13. Population aging and debt

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1. INTRODUCTION

Many governments support seniors by taxing workers and funding health-care programs and public pensions. If patterns of taxing and spending do not change, aging will push total spending to much higher levels without a commensurate increase in tax revenues. This would expand deficits and accelerate growth in public debt. In the absence of substantial reform, debt could easily reach unsustainable levels.

Whether higher debt is sustainable will depend, in part, on how aging affects the demand for debt and the willingness of households and the firms that represent them to hold government-supplied debt. Aging has important implications for the demand for assets in all forms, including public and private debt, to help meet retirement needs. An increase in life expectancy, which contributes to aging, lengthens the duration of retirement. Thus, individuals may accumulate more assets to support any given level of annual consumption during retirement. Compositional effects reinforce the impact on the individual. Older populations have a greater aggregate demand for retirement assets because they have been accumulating assets over many years of work.

This chapter assesses how population age structure will affect debt throughout Asia. Rapid increase in public debt is an urgent concern in many high-income economies whose populations are aging rapidly, and in particular those that have implemented expansive public social welfare systems. The populations of low- and middle-income economies in Asia are younger than those in advanced economies, but they too are aging. These low- and middle-income economies also tend to have modest social welfare systems. For now, their age structure favors program expansion because a relatively large number of individuals are in the younger tax-paying age groups and relatively few are in the older benefit-receiving age groups. As the population ages, however, the fiscal strain from providing more public support to seniors will become increasingly apparent even in low- and middle-income economies in Asia in the future.

Furthermore, demographic change can impede economic growth and thus make it more difficult for economies to grow out of debt. Whether or not this becomes a problem will depend on trends in interest rates. If gross domestic product (GDP) growth and real interest rates both fall, existing debt may decline or rise relative to GDP.

Little has been written about how aging might influence consumers' willingness to extend credit to the public sector. Our analysis indicates that aging will result in a substantial increase in Asian households' demand for public debt and for public and private debt combined.

Without major public sector reform, however, Asian governments will have to increase their supply of public debt by much more. High levels of public sector indebtedness could be met to some extent if households substitute public for private debt. Moreover, Asian governments could turn to foreign sources to fund high debt levels. The problem with this strategy, of course, is that aging and increasing debt have become issues of global concern.

2. THE DEMAND FOR DEBT

The next two sections of this chapter consider the impact of aging on the demand for both public and private debt on the part of households. The impact of aging on the supply of public debt, that is, debt incurred by governments is discussed in section 4, and some concluding remarks are offered in section 5.

2.1 Foundation

During the retirement phase of life, individuals rely heavily on wealth to fund the gap between what they produce through their labor and what they consume. However, the wealth required to fund retirement is accumulated during the working years. Consequently, the total demand for wealth depends on behavior during retirement and long before retirement begins.

Given standard assumptions, per capita wealth rises during the working years, peaks near the age of retirement, and declines thereafter. Retirement needs are met by dis-accumulating wealth and by relying on income generated by the wealth that remains at each age (Diamond 1965; Lee and Mason 2011; Lee 1994; Mason 1988; Modigliani and Brumberg 1954; Samuelson 1958; Willis 1988).

Changes in population during the demographic transition influence aggregate pension wealth in three important ways. First, changes in age structure over the demographic transition have compositional effects on aggregate wealth—the larger the share of population concentrated nearer the peak of the age profile of wealth, the greater will be aggregate wealth.

Second, the demographic transition also affects the age profile of per capita life-cycle wealth by influencing the expected duration of life and, hence, the duration of retirement. A longer period of retirement, other things being equal, requires greater pension wealth at each age.

Third, the demographic transition influences aggregate economic growth and, hence, the size of the economy. Rapid growth in the working age population will produce a demographic dividend in many economies, resulting in more rapid growth in national income and, hence, national wealth. As population aging sets in and growth in labor slackens, however, aggregate wealth can be expected to grow more slowly than in recent decades.

There may be important indirect effects of population aging on debt, but we do not explore them in this chapter. Slowing population growth could lead to secular stagnation and lower interest rates (Summers 2015; Eggertsson et al. 2019). Should interest rates drop below GDP growth for a sustained period of time it will have substantial effects on debt as a share of GDP (see Chapter 2 in this volume).

The trends in components of aggregate debt depend on the trends in pension wealth and on the composition of that wealth which takes various forms: transfer wealth, capital, and credit or debt. Old-age transfer wealth is the present value of anticipated net transfers on which seniors rely to fund old-age needs. Old-age transfer wealth includes both private transfers

mostly through families and public old-age transfer wealth consisting of publicly funded pensions and health-care programs along with other goods and services provided by the public sector. Public transfer wealth is net of the taxes paid to fund such programs (Lee et al. 2003; Lee 1994).

Life-cycle needs can be satisfied by accumulating capital. This might include direct investment in businesses, farms and owner-occupied housing, for example, or indirectly through equity markets. The third component of wealth is credit/debt—the value of loans extended to governments, firms, or individuals less loans undertaken. Loans between financial institutions are not of interest here because debt undertaken is exactly balanced by debt extended. No net debt is created.

In a closed financial system, credit and debt must be equal. For this reason, as first pointed out by Samuelson (1958), the life-cycle role of private credit is limited. If children supported their life-cycle needs by accumulating debt, it could be balanced by assets accumulated by older adults to fund their old-age needs. In the real world, however, debt can be relied on to a very limited extent to fund consumption during the younger ages. Those in their late teens and early twenties can take out student loans and incur credit card debt, but younger children cannot. Because the supply of debt by children is relatively small, the potential demand for debt at older ages greatly exceeds the potential supply of debt at younger ages unless interest rates are very negative. The demand for debt over the life-cycle can be satisfied by the supply of debt by firms and governments (Diamond 1965; Lee and Mason 2010). The debt demanded by residents can differ from the debt supplied by domestic firms and governments with the difference equal to external debt. This possibility is not explored further in this chapter.

The total demand for wealth by households is increasing sharply worldwide because of population aging. Almost all high-income economies, where global wealth is concentrated, are aging and many quite rapidly. Even in economies where aging is in its early stages, the demand for wealth is rising in anticipation of retirement needs of the future.

In what follows, we place particular emphasis on how aging could affect public debt, considered from two perspectives. The first is the perspective of the government which adopts policies that influence the size of deficits and the evolution of public debt. We call this the supply of public debt. The second perspective is that of private individuals who choose to allocate some part of their life-cycle pension wealth to public debt. We call this the demand for public debt. We also project the demand for public and private debt combined given that public and private debt demanded by individuals may be close substitutes.

Our analysis relies heavily on baseline scenarios using business-as-usual assumptions. We do not consider some interesting possibilities that bear further consideration. Aging could have an influence on the share of public resources claimed by seniors through their increasing power at the polls. Or aging could influence the demand by seniors for debt versus equity (or capital). We do not find compelling evidence that would warrant incorporating these kinds of effects into our baseline scenarios. We do not, for example, find that net transfers to seniors are rising relative to net transfers to children as populations age. Nor do empirical studies of pension funds consistently show that participants reduce their equity holdings with age (Cappelletti et al. 2014; Bikker et al. 2012; Alestalo and Puttonen 2006; Gerber and Weber 2007; Lucas and Zeldes 2009).

