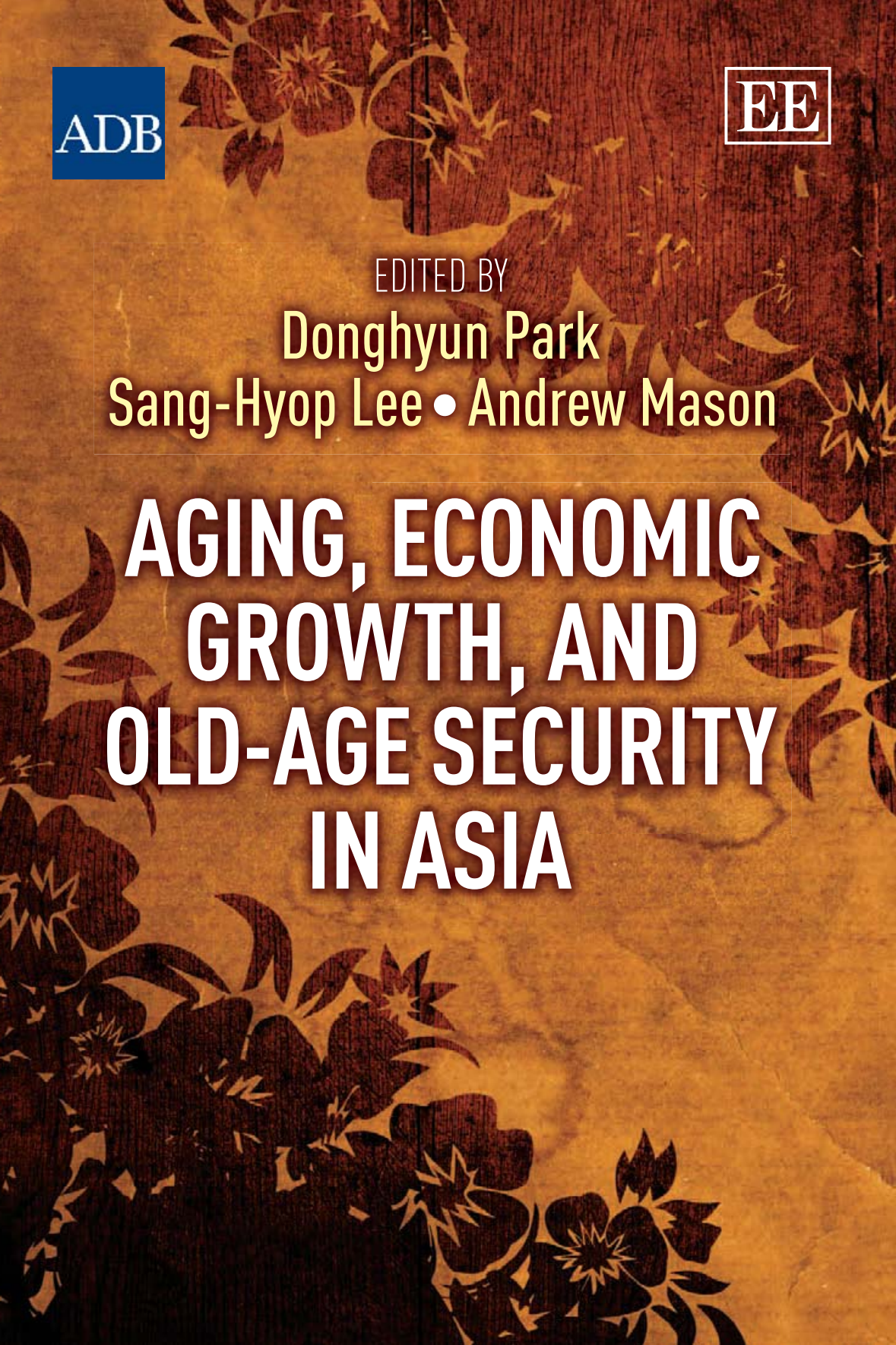
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AGING, ECONOMIC GROWTH, AND OLD-AGE SECURITY IN ASIA

Aging, Economic Growth, and Old-Age Security in Asia

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CO-PUBLICATION OF THE ASIAN DEVELOPMENT BANK AND EDWARD ELGAR PUBLISHING

Edward Elgar
Cheltenham, UK • Northampton, MA, USA

Published by
Edward Elgar Publishing Limited
The Lypiatts
15 Lansdown Road
Cheltenham
Glos GL50 2JA
UK

Edward Elgar Publishing, Inc.
William Pratt House
9 Dewey Court
Northampton
Massachusetts 01060
USA

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6 ADB Avenue, Mandaluyong City
1550 Metro Manila, Philippines
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Fax +63 2 636 2444
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A catalogue record for this book
is available from the British Library

Library of Congress Control Number: 2012939257

ISBN 978 1 78195 230 6

Typeset by Servis Filmsetting Ltd, Stockport, Cheshire
Printed and bound by MPG Books Group, UK

Contents

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Foreword

Rapid demographic change toward older populations is one of the biggest, if not the single biggest, medium-term structural challenge confronting developing Asia in the post-global crisis period. Throughout Asia, the share of the elderly in the population is rising as a result of falling fertility and rising life expectancy. Within the common region-wide trend of demographic change, there is considerable heterogeneity. Some countries, such as the Repulic of Korea and Singapore, are at an advanced stage of the demographic transition while others such as India and the Philippines are at an early stage. Yet others, such as the People's Republic of China and Thailand, are in between. Diversity in the level and speed of population aging across Asian countries implies that each country faces unique aging-related challenges. Nevertheless, the demographic landscape of even younger Asia countries will be fundamentally altered by 2050, which means that all Asian countries should start preparing now for demographic change.

Broadly speaking, demographic transition poses two huge strategic challenges for Asia: (1) sustaining growth in the face of less favorable population structures; and (2) delivering affordable, adequate and sustainable old-age income support for the region's fast-growing elderly population. With respect to sustaining growth, a youthful population structure contributed substantially to Asia's rapid economic growth in the past. Benign demographics implied a working-age population and hence workforce which is large relative to the population. However, the demographic dividend is coming to an end across the region, albeit at different speeds in different countries. With respect to economic security for the elderly, traditional family-based support – that is, transfers from children to parents – played a major role in Asia's old-age income support in the past. But such support is weakening due to extensive socioeconomic changes at a time when demographic change is rendering old-age support more important than ever.

The two strategic challenges arising from demographic transition are not independent but closely interrelated. For one, sustaining rapid growth into the medium term is required to generate the fiscal resources necessary to provide economic security for the elderly. Public transfers to the

elderly are underdeveloped in Asia relative to both advanced economies and Latin America, but are expected to play a greater role in the future. In the absence of rapid growth, expansion of public transfers to the elderly is likely to generate a great deal of resistance from the younger generation. On the other hand, how the elderly finance their consumption will affect economic growth. Above all, an old-age support system which is based to some extent on private savings is more conducive for capital accumulation and growth than a system based disproportionately on public transfers. More fundamentally, allocating more resources to the elderly implies fewer resources for the rest of the population, so it necessarily involves a tradeoff.

In light of the far-reaching repercussions of developing Asia's demographic change, the Asian Development Bank undertook this study with the goal of helping the region's policymakers gain a better understanding of the challenge they face. On the basis of rigorous analysis, the study, which formed the backbone of the *Asian Development Outlook 2011 Update* theme chapter, sets forth a wide range of concrete policy options for sustaining economic growth while delivering economic security for the elderly. There are some Asia-wide policy options which are relevant for the entire region, such as building up strong national pension systems. Other policy options are more relevant for sub-groups of countries, for example policies for capturing the demographic dividend matter more for younger countries. While this study is the ADB's most comprehensive and in-depth analysis of the impact of population aging on Asia, it is by no means the only one. For example, last year we produced the book *Pension Systems and Old-Age Income Support in East and Southeast Asia: Overview and Reform Directions*. This year we published *Social Protection for Older Persons: Social Pensions in Asia* and *East and Southeast Asian Pension Systems: Promoting Fairness and Sustainability*.

Finally, I would like to express my deepest appreciation to all the ADB staff and external experts who contributed to this outstanding collective volume on one of developing Asia's biggest medium-term socioeconomic challenges. I have no doubt that this work will figure prominently in any future public discussions about the socioeconomic impact of demographic change on the region. I would like to thank Donghyun Park, who originated, managed and led the research project, and Arief Ramayandi and Gemma Estrada for their many intellectual contributions. Thanks are also due to Joseph Zveglich for his strategic support and guidance, and to Lagrimas Cuevas and Arnelyn Abdon for their high-caliber administrative support. This research project would not have been possible without the excellent work of the many external experts who took part in it. In

particular, I would like to thank Sang-Hyop Lee, Andrew Mason and Kwanho Shin for providing a great deal of intellectual leadership for the project.

Changyong Rhee
Chief Economist, Asian Development Bank

Abbreviations and acronyms

DMC	developing member country
ESR	economic support ratio
EU	European Union
G3	European Union, Japan, and the United States
GDP	gross domestic product
ILO	International Labour Organization
IMF	International Monetary Fund
IRA	individual retirement account
LCD	lifecycle deficit
NIE	newly industrializing economies
NIPA	national income and product accounts
NTA	National Transfer Accounts
OECD	Organisation for Economic Co-operation and Development
PRC	People's Republic of China
TFP	total factor productivity
TFR	total fertility rate
USA	United States
UN	United Nations
WHO	World Health Organization

Note: $ refers to United States dollars unless otherwise specified.

1. Overview: why does population aging matter so much for Asia? Population aging, economic growth, and economic security in Asia

Sang-Hyop Lee, Andrew Mason, and Donghyun Park

1. INTRODUCTION

The speed and strength of developing Asia's recovery from the global financial and economic crisis has been surprising. Although exports and economic growth plummeted during the fourth quarter of 2008 and the first quarter of 2009, the sizable fiscal and monetary stimulus programs quickly enacted by governments around the region initially supported aggregate demand and growth in the face of collapsing world trade. The region's resilient V-shaped recovery has gained depth and breadth as exports have recovered and private domestic demand has strengthened. What is all the more surprising is that the turnaround has taken place despite the continued fragility and uncertainty of the advanced economies. While it is far too early to tell whether Asia has decoupled from the business cycles of the advanced economies, the region's robust performance is making a substantial contribution to the global outlook.

The region now faces the difficult, fundamental challenge of sustaining growth beyond the crisis into the medium and long term. For decades prior to the crisis, Asia was the world's fastest growing economic region; this strong, sustained performance transformed it from a group of typical developing countries into the third center of gravity of the world economy along with the European Union (EU) and the United States (US). The question remains, will Asia be able to return to its high-growth trajectory once the global crisis abates?

Asia's continued post-crisis success is far from automatic. The external environment is likely to be less benign because to a large extent, the weakness of the advanced economies reflects structural problems – failures in

the US housing and financial markets and fiscal concerns in some EU countries – that will take time to sort out. The medium-term weakening of the advanced economies has negative repercussions for Asia's medium-term growth since those economies have traditionally been and remain key markets for its exports.

In addition to a less benign external environment, Asia also faces structural shifts that impinge on long-term economic growth. Above all, the first demographic dividend – a major contributor to growth in the past – is coming to an end. The first demographic dividend refers to the accelerated economic growth associated with a rise in the share of people of working age in the total population. That rise leads to an increase in per capita income; hence, for a given saving rate, the rise in the share of working-age people leads to an increase in consumption per person, that is, to a higher living standard. The first demographic dividend is not, however, an automatic consequence of favorable demographics; it depends on the ability of the economy to use the additional workers productively. The success of East Asian economies in creating policy environments conducive to taking full advantage of their demographic dividends played a major role in the East Asian miracle.[1]

As the large working-age cohort that drove the demographic dividend grows older, however, population aging sets in. An aging population implies a fall in the working-age population that will lead to lower output. Aging also implies that each worker will have to support more and more retirees under public pension and healthcare systems. All in all, while demographic trends in Asia were conducive to economic growth in the past, they will be markedly less so in the future. Responses to population aging can lead to very different outcomes. People may work longer, workers may increase savings to cover longer life expectancy, or there may be greater investment in human capital that will lead to higher productivity. If, for example, workers accumulate assets in anticipation of living longer, then population aging may possibly lead to a more favorable outcome for the economy. This increase in the demand for capital in response to aging is called the second demographic dividend (Mason and Lee, 2007).

Achieving the second demographic dividend in large part relies on policy. In fact, for Asian policymakers, population aging gives rise to two major objectives that sometimes sharply conflict with each other. The first is to sustain strong economic growth over the next few decades, and the second is to develop social systems that will provide economic security to a growing number of elderly people. Success in achieving these two objectives will require policies that promote saving, investment in human capital, well-functioning financial and labor markets, and macroeconomic

stability. It will also require avoiding disproportionately large transfer programs for the elderly.

As in other parts of the world, population aging in Asia is due to two factors: lower fertility and longer life expectancy. Asian economies are at very different stages of population aging due to significant differences in the timing and speed of fertility and mortality declines. In South Asia, for example, populations are still relatively young, while in East Asia they are substantially older, but two important demographic changes are common to all. The percentage of children is declining or has already reached low levels due to rapid declines in birth rates, and the share of the working-age population is increasing or has reached very high levels.

As indicated above, the increase in the working-age population has had a direct and favorable impact on growth in per capita income, but this is a transitory phenomenon. In some East Asian economies, the working-age cohort has already started to decline and the older population is increasing rapidly, particularly in high-income economies, in large part because they have very low fertility rates. Lower-income economies will also experience significant increases in the share of older people in the next few decades. This rapid and massive transition will have important implications for economic growth, the sustainability of publicly funded pension and healthcare systems, labor supply, saving and capital formation, spending on human resources, poverty, and intergenerational inequality.

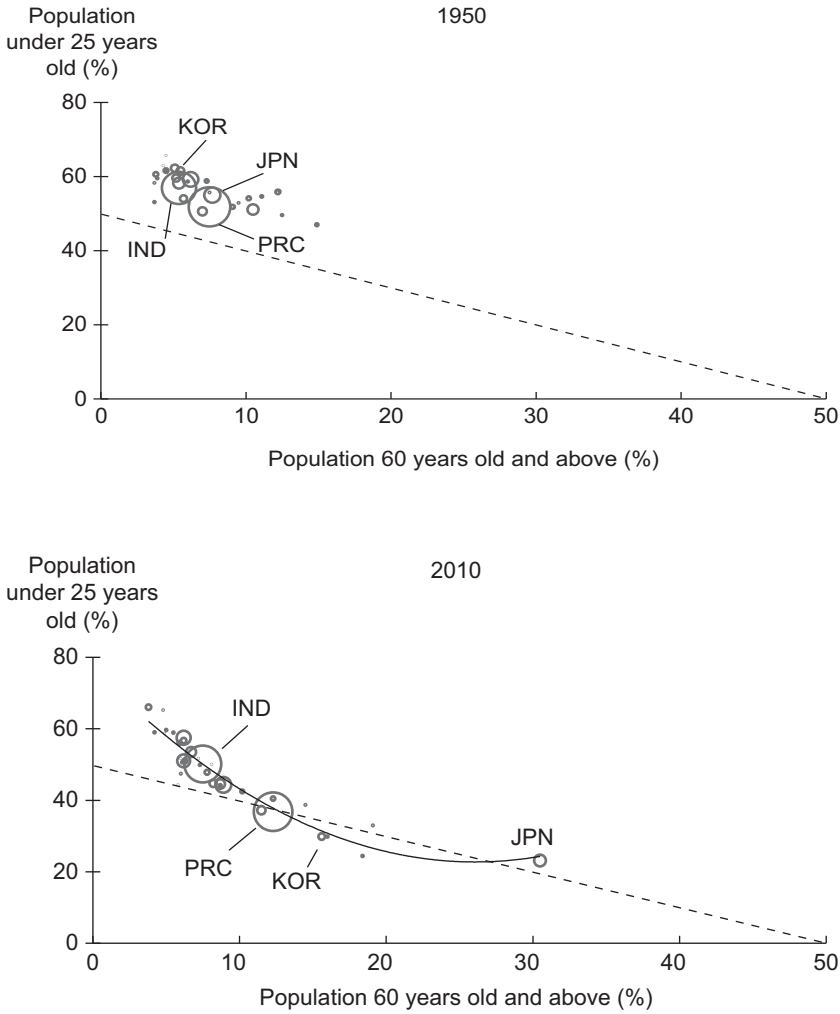
2. KEY FEATURES OF AGING IN ASIA

To understand the economic implications of the demographic transition, we must identify its key features, explain why it is occurring, and describe how it varies across countries. The estimates and projections presented here are based on the United Nations (UN) Population Division's 'World population prospects: the 2008 revision' (UN, 2009).

2.1 The Three Phases of the Transition

Important changes in the age structure in Asia began to occur around 1950. Most populations were then young, with more than half under the age of 25. The rest were concentrated in the prime working ages of 25–59, while the percentage of the total population aged 60 and older ranged from 3 to 15 percent.

The range of age structure in 1950 is shown in the first panel in Figure 1.1. Countries are represented by bubbles that are proportional to the size of their population. The percentage of the population under



Notes:
Below diagonal line population exceeds 50 percent of the total population.
PRC = People's Republic of China; IND = India; JPN = Japan; KOR = Republic of Korea.

Source: UN (2009), accessed 1 July 2011.

Figure 1.1 Population age structure for Asian countries, 1950, 2010, and 2050

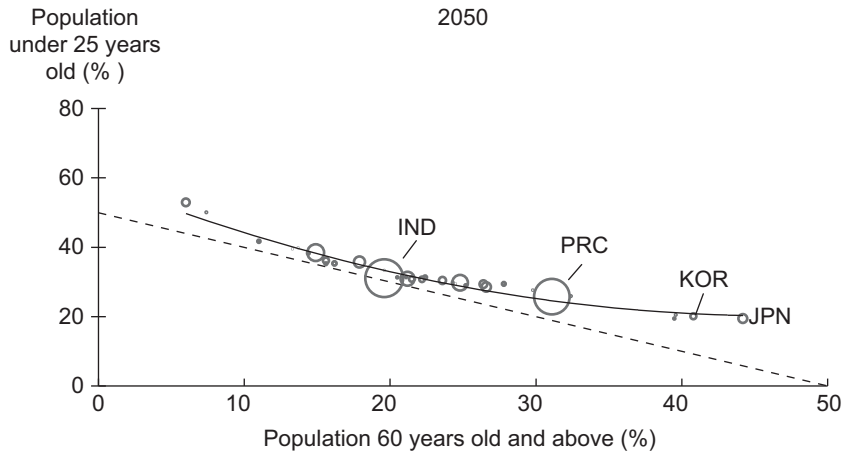


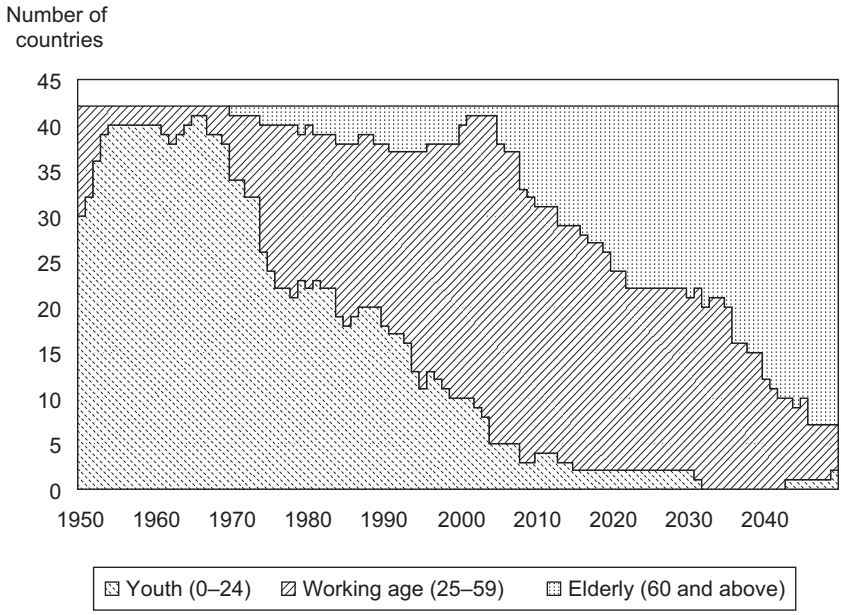
Figure 1.1 (continued)

age 25 is measured on the vertical axis, the percentage aged 60 and older on the horizontal axis, and the percentage aged 25–59 can be represented by diagonal gridlines. Only the 50 percent gridline is shown. In 1950, no Asian country had a large population concentration in the prime working ages. India's population was somewhat younger than that of the People's Republic of China (PRC), and Japan's age structure was very similar to the PRC's.

Asia's age structure changed very dramatically between 1950 and 2010 (second panel). During the 1950s and 1960s, most Asian countries except Japan became younger, but after that the percentage under age 25 declined very markedly, while the percentage in the prime working ages increased. The percentage aged 60 and older also increased in many countries, most notably in Japan.

In the coming decades, the age structure will continue to change (third panel). The percentage of children will continue to decline, although in many countries the decline is expected to be modest. The dominant change will be a shift from working ages to old age. The percentage aged 25–59 will decline while the percentage aged 60 and older will rise to unprecedented levels. Japan is projected to have the oldest population in 2050, with 44 percent aged 60 or older. The 60 and older population of the Republic of Korea is projected to reach 40 percent by 2050.

The transition in age structure is summarized in Figure 1.2 by classifying countries by the age group experiencing the largest absolute



Note: Countries are classified by the age group with the largest absolute increase in population in each year.

Source: UN (2009), accessed 1 July 2011.

Figure 1.2 Phases of age transition in Asia from 1950 to 2040 by age group

increase: young people (under 25), working-age adults (25–59), or elderly (60 and older). Throughout the 1950s and 1960s, the dominant trend was a large increase in the number of children.[2] In fact, in 1965, Japan was the only country in which demographic change was not dominated by an increase in the number of young people. The second phase emerged in the 1970s, when the increase in the number of people of working age exceeded the increase in the number of young people in a growing number of countries. By 1985 more Asian countries were in the second phase of the age transition than in the first. During the last few decades, growth in the working-age population has become dominant. In 2004, the peak year, 36 of 42 countries experienced a greater increase in the working-age population than in either the young or elderly populations.

Asia is now entering the third phase of the transition. While in 2010 countries in the second phase outnumbered those in the third phase by three to one, the trend is, however, very clear. By 2030, 20 of 42 countries

will have reached the final phase of the transition. During the last year of the projection, the change in the 60 and older population will dominate changes in other age groups in 34 countries.

2.2 How and Why Age Structures are Changing

Changes in age structure are a consequence of the demographic transition. Before the onset of the transition, birth and death rates were quite high and populations grew relatively slowly or not at all. The demographic transition began in most countries with a decline in death rates. Improvements in mortality were particularly concentrated among children and infants, and this led to substantial growth in the young population. In developing Asia, this transition occurred mainly in the 1950s and the 1960s. Then birth rates began to decline, and the large birth cohorts of the 1950s and 1960s began to reach maturity starting in the 1970s, fueling the growth of the working-age population: phase two of the transition began.

Over time, the decline in death rates has become increasingly concentrated at older ages. People are not only more likely to survive childhood, they are more likely to survive well into retirement. While improvements in mortality rates at older ages have led to more rapid population aging, the most important factor leading to an increase in the share of the old-age population is low fertility. The share of the old-age population in countries like Japan, Republic of Korea, and Singapore is projected to reach high levels because low fertility rates will lead to substantial declines in the working-age population.

Understanding the reasons for population aging is important for identifying solutions. For example, a solution frequently offered for a shrinking working-age population is to extend the retirement age. The logic behind this idea is powerful: if people are living longer they should work longer. This solution is a potentially important response to population aging, but it does not address the low fertility problem. In many countries the elderly are heavily dependent on workers (taxpayers) who fund public pension and healthcare programs. Low fertility will lead to fewer children and then to fewer taxpayers on whom the elderly can rely.

Although this broad outline of a changing age structure appears to be common to all Asian economies, there is enormous diversity and uncertainty about the path any one of them should take to address it. East Asian and a few Southeast Asian economies are relatively far along in their demographic transitions. Life expectancy has already reached high levels and continues to rise steadily. Fertility has dropped to very low levels in East Asia and is in fact much lower than in the US and in many European countries. Recently, fertility has increased in the lowest fertility countries

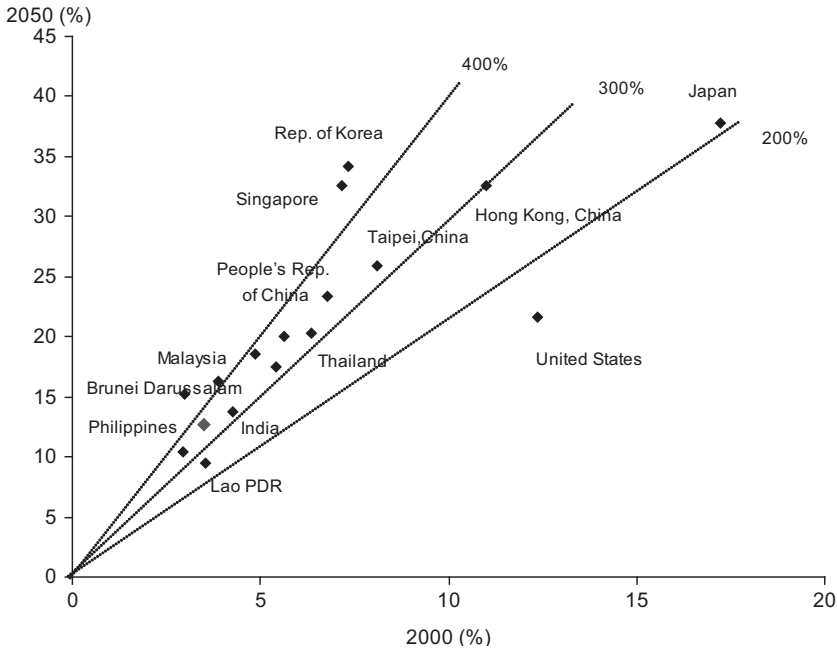
of Europe, but this has not happened in low-fertility Asia (Goldstein et al., 2009).

Elsewhere in Asia, the demographic transition is an evolving event. Birth and death rates continue to decline steadily in some cases and more erratically in others (Appendix Tables A1.1–A1.3). There is considerable uncertainty, however, about the speed and the extent of fertility decline. If other Asian economies follow the path of East Asia and fertility rates drop to very low levels, their populations will age more rapidly than the projections in Figure 1.1 indicate.

There is also considerable diversity within economies. The regional and urban–rural differences in fertility in the PRC and India are quite substantial. By 2000, more than 500 million Chinese were living in provinces where the estimated total fertility rate was 1.3 or less, a fertility rate similar to Japan's (National Bureau of Statistics of the PRC and East-West Center, 2007).

One notable feature of Asia's demographic transition is its exceptional speed. While the basic picture is the same worldwide, Asia is aging more rapidly than elsewhere, primarily because fertility rates have declined more rapidly than elsewhere. Figure 1.3 illustrates how rapidly Asian economies are aging and how diverse they are. By 2000, the share of the population aged 65 and older had exceeded 15 percent only in Japan, but by 2050 a majority of economies in the region will surpass this level, including a number of low-income ones such as Indonesia, Myanmar, and Viet Nam. India's elderly population is also expected to be close to 14 percent by 2050. In short, the percentage of elderly people will more than triple between 2000 and 2050 throughout the region. In only two economies – Japan and the Lao People's Democratic Republic – will the proportion less than double during this period, while it will more than double in Brunei Darussalam, Malaysia, Republic of Korea, and actually quadruple in Singapore. This is in stark contrast to the US, which is aging at a relatively slow pace due to a relatively high birth rate, a somewhat shorter life expectancy, and a high rate of immigration.

The first group of aging societies in Asia – Japan, Republic of Korea, Singapore, and Taipei,China – are all relatively rich, and many of the institutional elements that are important in aging societies are in place. Their governments are stable, relatively efficient, and capable of managing public healthcare systems and pension programs, although even the most advanced Asian economies have encountered difficulties in administering their social security systems effectively. Moreover, the private financial systems in these economies provide a relatively secure economic environment in which workers can accumulate wealth and provide for their own material needs at the end of life.



Source: UN (2009) and Council for Economic Planning and Development Statistics Database, accessed 1 July 2011.

Figure 1.3 Percentage of people aged 65 and older in Asia and the United States in 2000 and 2050

Asia's next wave of aging economies may be less prepared to meet these challenges. The speed at which their age structures are changing is unprecedented in human history. In fact, aging is occurring more rapidly than development; hence, they will grow old before they grow rich. The concern is not wealth per se, but that the financial and political institutions important in aging societies may be relatively underdeveloped. This is not what the first group experienced.

3. THE ECONOMIC LIFECYCLE AND THE SUPPORT RATIO

The age structure of a population is important due to a fundamental feature of human society: the economic lifecycle. In all modern societies, there are periods of dependency at the beginning of life and at the end of

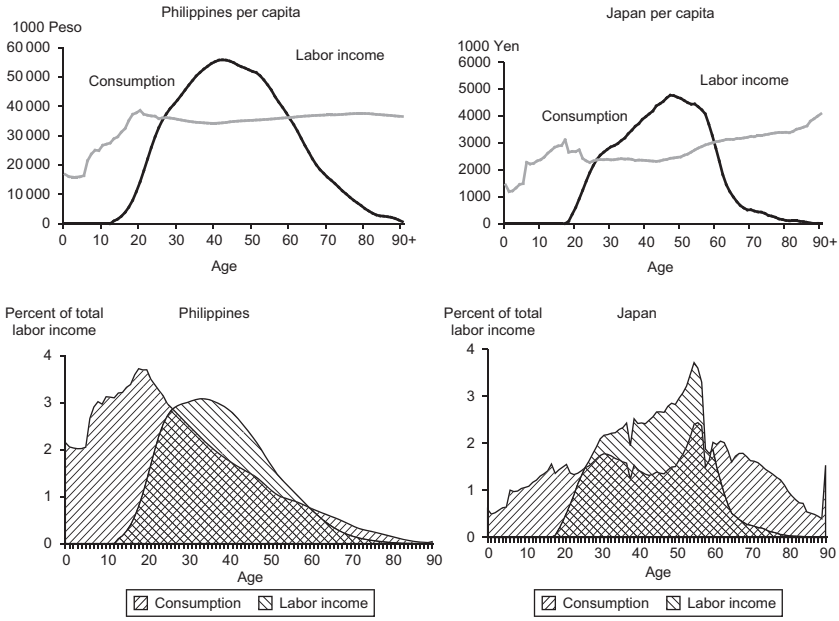
life because children and the elderly consume more resources than they produce through their labor. The gaps between consumption and labor income – the lifecycle deficit – should be filled by reallocations from people of working age.

Our understanding of the economic lifecycle and the ability to measure resource reallocations across ages have been vastly improved due to the recent development of national transfer accounts (NTA), which measure on the aggregate how people at each age in the lifecycle acquire and use economic resources (Lee, 1994; Mason et al., 2009; R. Lee and Mason, 2011).[3] The NTA represent a significant advance because they provide a comprehensive set of measures of production, consumption, saving, and transfers in a manner consistent with national income and product accounts.[4] The NTA also consider the public and private sectors, both of which mediate economic flows across ages, so they can be used to study the implications of population aging for both.

Using NTA data, the economic lifecycle is represented by labor income and consumption by age for Japan and the Philippines in Figure 1.4. The per capita economic lifecycle varies by age because of individual characteristics and behaviors, institutions, and market forces. Productivity increases as children mature and benefit from human capital investments. Subsequently, productivity declines as health deteriorates and disability increases. Labor force participation, hours worked, and unemployment all vary with age as does their influence on the labor-income profile. Consumption is influenced by preferences, prices, interest rates, income, and public institutions. Both profiles depend on many other historical, cultural, political, social, and economic factors.

The economic lifecycle to a large extent reflects population age structure. Essentially, countries are trading a youth deficit for an old-age deficit of similar size over the course of the demographic transition. The Philippines, for example, has a very young population and a very large deficit at young ages. In Japan, which has an older population, the deficit is much larger at older ages compared with the youth deficit; the old-age deficit will grow substantially unless consumption and labor income patterns change radically.

There are, however, several important opportunities for changing course. Between the two points of high dependency in the last three decades, Asia has had an age structure very favorable to rapid economic growth: the first demographic dividend (Bloom and Williamson, 1998; Kelley and Schmidt, 2001; Mason, 2001; and Mason and Lee, 2007). This direct impact of the age structure is effectively described as a change in support ratios – the number of workers per person – that is direct and unambiguous. Many Asian and Pacific countries



Notes: Labor income is a broad measure consisting of earnings and benefits received by employees and the estimated value of the labor of the self-employed, including unpaid family workers. Consumption is also a broad measure that includes the value of all goods and services consumed by individuals and by governments on their behalf.

Source: National Transfer Accounts database, www.ntaccounts.org, accessed 1 July 2011.

Figure 1.4 Comparison of labor income and consumption by age in Japan (2004) and the Philippines (1999), per capita and aggregate

including Bangladesh, India, Indonesia, Pakistan, and the Philippines, will continue to experience the first demographic dividend as their working-age populations grow relative to their dependent populations. Favorable conditions should persist for at least the next 15 years and, in most cases, for much longer. The magnitude of the demographic dividend depends on age patterns of labor income and consumption, but estimates of these patterns are not available for most countries. Based, however, on the eight Asian countries for which age profiles have been constructed in the NTA, a substantial demographic dividend can be expected (Table 1.1).

Over time, the populations of Asia and the Pacific will become increasingly concentrated at older ages where in all cases labor income is quite modest. In part this reflects low levels of employment at older ages, but

Table 1.1 Growth in the support ratio during first dividend for selected countries

	Minimum		Maximum		Support ratio in 2050	Annual gain (Max–Min %)	Annual loss (2050–Max %)
	Support ratio	Year	Support ratio	Year			
Bangladesh	0.69	1982	0.98	2033	0.94	0.69	−0.22
PRC	0.75	1972	1.00	2015	0.87	0.66	−0.39
India	0.75	1973	0.97	2042	0.96	0.37	−0.12
Indonesia	0.74	1976	0.96	2026	0.91	0.53	−0.26
Japan	0.69	1950	0.86	1978	0.64	0.78	−0.42
Republic of Korea	0.64	1966	0.93	2010	0.68	0.86	−0.79
Pakistan	0.71	1986	0.92	2050	0.92	0.42	na
Philippines	0.68	1969	0.92	2046	0.92	0.40	−0.03
Thailand	0.71	1971	0.99	2011	0.89	0.84	−0.27
Viet Nam	0.67	1980	0.97	2021	0.89	0.90	−0.30

Source: Mason and Lee (2011).

it also reflects low wages and productivity for older adults. Population aging could serve as a drag on economic growth as the effective number of workers declines relative to the effective number of consumers. East Asia faces the most serious problems. In the Republic of Korea, for example, the support ratio is expected to decline by 0.8 percent per year over the next 40 years. In the absence of measures to compensate for this change, standards of living will be reduced by more than 25 percent between 2010 and 2050.

A second potential problem caused by population aging is the strain on public transfer systems. The old-age transfer system is relatively underdeveloped in many developing Asian countries, so the effects would be smaller than in Europe, Japan, or Latin America, but the effects will nonetheless be significant. In a business-as-usual simulation, transfers of wealth (or implicit debt) would range from 90 percent of total labor income in Pacific island nations, to 240 percent of total labor income in East Asia. If countries in the region were to shift toward the consumption, labor income, and transfer patterns characteristic of rich countries, implicit debt would increase to much higher levels. For Asian Development Bank (ADB) developing member countries (DMCs) as a whole, implicit debt would reach 320 percent of total labor income in 2030, and 540 percent of total labor income in 2050 (Mason and Lee, 2011).

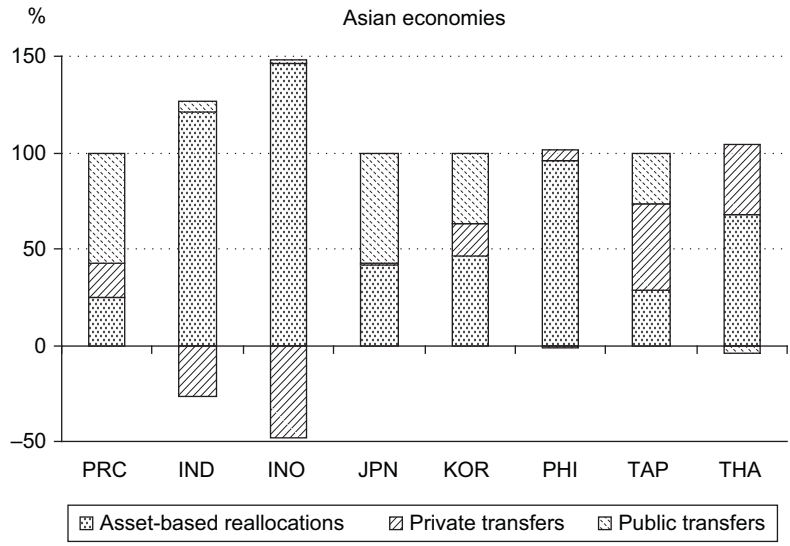
3.1 Support Systems in Asia

Economic lifecycles are sustainable only because a complex system of institutions and economic mechanisms enables economic resources to flow from surplus ages to deficit ages. Essentially, two economic mechanisms are used for age reallocations: transfers and asset-based reallocations. A defining feature of transfers is that they involve no explicit quid pro quo. Resources flow from one party to another either voluntarily in the case of most private transfers or involuntarily in the case of public transfers, though private transfers may involve implicit contracts enforced by social conventions. Asset-based reallocations rely on inter-temporal exchanges. An asset acquired in one period can be used to support consumption in subsequent periods either by using income from the asset or by disposing of it. When individuals accumulate pension funds or personal savings during their working years and rely on income from and/or the disposal of those assets during retirement, they are relying on asset-based reallocations. Likewise, when individuals borrow to finance education or to buy a car or a home, they are relying on asset-based reallocations to consume more than their current labor income. This means that they must forgo consumption in later periods to repay those loans.

