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18 Thailand's Generational Accounts

Nanak Kakwani and Medhi Krongkaew

18.1 Introduction

Like many other countries in East Asia, Thailand has a long history of extended family relationships in which family members across generations provide help to one another throughout their lifetimes. The state or government in this case plays a relatively minor role (vis-à-vis families) in assisting individuals in their lives and livelihood. Until 1993 Thailand did not have a well-defined social security system, and although some systems of public assistance were always in existence, the size and extent of this public assistance was not large. Therefore, whether the government would create an intergenerational fiscal burden on future generations as a result of present tax and transfer policies has yet to become a hot issue. Things may change with the full operation of the social security system in 1998, when Thailand will add an old-age pension to the existing four areas of coverage, namely, sickness not related to work, maternity leave, invalidity, and death.

The involvement of the state in the lives of its citizens is manifest in the traditional instrument of the public sector—fiscal policy. The government taxes the people to transfer resources from private hands to public hands. By so doing the government effects change in both the level and the distribution of welfare of people in the posttax situation. The level and distribution of public welfare change again with the spending of the public money raised from

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This paper draws heavily on a previous study by Nanak Kakwani, Laurence J. Kotlikoff, Medhi Krongkaew, Sudhir Shetty, and Jan Walliser. See Kakwani et al. (1996).

taxes and other revenue sources. The net effect of these tax-transfer policies, or the net fiscal incidence, can be linked with the concern about intergenerational fiscal burden to answer the question of whether the government through its fiscal policy helps or hurts future generations.

This paper uses a recently developed technique called generational accounting to assess the sustainability of Thailand's fiscal policy. Generational accounting determines whether the spending policies currently in place can be maintained without raising the net lifetime tax payments (tax paid net of transfers received) of future generations. Several studies in OECD countries have suggested the existence of serious generational imbalances (see Auerbach, Gokhale, and Kotlikoff 1991; Franco et al. 1993; Auerbach et al. 1993; Gokhale, Raffelhüschen, and Walliser 1995; Hagemann and John 1995). An application of generational accounting to Thailand is therefore of particular interest because it can shed light on the intergenerational stance of fiscal policy in a developing country. It has been observed that many developing countries' economic and demographic structures contrast sharply with those of developed countries. Specifically, populations tend to be very young, with the fraction below age 25 often exceeding 50 percent of the total population. Productivity growth rates are generally either much higher or much lower than in industrialized countries.[1] In addition, the tax systems in developing countries are often characterized by limited personal income taxation and transfer payments.

Countries with limited transfer payments are likely to have more favorable generational policies because transfer programs typically benefit the elderly at the expense of current young and future generations. However, the structure of the tax-transfer system in many developing countries is subject to change—change that may produce imbalances in generational policies. What can we say about the situation in Thailand? Have Thai fiscal policies a tendency to favor present or future generations? Will the pay-as-you-go social security system that Thailand launched in 1993 create an unfair intergenerational burden on future Thai generations? What kind of fiscal planning is needed for a more balanced generational account? And so on. These are some of the questions we will be dealing with in this paper.

In what follows, section 18.2 describes the demographic and fiscal structures of Thailand. It will emphasize the changes in tax and expenditure structures of the Thai government in the past two and half decades to see their prospective impacts the population as a whole. Section 18.3 discusses the construction of generational accounts and the data used. Section 18.4 presents the results, along with some policy simulations. Section 18.5 summarizes the findings and concludes.

1. See Kotlikoff and Walliser (1995) for more detailed description of how these characteristics may affect generational accounts.

Table 18.1 **Population by Age Group (percent of total population)**

Year	Age 0–24	Age 25–64	Age 65+
1993	52.2	43.8	3.9
1995	50.3	45.5	4.2
2000	46.6	48.6	4.8
2010	41.4	52.9	5.7
2020	38.8	53.7	7.6
2030	36.2	52.9	10.9
2040	34.3	51.0	14.7
2050	33.3	49.5	17.1
2060	32.4	49.7	17.9
2070	31.7	49.2	19.0
2080	31.2	48.5	20.3
2090	30.8	48.2	21.0
2100	30.5	47.9	21.6

Source: Data provided by Eduard Bos of the World Bank.

18.2 Demographic and Fiscal Structures of Thailand

Thailand had a population of about 60 million in 1995. Due to very high fertility rates in the 1960s and 1970s, the population is very young. As table 18.1 shows, 52 percent of the population was under age 25 in 1993, whereas only 4 percent was over age 65. However, the rapid reduction in the fertility rate, from 5.4 to 2.8, experienced over the past 20 years combined with an increase in life expectancy will cause a significant change in the Thai population structure. As shown in table 18.1, by the year 2030 the population under age 25 is predicted to fall to 36 percent, and the percentage of elderly over age 65 will rise to 11 percent. In 2080, the corresponding numbers will be 31 and 20 percent, respectively.

The reduction of population growth rates in the 1980s was accompanied by an acceleration of economic growth. Between 1980 and 1990, Thailand's GDP expanded at a rate of 8 percent per annum and continued to grow at this rate during the first half of the 1990s. GNP per capita reached a level of 69,000 baht, or about U.S.$2,760, in 1995, characterizing Thailand as a middle-income country at the level achieved by Korea in mid-1980s. What is more, economic growth occurred with moderate levels of inflation.

During the 1980s, annual inflation measured by the percentage change in the GDP deflator averaged less than 4 percent per year. As a consequence of economic transformation, the Thai economy has a declining agricultural sector, which in 1995 accounted for just 10.9 percent of GDP. In that year, industrial production accounted for 46.8 percent of GDP, of which 28.9 percent originated from manufacturing activities.

Like many other Southeast Asian and East Asian countries before it, Thailand is an export-oriented country. Exports of manufactured products such as

garments, electronic components, electrical appliances, processed food, gems and jewelry, and traditional primary commodities such as rice, rubber, cassava, and sugar have combined to enable Thailand to achieve its present high economic growth rate. Thailand, however, is also a trade deficit country, with revenue from export trade that always falls below its purchase of imported goods. In 1995, for example, the trade deficit of Thailand amounted to some U.S.$14.9 billion. And although the service account shows some surplus, it was not large enough to compensate for this huge trade deficit. Therefore, the current account deficit for that year was about U.S.$13.5 billion, or about 8 percent of GDP. This high level of current account deficit has worried Thai economic leaders, but some have argued that since Thailand's gross national savings rate of 33.6 percent in 1995 is very high, the Thai current account deficit was not being driven by overconsumption but rather by spending on investment goods and by a desire among foreign investors to invest in Thailand.

This picture of a fundamentally sound Thai economy is reinforced by an analysis of its fiscal policy. As a unitary state with a long history of independence and noncolonization by any Western powers, the government in Thailand is very centralized and has strong political power. And yet the size of the government is not large by the standards of developed, industrialized countries as measured by the share of government revenue or expenditure in GDP. In 1961 when Thailand launched its first national economic development plan, the share of central government revenue in GDP was only about 10 percent. The share of government expenditure in the country's GDP was slightly higher, at 12 percent. Of course the role of the Thai government expanded with overall economic development as these shares increased in later years and peaked at around 16 percent for revenue and 20 percent for expenditure in the mid-1980s. The change in the absolute size of the government as seen through its revenue and expenditure shares of GDP could give a misleading or confusing picture of the role of the Thai government if not seen within the context of other changes that had taken place in the structure and composition of government revenue and expenditure. This is what we turn to next.