To summarize, the empirical analysis presented below is informed by the following key points:

- Aging will lead to an increase in life-cycle pension wealth relative to labor income.
- Growth in total pension wealth and total debt may slacken due to slower growth in the effective labor force.
- The share of assets in total pension wealth will depend on public policies regarding old-age transfer systems, examined in more detail later in the chapter.
- Debt as a share of labor income will rise with aging.

2.2 Methods for Projecting Debt

To assess the impact of population change on debt, we build on projections of other key macroeconomic variables detailed below. These methods are applied both to the demand for debt by households and the supply of debt by governments. Projections of population by age are based on the most recent available data from the United Nations. The implications for macroeconomic variables are incorporated using age profiles of economic flows based on National Transfer Accounts (NTA). The baseline projections of economic series are used to assess the impact of population change, holding the age patterns of those variables fixed at the base year values. The per capita age profiles of economic variables are assumed to shift upward at a productivity growth rate of 1.5 percent per annum.

Projecting economic variables employs a simple approach as compared with more complex models, for example, general equilibrium models, often used to assess the impact of aging on individual economies. Projections are used here because of our interest in considering the impact of aging over many years and for many economies under very heterogeneous circumstances. It is very important that the results be interpreted as a way to assess the first order effects of aging in the absence of changes in economic structure, public policy, or other features of economies in Asia. The results presented here are not intended as long-term forecasts of macroeconomic trends. Indeed, projections presented here and below show that business as usual is not possible.

The same approach is used to project economic flows: GDP, labor income, consumption, public transfer inflows, taxes and related measures. The economic flows are then used as the basis for projecting the demand for wealth, and public and private debt, as well as the supply of debt by governments examined below. The general approach to projecting flows can be represented as follows. Denote the per capita value of economic flow at age x in the base year b by $v(x,b)$ and the population of age x in year t by $N(x,t)$. The projected aggregate flow $V(t)$ is equal to:

$$V(t) = (1+\lambda)^{t-b} \sum_{x=0}^{\omega} v(x,b)N(x,t) \qquad (13.1)$$

where λ is the annual rate of productivity growth and ω is the maximum years of life. To simplify notation, the country indicator has been dropped but the per capita age profiles and population data vary by country.

Projected values of economic flows are calculated as shown in Table 13.1.

Table 13.1 Calculation of projected economic flows

Labor income	*Yl*(*t*)	Annual income by age for employees, self-employed workers, and the value of uncompensated family labor. Labor income incorporates age-specific variation in labor force participation, unemployment, hours worked, and wages.
Gross domestic product (GDP)	*GDP*(*t*)	The ratio of GDP to total labor income is constant and, hence, total labor income and GDP grow at the same annual rate.
Consumption	*C*(*t*)	Consumption by age is the value of all goods and services consumed including both public and private consumption.
Public transfer inflows	*TGI*(t)	The value of goods and services at each age provided by general government to residents.
Taxes	Taxes(*t*)	The value of taxes paid at each age for general government.
Fiscal balance	Fiscal(*t*)	The fiscal balance is equal to taxes less public transfer inflows.
Public saving	*SG*(*t*)	Fiscal balance plus public asset income.

Source: Authors.

Two methods are used to project stocks, wealth, assets and debt. The first method emphasizes life-cycle decision-making of individuals. The life-cycle wealth of each cohort is calculated as the cumulative prospective value of consumption and labor income over the remaining existence of that cohort. The life-cycle wealth of all persons aged x in year t, $WP(x,t)$, is calculated as:

$$WP(x,t) = \sum_{z=0}^{\omega-x} \left(1+\delta\right)^{-z} \left(C(x+z,t+z) - Yl(x+z,t+z)\right) \tag{13.2}$$

Total pension wealth in year t, $WP(t)$, is the sum of pension wealth of retirees and pre-retirees:

$$WP(t) = \sum_{x=P}^{\omega} WP(x,t) \tag{13.3}$$

Pension wealth includes life-cycle wealth accumulated toward retirement and life-cycle wealth held after retirement has begun. Mason et al. (2017) provide details about estimating the age at which accumulation of life-cycle retirement wealth begins. We assume that credit extended over the life cycle to the private and public sectors, MF and MG, respectively, are a constant share of life-cycle pension wealth:

$$\begin{aligned} MF(t) &= b_1 WP(t) \\ MG(t) &= b_2 WP(t). \end{aligned} \tag{13.4}$$

The second approach applies to public debt and relies on projections of the fiscal balance, $BF(t)$, and public saving:

$$\begin{aligned} BF(t) &= Taxes(t) - TGI(t) \\ SG(t) &= BF(t) + rAG(t) \end{aligned} \tag{13.5}$$

We have adjusted taxes so that taxes and transfers are balanced in the base year with taxes and transfers projected following equation (13.1). Hence, changes in debt do not reflect existing deficits, only deficits that arise due to aging. Public assets (AG) are projected using:

$$AG(t+1) = AG(t) + SG(t) \tag{13.6}$$

with public debt equal to the negative of public assets.

We distinguish two forms of public assets (or debt). The first is legacy debt that is a consequence of public debt that economies have already accumulated. To some extent legacy debt may reflect aging that economies have already experienced but it will also reflect the impact of war, fiscal crises, and other factors unrelated to aging. New debt measures only the imbalances between public transfer inflows and outflows that are driven by population aging.

$$\begin{aligned} &\text{Legacy debt: } -(1+r)^{t-t0} AG(t0) \\ &\text{New debt: } -\sum_{z=0}^{t-t0} (1+r)^{z} BF(t0+z) \end{aligned} \tag{13.7}$$

where r is the rate of interest, $t0$ is the base year, and t the year of the projected value.

The projections presented below distinguish the demand and supply of public debt. The demand for public debt refers to securities held by consumers who are seeking to diversify their portfolio between public and private credit and other forms of life-cycle wealth. The supply of debt refers to debt incurred by the government as a consequence of their policies regarding spending and taxation. To the extent that these projected values differ, governments will be pressured to adjust their fiscal policy, and consumers to adjust their reliance on public debt.

A simple extension of this method allows for changes in the per capita public transfer inflow and tax profiles. Several earlier papers (Lee et al. 2017; Lee and Mason 2015; Mason et al. 2016) use this approach.

2.3 Data

The analysis is dictated in part by the availability of data. Demographic data and NTA data are used to provide baseline projections to show how population aging would affect life-cycle wealth and the household demand for private and public debt. For a more limited group of economies (see Table 13.7), data on public transfer inflows (cash and in-kind benefits from public programs) and taxes are used to simulate how demographic change will affect public fiscal balance and public debt embodied in current public policy. Life-cycle pension wealth as a share of total labor income is converted to life-cycle pension wealth as a share of GDP

assuming that total labor income is two-thirds of GDP. See Appendix Table 13A.1 for information on data sources.

3. AGING AND OLD-AGE NEEDS IN ASIA

This section provides basic information about demographic trends and old-age needs in Asia. For a subset of economies (shown in Table 13.7), we describe the role of the public sector in funding old-age needs.