Both the public and private sectors mediate economic flows across age groups. The public sector reallocates resources relying on social mandates embodied in laws and regulations and implemented by governments. Education, public pensions, and healthcare programs are important examples of public reallocations. Private sector reallocations are sometimes governed by law but are also governed by voluntary contracts, social conventions, and deeply ingrained behavior patterns that are mediated by markets, households, families, charitable organizations, and other private institutions.

Familial transfers are the dominant support system for children, not just in Asia. The difference between Asia and non-Asian countries is that, in Asia, familial transfers are especially important for supporting the elderly as well. Although in Japan and the Republic of Korea, the extended family as an institution has declined very rapidly in the last few decades, roughly half the elderly still live with their children. In other Asian countries, the great majority of the elderly live with their children, and there is a surprising degree of stability in these arrangements.

Figure 1.5 shows the relative importance in Asian, Latin American, and European economies with available data and in the US of the three ways the elderly fund the gap between what they consume and their labor incomes. Private and public transfers are measured as net transfers – transfers received minus transfers made – relative to consumption in

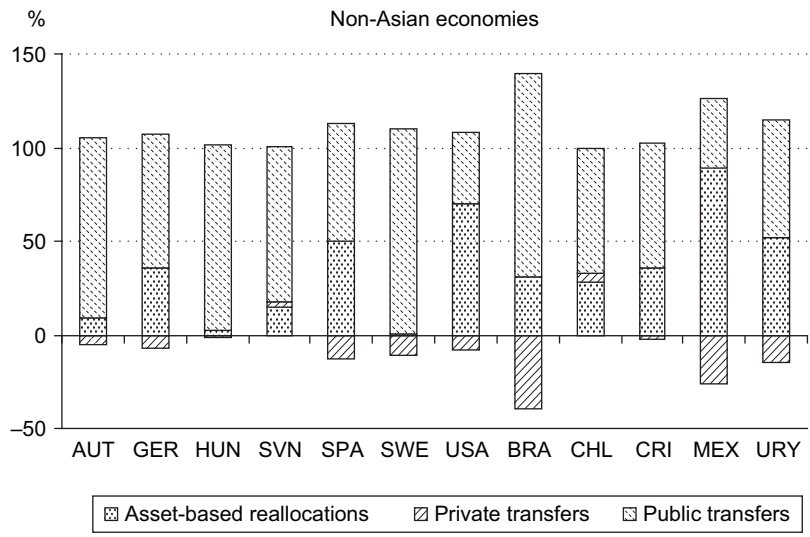


Note: PRC = People's Republic of China (2002), IND = India (2004), INO = Indonesia, JPN = Japan (2004), KOR = Republic of Korea (2000), PHI = Philippines (1999), TAP = Taipei,China (1998), THA = Thailand (2004).

Figure 1.5 Support systems for people aged 65 and older for Asian and non-Asian economies

excess of labor income for those aged 65 and older. Reliance on assets is measured as asset-based reallocations – asset income minus saving – relative to consumption in excess of labor income for those aged 65 and older. The lifecycle deficit – consumption minus labor income – must equal net public transfers plus net private transfers plus asset-based reallocations, that is, the three components of the support systems must add up to 100 percent (Mason and Lee, 2011).

There are interesting regional patterns in the support systems. Familial transfers for old age are much more significant in many Asian economies than in the other economies in Figure 1.5. Familial transfers fund about 45 percent of the lifecycle deficit for the elderly in Taipei,China, 33 percent in Thailand, and slightly under 20 percent in the PRC and the Republic of Korea. Compared with European and Latin American countries, the public sector is generally less important to the elderly in Asia. In the Philippines and Thailand, net public transfers are zero, that is, the elderly are paying as much in taxes as they are receiving in benefits. In Indonesia, the elderly pay somewhat more in taxes than they receive in benefits. In



Notes:
Negative values represent net outflows, i.e., the elderly provide more support to their families than they receive. If values in one support system are negative, values in another support system can be greater than 100 percent.
AUT = Austria (2000), BRA = Brazil (1996), CHL = Chile (1997), CRI = Costa Rica (2004), GER = Germany (2003), HUN = Hungary (2005), MEX = Mexico (2004), SPA = Spain (2000), SWE = Sweden (2003), SVN = Slovenia (2004), USA = United States (2003), URY = Uruguay (2006).

Source: National Transfer Accounts database, www.ntaccounts.org, accessed 1 July 2011.

Figure 1.5 (continued)

the Republic of Korea and Taipei,China, net public transfers are funding about 33 percent of the lifecycle deficits of the elderly. Elderly people in the PRC and Japan rely more on public transfers than do the elderly in the US, but less than the elderly in many European welfare states.

Assets are an important source of support in all Asian countries except the PRC and Taipei,China, where transfers are more important. In Indonesia and the Philippines, the elderly rely almost entirely on assets. Certainly some elderly in those economies do depend on familial and public transfers, but as a group, net transfers to the elderly are zero or negative, and asset-based reallocations are equal to or exceed the lifecycle deficit. Thailand's elderly also rely heavily on assets. In the PRC, asset-based reallocations are the lowest among the Asian economies in this study. The elderly are saving quite a bit, but they also have relatively low asset-based incomes.

Table 1.2 Fiscal support ratios (%) from 1950 to 2050 for selected Asian economies and the United States

	1950	2010	2020	2030	2050	Year of most favorable age structure
PRC	89	100	97	89	82	2012
India	97	100	102	103	102	2028
Indonesia	79	100	106	110	108	2033
Japan	91	100	92	87	74	1976
Philippines	87	100	106	111	116	2050
Republic of Korea	76	100	97	89	80	2008
Taipei,China	68	100	100	94	78	2015
Thailand	66	100	104	104	104	2039
USA	99	100	96	92	89	2006

Note: Recalculated based on Miller (2011).

Source: National Transfer Accounts database, www.ntaccounts.org, accessed 1 July 2011.

There are some interesting saving patterns for Asian countries that require further examination. In the conventional lifecycle saving model, asset-based reallocations follow a simple age pattern: they are negative during the working years as individuals save some portion of their labor incomes, and are positive in old age as individuals rely on asset-based income and draw down their savings to fund consumption. There are elements of this lifecycle model that are supported by NTA estimates. In countries without extensive old-age transfer systems, the elderly do rely heavily on assets to support themselves, as shown in Figure 1.5. Available evidence from the NTA and other studies is, however, that the elderly do not in fact dissave. With minor exceptions, the elderly continue to save and often at surprisingly high rates. In other words, the elderly in Asia are relying on asset income and do not dissave to support themselves.

Although some have speculated that the elderly in low-income settings might rely more on family transfers than on assets, we did not find this to be the case.

Changes in age structure have a strong effect on financing public transfers; Miller (2011) calculated the fiscal support ratio to assess the pressure those transfers exert on fiscal sustainability. The ratio is calculated holding age-specific public transfer inflows and outflows constant while allowing the population's age structure to change in accordance

with historical estimates and projections. Table 1.2 shows the evolution of the fiscal support ratio for selected Asian economies using the age profiles of public transfers in NTA data sets. The effective number of taxpayers is calculated by weighting the population in each year using the age profile of per capita taxes paid. The effective number of beneficiaries is calculated using per capita benefits in the base year to weight the population age distribution. The ratio is set at 100 in the base year of 2010 so that all values are expressed relative to the fiscal position in 2010.

In Japan, population aging combined with the current tax and benefit policies would lead to a 26 percent decline in the fiscal support ratio by 2050. Thus, taxes must increase, or benefits must decrease, or deficits must increase, or some combination of the three must occur. The PRC, Republic of Korea, and Taipei,China show somewhat smaller fiscal impacts with an 18 to 22 percent reduction in the fiscal support ratio by 2050. In contrast, India, Indonesia, the Philippines, and Thailand will see an increase in their fiscal support ratios because net transfers to the elderly are modest or in some cases negative, and because changes in their age structures are partially concentrated at ages when net transfers are generally negative. For these four, changes in age structure will relax public sector budget constraints.

The danger, of course, is that countries with favorable demographics will implement generous transfer systems that ultimately prove to be unsustainable. The role of the public sector is, in fact, growing quite rapidly in the region. In the Republic of Korea, for example, social welfare benefits for the elderly rose sharply over a very short time span.

Medical insurance benefits rose 15.3 percent annually between 2000 and 2005, and public pension benefits grew by 9 percent annually during the same period (An et al., 2011). Such a sharp rise is somewhat exceptional, but low-income countries are also experiencing a rapid increase in per capita public transfers to the elderly. Recognizing the importance of a guaranteed support system for its aging population, in 2006 the Government of Indonesia issued Law No. 40/2004 expanding the social security system to include a national pension system for workers in both the formal and informal sectors (Maliki, 2011). In 2009, the PRC committed itself to building a universal public pension system in rural areas funded by individual premiums and government subsidies. The government also made public health insurance available to urban employees in 1998, to rural citizens in 2003, and to urban citizens in 2007 (Li et al., 2011).

The elderly in Asia are relying less on their families than they did in the past. The question is, what strategy should be used to compensate for the decline in this traditional source of old-age support: developing extensive social welfare systems as in Europe and parts of Latin America or relying

more on accumulating personal assets as in the Philippines, Thailand, and the US? The strategy must simultaneously meet both challenges of providing economic security for the elderly and sustaining economic growth.

3.2 Options for Sustaining Growth in the Face of Population Aging

One strategy for responding to population aging emphasizes capital accumulation. Many of the fundamental insights were established by Modigliani and Brumberg (1954) and Tobin (1967) who explored the implications of the economic lifecycle for saving and investment. The lifecycle has implications for both because the old-age deficit is funded in part by asset-based reallocations. Population aging will lead to an increase in the demand for assets for three reasons. First, to the extent that longer life expectancy leads to longer retirement, the incentive to accumulate more during the working years will increase. Second, because fertility is lower, fewer resources may be devoted to child rearing and more to saving for retirement. The third reason is simply due to age composition. Older individuals are wealthier because they have had longer to accumulate wealth; hence, a population composed of more old people will have greater wealth per capita.

The strength of the relationship between age structure and capital depends, however, on the nature of the old-age income support system. This idea has been explored in many industrialized countries and to a more limited extent in developing countries. The primary focus has been the possibility that public transfers will crowd out saving (Feldstein, 1974, 1998; Gale, 1998; and Munnell, 1974). These and similar studies inform efforts to evaluate existing transfer systems, to guide the development of new systems, and to anticipate the implications of alternative reform proposals. Social security reform, in particular, has been the subject of an enormous amount of research (Feldstein and Samwick, 2001; Feldstein, 1998; and Krueger and Kubler, 2002).

The evidence suggests that East Asian countries have actively pursued the high saving, high investment paradigm. Singapore is an interesting example because it has institutionalized this approach to aging through its Central Provident Fund in which Singaporeans are required to save a high fraction of their earnings through mandatory contributions. The fund provides pension benefits and has led to high rates of saving, investment, and economic growth. This is quite different from the public pension systems in Japan, Europe, Latin America and the US that provide for retirees out of current taxes and therefore have no positive growth effects.

The experience of other East Asian countries indicates that mandatory saving may not be required as very high rates of saving have accompanied the age transition in the absence of mandatory schemes This is certainly

Table 1.3 Pension assets relative to labor income in Asia and the Pacific from 2010 to 2050

	Low-income profiles			High-income profiles		
	2010	2030	2050	2010	2030	2050
Asia and the Pacific countries	1.6	2.4	3.0	1.1	1.6	2.0
Developing member countries	1.2	2.1	2.7	0.8	1.4	1.8
Central and West Asia	0.9	1.3	1.9	0.6	0.9	1.3
East Asia	1.4	2.4	3.0	0.9	1.6	2.0
South Asia	0.9	1.3	2.0	0.6	0.9	1.3
Southeast Asia	1.1	1.9	2.5	0.8	1.3	1.6
The Pacific	0.7	1.0	1.4	0.5	0.7	1.0
Non-developing member countries	2.9	3.7	4.4	1.9	2.5	3.0

Source: Authors' calculation based on NTA database, accessed 1 July 2011.

true of the PRC today. East Asian economies share two important features: rapid population aging and low reliance on public transfers. Thus, the incentive to save more generated by population aging is not undermined by large public transfers to the elderly (Feldstein, 1974; Gale, 1998; Lee et al., 2003; and Lee and Mason, 2010).

Nevertheless, healthcare for the elderly is a large and increasing cost that is often heavily subsidized by the public sector, and familial transfers to the elderly may be very important in Asia. Thus, aging in Asia may lead to large implicit debts that are shared by taxpayers and the adult children of the elderly. If the needs of a growing elderly population are met through greater reliance on lifecycle saving, population aging will lead to an increase in assets with favorable implications for economic growth. Previous studies and the following analysis show that through this mechanism, changes in age structure can lead to the second demographic dividend (Mason and Lee, 2007), that is, to higher standards of living that persist long after the favorable effects of the first dividend have ended.

According to estimates by S.-H. Lee and Mason (2011), population aging will lead to substantial capital deepening, a strategy very much in line with Asia's traditionally high saving and investment rates. Table 1.3 shows that pension assets in ADB DMCs would rise from 1.2 times total labor income in 2010, to 2.1 times total labor income in 2030, and 2.7 times total labor income in 2050. This capital deepening should provide a boost to economic growth that easily dominates the effects of a declining support ratio.

Given current patterns of old-age consumption, production, and transfers, the total demand for pension assets will increase very substantially

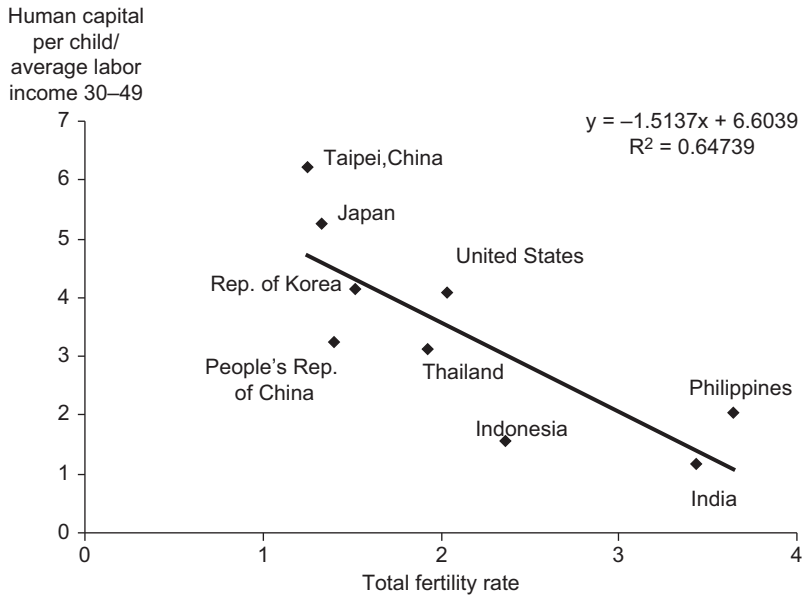
over the coming decades, rising from $26 trillion in 2010 to $157 trillion in 2050. Thus, under these circumstances, aging should not depress saving rates. The gross saving rates required to meet the demand for pension assets will increase from 12.2 percent of gross domestic product (GDP) from 2010 to 2020, to 15.4 percent of GDP from 2040 to 2050.

Another possible response to population aging is to scale up investment in human capital. Children rely almost exclusively on transfers to fund their lifecycle deficit, but countries vary in the extent to which those resources are provided through the public sector rather than the private sector. They also vary a great deal in the extent to which transfers are devoted to investments in human capital, that is education and healthcare.

Asia's population aging is primarily a consequence of low fertility. The total productivity of the working-age population is not, however, determined exclusively by the number of workers. Total labor income could be raised by increasing the quality of the labor force through investments in human capital (Becker and Barro, 1988).

A recent analysis by Lee and Mason (2010) showed that the impact of spending on education is strong enough to offset the adverse effects of population aging, but this conclusion depends on the effectiveness of the investment. Figure 1.6 compares human capital spending per child and the total fertility rate for Asian economies for which estimates are available (Mason et al., 2010). The total fertility rate is the average number of births per woman over her reproductive life given current age-specific birth rates. Human capital spending is measured in a similar way as the average expenditure on health and education during childhood given current age-specific spending. To facilitate comparisons across economies at very different levels of development, human spending is expressed as a fraction of the average labor income of a working adult aged 30–49. Therefore, the highest level of human capital investment in Figure 1.6, 6.2 for Taipei,China, means that human capital spending during childhood is equal to about six years' worth of the pre-tax labor income of a working-age adult. Note that this value includes both public and private spending on education.

The investment response to population aging naturally integrates sustaining economic growth and providing economic security to the elderly. This is because the high rate of investment is a consequence of workers saving more for their retirement. The situation is very different with human capital. Retirees do not own the human capital in which they have invested; instead it is owned by the children who received it. The only way to recoup the investment is through expanded public transfers. Given current trends in private transfers, it seems unlikely that parents who invest more in their children will be compensated by old-age support



Note: Human capital spending is cumulated per capita values (public and private combined) for ages 0–26 for education and 0–18 for healthcare for the most recent year (1997 to 2005) available.

Source: Recalculated from Lee and Mason (2010).

Figure 1.6 Human capital spending per child in years of average labor income for a worker aged 30–49 in relation to total fertility rates in eight Asian economies and the United States

directly from their children. The compensation is more likely to take the form of public transfers intermediated by the government. Smaller cohorts of workers would thus pay higher taxes to support the elderly as compensation for the higher levels of human capital investment they received.

It should be emphasized that the two paths to coping successfully with population aging, investing in physical capital and human capital, are not mutually exclusive. A sound approach to sustaining economic growth *and* providing economic security for the elderly would strike the right balance between assets and public transfers while promoting high rates of human capital investment. Finally, although this discussion has centered on economic growth and average standards of living, poverty and inequality are also inextricably linked to population aging. Unfortunately, little is known about these issues in Asia though several studies have examined the link between population aging and poverty/inequality in Latin America.

One school of thought views intergenerational conflict through the prism of intragenerational inequality. For example, Turra and Holz (2009) using NTA data for Brazil stress a view of government as controlled by class interests in which most public pension benefits are directed to the wealthy elderly and most public tertiary education benefits are directed toward wealthy university students. Although studies for Asia are limited, we hope that enriched microeconomic data can shed light on this issue soon.

4. CONCLUSIONS

After recovering from the global financial and economic crisis with remarkable speed and vigor, Asia now faces the fundamental challenge of sustaining economic growth in the medium and long term. The external environment is likely to be less favorable for Asia's spectacularly successful export-led growth strategy in light of the prospective weakness of the advanced economies and their declining demand for imports. In addition, Asia faces the challenge of population aging. The youthful populations that contributed substantially to growth in the past are maturing; even countries that currently have relatively youthful populations will experience substantial graying in the years to come.

Asia's demographic transition poses two huge challenges: (1) developing social systems and institutions that can provide economic security to the growing number of elderly and (2) sustaining strong economic growth over the next few decades. How well Asia tackles these two challenges will determine whether the region will be able to revert to its pre-crisis high-growth trajectory in the medium and long term. One strategy for supporting the elderly *and* achieving strong, sustained growth is to promote investment in physical capital, a strategy very much in line with Asia's traditionally high saving and investment rates. The other strategy is to promote investment in human capital to make workers more productive. Parents' recovery of human capital investments in their children will require taxes and public transfers.

Asian policymakers face a number of difficult obstacles in meeting the two challenges posed by population aging. Asia's financial systems still lag substantially behind the region's dynamic real economy, and many Asian countries are saddled with rigid, inflexible labor markets that discourage employers from hiring any workers, let alone older workers. Governments need to put in place policies that are conducive to working, to generating high rates of saving and investment, and to greater investment in human capital. Closer regional cooperation and integration are integral components of such policies.

The sheer speed and scale of Asia's demographic transition, which is unprecedented in human history, adds a sense of urgency to policymakers' tasks. While it is true that the more immediate priority for younger countries is to take full advantage of a still wide-open window of demographic opportunity, they too should start planning for a grayer future. Even though the age structure of 2050 may seem too distant to be relevant today, the policies implemented by today's governments influence the ability of today's workers to prepare adequately for retirement. In fact, regardless of their current demographic profiles, countries across the region should prepare as early as possible to cope with the socioeconomic impacts of population aging. They would also do well to learn from the policy mistakes of advanced economies that aged earlier, for example fiscally unsustainable public transfers and premature retirement ages. Once inappropriate old-age support policies become entrenched, they are politically almost impossible to reverse as is evident in the vocal opposition to even relatively limited pension reforms in the advanced economies. On the other hand, the failure to spread the fruits of growth to the elderly will not only be socially costly but may adversely affect economic growth by causing political instability.

NOTES

1. See, for example, Bloom et al. (2000) and Bloom and Williamson (1998).
2. Often studies emphasize the growth rates of each age group, but this tends to overstate the economic impact of population aging for the many countries in which the older population is relatively small.
3. NTA were developed as an international project led by Ronald Lee of the University of California at Berkeley and Andrew Mason of the East-West Center.
4. NTA are estimated relying on a variety of data sources. In addition to national income and product accounts, government financial statistics and government administrative records are used to estimate economy-wide aggregates. Age profiles are estimated by making extensive use of administrative records and nationally representative income and expenditure surveys, labor force surveys, health expenditure surveys, and special-purpose household surveys.

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APPENDIX: POPULATION STATISTICS

Table A1.1 Share of population aged 0–19 (%)

	1950	1975	2000	2010	2025	2050
Central and West Asia						
Afghanistan	52.9	54.8	57.6	56.9	53.6	43.2
Armenia	44.3	46.4	35.5	28.8	26.9	22.2
Azerbaijan	44.1	52.1	41.1	33.8	30.0	23.1
Georgia	36.5	38.1	29.9	24.6	22.9	20.8
Kazakhstan	42.9	45.8	37.1	32.6	31.8	25.2
Kyrgyz Republic	38.9	51.1	45.5	39.5	33.9	25.2
Pakistan	43.7	52.1	52.1	47.4	41.2	30.8
Tajikistan	45.1	56.1	53.4	48.3	40.4	27.8
Turkmenistan	42.9	54.6	47.0	39.9	32.8	25.0
Uzbekistan	41.8	54.8	48.3	40.1	32.5	24.3
East Asia						
China, People's Rep. of	43.3	48.9	33.8	27.7	24.0	20.4
Hong Kong, China	41.2	42.3	23.7	18.1	15.6	15.1
Korea, Rep. of	51.8	50.1	28.9	23.3	17.5	15.6
Mongolia	51.9	54.1	46.1	35.8	30.5	23.6
Taipei,China	52.5	47.3	29.6	22.6	15.2	12.8
South Asia						
Bangladesh	49.1	55.3	48.4	41.0	32.5	24.4
Bhutan	54.1	50.8	51.7	40.8	32.7	24.6
India	47.7	50.6	45.2	40.8	33.2	24.5
Maldives	42.1	52.4	52.7	39.3	31.1	23.3
Nepal	51.4	52.4	51.6	47.0	38.1	28.7
Sri Lanka	47.4	48.3	36.4	31.9	29.1	23.5
Southeast Asia						
Brunei Darussalam	46.0	50.5	40.0	35.1	28.5	24.2
Cambodia	52.6	52.8	54.3	44.8	37.5	28.2
Indonesia	50.0	52.3	40.6	35.5	28.9	23.6
Lao People's Dem. Rep.	50.4	52.7	53.8	48.7	40.7	30.5
Malaysia	50.4	53.2	43.6	38.6	31.6	24.5
Myanmar	44.3	51.7	40.9	35.5	30.5	24.2
Philippines	53.7	55.3	48.4	43.9	37.3	28.3
Singapore	50.0	45.7	28.1	23.3	16.4	15.6
Thailand	53.0	53.5	33.7	29.3	26.0	23.2
Viet Nam	41.9	53.8	44.0	35.2	27.8	22.5
The Pacific						
Fiji, Rep. of	57.1	52.4	45.0	41.0	34.1	26.2
Micronesia, Fed. States of	50.5	58.7	52.7	48.3	39.7	27.7

Table A1.1 (continued)

	1950	1975	2000	2010	2025	2050
The Pacific						
Papua New Guinea	49.5	54.5	51.6	49.9	43.5	33.4
Samoa	56.9	57.6	50.6	51.1	40.1	30.9
Solomon Islands	53.8	57.8	53.2	49.4	41.8	31.6
Timor-Leste	50.7	52.3	59.7	55.9	53.3	40.8
Tonga	59.6	58.6	50.7	47.8	42.1	33.1
Vanuatu	56.7	56.1	52.8	49.0	42.3	32.0
Developed Asia and the Pacific						
Japan	45.7	31.4	20.5	17.9	15.4	15.2
New Zealand	36.1	39.6	29.8	27.6	24.9	22.2
Australia	33.3	36.6	27.6	25.6	23.9	22.3

Source: UN (2009).

Table A1.2 Share of population aged 65 and older (%)

	1950	1975	2000	2010	2025	2050
Central and West Asia						
Afghanistan	2.6	2.3	2.2	2.2	2.4	3.6
Armenia	8.3	5.8	10.0	11.0	15.3	21.5
Azerbaijan	6.9	5.6	5.7	6.6	9.9	17.9
Georgia	10.1	8.5	12.4	14.3	18.3	24.2
Kazakhstan	6.5	5.7	6.8	6.9	9.6	15.6
Kyrgyz Republic	8.2	5.9	5.5	5.0	7.5	14.7
Pakistan	7.0	5.0	3.7	4.1	5.1	10.0
Tajikistan	4.4	4.7	3.6	3.6	4.8	10.0
Turkmenistan	5.9	4.5	4.3	4.1	6.5	14.0
Uzbekistan	5.6	5.5	4.3	4.4	6.9	14.8
East Asia						
China, People's Rep. of	4.5	4.4	6.8	8.2	13.4	23.3
Hong Kong, China	2.5	5.4	11.0	12.9	22.1	32.6
Korea, Rep. of	2.9	3.5	7.3	11.0	19.3	34.2
Mongolia	3.3	2.9	3.4	4.1	6.4	16.8
Taipei,China	2.5	3.5	8.6	10.7	20.3	37.9
South Asia						
Bangladesh	3.1	3.1	3.4	4.0	6.1	14.9
Bhutan	2.5	2.7	4.4	4.9	6.5	15.0
India	3.1	3.4	4.3	4.9	7.3	13.7
Maldives	5.1	4.4	3.4	4.4	5.5	16.8
Nepal	1.9	3.0	3.5	4.1	5.2	10.6
Sri Lanka	10.0	4.0	6.4	7.7	13.9	21.4
Southeast Asia						
Brunei Darussalam	4.9	3.5	2.9	3.5	7.8	15.3
Cambodia	2.7	2.8	3.0	3.6	5.3	10.4
Indonesia	4.0	3.3	4.9	6.1	9.0	18.6
Lao People's Dem. Rep.	2.1	3.2	3.6	3.7	4.7	9.5
Malaysia	5.1	3.7	3.9	4.8	8.7	16.3
Myanmar	3.4	4.3	5.4	5.5	8.6	17.5
Philippines	3.6	3.1	3.5	4.3	6.6	12.7
Singapore	2.4	4.1	7.2	10.2	22.9	32.6
Thailand	3.2	3.6	6.3	7.7	12.9	20.2
Viet Nam	4.2	4.9	5.6	6.3	9.8	20.0
The Pacific						
Fiji, Rep. of	2.8	2.7	3.5	5.0	8.5	14.2
Micronesia, Fed. States of	4.1	4.2	3.7	3.7	6.3	10.1
Papua New Guinea	4.1	2.1	2.2	2.5	3.8	7.4
Samoa	2.3	1.8	4.4	4.9	6.5	8.9

Table A1.2 (continued)

	1950	1975	2000	2010	2025	2050
The Pacific						
Solomon Islands	2.0	3.3	2.9	3.1	4.1	9.0
Timor-Leste	3.3	2.7	2.5	3.0	3.4	4.6
Tonga	1.8	2.5	5.5	5.9	6.8	10.1
Vanuatu	2.7	2.9	3.3	3.3	4.8	9.3
Developed Asia and the Pacific						
Japan	4.9	7.9	17.2	22.6	29.7	37.8
New Zealand	9.0	8.7	11.8	13.0	18.1	23.2
Australia	8.1	8.7	12.5	13.9	19.1	23.8

Source: UN (2009).

Table A1.3 Share of population aged 20–64 (%)

	1950	1975	2000	2010	2025	2050
Central and West Asia						
Afghanistan	44.6	42.8	40.2	40.9	44.0	53.2
Armenia	47.3	47.8	54.5	60.2	57.8	56.3
Azerbaijan	49.0	42.3	53.3	59.6	60.1	59.0
Georgia	53.4	53.4	57.7	61.2	58.9	55.0
Kazakhstan	50.6	48.5	56.1	60.5	58.6	59.2
Kyrgyz Republic	52.9	43.0	49.0	55.5	58.6	60.1
Pakistan	49.3	42.9	44.2	48.5	53.6	59.2
Tajikistan	50.6	39.3	43.0	48.1	54.7	62.2
Turkmenistan	51.2	40.9	48.7	55.9	60.7	61.0
Uzbekistan	52.7	39.7	47.4	55.5	60.6	60.9
East Asia						
China, People's Rep. of	52.2	46.7	59.4	64.0	62.6	56.2
Hong Kong, China	56.3	52.3	65.3	69.0	62.2	52.3
Korea, Rep. of	45.3	46.4	63.7	65.6	63.2	50.2
Mongolia	44.7	42.9	50.5	60.2	63.1	59.6
Taipei,China	45.0	49.2	61.8	66.7	64.5	49.3
South Asia						
Bangladesh	47.9	41.6	48.2	55.0	61.4	60.6
Bhutan	43.3	46.6	43.9	54.3	60.7	60.3
India	49.2	46.0	50.5	54.3	59.4	61.8
Maldives	52.8	43.2	43.9	56.3	63.4	59.9
Nepal	46.7	44.6	44.9	48.9	56.7	60.7
Sri Lanka	42.7	47.7	57.2	60.3	57.0	55.1
Southeast Asia						
Brunei Darussalam	49.2	46.0	57.0	61.5	63.7	60.4
Cambodia	44.7	44.4	42.7	51.6	57.2	61.5
Indonesia	46.1	44.4	54.5	58.4	62.1	57.8
Lao People's Dem. Rep.	47.4	44.1	42.7	47.7	54.5	60.1
Malaysia	44.6	43.0	52.5	56.5	59.7	59.2
Myanmar	52.3	44.0	53.7	59.0	60.9	58.3
Philippines	42.7	41.6	48.1	51.8	56.1	59.0
Singapore	47.6	50.1	64.8	66.5	60.7	51.8
Thailand	43.8	42.9	60.0	63.0	61.1	56.5
Viet Nam	53.9	41.3	50.4	58.4	62.4	57.5
The Pacific						
Fiji, Rep. of	40.1	44.9	51.4	54.0	57.4	59.6
Micronesia, Fed. States of	45.5	37.1	43.6	48.0	54.0	62.2
Papua New Guinea	46.3	43.4	46.1	47.6	52.7	59.2
Samoa	40.8	40.6	45.1	44.0	53.5	60.2

Table A1.3 (continued)

	1950	1975	2000	2010	2025	2050
The Pacific						
Solomon Islands	44.2	39.0	43.9	47.5	54.1	59.4
Timor-Leste	45.9	45.0	37.9	41.1	43.3	54.6
Tonga	38.6	39.0	43.8	46.4	51.1	56.7
Vanuatu	40.5	41.0	43.9	47.6	52.9	58.8
Developed Asia and the Pacific						
Japan	49.3	60.7	62.2	59.5	55.0	46.9
New Zealand	55.0	51.7	58.4	59.4	57.0	54.6
Australia	58.6	54.7	59.9	60.5	57.0	53.9

Source: UN (2009).

2. Population, wealth, and economic growth in Asia and the Pacific

Andrew Mason and Sang-Hyop Lee

1. INTRODUCTION

The Asia and Pacific region is extraordinarily diverse, but all of the economies are experiencing a demographic transition with important common features related to population size, growth, and age structure. In many of them, demographic change favors economic growth in both aggregate and per capita terms because working-age populations are growing more rapidly than dependent populations and are creating a demographic dividend. In a few economies in the region and in many more in the near future, however, the obviously favorable demographics are coming to an end. They will experience slower growth and then declines in their working-age populations and substantial increases in their old-age populations. We explored how these demographic changes are likely to influence economic growth and other features of Asia and the Pacific economies. Several key findings emerged.

- Many Asia and the Pacific countries including Bangladesh, India, Indonesia, Pakistan, and the Philippines will continue to experience a demographic dividend as their working-age populations grow relative to their dependent populations. Favorable conditions should persist for at least the next 15 years and, in most cases, for much longer.
- The magnitude of the demographic dividend depends on age patterns of labor income and consumption. For most countries, estimates of these patterns are not available, but based on the eight Asia and the Pacific economies for which age profiles have been constructed, a substantial demographic dividend can be expected.
- Over time, the populations of Asia and the Pacific will become increasingly concentrated at older ages where in all cases labor income is quite modest. In part this reflects low levels of employment at older ages, but it also reflects low wages and productivity for older adults who are working.

- Low labor income is often matched with high consumption among the elderly in high-income countries. This pattern is true of Asia as well, although the picture is more mixed. In middle- and low-income countries, the elderly are consuming at levels similar to those for other adults.
- Population aging could serve as a drag on economic growth over the coming decades as the effective number of workers declines relative to the effective number of consumers. East Asia faces the most serious problems. In the Republic of Korea, for example, the support ratio is expected to decline by 0.8 percent per year over the next 40 years. In the absence of compensating changes, standards of living would thus be reduced by more than 25 percent between 2010 and 2050.
- A second potential problem arising from population aging is the strain on public transfer systems. The old-age transfer system is relatively underdeveloped in many Asian countries so the effects would be smaller than those in Japan, Europe, or Latin America, but the effects will still be large. In a "business as usual" simulation, transfer wealth (or implicit debt) would range from 90 percent of total labor income in Pacific island nations to 240 percent of total labor income in East Asia.
- If countries in the region were to shift toward consumption, labor income, and transfer patterns characteristic of rich countries, implicit debt would increase to much higher levels. For the Asian Development Bank's developing member countries (DMCs), implicit debt would reach 320 percent of total labor income in 2030 and 540 percent of total labor income in 2050.
- Population aging will lead to substantial capital deepening. For the DMCs as a whole, given their low income profiles, pension assets would rise from 1.2 times total labor income to 2.1 times total labor income in 2030, and to 2.7 times in 2050. Capital deepening should provide a boost to economic growth, which easily dominates the effects of a declining support ratio.
- Given current patterns of old-age consumption, production, and transfers, the total demand for pension assets will increase very substantially over the coming decades, rising from $26 trillion in 2010 to $157 trillion in 2050.
- Under these circumstances aging should not depress saving rates. The gross saving rates required to meet the demand for pension assets would increase from 12.2 percent of gross domestic product (GDP) in 2010–2020 to 15.4 percent of GDP in 2040–2050. The view that population aging will lead to lower saving rates is not borne out by the analysis presented here.

2. THE FIRST DEMOGRAPHIC DIVIDEND

A change in population age structure has a very direct, first-order effect on income and consumption that does not depend on behavioral responses. An increase in the population concentrated in the working ages, given output per worker, leads to an increase in output or income per person. Holding the saving rate constant in addition to output per worker, an increase in the share of persons in the working ages leads to higher consumption per person (Bloom and Williamson, 1998; Mason, 2001; Mason and Lee, 2007).

The demographic dividend follows from a simple identity:

$$\frac{C}{N} = (1 - s)\frac{Y}{L}\frac{L}{N} \tag{2.1}$$

where C/N is per capita consumption, s is the saving rate, Y/L is income per worker, and L/N is the support ratio, that is, the number of workers per person. How changes in population age structure influence the saving rate and output per worker is an important and complex issue. The effects of changes in population age structure through the support ratio, however, are direct and unambiguous. Age transitions in Asia, the Pacific, and elsewhere are leading to swings in population concentrations in the working ages and swings in the support ratio matched by swings in per capita income and consumption.

The relationship between consumption growth and growth in the support ratio can also be readily represented as a simple transformation of equation (2.1). Let $gr[\,]$ represent the growth rate:

$$gr[C/N] = gr[1 - s] + gr[Y/L] + gr[L/N] \tag{2.2}$$

Holding the saving rate and income per worker constant, the growth rate of income per capita and consumption are equal to the growth rate of the support ratio.[1]

Researchers have constructed the support ratio in different ways. One approach is to use a purely demographic measure: the population in the working ages divided by the total population. The approach used here is to incorporate age variation in the numerator and denominator that reflects systematic differences in labor income and consumption over the lifecycle. A similar approach was used by Cutler et al. (1990), who relied on very simple assumptions. Here we exploit newly available, detailed estimates of consumption and labor income profiles to construct the support ratio.

The value of labor provided by an additional individual of any age

depends on age patterns of labor force participation, hours worked, unemployment rates, and productivity. In general, the value of labor rises at young adult ages and then declines later in life, but details vary across countries, influenced by features of the labor market, investment in education, returns on experience, skill obsolescence, disability patterns, employment practices, mandatory retirement policies, tax and pension systems, and so forth. Consumption also varies systematically with age because of tastes, physiological factors, and many other issues. Age variation in consumption should not be ignored. The very young do not produce, but they may not consume much. In some countries, the elderly do not produce much, but they consume a great deal. Hence, an important refinement of the support ratio is to incorporate age variation in the value of goods and services produced and consumed at each age. This is accomplished by constructing a support ratio that uses weighted population:

$$\frac{L_t}{N_t} = \frac{\sum_x y_0(x) P(x, t)}{\sum_x c_0(x) P(x, t)} \tag{2.3}$$

where $y_0(x)$ is the labor income age profile in the base year, $c_0(x)$ is the consumption profile in the base year, and $P(x, t)$ is the population by age x.[2]

Two strategies have been employed in recent studies to estimate the demographic dividend. One approach is to apply a regression analysis to pooled, cross-section, time series data for national economies. This approach has been used by Bloom and Williamson (1998), Bloom and Canning (2001), and Kelley and Schmidt (1995; 2007). An alternative approach is to rely on simulation models of varying complexities (Mason, 2001; Mason and Lee, 2007; Mason et al., 2010; Romero et al., 2010). Either approach supports the view that the demographic dividend has been quantitatively important, especially in East Asia.