18.2.1 Government Revenue

Strictly speaking, "government" here means only central government. So government revenue here does not include the revenues of the other two bodies of the public sector, namely, state-owned enterprises and local governments. If we assume, however, that state enterprises operate in a manner similar to private, commercial enterprises, their exclusion should not affect the traditional role of the state too much. As for local governments, their economic importance in the context of the role of the public sector is small because the size of revenue of local governments has always been around 5 or 6 percent of the central government's. Therefore, it is not inappropriate to analyze the role of

the Thai state by looking only at the revenue (and expenditure) of the central government.[2]

Tables 18.2A and 18.2B give the structure and distribution of revenue of the central government of Thailand between 1970 and 1995. It may be seen from this table that the major source of government revenue was taxation, ranging between 90.31 and 92.73 percent of total revenue. While it was true that as in many other developing economies, the majority of tax revenues in Thailand came from indirect taxes, there has been a drastic change in the composition and proportion of direct taxes vis-à-vis indirect taxes during the past decade or so. For example, the share of income taxes in 1970 was only 11.89 percent, whereas the share of indirect taxes was 76.37 percent. There was little change in the share of indirect taxes during the 1970s, but the beginning of the 1980s saw a downward shift of this share to around 68 percent. This downward shift continued in the first half of the 1990s, when the share of indirect taxes was less than 60 percent. In step with the gradual loss of dominance of indirect taxes in the Thai revenue structure is the rising share of direct tax revenue in total revenue. Indeed, this share doubled to 20.90 percent during 1981–85 and more than tripled to 32.01 percent in 1995. Looking inside the composition of direct taxes, the contribution from corporate income tax is a major factor explaining the rapid increase of the direct tax share. In 1995, for example, the corporate income tax contributed a full 20.25 percent of the total revenue of the central government. Personal income tax also increased its share of total revenue (from 7.02 percent in 1970 to 11.34 percent in 1995), but not as fast as the corporate income tax. The direction makes clear, however, that the government will attempt to improve its collection of personal income tax from richer income earners.

Within the indirect tax structure, three taxes have dominated. These are import duties, business taxes (and later the value-added tax), and excise or selective sales taxes. During the past decade, however, one can see a drastic decline in the share of import taxes, from 29.21 percent in 1970 to 16.39 percent in 1995. This has been the result of gradual reduction in Thai import tariffs as the government tries to reduce the rate of protection of domestic industries and to liberalize its foreign trade under the agreements of greater regional and global cooperation in the form of the ASEAN Free Trade Area, the Asia Pacific Economic Cooperation, and the GATT Uruguay Round trade negotiations and the subsequent World Trade Organization.

Beginning in 1995, the Thai authorities adopted a simplified tariff schedule whereby the number of tariff rates was reduced from about sixty to just five. These five rates were zero percent for raw materials in short supply within the country, 5 percent for other raw materials, 10 percent for intermediate

2. Of course, if and when necessary, we can make some adjustments to central government figures by adding the revenue contributions of local governments and state-owned enterprises.

Table 18.2A **Structure of Central Government Revenue, 1970–95 (millions of baht)**

	1970	1971–75	1976–80	1981–85	1986–90	1991–95	1995
Taxation	16,776	26,320	62,203	123,247	253,887	547,305	711,357
Income taxes	2,200	3,899	11,613	28,437	58,749	176,673	248,827
Personal	1,298	1,918	5,146	14,551	26,688	62,356	88,170
Corporation	902	1,981	6,467	13,886	31,587	111,154	157,430
Petroleum	0	0	0	0	474	3,162	3,227
Indirect taxes	14,130	21,892	49,714	92,818	187,954	356,639	445,917
Import duties	5,404	6,939	14,678	26,105	58,833	104,560	127,389
Export duties	848	1,659	2,278	2,033	692	12	12
Business taxes	3,408	5,761	13,603	25,882	54,415	23,413	699
Value-added tax	0	0	0	0	0	88,199	142,955
Selective sales taxes	3,049	5,263	13,728	31,344	61,914	125,365	161,170
Fiscal monopoly	647	1,240	2,269	2,369	4,250	7,087	7,890
Royalties	399	578	2,580	2,925	2,553	3,860	4,233
Licenses and fees	375	451	580	2,159	5,298	4,142	1,569
Other taxes	446	530	875	1,992	7,185	13,993	16,613
Nontaxation	1,727	2,823	5,220	12,783	19,893	54,037	66,147
Sales and charges	483	780	1,242	2,081	3,987	8,198	7,773
Contribution from government enterprises and dividends	623	1,088	1,814	4,017	8,014	29,875	36,766
Miscellaneous revenue and income	621	955	2,165	6,685	7,893	15,964	21,609
Total revenue	18,503	29,143	67,421	136,030	273,784	601,296	777,286

Source: Bank of Thailand, *Monthly Bulletin* (various years).

Table 18.2B **Distribution of Central Government Revenue, 1970–95 (percent)**

	1970	1971–75	1976–80	1981–85	1986–90	1991–95	1995
Taxation	90.67	90.31	92.26	90.60	92.73	91.02	91.52
Income taxes	11.89	13.38	17.22	20.90	21.46	29.38	32.01
Personal	7.02	6.58	7.63	10.70	9.75	10.37	11.34
Corporation	4.87	6.80	9.59	10.21	11.54	18.49	20.25
Petroleum	0.00	0.00	0.00	0.00	0.17	0.53	0.42
Indirect taxes	76.37	75.12	73.74	68.23	68.65	59.31	57.37
Import duties	29.21	23.81	21.77	19.19	21.49	17.39	16.39
Export duties	4.58	5.69	3.38	1.49	0.25	0.00	0.00
Business taxes	18.42	19.77	20.18	19.03	19.88	3.89	0.09
Value-added tax	0.00	0.00	0.00	0.00	0.00	14.67	18.39
Selective sales taxes	16.48	18.06	20.36	23.04	22.61	20.85	20.73
Fiscal monopoly	3.50	4.26	3.37	1.74	1.55	1.18	1.02
Royalties	2.16	1.98	3.83	2.15	0.93	0.64	0.54
Licenses and fees	2.03	1.55	0.86	1.59	1.94	0.69	0.20
Other taxes	2.41	1.82	1.30	1.46	2.62	2.33	2.14
Nontaxation	9.33	9.69	7.74	9.40	7.27	8.99	8.51
Sales and charges	2.61	2.68	1.84	1.53	1.46	1.36	1.00
Contribution from government enterprises and dividends	3.37	3.73	2.69	2.95	2.93	4.97	4.73
Miscellaneous revenue and income	3.36	3.28	3.21	4.91	2.88	2.65	2.78
Total revenue	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Bank of Thailand, *Monthly Bulletin* (various years).

products, 20 percent for finished manufactured products, and over 20 percent for products whose domestic protection was still needed. Specifically it is expected that by the year 2003, the tariff rates for all products traded among ASEAN countries will be reduced to no more than 5 percent.

In the 1950s taxes on rice exports were the largest revenue item for the government. As the burden of these taxes was believed to fall on domestic producers the majority of whom were poor, there was a concerted effort to abolish these taxes to reduce the tax burden as well as to increase the return to these farmers. The government succeeded in removing rice export taxes and most other export taxes in the late 1980s.

Another important indirect tax in Thailand is the business tax. This is a kind of sales tax levied on producers and importers of goods and services based on their gross sale receipts or import values. As each point of sale is subject to this tax it was in fact a turnover tax whose cascading effects were large and created distortions in resource allocation and posed an unfair burden on consumers. In the early 1980s, the Thai tax authorities had proposed to replace this indirect consumption tax with a value-added tax and spent more than 10 years preparing for the eventual adoption of the new tax, which became a reality in 1992 with a consumption-type value-added tax with a beginning tax rate of 7 percent. The changeover caused a slight fall in tax collection in initial periods, but as the tax office gained experience the public became more familiar with the tax, value-added tax collection has begun to increase markedly in the past few years.

Excise taxes in Thailand are levied on a few sumptuary items such as tobacco and liquor and on petroleum products. The contributions of these taxes to overall revenue have always been large. In the future these excise taxes may even be used to supplement the single-rate value-added tax if more curbing of consumption is required. The contributions from fiscal monopolies and royalties have declined in share in recent years because the government has adopted greater liberalization and privatization policies, allowing price and other production and management adjustments in government agencies and state-owned enterprises. This privatization has shown some success recently as the contributions of these state-owned enterprises to the government have increased in the past few years.

In all, it may be concluded that the Thai government has started to rely more on direct income taxes as a source of revenue. Indirect taxes, which were often regarded as regressive, have continued to lose their share. The use of a value-added tax has increased the efficiency of the tax system and also is expected to increase tax collection due to the built-in tax control. In the future, greater taxing power will be given to local governments, who will concentrate on property and wealth taxes, which are currently very weak. The size of the government in the future may grow if the present rapid economic growth continues as the government finds it necessary to spend more on public infrastructure as

well as public welfare. This point will become clear as we look at government expenditure in the next subsection.