3.1 The Life Cycle and Demographic Trends

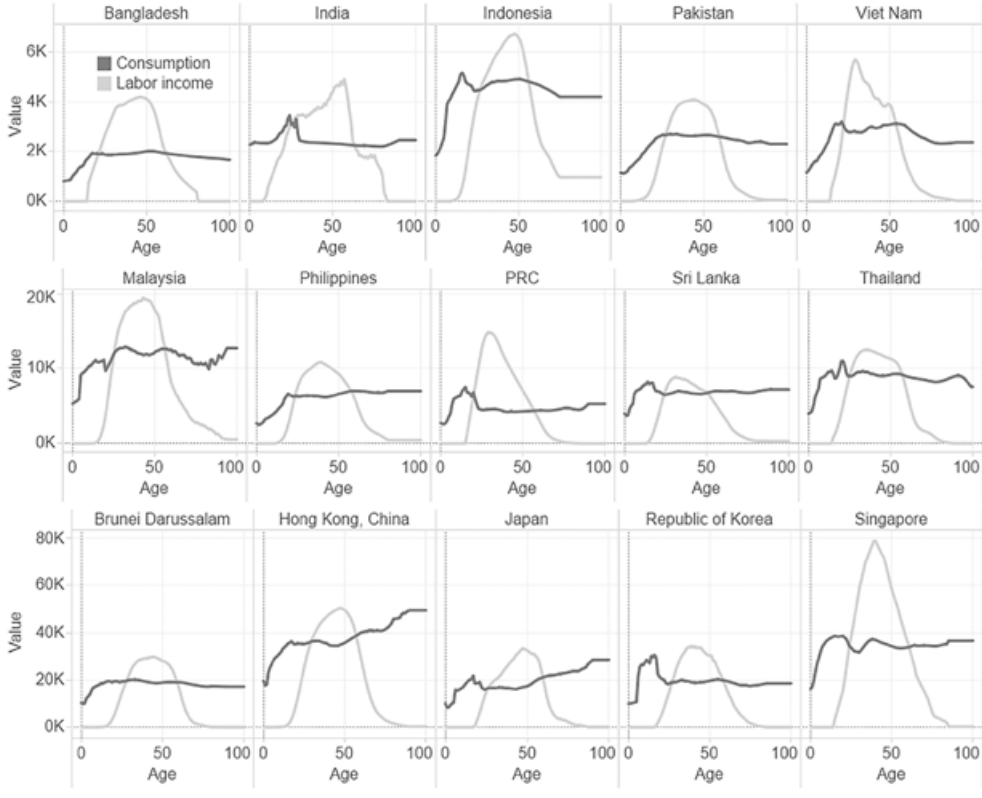
The effects of demographic change on the economy can be traced to fundamental features of the life cycle. For extended periods, at the beginning and the end of life, people consume much more than they produce through their labor. We call these deficit ages. Between these two phases of life, which we call surplus ages, people produce more through their labor than they consume. Over the demographic transition the concentrations of the population in the surplus and deficit ages are changing. Two trends are particularly important to economic trends, in general, and debt in particular.

First, the population in the productive ages is growing more slowly than in the past and is expected to grow even more slowly in the future. Second, the population concentrated at the old-age-deficit ages is increasing relative to the population concentrated at the productive ages. This has been going on for some time, but it is accelerating in many parts of the world and particularly in Asia.

To understand these trends, it is helpful to recognize that the years devoted to schooling and, hence, the age at which people begin to work is relatively high in East Asian economies. The relationship between age and labor income at older ages varies as well, because of differences in health, labor markets, and laws and policies that govern work at older ages. The cost of being old also varies considerably across economies. In general, the consumption of seniors is high compared with younger adults in rich economies. This is driven in large part by high spending on health care. But this pattern does not hold in all high-income economies in Asia, for example, the Republic of Korea.

The life cycle is incorporated into our analysis using NTA data. Figure 13.1 displays per capita labor income and consumption estimates by age, circa 2010 for 15 economies ranging from relatively low income in the top row to relatively high income in the bottom row.

These life-cycle profiles are used to capture major demographic trends in a way that reflects economy-specific economic features of the life cycle. The trends in growth are measured by the rate of growth of the effective number of workers. The number of effective workers is calculated as the population weighted using the labor income profile. The weight for each age is labor income at that age divided by the average of labor income for those 30–49 years of age. The second measure is the old-age gap ratio which is equal to the ratio of total consumption less total labor income for those 65 and older relative to total labor income for all ages combined.



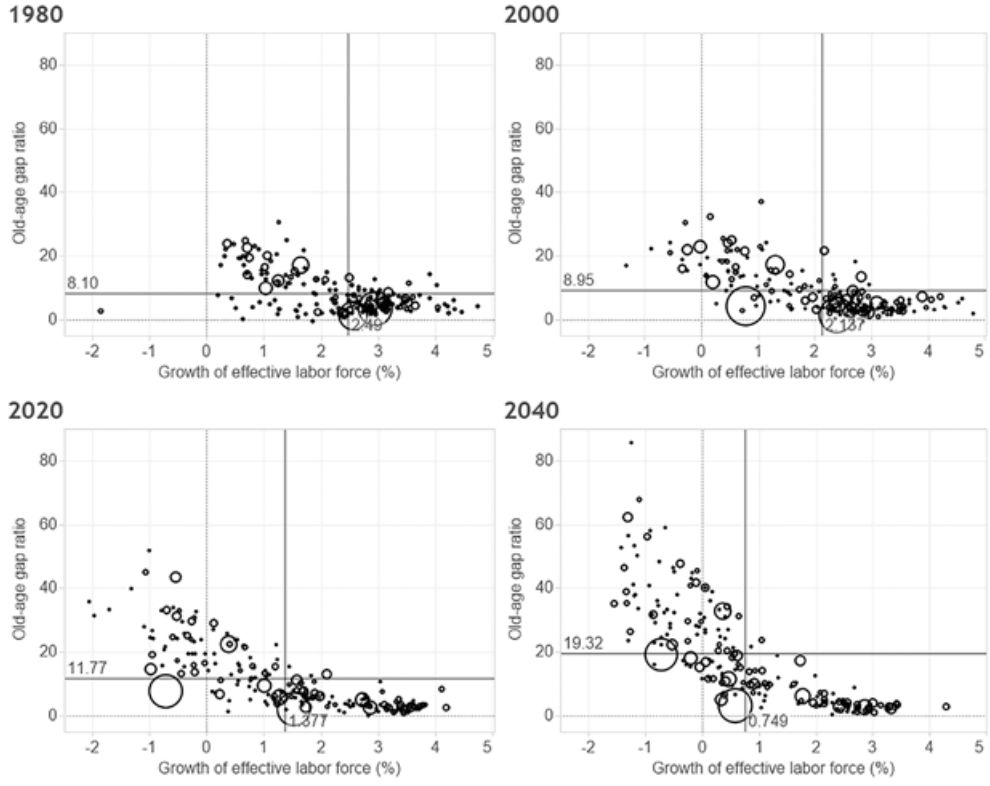
Notes:
PRC = People's Republic of China.
All values are in purchasing power parity dollars. K represents "thousands".
Source: Mason et al. (2017).

Figure 13.1 Per capita consumption and labor income by age for selected Asian economies ($ 000)

Figure 13.2 shows two features of the global demographic transition: growth rate of effective labor and the old-age gap ratio for 185 economies in 1980, 2000, 2020, and 2040. The regional groupings used in this figure are based on the UN population division classifications. Asia refers to all Asian economies as defined in that grouping.

In 1980, effective labor was growing rapidly in Asia and in many economies worldwide. The average growth rate for Asia (simple average of economies) was 3.2 percent per year. The growth rate was not as rapid in any other region of the world, and for European economies the average was only 1.1 percent per year. Asia was also quite young in 1980. The old-age gap was only 6.3 percent of total labor income as compared with an average of 17.4 percent for European economies.