The rate of growth of the support ratio – the first demographic dividend – varies in its timing and its magnitude in each economy depending on the speed and magnitude of changes in population age structure. In East Asia, for example, the age transition has been very rapid, and the swings in age structure have been very large. Changes in the support ratio also depend on policies, institutions, and behavioral differences that influence the ages at which people enter and leave the labor force, age variation in unemployment and hours worked, and age patterns of unemployment. Also influencing it are factors that affect consumption at each age. Adding a child to a population will have less effect than adding an elderly adult if the child consumes less than the adult (Mason, 2005).

The analysis presented below builds on these concepts, and exploits newly available estimates of age patterns of labor income and consumption. New estimates of the support ratio and the first demographic dividend are presented and show benefits from an increasing support ratio, but in the future a declining support ratio will pervade in the region.

3. THE SECOND DEMOGRAPHIC DIVIDEND

The support ratio quantifies the first-order effect on income or consumption of changes in the population age structure. Income per capita varies in direct proportion to changes in the support ratio given income per worker; consumption per capita varies in direct proportion to changes in the support ratio given income per worker and the saving rate. In the absence of other changes, age transition can lead to more rapid economic growth, but with population aging the support ratio declines and economic growth is curtailed. Responses to demographic changes by individuals, families, firms, and governments may, however, lead to very different and possibly more favorable outcomes.

In general, societies can respond to changes in population age structure in one of four ways. One possibility is to allow consumption to vary. Standards of living will rise as the support ratio becomes more favorable and will decline as it deteriorates. This would be the inevitable outcome if societies relied exclusively on transfer programs to meet the needs of dependent populations. Transfer systems can affect the distribution of income and consumption but not the totals; hence, per capita income and consumption will rise and fall with the support ratio.

A second possible response is to change policies or behaviors that link change in population age structure to the support ratio. People can work longer by delaying retirement, and women may choose to enter the formal labor force in greater numbers in part as a result of lower fertility. As older adults enjoy longer, healthier lives, delaying retirement appears to be a natural response. Policies that prohibit and discourage older workers from continuing their employment can be reformed. Consumption patterns, particularly spending on healthcare and long-term care, are also very important.

A third possibility is to increase investment in human capital. Low fertility results in relatively fewer workers, but increased spending on human capital can make them more productive. This possibility is discussed in some detail by Lee and Mason (2010a), Ogawa et al. (2009), and Prettner and Prskawetz (2010).

A fourth possible response is that workers may increase their saving in

order to fund a longer period of retirement. They may do this through personal saving, through pension systems funded by employers, or through publicly funded retirement programs. This response initially leads to higher saving and lower consumption, but the additional capital that is generated is growth enhancing, and eventually income per worker rises, offsetting to some extent the decline in the support ratio. Not all changes in saving and wealth are necessarily behavioral, however, and changes in the age composition of the population also have an important influence.

4. POPULATION, SAVING, AND WEALTH

Concerns often raised about population aging are that it will lead to lower saving rates and a decline in capital and to all of the attendant economic problems, for example, slower economic growth and a collapse in asset prices. Among mainstream economists, however, the most familiar idea about the relationship between population and capital is embodied in the Solow growth model. Solow showed that given a constant saving rate, slower labor force growth would lead to an increase in capital per worker and per capita income (Solow, 1956). Thus, in the simple accounting identity, equation (2.1), changes in the growth rate of the labor force will influence output per worker. Given the saving rate, a decline in the support ratio due to a decline in the growth rate of the effective labor force will lead to capital deepening and to higher income per capita. Capital deepening induced by slower labor force growth will to some extent offset the effect on economic growth of the decline in the support ratio that occurs as populations grow more slowly and age.

To understand how changes in population age structure influence the capital–output ratio and labor productivity, it is essential to understand how the aggregate saving rate is influenced by changes in population age structure. Many studies have addressed this issue relying on the lifecycle saving model. Tobin (1967) extended the neo-classical growth model with endogenous lifecycle saving. Cutler et al. (1990) explored the effects of aging using a Ramsey framework and concluded that population aging would lead to higher standards of living because a lower saving rate would be needed to maintain the capital–output ratio in an aging United States (US) economy. Mason and Lee (2007) modeled a small open economy and showed that population aging would lead to a substantial increase in assets that would be sufficient to offset the effects on per capita consumption of a decline in the support ratio, but only if there were strong reliance on lifecycle saving to fund old-age retirement. If countries rely primarily on either public or private transfers to support retirement needs,

population aging leads to a significant decline in per capita income and per capita consumption.

A similar conclusion is reached for a closed economy in equilibrium (Lee and Mason, 2010b; Romero et al., 2010) and in economies with immigration (Mason et al., 2010). These studies vary in their details but agree that population aging may lead to an increase in capital and standards of living because it will not lead to a decline in saving rates sufficient to offset the capital deepening effects of slower labor force growth. An important point, however, is that the link between population aging, saving, and capital will depend to a significant degree on the extent to which saving is motivated by lifecycle concerns. This, in turn, will depend on the extent to which the elderly are relying on continued work, adult children, and public transfer programs rather than on personal wealth to support old-age consumption.

Many studies have considered the effects of changes in population age structure on saving rates. Relying on variants of the lifecycle model, several have used aggregate, cross-section, time series data to estimate the effects of age structure on aggregate saving (Mason, 1981; Fry and Mason, 1982; Mason, 1988; Higgins and Williamson, 1997; Higgins, 1998; Bosworth and Chodorow-Reich, 2007) and have concluded that saving rates will rise and then fall over the course of the demographic transition.

The strong effects on saving of population age structure are often driven by saving rates in Asia, which have experienced especially large swings during the demographic transition. Several explanations have been offered for why these patterns have been so important in Asia, including the rapid rate of economic growth, less reliance on public transfer systems for old-age support, and the speed of the demographic transition. Using both historical and contemporary data, Kinugasa (2004) and Kinugasa and Mason (2007) showed that rapid increases in life expectancy led to high saving rates and increases in wealth per capita. An important feature of their result is that the finding in contemporary economies is confined to Asia, where transfer systems tend to be less important for old-age support than they are in Europe and Latin America.

The empirical evidence about saving and demography is far from settled as saving may be very context dependent in ways that have not been fully captured by empirical models (Zhang and Zhang, 2005). Another difficulty is that behavioral responses to population aging are quite complex. Increases in life expectancy and the duration of retirement may influence the age at retirement (Bloom et al., 2003), the extent to which the elderly can rely on family members for support, and the magnitude of public transfer systems (Preston, 1984).

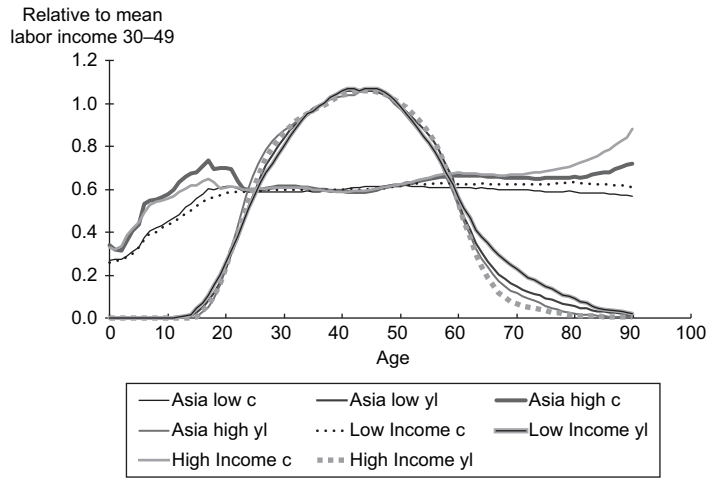
Simulation analyses have often been used to consider the implications of population age structure for lifecycle saving. One value of such models is to assess whether the large swings in saving rates observed in Asian countries, for example, can be explained by the lifecycle model. Most studies have concluded that demographic change produces swings in saving rates that are more modest than the observed changes and more modest than those implied by empirical studies. Lee et al. (2003), for example, concluded that changes in age structure can explain US saving trends but not the sharp increases in saving in Taipei,China, which can instead be explained by changes in population age structure combined with a rapid shift in the old-age support system from familial transfers to lifecycle saving.

5. THE ECONOMIC LIFECYCLE

Changes in population age structure matter only because the human lifecycle influences economic behavior in important, fundamental ways. During the periods of "dependency" at the beginning and the end of life, we consume much more than we produce through our labor. Sandwiched between is a period during which we consume much less than we produce through our labor. This economic lifecycle is central to our analysis. First, the interaction between the economic lifecycle and population age structure determines the support ratio and the magnitude of the demographic dividend. The economic lifecycle is critical to the timing and magnitude of the dividend and is also critical to identifying ways in which changes in behavior or policies might influence it. Second, the economic lifecycle is the fundamental building block for lifecycle saving as it determines lifecycle needs for accumulating wealth.

The National Transfer Accounts (NTA) provide comprehensive estimates of economic flows by age in a manner consistent with national income and product accounts; research teams in 35 countries are currently constructing them. In Asia, accounts have been constructed for eight economies: the People's Republic of China (PRC), India, Indonesia, Japan, the Republic of Korea, Philippines, Taipei,China, and Thailand (Lee et al., 2008; Mason et al., 2009; Lee and Mason, 2011). Detailed information about NTA is available at www.ntaccounts.org.

The economic lifecycle is defined by age profiles of labor income and consumption. Labor income is a comprehensive measure of the value of labor production at each age, reflecting age variation in labor force participation, unemployment rates, hours worked, and wages. Labor income includes the estimated value of labor of unpaid family workers who often are young or old. Also included are benefits provided by employers



Note: c = consumption; yl = labor income.

Source: Lee and Mason (2011); National Transfer Accounts database, www.ntaccounts.org, accessed 12 May 2011.

Figure 2.1 Per capita consumption and labor income by age in low- and high-income economies

including their contributions to publicly funded social security programs. Labor income does not, however, include the value of time spent in child rearing and other important forms of in-home production.

Consumption is also a comprehensive measure that is both public and private. Public education and publicly funded healthcare, for example, are allocated to age groups relying on a combination of administrative records and household surveys. Non-assignable public consumption is allocated to age groups in proportion to the population in those age groups. Private consumption is allocated to age groups using nationally representative household surveys. Detailed methods are described in the references provided above.

NTA estimates are currently available for 23 economies. Per capita labor income and consumption profiles are charted in Figure 2.1 using simple averages in four different groups. The low-income group includes the 12 economies with the lowest per capita incomes, and the high-income group includes the 11 economies with higher per capita incomes. In Asia, the low-income group includes the PRC, India, Indonesia, the Philippines, and Thailand, while the high-income group includes Japan, Republic of Korea, and Taipei,China.

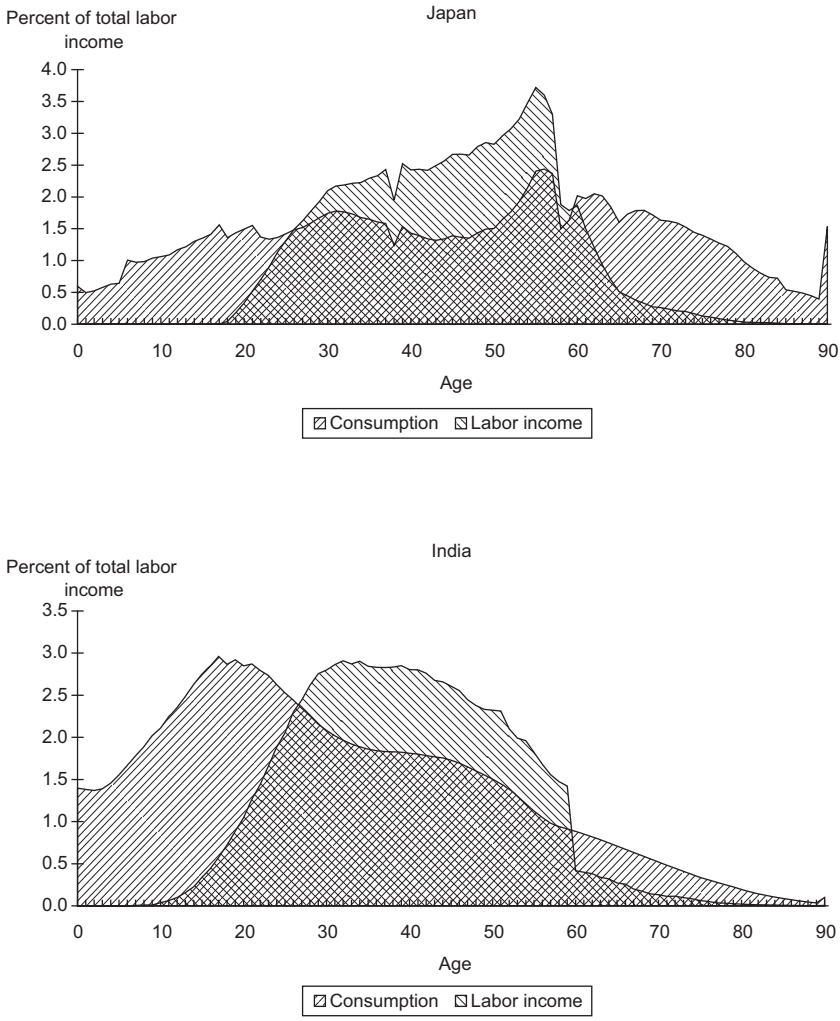
The labor income profiles for high-income economies and Asian high-income economies are very similar except that labor income is somewhat higher in Asia than in the combined high-income profile. Likewise, the labor income profile in the low-income economies of Asia is very similar to that in low-income economies in general, though it has a somewhat different profile than that in high-income economies. In low-income economies, labor income rises at a somewhat earlier age but a bit more slowly than in high-income economies. The peaks come at similar ages. At older ages, low-income economies have relatively high labor incomes.

The consumption profile for low-income Asian economies is not much different from that of low-income countries in general. Consumption rises with age during childhood and then is remarkably flat across adult ages. In high-income economies, child consumption is higher at all ages, particularly among school-age children. Human capital spending on children is very high in high-income Asian economies, and the consumption profile is not flat over the adult ages. Consumption is higher among adults in their late fifties and sixties compared with younger adults.

Starting in the late sixties or early seventies, consumption rises steeply in non-Asian high-income countries but is less pronounced in Asia. The steep increase is primarily a consequence of high levels of spending on health and long-term care. Asia's high-income economies are quite varied, however. Consumption rises steeply at older ages in Japan, less so in Taipei,China, and actually declines in the Republic of Korea. It must be kept in mind that these estimates are for a year near 2000. Some important changes may have occurred in recent years, but the key features of the profiles are quite persistent based on a preliminary analysis of time series estimates.

Aggregate consumption and labor income by age vary considerably as population age structure changes. This point is illustrated in Figure 2.2, which compares aggregate consumption and production by age in India with aggregate consumption and production by age in Japan. In India, the lifecycle deficit for children – the difference between their consumption and labor income – is enormous, while the lifecycle deficit for the elderly is relatively small. In Japan, however, the old-age deficit for the elderly is somewhat larger than the deficit for the young. Although the per capita profiles for India differ from Japan's, population age structure is the main cause of the difference in the aggregate profiles for these two countries and for other countries that have been studied.

Studies of the economic implications of population age structure usually emphasize the overall level of dependency using the support ratio, the dependency ratio, or a similar measure. The next section follows this



Source: National Transfer Accounts database, available at www.ntaccounts.org, accessed 12 May 2011.

Figure 2.2 Aggregate consumption and labor income by age in Japan and India in 2004

approach by describing changes in the support ratio that are occurring in Asia. This is a very useful starting point for considering the economic implications of changes in population age structure, but it is very important to keep in mind that it is only a starting point.

6. SUPPORT RATIO

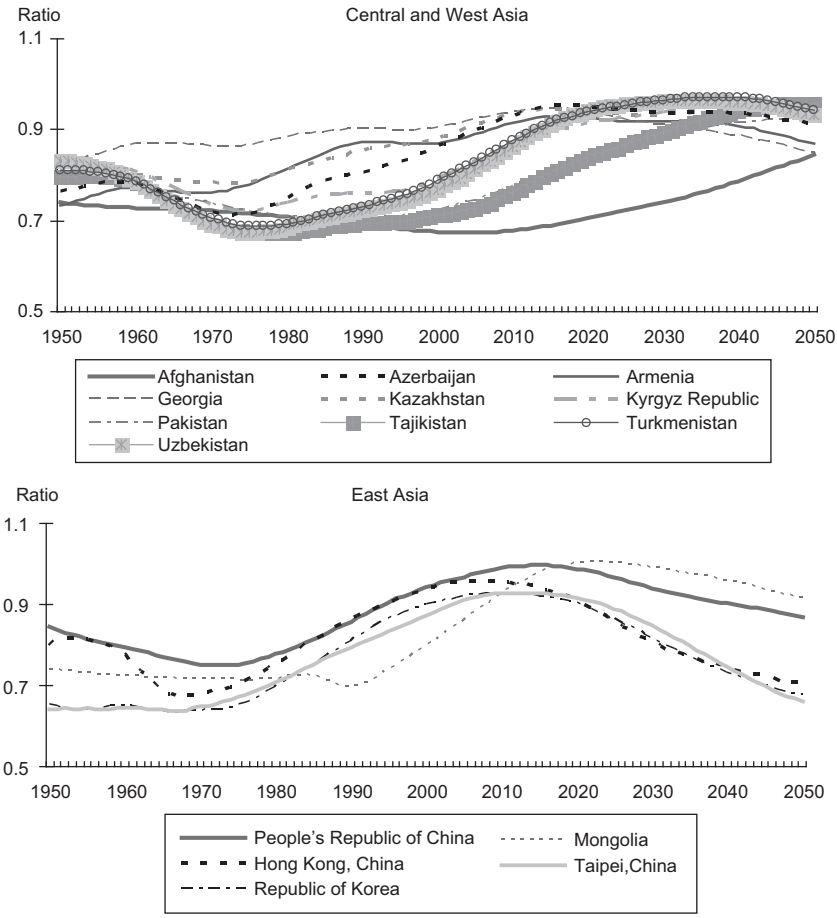
The support ratio shown in equation (2.3) for Asian and Pacific economies was constructed using population data and the age profiles of consumption and labor income shown in Figure 2.1. The population data were taken from United Nations (UN) population estimates and projections based on the medium fertility scenario. For the base year labor income and consumption weights, the low-income Asian profiles were used except for Japan, Hong Kong, China, Malaysia, Republic of Korea, Singapore, and Taipei,China, where high-income profiles were used.

The East Asian DMCs in the second panel of Figure 2.3 are distinctive because their age transition has been so rapid. The PRC provides a useful benchmark against which other countries can be compared. The support ratio declined between 1950 and the early 1970s due to improved child survival, then began to increase as a consequence of lower birth rates and child dependency. This increase has continued since 1972, but it is currently very close to its peak. In the coming decades, the support ratio will decline as smaller cohorts begin entering the labor force and as the elderly live to older ages. By 2050, the support ratio in the PRC will be only slightly greater than it was in 1950.

As in the PRC, the support ratio declined in most Asian developing countries and then increased in essentially all of them, though the point at which it began to increase varied considerably. A broad perspective on the growth in the support ratios is provided in Figure 2.4, which plots their growth rates in each economy against the rate of growth of the effective number of producers during four periods. The effective number of producers is the population weighted by the labor income profile, that is, the numerator of the support ratio. From 1950 to 1975, the effective number of workers was growing between 1 and 3 percent per annum in all but a few countries, but in most cases, the effective number of consumers was growing even more rapidly, and the support ratio was declining by as much as 1 percent per year.

Between 1975 and 2000, the rate of growth of effective consumers shifted towards zero in some countries but remained very high in many others. The mass of points shifted to a higher level as the greater majority of countries experienced a rising support ratio. The next 50 years are marked by a steady shift towards the southwest quadrant, where the effective number of workers and the support ratio are both declining.

Two phases in the trend in the support ratio are of particular interest: the rise that marked the first demographic dividend and the decline that for most countries is coming in the future. The timing and magnitude of the first dividend are quite varied. In the Republic of Korea, the support



Source: Lee and Mason (2011).

Figure 2.3 Support ratios in the Asia and Pacific region from 1950 to 2050

ratio began its steep ascent in 1966, while in Pakistan it did not begin to rise for another 20 years. The support ratio is expected to peak in the PRC in 2015 after rising for more than four decades. A few other countries have similarly rapid transitions, for example, Thailand and Viet Nam. For many others, the transition from trough to peak is much slower, for example, 51 years in Bangladesh, 69 years in India, and 77 years in the Philippines (Table 2.1).

In many Asian economies, the support ratio is projected to decline substantially by 2050, but in many others, the impact of population aging

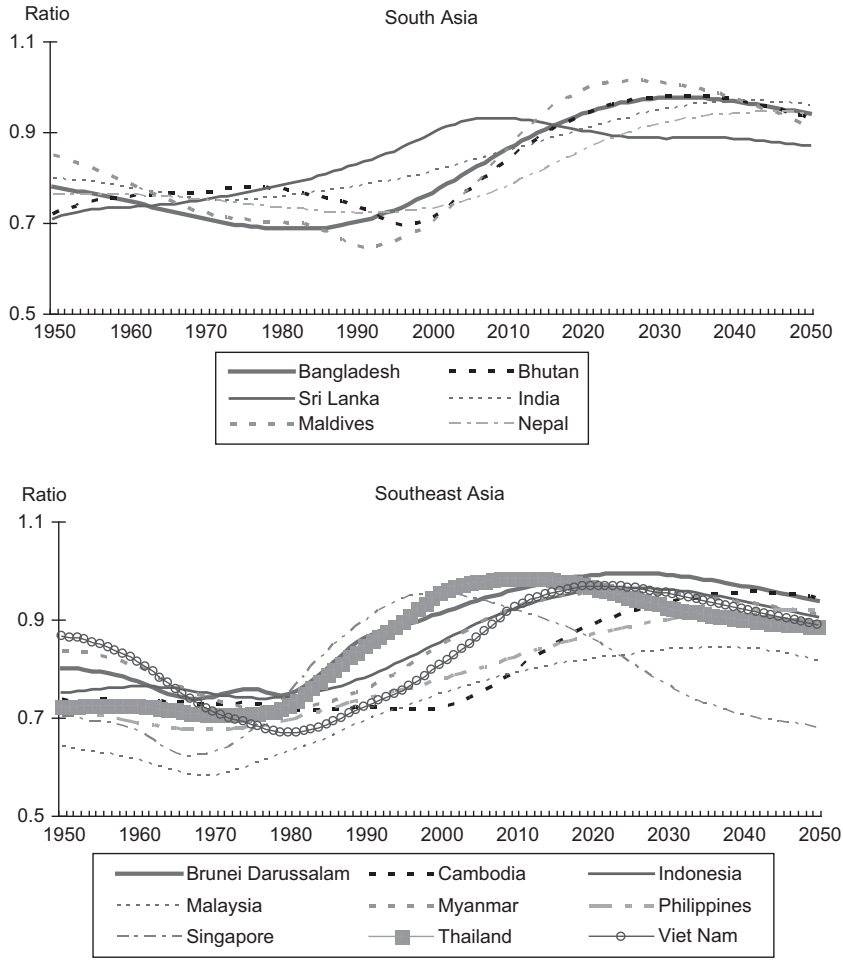


Figure 2.3 (continued)

will just be starting. The support ratio is expected to drop to very low levels in Hong Kong, China, the Republic of Korea, and Singapore by 2050, while elsewhere it will decline substantially after 2050. Table 2.2 shows values for the same set of countries in Table 2.1 after the support ratio has peaked. The PRC, Japan, and Republic of Korea are three countries in which the declining support ratio could be a serious drag on economic growth.

The direct effect of the support ratio on per capita consumption – the first demographic dividend – is captured in equation (2.1). Given the

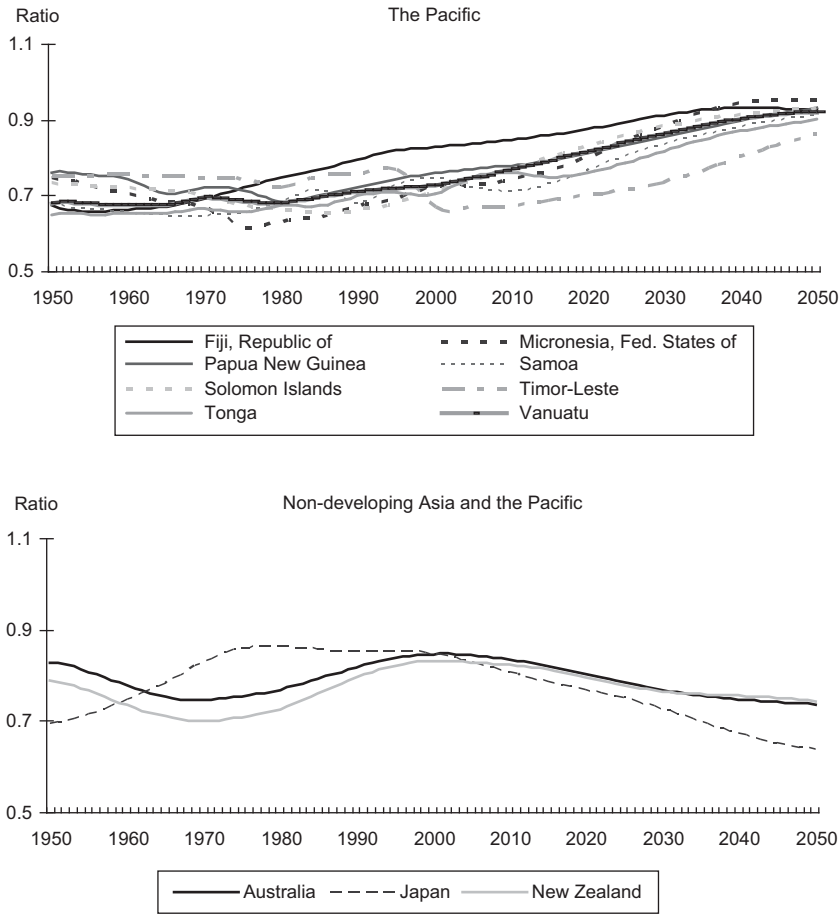
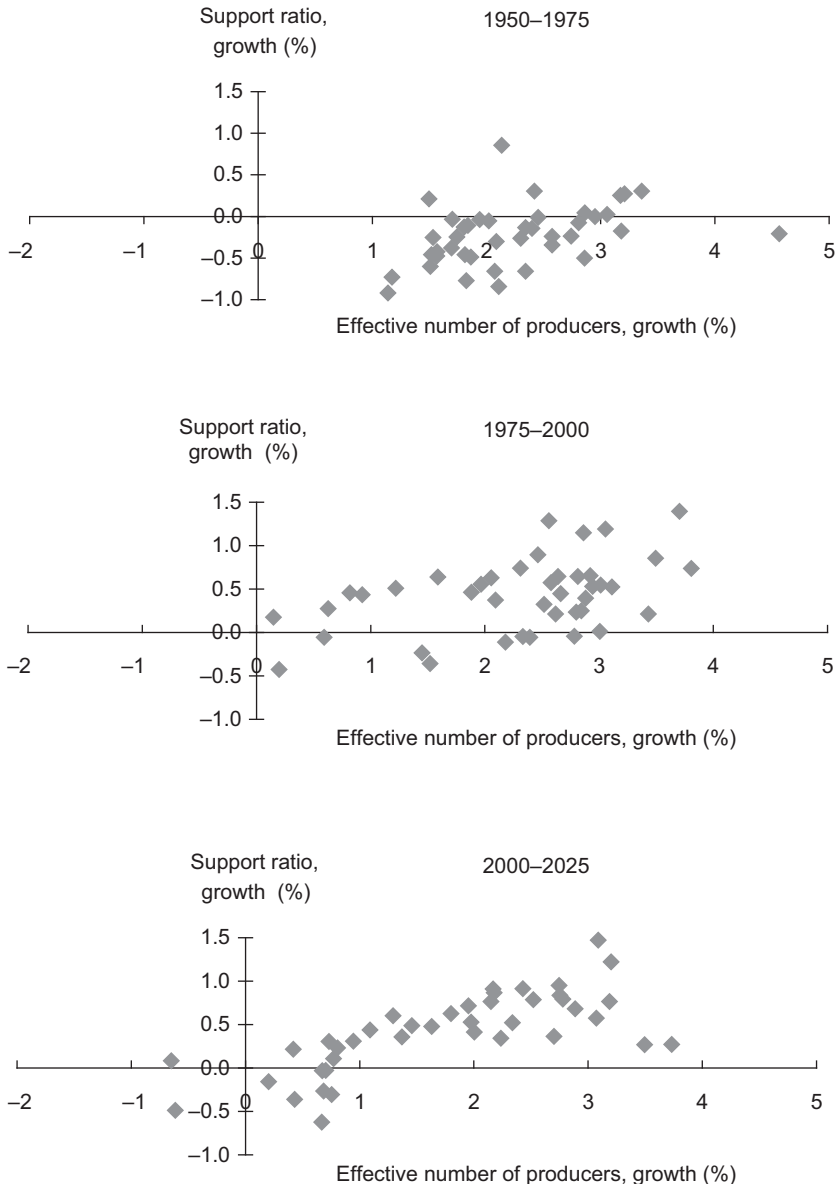


Figure 2.3 (continued)

saving rate and output per effective worker, an increase of 1 percent in the support ratio produces a 1 percent increase in consumption per effective consumer. The final two columns in Table 2.1 report the total gain in the support ratio and the annual gain during the first dividend phase. The Republic of Korea has the largest total gain, with an increase in consumption per effective consumer of 46 percent. Similar gains are projected for Bangladesh and Viet Nam. In contrast, the total gains for the PRC and India are smaller, at 33 percent and 29 percent respectively. Table A2.1 in the appendix summarizes the support ratio for all Asian and Pacific economies for which estimates could be constructed.



Source: National Transfer Accounts database, www.ntaccounts.org, accessed 12 May 2011.

Figure 2.4 Support ratio vs effective number of producers, annual growth rates in Asian and Pacific economies from 1950 to 2050

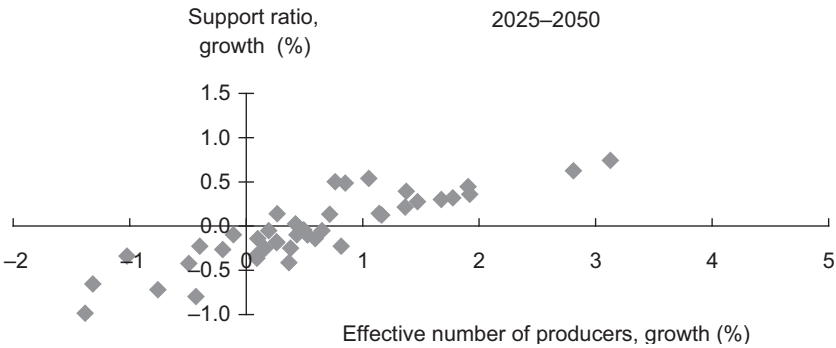


Figure 2.4 (continued)

Table 2.1 Growth in the support ratio during the first demographic dividend in selected countries

	Minimum		Maximum		Span	Total gain (%)	Annual gain (%)
	Support ratio	Year	Support ratio	Year			
Bangladesh	0.69	1982	0.98	2033	51	42.1	0.69
PRC	0.75	1972	1.00	2015	43	33.0	0.66
India	0.75	1973	0.97	2042	69	29.3	0.37
Indonesia	0.74	1976	0.96	2026	50	30.3	0.53
Japan	0.69	1950	0.86	1978	28	24.5	0.78
Republic of Korea	0.64	1966	0.93	2010	44	46.1	0.86
Pakistan	0.71	1986	0.92	2050	64	30.7	0.42
Philippines	0.68	1969	0.92	2046	77	36.2	0.40
Thailand	0.71	1971	0.99	2011	40	39.9	0.84
Viet Nam	0.67	1980	0.97	2021	41	44.8	0.90

Source: Authors' calculations using the NTA database, accessed 29 June 2011.

7. LIFECYCLE WEALTH, PENSIONS, AND TRANSFER SYSTEMS

The economic lifecycle is key to understanding how changes in population age structure influence the demand for lifecycle wealth. Basic concepts are illustrated based on the experience of Japan before we look in more depth at the situation across the Asia and Pacific region.

Table 2.2 Growth in the support ratio after the first demographic dividend in selected countries

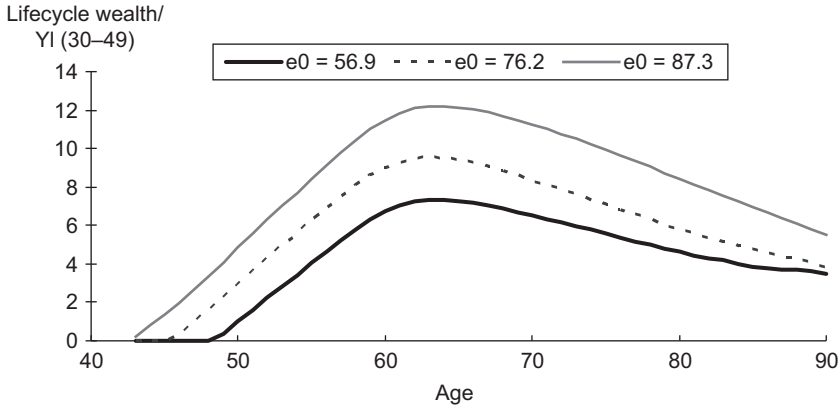
	Maximum		Support ratio in 2050	Span	Total loss (%)	Annual gain (%)
	Support ratio	Year				
Bangladesh	0.98	2033	0.94	17	−3.7	−0.22
PRC	1.00	2015	0.87	35	−12.7	−0.39
India	0.97	2042	0.96	8	−1.0	−0.12
Indonesia	0.96	2026	0.91	24	−6.1	−0.26
Japan	0.86	1978	0.64	72	−26.2	−0.42
Republic of Korea	0.93	2010	0.68	40	−27.2	−0.79
Pakistan	0.92	2050	0.92	0	0.0	na
Philippines	0.92	2046	0.92	4	−0.1	−0.03
Thailand	0.99	2011	0.89	39	−10.1	−0.27
Viet Nam	0.97	2021	0.89	29	−8.2	−0.30

Source: Authors' calculations using the NTA database, accessed 29 June 2011.

7.1 Lifecycle Wealth in Japan

The relationship between demographics and the demand for lifecycle wealth can be calculated given age profiles of consumption and labor income. For any cohort of adults aged x in year t, lifecycle wealth is defined as the present value of lifetime consumption less the present value of lifetime labor income. This follows directly from the lifetime budget constraint and the assumption of no bequests. Lifecycle wealth is the wealth necessary to realize a particular level of consumption at each future age, given labor income at each future age. In order to construct a measure of lifecycle wealth, we made several simplifying assumptions. First, the shapes of the age profiles of per capita consumption and labor income do not change over time, but they shift upward at a constant rate of growth. Second, the population is closed to immigration. Third, the discount rate is exogenous and constant. This removes potentially important general equilibrium considerations or economic feedback that have been explored in other studies discussed above.

Two demographic factors are considered here: changes in life expectancy that influence an individual's saving, and changes in age structure that arise due both to longer life expectancy and to fertility declines. First, the effects of longer life expectancy on saving are analyzed by calculating the path of lifecycle wealth over the lifecycle for three different synthetic cohorts subject to the mortality conditions that prevailed in Japan in



Source: Consumption and labor income profiles are NTA estimates for Japan in 2004 (Ogawa et al., 2010). Life expectancy and age-specific mortality rates are estimates for Japan for 1949, 1979, and 2009 (University of California, Berkeley and Max Planck Institute, Human Mortality Database, 2011), accessed 12 May 2011.

Figure 2.5 Simulated per capita lifecycle pension wealth by age for Japan

1949, 1979, and 2009. Japan's mortality experience is quite useful for considering the effects of longer life expectancy because in the aftermath of World War II, Japan had the shortest life expectancy of any industrialized country; now it has the longest. Thus, the simulated changes for Japan are the maximum one could anticipate over a 60-year period.

The effect of gains in life expectancy on the demand for lifecycle pension wealth may seem obvious to those who are not demographers. If people live longer but do not work longer, they must accumulate more wealth to support their old-age consumption. Gains in life expectancy, however, add years at all ages. When life expectancy is low, the gains tend to be concentrated at younger ages when people are both consuming and producing. As life expectancy reaches high levels, additional gains are concentrated at old ages where the effects on the demand for lifecycle wealth are clear.

Figure 2.5 shows the demand for lifecycle pension wealth using the per capita consumption and labor income profiles for Japan in 2004 (Ogawa et al., 2010) and age-specific mortality rates for Japan in 1949, 1979, and 2009 (University of California, Berkeley and Max Planck Institute, Human Mortality Database). These values are for synthetic cohorts based on the assumption that mortality conditions remain constant at the levels observed in a particular year. The present value is calculated using a discount rate of 3 percent.

Lifecycle wealth for each mortality level follows the classic lifecycle

Table 2.3 Life expectancy and lifecycle pension wealth in Japan

	1949	1979	2009
Life expectancy at birth	56.9	76.2	87.3
Lifecycle pension wealth	5.08	6.72	9.17
Partial effect	0.09	0.22	
Elasticity	1.13	2.65	

Note: Lifecycle wealth is the simple average of values for those aged 50–90 normalized on labor income of those aged 30–49. Partial effect is change in wealth divided by the change in life expectancy. Elasticity is the percentage change in wealth divided by the percentage change in life expectancy. Both measures are for the 30-year periods.

