H. Lee, et al. (2006). "Charting the Economic Life-Cycle." NBER Working Papers(12379).
- Lillard, L. A. and R. J. Willis (1997). "Motives for Intergenerational Transfers: Evidence from Malaysia." Demography **34**(1): 115-34.
- Martin, L. G. (1989). "Living Arrangements of the Elderly in Fiji, Korea, Malaysia, and the Philippines." Demography **26**(4): 627-643.
- Mason, K. (1992). "Family Change and Support of the Elderly in Asia: What Do We Know?" Asia-Pacific Population Journal **7**(3): 13-32.
- Mason, A., R. D. Lee, et al. (forthcoming). Population Aging and Intergenerational Transfers: Introducing Age into National Accounts. Economics of Aging Series. D. Wise. Chicago, NBER and University of Chicago Press.
- Modigliani, F. (1988). "The role of Intergenerational Transfers and Life Cycle Saving in the Accumulation of Wealth." Journal of Economic Perspectives **2**(2): 15-40.

- National Economic and Social Development Board (NESDB) (2001). National Income of Thailand. Bangkok, Office of the Prime Minister.
- Pongpanitch, A., C. Chanchareon, et al. (2005). National Health Account of Thailand. Bangkok, Ministry of Public Health.
- 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.
- Social Security Fund (SSF) (2003). Annual Report 2003 Social Security Office. Nonthaburi, Ministry of Labor.
- Stecklov, G. (1999). "Evaluating the Economic Returns to Childbearing in Cote d'Ivoire." Population Studies **53**(1): 1-17.
- United Nations, P. D. (2003). World Population Prospects: The 2002 Revision. New York, United Nations.