Since 1980, the growth of effective labor has slowed and populations have aged. The average growth rate of effective labor dropped to 2.7 percent by 2000, to 1.4 percent by 2020, and to



Notes: The size of the circle is proportional to population size. See Appendix Table 13A.2 for list of economies.
Source: Mason et al. (2017).

Figure 13.2 Growth rate of effective labor and old-age gap ratio, selected economies

a projected growth rate of only 0.4 percent in 2040. For European economies, the growth rate of effective labor has also dropped sharply since 1980. For 2020, a decline of 0.4 percent per year is expected and an even more rapid decline at −0.6 percent per year is projected for 2040.

As measured by the old-age gap ratio, aging for the Asian region as a whole has been relatively modest so far, with the regional average rising from 6.3 percent in 1980 to 6.7 percent in 2000 and to 8.7 percent by 2020. A very sharp increase is anticipated over the next two decades, however, with the gap ratio expected to reach 17.6 percent by 2040. European economies are much older than Asian economies but very sharp increases are also projected for those economies over the next 20 years. By 2040, the gap ratio is projected to reach 40.8 percent.

Asia was much less heterogeneous demographically in 1980 than it is today. Japan was the only major economy in that year that had begun to experience slower growth and aging. The growth rate and the gap ratio in the People's Republic of China (PRC), India, Indonesia, Pakistan, Bangladesh, and other Asian economies were similar, and these economies were all

growing more rapidly and had larger younger populations than the average economy in the world.

The diversity that now marks Asia was becoming apparent by 2000 with particularly rapid decline in the growth rate of effective labor force in the PRC to −0.7 percent per year. Several other economies in East Asia and Southeast Asia are experiencing decline such as Japan; the Republic of Korea; Taipei,China; and Thailand. In many Asian economies, however, the effective labor force is growing 1–2 percent per year, including in Bangladesh, India, Indonesia and the Philippines, and more rapidly in Pakistan.

When it comes to aging, economies in Asia look similar, while economies in Europe and North America are more heterogeneous. The exception is Japan, of course, which has the highest old-age gap ratio of any economy in the world. Asia will become much more diverse on the aging dimension during the next two decades. East Asian economies and some Southeast Asian economies are expected to age very rapidly between now and 2040. From a demographic perspective these economies will look more like Europe and less like other economies in Asia.

3.2 Life-Cycle Pension Wealth

A surprising, and to our knowledge so far unknown, finding is that that demographic trends in Asia have led to a sharp, but amazingly steady rise in "projected" life-cycle wealth for the last 40 years. In 1980–2020, total "projected" life-cycle wealth increased at close to 5 percent per annum, year in and year out. Total life-cycle wealth increased from $14 trillion in 1980 to $92 trillion in 2020 (at 2010 United States dollars purchasing power parity (PPP)). Note that the trends in these values are only a reflection of demographic change. We refer to the values before 2020 as "projected", to be crystal clear that the plots capture the effects of historical changes in population, holding per capita age profiles of consumption and labor income constant, other than a 1.5 percent annual increase at every age.

Further increases in total wealth are projected for the future but the era of rapid growth, driven by population growth and aging, has clearly ended. Over the next 40 years, total life-cycle wealth is projected to grow at 2.4 percent per year, essentially half the rate experienced during the preceding 40 years. The rate of growth is expected to be more rapid at 3 percent per year during the next 20 years than the rate of growth of 1.8 percent in 2040–2060 (Table 13.2).

Regional differences in wealth are substantial in Asia, with more than half of total life-cycle wealth found in East Asia. In 2020, total wealth in East Asia was 82 percent of Asia's total but by 2060 the projected share will drop to 70 percent. Other Asian regions will all gain at the expense of East Asia.

Table 13.2 Life-cycle wealth for selected ADB subregions, 1980 to 2060

	1980	2000	2020	2040	2060
	Life-Cycle Wealth ($ billion, 2010 $ at PPP)				
Total	13,522	36,980	92,384	167,393	239,024
Central Asia	363	630	1,697	4,030	6,874
East Asia	11,457	31,552	75,513	128,396	166,276
South Asia	515	1,416	4,075	10,639	24,186
Southeast Asia	1,187	3,381	11,098	24,328	41,689
	Annual Growth Rate over the Preceding 20-Year Period (%)				
Asia		**5.16**	4.68	3.02	1.80
Central Asia		2.80	**5.08**	4.42	2.71
East Asia		**5.20**	4.46	2.69	1.30
South Asia		5.19	**5.43**	4.91	4.19
Southeast Asia		5.37	**6.12**	4.00	2.73

Notes:
PPP = purchasing power parity.
Peak values are in bold font; subregions as defined by the Asian Development Bank (ADB).
Source: Authors' calculation based on NTA Indicators 2019. www.ntaccounts.org (accessed 15 September 2019).

3.3 Aging and Debt Estimates: Household Demand for Debt

Although our focus is on Asia, Table 13.3 provides some context by comparing Asian debt to debt in other regions of the world over the last 25-year period (1995–2019). For the period as a whole, debt was about 140 percent of GDP in Asia, less than in Europe, Oceania, and especially North America, but more than in Africa and Latin America. The rankings for private debt were similar as for total debt, with Asia's private debt higher than in Africa or Latin America and the Caribbean, but lower than other regions of the world. Note that comparisons with Oceania are problematic because private debt includes many Pacific island nations but public debt and total debt are based solely on New Zealand and Australia.

Debt as a percentage of GDP is rising around the world, driven largely by an increase in private debt as a percentage of GDP. The increase was very rapid in Europe and North America as compared with Asia where the increase was 1.8 percentage points per year for total debt and 1.6 percentage points per year for private debt. The picture is more mixed for public debt. Public debt in Asia and in Latin America and the Caribbean declined by 0.2 percentage points per year over this period, whereas it increased in Europe (0.7) and North America (1.2).

Table 13.3 Debt statistics for regions of the world, 1995–2019

	Africa	Asia	Europe	LAC	North America	Oceania
(%)						
Debt/GDP	91.5	139.9	185.6	94.3	239.8	188.6
Private debt/GDP	17.7	68.3	129.2	55.2	158.5	68.9
Public debt/GDP	66.3	50.9	54	43.8	81.3	23.6
Annual Change (%)						
Debt/GDP	−2.2	1.8	4.4	1.0	3.5	4.6
Private debt/GDP	0.6	1.6	3.4	1.4	2.3	1.6
Public debt/GDP	−2.8	−0.2	0.7	−0.2	1.2	0.7

Notes:
GDP = gross domestic product; LAC = Latin America and the Caribbean.
Private and public debt do not sum to total debt because economies reporting public and private debt vary. See Appendix 13A.2 for list of economies.
Source: International Monetary Fund (2019).

The extent of debt varies considerably among the economies of Asia. Average total debt and public debt are particularly high in Japan. Private debt is relatively high there but has declined in recent years as a percentage of GDP. Total debt is high in the PRC, the Republic of Korea, and Malaysia, mostly due to high levels of private debt. Private debt is also high in Hong Kong, China (IMF 2019).

Public and private debt are projected assuming that the partial effect of life-cycle pension wealth on debt is constant. Based on available data for Asian economies, an increase in life-cycle pension wealth by $100 was matched by an increase in total debt by $39. The estimated increase is greater for private debt ($22) than for public debt ($14). (Private and public debt do not equal total debt because of differences in the economies included in the calculations.)