Source: Authors' calculations using the NTA database, accessed 29 June 2011.

pattern rising as individuals approach retirement, peaking during the early to mid-sixties, and then declining. The accumulation doesn't begin until around age 40 because of the costs of child rearing that younger parents must bear. The profiles are shown only to age 90 but are calculated to higher ages (110 in 2009 and 1979; 107 in 1949). Given longer life expectancy, accumulation begins at a somewhat earlier age and is substantially higher at every age once begun.

The upward shift in the age profile of lifecycle wealth generated by the rise in life expectancy is summarized in Table 2.3. The average of lifecycle pension wealth is calculated as a simple average of the values for ages 50–90 inclusive. Given 1949 mortality conditions, the average lifecycle wealth per person was about five times the average annual pre-tax labor income of a prime working-age (30–49) adult. The average rose to 6.7 times average labor income given 1979 mortality conditions, and 9.2 times annual labor income given 2009 mortality conditions.

The gain in life expectancy was much greater between 1949 and 1979 than between 1979 and 2009. Once we take this into consideration, we see that an additional year of life had a greater effect at higher life expectancy than at lower life expectancy. Between 1949 and 1979, a one-year increase in life expectancy shifted the age profile of wealth upward by about 0.1 of the annual pre-tax labor income of a prime working-age adult, but between 1979 and 2009, a one-year increase shifted it upward by about 0.2 (partial effect). A similar conclusion follows using elasticities to compare effects. A 1 percent increase in life expectancy led to a 1.1 percent increase in wealth between 1949 and 1979, and to a 2.7 percent increase between 1979 and 2009.

The economy-wide demand for lifecycle pension wealth depends on age structure as well as on changes in the age profile of lifecycle wealth. The Japanese demand for lifecycle wealth peaks when cohorts are in their

Table 2.4 Lifecycle pension wealth relative to total labor income

Pop growth rate	Life expectancy at birth		
	87.3	76.2	56.9
−0.01	12.3	7.5	4.1
0.00	8.4	5.3	2.9
0.01	5.7	3.7	2.1
0.02	3.9	2.6	1.5

Note: Values were calculated using the age profiles of lifecycle wealth from Figure 2.5 and the population age distribution implied population growth rate and life table values (Lx) for Japan taken from the Human Mortality Database, (University of California, Berkeley and Max Planck Institute, 2011), accessed 6 April 2011.

Source: Authors' calculations.

early sixties, hence an increased concentration of the population near these peak wealth ages leads to greater aggregate wealth. In the special case of a steady-state population, the age distribution depends on the age schedule of survival and the rate of population growth (the fertility rate). A shift from low life expectancy and a high rate of population growth – characteristics of countries in the early stages of the demographic transition – yields a ratio of lifecycle wealth to labor income of only 1.5 (Table 2.4). By comparison, rates characteristic of rapidly aging societies – a life expectancy of 87 and a population growth rate of –1 percent per year – yields a wealth to labor income ratio of 12.3.

The values in Table 2.4 rely on a steady-state assumption and hence provide little insight about the dynamics of wealth transfers. In the next section, the same concepts are applied in a more detailed fashion to project lifecycle wealth over the next four decades in the Asia and Pacific region. The analysis goes beyond this calculation, however, to assess the extent to which the demand for lifecycle wealth will be met by accumulating pension assets and by expanding transfers to support the elderly.

7.2 Lifecycle Wealth, Transfers, and Assets

Lifecycle wealth is projected by assuming that given age patterns of consumption and labor income persist into the future while allowing for a constant and exogenous change in labor productivity due, for example, to technological progress. The objective of the projections is to answer the following question: in the absence of a labor response, how much additional wealth is required to sustain consumption levels that keep pace with changes

in productivity? In effect, two of the possible responses to population aging are ruled out: sacrificing consumption and increasing work effort.

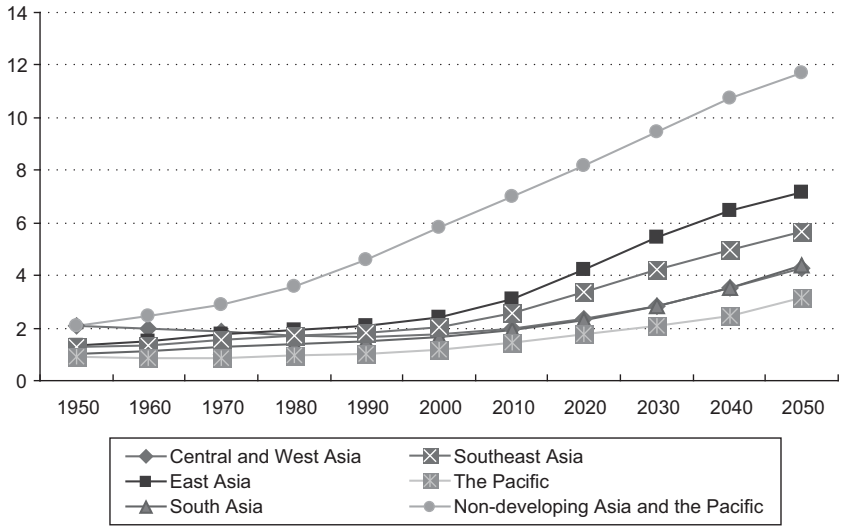
The additional wealth required to meet the needs of the elderly can be obtained in two ways. One way is to establish or expand transfer programs that provide pensions and fund healthcare services and the other needs of the elderly. The alternative is to accumulate assets that can fund these same needs. The projections presented here present alternatives based on the experience of NTA economies in Asia that differ considerably in their emphasis on transfers versus assets in funding old-age consumption.

Lifecycle wealth is projected in the following way. Two scenarios are constructed based on the age profiles of per capita consumption and labor income for high- and low-income Asian NTA economies, as shown in Figure 2.1. The consumption and labor income profiles are assumed to shift at a constant rate that is exogenously given. Total consumption and labor income at each age in a given year are calculated by combining the profiles of consumption and labor income with the projected population for each cohort. The present value of consumption and labor income for each cohort is calculated using a constant discount rate. Lifecycle wealth at each age is calculated as the difference between the present value of consumption and labor income at each age.

Lifecycle wealth arises in part to meet the needs of children, but our interest here is the lifecycle wealth required to meet the needs of the elderly. Lifecycle pension wealth is defined as lifecycle wealth used to fund consumption in old age. In order to isolate lifecycle pension wealth, we assumed that adults fund their children and then fund their retirement; hence, lifecycle pension wealth is approximated by the positive portion of lifecycle wealth held by older adults, as shown for Japan in Figure 2.5.

Transfers and asset-based reallocations as shares of consumption at each age are held constant.[3] Note that transfers include both public and private transfers, including familial transfers. We assumed that the ratio of pension assets to pension transfer wealth is equal to the ratio for adults aged 65 and older. Two age profiles of per capita net transfers by age are used, one from high-income Asian economies and the other from low-income Asian economies. Asset-based reallocations are estimated as the balancing item drawing on the identity that consumption must equal asset-based reallocations plus net transfers plus labor income.

The population estimates and projections used here for 1950–2050 are from the UN Population Division, *World Population Prospects 2008*.[4] Longer-term projections are required to calculate wealth because each cohort must be tracked over its entire lifetime. Thus, long-term projections prepared by the UN Population Division have been used to extend the standard population projections in such a way as to minimize



Source: Authors' calculations.

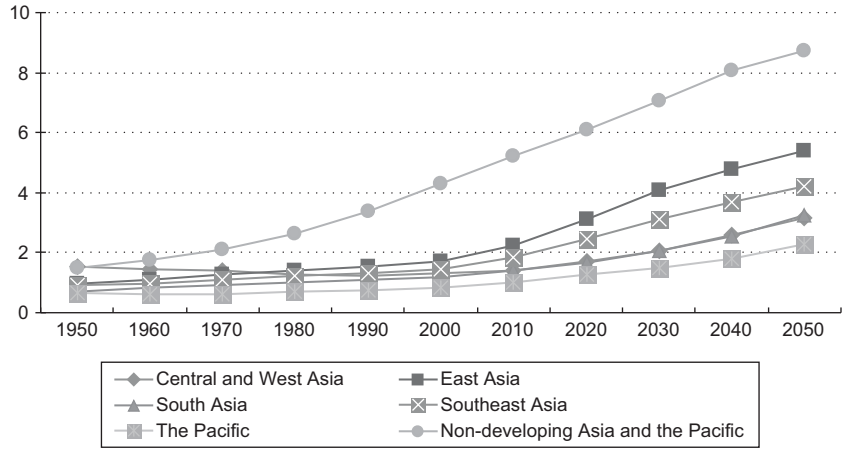
Figure 2.6 Lifecycle pension wealth relative to labor income in Asia and the Pacific for high-income economic lifecycle profiles

discontinuities that are otherwise introduced into the calculations. Details are available from the authors.

As noted, lifecycle wealth can be accumulated in the form of assets or transfer wealth. These values are also projected by assuming that net transfers fund a constant share of consumption by the elderly of a given age. Thus, the importance of net transfers to the elderly varies as the age distribution of the elderly population changes. As will be seen, the very old are more reliant on transfers than the younger elderly, hence the importance of transfers increases as elderly populations become older.

The ratio of lifecycle pension wealth to labor income is charted in Figures 2.6 and 2.7 at ten-year intervals from 1950 to 2050 for regional groups. The average values are calculated using GDP weights rather than as simple averages of the values for countries that are members of each group. Hence, the values for East Asia are dominated by the PRC, for South Asia by India, and for non-DMCs by Japan. Country values are reported in Tables A2.2 and A2.3 in the Appendix.

The path of the non-DMCs in Figure 2.6 is striking in two respects. The first is that it begins to rise so early. In 1950 for the high-income profile, lifecycle pension wealth is less than twice total labor income, but by 1990 it has doubled. The second feature is that it reaches such high levels,



Source: Authors' calculations.

Figure 2.7 Lifecycle pension wealth relative to labor income in Asia and the Pacific for low-income economic lifecycle profiles

approaching 12 times aggregate labor income by 2050. By comparison, DMC regions experienced modest growth in lifecycle pension wealth of about 1 percent per year faster than the growth in labor income before 2000. In Central and West Asia, lifecycle pension wealth actually declined relative to income during this period. The effects of aging are very strong starting around 2000, particularly in East and Southeast Asia. In East Asia, lifecycle pension wealth is projected to grow by over 3 percent per year from 2010 to 2020 compared with productivity growth. For DMCs as a whole, growth in lifecycle pension wealth will slow over the next four decades but will remain above 1 percent relative to labor income growth.

Less lifecycle pension wealth is required to maintain the low-income lifecycle profiles than the high-income profiles. Taking the DMCs as a whole, lifecycle pension wealth is about 25 percent lower, though the trends are otherwise very similar, and the most rapid growth in wealth is concentrated between 2010 and 2030 (Figure 2.7).

Table 2.5 shows pension transfer wealth for Asia and the Pacific. DMCs and regional groupings are reported for 2010, 2030, and 2050. Values for each country at ten-year intervals from 1950 to 2050 are provided in the Appendix in Tables A2.4 and A2.5 for both the low- and high-income profiles. The low-income profile is based on both the low-income economic lifecycle and the low-income transfer profile, while the high-income profile uses the high-income lifecycle and the high-income transfer profile.

Table 2.5 Pension transfer wealth relative to labor income

	Low-income profiles			High-income profiles		
	2010	2030	2050	2010	2030	2050
Asia and the Pacific Countries	1.1	1.8	2.5	2.6	4.0	5.4
Developing Member Countries (DMCs)	0.8	1.4	2.0	1.9	3.2	4.5
Central and West Asia	0.5	0.8	1.3	1.4	2.0	3.0
East Asia	0.9	1.6	2.4	2.2	3.8	5.2
South Asia	0.5	0.8	1.3	1.3	1.9	3.1
Southeast Asia	0.7	1.2	1.8	1.8	2.9	4.0
Pacific Island Nations	0.3	0.5	0.9	1.0	1.4	2.2
Non-DMCs	2.3	3.4	4.3	5.1	7.0	8.7

Source: Authors' calculations using the NTA database, accessed 29 June 2011.

Pension transfer wealth increases very sharply between 2010 and 2050. Given the low-income profiles, pension transfer wealth almost triples for Central and West Asia, East Asia, South Asia, the Pacific island nations, and DMCs as a whole. The growth is somewhat slower in Southeast Asia. For the non-DMCs, pension transfer wealth does not quite double. Given the high-income profiles, the growth of pension transfer wealth is slower. For the DMCs, the increase is roughly 150 percent of the 2010 value.

Pension transfer wealth is much higher given the high-income profiles. A useful place to start would be the non-DMCs, which clearly fall into the high-income group. From 2010 to 2050, the required pension transfer wealth rises from 5.1 to 8.7 times total labor income. Pension transfer wealth would be almost six times GDP in 2050 given this "business as usual" simulation. To maintain consumption levels growing at the rate of productivity and current retirement patterns would require imposing an implicit debt on future generations equal to almost six times GDP. This compares with total wealth in Japan of about eight times GDP. Other regions in which pension transfer wealth would reach very high levels given high-income lifecycle and transfer patterns are East Asia, where it would reach 520 percent of total labor income in 2050, and Southeast Asia, where it would reach 400 percent of total labor income in 2050.

Pension transfer wealth would be lower if the low-income profiles of consumption, labor income, and net transfers were to persist during the next 40 years. Among the DMCs, East Asia would have the highest pension transfer wealth in 2050, at 240 percent of total labor income. For all DMCs combined, pension transfer wealth would be 200 percent of

Table 2.6 Pension assets relative to labor income

	Low-income profiles			High-income profiles		
	2010	2030	2050	2010	2030	2050
Asia and the Pacific Countries	1.6	2.4	3.0	1.1	1.6	2.0
Developing Member Countries (DMCs)	1.2	2.1	2.7	0.8	1.4	1.8
Central and West Asia	0.9	1.3	1.9	0.6	0.9	1.3
East Asia	1.4	2.4	3.0	0.9	1.6	2.0
South Asia	0.9	1.3	2.0	0.6	0.9	1.3
Southeast Asia	1.1	1.9	2.5	0.8	1.3	1.6
Pacific Island Nations	0.7	1.0	1.4	0.5	0.7	1.0
Non-DMCs	2.9	3.7	4.4	1.9	2.5	3.0

Source: Authors' calculations using the NTA database, accessed 29 June 2011.

total labor income. Although these values are well below those required to follow the high-income profile path, they are still substantial. The unfunded obligation needed to meet the needs of the elderly in 2050 would be approaching twice the labor income of all workers combined.

The elderly rely more on assets than transfers in low-income countries in Asia and elsewhere. The relative importance of net transfers and asset-based reallocations – asset income less savings – relative to consumption net of labor income varies with the age structure because the older elderly depend more on transfers and less on assets, compared with the younger elderly. Confining comparisons to 2000 and later, net transfers as a share of consumption net of labor income for those aged 65 and older vary from a low of 33 percent in the Pacific islands and 35 percent in South Asia to highs of 37 percent in East Asia and 43 percent in non-DMCs. By 2050, however, the share of net transfers is projected to rise to 42 percent in DMCs and 49 percent in non-DMCs, while asset-based reallocations will decline. For DMCs as a whole, for example, asset-based flows fund 64 percent of consumption net of labor income in 2000 and 58 percent in 2050.

Transfers are much more important and asset-based flows are much less important in the high-income profiles. In 2000 for DMCs, net transfers accounted for almost 70 percent of consumption net of labor income; asset-based flows accounted for about 30 percent. Again asset-based flows will decline relative to other sources of support for the elderly as populations age, but the changes are relatively small for the high-income profiles.

Table 2.6 reports assets relative to labor income required to meet the lifecycle needs of the elderly in the coming decades. A surprising aspect

Table 2.7 Annual growth rate of assets relative to labor income (%)

	Low-income profiles		High-income profiles	
	2010–2030	2030–2050	2010–2030	2030–2050
Asia and the Pacific Countries	2.1	1.2	2.1	1.1
Developing Member Countries (DMCs)	2.6	1.3	2.5	1.2
Central and West Asia	1.9	1.9	1.8	1.8
East Asia	2.9	1.1	2.7	1.0
South Asia	1.8	2.2	1.7	2.1
Southeast Asia	2.6	1.3	2.4	1.2
Pacific Island Nations	1.9	1.8	1.8	1.8
Non-DMCs	1.2	0.9	1.2	0.9

Source: Authors' calculations using the NTA database, accessed 29 June 2011.

of the results is that the assets under the high-income profiles are less than the assets for the low-income profiles. In short this occurs because the high consumption and lower labor income in the high-income profile countries is more than offset by the high net transfers received by the elderly. Hence, higher consumption net of labor income would be supported with lower levels of assets but with higher levels of transfer wealth.

Two macroeconomic issues are of particular interest. One is that the growth in assets relative to labor income will accelerate economic growth through capital deepening to the extent that greater demand for pension assets in the Asia and the Pacific economies results in greater investment in Asia and the Pacific. Capital deepening in turn leads to higher labor productivity, higher wages, and higher GDP per worker. The simplest case is the constant-returns-to-scale, neo-classical growth model in which capital and labor determine GDP. In this case, growth in capital relative to labor income yields growth in output per worker equal to $\alpha/1 - \alpha$, where α is the elasticity of output with respect to capital. Using a typical value for α of one-third, a 1 percent increase in the ratio of capital relative to labor income leads to a 0.5 percent increase in output per worker. The impact on output per worker of increased pension assets is readily assessed.

The rates of growth of pension assets are quite insensitive to whether the high- or low-income profile is employed, hence the discussion is limited to the low-income profiles (Table 2.7). Growth in the ratio of pension assets to labor income is particularly rapid in East Asia and Southeast Asia from 2010 to 2030, at 2.9 percent and 2.6 percent per annum, respectively. If invested in regional economies, output per worker would grow by 1.45 percent per annum in East Asia and 1.3 percent per annum in Southeast

Asia.[5] The capital deepening effects drop by almost 67 percent in East Asia and by 50 percent in Southeast Asia from 2030 to 2050, compared with 2010 to 2030.

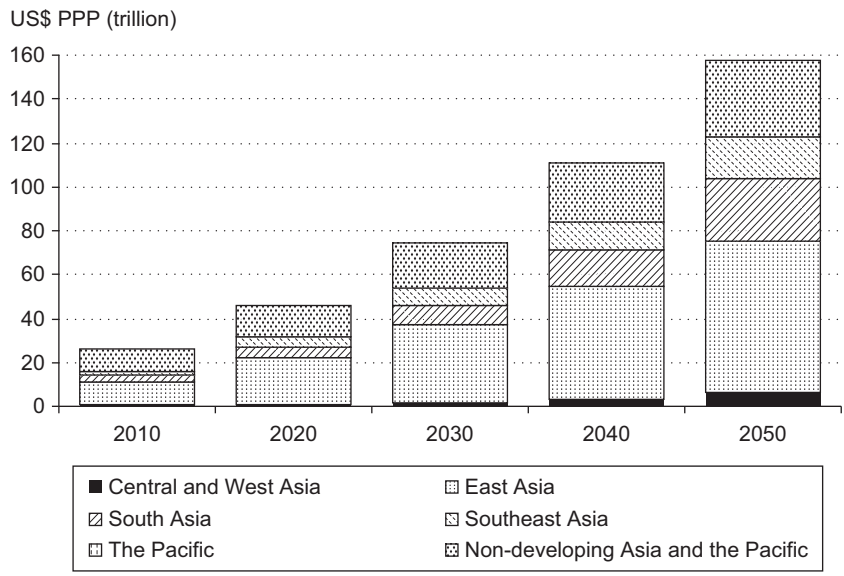
In other regions, the rates of capital deepening are similar for 2010–2030 and 2030–2050 at around 2 percent per annum from 2010 to 2050. Again, applying our very simple rule, this would produce growth in output per worker equal to about 1 percent per annum. The capital deepening effects dominate the effects of the declining support ratio on output per capita shown in Table 2.2.

7.3 Pension Assets

Rapid growth in the populations of the currently retired and near retirement will lead to rapid growth in pension assets depending on a variety of factors: the rate of economic growth, changes in age patterns of consumption and labor income, and changes in transfer systems. The results presented here are based on simple assumptions and are intended only to illustrate the connections between demographic factors and assets required to support retirement. We have assumed that GDP growth is equal to the rate of growth of the effective labor force plus 3 percent per year and that labor income is 65 percent of GDP. Initial GDP estimates are taken from Key Economic Indicators, and for this purpose we have used purchasing power parity estimates of GDP for the most recently available year, that is, 2008 or 2009. Pension assets were calculated using the projected values of total labor income for each economy and the ratio of pension assets to labor income summarized in Table 2.6 and reported in detail in Tables A2.6 and A2.7 in the Appendix. The results are summarized in Figure 2.8, which shows total pension assets by region at ten-year intervals from 2010 to 2050.

For 2010, pension assets for the whole region are estimated at $26 trillion, increasing to $158 trillion in 2050. Pension assets are heavily concentrated in East Asia. For 2010, pension assets for East Asian DMCs and for non-DMCs are at $11 trillion and $12 trillion respectively, and by 2050, pension assets for East Asian DMCs will be $69 trillion, compared with $35 trillion for non-DMCs.

Pension assets are similar for South and Southeast Asia. In 2010, total pension assets for both regions were between $2 and $3 trillion, but by 2050 they will reach $29 trillion in South Asia and $18 trillion in Southeast Asia. In Central and West Asia total pension assets will grow from $0.5 trillion in 2010 to $6.3 trillion in 2050. For Pacific island nations, the change over the 40-year period will be from $10 billion in 2010 to $149 billion in 2050.



Note: GDP growth is equal to the growth in effective number of consumers plus 3 percent per year. Labor income as a share of GDP is constant at 0.65. Low-income age profiles are used for consumption and labor income; low-income Asia profiles for net transfers.

Source: Authors' calculations.

Figure 2.8 Total pension assets by region from 2010 to 2050

We cannot overemphasize the illustrative nature of these results and the importance of focusing on the broad patterns, that is, the substantial increase in pension assets and the shifting regional patterns. First, there is a great deal of uncertainty about how rapidly GDP will grow over the next 40 years. Second, we have used age profiles of consumption and labor income from low-income countries where labor income is relatively high and consumption is relatively low in old age. There is certainly reason to believe that consumption at older ages will rise more rapidly than assumed here, primarily because of increased spending on healthcare.

There are two other important complexities to consider. First is the likely change in labor income at older ages. As an empirical matter, labor income at older ages is less important relative to labor earned during the prime working ages in high-income countries. Moreover, relative labor income at older ages has declined very substantially over time in the few economies for which time series estimates are available. If this trend

continues, pension assets will grow more rapidly. Public policy, however, is likely to push in the opposite direction as countries raise the pensionable and mandatory retirement ages, reform pension and tax systems to increase incentives to work longer, and reduce the generosity of transfer systems to the elderly. These changes all have the common goal of raising labor income at older ages and may partially or completely offset the decline in labor income that would otherwise occur.

The second important issue is the likely direction of net transfers to the elderly. The elderly in low-income Asia rely to a relatively modest degree on net transfers, including familial transfers. As economies develop, public transfer systems have become more important, and familial transfers have become less important. Apparently the increase in public transfers has substantially exceeded the decline in familial transfers judging from the importance of net transfers as a share of consumption in high-income economies like Japan, the Republic of Korea, and Taipei,China. As DMCs develop, they will almost surely place more emphasis on public pensions, healthcare systems, and other social protection programs, but it also seems likely, given greater awareness of aging issues, that these programs may be more modest than those in place in high-income countries in Asia or elsewhere. Another possibility is that programs may rely more on funded approaches, such as those that figure prominently in Singapore. If this proves to be the case, then the pension assets required to maintain standards of living among the elderly could be substantially greater than those shown in Figure 2.8.

Accumulating pension assets requires lifecycle saving,[6] that is, the combined public and private saving necessary to support old-age consumption given current age-specific patterns of labor income, consumption, and net public and private transfers. Table 2.8 reports gross lifecycle saving as a percentage of GDP. Lifecycle saving follows directly from the assumptions made to calculate pension assets and will be sensitive to variations in those assumptions. One additional assumption is that the depreciation rate is 5 percent. To the extent that pension assets actually exceed those shown above, lifecycle saving rates also will be higher.

Population aging is consistently leading to higher gross lifecycle saving rates. The highest rates are found in the oldest economies and regions – Southeast Asia, East Asia, and especially the non-DMCs. In East Asia, the gross saving rate will increase from 12 percent to 15 percent of GDP over the next four decades; for the non-DMCs, the increase will be from about 18 percent to 21 percent.

A substantial part of the increase in gross saving rates occurs because the capital–output ratio increases with population aging. Consequently, depreciation as a share of GDP rises, and gross saving must increase in

Table 2.8 Gross lifecycle saving as a percentage of gross domestic product

	2010–2020	2020–2030	2030–2040	2040–2050
Asia and the Pacific Countries	12.2	13.6	14.7	15.4
Developing Member Countries (DMCs)	10.8	12.2	13.2	14.1
Central and West Asia	7.4	8.4	9.8	11.5
East Asia	12.4	14.2	14.9	15.0
South Asia	7.4	8.4	10.0	12.0
Southeast Asia	10.4	11.7	12.6	13.6
Pacific Island Nations	6.0	6.7	7.4	9.1
Non-DMC	17.6	18.8	20.8	20.7

Note: Assumes the following: (a) real GDP growth equal to growth in the effective number of producers plus 3% per year; (b) labor income is 65% of GDP; (c) age profiles of consumption and labor income are proportional to low-income NTA estimates; (d) net transfers as a share of consumption are equal to low-income NTA estimates for Asia; (e) depreciation rate is 5%.

Source: Authors' calculations using the NTA database, accessed 29 June 2011.

order to maintain high capital–output ratios. The trend in net saving (not shown) is more varied. For most regions, the net saving rate is higher in 2040–2050 than in 2010–2020, but in East Asia the net saving rates declines from 11 percent of labor income from 2010 to 2030, to 8.5 percent from 2040 to 2050. In Southeast Asia, net saving as a share of labor income is relatively constant at slightly more than 9 percent. Among the non-DMCs, net saving will decline modestly from 2010 to 2050, but during the final decade will be 10 percent of labor income. Simple generalizations about the relationship between net saving and aging should, however, be made with caution.

The results do not support the view that the large swings in saving in many Asian countries can be explained by the effects of demographic factors on lifecycle saving. The difference in gross saving rates for 2010 to 2020 varies from a low of 6 percent to a high of 17.6 percent. Much higher rates of saving are found in many East Asian economies. The results also do not support the view that population aging will lead to substantially lower saving rates. As populations age, however, age-specific saving rates must increase in order to generate the higher lifecycle wealth required to fund longer periods of retirement. Changes in the age composition of the population tend to offset the effect of the higher age-specific values to some extent. Lifecycle saving will eventually plateau and decline modestly, but aggregate pension assets will rise as populations age.[7]

8. HUMAN CAPITAL

The important connection between population aging and human capital may not be immediately apparent to those who do not understand why population aging is occurring. As previously explained, the most important proximate cause of population aging is fertility decline. Aging is especially rapid in East Asia because fertility has declined to such low levels in Japan, Republic of Korea, and Taipei,China. There are certainly some indications that the PRC will follow a similar path, with very low fertility already taking hold in many of the most economically advanced provinces. This point is important because of the quantity–quality tradeoff. This idea was first introduced by Gary Becker, with important contributions by others studying the economics of fertility (Becker and Lewis, 1973; Willis, 1973). The idea is that with economic development, parents opt for children of "higher quality". As incomes rise, fertility declines and spending per child rises. To the extent that the higher spending is human capital spending, couples will have fewer children, but those children will be more productive during their working years. At the aggregate level, entering cohorts of workers will be fewer in number, but they will be healthier, more educated, and hence more productive.

The quantity–quality tradeoff described by Becker, Lewis, and Willis refers to private decision-making by parents about their own children, but a similar phenomenon may characterize public spending on human capital. Several mechanisms could account for a tradeoff. One possibility is that as the number of children declines, public budget constraints ease, and spending per child on education and health rises. Governments may also choose to invest more in children as a mechanism for maintaining growth in tax revenues in the face of lower fertility, possibly in anticipation of increased needs for support for pensions and public healthcare systems. This idea is consistent with the hypothesis advanced by Becker and Murphy that the increase in transfers to the elderly through pensions was a return on the public investment made in the education of children (Becker and Murphy, 1988; Bommier et al., 2010).

Two issues are important here. The first is the return on investment in human capital. Only if that investment actually leads to higher productivity during the working years will spending more per child be a successful alternative to having more children. The returns on education have been studied very extensively and a broad consensus has been reached that the rates are high. There is probably less agreement about the rates of return on investments in health. This literature is reviewed in Lee and Mason (2010a).

The second issue is the strength of the tradeoff between quantity and

quality. This point has been addressed in a number of recent studies using NTA estimates of spending on the health and education of children. NTA provide average health and education consumption by single year of age through the public and private sectors. A human capital measure has been constructed by summing the single-year-of-age estimates for health from age 0 to 17 and for education from age 0 to 26. Age 26 for education was selected to include spending on college education, and age 17 was chosen for health to exclude most spending related to childbearing. The tradeoff has been estimated using both cross-section data and time series data (Ogawa et al., 2009; Lee and Mason, 2010a). The estimated elasticity in the cross-sectional data is −0.68 for all NTA economies, −0.95 for Asian NTA economies, and elasticities greater than −1 based on time series estimates for Japan and Taipei,China. The decline in fertility has resulted in smaller cohorts, but those cohorts have substantially greater human capital investment. In Asia, the total value of human capital may have held steady or may have actually increased.

To what extent can the quantity–quality tradeoff mitigate the effects of low fertility and the associated aging of populations? Simulations based on an elasticity of −1.0 and standard estimates of the return on human capital indicate that increased human capital can entirely offset declines in fertility (Lee and Mason, 2010a).

9. POLICY IMPLICATIONS AND CONCLUSIONS

The following are some of the key points that should be considered in thinking about population aging.

First, throughout this chapter we have taken population aging as a given, which in a sense reflects its near inevitability. Life expectancy has been increasing with regularity in almost all DMCs, and this phenomenon is likely to continue for the foreseeable future. Certainly improving health and reducing mortality are important development goals, and population aging is, in part, a consequence of meeting those goals. Immigration can have some influence on population aging, but for the most part immigration policies will not be decisive because the entire region is aging, many DMCs are enormous and are not likely to be greatly affected by reforms in immigration policies, and many have not been receptive to substantial increases in their immigrant populations.

Fertility is the key demographic factor from a policy perspective because changes in fertility rates have a large impact on population aging and because low-income countries are open to pro-natalist policies. There are, however, some important issues about fertility, for example, what kinds of policies are

likely to be effective and how much should be invested by governments, non-government organizations, and the private sector. For the PRC, the pressing issue is the speed with which it abandons the one-child policy.

Second, the economic effects of population aging depend on features of the economic lifecycle. The effects will be particularly pronounced if older adults continue to contribute little to GDP through their labor. In many countries, public policies create roadblocks that reduce the productivity of older workers or push them out of the labor force altogether. These roadblocks come in a variety of forms, for example, mandatory retirement ages, tax codes that undermine work incentives, and pension rules that do the same. Most thinking about productivity at older ages focuses on retirement decisions, but often labor income is low at older ages because of low wages. A priority is to understand why wages of older workers are so low and whether improved employment practices could lead to a more productive older workforce.

The economic pressures from aging also arise because of the high levels of spending on the older elderly in many older, high-income economies. Consumption is high at old age because of high levels of spending on healthcare. To a great extent, this spending is funded by public transfer systems. A likely prospect, and perhaps even a preferred outcome, is that spending on healthcare should rise as countries can afford to spend more on it. While spending on health may be highly valued, there are nonetheless many important issues about healthcare financing and whether it leads to inefficient systems and unnecessary costs.

Third, most DMCs have not established extensive public transfer systems that target the needs of the elderly. As standards of living rise and the administrative capacities of governments improve, they will surely wish to develop more extensive systems of social insurance, The DMCs are, however, in advantageous positions because they have not yet made extensive commitments that will be unsustainable in the future as their populations age.

The only alternative to ratcheting up transfer systems is to increase the accumulation of assets. Accumulating assets does, however, raise a whole host of issues: the respective roles of the private and public sectors, consumer education, financial regulation, and the investment environment. Success will depend on: (1) individuals accumulating enough to provide for their needs in old age, whether voluntarily or through mandates; (2) a financial system that is secure and efficient; and (3) an investment environment that will yield adequate returns without undue risk.

The fourth major issue has to do with successful investments in human capital. The evidence is quite strong that low fertility is leading to high human capital investment, and past experience is promising about the

returns on investments in education. An important issue, however, is whether the very high levels of investment we see in very low fertility economies will yield strong returns. This will depend on both the effective administration of education systems and on the capacity of the economy to employ more educated workers.

NOTES

1. The growth rate of per capita income is equal to the sum of the second and third terms on the right-hand side.
2. The labor income and consumption profiles are both normalized by dividing them by the average labor income of those aged 30–49. The consumption profile is scaled so that the average consumption of those aged 30–49 is 60 percent of average labor income of those aged 30–49. This adjustment eliminates the effects of inter-country differences in saving rates on the support ratio.
3. This assumption means that the transfer burden on the non-elderly will increase as populations age.
4. The UN does not produce population projections for Taipei,China and for some small DMCs. Population projections from the NTA database are used for Taipei,China.
5. Note that this is a partial analysis in that the feedback from capital deepening to growth in output per worker to the demand for pension assets is not incorporated. General equilibrium models incorporate this feedback. The general findings are not reversed when this feedback is taken into consideration.
6. Another possibility would be to redirect assets accumulated for some other purpose to lifecycle needs.
7. Related empirical literature argues that saving rates are not as low among the elderly as is widely believed. These patterns are influenced by both lifecycle saving and non-lifecycle saving. For example, to the extent that the elderly continue to save in old age because they are risk averse or because they want to leave bequests, aging may not lead to lower saving rates.

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APPENDIX: STATISTICAL TABLES

Table A2.1 Support ratios for the Asia and Pacific region from 1950 to 2050

	1950	1960	1970	1980	1990	2000	2010	2020	2030	2040	2050
Central and West Asia											
Afghanistan	0.739	0.728	0.722	0.708	0.691	0.675	0.679	0.705	0.740	0.787	0.844
Armenia	0.733	0.774	0.761	0.815	0.873	0.870	0.916	0.926	0.918	0.909	0.868
Azerbaijan	0.766	0.783	0.721	0.748	0.808	0.863	0.932	0.953	0.938	0.936	0.910
Georgia	0.821	0.869	0.864	0.885	0.901	0.904	0.938	0.939	0.910	0.886	0.849
Kazakhstan	0.787	0.800	0.784	0.812	0.855	0.882	0.935	0.942	0.935	0.940	0.922
Kyrgyz Republic	0.817	0.808	0.738	0.740	0.763	0.793	0.867	0.916	0.939	0.953	0.934
Pakistan	0.812	0.769	0.737	0.709	0.708	0.723	0.775	0.833	0.880	0.915	0.925
Tajikistan	0.796	0.782	0.693	0.675	0.694	0.712	0.762	0.838	0.893	0.942	0.956
Turkmenistan	0.811	0.786	0.706	0.693	0.731	0.788	0.875	0.939	0.966	0.971	0.944
Uzbekistan	0.832	0.786	0.693	0.686	0.723	0.770	0.864	0.941	0.963	0.961	0.933
East Asia											
China, People's Rep. of	0.844	0.795	0.752	0.777	0.858	0.941	0.990	0.988	0.941	0.903	0.870
Hong Kong, China	0.799	0.774	0.680	0.753	0.865	0.939	0.957	0.910	0.808	0.745	0.703
Korea, Rep. of	0.653	0.649	0.638	0.697	0.810	0.898	0.928	0.902	0.817	0.733	0.675
Mongolia	0.740	0.724	0.716	0.716	0.696	0.798	0.927	1.002	0.992	0.958	0.915
Taipei,China	0.641	0.645	0.648	0.709	0.795	0.873	0.928	0.917	0.847	0.746	0.660
South Asia											
Bangladesh	0.780	0.748	0.709	0.689	0.702	0.768	0.863	0.941	0.976	0.969	0.941
Bhutan	0.722	0.760	0.770	0.777	0.739	0.712	0.839	0.940	0.979	0.973	0.933
India	0.799	0.779	0.751	0.758	0.782	0.814	0.859	0.907	0.948	0.969	0.960
Maldives	0.851	0.789	0.723	0.703	0.651	0.701	0.861	0.994	1.012	0.977	0.914
Nepal	0.763	0.763	0.751	0.734	0.723	0.732	0.782	0.859	0.917	0.942	0.943
Sri Lanka	0.711	0.737	0.752	0.785	0.831	0.899	0.932	0.905	0.888	0.887	0.871

Table A2.1 (continued)

	1950	1960	1970	1980	1990	2000	2010	2020	2030	2040	2050
Southeast Asia											
Brunei Darussalam	0.801	0.774	0.744	0.750	0.864	0.914	0.962	0.991	0.992	0.970	0.940
Cambodia	0.738	0.736	0.728	0.716	0.723	0.723	0.797	0.889	0.935	0.958	0.945
Indonesia	0.751	0.765	0.749	0.744	0.783	0.856	0.924	0.959	0.963	0.938	0.906
Malaysia	0.641	0.613	0.583	0.631	0.695	0.748	0.792	0.820	0.838	0.842	0.819
Myanmar	0.838	0.803	0.737	0.722	0.759	0.848	0.926	0.956	0.954	0.937	0.914
Philippines	0.724	0.690	0.676	0.697	0.739	0.779	0.825	0.870	0.901	0.918	0.919
Singapore	0.703	0.673	0.630	0.751	0.898	0.953	0.920	0.861	0.768	0.708	0.681
Thailand	0.722	0.725	0.706	0.726	0.846	0.955	0.986	0.967	0.928	0.901	0.887
Viet Nam	0.866	0.814	0.713	0.669	0.724	0.808	0.926	0.969	0.955	0.923	0.889
The Pacific											
Fiji, Rep. of	0.674	0.665	0.693	0.748	0.796	0.829	0.849	0.876	0.913	0.932	0.927
Micronesia, Fed. States of	0.748	0.707	0.670	0.633	0.673	0.727	0.743	0.803	0.885	0.944	0.954
Papua New Guinea	0.763	0.744	0.721	0.686	0.723	0.760	0.780	0.811	0.855	0.899	0.931
Samoa	0.679	0.656	0.647	0.684	0.680	0.745	0.712	0.766	0.835	0.880	0.912
Solomon Islands	0.734	0.721	0.701	0.665	0.662	0.711	0.771	0.832	0.884	0.915	0.932
Timor-Leste	0.751	0.755	0.749	0.723	0.758	0.670	0.675	0.702	0.737	0.802	0.863
Tonga	0.651	0.653	0.666	0.676	0.700	0.705	0.761	0.761	0.819	0.871	0.901
Vanuatu	0.681	0.677	0.695	0.682	0.710	0.729	0.769	0.817	0.865	0.904	0.921
Developed Asian countries											
Australia	0.829	0.779	0.748	0.770	0.818	0.847	0.836	0.805	0.769	0.749	0.737
Japan	0.693	0.746	0.828	0.863	0.852	0.847	0.807	0.768	0.727	0.673	0.637
New Zealand	0.789	0.735	0.700	0.726	0.796	0.833	0.824	0.798	0.766	0.756	0.745

Source: Authors' calculations.