In closing, we would like to make one comment about the state of personal income taxation in Thailand. As seen from table 18.2B, the personal income tax contributes only 11.34 percent to total revenue. As has been noted by many studies, including that of Kakwani (1997), income inequality in Thailand is extremely high. The Gini index of per capita income in 1992 was as high as 0.53. It is possible that many people with high income are not paying their due share of income tax. Rich people tend to consume more imported goods. Thus these people also benefit from a continuous lowering of tariffs. The government should be looking at reforming personal income taxation so that rich people pay their due share of taxation. This will also have an impact on the current account deficit because it will lower the propensity of rich people to consume imported goods.

18.2.2 Government Expenditure

As a rule, the Thai government decides how much it will spend each year on the strength of its revenue projection. If it expects healthy revenue collection, the tendency to spend more is likely to be greater than when prospective public income is small. The practice of changing taxes or tax rates or raising other revenues as a precondition for a package of future spending is simply not followed in Thailand. This does not mean, however, that the budget in Thailand must always be in balance. The government can, and often does, borrow internally and externally to compensate for budget deficits and to finance public projects that it believes to be worthwhile or important. However, past records have shown the Thai government to be a cautious spender and borrower. This is due partly to budget laws that set effective controls on government borrowing and partly to the slow manner in which the government deliberates on the benefits and costs of public projects. As a result, Thailand has avoided foreign debt traps that have crushed many developing countries, especially during the mid-1980s.

Tables 18.3A and 18.3B show the structure and distribution of expenditure of the Thai government classified into budget type and function. First, the annual budget is classified into current and capital expenditure. Current expenditure includes the part of the budget that goes into wages and salaries of public officials and the maintenance of existing official services, whereas capital expenditure includes the purchase of land and other immovable properties, necessary equipment and materials, and the construction of public buildings and other infrastructure projects. It may be observed that during the 1970s and 1980s, a large proportion of the government budget was spent on current expenditure with little left for capital spending. This was necessary because of the relatively large size of public servants. Since the early 1980s, however, the government has frozen the expansion of the size of public servants to no more

Table 18.3A **Government Expenditure Classified by Type and Function (millions of baht)**

	1970	1971–75	1976–80	1981–85	1986–90	1991–95	1995
Total expenditures	25,135	33,801	82,341	167,961	241,525	509,355	642,321
Economic classification							
Current	17,204	25,711	62,884	137,987	204,632	362,407	442,456
Capital	7,931	8,091	19,457	29,974	36,894	146,948	199,865
Major functional classification							
Economic services	7,324	7,827	17,460	28,239	37,133	133,386	169,964
Social services	6,622	9,671	25,142	50,084	72,816	185,244	242,417
Defense	4,403	6,493	16,115	33,634	46,402	78,692	96,331
General administration and services	3,554	4,919	10,970	22,437	31,824	58,509	72,974
Unallocated items	3,232	4,891	12,656	33,568	53,349	53,523	60,635

Source: Bank of Thailand, *Monthly Bulletin* (various issues).

Table 18.3B **Distribution of Government Expenditure Classified by Type and Function (percent)**

	1970	1971–75	1976–80	1981–85	1986–90	1991–95	1995
Total expenditures	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Economic classification							
Current	68.45	76.06	76.37	82.15	84.72	71.15	68.88
Capital	31.55	23.94	23.63	17.85	15.28	28.85	31.12
Major functional classification							
Economic services	29.14	23.16	21.20	16.81	15.37	26.19	26.46
Social services	26.35	28.61	30.53	29.82	30.15	36.37	37.74
Defense	17.52	19.21	19.57	20.02	19.21	15.45	15.00
General administration and services	14.14	14.55	13.32	13.36	13.18	11.49	11.36
Unallocated items	12.86	14.47	15.37	19.99	22.09	10.51	9.44

Source: Bank of Thailand, *Monthly Bulletin* (various issues).

than 2 percent a year, which slowed down the share of current expenditure some years later.

The slowdown in public expenditure during the mid-1980s was also appropriate considering the fiscal difficulties that the government experienced with revenue shortfalls and huge budget deficits. However, the economy rebounded in the latter half of the 1980s with extraordinary export growth, a large influx of foreign investment, especially from Japan, and successful promotion of foreign tourism in Thailand. This has led to unexpected increases in government revenue from all kinds of taxes, especially income and sales taxes. The economic boom in Thailand that started in 1987 continued until 1991 when the country suffered a slight setback due to internal political problems. During this period problems with infrastructure shortages became very apparent, prompting the government to decide to spend more on infrastructure such as roads and rails, telecommunications, power and utilities, and traffic management systems. By the early 1990s, the central government had already accumulated a large sum of treasury surplus, something experienced only once in the postwar history of Thailand. The government then started to spend on capital projects. From table 18.3B, it may be seen that the average share of capital expenditure in total government expenditure during 1991–95 was 28.85 percent, compared to only 15.28 percent in the previous five years. This part of government spending is still growing. In 1995, its share was 31.12 percent.

More could be said about this pattern of government spending during the past few years. During the start of the economic boom period during the last half of the 1980s, the nonspending of the government while taking in large fiscal surpluses acted in a beneficent countercyclical manner in the economy, effectively forestalling inflationary pressure. When the private-sector-led economic boom was coming to an end in the early 1990s, the government decided to use its large public savings on numerous public projects, thus easing the crash landing of the economy. This appropriate policy by the Thai government has won accolades from many international organizations such as the International Monetary Fund and the World Bank, although we must contend that the Thai government was just lucky.

But how much luck will continue to befall the Thai government? Treasury reserves at the end of 1996 stood at more than U.S.$12 billion, the highest in recorded history. And indeed, it could be said that this huge budget surplus enabled the Thai authorities to agree to participate equally in the tripartite system of social security contributions. (They were not inclined to make any contributions earlier.) The economic slowdown in 1996 due to dismal performance in the export sector, high inflation, and the tight monetary situation gave a clear warning that the good times may have come to an end. The government may be required to return to its cautious mode of spending again.

The bottom half of table 18.3B shows the distribution of government expenditures classified by function. Of the four major functions, namely, economic services, social services, defense, and general administration, social services

now rank first in terms of share of total expenditure. Looking back to the situation in the 1970s and 1980s, one can see an interesting change in the function of the Thai budget. The defense allocation, which was as high as 20 percent of total expenditure, gradually declined in the latter half of the 1980s, falling as low as 15.01 percent in 1995. Social services, which have traditionally assumed a major share of the Thai budget (because they include educational spending, which in the past was the largest budget item, and health spending, which has enjoyed a phenomenal rate of growth in the past decade and a half), have increased their share even more during this decade. And so have expenditures on economic services, which include spending on agricultural development and industrial infrastructure. The comparison between productive economic and social services and nonproductive defense spending alone should make most public finance specialists happy.

It has been alluded to earlier that countries with limited transfer payments are likely to have more favorable generational policies. Will the recent changes in the budget composition of the Thai government make Thai generational accounts less favorable? No one could give a clear answer until empirical generational accounting studies like this one could be undertaken frequently enough. It suffices to say at this juncture that it is unlikely that the Thai government will get carried away with spending on anything when the revenue situation does not warrant it. If the government were able to mobilize domestic resources in an efficient way, it should be in a position to spend more on neglected sectors such as poverty and rural areas. Present Thai economic development has come about partly as a result of sacrifice of the agricultural sector and the farmers. It can only be proper to return more of the fruits of development to this sector and these people.

Before concluding this section, a word should be said about fiscal incidence, or the impact of fiscal policy on the income distribution of the country. We have maintained that despite the correct development policy of the Thai government—giving investment initiatives to the private sector during the past three decades of economic development while the government concentrated on infrastructure and other economic institution building—the government has not done much in terms of poverty alleviation and the improvement of income inequality until recently. On poverty alleviation, the incidence of poverty based on the traditional poverty line stayed very high at around 20 percent throughout the 1970s and much of the 1980s. Only when the economy entered the private-sector-led economic boom in the latter part of the 1980s and early 1990s did the incidence of poverty show some marked reduction, mainly through the rise in personal or household income. On income inequality, a study by one of the present authors on the incidence of the Thai fiscal system during the 1960s and the early 1970s has shown that the equalizing effects of government expenditure were not large enough to overwhelm the disequalizing effects of government taxation, leading to, at best, a neutral overall effect of fiscal policy on the Thai income distribution (Medhi 1980). Generational accounting can in-

deed be looked upon as a fiscal incidence study, but the impact is measured on people of different ages and sexes rather than on people with different incomes.