3.4 Projections: The Demand for Debt

Based on the projected values for Asia (Table 13.4), demographic change will lead to an increase in the total demand for debt, combining public and private, from just under $36 trillion in 2020 to almost $65 trillion in 2040. By 2060, the total demand for debt is projected to fall just short of $93 trillion. Although aging could lead to a shift toward a demand for public debt, we do not find any compelling evidence that this will occur and, hence, the demand for private debt and public debt maintain their respective shares in total debt. Projected demand for private debt is a little less than 60 percent, and demand for public debt is a little more than 40 percent of total debt.

Projected demand for debt is heavily concentrated in East Asia, with 82 percent of the total in 2020. About 12 percent of the projected demand for debt is concentrated in Southeast Asia. Demand for debt is projected to experience a significant increase in regional dispersion over the coming decades, however. By 2060, regional debt in East Asia is projected to drop to 70 percent of Asia's total debt. The shares for all other regions are projected to rise, but particularly in South Asia.

Table 13.4 Projected demand for debt in selected ADB subregions, 2000, 2020, 2040 and 2060 ($ billion at PPP)

	2000	2020	2040	2060
Total Debt				
Total	14,328	35,791	64,850	92,600
Central Asia	245	658	1,562	2,663
East Asia	12,224	29,254	49,741	64,416
South Asia	549	1,579	4,122	9,370
Southeast Asia	1,310	4,300	9,425	16,151
Private Debt				
Total	8,223	20,541	37,219	53,145
Central Asia	140	377	896	1,528
East Asia	7,015	16,790	28,548	36,970
South Asia	315	906	2,366	5,378
Southeast Asia	752	2,468	5,409	9,269
Public Debt				
Total	5,176	12,930	23,428	33,453
Central Asia	88	238	564	962
East Asia	4,416	10,568	17,970	23,271
South Asia	198	571	1,489	3,385
Southeast Asia	473	1,553	3,405	5,835
Regional Distribution of Debt				
Total	100.0	100.0	100.0	100.0
Central Asia	1.7	1.8	2.4	2.9
East Asia	85.3	81.7	76.7	69.6
South Asia	3.8	4.4	6.4	10.1
Southeast Asia	9.1	12.0	14.5	17.4

Notes:
PPP = purchasing power parity.
Subregions as defined by the ADB.
Source: Authors' calculations.

Throughout Asia, aging is leading to a projected increase in the demand for debt relative to total labor income (Table 13.5). Roughly speaking, starting in 2000, debt increased from 1× total labor income, to 1.6×, to 2.2×, and to 2.5× total labor income at 20-year intervals. A more precise examination of the data shows that the increase is greatest for the next 20-year period. The greatest impact of aging on debt as a share of total labor income (or of the aggregate economy in general) is expected between 2020 and 2040.

Table 13.5 Projected debt as a percentage of labor income in selected ADB subregions, 2000, 2020, 2040, and 2060

	2000	2020	2040	2060
Total Debt				
Total	104.1	161.4	221.2	251.2
Central Asia	127.1	172.4	254.7	294.2
East Asia	127.9	213.9	324.1	377.9
South Asia	23.4	32.3	48.8	76.5
Southeast Asia	78.8	133.2	192.0	242.2
Private Debt				
Total	59.8	92.6	126.9	144.2
Central Asia	72.9	98.9	146.2	168.8
East Asia	73.4	122.8	186.0	216.9
South Asia	13.4	18.5	28.0	43.9
Southeast Asia	45.2	76.5	110.2	139.0
Public Debt				
Total	37.6	58.3	79.9	90.7
Central Asia	45.9	62.3	92.0	106.3
East Asia	46.2	77.3	117.1	136.5
South Asia	8.5	11.7	17.6	27.6
Southeast Asia	28.5	48.1	69.4	87.5

Note: Subregions as defined by the ADB.
Source: Authors' calculations.

Table 13.6 presents annual growth rates of debt and its components. Keep in mind that the projections are based on an assumed productivity growth rate of 1.5 percent per year and, hence, debt and labor income will grow at 1.5 percent per year if the effects of demographic change are neutral.

Table 13.6 Growth of debt and its component, annual rates

	Debt			Debt/Labor Income			Labor Income		
	2000–2020	2020–2040	2040–2060	2000–2020	2020–2040	2040–2060	2000–2020	2020–2040	2040–2060
Total	4.58	2.97	1.78	2.19	1.58	0.64	2.39	1.40	1.14
Central Asia	4.95	4.32	2.67	1.53	1.95	0.72	3.42	2.37	1.95
East Asia	4.36	2.65	1.29	2.57	2.08	0.77	1.79	0.58	0.52
South Asia	5.29	4.80	4.11	1.61	2.06	2.25	3.68	2.73	1.85
Southeast Asia	5.94	3.92	2.69	2.63	1.83	1.16	3.31	2.10	1.53

Note: Growth of debt equals growth of debt/labor income plus growth of labor income.
Source: Authors' calculations.

In the absence of demographic change, debt would have increased by 1.5 percent per year, the assumed rate of productivity growth. Thus, for 2000–2020, the demographic change led to more rapid growth in debt of 3.08 percent (i.e., 4.58–1.50) for the region as a whole. The impact of aging on debt is projected to remain positive at 1.47 percent and 0.28 percent for 2020–2040 and 2040–2060, respectively, but over time the impact on the growth of total debt is projected to be considerably smaller. Growth in debt/labor income and in labor income are reinforcing with both growing more slowly in future periods. For 2040–2060, the effective labor force is actually projected to decline (−0.36 = 1.14–1.50).

The changing impact of demography on debt is occurring earlier in East Asia and to some extent in Southeast Asia. Of particular note is that the labor income is projected to grow substantially less than productivity growth after 2000. As a result, total debt is projected to increase by only 1.14 percent per year between 2040 and 2060 as compared with the assumed rate of productivity growth of 1.5 percent per year.

4. AGING AND DEBT: PERSPECTIVE OF THE PUBLIC SECTOR

Studies of the impact of population on public finances emphasize the close connection between age and tax revenues on the one hand and public benefits provided on the other. In general, prime-age adults fund government programs while children and seniors depend on them. An increase in the population of prime-age, tax-paying adults improves a country's fiscal balance while an increase in the child or senior populations weakens a country's fiscal balance, undermining public finances.

This fundamental interaction between public finances and population is captured for individual economies using per capita age profiles of taxes and benefits based on NTA estimates. Taxes include both direct and indirect taxes which are allocated to individuals based on the nature of the tax. Benefits that are individual in nature, such as health-care benefits or public pensions, are allocated to the recipients of those programs. Collective benefits, such as public diplomacy or safety and security, are allocated on a pro-rata basis. As explained in the methods section above, the projected fiscal balance rises and falls depending on the age profile of the fiscal balance and population age structure.

Our projections are based on the assumption that age patterns of taxes and benefits do not change over time, but it is important to acknowledge that important changes are likely to occur in the future. Many economies have implemented more generous transfer systems over time. The importance of the public sector has grown quite rapidly in Asia not only because of population change, but because of more rapid increase in transfer programs compared with their productivity growth. Per capita government transfers for children and the elderly have increased much more rapidly than transfers for prime-age adults as per capita income increased.