Table A2.2 Lifecycle wealth relative to labor income, high-income profiles

	1950	1960	1970	1980	1990	2000	2010	2020	2030	2040	2050
Asia and the Pacific region	*1.44*	*1.64*	*1.90*	*2.17*	*2.48*	*2.93*	*3.64*	*4.59*	*5.64*	*6.61*	*7.41*
Developing economies	*1.27*	*1.43*	*1.64*	*1.80*	*1.93*	*2.18*	*2.76*	*3.65*	*4.63*	*5.52*	*6.29*
Central and West Asia	*2.09*	*1.99*	*1.88*	*1.73*	*1.68*	*1.78*	*1.99*	*2.37*	*2.85*	*3.52*	*4.26*
Afghanistan	0.80	0.80	0.73	0.72	1.17	1.04	1.01	1.00	1.08	1.29	1.63
Armenia	2.87	2.39	2.13	2.03	2.26	3.00	3.55	4.16	4.60	5.33	6.11
Azerbaijan	2.50	2.11	1.92	1.71	1.85	1.91	2.36	3.18	3.95	4.79	5.73
Georgia	2.82	2.41	2.40	2.45	2.61	3.12	3.78	4.57	5.32	6.17	7.10
Kazakhstan	2.42	2.03	1.84	1.70	1.65	1.86	2.13	2.66	3.26	4.00	4.68
Kyrgyz Republic	2.44	2.35	2.09	1.90	1.83	1.71	1.92	2.40	3.01	3.84	4.83
Pakistan	1.91	1.94	1.87	1.74	1.62	1.71	1.83	2.04	2.41	2.98	3.66
Tajikistan	1.93	2.05	1.98	1.71	1.50	1.40	1.66	1.98	2.33	3.01	3.96
Turkmenistan	1.85	1.81	1.81	1.71	1.63	1.44	1.64	2.13	2.78	3.69	4.76
Uzbekistan	2.11	2.34	2.24	1.89	1.73	1.57	1.81	2.31	2.96	3.95	5.08
East Asia	*1.32*	*1.52*	*1.77*	*1.95*	*2.10*	*2.40*	*3.12*	*4.24*	*5.46*	*6.45*	*7.18*
China, People's Rep. of	1.32	1.54	1.77	1.92	2.03	2.28	2.91	3.96	5.09	6.01	6.70
Hong Kong, China	1.33	1.71	2.72	3.09	3.36	3.75	5.20	6.82	8.44	9.50	9.85
Korea, Rep. of	1.26	1.31	1.53	1.88	2.28	2.93	4.03	5.55	7.28	8.80	9.83
Mongolia	1.17	1.25	1.36	1.36	1.37	1.31	1.50	2.10	3.01	4.19	5.18
Taipei,China	1.12	1.37	1.71	2.19	2.48	2.90	3.85	5.19	6.59	7.78	8.67
South Asia	*1.01*	*1.14*	*1.31*	*1.41*	*1.51*	*1.65*	*1.94*	*2.32*	*2.81*	*3.51*	*4.40*
Bangladesh	1.04	1.14	1.21	1.28	1.34	1.39	1.56	1.95	2.59	3.44	4.27
Bhutan	1.00	1.01	1.13	1.19	1.42	2.07	1.88	2.08	2.72	3.81	4.90
India	0.98	1.13	1.31	1.41	1.51	1.64	1.93	2.30	2.78	3.47	4.37
Maldives	1.36	1.46	1.45	1.42	1.66	1.64	1.60	1.98	2.85	4.17	5.39
Nepal	0.81	0.98	1.12	1.25	1.43	1.56	1.67	1.86	2.21	2.77	3.49
Sri Lanka	2.10	1.62	1.68	1.84	2.02	2.47	3.25	4.20	4.88	5.48	6.04

Table A2.2 (continued)

	1950	1960	1970	1980	1990	2000	2010	2020	2030	2040	2050
Southeast Asia	*1.29*	*1.36*	*1.55*	*1.71*	*1.82*	*2.04*	*2.56*	*3.38*	*4.22*	*4.99*	*5.68*
Brunei Darussalam	1.97	1.67	1.32	1.12	1.02	1.27	1.88	2.60	3.38	4.24	5.13
Cambodia	0.94	0.91	0.88	1.23	1.24	1.37	1.55	1.73	1.98	2.66	3.46
Indonesia	1.15	1.14	1.28	1.45	1.66	1.83	2.16	2.80	3.61	4.42	5.08
Lao People's Dem. Rep.	0.88	1.07	1.24	1.49	1.51	1.46	1.57	1.77	2.11	2.69	3.44
Malaysia	1.53	1.50	1.61	1.56	1.57	1.78	2.35	3.02	3.66	4.39	5.26
Myanmar	1.17	1.46	1.78	1.89	1.80	1.68	2.05	2.67	3.47	4.28	4.90
Philippines	1.29	1.34	1.41	1.39	1.42	1.63	1.99	2.42	2.95	3.60	4.36
Singapore	1.11	1.37	1.99	2.48	2.95	3.72	5.24	7.13	8.54	9.31	9.68
Thailand	1.42	1.56	1.71	1.86	1.85	2.03	2.65	3.65	4.62	5.35	5.97
Viet Nam	1.34	1.65	1.99	2.32	2.28	2.24	2.52	3.38	4.33	5.23	6.06
The Pacific	*0.90*	*0.83*	*0.88*	*0.97*	*1.02*	*1.15*	*1.42*	*1.77*	*2.07*	*2.47*	*3.14*
Fiji, Rep. of	1.21	1.11	1.04	0.98	1.11	1.44	1.99	2.50	2.90	3.58	4.63
Micronesia, Fed. States of	1.49	1.52	1.57	1.73	1.37	1.29	1.74	2.01	2.05	2.69	3.87
Papua New Guinea	0.79	0.68	0.75	0.86	0.89	0.97	1.20	1.54	1.86	2.20	2.78
Samoa	0.76	0.75	0.90	1.25	1.62	1.57	2.08	2.48	2.48	2.75	3.92
Solomon Islands	1.17	1.47	1.46	1.46	1.38	1.33	1.39	1.64	2.16	2.81	3.60
Timor-Leste	0.86	0.81	0.69	0.80	0.86	1.53	1.57	1.56	1.51	1.64	1.91
Tonga	0.98	1.01	1.03	1.45	1.84	2.05	2.09	2.52	2.64	2.76	3.36
Vanuatu	1.18	1.35	1.44	1.47	1.42	1.52	1.73	2.07	2.41	2.86	3.43
Developed countries	*2.06*	*2.44*	*2.89*	*3.60*	*4.62*	*5.80*	*7.01*	*8.19*	*9.47*	*10.77*	*11.70*
Australia	2.57	2.88	3.29	3.75	3.90	4.44	5.31	6.22	6.87	7.21	7.34
Japan	1.94	2.34	2.80	3.57	4.78	6.12	7.40	8.64	10.07	11.58	12.69
New Zealand	2.71	2.91	3.28	3.58	3.78	4.08	4.94	5.87	6.47	6.73	6.95

Source: Authors' calculations.

Table A2.3 Lifecycle wealth relative to labor income, low-income profiles

	1950	1960	1970	1980	1990	2000	2010	2020	2030	2040	2050
Asia and the Pacific region	*1.04*	*1.17*	*1.36*	*1.57*	*1.81*	*2.13*	*2.66*	*3.37*	*4.18*	*4.92*	*5.54*
Developing economies	*0.92*	*1.02*	*1.17*	*1.29*	*1.40*	*1.57*	*1.98*	*2.67*	*3.43*	*4.10*	*4.70*
Central and West Asia	*1.53*	*1.46*	*1.39*	*1.26*	*1.23*	*1.30*	*1.42*	*1.72*	*2.07*	*2.57*	*3.16*
Afghanistan	0.57	0.57	0.53	0.51	0.83	0.74	0.73	0.71	0.77	0.91	1.16
Armenia	2.14	1.77	1.58	1.45	1.69	2.22	2.58	3.14	3.42	3.95	4.61
Azerbaijan	1.87	1.58	1.45	1.21	1.36	1.41	1.65	2.34	2.91	3.53	4.30
Georgia	2.12	1.79	1.78	1.78	1.94	2.34	2.77	3.42	3.97	4.59	5.36
Kazakhstan	1.78	1.49	1.37	1.26	1.22	1.37	1.53	1.95	2.38	2.95	3.51
Kyrgyz Republic	1.80	1.75	1.56	1.38	1.37	1.27	1.37	1.75	2.19	2.80	3.60
Pakistan	1.40	1.42	1.38	1.27	1.17	1.24	1.32	1.47	1.74	2.16	2.68
Tajikistan	1.38	1.52	1.47	1.25	1.11	1.04	1.17	1.45	1.69	2.16	2.92
Turkmenistan	1.36	1.33	1.33	1.24	1.22	1.05	1.15	1.54	2.01	2.68	3.53
Uzbekistan	1.51	1.72	1.68	1.38	1.29	1.16	1.28	1.67	2.15	2.87	3.79
East Asia	*0.96*	*1.09*	*1.26*	*1.40*	*1.54*	*1.73*	*2.24*	*3.10*	*4.06*	*4.80*	*5.39*
China, People's Rep. of	0.97	1.11	1.27	1.39	1.49	1.64	2.10	2.88	3.78	4.47	5.04
Hong Kong, China	0.93	1.18	1.90	2.24	2.49	2.69	3.73	5.07	6.29	7.07	7.39
Korea, Rep. of	0.91	0.93	1.09	1.33	1.65	2.12	2.91	4.10	5.45	6.58	7.36
Mongolia	0.84	0.89	0.99	1.00	1.01	0.96	1.05	1.49	2.17	3.06	3.89
Taipei,China	0.79	0.94	1.19	1.57	1.84	2.09	2.79	3.84	4.90	5.82	6.50
South Asia	*0.72*	*0.81*	*0.94*	*1.01*	*1.09*	*1.18*	*1.39*	*1.69*	*2.04*	*2.56*	*3.24*
Bangladesh	0.75	0.82	0.87	0.92	0.97	1.00	1.12	1.39	1.86	2.51	3.15
Bhutan	0.71	0.71	0.80	0.84	1.03	1.51	1.36	1.50	1.94	2.77	3.65
India	0.70	0.81	0.93	1.01	1.09	1.18	1.39	1.67	2.02	2.53	3.22
Maldives	0.98	1.07	1.06	1.00	1.18	1.21	1.14	1.41	2.02	3.02	4.04
Nepal	0.57	0.69	0.80	0.89	1.02	1.13	1.20	1.34	1.59	2.00	2.55
Sri Lanka	1.59	1.17	1.21	1.34	1.46	1.76	2.36	3.12	3.62	4.10	4.52

Table A2.3 (continued)

	1950	1960	1970	1980	1990	2000	2010	2020	2030	2040	2050
Southeast Asia	*0.93*	*0.98*	*1.12*	*1.22*	*1.31*	*1.46*	*1.83*	*2.47*	*3.12*	*3.70*	*4.23*
Brunei Darussalam	1.41	1.22	0.97	0.81	0.75	0.88	1.33	1.88	2.48	3.12	3.81
Cambodia	0.68	0.66	0.63	0.88	0.89	0.97	1.11	1.26	1.42	1.89	2.56
Indonesia	0.84	0.81	0.92	1.03	1.19	1.33	1.54	2.02	2.64	3.27	3.78
Lao People's Dem. Rep.	0.62	0.76	0.89	1.07	1.11	1.06	1.13	1.28	1.52	1.93	2.53
Malaysia	1.13	1.08	1.17	1.13	1.13	1.25	1.67	2.20	2.68	3.23	3.89
Myanmar	0.84	1.05	1.28	1.39	1.34	1.22	1.47	1.93	2.53	3.17	3.66
Philippines	0.94	0.96	1.02	1.01	1.02	1.16	1.42	1.75	2.14	2.64	3.22
Singapore	0.77	0.95	1.40	1.75	2.08	2.57	3.74	5.34	6.44	6.91	7.24
Thailand	1.02	1.13	1.24	1.34	1.35	1.46	1.89	2.67	3.43	3.99	4.46
Viet Nam	0.95	1.19	1.43	1.68	1.70	1.63	1.78	2.46	3.21	3.88	4.53
The Pacific	*0.66*	*0.60*	*0.63*	*0.70*	*0.73*	*0.82*	*1.00*	*1.27*	*1.51*	*1.78*	*2.28*
Fiji, Rep. of	0.90	0.81	0.76	0.72	0.79	1.02	1.42	1.85	2.12	2.62	3.41
Micronesia, Fed. States of	1.09	1.10	1.14	1.27	1.04	0.93	1.25	1.51	1.49	1.91	2.83
Papua New Guinea	0.59	0.48	0.53	0.61	0.63	0.69	0.84	1.10	1.35	1.58	2.00
Samoa	0.55	0.53	0.63	0.93	1.20	1.17	1.50	1.86	1.90	1.97	2.83
Solomon Islands	0.78	1.07	1.07	1.06	1.00	0.96	0.99	1.15	1.53	2.03	2.62
Timor-Leste	0.63	0.59	0.51	0.57	0.61	1.08	1.13	1.14	1.09	1.16	1.38
Tonga	0.70	0.72	0.74	1.05	1.36	1.53	1.55	1.86	1.99	2.05	2.42
Vanuatu	0.84	0.98	1.07	1.10	1.05	1.09	1.23	1.49	1.75	2.07	2.51
Developed countries	*1.48*	*1.75*	*2.09*	*2.61*	*3.37*	*4.30*	*5.24*	*6.08*	*7.06*	*8.06*	*8.73*
Australia	1.87	2.08	2.38	2.76	2.87	3.24	3.91	4.63	5.14	5.39	5.49
Japan	1.38	1.67	2.03	2.58	3.49	4.55	5.54	6.41	7.50	8.67	9.47
New Zealand	1.99	2.11	2.39	2.65	2.80	2.98	3.61	4.39	4.86	5.03	5.19

Source: Authors' calculations.

Table A2.4 Pension transfer wealth relative to labor income, high-income profiles

	1950	1960	1970	1980	1990	2000	2010	2020	2030	2040	2050
Asia and the Pacific region	*0.95*	*1.09*	*1.28*	*1.48*	*1.71*	*2.04*	*2.57*	*3.25*	*4.02*	*4.75*	*5.38*
Developing economies	*0.83*	*0.94*	*1.09*	*1.20*	*1.31*	*1.49*	*1.92*	*2.54*	*3.25*	*3.92*	*4.51*
Central and West Asia	*1.41*	*1.35*	*1.27*	*1.18*	*1.14*	*1.21*	*1.37*	*1.63*	*1.97*	*2.47*	*3.00*
Afghanistan	0.50	0.51	0.47	0.46	0.76	0.68	0.66	0.65	0.71	0.85	1.08
Armenia	1.95	1.67	1.47	1.40	1.56	2.06	2.54	2.91	3.24	3.86	4.32
Azerbaijan	1.68	1.47	1.33	1.17	1.25	1.29	1.66	2.20	2.73	3.42	4.09
Georgia	1.91	1.67	1.66	1.68	1.78	2.13	2.66	3.18	3.73	4.42	5.09
Kazakhstan	1.63	1.39	1.25	1.17	1.13	1.26	1.47	1.81	2.25	2.81	3.30
Kyrgyz Republic	1.64	1.61	1.44	1.31	1.24	1.16	1.35	1.64	2.08	2.69	3.41
Pakistan	1.28	1.31	1.26	1.18	1.10	1.17	1.25	1.41	1.67	2.08	2.55
Tajikistan	1.30	1.41	1.36	1.18	1.02	0.96	1.17	1.37	1.61	2.12	2.79
Turkmenistan	1.23	1.24	1.23	1.16	1.11	0.97	1.14	1.45	1.90	2.58	3.35
Uzbekistan	1.42	1.61	1.53	1.31	1.19	1.08	1.28	1.59	2.05	2.78	3.59
East Asia	*0.85*	*1.00*	*1.18*	*1.30*	*1.43*	*1.65*	*2.18*	*2.95*	*3.84*	*4.59*	*5.19*
China, People's Rep. of	0.85	1.01	1.18	1.28	1.37	1.56	2.03	2.75	3.57	4.25	4.83
Hong Kong, China	0.89	1.15	1.86	2.13	2.35	2.67	3.77	4.88	6.09	6.98	7.26
Korea, Rep. of	0.84	0.86	1.03	1.27	1.57	2.04	2.85	3.95	5.20	6.38	7.19
Mongolia	0.76	0.82	0.91	0.92	0.92	0.89	1.03	1.45	2.07	2.92	3.63
Taipei,China	0.74	0.92	1.15	1.48	1.70	2.03	2.74	3.64	4.69	5.63	6.30
South Asia	*0.67*	*0.75*	*0.87*	*0.94*	*1.01*	*1.11*	*1.33*	*1.59*	*1.94*	*2.44*	*3.07*
Bangladesh	0.66	0.74	0.79	0.84	0.89	0.93	1.05	1.31	1.76	2.35	2.93
Bhutan	0.64	0.65	0.73	0.78	0.94	1.40	1.28	1.42	1.88	2.64	3.40
India	0.65	0.74	0.87	0.94	1.01	1.11	1.32	1.57	1.92	2.41	3.06
Maldives	0.89	0.96	0.95	0.93	1.10	1.09	1.09	1.37	1.95	2.90	3.74
Nepal	0.50	0.63	0.72	0.82	0.95	1.04	1.12	1.26	1.50	1.90	2.40
Sri Lanka	1.47	1.11	1.13	1.26	1.38	1.71	2.27	2.93	3.45	3.94	4.30

Table A2.4 (continued)

	1950	1960	1970	1980	1990	2000	2010	2020	2030	2040	2050
Southeast Asia	*0.85*	*0.91*	*1.03*	*1.15*	*1.24*	*1.39*	*1.77*	*2.33*	*2.94*	*3.53*	*4.05*
Brunei Darussalam	1.32	1.12	0.89	0.76	0.70	0.86	1.30	1.77	2.36	2.99	3.66
Cambodia	0.60	0.59	0.56	0.80	0.82	0.91	1.03	1.16	1.34	1.82	2.34
Indonesia	0.75	0.75	0.84	0.96	1.11	1.22	1.47	1.92	2.48	3.07	3.57
Lao People's Dem. Rep.	0.56	0.69	0.81	0.97	1.00	0.98	1.06	1.19	1.43	1.84	2.37
Malaysia	1.03	1.03	1.09	1.06	1.07	1.22	1.62	2.08	2.55	3.11	3.74
Myanmar	0.77	0.97	1.20	1.28	1.22	1.15	1.42	1.83	2.41	2.99	3.45
Philippines	0.85	0.89	0.94	0.92	0.96	1.10	1.35	1.65	2.04	2.52	3.07
Singapore	0.76	0.94	1.34	1.70	2.07	2.62	3.72	5.05	6.13	6.82	7.14
Thailand	0.96	1.06	1.16	1.28	1.26	1.38	1.82	2.50	3.20	3.78	4.27
Viet Nam	0.87	1.08	1.32	1.56	1.56	1.55	1.77	2.35	3.02	3.71	4.34
The Pacific	*0.59*	*0.55*	*0.57*	*0.63*	*0.67*	*0.77*	*0.95*	*1.19*	*1.41*	*1.70*	*2.19*
Fiji, Rep. of	0.82	0.75	0.69	0.65	0.74	0.96	1.33	1.69	1.99	2.52	3.25
Micronesia, Fed. States of	0.99	1.01	1.05	1.15	0.92	0.88	1.19	1.34	1.40	1.88	2.66
Papua New Guinea	0.51	0.44	0.48	0.55	0.58	0.64	0.80	1.04	1.25	1.50	1.93
Samoa	0.50	0.50	0.60	0.84	1.09	1.08	1.45	1.73	1.72	1.97	2.81
Solomon Islands	0.78	0.95	0.97	0.97	0.92	0.89	0.93	1.11	1.46	1.92	2.51
Timor-Leste	0.55	0.53	0.43	0.51	0.56	1.01	1.04	1.05	1.02	1.11	1.29
Tonga	0.65	0.67	0.69	0.98	1.25	1.41	1.45	1.76	1.84	1.94	2.37
Vanuatu	0.77	0.90	0.97	1.01	0.97	1.03	1.17	1.41	1.65	1.98	2.40
Developed countries	*1.38*	*1.66*	*1.99*	*2.52*	*3.28*	*4.15*	*5.07*	*5.97*	*6.99*	*7.92*	*8.70*
Australia	1.75	1.97	2.28	2.62	2.75	3.18	3.81	4.47	4.98	5.26	5.37
Japan	1.30	1.59	1.92	2.50	3.40	4.38	5.36	6.32	7.45	8.53	9.46
New Zealand	1.84	2.01	2.26	2.50	2.67	2.91	3.53	4.20	4.66	4.91	5.07

Source: Authors' calculations.

Table A2.5 Pension transfer wealth relative to labor income, low-income profiles

	1950	1960	1970	1980	1990	2000	2010	2020	2030	2040	2050
Asia and the Pacific region	*0.33*	*0.39*	*0.47*	*0.56*	*0.68*	*0.84*	*1.09*	*1.39*	*1.78*	*2.14*	*2.49*
Developing economies	*0.29*	*0.33*	*0.39*	*0.44*	*0.50*	*0.58*	*0.77*	*1.03*	*1.36*	*1.69*	*2.02*
Central and West Asia	*0.53*	*0.52*	*0.49*	*0.46*	*0.44*	*0.46*	*0.54*	*0.64*	*0.79*	*1.02*	*1.27*
Afghanistan	0.16	0.16	0.15	0.15	0.26	0.23	0.22	0.22	0.24	0.29	0.38
Armenia	0.76	0.68	0.59	0.55	0.63	0.83	1.09	1.26	1.38	1.73	1.90
Azerbaijan	0.64	0.60	0.54	0.44	0.48	0.49	0.66	0.89	1.10	1.48	1.82
Georgia	0.74	0.68	0.67	0.66	0.70	0.85	1.09	1.32	1.56	1.95	2.30
Kazakhstan	0.62	0.54	0.50	0.46	0.44	0.48	0.57	0.70	0.90	1.18	1.42
Kyrgyz Republic	0.63	0.65	0.58	0.52	0.49	0.45	0.53	0.64	0.82	1.12	1.46
Pakistan	0.48	0.49	0.48	0.45	0.42	0.45	0.48	0.55	0.66	0.84	1.05
Tajikistan	0.49	0.57	0.55	0.48	0.40	0.38	0.46	0.55	0.63	0.87	1.18
Turkmenistan	0.45	0.48	0.47	0.44	0.43	0.37	0.44	0.55	0.74	1.05	1.43
Uzbekistan	0.53	0.64	0.61	0.53	0.49	0.43	0.51	0.63	0.81	1.15	1.55
East Asia	*0.29*	*0.34*	*0.42*	*0.47*	*0.55*	*0.64*	*0.88*	*1.21*	*1.63*	*2.01*	*2.37*
China, People's Rep. of	0.29	0.35	0.42	0.46	0.52	0.60	0.81	1.10	1.50	1.83	2.19
Hong Kong, China	0.32	0.41	0.69	0.83	0.99	1.13	1.66	2.18	2.77	3.31	3.51
Korea, Rep. of	0.29	0.30	0.37	0.47	0.61	0.82	1.19	1.72	2.31	2.92	3.39
Mongolia	0.26	0.28	0.32	0.34	0.35	0.35	0.39	0.56	0.80	1.19	1.54
Taipei,China	0.25	0.32	0.40	0.55	0.67	0.82	1.15	1.54	2.04	2.56	2.93
South Asia	*0.23*	*0.26*	*0.31*	*0.33*	*0.37*	*0.41*	*0.51*	*0.61*	*0.76*	*0.99*	*1.27*
Bangladesh	0.21	0.25	0.27	0.29	0.31	0.33	0.38	0.48	0.66	0.91	1.17
Bhutan	0.21	0.21	0.25	0.26	0.33	0.52	0.50	0.55	0.73	1.06	1.40
India	0.23	0.26	0.31	0.33	0.37	0.41	0.50	0.61	0.75	0.97	1.27
Maldives	0.31	0.34	0.33	0.31	0.39	0.40	0.41	0.53	0.74	1.15	1.55
Nepal	0.14	0.20	0.24	0.28	0.33	0.38	0.41	0.47	0.57	0.73	0.94
Sri Lanka	0.62	0.43	0.43	0.49	0.54	0.67	0.92	1.22	1.48	1.76	1.90

Table A2.5 (continued)

	1950	1960	1970	1980	1990	2000	2010	2020	2030	2040	2050
Southeast Asia	*0.30*	*0.33*	*0.38*	*0.42*	*0.47*	*0.52*	*0.68*	*0.93*	*1.21*	*1.51*	*1.77*
Brunei Darussalam	0.48	0.42	0.34	0.30	0.28	0.32	0.50	0.68	0.96	1.27	1.61
Cambodia	0.20	0.19	0.18	0.26	0.29	0.32	0.37	0.43	0.50	0.69	0.90
Indonesia	0.26	0.26	0.29	0.33	0.40	0.45	0.55	0.74	0.99	1.26	1.50
Lao People's Dem. Rep.	0.18	0.23	0.27	0.34	0.36	0.36	0.39	0.44	0.54	0.70	0.94
Malaysia	0.39	0.39	0.41	0.40	0.41	0.46	0.62	0.82	1.05	1.33	1.62
Myanmar	0.27	0.35	0.44	0.49	0.48	0.45	0.56	0.71	0.97	1.24	1.47
Philippines	0.30	0.32	0.34	0.33	0.35	0.40	0.50	0.63	0.81	1.03	1.29
Singapore	0.28	0.34	0.48	0.64	0.82	1.04	1.55	2.20	2.78	3.18	3.44
Thailand	0.35	0.40	0.44	0.49	0.49	0.52	0.70	0.97	1.30	1.62	1.89
Viet Nam	0.29	0.38	0.47	0.59	0.62	0.62	0.71	0.96	1.25	1.59	1.93
The Pacific	*0.20*	*0.19*	*0.19*	*0.21*	*0.23*	*0.27*	*0.34*	*0.44*	*0.54*	*0.67*	*0.88*
Fiji, Rep. of	0.32	0.28	0.25	0.23	0.26	0.34	0.48	0.65	0.79	1.05	1.36
Micronesia, Fed. States of	0.36	0.37	0.38	0.42	0.36	0.33	0.45	0.50	0.54	0.75	1.05
Papua New Guinea	0.17	0.15	0.15	0.17	0.19	0.22	0.28	0.37	0.47	0.58	0.76
Samoa	0.18	0.18	0.21	0.32	0.41	0.44	0.58	0.73	0.74	0.83	1.22
Solomon Islands	0.26	0.32	0.35	0.35	0.33	0.32	0.33	0.40	0.53	0.74	1.03
Timor-Leste	0.18	0.18	0.14	0.16	0.18	0.35	0.37	0.39	0.38	0.41	0.47
Tonga	0.23	0.25	0.26	0.37	0.48	0.56	0.59	0.72	0.78	0.82	0.98
Vanuatu	0.26	0.32	0.36	0.40	0.38	0.39	0.43	0.53	0.64	0.80	0.99
Developed countries	*0.51*	*0.63*	*0.78*	*1.03*	*1.39*	*1.84*	*2.32*	*2.78*	*3.36*	*3.83*	*4.28*
Australia	0.67	0.76	0.91	1.09	1.17	1.38	1.68	2.01	2.29	2.46	2.54
Japan	0.47	0.60	0.75	1.01	1.45	1.95	2.47	2.95	3.61	4.14	4.68
New Zealand	0.71	0.79	0.90	1.03	1.13	1.25	1.53	1.87	2.12	2.28	2.37

Source: Authors' calculations.

Table A2.6 Assets relative to labor income, high-income profiles

	1950	1960	1970	1980	1990	2000	2010	2020	2030	2040	2050
Asia and the Pacific region	*0.49*	*0.54*	*0.62*	*0.69*	*0.77*	*0.88*	*1.07*	*1.35*	*1.61*	*1.86*	*2.03*
Developing economies	*0.44*	*0.48*	*0.55*	*0.59*	*0.62*	*0.68*	*0.84*	*1.12*	*1.39*	*1.61*	*1.78*
Central and West Asia	*0.69*	*0.64*	*0.60*	*0.55*	*0.54*	*0.57*	*0.61*	*0.74*	*0.88*	*1.05*	*1.26*
Afghanistan	0.30	0.29	0.27	0.26	0.41	0.36	0.35	0.34	0.37	0.44	0.55
Armenia	0.92	0.72	0.66	0.62	0.71	0.93	1.01	1.24	1.36	1.47	1.79
Azerbaijan	0.82	0.64	0.59	0.54	0.60	0.62	0.70	0.98	1.22	1.37	1.64
Georgia	0.91	0.74	0.74	0.77	0.83	0.99	1.12	1.39	1.60	1.75	2.01
Kazakhstan	0.79	0.64	0.58	0.54	0.53	0.60	0.66	0.85	1.01	1.19	1.39
Kyrgyz Republic	0.80	0.73	0.66	0.59	0.59	0.55	0.57	0.77	0.94	1.14	1.43
Pakistan	0.63	0.64	0.61	0.56	0.52	0.55	0.58	0.64	0.74	0.91	1.10
Tajikistan	0.63	0.64	0.62	0.53	0.48	0.45	0.49	0.62	0.73	0.89	1.17
Turkmenistan	0.62	0.58	0.58	0.54	0.52	0.46	0.50	0.68	0.87	1.11	1.41
Uzbekistan	0.69	0.73	0.71	0.57	0.53	0.49	0.54	0.72	0.92	1.17	1.49
East Asia	*0.46*	*0.52*	*0.59*	*0.64*	*0.67*	*0.75*	*0.94*	*1.29*	*1.62*	*1.86*	*1.99*
China, People's Rep. of	0.47	0.53	0.59	0.64	0.66	0.72	0.89	1.22	1.53	1.75	1.88
Hong Kong, China	0.44	0.56	0.87	0.97	1.00	1.08	1.43	1.94	2.35	2.52	2.59
Korea, Rep. of	0.43	0.45	0.51	0.60	0.71	0.89	1.18	1.60	2.08	2.43	2.64
Mongolia	0.41	0.43	0.46	0.44	0.45	0.42	0.47	0.65	0.95	1.27	1.54
Taipei,China	0.38	0.45	0.57	0.71	0.78	0.87	1.12	1.54	1.90	2.15	2.37
South Asia	*0.34*	*0.39*	*0.44*	*0.47*	*0.50*	*0.54*	*0.62*	*0.74*	*0.87*	*1.07*	*1.32*
Bangladesh	0.38	0.40	0.42	0.44	0.46	0.46	0.51	0.64	0.83	1.09	1.33
Bhutan	0.36	0.36	0.39	0.41	0.48	0.68	0.59	0.65	0.84	1.16	1.49
India	0.33	0.38	0.44	0.47	0.50	0.54	0.61	0.73	0.86	1.06	1.31
Maldives	0.47	0.51	0.50	0.50	0.55	0.54	0.51	0.61	0.89	1.28	1.65
Nepal	0.31	0.35	0.39	0.43	0.49	0.52	0.55	0.60	0.71	0.87	1.09
Sri Lanka	0.63	0.51	0.54	0.59	0.64	0.76	0.98	1.27	1.43	1.54	1.74

Table A2.6 (continued)

	1950	1960	1970	1980	1990	2000	2010	2020	2030	2040	2050
Southeast Asia	*0.43*	*0.45*	*0.51*	*0.56*	*0.58*	*0.65*	*0.79*	*1.05*	*1.28*	*1.46*	*1.63*
Brunei Darussalam	0.65	0.55	0.43	0.36	0.32	0.40	0.58	0.83	1.02	1.25	1.47
Cambodia	0.33	0.33	0.32	0.44	0.42	0.46	0.52	0.57	0.64	0.84	1.12
Indonesia	0.40	0.39	0.44	0.49	0.55	0.60	0.69	0.88	1.12	1.34	1.52
Lao People's Dem. Rep.	0.32	0.38	0.44	0.51	0.51	0.48	0.51	0.58	0.68	0.85	1.07
Malaysia	0.50	0.47	0.52	0.50	0.50	0.56	0.73	0.94	1.11	1.28	1.52
Myanmar	0.40	0.49	0.59	0.61	0.58	0.53	0.63	0.84	1.06	1.29	1.45
Philippines	0.44	0.45	0.48	0.46	0.46	0.53	0.64	0.77	0.91	1.09	1.30
Singapore	0.35	0.44	0.65	0.78	0.88	1.10	1.52	2.09	2.41	2.48	2.54
Thailand	0.47	0.51	0.55	0.59	0.58	0.65	0.83	1.16	1.42	1.57	1.70
Viet Nam	0.47	0.57	0.67	0.75	0.72	0.69	0.75	1.02	1.31	1.52	1.72
The Pacific	*0.31*	*0.29*	*0.31*	*0.34*	*0.35*	*0.39*	*0.47*	*0.58*	*0.66*	*0.76*	*0.95*
Fiji, Rep. of	0.39	0.36	0.35	0.34	0.37	0.48	0.66	0.80	0.90	1.06	1.38
Micronesia, Fed. States of	0.50	0.50	0.52	0.58	0.44	0.41	0.55	0.67	0.65	0.80	1.21
Papua New Guinea	0.28	0.24	0.27	0.31	0.31	0.33	0.40	0.51	0.60	0.69	0.85
Samoa	0.26	0.25	0.31	0.41	0.53	0.49	0.63	0.75	0.76	0.78	1.10
Solomon Islands	0.39	0.52	0.49	0.49	0.46	0.44	0.46	0.54	0.70	0.89	1.09
Timor-Leste	0.31	0.28	0.26	0.29	0.30	0.52	0.53	0.51	0.49	0.52	0.63
Tonga	0.33	0.33	0.33	0.46	0.59	0.65	0.64	0.76	0.80	0.82	0.99
Vanuatu	0.41	0.45	0.47	0.46	0.45	0.49	0.56	0.66	0.76	0.87	1.03
Developed countries	*0.68*	*0.78*	*0.90*	*1.08*	*1.34*	*1.65*	*1.94*	*2.22*	*2.48*	*2.84*	*3.00*
Australia	0.82	0.91	1.01	1.13	1.14	1.26	1.50	1.75	1.89	1.95	1.97
Japan	0.64	0.75	0.88	1.08	1.39	1.74	2.04	2.32	2.62	3.05	3.24
New Zealand	0.87	0.90	1.02	1.09	1.12	1.17	1.41	1.67	1.81	1.83	1.88

Source: Authors' calculations.