18.3 Construction of Generational Accounts

Generational accounting is based on the government's intertemporal budget constraint. This constraint requires that the future net tax payments of current and future generations be sufficient, in present value, to cover the present value of future government consumption as well as to service the government's initial net indebtedness.[3] In order to solve this budget constraint, we require (1) a population projection, (2) projections of average net taxes by age and sex, (3) an estimate of government net wealth, (4) a discount rate, and (5) a projection of government purchases.

18.3.1 Population Projections

Our demographic projection as shown in table 18.1 comes from the World Bank and incorporates its long-term forecasts for fertility and life expectancy.[4] Specifically, total fertility is assumed to reach a level of 2.1 by the year 2000, which guarantees that the population slowly settles into a stationary distribution. Life expectancy at birth is expected to increase from 65 years in 1990 to 72 years in 2010, 77 years in 2030, and 80 years in 2050.

18.3.2 Projection of Taxes and Transfers

Average tax and benefit payments by age and sex were obtained from the 1992 Socioeconomic Survey (SES) conducted by the National Statistical Office, which is described in appendix B. In this survey, 13,458 households selected by a two-stage cluster sampling were asked about their household income and expenditure and other household socioeconomic characteristics. In order to account for the different sizes of clusters, observations are weighted according to their sampling probabilities. Since the survey provides data for total households as well as individuals, a calculation of age- and sex-specific average payments is possible. In particular, data from the 1992 SES have been used to distribute by age and sex revenues from personal and corporate income taxes, monopoly profits, petroleum taxes, motor vehicle taxes, duties, state lottery revenues, and local taxes. Incidence assumptions are given in appendix C.

In some cases, specific incidence assumptions were necessary. Personal income taxes, for example, are only available at the household level. They have been distributed to individual household members according to their share of

3. Appendix A of this paper gives a brief discussion of the methodology of generational accounting. Readers who are not familiar with the technique of generational accounting can find some technical information there.

4. We thank Eduard Bos of the World Bank for providing us with special demographic tabulations for Thailand.

total household taxable income. We proceed similarly with property taxes. Corporate taxes are allocated to individuals according to their wage and salary income since in a small open economy the capital tax incidence is on labor.[5] Value-added taxes are distributed in proportion to household consumption and then divided within the family according to an equivalence scale that gives lower weight to children. Finally, excise taxes are divided equally among adult household members with the exception of petroleum and motor vehicle taxes, which are allocated only to the household head.

As far as benefits are concerned, we distribute education and health expenditures by age and sex. Educational spending is allocated evenly among all individuals attending schools and universities. Payments of old-age pensions to former government workers are included with government spending on goods and services since these payments may be viewed as part of the compensation package that the Thai government needed to offer these workers to solicit their employment. Unfortunately, there are no data available to allocate health care expenditure by age and sex. For this profile, we used the corresponding German profile of relative health expenditures by age and sex described in Gokhale, Raffelhüschen, and Walliser (1994). The German data entail higher per capita health care expenditures by age, with per capita expenditures on 80-year-olds equal to roughly twice that on 40-year-olds. All raw profiles obtained in the described manner have then been smoothed with an eighth-order polynomial. Finally, we rescale all average tax and benefit payments to accord with 1993 fiscal aggregates.[6]

18.3.3 Government Net Wealth

We take government financial wealth as our estimate for 1993 government net worth. As previously mentioned, this number is 224.6 billion baht, or 6.4 percent of GDP in 1993.

18.3.4 Growth and Discount Rates

For productivity growth we assume a rate of 2 percent per year, in line with other recent studies of the Thai economy (see Hagemann, Amieva-Huerta, and Ross 1992). Future government receipts are risky, which suggests that they be discounted with a higher rate than the real interest on government securities. However, government receipts and expenditures appear less volatile than the return on capital, which suggests that they be discounted with a lower rate than

5. See Fehr and Kotlikoff (chap. 3 in this volume) for an analysis of the capital tax incidence in a small open economy.

6. We have used the fiscal aggregates of 1993 as a proper consequence of the availability of household income and expenditure statistics for 1992 (the 1992 SES). At the end of 1996, the latest socioeconomic survey data—the 1994 SES—also became available, which should enable us to construct generational accounts for 1995. But the time and resources needed to analyze the new data set were not available, so we have to contend with the fiscal situation of 1993 for the time being.

that.[7] Our discount rate of 6 percent therefore reflects a long-term risk-free interest rate augmented by a risk premium but is smaller that the rate of return on capital.

18.3.5 Government Consumption

Finally, we assume that government spending after 1993 grows with the overall economy. For 1993, government spending is calculated as the sum of all non-age-specific government expenditures net of revenues not distributed by age and sex. In this calculation, profits from state enterprises and other nontax revenues are treated as negative government spending.

18.4 Results

18.4.1 Major Findings

Tables 18.4A and 18.4B present generational accounts for the Thai male and female populations, respectively. The accounts exhibit a life cycle pattern with the maximum expected future net payment peaking at age 30 for males and age 25 for females. Male newborns, whose generational accounts reflect their entire lifetime net tax payments, can anticipate a net tax burden of $7,700 in present value. For females, the lifetime net tax burden is $4,000. The highest expected tax burden facing these newborns comes from corporate income tax, followed by value-added taxes and other excise taxes. This is not surprising; developing countries rely heavily on indirect taxes and corporate taxes since the collection of personal income taxes requires a fairly sophisticated tax system.

The age pattern of the present value of future taxes differs for each tax. Whereas the present values of remaining lifetime personal income taxes and, due to our incidence assumption, corporate taxes peak between ages 25 and 30, the present value of remaining lifetime property taxes peaks at age 45. Clearly, corporate and personal income taxes reflect the present value of expected future wages and salaries whereas property taxes depend on wealth, which is accumulated more slowly over the life cycle. Additionally, some taxes, specifically value-added taxes and other consumption taxes, are more evenly spread over the life cycle than are, say, personal income taxes. Note that generational accounts at all ages are positive. This is in contrast to most developed countries, which show generational accounts eventually becoming negative due to welfare programs targeted at the elderly.

Tables 18.4A and 18.4B also indicate that the residual fiscal burden facing future generations is negative. If current Thais make the remaining lifetime net tax payments indicated in these tables, the Thai government will have sufficient resources to provide a very large subsidy to future Thais. Is this result

7. For a more detailed discussion of the choice of a discount rate, see Auerbach et al. (1991, 1994).

Table 18.4A **Composition of Male Generational Accounts: Present Value of Receipts and Payments (thousands of baht)**

		Tax Payments								Transfer Receipts		
Generation's Age in 1993	Net Payment	Personal Income	Corporate Income	Property and Local	VAT	Alcohol and Tobacco	Petroleum and Vehicle	Duties	State Lottery	University Education	Education	Health
0	163.5	24.0	52.6	21.5	43.8	16.6	41.8	41.6	1.3	6.9	55.1	17.6
5	196.5	29.2	64.1	26.0	48.2	20.2	50.8	45.9	1.6	8.4	62.0	19.1
10	262.3	35.3	77.7	31.2	52.1	24.5	61.3	49.5	1.9	10.2	40.2	20.6
15	337.4	42.8	93.3	37.4	54.2	29.7	74.0	51.6	2.3	12.4	13.1	22.3
20	400.3	51.8	106.8	44.8	54.5	34.7	88.3	51.8	2.7	9.7	1.6	23.8
25	441.6	59.4	114.2	53.4	53.1	35.5	100.3	50.5	2.9	2.8	0	25.0
30	452.1	62.8	112.8	62.5	50.3	33.9	105.5	47.9	2.8	0.7	0	25.6
35	436.4	61.2	102.9	71.3	46.7	30.4	103.1	44.4	2.5	0.2	0	26.0
40	396.0	54.4	85.7	77.6	42.4	25.8	93.9	40.3	2.1	0	0	26.2
45	338.4	43.8	64.7	79.7	37.6	21.0	80.5	35.8	1.7	0	0	26.2
50	273.7	31.6	43.4	76.9	32.7	16.6	66.1	31.1	1.4	0	0	26.0
55	209.4	19.8	25.0	68.9	27.8	13.0	52.8	26.4	1.1	0	0	25.4
60	154.0	10.4	11.4	56.7	23.2	10.3	41.9	22.0	0.8	0	0	22.9
65	109.3	4.4	3.4	41.9	19.0	8.3	32.9	18.0	0.7	0	0	19.3
70	75.8	1.8	0.2	27.5	15.3	6.6	25.2	14.6	0.5	0	0	15.9
75	48.7	0.8	0	14.6	11.5	4.9	17.7	10.9	0.3	0	0	12.1
80	29.7	0.5	0	6.1	8.6	3.4	11.8	8.2	0.2	0	0	9.2
85	17.2	0.3	0	1.6	6.4	2.2	7.4	6.1	0.1	0	0	7.0
90	9.0	0.2	0	0.2	4.2	1.1	4.0	4.0	0.1	0	0	4.7
Future generations	−189.3											
Percentage difference	−215.8											