Tax profiles have changed too. There is a growing body of literature on the impact of the tax mix on economic growth, equity, and tax revenue. One part of this literature compares the effects of direct versus indirect tax choices in the context of the dynamic endogenous growth model. Since income taxes are more difficult to evade than indirect taxes, tax authorities are more likely to rely on indirect taxes where tax evasion prevails. Consequently, developing economies may rely more on indirect taxes, while developed economies tend to rely more on

direct taxes. A number of empirical studies show that reliance on direct taxes rises with per capita income (Hines and Summers 2009; Estrada et al. 2015). This has implications for tax incidence by age, for example, because the age profiles of consumption are different from the age profile of income.

Tax and spending patterns vary considerably in Asia. Japan and the Republic of Korea depend on income, corporate and valued-added taxes, which account for about 80 percent of their tax revenues, while the Republic of Korea relies less on income taxes. The financing of social welfare expenditures is also different in the two economies.

4.1 Public Debt Projections for Asia

The growing public debt is a concern for many Asian governments. Japan in particular has the oldest population in Asia; its working-age population has begun to decline rapidly; and its public programs, pensions, health care, and long-term care provide ample support for seniors. Thus, Japan provides an instructive case.

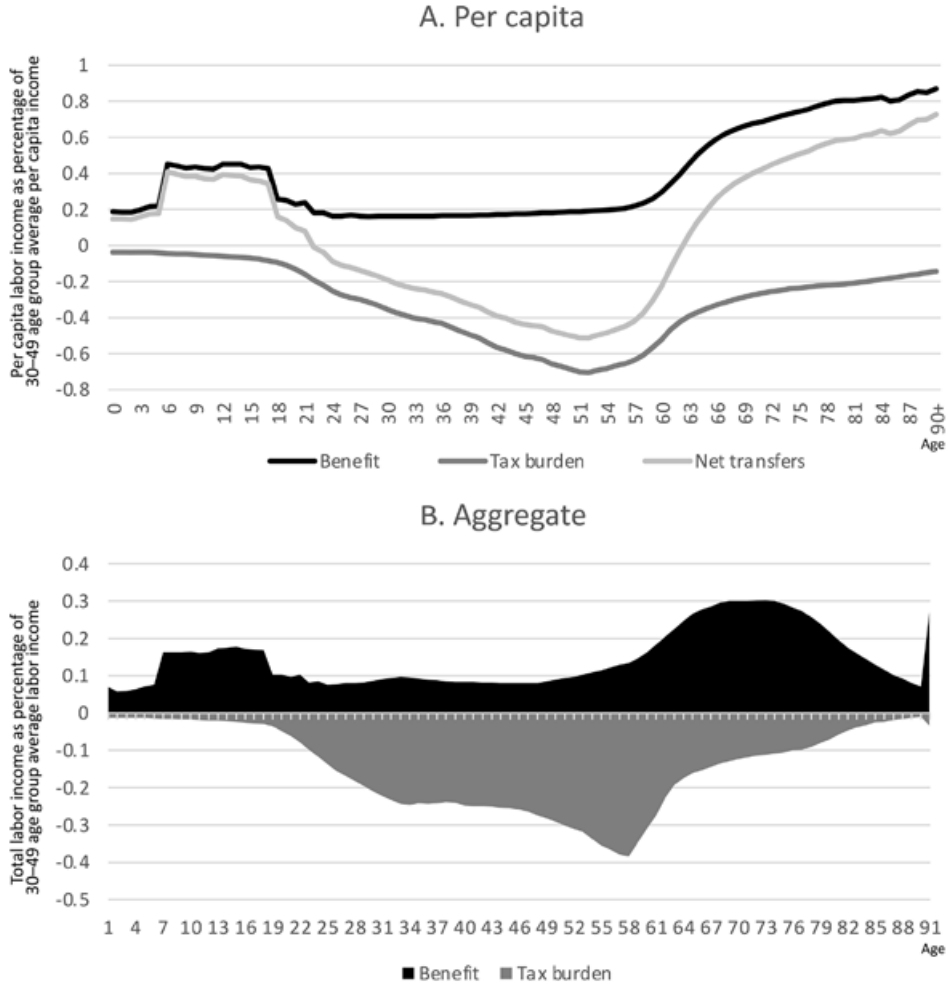
Figure 13.3 shows per capita and aggregate public transfer flows by age for Japan in 2009. The per capita flows are normalized by dividing the annual flows by the annual per capita labor income of persons aged 30 to 49, the prime working ages in most economies. The aggregate profiles are normalized by dividing the annual flows by the total labor income of persons aged 30 to 49. Per capita age profiles (panel A) show two peaks: the first for children, which is driven primarily by public spending on education; and the second for seniors, which is driven primarily by public pensions and health-care spending. The tax burden profiles peak around ages 45–54 when labor income peaks. The aggregate flows by age are the product of the per capita flows shown in panel B. The influence of Japan's old population age structure is clearly evident as most public transfers go to the elderly.

Table 13.7 presents debt projections based on current tax and spending age profiles. Data are available to construct projections of gross debt and new debt for eight member economies. Net debt estimates are available only for three economies—Japan, the Republic of Korea, and Indonesia. New debt estimates are based on the adjusted tax profiles and government transfers that produce fiscal balance in 2015. Arguably, deficits in recent decades are a consequence of the aging already experienced. There is no obvious way, however, to quantify the effects of aging as compared with other macroeconomic factors. For this reason, we are particularly interested in the increase in debt, which we call new debt, that is attributable to demographic factors. Japan has been running a deficit in recent years. Our projection for 2020 is that gross debt will exceed 250 percent of GDP and net debt will reach 175 percent of GDP, far higher levels of debt than in any other Asian economy. New debt for Japan is projected to reach just over 700 percent and legacy debt 600 percent of GDP in 2060. Total net debt would approach 1,300 percent of GDP by 2060.

The projected impact of population on public debt is substantial in East Asian economies. The accumulation of new debt is smallest in Taipei,China but even there it is 341 percent by 2060. Elsewhere in East Asia, new debt is even greater, with the greatest increase projected for the Republic of Korea at 826 percent of GDP. Increases of this magnitude are surely unsustainable. We discuss some possible responses below.

The situation is quite different in the four Southeast Asian economies for which projections are available. In three—Thailand, Singapore, and Indonesia—an increase in new debt is pro-

jected to range between 6 percent of GDP in Singapore and 62 percent of GDP in Indonesia in 2050. Only in Indonesia is the projected value greater than 100 percent of GDP in 2060. The situation in the Philippines is entirely different because transfers to seniors are very limited there, and thus, aging is projected to lead to budget surpluses rather than deficits.



Notes: Per capita profiles are normalized by the average labor income of those aged 30–49. Aggregate profiles are normalized by the total labor income of those aged 30–49.
Source: Authors' calculations.