Table A2.7 Assets relative to labor income, low-income profiles

	1950	1960	1970	1980	1990	2000	2010	2020	2030	2040	2050
Asia and the Pacific region	*0.70*	*0.78*	*0.89*	*1.01*	*1.13*	*1.30*	*1.57*	*1.99*	*2.41*	*2.78*	*3.05*
Developing economies	*0.63*	*0.69*	*0.78*	*0.85*	*0.91*	*0.99*	*1.22*	*1.64*	*2.07*	*2.40*	*2.68*
Central and West Asia	*1.01*	*0.94*	*0.90*	*0.81*	*0.79*	*0.83*	*0.89*	*1.08*	*1.29*	*1.55*	*1.89*
Afghanistan	0.42	0.41	0.38	0.36	0.58	0.52	0.50	0.49	0.52	0.62	0.78
Armenia	1.38	1.08	0.99	0.90	1.06	1.40	1.49	1.88	2.04	2.21	2.71
Azerbaijan	1.23	0.98	0.91	0.77	0.89	0.91	1.00	1.45	1.81	2.05	2.48
Georgia	1.37	1.12	1.12	1.12	1.24	1.49	1.67	2.09	2.41	2.64	3.06
Kazakhstan	1.16	0.95	0.88	0.80	0.78	0.88	0.96	1.25	1.49	1.77	2.09
Kyrgyz Republic	1.17	1.10	0.98	0.87	0.88	0.82	0.83	1.12	1.38	1.69	2.14
Pakistan	0.92	0.93	0.90	0.82	0.75	0.79	0.84	0.92	1.08	1.33	1.63
Tajikistan	0.90	0.95	0.92	0.77	0.71	0.66	0.71	0.90	1.06	1.29	1.74
Turkmenistan	0.91	0.85	0.86	0.79	0.78	0.68	0.71	0.99	1.27	1.63	2.11
Uzbekistan	0.99	1.08	1.06	0.85	0.80	0.73	0.77	1.05	1.34	1.71	2.24
East Asia	*0.67*	*0.74*	*0.84*	*0.93*	*0.99*	*1.08*	*1.36*	*1.89*	*2.43*	*2.79*	*3.02*
China, People's Rep. of	0.68	0.76	0.85	0.92	0.97	1.04	1.29	1.78	2.29	2.63	2.85
Hong Kong, China	0.61	0.77	1.21	1.41	1.50	1.56	2.07	2.89	3.52	3.76	3.87
Korea, Rep. of	0.61	0.64	0.72	0.86	1.03	1.30	1.72	2.39	3.14	3.66	3.98
Mongolia	0.58	0.61	0.66	0.65	0.66	0.61	0.66	0.93	1.37	1.88	2.34
Taipei,China	0.54	0.63	0.79	1.02	1.17	1.27	1.64	2.30	2.87	3.26	3.58
South Asia	*0.49*	*0.55*	*0.63*	*0.68*	*0.72*	*0.77*	*0.89*	*1.08*	*1.28*	*1.57*	*1.97*
Bangladesh	0.54	0.57	0.60	0.63	0.66	0.66	0.74	0.91	1.20	1.61	1.99
Bhutan	0.50	0.50	0.55	0.58	0.70	0.99	0.87	0.95	1.21	1.71	2.25
India	0.48	0.55	0.63	0.68	0.72	0.77	0.89	1.07	1.26	1.56	1.95
Maldives	0.68	0.73	0.72	0.69	0.79	0.80	0.73	0.88	1.28	1.87	2.49
Nepal	0.42	0.49	0.56	0.62	0.69	0.76	0.79	0.87	1.02	1.27	1.61
Sri Lanka	0.97	0.74	0.79	0.86	0.93	1.08	1.44	1.90	2.15	2.34	2.62

Table A2.7 (continued)

	1950	1960	1970	1980	1990	2000	2010	2020	2030	2040	2050
Southeast Asia	*0.63*	*0.65*	*0.74*	*0.80*	*0.84*	*0.93*	*1.14*	*1.54*	*1.91*	*2.19*	*2.45*
Brunei Darussalam	0.93	0.80	0.63	0.52	0.48	0.56	0.83	1.20	1.51	1.85	2.20
Cambodia	0.47	0.47	0.46	0.62	0.60	0.65	0.74	0.83	0.93	1.20	1.66
Indonesia	0.58	0.56	0.63	0.70	0.79	0.88	0.99	1.28	1.66	2.02	2.28
Lao People's Dem. Rep.	0.44	0.54	0.62	0.74	0.75	0.71	0.73	0.84	0.99	1.22	1.58
Malaysia	0.75	0.69	0.76	0.73	0.72	0.80	1.05	1.38	1.64	1.91	2.27
Myanmar	0.57	0.70	0.84	0.90	0.86	0.78	0.91	1.22	1.57	1.93	2.19
Philippines	0.63	0.64	0.69	0.68	0.67	0.76	0.92	1.12	1.34	1.61	1.93
Singapore	0.49	0.61	0.92	1.11	1.26	1.53	2.19	3.14	3.67	3.72	3.81
Thailand	0.67	0.73	0.80	0.85	0.86	0.95	1.20	1.70	2.13	2.38	2.57
Viet Nam	0.66	0.81	0.96	1.09	1.08	1.02	1.07	1.50	1.96	2.29	2.60
The Pacific	*0.46*	*0.41*	*0.44*	*0.49*	*0.50*	*0.55*	*0.66*	*0.83*	*0.97*	*1.11*	*1.39*
Fiji, Rep. of	0.58	0.53	0.51	0.49	0.53	0.68	0.94	1.20	1.33	1.58	2.05
Micronesia, Fed. States of	0.73	0.73	0.76	0.84	0.68	0.60	0.80	1.01	0.95	1.16	1.78
Papua New Guinea	0.42	0.34	0.38	0.44	0.44	0.47	0.56	0.72	0.88	1.00	1.24
Samoa	0.38	0.36	0.42	0.61	0.79	0.73	0.91	1.13	1.17	1.14	1.60
Solomon Islands	0.52	0.75	0.72	0.71	0.67	0.64	0.66	0.76	1.00	1.29	1.60
Timor-Leste	0.46	0.41	0.37	0.41	0.42	0.73	0.76	0.76	0.72	0.75	0.91
Tonga	0.47	0.48	0.48	0.68	0.88	0.97	0.96	1.14	1.21	1.23	1.44
Vanuatu	0.58	0.65	0.71	0.70	0.67	0.70	0.80	0.96	1.11	1.28	1.52
Developed countries	*0.97*	*1.12*	*1.31*	*1.59*	*1.98*	*2.46*	*2.91*	*3.30*	*3.70*	*4.23*	*4.45*
Australia	1.20	1.32	1.47	1.68	1.70	1.86	2.22	2.63	2.85	2.93	2.95
Japan	0.91	1.07	1.28	1.57	2.04	2.60	3.07	3.46	3.89	4.53	4.79
New Zealand	1.29	1.32	1.49	1.63	1.67	1.73	2.08	2.52	2.75	2.75	2.82

Source: Authors' calculations.

3. Impact of population aging on Asia's future growth

Donghyun Park and Kwanho Shin

1. INTRODUCTION

Logically, demographic structure – the age structure of a country's population – should affect that country's economic performance. A country with a youthful population will be more productive than a country with an older one as it will have a larger labor force relative to population size. More workers produce more goods and services, so younger countries tend to grow faster economically than older countries. A general loss of economic dynamism explains why advanced economies with maturing populations are concerned about population aging and also helps to explain why such economies have become more open to immigration in recent years. The ongoing shift of global economic power from advanced economies to developing economies to some extent reflects the demographic differences between the two.

Due to a wide range of economic and social factors, developing Asia has begun to follow in the demographic footsteps of the advanced economies; the demographic transition now underway in the region shares many of the same features. Rising living standards have led to declines in mortality that in turn have resulted in a fall in birth rates and a rise in life expectancy. Better healthcare has been a key factor in both, and improvements in female education and the greater participation of women in the labor force along with reduced reliance on children for old-age support have also contributed to lower birth rates. In short, developing Asia's population aging follows the general historical pattern of countries growing older as they get richer.

Developing Asia's seemingly inexhaustible supply of workers for export-oriented industrialization catapulted the region from the periphery to the center of the world economy, but the working-age population in the region is aging and is expected to do so at accelerated rates in the coming decades, though this will vary from economy to economy. Some economies still have youthful populations while in others aging is a much more

immediate issue. Regardless of these differences, the region as a whole will have to address the economic consequences of the demographic transition to sustain growth in the medium and long term.

Our objective was to project the impact of the demographic transition on the economic growth of 12 developing Asian economies from 2011 to 2020 and from 2021 to 2030 using projections of age structures readily available from the United Nations (UN) population database. To make our projections, we first used past data to estimate the impact of the old-age dependency ratio and the youth dependency ratio on three primary determinants of economic growth: labor force participation, capital accumulation, and the growth of total factor productivity (TFP). On the basis of those estimates, we projected how the two dependency ratios would affect the three determinants in the next two decades. We made separate projections for each of the two channels through which demographic change can influence capital accumulation, that is, directly and indirectly via saving. Summing the projected impact of the two demographic variables gave us the projected impact on growth.

Our analysis is based on well grounded theoretical rationales for why demographic change can have a significant influence on economic growth. The economic needs and contributions of individuals vary over the course of their economic lifecycles. It is well known that working-age adults tend to work and save more than young people or those aged 60 and older. That is, the ratio of consumption to production is generally high for young people and low for working-age adults. Children rely on parents for material needs during the early years of life. After retirement, adults rely on income from saving, transfers from children, and pension benefits. Between youth and retirement, adults work to provide for their families and to save for retirement. A larger labor force therefore contributes directly to economic growth, and higher saving rates contribute to growth by boosting the investment rate.

The theoretical basis for the relationship between demographic change on one hand and labor supply and saving on the other is well established. It is also intuitively plausible that population aging may directly affect investment. To the extent that physical capital can substitute for labor, an economy can accumulate more capital in order to compensate for the slowdown in the growth of the labor force. Capital and labor can, however, also be complements; this would dilute the positive effect of aging on investment. Changes in the age structure of the labor force can also influence the investment rate. For example, older workers may need more capital than younger workers to compensate for their diminished physical strength. In addition, demographic change will have a sizable effect on the structure of demand for services and goods for the elderly and

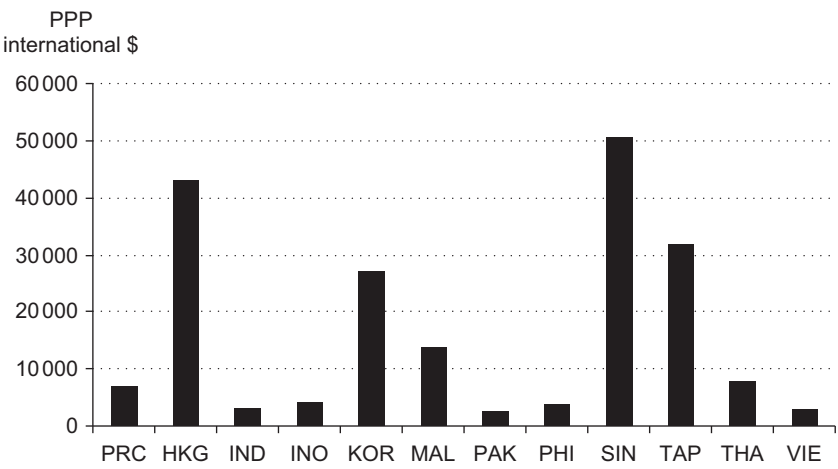
may bring about structural changes in production, for example, the capital intensity of production that can in turn influence the investment rate.

Finally, economic intuition suggests that demographic changes will affect labor productivity. Older workers tend to have more experience and knowledge, but younger workers tend to be physically stronger and have stronger incentives to invest in human capital. Alesina et al. (2003) point out that declining fertility affects not only the size of the working-age population but also its age structure. Due to age-specific differences in labor productivity, the aggregate productivity of a country with larger numbers of older, experienced workers will be higher than that of a younger country. Since labor productivity grows fastest and peaks between the ages of 35 and 54, the productive capacity of a country with a large proportion of workers in the prime age group should be markedly higher than that of a country with more younger or older workers. An analysis of a balanced panel of 84 countries by Gomez and Hernandez de Cos (2008) found evidence that an increase in the share of workers in the prime age group had a positive but curvilinear effect on per capita gross domestic product (GDP). While labor productivity and TFP are separate concepts, the former will have a significant effect on the latter under certain conditions. In fact, the two appear to be equivalent if we assume a Cobb–Douglas production function. In this connection, in a study of ten Canadian provinces from 1981 to 2001 with projections up to 2046, Tang and MacLeod (2006) found that older workers were, on average, less productive than younger workers and that an aging labor force had a negative effect on productivity.

Our quantitative projections will give developing Asia's policymakers some insights into the impact of demographic change on economic growth that will help them design and implement appropriate policies for sustaining growth as the demographic dividend dissipates. The exact impact of aging and hence the appropriate policy response will necessarily differ from economy to economy given the wide diversity of demographic profiles in the region.

2. POPULATION AGING IN DEVELOPING ASIA: TRENDS AND PROSPECTS

The 12 economies in our sample are the People's Republic of China (PRC), Hong Kong, China, India, Indonesia, the Republic of Korea, Malaysia, Pakistan, the Philippines, Singapore, Taipei,China, Thailand, and Viet Nam. They encompass a very wide range of income and development levels. In terms of purchasing power parity, GDP per capita in 2009



Notes: PRC = People's Rep. of China; HKG = Hong Kong, China; IND = India; INO = Indonesia; KOR = Rep. of Korea; MAL = Malaysia; PAK = Pakistan; PHI = Philippines; SIN = Singapore; TAP = Taipei,China; THA = Thailand; VIE = Viet Nam.

Sources: International Monetary Fund, World Economic Outlook online database; World Bank, World Development Indicators online database, both accessed 19 September 2011.

Figure 3.1 Gross domestic product per capita, purchasing power parity in 2009 for twelve Asian economies

ranged from $2596 in Pakistan and $2939 in Viet Nam to $43 134 in Hong Kong, China and $50 650 in Singapore (Figure 3.1).

In general, all the economies in our sample are clearly experiencing a demographic transition toward older populations. Table 3.1 shows the old-age ratio – the ratio of those aged 65 or over to the working-age population (people aged 15–64) – and the youth-dependency ratio – the ratio of those aged 0–14 to the working-age population. Figures 3.2 and 3.3 show slightly different definitions of the old-age and youth-dependency ratios with total population replacing the working-age population as the denominator.[1] For both definitions, the share of the elderly has grown visibly throughout the region and is projected to growth further in the next two decades. Conversely, the share of youth has shrunk and will continue to shrink in the coming years.

Although the trend toward older populations is region-wide, there is nevertheless a great deal of diversity in the demographic profiles of the 12. By 2021–2030, the ratio of elderly to the working-age population will exceed 33 percent in Hong Kong, China and Singapore. In striking

Table 3.1 Actual and projected demographic changes in 12 Asian economies from 1981 to 2030

	Actual			Projections	
	1981–1990	1991–2000	2001–2007[a]	2011–2020	2021–2030
PRC					
Youth dependency	0.481	0.409	0.328	0.273	0.260
Old-age dependency	0.081	0.092	0.106	0.137	0.200
Hong Kong, China					
Youth dependency	0.336	0.268	0.203	0.150	0.173
Old-age dependency	0.109	0.139	0.163	0.210	0.340
India					
Youth dependency	0.668	0.613	0.540	0.440	0.363
Old-age dependency	0.064	0.068	0.073	0.083	0.107
Indonesia					
Youth dependency	0.654	0.522	0.437	0.363	0.307
Old-age dependency	0.062	0.069	0.082	0.100	0.130
Republic of Korea					
Youth dependency	0.448	0.321	0.270	0.200	0.193
Old-age dependency	0.067	0.086	0.124	0.183	0.287
Malaysia					
Youth dependency	0.664	0.588	0.496	0.407	0.347
Old-age dependency	0.064	0.062	0.066	0.090	0.130
Pakistan					
Youth dependency	0.827	0.800	0.686	0.580	0.497
Old-age dependency	0.076	0.068	0.066	0.073	0.083
Philippines					
Youth dependency	0.758	0.683	0.599	0.500	0.430

Table 3.1 (continued)

	Actual			Projections	
	1981–1990	1991–2000	2001–2007[a]	2011–2020	2021–2030
Philippines					
Old-age dependency	0.058	0.058	0.063	0.080	0.103
Singapore					
Youth dependency	0.337	0.307	0.279	0.183	0.193
Old-age dependency	0.074	0.089	0.115	0.193	0.357
Taipei,China					
Youth dependency	0.449	0.343	0.270	0.183	0.163
Old-age dependency	0.080	0.111	0.133	0.180	0.299
Thailand					
Youth dependency	0.554	0.403	0.336	0.293	0.287
Old-age dependency	0.068	0.082	0.100	0.127	0.190
Viet Nam					
Youth dependency	0.747	0.632	0.471	0.337	0.300
Old-age dependency	0.085	0.088	0.095	0.097	0.143

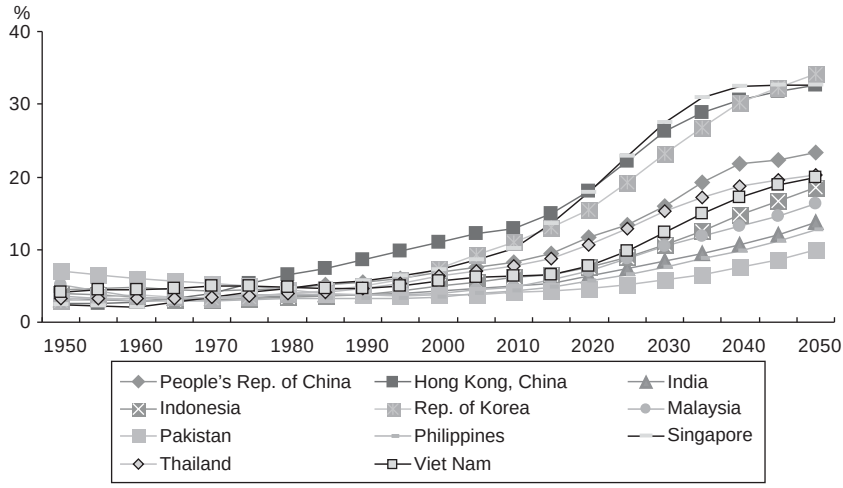
Notes: Youth and old-age dependency rates, obtained from World Bank (2010), are defined as the percentage of the population below age 15 and over age 64 divided by the working-age population (aged between 15 and 64) , respectively. Projections of aging were obtained from UN (2009).

a. This time period is 2001–2007 rather than 2001–2010 due to data limitations.

Sources: World Bank (2010), accessed 5 April 2011; UN (2009), accessed 1 May 2011.

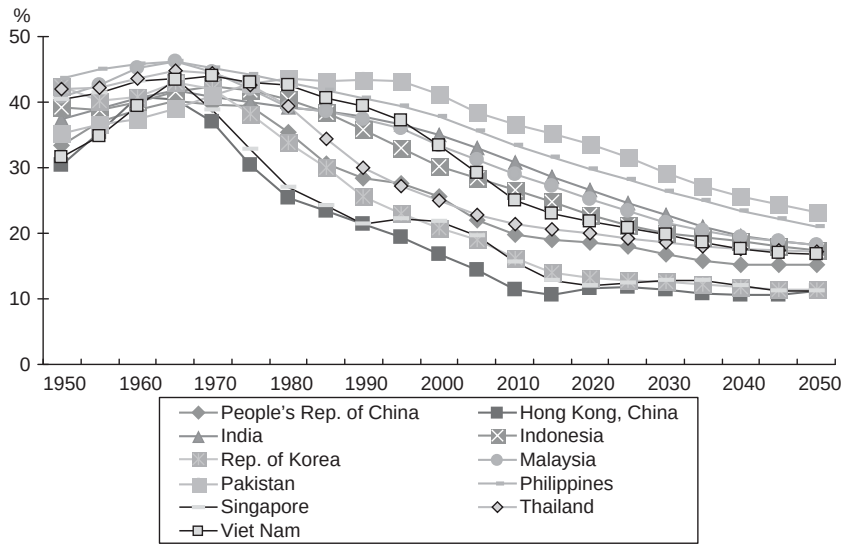
contrast, the corresponding figures for Pakistan and the Philippines will be only 8.3 percent and 10.3 percent respectively (Table 3.1).

Due to its very rapid growth, developing Asia is compressing industrialization and economic transformation into a much shorter time period than the advanced economies did, and the region is replicating the demographic transition of the advanced economies within a much shorter time frame as well. In fact, the sheer speed and scale of the region's population



Source: UN (2009), accessed 1 May 2011.

Figure 3.2 Population aged 65 and older as a share of total population in 11 Asian economies from 1950 to 2050



Source: UN (2009), accessed 1 May 2011.

Figure 3.3 Population aged 0–14 as a share of total population in 11 Asian economies from 1950 to 2050

aging are unprecedented and are largely driven by the region's exceptional economic growth.

3. SOURCES OF GROWTH

Because demographic change affects growth through a number of different channels, in order to estimate the impact of population aging on economic growth we first have to estimate growth and identify its sources. In order to get the broader picture in developing Asia, we estimated growth rates of aggregate GDP, per capita GDP, per capita labor input, TFP, per capita physical capital, and education or human capital from 1981 to 2007. We also estimated the relative contribution of the different determinants of per capita GDP, that is, per capita labor input, TFP, per capita physical capital, and education.

We used a standard Cobb–Douglas aggregate production function in which output is produced by combining productive inputs and TFP. In order to capture the impact of demographic change we distinguished between population, P, and labor force, L. Per capita GDP (Y/P) is the product of per capita labor force – the ratio of workers to total population – and the ratio of output to labor force.

$$\frac{Y}{P} = \frac{L}{P}\frac{Y}{L} = \frac{L}{P}\frac{AK^{\propto}(hL)^{1-\propto}}{L} = \frac{L}{P}A\left(\frac{K}{L}\right)^{\propto}h^{1-\propto} \tag{3.1}$$

where Y = aggregate GDP, P = population, L = labor force, A = total factor productivity, K = aggregate physical capital, h = human capital, and $\propto$ = share of capital in income.

The growth rate of per capita GDP ($= Y/P$) is equal to the growth rate of per capita labor force plus the growth rate of per labor GDP.

$$\Delta\ln\left(\frac{Y}{P}\right) = \Delta\ln\left(\frac{L}{P}\right) + \Delta\ln\left(\frac{Y}{L}\right) \tag{3.2}$$

As population aging progresses, if the labor participation rate of the elderly does not change, the growth rate of the per capita labor force will decrease. This should be a very important channel through which aging influences economic growth; we explore it in the next section. Note, however, that this is only a temporary effect because the growth rate of the per capita labor force cannot increase or decrease forever.

We can disaggregate the growth rate of per labor GDP $(= Y/L)$ further as follows:

$$\Delta \ln\left(\frac{Y}{L}\right) = \Delta \ln (A) + \propto \Delta \ln\left(\frac{K}{L}\right) + (1 - \propto) \Delta \ln (h) \qquad (3.3)$$

Combining (3.2) and (3.3) gives us:

$$\Delta \ln\left(\frac{Y}{P}\right) = \Delta \ln\left(\frac{L}{P}\right) + \Delta \ln (A) + \propto \Delta \ln\left(\frac{K}{L}\right) + (1 - \propto) \Delta \ln (h) \qquad (3.2)'$$

Equation (3.2)′ shows that the growth rate of per capita GDP is made up of four components: the growth rates of (i) per capita labor; (ii) TFP; (iii) per labor physical capital; and (iv) human capital.

Our data source for aggregate and per capita GDP and for investment and population was Penn World Table 6.3 (Heston et al., 2009), for the labor force it was the International Labour Organization's Office of Statistics LABORSTA database (ILO, 2010), accessed 15 March 2011, and for human capital it was Barro and Lee (2010). We calculated the physical capital stock by using the standard approach of Harberger (1978), which assumes that the economy is initially in a steady state. Then the remaining capital stock is constructed by the perpetual inventory method:

$$K_t = (1 - \delta) K_{t-1} + I_t \qquad (3.4)$$

where δ is the depreciation rate set at 6 percent.

Following Barro and Lee (2010), we assumed that human capital per unit of labor has a relation to the number of years of schooling as follows:

$$h = e^{\theta s} \qquad (3.5)$$

where θ measures the average marginal return on an additional year of schooling, and hence θs is the efficiency of a unit of labor with s years of education relative to one without any schooling. Following Barro and Lee (2010), we set $\theta = 8$ percent.

Table 3.2 reports the results of our basic growth accounting exercise for per capita GDP. We assumed that share of labor income was 0.6. The table reports the growth rates of aggregate GDP, per capita GDP, per capita labor input, TFP, per capita physical capital, and human capital output for the two most recent decades, 1981–1990 and 1991–2000, and for 2001–2007 as well as the entire sample period 1981–2007.[2]

Table 3.2 Growth accounts for 12 Asian economies from 1981 to 2007 (%)

	1981–1990	1991–2000	2001–2007	1981–2007
PRC				
Aggregate GDP	8.34	9.10	11.10	9.34
Per capita GDP	6.80	8.10	10.52	8.25
Per capita labor input	1.01	0.14	0.25	0.49
Total factor productivity	2.98	3.76	6.11	4.08
Per labor physical capital	5.97	8.73	9.14	7.82
Education/human capital	0.70	1.19	0.84	0.92
Hong Kong, China				
Aggregate GDP	6.24	3.85	4.69	4.95
Per capita GDP	5.07	2.28	4.02	3.76
Per capita labor input	0.41	0.13	0.75	0.39
Total factor productivity	1.77	0.32	1.99	1.29
Per labor physical capital	5.58	4.70	1.80	4.27
Education/human capital	1.11	−0.08	0.93	0.62
India				
Aggregate GDP	5.39	4.75	6.74	5.50
Per capita GDP	3.37	2.94	5.05	3.65
Per capita labor input	0.16	0.16	0.45	0.23
Total factor productivity	1.61	1.05	1.84	1.46
Per labor physical capital	2.66	3.44	5.76	3.76
Education/human capital	0.88	0.60	0.75	0.75
Indonesia				
Aggregate GDP	5.67	4.17	4.51	4.81
Per capita GDP	3.78	2.55	3.18	3.17
Per capita labor input	1.14	1.12	0.64	1.00
Total factor productivity	0.17	−0.31	2.05	0.48
Per labor physical capital	5.87	3.15	0.01	3.34
Education/human capital	0.21	0.79	0.80	0.58
Republic of Korea				
Aggregate GDP	8.96	5.34	3.98	6.33
Per capita GDP	7.78	4.46	3.55	5.46
Per capita labor input	1.25	0.76	0.59	0.90
Total factor productivity	3.04	−0.04	1.12	1.40
Per labor physical capital	7.46	7.31	3.62	6.41
Education/human capital	0.84	1.37	0.65	0.99
Malaysia				
Aggregate GDP	5.86	7.41	5.18	6.26
Per capita GDP	3.45	5.21	3.32	4.07
Per capita labor input	0.68	0.77	0.48	0.66
Total factor productivity	0.29	1.10	1.84	0.99

Table 3.2 (continued)

	1981–1990	1991–2000	2001–2007	1981–2007
Malaysia				
Per labor physical capital	4.68	5.81	1.18	4.19
Education/human capital	1.02	1.70	0.89	1.24
Pakistan				
Aggregate GDP	5.99	3.50	6.16	5.11
Per capita GDP	3.03	1.06	4.08	2.57
Per capita labor input	−0.12	0.49	1.50	0.53
Total factor productivity	1.84	−0.35	1.63	0.97
Per labor physical capital	2.37	1.12	0.12	1.33
Education/human capital	0.61	0.77	1.50	0.90
Philippines				
Aggregate GDP	2.02	3.77	4.85	3.40
Per capita GDP	−0.43	1.55	2.74	1.12
Per capita labor input	0.42	0.48	0.35	0.42
Total factor productivity	−1.26	0.42	1.98	0.20
Per labor physical capital	0.02	0.68	0.18	0.31
Education/human capital	0.67	0.65	0.56	0.63
Singapore				
Aggregate GDP	7.03	7.84	5.02	6.81
Per capita GDP	4.70	5.03	3.30	4.46
Per capita labor input	0.98	0.04	0.58	0.53
Total factor productivity	1.49	2.64	1.90	2.02
Per labor physical capital	3.91	4.12	0.90	3.21
Education/human capital	1.11	1.16	0.76	1.04
Taipei,China				
Aggregate GDP	7.61	6.38	3.70	6.14
Per capita GDP	6.25	5.48	3.25	5.19
Per capita labor input	1.02	0.60	0.85	0.82
Total factor productivity	2.47	1.28	0.49	1.52
Per labor physical capital	5.52	7.40	2.99	5.56
Education/human capital	0.91	1.06	1.18	1.03
Thailand				
Aggregate GDP	7.53	3.81	4.82	5.45
Per capita GDP	5.93	2.67	4.10	4.25
Per capita labor input	1.43	−0.30	0.49	0.54
Total factor productivity	2.40	0.04	2.61	1.58
Per labor physical capital	4.04	6.47	0.81	4.10
Education/human capital	0.81	0.56	1.12	0.80
Viet Nam				
Aggregate GDP	5.69	6.45	7.38	6.41
Per capita GDP	3.44	4.84	6.30	4.70

Table 3.2 (continued)

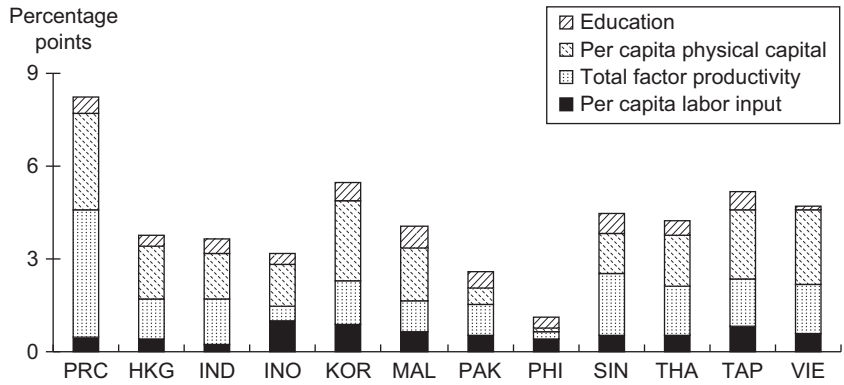
	1981–1990	1991–2000	2001–2007	1981–2007
Viet Nam				
Per capita labor input	0.50	0.38	1.00	0.58
Total factor productivity	2.95	0.38	1.39	1.60
Per labor physical capital	1.35	9.04	8.23	5.98
Education/human capital	−0.92	0.77	1.04	0.22

Note: Reported here are annual average growth rates. The labor share is set at 0.6 for all economies.

Source: Authors' calculations.

Again, it is worth repeating that our variable of interest is per capita GDP, not per labor GDP. The growth rate of per capita GDP steadily decreased in the Republic of Korea and Taipei,China, both of which are maturing, high-income economies, while the growth rates in the PRC and Viet Nam – two fast-growing economies at much lower income levels – accelerated from 1981 to 2007. The growth rate of per capita GDP from 2001 to 2007 was lower than that for the entire sample period in the Republic of Korea, Malaysia, Singapore, Taipei,China, and Thailand. The average growth rate of per capita labor input was higher than 0.5 percent from 1981 to 2007 in Indonesia, the Republic of Korea, Malaysia, Pakistan, Singapore, Taipei,China, Thailand, and Viet Nam, but it is likely that this trend will be reversed as the populations age.

Figure 3.4 shows the relative contributions of per capita labor input, TFP, per capita physical capital, and education to the growth rate of per capita GDP. Our results indicated that in most countries, per capita physical capital has played a major role in economic growth, which is consistent with the results of most existing studies and with the widespread perception that high investment rates contributed substantially to developing Asia's growth by rapidly augmenting the physical capital stock and hence productive capacity. At the same time, TFP growth also played a key role. This suggests that changes in technical efficiency along with technical progress made a substantial contribution to the region's economic growth. In the case of the PRC, in fact, growth in TFP contributed more to economic growth than capital accumulation. For the region as a whole, labor inputs and education accounted for only a relatively small share of growth.



Note: PRC = People's Rep. of China; HKG = Hong Kong, China; IND = India; INO = Indonesia; KOR = Rep. of Korea; MAL = Malaysia; PAK = Pakistan; PHI = Philippines; SIN = Singapore; THA = Thailand; TAP = Taipei,China; VIE = Viet Nam.

Source: Authors' calculations.

Figure 3.4 Contribution to per capita GDP growth from 1981 to 2007 in 12 Asian economies

4. THE IMPACT OF DEMOGRAPHIC CHANGE ON DEVELOPING ASIA'S ECONOMIC GROWTH

We estimated the effects of the old-age dependency and youth ratios on four sources of growth in the 12 economies: labor force participation, TFP, the capital to labor ratio, and the saving rate. More precisely, we measured the impact of aging on the growth rate of per capita GDP ($= Y/P$) based on equation (3.2)′:

$$\Delta \ln\left(\frac{Y}{P}\right) = \Delta \ln\left(\frac{L}{P}\right) + \Delta \ln(A) + \propto \Delta \ln\left(\frac{K}{L}\right) + (1 - \propto)\Delta \ln(h) \qquad (3.2)'$$

Suppose the growth rate of per capita GDP changed. According to equation (3.2)′, this means that there were changes in any of the four components on the right-hand side. It is reasonable to expect that the four components are simultaneously determined, so although it would be best to form a system of four equations, it would be too complicated. To simplify the analysis, we assumed that the first and the last terms, labor force participation and education, were independently determined. We assumed that the labor participation rate was determined primarily by the level of

Table 3.3 Impact on aging of the growth rate of labor force participation

	[1] Random Effects	[2] Fixed Effects
Old-age dependency	−0.056***	−0.068**
	[0.008]	[0.028]
Youth dependency	−0.003	−0.016**
	[0.003]	[0.007]
Per capita GDP	0.010***	0.003
	[0.004]	[0.011]
Per capita GDP^2	−0.000**	0
	[0.000]	[0.001]
Observations	514	514
R-squared	0.32	0.125

Notes:
Both dependent and explanatory variables are ten-year averages.
** Significant at 0.05 and *** significant at 0.01 using a two-tailed test.

Source: Authors' calculations.

per capita GDP and by demographic factors. The results of the regression analysis are reported in Table 3.3.

The dependent variable is the growth rate of the per capita labor force, that is, the labor force divided by the total population. The independent variables are old-age dependency, youth dependency, per capita GDP and per capita GDP squared. We included the squared term to capture possible non-linear effects. Both dependent and explanatory variables are ten-year average values.

Table 3.3 includes results for both random effects and fixed effects. The old-age dependency ratio is highly significant in both results, while the youth dependency ratio is significant only in the fixed-effects regression. As expected, both coefficients are negative. The coefficient indicates that if the old-age dependency ratio increased by 10 percent, the growth rate of per capita labor would decrease either by 0.56 percent (random effects) or by 0.68 percent (fixed effects). This effect is expected to persist for ten years. Thus, as expected, our results indicate that demographic change has a significant impact on labor force participation.

In addition to labor force participation – the first term – we also assumed education and human capital – the last term – was independently determined. To calculate it, we used the projections made by Lee and Francisco (2010) (Table 3.4). Intuitively, the first and the last terms cannot increase or decrease forever because there are limits to their values. For

Table 3.4 Estimation results

	[1]	[2]
Total Factor Productivity (TFP) growth		
Initial TFP	−0.020***	−0.018***
	[0.003]	[0.003]
Initial life expectancy	0.050***	−0.006
	[0.012]	[0.015]
Years of schooling	0	0
	[0.001]	[0.001]
Initial population	0.001**	0
	[0.001]	[0.001]
Research and development stock growth	0.064***	0.031
	[0.020]	[0.021]
Old-age dependency		−0.068***
		[0.024]
Youth dependency		−0.061***
		[0.011]
K/L growth		
Initial per labor physical capital	−0.023***	−0.027***
	[0.003]	[0.003]
Initial TFP	0.022***	0.01
	[0.006]	[0.009]
Growth rate of TFP	0.680***	−0.046
	[0.240]	[0.570]
Growth rate of population	−0.447*	
	[0.254]	
Saving rate	0.122***	0.141***
	[0.025]	[0.030]
Openness	0	0
	[0.003]	[0.003]
Property rights	0.000***	0.000***
	[0.000]	[0.000]
Old-age dependency		0.062
		[0.059]
Youth dependency		−0.044
		[0.049]
Saving rate		
Life expectancy	0.001	0.003*
	[0.002]	[0.002]
Elderly participation	0.268***	0.261***
	[0.060]	[0.060]
GDP growth	2.479***	2.619***
	[0.786]	[0.838]

Table 3.4 (continued)

	[1]	[2]
Saving rate		
Initial per capita GDP	0.109***	0.109***
	[0.018]	[0.018]
Old-age dependency	−0.638***	−0.597***
	[0.154]	[0.160]
Youth dependency	−0.294***	−0.199*
	[0.107]	[0.113]
Observations	170	170

Notes: Column 1 is a replication of the estimation made by Lee and Hong (2010). Column 2 includes demographic variables (old-age dependency and youth dependency ratios) as explanatory variables in all three equations.
K/L = aggregate physical capital/labor force.

Source: Authors' calculations.

example, the labor force participation rate cannot decrease to zero. Hence the impact, if any, should be temporary. For the second and third terms – TFP and physical capital per labor – we followed the growth projection framework of Lee and Hong (2010) but considered the impact of demographic change and quantified its importance.

The system of three equations is

$$\text{TFP: } \Delta\ln(A_t) = f_A(Z_{At}) \tag{3.6}$$

$$\text{Physical capital per labor: } \Delta\ln(k_t) = f_k(S_t, Z_{kt}) \tag{3.7}$$

$$\text{Saving rate: } S_t = f_s\left(\Delta\ln\left(\frac{Y_t}{P_t}\right), Z_{st}\right) \tag{3.8}$$

where k_t is physical capital per labor $(=K_t/L_t)$ and S_t is the saving rate at time t. Furthermore, Z_{At}, Z_{kt}, and Z_{st} are exogenous variables affecting $\Delta\ln(A_t)$, $\Delta\ln(k_t)$ and S_t, respectively. We added equation (3.8) for the saving rate because it influences physical capital per labor. Originally equations (3.6), (3.7) and (3.8) were derived from Park (2010), Shioji and Vu (2011) and Horioka and Terada-Hagiwara (2010), respectively. Lee and Hong (2010) combine these three to form a system of equations.

When you plug (3.3) into (3.8), it becomes:

$$S_t = f_s(\ln(A_t) + \propto \Delta\ln(k_t) + (1 - \propto)\Delta\ln(h_t), Z_{st}) \tag{3.8}'$$

where we explicitly included the time subscript and utilized the fact that $k_t = K_t/L_t$.

Now equations (3.6), (3.7) and (3.8)′ form a three-equation system with three endogenous variables:

$$\ln(A_t),\ \Delta\ln(k_t) \text{ and } S_t.$$

All other variables including $\Delta\ln(h_t)$ were considered as exogenous.