Note: Productivity growth assumed to be 2 percent; discount rate, 6 percent.

Table 18.4B **Composition of Female Generational Accounts: Present Value of Receipts and Payments (thousands of baht)**

		Tax Payments								Transfer Receipts		
Generation's Age in 1993	Net Payment	Personal Income	Corporate Income	Property and Local	VAT	Alcohol and Tobacco	Petroleum and Vehicle	Duties	State Lottery	University Education	Education	Health
0	84.2	13.8	28.2	11.5	45.4	14.0	7.2	43.2	1.3	8.7	51.7	20.1
5	96.4	16.8	34.4	13.9	50.0	17.0	8.7	47.6	1.6	10.7	60.8	22.0
10	139.9	20.3	41.7	16.6	54.2	20.5	10.4	51.5	1.9	13.0	40.1	24.1
15	192.2	24.7	50.3	19.8	56.7	24.8	12.4	53.9	2.3	15.8	10.5	26.3
20	224.2	28.4	55.3	23.9	57.2	28.4	14.3	54.4	2.6	11.1	1.1	28.0
25	239.1	30.6	55.8	28.9	55.7	28.9	15.9	53.0	2.7	2.4	0.2	29.0
30	236.1	30.5	51.3	33.7	52.6	27.6	17.3	50.0	2.6	0.4	0	29.1
35	218.1	28.1	43.0	35.4	48.6	25.1	18.1	46.2	2.4	0	0	28.9
40	191.2	23.9	32.5	34.3	44.2	22.0	18.6	42.1	2.0	0	0	28.4
45	160.2	18.6	21.7	31.3	39.6	18.8	18.5	37.7	1.7	0	0	27.7
50	131.2	13.3	12.5	28.1	31.3	15.9	18.0	33.5	1.3	0	0	26.7
55	107.4	8.6	5.9	26.0	27.1	13.6	17.1	29.5	1.0	0	0	25.4
60	90.3	5.0	2.1	25.6	23.1	11.6	15.7	25.8	0.8	0	0	23.5
65	77.8	2.8	0.5	26.2	19.1	10.0	13.8	22.0	0.6	0	0	21.1
70	67.8	1.6	0.1	26.4	15.3	8.3	11.3	18.2	0.5	0	0	17.6
75	57.5	1.1	0	25.0	12.1	6.7	8.6	14.5	0.3	0	0	14.1
80	46.2	0.9	0	21.5	9.2	5.2	6.1	11.5	0.2	0	0	11.2
85	32.4	0.6	0	15.0	5.8	3.7	3.8	8.7	0.2	0	0	8.7
90	15.0	0.2	0	5.6	4.2	2.1	1.6	5.5	0.1	0	0	5.9
Future generations	−97.4											

Note: Productivity growth assumed to be 2 percent; discount rate, 6 percent.

Table 18.5 **Sensitivity Analysis: Percentage Difference between Generational Accounts of Newborns and Future Generations for Alternative Growth and Interest Rates**

	Growth Rate (%)		
Interest Rate (%)	1	2	3
5	−218.6	−155.2	−111.5
6	−307.0	−215.8	−153.8
7	−435.9	−301.9	−213.0

Source: See text.

surprising? Not if one reconsiders the demographic and fiscal scenario. Remember, 52.2 percent of the 1993 population was less than 25 years old. Under baseline policy, all these people can be expected to contribute net payments of between $6,128 and $16,852 in present value. Given that the Thai government already runs a surplus, this implies a very large accumulation of government wealth over the next 40 years, when the currently young are at their peak earning years, which can be used to subsidize the next generation. Additionally, the aging of the Thai population will not, under baseline policy, put a substantial strain on government expenditures because there is, under baseline policy, no national social security system that would potentially leave elderly Thais with negative annual net taxes.

Table 18.5 demonstrates that our finding that baseline Thai policy is, generationally speaking, highly favorable holds for a range of interest and growth rates. Though the percentage difference in lifetime net tax payments between current and future newborns varies somewhat, in all cases future generations are much better off than are current newborns. In fact, if we were to balance the burden between currently living generations in the base case we could permanently lower personal and corporate income taxes, value-added taxes, and property tax by about 70 percent. Alternatively, a reduction of all taxes by 36 percent would suffice. Would we recommend such a policy? No, particularly given the introduction of pay-as-you-go social security by the Thai government.

18.4.2 The Generational Implications of Introducing Pay-As-You-Go Social Security

We now consider how our generational accounts change with the Thai government's introduction of a pay-as-you-go system in 1993. In particular we follow the current plan by choosing a level of aggregate social security benefits equal to 9 percent of wages and assuming that a third of these benefits will be financed by the Thai budgetary surplus without raising taxes and the rest financed through a payroll tax.[8] All revenues are divided equally among the pop-

8. We assume a GDP labor share of 50 percent, consistent with the estimate in Pranee and Chalongphob (1994).

ulation over the age 65. Tables 18.6A and 18.6B present the results for males and females, respectively. Since payroll taxes are allocated according to wage income, they are included in the corporate tax column. Social security benefits are shown in a separate column. All other payments remain unchanged. Compared to the baseline results, net payments of male newborns are reduced since they can now expect social security benefits over 48,000 baht in present value exceeding the present value of payroll taxes by 11,000 baht. Furthermore, accounts of males over age 55 turn negative, indicating that future benefits exceed future tax payments in present value. Similar results hold for females. Net payments of female newborns are reduced by more than those of males due to a lower payroll tax burden facing females.

Despite the reduction of net payments by living generations, future generations are still better off than current newborns assuming a 2 percent growth rate and a 6 percent discount rate. Note though that their net tax payments are now positive; under pay-as-you-go social security, future generations can no longer expect a net transfer from the government. Table 18.7 recognizes the introduction of pay-as-you-go social security in 1993 and shows the percentage difference between lifetime net tax payments of current and future newborns under alternative discount and growth rates. As table 18.7 indicates, in a high-growth environment future generations may face considerably higher lifetime net tax burdens than current newborns as a result of introducing pay-as-you-go social security. Furthermore, as mentioned earlier, because the expenditures of the existing welfare system are more likely to grow until 2030 than in our base-case social security simulation, we find that future generations must pay net taxes that are 40.7 percent higher than those of 1993 newborns.

18.5 Summary and Conclusion

This paper has applied generational accounting—a new method of assessing the sustainability of fiscal policy—to Thailand. We find that Thailand's current fiscal policy is, generationally speaking, very favorable. Indeed, it is favorable enough that future Thais are likely to bear substantially smaller fiscal burdens and might even be, on net, subsidized by the fiscal system. This finding could, however, be reversed by the planned introduction in Thailand of a pay-as-you-go social security system. Depending on the scale and other features of the system, this policy could leave future Thais with a significantly higher growth-adjusted lifetime net tax burden than that faced by current Thais. Consequently, this paper's message for Thailand is that it should consider introducing a funded, rather than an unfunded, social security system if it wants to preserve its well-deserved reputation for fiscal prudence and generational responsibility.