Figure 13.3 Profiles of government transfers in Japan, 2009

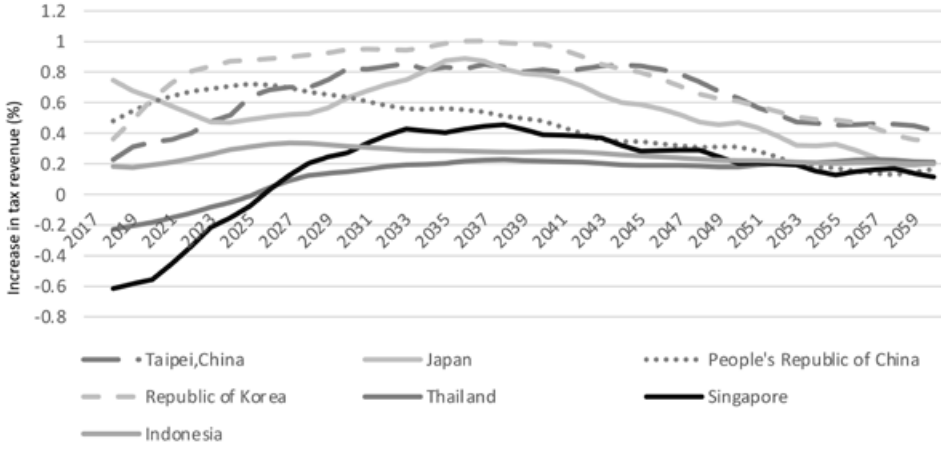
Table 13.7 Projected public debt for eight economies, 2010 to 2060 (% of GDP)

		2010	2020	2030	2040	2050	2060
Legacy Debt, Gross							
East Asia	PRC	33.7	51.1	68.7	92.3	124.1	166.8
	Japan	207.9	256.8	345.1	463.8	623.3	837.6
	Korea, Republic of	...	43.8	58.8	79.0	106.2	142.8
	Taipei,China	36.7	38.8	52.1	70.0	94.1	126.5
Southeast Asia	Indonesia	24.5	32.1	43.2	58.0	78.0	104.8
	Philippines	49.7	43.6	58.6	78.8	105.9	142.3
	Singapore	98.7	119.7	160.8	216.1	290.4	390.3
	Thailand	27.8	35.6	47.9	64.3	86.5	116.2
Legacy Debt, Net							
	Japan	137.2	174.7	234.8	315.6	424.1	570.0
	Korea, Republic of	11.3	11.8	15.9	21.3	28.7	38.5
	Indonesia	9.1	3.7	5.0	6.8	9.1	12.2
New Debt							
East Asia							
	PRC		2.2	29.9	105.5	248.4	476.9
	Korea, Republic of		2.2	36.6	150.6	400.1	826.6
	Taipei,China		0.7	12.7	58.3	162.0	341.2
	Japan		4.8	40.0	144.8	362.6	708.9
Southeast Asia							
	Indonesia		−0.6	7.0	25.6	62.4	124.9
	Philippines		−2.8	−27.4	−89.4	−209.7	−424.4
	Singapore		−1.4	−8.4	−9.4	6.1	41.2
	Thailand		−0.8	−4.2	−1.7	15.2	57.0
Combined Debt, Gross							
East Asia							
	PRC	33.7	53.3	98.6	197.8	372.5	643.7
	Korea, Republic of	...	46.0	95.4	229.7	506.3	969.4
	Taipei,China	36.7	39.5	64.9	128.4	256.1	467.7
	Japan	207.9	261.6	385.0	608.6	985.8	1,546.5
Southeast Asia							
	Indonesia	24.5	32.7	50.2	83.7	140.4	229.7
	Philippines	49.7	40.9	31.2	−10.6	−103.9	−282.1
	Singapore	98.7	118.2	152.4	206.7	296.5	431.5
	Thailand	27.8	34.8	43.6	62.6	101.6	173.2
Combined Debt, Net							
	Japan	137.2	179.5	274.8	460.4	786.7	1,278.8
	Korea, Republic of	11.3	14.0	52.5	171.9	428.8	865.1
	Indonesia	9.1	4.3	12.1	32.4	71.5	137.2

Notes:
… = data not available; GDP = gross domestic product; PRC = People's Republic of China.
Source: Authors' calculations.

4.2 Extensions

To mitigate the negative impact of population aging, taxes must increase, benefits must decrease, or some combination of these should occur. Figure 13.4 shows a required tax increase (benefit decreases) schedule which removes the aging effect year by year until 2060. This is calculated to make fiscal balance zero every year, holding government transfer profiles constant. For example, in the Republic of Korea, tax (expenditure) should increase (decrease) by 0.4–1.0 percent every year holding expenditure (tax) profiles constant. This *tax gap* is ranging from 0.1 percent to 1 percent per year for all case studies in this chapter.



Source: Authors' calculations.

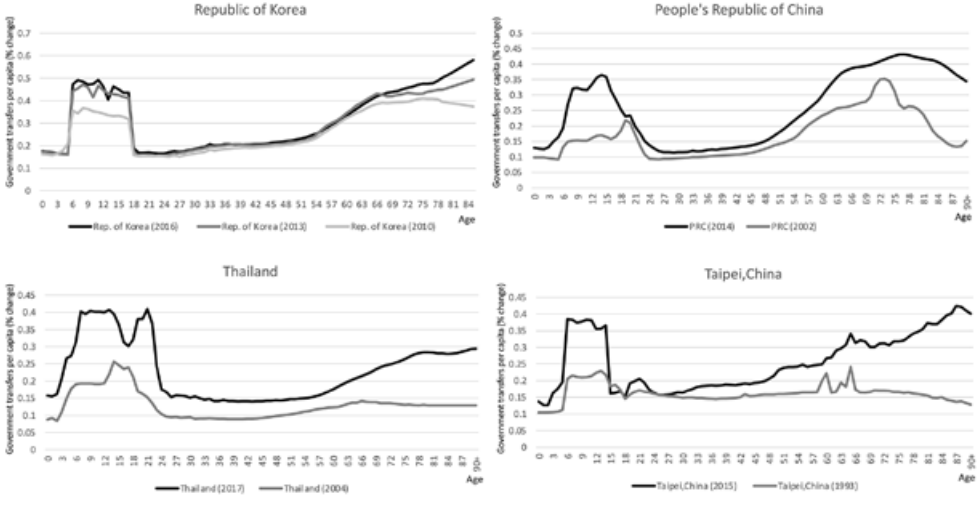
Figure 13.4 Tax growth required to eliminate population aging effects, 2017–2060, 3-year moving average (%)

Two things should be noted. First, needless to say, our projection is dependent upon our basic assumptions on productivity growth as well as interest rates. However, the projected new debt is still enormous, with very favorable assumptions leading to a lower level of debt (i.e., very low interest rates and higher growth rates). This implies that the impact of demographic change on debt is quite substantial for some economies regardless of assumptions. Second, economies in Asia are very different in terms of their speed of demographic transition and their macroeconomic condition. While the four East Asian economies in our projections are experiencing very rapid population aging, some lower-income economies are not. However, it should be noted that population aging is a region-wide trend which will affect all of Asia eventually.

On the other hand, our projections assume that the tax and benefit profiles will be held constant. However, historical data show that this cannot be true. In the real world, public benefits

for children and the elderly have risen sharply in all economies regardless of their level of economic development.

Figure 13.5 presents the per capita government transfers of selected economies, which shows clearly a sharp increase in public benefits for children and the elderly in all economies regardless of time range. But the transfers for other ages have increased as well. The PRC and Thailand show dramatic changes over even a shorter period of time, 12–13 years, which can be due to their rapid growth and favorable demographic conditions. However, this is also largely due to their expansion of welfare programs. For example, in 2009, the PRC committed to building a universal public pension system in rural areas funded by individual premiums and government subsidies. The transfers for children and the elderly have increased substantially for the Republic of Korea as well within only six years. Such a sharp rise is somewhat exceptional, but other Asian economies are also experiencing the same.



Notes:
PRC = People's Republic of China.
The per capita flows are normalized by dividing the annual flows by the annual per capita labor income of persons aged 30–49.
Source: Authors' calculations.