Lee and Hong (2010) included the following exogenous variables:

$$Z_{At} = (\ln(A_{t-1}),\ \ln(Life_{t-1}), h_t,\ \ln(pop_{t-1}), \Delta RND_t) \tag{3.9}$$

$$Z_{kt} = (k_{t-1},\ \Delta\ln(A_{t-1}),\ \ln(A_{t-1}),\ \ln(pop_{t-1}), open_t, propright_t) \tag{3.10}$$

$$Z_{st} = (Life_t,\ Old_t,\ Young_t,\ \ln(y_t), \Delta\ln(y_t), labor\_p65_t) \tag{3.11}$$

where $Life_t$ = life expectancy at t, pop_{t-1} = population at $t-1$, ΔRND_t = growth rate of research and development, $open_t$ = a measure of openness, (exports+imports)/GDP, $propright_t$ = the Heritage Foundation's Property Rights Index, Old_t = the old-age dependency ratio defined as the population aged 65 and older divided by the population aged 15–64, $Young_t$ = youth dependency ratio defined as the population aged 14 and under divided by the population aged 15–64, $labor\_p65_t$ = the labor force participation rate of elderly people.

A major departure from Lee and Hong (2010) is that we included the demographic variables old-age and youth dependency ratios in either Z_{At} or Z_{kt} and reported the results when the demographic variables were included in both Z_{At} and Z_{kt}. The data sources for our variables were as follows: (i) The World Bank's World Development Indicators (WDI) (World Bank, 2010, accessed 5 April 2011) for old-age and youth dependency ratios except for Taipei,China, for which we relied on the Council for Economic Planning and Development (2010, accessed 5 April 2011); (ii) Penn World Table 6.3 (Heston et al., 2009) for the saving rate ($S/Y=(Y-C-G)/Y$); (iii) WDI (2010) for life expectancy; (iv) Lee and Hong (2010) for research and development; (v) Penn World Table 3.1 (Heston et al., 2009) for openness; (vi) The Heritage Foundation for property rights (2011, accessed 5 April 2011), and the International Labour Organization's LABORSTA database (ILO, 2010, accessed 15 March 2011) for labor force participation and the labor force participation rate of the elderly.

Column 1 in Table 3.4 replicates the analysis of Lee and Hong (2010), and the results are reasonably similar. Column 2 is the result of

the regression when we included the demographic factors (the old-age and youth dependency ratios). We excluded population growth from the explanatory variables in Column 2 when the dependent variable was per capita physical capital since other demographic factors were already included. Our variables of interest are the old-age and youth dependency ratios since we are interested in the impact of demographic change on the different sources of economic growth. Both demographic variables have a negative effect on TFP growth. This implies that the age structure of the labor forces affects labor productivity and the productivity of all productive inputs. On the other hand, neither the old-age nor the youth dependency ratio was significant for capital accumulation. Therefore, demographic change does not seem to have a direct effect on investment. At the same time, the saving rate had a positive and highly significant effect on capital accumulation, and both the old-age and youth dependency ratios had a negative effect on the saving rate. Therefore, although demographic change does not exert a direct effect on capital accumulation, it does so indirectly through its negative effect on the saving rate.

5. PROJECTIONS OF THE IMPACT OF DEMOGRAPHIC CHANGE

We used the regression estimates in section 4 to make projections about the impact of demographic change on the future economic growth of the sample. More precisely, we projected the impact of the old-age and youth dependency ratios on the change in the future growth rate of per capita GDP. There are three channels through which demographic change affects growth: (i) per capita labor force; (ii) TFP; and (iii) capital accumulation.[3] The third channel is further divided into direct impact and indirect impact through the saving rate. To simplify the analysis, we assumed that the 2001–2010 averages were the same as those for 2001–2007. Table 3.5 reports the projections for 2011–2020 and for 2021–2030.

The following example will help to illustrate how we can interpret the projections in Table 3.5. According to Table 3.1, the youth and old-age dependency ratios in the PRC are expected to change from 0.328 to 0.273 and from 0.106 to 0.137 respectively from 2001 to 2020. The fixed-effects regression estimates in Table 3.3 imply that the change in the youth dependency ratio will increase the growth rate of the per capita labor force by 0.087 percent while the change in the old-age dependency ratio will reduce it by 0.209 percent. The estimates in the first panel of Table

Table 3.5 Impact of aging on economic growth projections for 12 Asian economies

Country	Variable (Dependency Ratio)	2011–2020 (%)					2021–2030 (%)				
		Labor Force/ Population	Total Factor Productivity	Aggregate Physical Capital/ Labor Force		Total	Labor Force/ Population	Total Factor Productivity	Aggregate Physical Capital/ Labor Force		Total
				Indirect (through saving)	Direct				Indirect (through saving)	Direct	
PRC											
	Youth	0.087	0.334	0.072	0.112	0.605	0.021	0.082	0.018	0.027	0.148
	Old-age	−0.209	−0.208	−0.121	0.089	−0.449	−0.434	−0.432	−0.251	0.184	−0.933
Hong Kong, China											
	Youth	0.085	0.327	0.070	0.110	0.592	−0.037	−0.143	−0.031	−0.048	−0.260
	Old-age	−0.319	−0.318	−0.185	0.136	−0.686	−0.891	−0.887	−0.516	0.378	−1.915
India											
	Youth	0.159	0.615	0.132	0.206	1.113	0.122	0.471	0.102	0.158	0.853
	Old-age	−0.072	−0.071	−0.041	0.030	−0.154	−0.160	−0.159	−0.093	0.068	−0.344
Indonesia											
	Youth	0.117	0.453	0.098	0.152	0.819	0.090	0.348	0.075	0.117	0.630
	Old-age	−0.125	−0.124	−0.072	0.053	−0.268	−0.206	−0.205	−0.119	0.087	−0.442

Table 3.5 (continued)

Country	Variable (Dependency Ratio)	2011–2020 (%)					2021–2030 (%)				
		Labor Force/ Population	Total Factor Productivity	Aggregate Physical Capital/ Labor Force		Total	Labor Force/ Population	Total Factor Productivity	Aggregate Physical Capital/ Labor Force		Total
				Indirect (through saving)	Direct				Indirect (through saving)	Direct	
Republic of Korea											
	Youth	0.112	0.431	0.093	0.145	0.780	0.011	0.041	0.009	0.014	0.074
	Old-age	−0.407	−0.405	−0.235	0.173	−0.874	−0.708	−0.705	−0.410	0.301	−1.522
Malaysia											
	Youth	0.142	0.549	0.118	0.184	0.994	0.095	0.369	0.079	0.124	0.667
	Old-age	−0.162	−0.161	−0.094	0.069	−0.349	−0.274	−0.273	−0.159	0.116	−0.589
Pakistan											
	Youth	0.169	0.651	0.140	0.218	1.178	0.133	0.512	0.110	0.172	0.927
	Old-age	−0.048	−0.048	−0.028	0.021	−0.104	−0.069	−0.068	−0.040	0.029	−0.147
Philippines											
	Youth	0.157	0.606	0.131	0.203	1.097	0.111	0.430	0.093	0.144	0.779
	Old-age	−0.117	−0.117	−0.068	0.050	−0.252	−0.160	−0.159	−0.093	0.068	−0.344

Singapore											
	Youth	0.152	0.586	0.126	0.197	1.061	−0.016	−0.061	−0.013	−0.021	−0.111
	Old-age	−0.540	−0.537	−0.312	0.229	−1.160	−1.119	−1.114	−0.648	0.475	−2.406
Taipei, China											
	Youth	0.140	0.539	0.116	0.181	0.976	0.032	0.123	0.026	0.041	0.222
	Old-age	−0.323	−0.321	−0.187	0.137	−0.694	−0.815	−0.812	−0.472	0.346	−1.753
Thailand											
	Youth	0.068	0.262	0.057	0.088	0.475	0.011	0.041	0.009	0.014	0.074
	Old-age	−0.184	−0.183	−0.107	0.078	−0.396	−0.434	−0.432	−0.251	0.184	−0.933
Viet Nam											
	Youth	0.214	0.826	0.178	0.277	1.494	0.058	0.225	0.049	0.076	0.408
	Old-age	−0.014	−0.014	−0.008	0.006	−0.030	−0.320	−0.318	−0.185	0.136	−0.687

Source: Authors' calculations.

3.4 imply that the impact of changes in the youth and old-age dependency ratios on the TFP growth rate would be 0.334 percent and −0.208 percent, respectively. In order to understand how the changes affect the growth rate of physical capital per labor, we relied on the reduced form equations converted from the estimates in the second and third panels in Table 3.5. According to those equations, the youth dependency ratio directly increases the growth rate of physical capital per labor by 0.112 percent and increases it indirectly through the saving rate by 0.072 percent. The old-age dependency ratio directly increases the growth rate of physical capital per labor by 0.089 percent but indirectly reduces it through the saving rate by 0.121 percent.

Combining the three channels, the collective impact of the change in the youth dependency ratio is to increase the PRC's growth rate of per capita GDP by 0.605 percent, while the total impact of the change in the old-age dependency ratio is to decrease it by 0.449 percent. Overall, demographic change raises the growth rate of per capita GDP by 0.156 percent. In the decade 2021–2030, the PRC's youth dependency ratio is expected to decrease further to 0.260 and the old-age dependency ratio is expected to increase further to 0.200 (Table 3.1). The three channels indicate that the change in the youth ratio will increase the growth rate of per capita GDP by 0.148 percent and the change in the old-age ratio will decrease it by 0.933 percent. Overall the demographic changes are expected to decrease the growth rate of per capita GDP by 0.785 percent. We repeated the exercise for the rest of the sample. As in the PRC, the youth dependency ratio exerted a positive effect on economic growth while the old-age dependency ratio exerted a negative effect.

Table 3.5 reveals a great deal of diversity among the 12 economies with respect to the size and timing of demographic effects on economic growth. In Hong Kong, China, the Republic of Korea, and Singapore where population aging is well under way, demography will already have a negative impact on growth in 2011–2020, that is, they will pay a demographic tax rather than earn a demographic dividend in the immediate future. In the PRC, Taipei,China, Thailand and Viet Nam, where aging began at a later stage, demographic impacts will still be positive from 2011 to 2020 but will turn negative in 2021–2030. India, Indonesia, Malaysia, Pakistan and the Philippines will continue to reap a demographic dividend in 2021–2030; however, even in those youthful economies the dividend will be visibly smaller in 2021–2030 relative to 2011–2020. All in all, our projections resoundingly supported the popular belief that the contribution of demography to developing Asia's growth is set to decline substantially as the region ages.

6. QUANTITATIVE ESTIMATES OF PAST DEMOGRAPHIC DIVIDENDS

We used the same regression estimates in section 4 but combined them with actual changes in the old-age and youth dependency ratios to quantitatively estimate the size of the demographic dividend in the sample in the decades 1981–1990, 1991–2000 and 2001–2010. Quantitative estimates of past demographic dividends are useful for comparative purposes and provide a better perspective on estimates of future dividends.

In contrast to the projections in Table 3.5, Table 3.6 shows that all developing economies in Asia earned a demographic dividend in the past. This was true even for those that according to Table 3.5 will begin to pay a demographic tax in the immediate future. For example, in 1981–1990 in the Republic of Korea, the collective impact of the change in the youth ratio was to raise the annual growth rate of per capita GDP by 2.196 percent, while the collective impact of the change in the old-age dependency ratio was to reduce the growth rate by 0.094 percent. Overall, therefore, demographic change raised the Republic of Korea's annual growth rate of per capita GDP in 1981–1990 by 2.102 percent. The Republic of Korea reaped a reduced but still sizable demographic dividend of 1.133 percent in 1991–2000, but the dividend disappeared in 2001–2010. These estimates resoundingly confirm the notion that economic growth in developing Asia benefited substantially from favorable demographic trends in the past.

7. CONCLUSIONS

While developing Asia is following in the demographic footsteps of the advanced economies, the sheer speed and scale of the transition make preparing for a grayer future all the more challenging and complex as the transition to an older population will deprive the region of one of the main drivers of its past economic success. According to Bloom et al. (2011), favorable demographics can explain much of East Asia's spectacular economic growth in the second half of the twentieth century. The rapid declines in infant and child mortality that began in the late 1940s triggered a fall in birth rates from 40 births per 1000 in 1950 to 20 per 1000 by 1980. The lag between mortality and fertility declines gave rise to a baby boom generation that was larger than the cohorts that preceded and followed it. When the baby boomers reached working age, both the saving rate and the size of the labor force shot up. Bloom et al. (2000) found that this demographic dividend accounted for up to 33 percent of East Asia's economic miracle between 1965 and 1990.

Table 3.6 Impact of aging on growth: historical estimations for 1981–1990, 1991–2000 and 2001–2010 for 12 Asian economies

Country	1981–1990 (%)					1991–2000 (%)					2001–2010 (%)				
	Labor Force/ Population	Total Factor Productivity	Aggregate Physical Capital/ Labor Force		Total	Labor Force/ Population	Total Factor Productivity	Aggregate Physical Capital/ Labor Force		Total	Labor Force/ Population	Total Factor Productivity	K/L		Total
			Indirect (through saving)	Direct				Indirect (through saving)	Direct				Indirect (through saving)	Direct	
PRC															
Youth dependency	0.312	1.204	0.259	0.404	2.180	0.115	0.443	0.095	0.149	0.801	0.130	0.502	0.108	0.168	0.908
Old-age dependency	−0.017	−0.017	−0.010	0.007	−0.036	−0.077	−0.076	−0.044	0.033	−0.165	−0.097	−0.096	−0.056	0.041	−0.208
Hong Kong, China															
Youth dependency	0.215	0.830	0.179	0.278	1.502	0.107	0.414	0.089	0.139	0.749	0.104	0.400	0.086	0.134	0.724
Old-age dependency	−0.170	−0.169	−0.098	0.072	−0.366	−0.204	−0.204	−0.118	0.087	−0.439	−0.169	−0.168	−0.098	0.072	−0.363
India															
Youth dependency	0.061	0.235	0.051	0.079	0.426	0.087	0.337	0.073	0.113	0.610	0.116	0.449	0.097	0.151	0.813
Old-age dependency	−0.024	−0.024	−0.014	0.010	−0.051	−0.021	−0.021	−0.012	0.009	−0.046	−0.036	−0.036	−0.021	0.015	−0.078

Indonesia															
Youth dependency	0.159	0.614	0.132	0.206	1.111	0.211	0.816	0.176	0.274	1.476	0.135	0.521	0.112	0.175	0.942
Old-age dependency	−0.016	−0.016	−0.009	0.007	−0.034	−0.050	−0.049	−0.029	0.021	−0.107	−0.087	−0.087	−0.050	0.037	−0.187
Republic of Korea															
Youth dependency	0.314	1.213	0.261	0.407	2.196	0.202	0.781	0.168	0.262	1.413	0.081	0.311	0.067	0.104	0.563
Old-age dependency	−0.044	−0.044	−0.025	0.019	−0.094	−0.130	−0.130	−0.075	0.055	−0.280	−0.262	−0.261	−0.152	0.111	−0.564
Malaysia															
Youth dependency	0.163	0.629	0.136	0.211	1.138	0.120	0.462	0.100	0.155	0.837	0.147	0.567	0.122	0.190	1.026
Old-age dependency	0.022	0.021	0.012	−0.009	0.046	0.014	0.014	0.008	−0.006	0.030	−0.031	−0.031	−0.018	0.013	−0.067
Pakistan															
Youth dependency	−0.015	−0.056	−0.012	−0.019	−0.102	0.042	0.164	0.035	0.055	0.296	0.182	0.702	0.151	0.235	1.270
Old-age dependency	0.121	0.121	0.070	−0.052	0.261	0.057	0.056	0.033	−0.024	0.122	0.012	0.012	0.007	−0.005	0.026
Philippines															
Youth dependency	0.124	0.477	0.103	0.160	0.864	0.119	0.459	0.099	0.154	0.830	0.134	0.518	0.112	0.174	0.938
Old-age dependency	0.002	0.002	0.001	−0.001	0.004	0.004	0.004	0.003	−0.002	0.010	−0.037	−0.036	−0.021	0.016	−0.079
Singapore															
Youth dependency	0.276	1.064	0.229	0.357	1.926	0.048	0.186	0.040	0.062	0.336	0.045	0.173	0.037	0.058	0.314

Table 3.6 (continued)

Country	1981–1990 (%)					1991–2000 (%)					2001–2010 (%)				
	Labor Force/ Population	Total Factor Productivity	Aggregate Physical Capital/ Labor Force		Total	Labor Force/ Population	Total Factor Productivity	Aggregate Physical Capital/ Labor Force		Total	Labor Force/ Population	Total Factor Productivity	K/L		Total
			Indirect (through saving)	Direct				Indirect (through saving)	Direct				Indirect (through saving)	Direct	
Singapore															
Old-age dependency	−0.063	−0.062	−0.036	0.027	−0.135	−0.103	−0.103	−0.060	0.044	−0.222	−0.173	−0.173	−0.100	0.074	−0.373
Taipei, China															
Youth dependency	0.204	0.789	0.170	0.265	1.428	0.168	0.649	0.140	0.218	1.175	0.116	0.448	0.097	0.150	0.811
Old-age dependency	−0.142	−0.142	−0.082	0.060	−0.306	−0.216	−0.216	−0.125	0.092	−0.465	−0.149	−0.149	−0.087	0.064	−0.321
Thailand															
Youth dependency	0.357	1.377	0.297	0.462	2.493	0.239	0.924	0.199	0.310	1.673	0.107	0.414	0.089	0.139	0.750
Old-age dependency	−0.003	−0.003	−0.002	0.001	−0.007	−0.096	−0.096	−0.056	0.041	−0.207	−0.121	−0.121	−0.070	0.051	−0.260
Viet Nam															
Youth dependency	0.136	0.524	0.113	0.176	0.949	0.182	0.705	0.152	0.236	1.275	0.256	0.990	0.213	0.332	1.791
Old-age dependency	0.055	0.054	0.032	−0.023	0.117	−0.018	−0.018	−0.011	0.008	−0.039	−0.046	−0.046	−0.027	0.020	−0.099

Source: Authors' calculations.

Our central objective was to project the impact of demographic change on economic growth from 2011 to 2030 in the 12 developing Asian economies that collectively make up the bulk of the region's population and output. Our projections indicate that the region's demographic transition will have a substantial effect on its economic growth in the next two decades; in fact, the demographic dividend that drove economic growth in the past will turn into a demographic tax that will subtract from it. The magnitude and timing of the transition from dividend to tax will differ from economy to economy, but the positive impact of demography on economic growth will weaken across the region even in youthful economies where the demographic dividend will persist in 2021–2030. Our projections support the notion that a primary means of sustaining economic growth in the sample in the future will be successful adaptations to rapidly changing population structures.

Aging populations pose a number of difficult policy challenges for developing Asian nations; the unprecedented nature of their transition means that the earlier experiences of the advanced economies can provide at best only limited guidance. Although the need to prepare for older populations is greatest where aging is most advanced, youthful economies should take advantage of their larger window of opportunity to prepare also. Just as reaping the demographic dividend requires appropriate institutions and policies, so does managing the impending demographic transition. Working longer and encouraging more women to participate in the labor force can mitigate the negative impact of aging on growth. Therefore, to the extent that governments implement policy reforms that bring about those responses – more and better childcare and raising the legal retirement age – our projections overestimate the demographic effects. In this context, a particularly challenging issue for policymakers will be to provide adequate income support and healthcare for the elderly without jeopardizing growth by imposing excessive burdens on the working-age population.

NOTES

1. Taipei,China is not included in Figures 3.2 and 3.3 due to a lack of United Nations data.
2. The last time period is 2001–2007 rather than 2001–2010 due to data limitations.
3. The projection of the future labor force is obtained from Kim (2010).

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4. Population aging and aggregate consumption in developing Asia

Gemma Estrada, Donghyun Park, and Arief Ramayandi

1. INTRODUCTION

While developing Asia's financial systems were largely unscathed by the global financial crisis in 2008 and 2009, its real economies were hit hard by the deep recession in the European Union (EU) and the United States (US). Nevertheless, overall developing Asia recovered from the global crisis with remarkable resilience. The region managed to grow by 6.7 percent in 2008 and 5.9 percent even in 2009 when the world economy as a whole contracted. Growth has picked up further to 9.0 percent in 2010 and is projected at 7.8 percent in 2011 and 7.7 percent in 2012. Although these growth rates are below those before the crisis – 9.4 percent in 2006 and 10.1 percent in 2007 (ADB, 2011) – the speed and strength of the region's rebound has surpassed all expectations. It was initially driven by fiscal and monetary stimuli, but subsequently private demand is playing a bigger role.

It is tempting to view this resilience as evidence of the region's decoupling from the economies of the EU, Japan and the US (G3) as the region has continued to grow robustly despite their fragile and uncertain recoveries. The region's exports and economic growth did, however, plummet during the depth of the global crisis, primarily due to severe recessions in the G3, so the crisis has far-reaching implications for the region's growth and development in the medium and long term. The G3 are saddled with a wide range of structural problems – high household debt and impaired housing markets – that will weaken their economic growth in the future. The obvious but troubling medium-term implication is that this weakness will deprive developing Asia of a traditionally important engine for demand and growth, so it is very much in the region's interest to achieve a more even balance between domestic demand and external demand.

Rebalancing ultimately requires robust domestic demand that can come

from robust consumption, robust investment, or both. Since diminishing marginal returns on capital eventually set in as an economy's stock grows, there is a limit on investment as a source of demand and growth. Because developing Asia has relied on high saving and high investment rates to power much of its growth in the past, the scope for investment-led growth may be quite limited.[1] In contrast, there is still considerable room for growth in consumption, especially as the region becomes increasingly middle income. Large numbers of individuals and households are joining the middle class and purchasing middle-class goods and services for the first time. In addition, there is evidence that developing Asia's large and persistent current account surplus reflects under-consumption rather than under-investment (Park and Shin, 2009). Therefore, strengthening domestic consumption will not only promote economic rebalancing but may also deliver sizable economic gains.

Aggregate consumption and the share of aggregate consumption in national income depend on a number of factors. Of particular interest for our purposes are demographic variables, especially the old-age dependency ratio – the share of the elderly in the working-age population. Since individuals tend to save for retirement when they are working and dissave for their consumption when they are retired, higher dependency is likely to increase aggregate private consumption. Furthermore, higher government outlays on healthcare and pensions may also boost aggregate public consumption. This is quite important for developing Asia because the population in the region as a whole is aging. While some countries are at a much more advanced stage of population aging than others, there is nevertheless a clear, region-wide trend toward older populations driven by falling fertility and rising life expectancy. This transition implies greater aggregate consumption.

Our central objective was to examine the relationship between demography and the share of aggregate consumption in national incomes for a large cross-section of Asian economies. First, however, to find out whether older populations led to higher consumption in the past, we examined trends in the old-age dependency ratio and the share of consumption in the gross domestic product (GDP) over time and measured the time-series correlation between the two. Our goal was to estimate the relationship using a simple econometric model. A positive relationship would bode well for rebalancing. Just as youthful populations drove the high-saving, high-investment growth model, older populations that consume more and save less could lead to more vibrant domestic demand and to more balanced economies.

2. REVIEW OF LITERATURE

The economic lifecycle theory suggests that individuals tend to smooth out consumption over their lifetimes. People tend to accumulate savings during the productive working ages and dissave during the early and later stages of life. Higher percentages of young (aged 0–14) and elderly (aged 65 and older) people relative to those of working age (15–64) – the youth and old-age dependency ratios – are associated with lower aggregate saving rates since those age groups are not generally economically active.

There is a vast amount of literature investigating the economic implications of a changing demographic structure, and many studies have examined how demographic factors affect economic growth and saving. Age distribution has been found to be an important variable in explaining variations in economic growth across countries and over time. Based on a sample of 78 countries, Bloom and Williamson (1998) found that age distribution rather than population growth was the primary demographic determinant of economic growth though its effects were temporary and depended on the stage of the demographic transition. In the early stage, per capita income growth is reduced by youth dependency and by small cohorts of working-age adults. This stage is followed by a demographic dividend in which youth dependency decreases and the working-age population increases. Later, the favorable impact on economic growth diminishes as the share of the elderly rises and the demographic dividend dissipates. When the growth rate of the economically active population exceeds that of the population, per capita GDP grows. Conversely, if the dependent population grows faster than the overall population, then the model predicts lower economic growth. They found, however, that the effect of an elderly population on economic growth was positive but insignificant, which they attributed in part to the smaller percentage of elderly relative to young people. In other words, the impact of the young population tended to dominate.

Other studies have also looked at the impact of population age structure on aggregate saving to better understand the macroeconomic implications of the demographic transition. In general, these studies support the lifecycle hypothesis and conclude that a higher proportion of young people and the elderly tend to decrease the aggregate saving rate. One of the earliest studies to test this relationship was done by Leff (1969) who found that the old-age and youth dependency ratios taken separately and combined had a significant negative influence on the saving rate. He tested this relationship in 74 countries and again after disaggregating them into developed or underdeveloped. While Adams (1971), Goldberger (1973), and Ram (1982) have questioned the robustness of Leff's findings, subsequent

studies have supported the inverse association between dependency ratios and saving rates.

Kelley and Schmidt (1996) applied the Leff model to a data set of 88 countries to estimate the impact of dependency ratios on saving in the 1960s, 1970s, and 1980s. They found that dependency reduced saving in the 1980s but that the impact was small and not statistically significant in the 1960s and 1970s, suggesting change over time. Higgins and Williamson (1997) estimated the relationship between the youth and old-age dependency ratios and national saving in some Asian countries and found that higher dependency ratios tended to decrease saving rates. Higgins (1998) studied 100 countries and also found a negative relationship between dependency and saving rates. He noted, however, that the negative association between the old-age dependency ratio and saving did not necessarily indicate that elderly households were drawing down on their assets to finance consumption as it could be due to the growing aggregate burden of supporting the elderly.

Bloom et al. (2003) also confirmed the negative relationship between saving and dependency ratios. In their empirical model, they included both age structure and life expectancy to examine the impact of these variables on saving rates and showed theoretically that the pure effect of longer life expectancy was to increase saving rates. Longer life expectancy increases the optimal length of working life but not enough to offset the greater need for retirement income, so the saving rate has to rise. However, since longer life expectancy may be associated with better health and higher productivity, its impact on saving may be ambiguous. To analyze the separate effect of longer life expectancy on saving, they studied 68 countries from 1960 to 1994 and found that both life expectancy and age structure were significant determinants of saving rates: longer life expectancy had a positive effect and the dependency ratios had a negative effect.

In a subsequent study, Bloom et al. (2007) also incorporated the impact of both life expectancy and old-age dependency in their model. They explored the hypothesis that the effect of life expectancy on national saving rates depends on the nature of the social security system and found that an increase in life expectancy increased saving when the system provided universal pensions and strong incentives to retire, but that the effect dissipated with pay-as-you-go systems and high replacement rates. As in other studies, they found that an increase in the old-age dependency ratio was linked to lower saving rates.

Lifecycle theory predictions of the effects of age structure on saving thus seem to be very well supported. At the macro level, higher old-age dependency ratios tend to reduce saving rates since older individuals dissave or save less to finance consumption. Population aging, therefore,

affects economic growth through at least two channels: it reduces the size of working-age cohorts and it reduces the saving rate and hence the investment rate.

3. TRENDS IN AGING AND CONSUMPTION PATTERNS IN ASIA

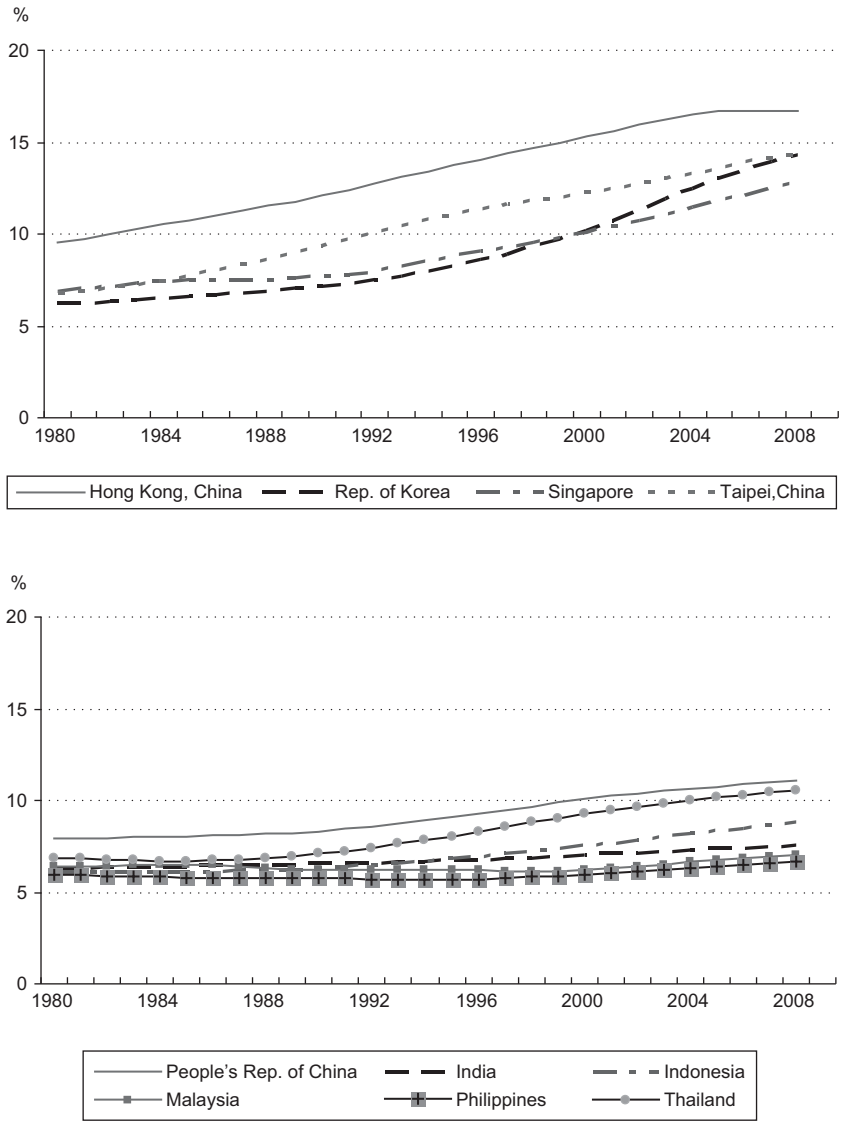
Since older populations are associated with lower saving rates, there should be a positive relationship between population aging and aggregate consumption rates because savings represent income that is not consumed. It is now widely accepted that if Asian economies were to consume a higher share of their output, it would significantly help to address global imbalances. In this context, understanding the effects of population aging on consumption in Asia may provide valuable policy insights. For example, if the old-age dependency ratio has a strong positive effect on consumption, then to some extent population aging will naturally and gradually promote domestic demand and hence rebalancing. On the other hand, if the ratio does not have a perceptible effect on consumption, the need for policies that promote rebalancing will be greater.

Figure 4.1 charts the old-age dependency ratio in ten Asian economies between 1980 and 2008 and shows that the ratio has risen steadily and more rapidly in the newly-industrializing economies (NIEs) of Hong Kong, China; Republic of Korea; Singapore, and Taipei,China than it has in the People's Republic of China (PRC), India, Indonesia, Malaysia, the Philippines and Thailand, and that the old-age dependency ratios in the latter group in recent years have been close to those of the NIEs 25 years ago, that is, between 5 and 10 percent.

Figure 4.2 shows trends in the share of consumption in GDP. In Hong Kong, China, the Republic of Korea, and Taipei,China, the rates fell between 1980 and 1990 but increased slightly after that, while in Singapore, consumption has been erratic, with visible declines in the early 1980s, between the late 1980s and 1990s, and again in recent years.

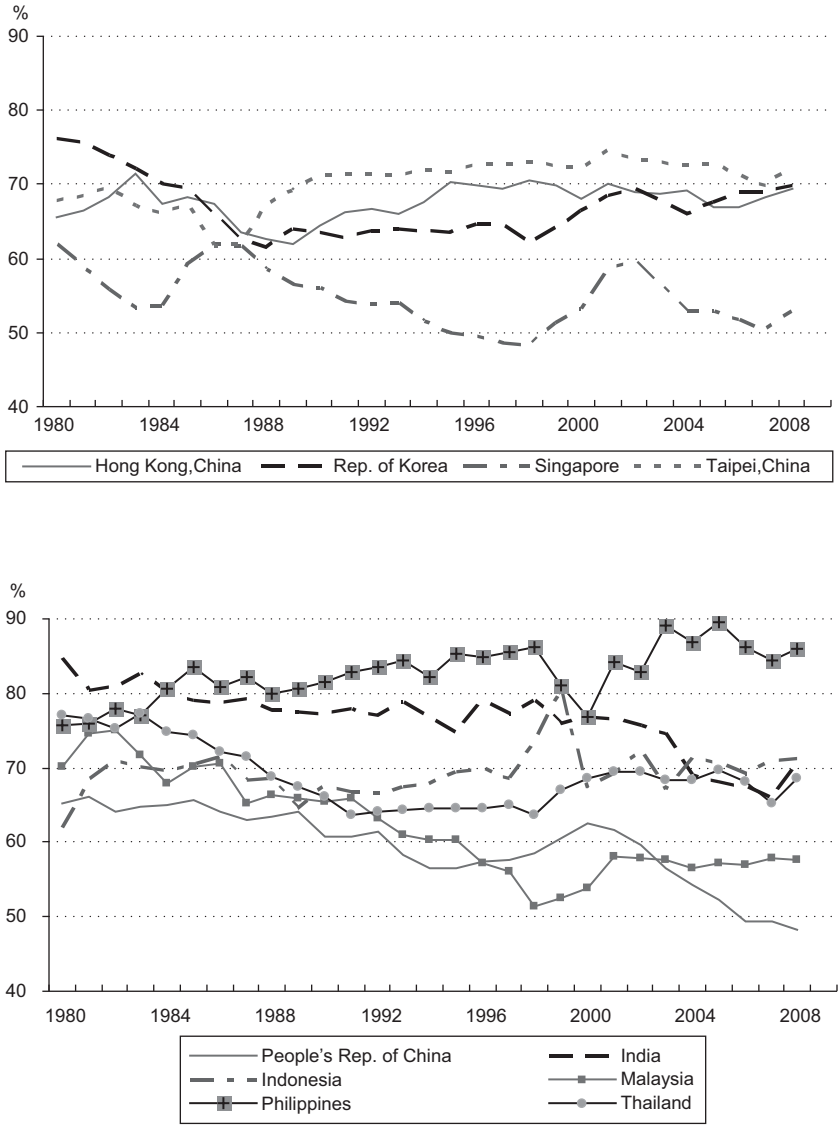
Consumption patterns have also varied among the less developed economies. Rates in the PRC and India have steadily declined since 1980 while in the Philippines they have generally increased. In both Malaysia and Thailand, consumption declined in the 1980s and 1990s but began to rise at the turn of the century.

Figure 4.3 shows the trends in both aging and consumption for each economy. In Hong Kong, China, the Philippines, and Taipei,China, the old-age ratio and share of consumption in GDP have been gradually rising since the 1980s, but there was no discernible positive association between



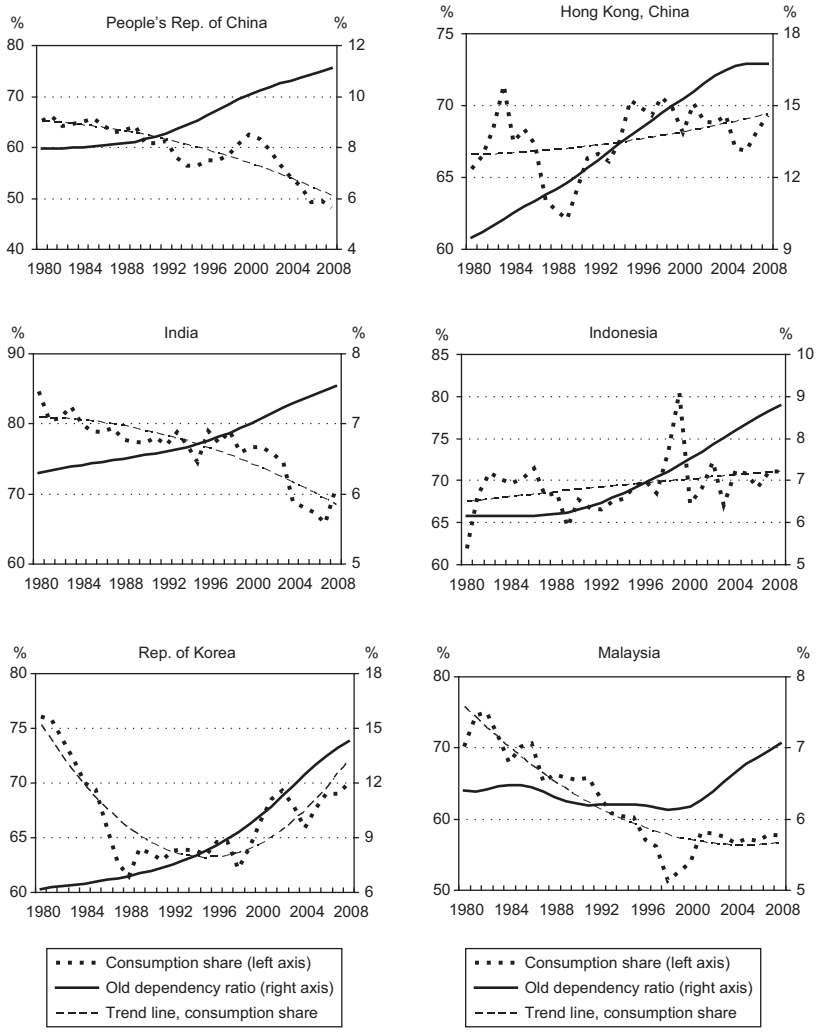
Source: World Bank (2010), accessed 1 June 2011.

Figure 4.1 Old-age dependency ratios for ten Asian developing economies from 1980 to 2008



Source: World Bank (2010), accessed 1 June 2011.

Figure 4.2 Share of consumption in gross domestic product for ten Asian developing economies from 1980 to 2008



Source: World Bank (2010), accessed 1 June 2011.