Lest our readers feel too uncomfortable about our analysis of pay-as-you-go social security in Thailand and its impact on the balance of intergenerational burden, we would offer a caveat that the Thai government has been very careful about the present and future operations of its social security fund. Although it is not a fully funded system, the present Thai social security system has started

Table 18.6A **Composition of Male Generational Accounts with Social Security: Present Value of Receipts and Payments (thousands of baht)**

		Tax Payments								Transfer Receipts			
Generation's Age in 1993	Net Payment	Personal Income	Corporate Income	Property and Local	VAT	Alcohol and Tobacco	Petroleum and Vehicle	Duties	State Lottery	University Education	Education	Social Security	Health
0	152.5	24.0	89.6	21.5	43.8	16.6	41.8	41.6	1.3	6.9	51.7	61.0	20.1
5	185.2	29.2	109.2	26.0	48.2	20.2	50.8	45.9	1.6	8.4	60.8	71.6	22.0
10	251.7	35.3	132.4	31.2	52.1	24.5	61.3	49.5	1.9	10.2	40.1	82.6	24.1
15	327.5	42.8	158.9	37.4	54.2	29.7	74.0	51.6	2.3	12.4	10.5	95.5	26.3
20	387.4	51.8	181.9	44.8	54.5	34.7	88.3	51.8	2.7	9.7	1.1	111.0	28.0
25	418.9	59.4	194.7	53.4	53.1	35.5	100.3	50.5	2.9	2.8	0.2	129.6	29.0
30	410.7	62.8	192.2	62.5	50.3	33.9	105.5	47.9	2.8	0.7	0	151.8	29.1
35	366.0	61.2	175.3	71.3	46.7	30.4	103.1	44.4	2.5	0.2	0	178.6	28.9
40	286.6	54.4	146.1	77.6	42.4	25.8	93.9	40.3	2.1	0	0	211.9	28.4
45	179.8	43.8	110.2	79.7	37.6	21.0	80.5	35.8	1.7	0	0	253.3	27.7
50	52.6	31.6	74.0	76.9	32.7	16.6	66.1	31.1	1.4	0	0	308.3	26.7
55	−92.8	19.8	42.6	68.9	27.8	13.0	52.8	26.4	1.1	0	0	384.9	25.4
60	−260.9	10.4	19.5	56.7	23.2	10.3	41.9	22.0	0.8	0	0	496.2	23.5
65	−473.3	4.4	5.8	41.9	19.0	8.3	32.9	18.0	0.7	0	0	656.9	21.1
70	−405.0	1.8	0.4	27.5	15.3	6.6	25.2	14.6	0.5	0	0	539.4	17.6
75	−318.4	0.8	0	14.6	11.5	4.9	17.7	10.9	0.3	0	0	429.6	14.1
80	−248.1	0.5	0	6.1	8.6	3.2	11.8	8.2	0.2	0	0	340.6	11.2
85	−193.5	0.3	0	1.6	6.4	2.2	7.4	6.1	0.1	0	0	265.6	8.7
90	−133.4	0.2	0	0.2	4.2	1.1	4.0	4.0	0.1	0	0	178.6	5.9
Future generations	108.6												
Percentage difference	−28.8												

Note: Productivity growth assumed to be 2 percent; discount rate, 6 percent.

Table 18.6B **Composition of Female Generational Accounts with Social Security: Present Value of Receipts and Payments (thousands of baht)**

		Tax Payments								Transfer Receipts			
Generation's Age in 1993	Net Payment	Personal Income	Corporate Income	Property and Local	VAT	Alcohol and Tobacco	Petroleum and Vehicle	Duties	State Lottery	University Education	Education	Social Security	Health
0	43.0	13.8	48.1	11.5	45.4	14.0	7.2	43.2	1.3	8.7	51.7	61.0	20.1
5	49.1	16.8	58.6	13.9	50.0	17.0	8.7	47.6	1.6	10.7	60.8	71.6	22.0
10	86.6	20.3	71.0	16.6	54.2	20.5	10.4	51.5	1.9	13.0	40.1	82.6	24.1
15	132.1	24.7	85.7	19.8	56.7	24.8	12.4	53.9	2.3	15.8	10.5	95.9	26.3
20	152.2	28.4	94.3	23.9	57.2	28.4	14.3	54.4	2.6	11.1	1.1	111.0	28.0
25	149.5	30.6	95.1	28.9	55.7	28.9	15.9	53.0	2.7	2.4	0.2	129.6	29.0
30	120.5	30.5	87.5	33.7	52.6	27.6	17.3	50.0	2.6	0.4	0	151.8	29.1
35	69.7	28.1	73.3	35.4	48.6	25.1	18.1	46.2	2.4	0	0	178.6	28.9
40	2.2	23.9	55.4	34.3	44.2	22.0	18.6	42.1	2.0	0	0	211.9	28.4
45	−77.8	18.6	37.0	31.3	39.6	18.8	18.5	37.7	1.7	0	0	253.3	27.7
50	−168.3	13.3	21.4	28.1	35.2	15.9	18.0	33.5	1.3	0	0	308.3	26.7
55	−273.4	8.6	10.1	26.0	31.1	13.6	17.1	29.5	1.0	0	0	384.9	25.4
60	−404.4	5.0	3.5	25.6	27.1	11.6	15.7	25.8	0.8	0	0	496.2	23.5
65	−578.7	2.8	0.8	26.2	23.1	10.0	13.8	22.0	0.6	0	0	656.9	21.1
70	−471.6	1.6	0.1	26.4	19.1	8.3	11.3	18.2	0.5	0	0	539.4	17.6
75	−372.1	1.1	0	25.0	15.3	6.7	8.6	14.5	0.3	0	0	429.6	14.1
80	−294.4	0.9	0	21.5	12.1	5.2	6.1	11.5	0.2	0	0	340.6	11.2
85	−233.3	0.6	0	15.0	9.2	3.7	3.8	8.7	0.2	0	0	265.6	8.7
90	−163.5	0.2	0	5.6	5.8	2.1	1.6	5.5	0.1	0	0	178.6	5.9
Future generations	30.6												

Note: Productivity growth assumed to be 2 percent; discount rate, 6 percent.

Table 18.7 **Sensitivity Analysis: Percentage Difference between Generational Accounts of Newborns and Future Generations for Alternative Growth and Interest Rates with Social Security**

	Growth Rate (%)		
Interest Rate (%)	1	2	3
5	−30.4	−11.1	−65.7
6	−73.4	−28.8	−12.3
7	−127.4	−71.1	−27.3

Source: See text.

with a large reserve fund as a result of very few claims during the first few years of operations and generous financial support from the government. Its current financial condition should go a long way toward cushioning future contingencies. Moreover, the government has aggressively sought ways to profitably invest this fund at this early stage of social security operations so as to expand its financial capability. It has also expressed deep interest in adopting a microsimulation study of how Thais will work and spend in the future so that it can even be more prepared to face future financial emergency. These facts should allay some fear that the present social security system is generationally unsound.

Appendix A
Methodology of Generational Accounting

Generational accounting is based on the government's intertemporal budget constraint.[9] This constraint, written as equation (A1), requires that the future net tax payments of current and future generations be sufficient, in present value, to cover the present value of future government consumption as well as to service the government's initial net indebtedness:[10]

$$\text{(A1)} \qquad \sum_{s=0}^{D} N_{t,t-s} + \sum_{s=1}^{\infty} N_{t,t+s} = \sum_{s=t}^{\infty} G_s(1 + r)^{-(s-t)} - W_t^g.$$

The first summation on the left-hand side of equation (A1) adds together the generational accounts (the present value of the remaining lifetime net payments) of existing generations. The term $N_{t,k}$ stands for the account of the gen-

9. This section only briefly describes the method of generational accounting. For an in-depth explanation of the methodology, see Auerbach et al. (1991).

10. It is not necessary to repay the debt in order to satisfy the intertemporal budget constraint. It is enough that the growth rate of debt not exceed the discount rate.

eration born in year k. The index s in this summation runs from age 0 to age D, the maximum length of life.[11]

The second summation on the left-hand side of equation (A1) adds together the present values of remaining net payments of future generations. The first term on the right-hand side of equation (A1) expresses the present value of government consumption. In this summation the value of government consumption in year s, given by G_s, is discounted by the pretax real interest rate, r. The remaining term on the right-hand side, W_t^g, denotes the government's net wealth in year t, its assets minus its debt.