Figure 13.5 Change in per capita government transfers (expenditure) by age

Raising taxes has been much more difficult than raising government expenditure, which is especially true for rapidly growing economies. Thus, the danger is that economies with favorable demographics and fast growth will implement generous transfer systems that prove ultimately to be unsustainable. In fact, lower-income economies in Asia spend relatively little on public programs for reasons that are largely unrelated to demographic conditions. As lower-income economies develop, however, the key issue for them is whether the public sector can expand at the same time as their populations are aging.

5. CONCLUDING OBSERVATIONS

Asia is still a relatively young region, but it is in the midst of a demographic transition toward older populations. The demand for debt—which consists of public and private debt and represents retirement-funding assets for the life-cycle consumer—is growing as the population grows older. Our projections indicate that the demand for both public and private debt will rise sharply between now and 2060 in developing Asia. All four subregions of developing Asia will see a significant increase in demand for debt although the exact patterns differ. Our projections confirm our expectation that as Asia turns older, Asians will demand more debt to finance their old-age consumption.

The implications of business-as-usual public policies are that there are very high levels of public debt that substantially exceed the demand for debt on the part of life-cycle consumers. The demand for public debt as a percentage of labor income from life-cycle households is projected to increase from 58 percent in 2020 to 91 percent of total labor income in 2060. For Southeast Asia, the 2020 value is 48 percent of total labor income in 2020 and 88 percent of total labor income in 2060. Private debt in East Asia is projected to increase from 123 percent to 217 percent of total labor income and in Southeast Asia from 77 percent to 139 percent. The expected increase in the supply of debt by Asian governments could be met in part by a shift from private debt to public debt on the part of life-cycle consumers. This appears to have been the case in Japan. Comparisons with individual economy projections in Table 13.7 suggest that life-cycle consumers in East Asia will not be in a position to absorb all the public debt that would result in the absence of public sector reform.

Our results show that population aging leads to very substantial increases in life-cycle wealth. At the same time, public programs are providing important sources of support for the elderly, especially in East Asian economies. The key question is how to sustain or reform current old-age support systems in the face of rapid population aging. The worsening fiscal health of economies like the Republic of Korea; Japan; Taipei,China; and the PRC suggests that current tax and expenditure systems will lead to huge increases in public debt, which would impair the future fiscal sustainability of aging Asian economies. On a more optimistic note, the favorable demographic position of lower-income economies such as the Philippines can substantially help their debt position. However, population aging is a region-wide trend affecting all of Asia although its timing and speed vary across economies. Therefore, all Asian economies will eventually face growing pressure from their public debt.

NOTE

1. The views expressed therein are those of the authors and do not necessarily reflect the views and policies of ADB, its Board of Governors or the governments they represent.

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APPENDIX 13.1

Table 13A.1 Data sources

Data	Source	Remarks
Demographic Data	United Nations Department of Economic and Social Affairs. World Population Prospects 2019. https://population.un.org/wpp/.	All projections are based on the medium-fertility scenario.
Macroeconomic Data	World Bank. World Development Indicators, Country Statistics. https://datacatalog.worldbank.org/dataset/world-development-indicators. Washington, DC. Asian Development Bank. Key Indicators for Asia and the Pacific. Manila. https://www.adb.org/data/key-indicators/main.	
Net Debt	International Monetary Fund (IMF). Global Debt Database. 2019 Global Debt (December).	
	IMF. Private Debt, Loans, and Debt Securities. https://www.imf.org/external/datamapper/PVD_LS@GDD/SWE.	Private debt is the total stock of loans and debt held by households and nonfinancial corporations as a share of gross domestic product (GDP).
	IMF. Central Government Debt. https://www.imf.org/external/datamapper/CG_DEBT_GDP@GDD/SWE.	Public debt is the total stock of debt issued by the central government as a share of GDP.
NTA Debt Measures	National Transfer Accounts (NTA). Time Series Indicators. https://ntaccounts.org/web/nta/show/Time%20Series%20Indicators. Mason et al. (2017).	NTA data on public sector finances for eight ADB member economies: People's Republic of China: 2002, 2014 Indonesia: 2005 Japan: 1984, 1989, 1999, 2004, 2009 Philippines: 2015 Singapore: 2013 Republic of Korea: 2010, 2013, 2016 Taipei,China: 1993, 2015 Thailand: 2004, 2017

Table 13A.2 List of economies

Afghanistan	People's Republic of China	French Polynesia	Lesotho	Portugal	Syrian Arab Republic
Albania	Colombia	Gabon	Liberia	Puerto Rico	Taipei,China
Algeria	Comoros	Gambia	Libya	Qatar	Tajikistan
Angola	Congo	Georgia	Lithuania	Republic of Korea	Thailand
Argentina	Costa Rica	Germany	Luxembourg	Republic of Moldova	Timor-Leste
Armenia	Côte D'Ivoire	Ghana	Macau, China	Romania	Togo
Australia	Croatia	Greece	Madagascar	Russian Federation	Tonga
Austria	Cuba	Guam	Malawi	Rwanda	Trinidad and Tobago
Azerbaijan	Cyprus	Guatemala	Malaysia	Saint Lucia	Tunisia
Bahamas	Czechia	Guinea	Maldives	Saint Vincent and The Grenadines	Turkey
Bahrain	Dem. People's Republic of Korea	Guinea-Bissau	Mali	Samoa	Turkmenistan
Bangladesh	Democratic Republic of The Congo	Guyana	Malta	Sao Tome and Principe	Uganda
Barbados	Denmark	Haiti	Mauritania	Saudi Arabia	Ukraine
Belarus	Djibouti	Honduras	Mauritius	Senegal	United Arab Emirates
Belgium	Dominican Republic	Hong Kong, China	Mexico	Serbia	United Kingdom
Belize	Ecuador	Hungary	Mongolia	Sierra Leone	United Republic of Tanzania
Benin	Egypt	Iceland	Montenegro	Singapore	United States
Bhutan	El Salvador	India	Morocco	Slovakia	United States Virgin Islands
Bolivia (Plurinational State of)	Equatorial Guinea	Indonesia	Mozambique	Slovenia	Uruguay
Bosnia and Herzegovina	Eritrea	Iran (Islamic Republic of)	Myanmar	Solomon Islands	Uzbekistan
Botswana	Estonia	Iraq	Namibia	Somalia	Vanuatu
Brazil	Eswatini	Ireland	Nepal	South Africa	Venezuela (Bolivarian Republic of)
Brunei Darussalam	Ethiopia	Israel	Netherlands	South Sudan	Viet Nam
Bulgaria	Fiji	Italy	New Caledonia	Spain	Yemen
Burkina Faso	Finland	Jamaica	New Zealand	Sri Lanka	Zambia
Burundi	France	Japan	Nicaragua	State of Palestine	Zimbabwe
Cabo Verde		Jordan	Niger	Sudan	
Cambodia		Kazakhstan	Nigeria	Suriname	
Cameroon		Kenya	Norway	Sweden	
Canada		Kuwait	Oman	Switzerland	
Central African Republic		Kyrgyz Republic	Pakistan		
Chad		Lao People's Democratic Republic	Panama		
Chile		Latvia	Papua New Guinea		
		Lebanon	Paraguay		
			Peru		
			Philippines		
			Poland		

Note: In this chapter, data for Afghanistan and Myanmar were valid as of 14 December 2020 and may have changed thereafter because of major recent events affecting the country.