Equation (A1) indicates the zero-sum nature of intergenerational fiscal policy. Holding the present value of government consumption fixed, a reduction in the present value of net taxes extracted from current generations (a decline in the first summation on the left-hand side of eq. [A1]) necessitates an increase in the present value of net tax payments of future generations.

The term $N_{t,k}$ is defined by

$$N_{t,k} = \sum_{s=\max(t+k)}^{k+D} T_{s,k} P_{s,k} (1 + r)^{-(s-t)}. \tag{A2}$$

In expression (A2) $T_{s,k}$ stands for the projected average net tax payment to the government made in year s by a member of the generation born in year k. The term $P_{s,k}$ stands for the number of surviving members of the cohort in year s who were born in year k. For generations who are born in year k, where $k > t$, the summation begins in year k. Regardless of the generation's year of birth, the discounting is always back to year t.

A set of generational accounts is simply a set of values of $N_{t,k}$, one for each existing and future generation, with the property that the combined present values add up to the right-hand side of equation (A1). Though we distinguish between male and female cohorts in our results, we suppress sex subscripts in equations (A1) and (A2) to ease notation.

Note that generational accounts reflect only taxes paid less transfers received. With the exception of government expenditures on education, which are treated as transfer payments, the accounts do not impute to particular generations the value of the government's purchases of goods and services because it is difficult to attribute the benefits of such purchases. Therefore, the accounts do not show the full net benefit or burden that any generation receives from government policy as a whole, although they can show a generation's net benefit or burden from a particular policy change that affects only taxes and transfers. Thus generational accounting tells us which generations will pay for government spending, rather than which generations will benefit from the spending.

11. Hence, the first element of this summation is $N_{t,t}$, which is the present value of net payments of the generation born in year t; the last term is $N_{t,t-D}$, the present value of remaining net payments of the oldest generation alive in year t, namely, those born in year $t - D$.

Assessing the Fiscal Burden Facing Future Generations. Given the right-hand side of equation (A1) and the first term on the left-hand side of equation (A1), we determine, as a residual the value of the second term on the right-hand side of equation (A1), which is the collective payment, measured as a time t present value, required of future generations. Based on this amount, we determine the average present value lifetime net tax payment of each member of each future generation under the assumption that the average lifetime tax payment of successive generations rises at the economy's rate of productivity growth. (This makes the lifetime payment a constant share of lifetime income.) Leaving out this growth adjustment, the lifetime net tax payments of future generations are directly comparable with those of current newborns, since the generational accounts of both newborns and future generations take into account net tax payments over these generations' entire lifetimes. Note that our assumption that the generational accounts of all future generations are equal, except for a growth adjustment, is just one of many assumptions we could make about the distribution across future generations of their collective net payment to the government. We could, for example, assume a phase-in of the additional fiscal burden (positive or negative) to be imposed on future generations, allocating a greater share of the burden to later future generations and a smaller share to earlier ones. Clearly, such a phase-in would mean that generations born after the phase-in period has elapsed would face larger values of lifetime burdens (the $N_{t,s}$) than we are calculating here.

Appendix B
Thailand's Socioeconomic Survey 1992

The present study uses data obtained from the SES 1992. Although the National Statistical Office (NSO) of Thailand conducted its first household expenditure survey in 1957, it did not begin to conduct these surveys on regular basis until 1968–69. The surveys were repeated every five years. In 1986, the NSO started conducting the surveys every two years. The SES 1992 is the eleventh survey of this kind. The survey covered all private, noninstitutional households residing permanently in municipal areas, sanitary districts (a form of administrative unit), and villages. However, it excluded that part of the population living in transient hotels or rooming houses, boarding schools, military barracks, temples, hospitals, prisons, and other such institutions (NSO 1994).

Sampling Design

The simplest household survey would be one in which each household has an equal probability of being selected. This is called simple random sampling. It is impractical to conduct large surveys in which each household in the popu-

Table 18B.1 Number of Blocks/Villages Sampled

Region	Municipal Areas	Sanitary Districts	Nonmunicipal Areas	Total
North	54	83	222	359
Northeast	41	84	264	389
Centre	54	84	197	335
South	54	71	154	279
Bangkok Metropolis	249	0	0	249
Remainder	12	18	33	63
Total	464	340	870	1,674

lation has an equal chance of inclusion. It is more economical and efficient to use stratified sampling procedures. The SES surveys were conducted using a stratified two-stage cluster sampling.

The entire country was divided into six regions: (1) North, (2) Northeast, (3) Centre (excluding regions 5 and 6), (4) South, (5) Bangkok Metropolis, (6) Remainder (Nonthaburi, Pathum Thani, and Samut Prakan). Each region was further divided into three parts according to the type of local administration, namely, municipal areas, sanitary districts, and nonmunicipal areas outside sanitary districts. Thus the sampling design consisted of 18 strata, 3 strata in each region. The primary sampling units were blocks for municipal areas and sanitary districts, villages for nonmunicipal areas outside sanitary districts. At the first stage of sampling, blocks/villages were randomly selected from each stratum by using probability proportional to size (the total number of households). The total number of blocks/villages was 1,674, from 77,981 blocks/villages.

Table 18B.1 presents the number of blocks/villages sampled from each stratum. The secondary sampling units were the private households that were sampled from each selected block/village. A systematic sample of 15 households was selected from each of sample blocks, while 9 and 7 households were selected from each of sample villages in sanitary districts and nonmunicipal areas outside sanitary districts, respectively. Table 18B.2 presents the total number of sample private households selected for enumeration.

It is often the case that not all households selected in the sample respond. Some households are unwilling to respond, and others provide incorrect information. Also errors are made in recording and coding data. The sample of households finally selected in the survey is smaller than the number of initially selected households. The difference between the two causes nonsampling errors in the survey. If the nonresponding households are distributed uniformly across various groups, the impact of nonsampling error is small. Since it is difficult to know the distribution of nonresponding households, it is not possible to estimate the overall degree of accuracy in the survey results.

Table 18B.3 presents the actual number of households in the final sample.

Table 18B.2 Number of Sample Households Selected for Enumeration

Region	Municipal Areas	Sanitary Districts	Nonmunicipal Areas	Total
North	810	747	1,554	3,111
Northeast	615	756	1,848	3,219
Centre	810	756	1,379	2,945
South	810	639	1,078	2,527
Bangkok Metropolis	3,735	0	0	3,735
Remainder	180	162	231	573
Total	6,960	3,060	6,090	16,110

Table 18B.3 Actual Numbers of Private Households Selected in Survey

Region	Municipal Areas	Sanitary Districts	Nonmunicipal Areas	Total
North	614	665	1,441	2,720
Northeast	507	667	1,737	2,911
Centre	628	633	1,274	2,535
South	632	546	964	2,142
Bangkok Metropolis	2,698	0	0	2,698
Remainder	129	130	193	452
Total	5,208	2,641	5,609	13,458

Table 18B.4 Nonsampling Error by Region and Community

Region	Municipal Areas	Sanitary Districts	Nonmunicipal Areas	Total
North	24.20	10.98	7.27	12.57
Northeast	17.56	11.77	6.01	9.57
Centre	22.47	6.33	12.74	25.35
South	21.98	14.55	10.58	21.42
Bangkok Metropolis	27.76	0	0	27.76
Remainder	28.33	19.75	16.45	21.12
Total	25.17	13.69	7.90	16.46

The percentage differences between tables 18B.2 and 18B.3 provide the magnitude of nonresponding households (expressed in percentage). These results are presented in table 18B.4.

Of 16,110 households initially selected, 13,458 households were eligible for inclusion in the survey, giving a response rate of 83.54 percent. The response rate of 83.54 percent can be considered satisfactory considering the nature of the survey. It is interesting to note from table 18B.4 that the nonresponse rate is much higher in urban areas than in rural areas. In Bangkok Metropolis, the

nonresponse rate is very high, 27.76 percent compared to the average nonresponse rate of 16.46 percent for the whole country. Since the sample size is so large in Bangkok, however, a higher level of nonresponse will not bias the results too much.

Weighting Sampling Observations

Expansion factors ("weights") need to be inserted in respondent household records to enable the data provided by these households to be expanded to obtain estimates for the defined population. For instance, if N is the total number of households in the population and n is the number of households selected in the survey, the weight attached to the ith household will be given by

$$\text{(B1)} \quad w_i = \frac{N}{n} \quad \text{such that} \quad \sum_{i=1}^{n} w_i = N \quad \text{(the total household population).}$$

The weight in equation (B1) is derived on the assumption that every household in the population has exactly the same probability of being selected in the survey. Generally, the design of the survey will not imply that each household in the population has exactly the same probability of being selected. Hence the weight given to each respondent household must be determined by its probability of selection within a stratum adjusted to take account of nonresponding households. This is what we do below.

Let k be the serial number of a household and j the serial number of a block/village. Index areas by i, where i is 1 for municipal areas, 2 for sanitary districts, and 3 for nonmunicipal areas outside sanitary districts. Index regions by h, where h is 1 for North, 2 for Northeast, 3 for Centre, 4 for South, 5 for Bangkok Metropolis, and 6 for Remainder. Now suppose N_{hij} and P_{hij} are the total number of households selected for enumeration and the probability of selection in the jth sample block/village, ith area, and hth region, respectively, then

$$H'_{hi} = \frac{N_{hij}}{P_{hij}}$$

will be the estimated number of population households in the ith area and hth region. H'_{hi} will be the same in each selected block/village because the probability of selecting a block/village is proportional to the number of households in each population block/village. If m_{hi} is the number of sample blocks/villages selected in the ith area and hth region, then H_{hi}/m_{hi} will be the estimated number of population households allocated to each of the selected block/villages. If n_{hij} is the number of interviewed households in the ith area, hth region, and jth block/village, then the estimated number of population households allocated to the kth interviewed household in the ith area, hth region, and jth block will be given by

Table 18B.5 Number of Households as of July 1992

Region	Municipal Areas	Sanitary Districts	Nonmunicipal Areas	Total
North	278,376	352,525	2,405,145	3,036,046
Northeast	247,841	374,332	4,063,994	4,686,167
Centre	3,242,666	455,988	2,052,994	2,851,648
South	303,126	144,158	1,484,637	1,931,921
Bangkok Metropolis	1,653,115	–	–	1,653,115
Remainder	374,691	156,506	306,392	837,589
Total	31,996,486	1,483,509	10,313,162	14,996,486

(B2) $$H'_{hi} = \frac{1}{m_{hi} n_{hij}} \cdot \frac{N_{hij}}{P_{hij}},$$

where H'_{hi} will be the same number for all interviewed households in the ith area, hth region, and jth block. Note that

$$H'_{hi} = \frac{1}{m_{hi}} \sum_{j=1}^{m_{hi}} \frac{N_{hij}}{P_{hij}} \cdot \frac{1}{n_{hij}}.$$

H'_{hi} is the estimated number of population households in the ith area and hth region. Suppose H_{hi} is the actual number of population households, based on the household projections as obtained from NSO (1994; see table 18B.5), then the household weight attached to each interviewed household will be given by

(B3) $$W_{hijk} = \frac{H_{hi}}{H'_{hi}} \cdot \frac{N_{hij}}{P_{hij}} \cdot \frac{1}{m_{hi} n_{hij}},$$

where $W_{hijk} = W_{hij}$ for all k.

Note from equation (B3) that

$$H_{hi} = \sum_{j=1}^{m_{hi}} W_{hij},$$

and if H is the total number of households in the entire population, then

$$H = \sum_{h=1}^{6} \sum_{i=1}^{3} H_{hi}.$$

From table 18B.5, it can be seen that the total number of households in Thailand is 14,996,486. If we multiply the household size by its household weight, we get the population weight for each household. If we add all the population weights, we get unbiased estimates of the population in Thailand. The population estimates are presented in table 18B.6.

Table 18B.6 Population as of July 1992 (millions)

Region	Municipal Areas	Sanitary Districts	Nonmunicipal Areas	Total
North	0.95	1.21	8.97	11.13
Northeast	0.90	1.47	17.58	19.96
Centre	1.15	1.60	7.93	10.68
South	1.05	0.53	6.20	7.78
Bangkok Metropolis	5.54	–	–	5.54
Remainder	1.41	0.56	1.09	3.06
Total	11.0	5.37	41.77	58.15
Percentage of total	18.92	9.23	71.83	100.00

The total population of Thailand is estimated to be 58.15 million. The population of Bangkok Metropolis is 5.54 million. Of the total population in Thailand 71.83 percent lives in nonmunicipal areas outside sanitary districts. Thus a large majority of population in Thailand lives in rural areas.

Appendix C
Incidence Assumptions

Definition of Taxable Income. The following income sources can be allocated to individuals who earn them (whose age and sex are given): (1) wage and salary; (2) profit, nonfarm; (3) profit from farm; (4) transfer payments; (5) property income; and (6) other money receipts. Taxable income is defined as total money income minus all taxes paid. We obtained the individual age and sex profiles for taxable income and property income.

Income Tax (method 1). Income tax was available at the household level. From the taxable incomes of individuals we calculated the taxable income for each household. Given taxable income and income tax for each household, we computed the tax rate for each household. Given this information, we allocated the household income tax to each individual within the household in proportion to the taxable income of the individual (using the household tax rate). This allowed us to calculate the age and sex profile for each individual. This procedure does not assume that the income tax is proportional to the taxable income in the country. The assumption of proportionality is rather strong because the income tax is generally progressive. In the above allocation, we assumed that income tax is proportional within each household. This is not entirely satisfactory, but it is better that assuming that taxes are proportional in the entire economy. Many households had positive taxable income but did not pay any income

tax. The assumption of proportionality would allocate taxes to households and then to individuals even if these households did not actually pay any income tax.

Income Tax (method 2). This method allocates income tax to individuals in proportion to their taxable income. This method assumes that income tax is proportional in the economy. This method is less accurate than method 1.

Property Tax (method 1). This method is exactly the same as income tax method 1. The property tax is available at the household level and property income at the individual level. So we calculated the tax rates for each household and allocated property tax to individuals within the households in proportion to each individual's share of property income.

Property Tax (method 2). The property tax is allocated to individuals within the economy in proportion to the individual's property income. This method assumes proportionality in the economy.

Corporate Tax. We assumed that corporate income taxes are borne by labor because of international capital mobility. So we allocated corporate taxes in proportion to wage and salary income, which is available at the individual level, giving immediately the age and sex profile of corporate taxes.

Value-Added Tax (VAT). The value-added tax was allocated to households in proportion to each household's total expenditure. The allocation of VAT within households was done in proportion to the following equivalence scale:

Age 0–5 years	0.5
Age 6–11 years	0.6
Age 12–15 years	0.7
Age 16–18 years	0.8
Age 18+ years	1.0

We used this equivalence scale in order to take account of the differing needs of household members of different ages.

Import Duty. The allocation of import duty follows exactly the same procedure as for VAT.

Tobacco, Alcohol, and State Lottery. Taxes on alcohol, tobacco, and gambling were allocated to households in proportion to household expenditures on these items. Within households, these taxes are allocated only to adults (giving zero weight to children aged 18 or younger). This is referred to as method 1. Since in Asian countries, alcohol and tobacco are generally consumed by males only, in method 2 none of these taxes are allocated to females within households.

Petroleum Products and Motor Vehicles. The excise on petroleum products and motor vehicles is allocated to the household head according to the household consumption of these items.

Expenditures on Education. Current and capital expenditures on education were allocated in proportion to the number of persons attending school or university. In Thailand about 22 percent of the population is attending school of some kind. University expenditures were allocated to individuals attending a university and other educational expenditures were allocated to individuals attending institutions and schools other than a university.

Social Security. Expenditure on social security is allocated to the household head according to pensions and disability payments received by the household. It should be noted that the Thai government gives pensions only to government employees.

Local Government Revenue. In 1993–94, local government revenue was 47.3 billion baht, which on dividing by population gives a per person tax (per month) paid equal to 813.5 baht. This amount can be allocated to individuals in proportion to the property tax.

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