Figure 4.3 Aging and consumption for ten Asian developing economies from 1980 to 2008

aging and consumption in the other economies. We further checked for an overall correlation between consumption and the old-age dependency ratios in the ten economies from 1980 to 2008, and found that it was negative in five and positive in five, but relatively low (Table 4.1). A time-series

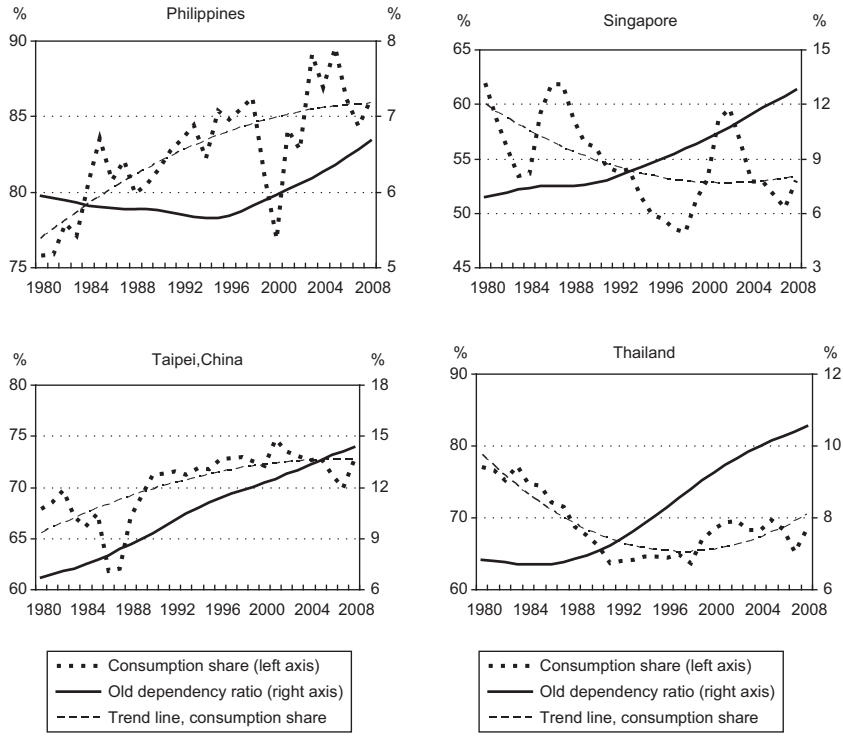


Figure 4.3 (continued)

correlation, for each economy for the whole sample period found strong negative correlations for the PRC and India and a strong positive correlation for Taipei,China. Singapore and Thailand also had negative correlations, although weaker than those for the PRC and India. Overall, our results cast doubt on the robustness of a positive link between aging and consumption in developing Asia, so we performed a more formal, econometric analysis of this relationship.

4. ECONOMETRIC ANALYSIS

To examine the link between age structure and consumption more formally, we analyzed data from the World Bank's World Development Indicators (WDI) online database from 153 countries averaged over the decade 1998–2007. The time period was relatively short, but the use of more recent data allowed us to include more economies. We used a

Table 4.1 Correlation between old-age dependency ratio and share of consumption in gross domestic product for ten Asian developing economies, 1980–2008

Economy	1980–2008
China, People's Rep. of	−0.84
India	−0.88
Hong Kong, China	0.39
Korea, Rep. of	0.01
Singapore	−0.42
Taipei,China	0.71
Indonesia	0.33
Malaysia	−0.02
Philippines	0.37
Thailand	−0.40
All 10 Asian economies	*−0.24*[c]
Developing Asia[a]	*−0.38*[c]
Non-developing Asia[b]	*−0.26*[c]
All economies	*−0.20*[c]

Notes:
a. Covers 16 economies.
b. Covers 90 economies.
c. Correlations are significant at 1% level.

Source: Authors' calculations based on World Bank (2010), accessed 1 June 2011.

cross-section regression analysis to explore variations between economies rather than the changes in a given economy captured by panel econometric techniques. As Higgins (1998) points out, differences in age distributions among countries tend to be more visible than changes within a country. For example, in 2007 the old-age dependency ratio in the Republic of Korea was 13.9 percent, compared with 6.4 percent in the Philippines, but changes in their elderly populations over time were not that pronounced. Between 2002 and 2007, the elderly population increased by 2.6 percent in the Republic of Korea and by 0.5 percent in the Philippines (World Bank, 2010).

4.1 Framework and Data

We did a regression analysis on the average share of consumption in GDP (C/Y) over 1998–2007 by controlling for a set of determinants. Although we were mainly interested in the link between population aging and

consumption, we included a set of additional, standard control variables to minimize misspecification. The basic model is as follows:

$$\frac{C}{Y} = \alpha + \beta_1 D_0 + \beta_2 D_y + \beta_3 \frac{Y}{P} + \beta_4 P + \varepsilon$$

The dependent variable (C/Y) is the share of total consumption in GDP. We included both the youth and old-age dependency ratios in the model (D_y and D_0, respectively). D_0, our proxy for an aging population, was computed as the decade-long average of the ratio of people older than 64 to the working-age population aged 15–64. D_y refers to the decade-long average of the ratio of people younger than 15 to the working-age population.

Real GDP per capita (Y/P) was included as a control variable. As this variable is averaged over a relatively long period of time, it can be a proxy for permanent income and is often used to analyze the consumption smoothing hypothesis. This variable can have both income and substitution effects on consumption (or saving). Therefore, its effect on the consumption rate will depend on which effect dominates. If the income effect dominates, individuals feel wealthier due to higher permanent incomes and therefore will prefer leisure to work, will retire earlier, and thus will tend to save more for retirement. In contrast, if the substitution effect dominates, higher permanent incomes will induce consumers to work longer, thus reducing the need to accumulate more savings for retirement (Bloom et al., 2003). In short, a lower share of consumption in GDP – a high saving rate – is associated with the income effect, while a higher consumption rate – a low saving rate – is associated with the substitution effect.

Another control in the model was population growth (P); its effect on consumption was ambiguous. On one hand, population growth could imply a growing youth population, which would lead to increased consumption and lower saving rates. On the other hand, population growth could also imply a declining elderly population and a rising working population that would reduce consumption and increase saving. The first is the dependency effect and the second is the rate-of-growth effect (Mason, 1988).

Our data set covered 31 developing Asian economies and 122 countries outside the region. Table 4.2 highlights the differences in consumption shares and old-age dependency ratios between the Asian economies and the rest of the sample. To accomplish our main objective, we extended the basic model to test for a possible difference in the way dependency ratios affected the rate of consumption in the Asian economies relative to the rest of the sample.

Table 4.2 Descriptive statistics

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
Consumption, share in GDP	153	80.962	13.115	44.231	112.604
Developing Asia	*31*	*77.187*	*14.605*	*53.541*	*112.604*
Non-developing Asia	*122*	*81.922*	*12.594*	*44.231*	*108.352*
Old-age dependency ratio	153	11.702	6.992	1.405	28.526
Developing Asia	*31*	*8.859*	*3.694*	*4.049*	*20.189*
Non-developing Asia	*122*	*12.425*	*7.445*	*1.405*	*28.526*
Youth dependency ratio	153	50.511	21.758	21.137	102.975
GDP per capita, ln	153	7.805	1.575	4.478	10.794
Population growth	153	1.322	1.106	−1.512	4.687

Source: Authors' estimates.

4.2 Results and Discussion

Tables 4.3a and 4.3b report the results of our regression analysis. All regressions controlled for both the old-age and youth dependency ratios, for GDP per capita, and for population growth, but there were some variations in specifications. For all specifications we found a robust negative and significant impact of real GDP per capita on the share of consumption, implying that the income effect is at play. This result is consistent with Bloom et al. (2003), among others, who found a positive link between real GDP per capita and the gross domestic saving rate. We found that estimated coefficients of population growth were significant in most specifications and were consistently negative.

Our baseline specification is reported in column (1). The result is perfectly consistent with the literature on the macroeconomic implications of population aging. The control variables explain about 40 percent of the variations among economies in aggregate consumption shares. The dependency ratios are associated with greater consumption. By extension, this implies that the ratios are associated with lower saving rates, a result that is very much in line with existing studies. Again as in the existing literature, our results suggest that the effect of the old-age dependency ratio on the share of aggregate consumption is stronger than that of the youth dependency ratio.

Table 4.3a Regression results (dependent variable: share of consumption in gross domestic product)

	(1)	(2)	(3)	(4)	(5)
Old-age dependency ratio	0.854	1.729	0.732	0.662	0.632
	(0.177)***	(0.772)**	(0.185)***	(0.189)***	(0.193)***
Youth dependency ratio	0.368	0.370	0.319	0.296	0.282
	(0.119)***	(0.123)***	(0.129)**	(0.134)**	(0.131)**
GDP per capita, ln	−3.547	−3.633	−3.953	−4.100	−4.029
	(1.087)***	(1.070)***	(1.171)***	(1.199)***	(1.207)***
Population growth	−2.878	−2.199	−3.183	−2.963	−2.946
	(1.595)*	(1.616)	(1.548)**	(1.556)*	(1.536)*
Old-age dependency ratio, squared		−0.027			
		(0.022)			
Old-age dependency ratio x developing Asia dummy			−0.445	−1.423	−2.651
			(0.248)*	(0.637)**	(1.338)**
Old-age dependency ratio, sq x developing Asia dummy				0.077	0.138
				(0.039)*	(0.076)*
Youth dependency ratio x developing Asia dummy					0.108
					(0.107)
Constant	83.846	78.291	92.152	95.314	95.755
	(12.701)***	(14.494)***	(14.318)***	(14.892)***	(14.706)***
Observations	153	153	153	153	153
Adjusted R-squared	0.398	0.399	0.409	0.418	0.418

Notes:
Robust standard errors in parentheses.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Source: Authors' estimates.

Table 4.3b Regression results (dependent variable: share of consumption, in gross domestic product)

	(6)	(7)	(8)
Old-age dependency ratio	0.885	0.691	0.761
	(0.258)***	(0.187)***	(0.193)***
Youth dependency ratio	0.318	0.225	0.099
	(0.139)**	(0.114)*	(0.111)
GDP per capita, ln	−3.875	−4.205	−5.589
	(1.239)***	(1.097)***	(1.156)***
Population growth	−2.572	−1.779	−0.155
	(1.554)*	(1.340)	(1.351)
Old-age dependency ratio × developing Asia dummy	−1.292	−1.670	−1.893
	(0.650)**	(0.551)***	(0.581)***
Old-age dependency ratio, squared × developing Asia dummy	0.067	0.091	0.104
	(0.040)*	(0.036)**	(0.038)***
Old-age dependency ratio × aging advanced economy dummy	−0.180		
	(0.116)		
Constant	89.858	96.984	111.271
	(16.170)***	(13.513)***	(13.462)***
Observations	153	145	133
Adjusted R-squared	0.419	0.422	0.432

Notes:
Robust standard errors in parentheses.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Source: Authors' estimates.

In short, our results are consistent with those of earlier studies. We found that population aging tends to increase the aggregate share of consumption and decrease the aggregate saving rate. We also tested for possible non-linear effects of aging on consumption by adding a squared term for the old-age dependency ratio to the basic equation. The results are in column (2); they do not support a non-linear effect.

4.2.1 How different is Asia?

Table 4.1 hints at a possible difference in the way aging is associated with consumption in Asia compared with the rest of the world. To formally test for this possibility, we separated out the developing Asian economies in our sample and tested for a differential effect of aging. The results are

in column (3) of Table 4.3a, and indicate that old-age dependency had a smaller impact on the region than it did on the rest of the world. This implies that the effect of population aging on the saving rate is stronger in Asia than in the rest of the world. The weaker link between aging and consumption in developing Asia may be attributed to the region's high saving rate despite rising old-age dependency ratios.

We further extended the model to examine any non-linear effects of population aging on developing Asia by adding the interaction between the squared term of the old-age dependency ratio and a developing Asia dummy. The results in column (4) indicate that the impact of the old-age dependency ratio on consumption is negative for developing Asian economies, but after the ratio reaches a certain level, it is positive, as shown in the significantly positive coefficient of the squared term. This suggests that up to a certain critical point, a rising share of elderly people in developing Asia is associated with a falling share of consumption in GDP. Based on our results, this critical point is at about 5 percent (the ratio of the sum of the old-age dependency ratio coefficient to twice the coefficient for the squared old-age dependency ratio for developing Asia). After developing Asia passes this critical point, however, the relationship changes course, and the share of consumption increases as the old-age dependency ratio rises. The threshold at which the impact of the old-age dependency ratio on the share of consumption in developing Asia is the same as that for the rest of the world is about 9 percent.

In column (5), we tested for the possibility that the impact of youth dependency on consumption in developing Asia was different from that in the rest of the sample. Our result suggests that it is not significantly different. As in column (4), the interaction between the term and a developing Asia dummy was significant. Also, estimates again provide support for the non-linear effects of the youth dependency ratio in developing Asia.

Thus, although at a certain point the aging population in developing Asia will increase aggregate consumption, it will do so to a lesser extent than in the rest of the sample. This further strengthens the case for deliberately pursuing policies that promote domestic demand and rebalancing.

4.2.2 Impact of aging on advanced aging economies and checking for robustness

In column (6) of Table 4.3b we examined whether the impact of the old-age dependency ratio on consumption in the 20 high-income Organisation for Economic Co-operation and Development (OECD) economies in the upper 80 percent of the old-age dependency ratio was different.[2] It is interesting to test for this impact to derive implications for high-income Asian economies that are reaching advanced stages of aging. Column (6) uses the

same set of variables as that in column (4) but adds an interaction between the old-age dependency ratio and a dummy variable for advanced aging economies. The results indicate that the impact of aging is no different for these economies than for others.

In columns (7) and (8), we checked the robustness of our results in column (4) by restricting our set of countries as follows. In column (7), we dropped eight economies including two in developing Asia that have consumption shares above 95 percent.[3] These economies also have consumption shares that are above 100 percent, that is, that exceed their incomes. In column (8), we included only economies with populations over 1 million, following Kelley and Schmidt (1996) and Bloom et al. (2003). Applying this restriction left us with a sample of 133, of which 26 were developing Asian economies.

It is interesting to note that adopting either restriction improves the fit of our regression analysis. The coefficients of the old-age dependency ratios in columns (7) and (8) are also similar to those in column (4). Furthermore, the coefficients of the interactive term between the old-age dependency ratio and the developing Asia dummy are statistically significant, and the absolute values of these coefficients are higher than those in column (4). We again see significant, non-linear effects for the region of consumption on aging, with estimated thresholds that are slightly higher than those computed based on column (4). Therefore, our most interesting Asia-specific results – the negative impact of the old-age dependency ratio on consumption and the non-linear effect of aging – remain robust and consistent across different specifications. Most significantly, the findings from our regression analysis in columns (7) and (8) reinforced our central overall finding in column (4): the impact of aging on consumption in developing Asia is less than in the other economies in the sample.

Why is this true? Aggregate saving in the region has been relatively high, and so far it does not seem to be influenced by population aging. One possible explanation lies in the way the elderly population finances consumption in developing Asia. While the elderly elsewhere in the world tend to rely more on government transfers, the Asian elderly tend to rely mostly on their accumulated assets as sources of old-age support (Lee and Mason, 2011). As a result, the need to prepare for retirement encourages Asians, including those who are still in their productive years, to save and accumulate assets.

5. CONCLUSIONS AND POLICY IMPLICATIONS

The key to rebalancing Asian economies is stronger domestic demand, and the key to stronger domestic demand is greater consumption. Existing

studies examine the impact of demographic variables on the saving rate, but it is worthwhile to examine their impact on consumption, which has a more direct effect on rebalancing. Investment can lead domestic demand and hence rebalancing in only parts of the region, but there is substantial room for growth in living standards and consumption levels throughout. A vibrant and sustainable economy ultimately requires healthy levels of consumption since consumption is the final demand for goods and services, whereas investment only adds to productive capacity.

Our preliminary analysis indicated that while population aging is indeed a region-wide trend, there was no uniform regional pattern of consumption as a share of GDP. Our examination of the correlation between the old-age dependency ratio and consumption over time in ten major Asian economies also failed to yield a common pattern. We then examined the impact of the old-age dependency ratio on the share of aggregate consumption in national income using data from 153 economies controlling for other variables such as per capita income.

For the complete sample, we found a positive relationship between old-age dependency and consumption, a result that was consistent with the findings of other studies, but for the 31 developing Asian countries in the sample we found evidence of a negative relationship, implying that their older populations *reduce* the share of consumption in national income. We also found a positive relationship above a certain level of the dependency ratio, though it was weaker for developing Asia than for the rest of the sample.

There are a number of ways to interpret these results. One is simply that developing Asia is still relatively youthful despite rapid population aging. The old-age dependency ratio there is 8.86 percent, which is lower than the 12.43 percent in the rest of the world and the 11.70 percent for the world as a whole (Table 4.2). Another interpretation is that there could be a threshold old-age dependency ratio below which population aging does not have a perceptible effect on consumption. In fact, the ratio might be dominated by the high saving and low consumption of the working-age population, as seems to be the case in developing Asia. Above the threshold, however, population aging has a positive effect on consumption. The findings of Lee and Mason (2011) from household data lend further support to this interpretation. They found that Asians tend to save for retirement instead of depending on government transfers or family support.

The most straightforward policy implication of our results is that population aging in developing Asia may not contribute significantly to robust consumption and domestic demand and hence to rebalancing, at least in economies in the early stages of the demographic transition. The obvious corollary is that governments must continue to pursue a wide range of

policies that strengthen domestic demand and that promote services and other sectors geared toward domestic demand, though such policies may affect the relationship between population aging and aggregate consumption. For example, in the rebalancing debate one of the most widely touted policy options for strengthening private consumption is to increase government expenditures on healthcare, education, pensions, and social protection. The underlying idea is that such spending will mitigate the need for saving and thus encourage households to spend more. Providing healthcare and pensions to the elderly will reduce the risks and uncertainties they face, so they will be likely to consume more.

NOTES

1. This is especially true in the absence of productivity growth.
2. Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Japan, Luxembourg, Netherlands, Norway, Portugal, Slovenia, Spain, Sweden, Switzerland, and United Kingdom.
3. Cape Verde, Comoros, Jordan, Moldova, Serbia, Sierra Leone, Tajikistan, and Tonga.

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5. The economic lifecycle and support systems in Asia

Sang-Hyop Lee and Andrew Mason

1. INTRODUCTION

Complex systems of institutions and economic mechanisms make the periods of dependency in the economic lifecycle possible. An understanding of the lifecycle and of reallocation systems is fundamental to understanding the support system in an economy and the consequences of changes in population age structure. First, countries vary greatly in per capita economic lifecycles. Second, aggregate profiles vary greatly as well because population age structures differ. Third, countries vary greatly in the systems they employ to fund the lifecycle deficit, that is, their reallocation systems. Our objective is to describe the support systems in Asia in detail and to highlight the importance of those support systems for economic growth, fiscal sustainability, and other policy issues.

The importance of support systems in Asia will increase substantially in the coming years because population aging is expected to be very rapid. Since the elderly will live longer and will be healthier, attitudes and policies about working life and retirement will and must change. Just working longer will not be sufficient. The current low reliance on public transfers will allow Asian economies to develop sustainable systems less encumbered by obligations to current and future generations of elderly (Mason and Lee, 2011). Keeping publicly funded healthcare for the elderly at a reasonable level will be crucial to developing sustainable systems.

The impacts of changing support systems on other means of support will be significant. Relying heavily on public transfers may reduce reliance on labor income and reduce saving, but if public transfers are maintained at low levels and labor income and familial transfers play a limited role in the future, Asia's elderly will have to rely on accumulating assets. This will help to create capital-intensive economies that can maintain standards of living as other support systems grow slowly or decline.

Table 5.1 Ratio of labor income to per capita consumption of children and young adults in eight Asian economies in various years

	Age Group			
	0–19	15–19	20–24	25–29
PRC (2002)	0.11	0.25	0.96	1.99
India (2004–05)	0.09	0.24	0.63	1.09
Indonesia (2005)	0.09	0.28	0.65	0.93
Japan (2004)	0.01	0.03	0.50	1.05
Republic of Korea (2000)	0.05	0.14	0.73	1.33
Philippines (1999)	0.07	0.18	0.59	1.03
Taipei,China (1998)	0.03	0.10	0.65	1.30
Thailand (2004)	0.07	0.20	0.65	1.11

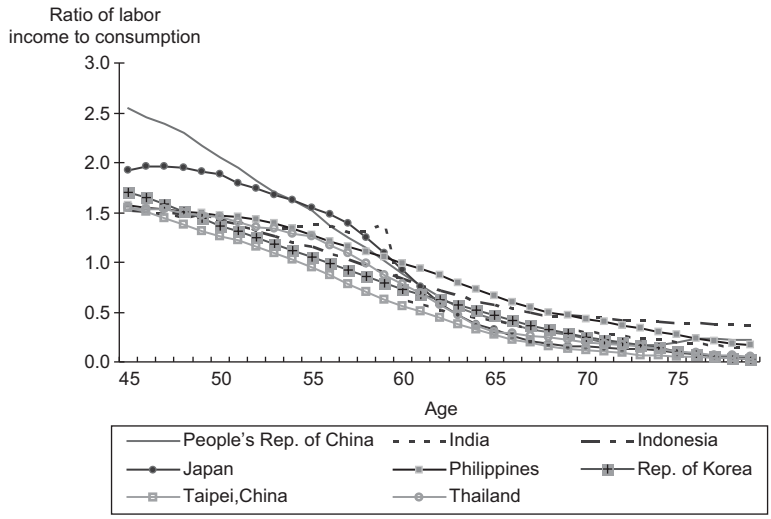
Note: These are synthetic cohort values that are calculated using recent data on survival weights of the United States. Values are the ratio of the sum of per capita labor income at each single year of age and the sum of per capita consumption at each single year of age within the age group.

Source: National Transfer Accounts database, accessed 1 July 2011.

2. LABOR INCOME

The young and the old can be somewhat self-sufficient to the extent that they work and generate the resources they need to fund their consumption. For the young, a critical decision is choosing between school and work. By continuing in school, the young sacrifice current income, but by investing in human capital, they realize greater incomes in the future. The elderly may opt for more leisure at the end of life and withdraw from the labor force. In either case, a longer working life yields greater labor income but at a cost not captured in standard measures of economic performance. For the many developing Asian economies that are relatively young, the transition to the workplace is a critical issue. The workforces of the more advanced Asian economies, on the other hand, are increasingly older; their success in dealing with changing age structures will depend more on how successfully they deal with the transition out of the labor force.

Individuals younger than 20 do not support themselves through their labor to any significant degree in any of the Asian economies for which estimates are available, and the labor income of children plays a secondary role even in the lower-income countries (Table 5.1). By their late teens children in the People's Republic of China (PRC), India, and Indonesia are funding about 25 percent of their consumption through their labor



Source: National Transfer Accounts database, accessed 1 July 2011.

Figure 5.1 Labor income funding consumption by single years of age from 45 to 79 in recent years for eight Asian economies

income, while those living in the Philippines and Thailand are funding about 20 percent.

The picture changes as they enter their twenties. In Japan, those in their early twenties contribute the least to their own support, funding only half of their consumption, but in their late twenties they are funding all of their consumption through their labor. Individuals in their early twenties have relatively high labor incomes in the PRC and the Republic of Korea, but the differences among the other economies are relatively small, with young adults aged 20–24 funding between 59 percent and 65 percent of their consumption through their labor income. In the Republic of Korea and Taipei,China, workers in their late twenties have labor incomes that exceed their consumption by over 30 percent. Labor income is especially high relative to consumption among Chinese workers in their twenties, a feature driven in large part by the high saving rates and low levels of consumption at all ages in the PRC.

Labor income peaks at relatively young ages in the eight Asian economies in Figure 5.1 and then drops for individuals in their late forties. Note that this is a cross-sectional profile; longitudinal profiles will peak at a later age because the cross-sectional profiles shift upward over time. Labor income is quite high relative to consumption at age 45 in the PRC and

Japan, but for different reasons. In the PRC, saving rates are very high, thus labor income is high relative to consumption, which is low at all ages, while in Japan the seniority-based wage system leads to steady increases in labor income until relatively late in working life.

In all eight economies, there is a relatively rapid transition to low incomes at older ages. Labor income drops below consumption at age 55 in Taipei,China followed by the Republic of Korea at 56 and Indonesia and Thailand at 58. In none do 60-year-olds produce more than they consume. In general, labor income is more important at older ages in low-income countries, as discussed in Mason and Lee (2011). Here we see that Indonesia and the Philippines have high labor incomes at old ages relative to more advanced Asian countries. This limited time-series evidence is consistent with the observation that economic growth leads to lower labor income at older ages. A relatively long time series for Taipei,China shows a sharp decline in labor income at older ages, bearing out this generalization.

The low level of labor income at older ages suggests that delaying retirement might provide an important mechanism for reducing old-age dependency in countries that are aging rapidly. Lee and Ogawa (2011) explore this idea by estimating the effect of delaying retirement on the labor income of those aged 65–74. The effect is relatively small for many developing Asian countries because older adults already have relatively high activity rates. The problem is that their productivity is low, but reducing unused productive capacity would have little effect. Older workers may have relatively low earnings because they are employed in low-productivity sectors, or because they have less education than young workers, or because they are forced into low-productivity jobs by mandatory retirement provisions and inflexible labor markets. The key to raising labor income at older ages in many Asian countries is to improve the productivity of older workers; reducing impediments to continued employment may also serve to reduce the dependency of older adults.

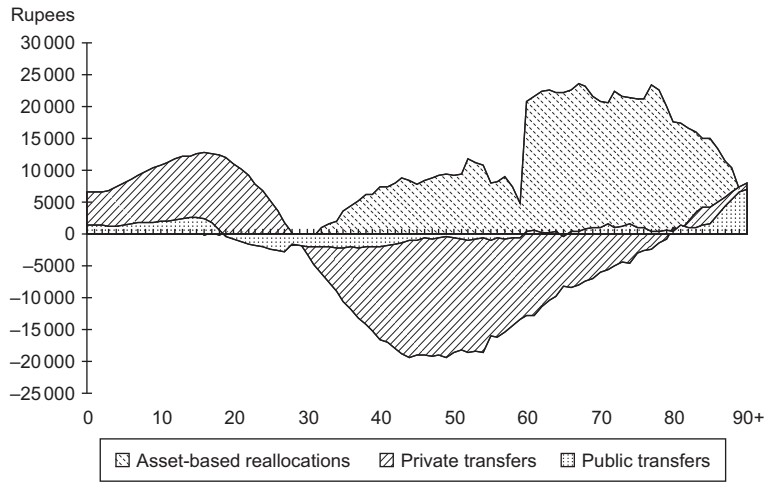
3. THE AGE REALLOCATION SYSTEM

Children and the elderly consume more than they produce, so economic mechanisms are required to shift resources from the surplus working ages to the deficit ages. The economic system that fulfills this critical need is called the age reallocation system. It consists of three components: public transfers, private transfers, and asset-based reallocations. Countries differ considerably in the ways that they deal with age reallocations, with important implications for the effects of population aging on their economies.

Local, regional, and national governments play an important role by taxing working-age adults and providing benefits to the young and the old. Education, public pensions, and healthcare are important examples of public-transfer programs that serve this purpose. Parents and grandparents perform a similar role by using their resources to support children, and to varying degrees, adult children provide for elderly parents. There are important differences between government transfers and familial transfers, however. Families are informal institutions, and transfers among members are more or less voluntary, although heavily influenced by social conventions and deeply ingrained attitudes. Public transfers, in contrast, are governed by law and are not voluntary. Asset-based reallocations refer to the flows across ages realized by acquired assets, including debt. Asset-based reallocations rely on inter-temporal exchanges and are heavily dependent on well functioning legal institutions and financial markets, but even in a very traditional setting, individuals can accumulate real assets that can be relied on later in life. In more contemporary settings, individuals can accumulate pension funds or personal saving during their working years and then rely on asset income or on dissaving those assets during retirement. Individuals can also borrow to finance their present consumption and reduce consumption in later periods to repay the loans.

The important contribution of the National Transfer Accounts (NTA) Project was to improve the ability to measure and to understand how economic resources are reallocated from surplus to deficit ages. The NTA provide a comprehensive measure that has been lacking, for example by estimating the extent to which the elderly rely on dissaving and familial transfers, including intra-household transfers. This feature of the NTA is very important for studying support systems in Asia where familial transfers are significant. Moreover, the analysis shows how in developed Asian countries the dependence of the elderly on their children for economic support is sharply declining. More detailed information on the methodology for calculating NTA is available from Mason et al. (2009); from Lee et al. (2008); or on the project website, www.ntaccounts.org.

The main features of the age reallocation system are illustrated in Figure 5.2, which reports per capita net economic flows by age in India in 2004 and 2005. Flows to both children and the elderly are shown to emphasize that transfers go in both directions – upward to the elderly and downward to the young. Children depend mostly on a combination of public and private transfers. The support system for older adults varies considerably with age in India, as it does in most countries. Those aged 60 and older rely primarily on assets while public transfers are more important for the very old. Asset-based reallocations increase abruptly at age 60 because labor income continues to grow until age 60 then drops very



Source: NTA database, accessed 1 July 2011.

Figure 5.2 Per capita net flows by age in India in 2004 and 2005

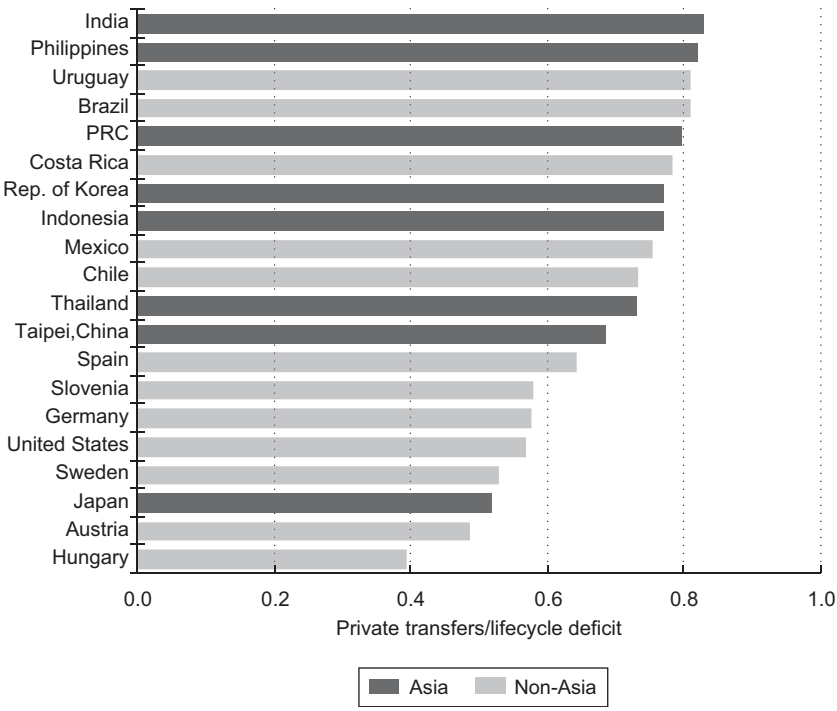
rapidly thereafter. Those younger than age 79 gave more to their descendants than they received, while those in their mid to late eighties and older relied heavily on their adult children.

Two features of Figure 5.2 are notable. First is the substantial difference in the composition of transfers to the elderly versus transfers to the young. Per capita private transfers to the young are much more important than per capita public transfers. For the old, the opposite is true. The second feature is the importance of assets for the elderly, as those in their sixties and seventies rely heavily on them. As we shall see in the following sections, however, support systems vary considerably from country to country.

3.1 Support Systems for Children

In countries with relatively young age structures like India, providing for the material needs of children is a great challenge, especially the needs of young children who are entirely dependent on others. In developing countries, the gap between consumption and labor income for children is filled almost entirely by a combination of public and private transfers.

Although public transfers to children (and to the elderly) are both high in European economies, the same is not true in Latin America (Figure 5.3). There, public transfers to the elderly are quite large but public transfers to



Notes:
These are synthetic cohort values calculated by summing per capita consumption for ages 0 to 19 and dividing by the sum of the per capita lifecycle deficit for ages 0 to 19.
Years: Austria (2000); Brazil (1996); Chile (1997); People's Rep. of China (2002); Costa Rica (2004); India (2004); Indonesia (2005); Republic of Korea (2000); Germany (2003); Hungary (2005); Japan (2004); Mexico (2004); Philippines (1999); Spain (2000); Slovenia (2004); Sweden (2003); Taipei,China (1998); Thailand (2004); United States (2003); Uruguay (2006).

Source: NTA database, accessed 1 July 2011.

Figure 5.3 Private transfers as a proportion of the lifecycle deficit for ages 0–19 in Asian and non-Asian economies

children are not. In a few high-income economies outside Asia, net public transfers to children are larger than net private transfers, that is, the state bears the cost of children to a greater extent than the family. Two examples are Hungary and Austria.[1] In most rich economies, however, private transfers to children fund more than half of their lifecycle deficit. In Japan, for example, private transfers cover 52 percent of the cost of raising a child from birth to age 19.[2] In the United States (US), families

assume 57 percent of the cost of raising children. In the six European economies in Figure 5.3, private transfers as a percentage of the lifecycle deficit over the childhood years vary from a low of 40 percent in Hungary to a high of 64 percent in Spain.

In Latin America and in Asia, Japan aside, families bear a higher share of the cost of children, and the public sector plays a less important role. In Taipei,China, private transfers to children are just under 70 percent of the total resources they require. In India, the private share is the highest, at 83 percent of the total, followed by the Philippines at 82 percent.

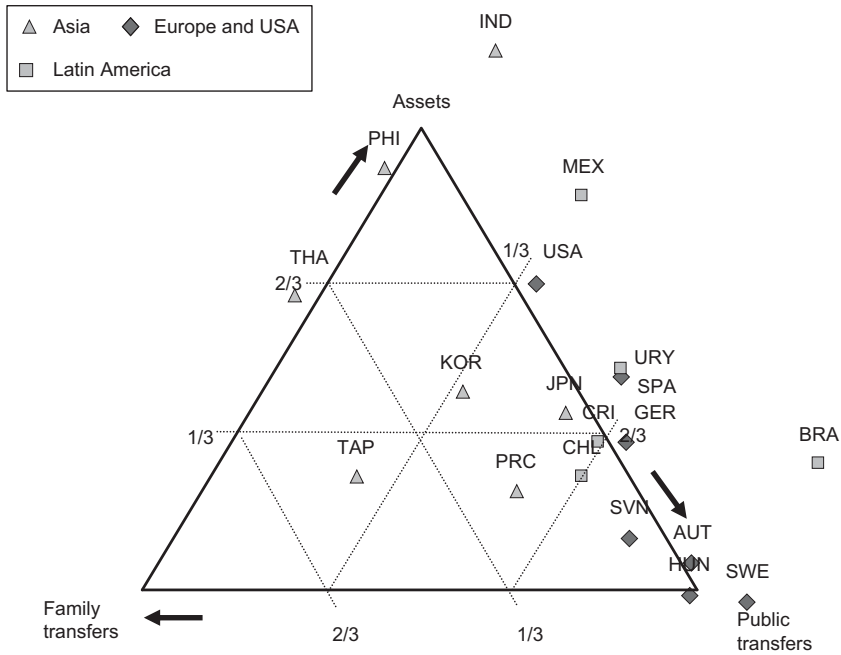
Clearly there is a close relationship between development level and the importance of private transfers (not shown). The simple correlation between purchasing power parity adjusted per capita income and the private transfer share is −0.79. An increase in per capita income of $1000 is associated roughly with a decline in the share of the deficit funded through private transfers by 0.8 percentage points. The Republic of Korea and the US have high private transfers relative to the predicted level. Austria and especially Hungary have low private transfers relative to the predicted values.

The size of private transfers to children in Asia is potentially important for a number of reasons. In some Asian economies, private transfers seem to be substitutes for public transfers. The per capita consumption of children in India, Indonesia, and the Philippines, is on the low side relative to consumption by adults aged 20–64 while in PRC, Republic of Korea, and Taipei,China, private consumption by children is higher, relative to consumption by adults, than in any other NTA economy. Moreover, total consumption by children in these economies tends to be relatively high compared with others (Tung, 2011).

An interesting possibility is that the high private transfer burden in Asia may serve to depress childbearing. This may be true, but the simple correlation between the total fertility rate and the private transfer proportion is positive, that is, high fertility is associated with families bearing a higher share of the cost of children. Thus, the private cost of children is particularly high in high fertility countries. Not only do couples have more children in low-income countries, they receive less help from the public sector in providing for their children as well.[3]

3.2 Support Systems for the Elderly

Figure 5.4 shows the relative importance of the three sources of old-age support – assets, private transfers and public transfers – in Asian, Latin American, and European economies for which estimates are available, and in the US. Private and public transfers are measured as net



Note: AUT = Austria; BRA = Brazil; CHL = Chile; PRC = People's Rep. of China; CRI = Costa Rica; IND = India; KOR = Rep. of Korea; GER = Germany; HUN = Hungary; JPN = Japan; MEX = Mexico; PHI = Philippines; SPA = Spain; SVN = Slovenia; SWE = Sweden; TAP = Taipei,China; THA = Thailand; USA = United States; URY = Uruguay.

Source: NTA database, accessed 1 July 2011.

Figure 5.4 Support systems for people aged 65 and older in recent years for 18 national transfer account economies

transfers – transfers received less transfers made – relative to consumption in excess of labor income for those aged 65 and older. Reliance on assets is measured as asset-based reallocations, that is, asset income less savings relative to consumption in excess of labor income for those aged 65 and older. The lifecycle deficit – consumption less labor income – must equal net public transfers plus net private transfers plus asset-based reallocations; hence, the three components of the support systems must sum to 1.

The support systems of Asian and other economies around the world are conveniently represented by the triangular graph in Figure 5.4. Any of the three vertices of the triangle represents exclusive reliance on one of the three sources of support, leaving the other two at zero. Along the sides of the triangle, one source is zero while the other two vary. Movement along

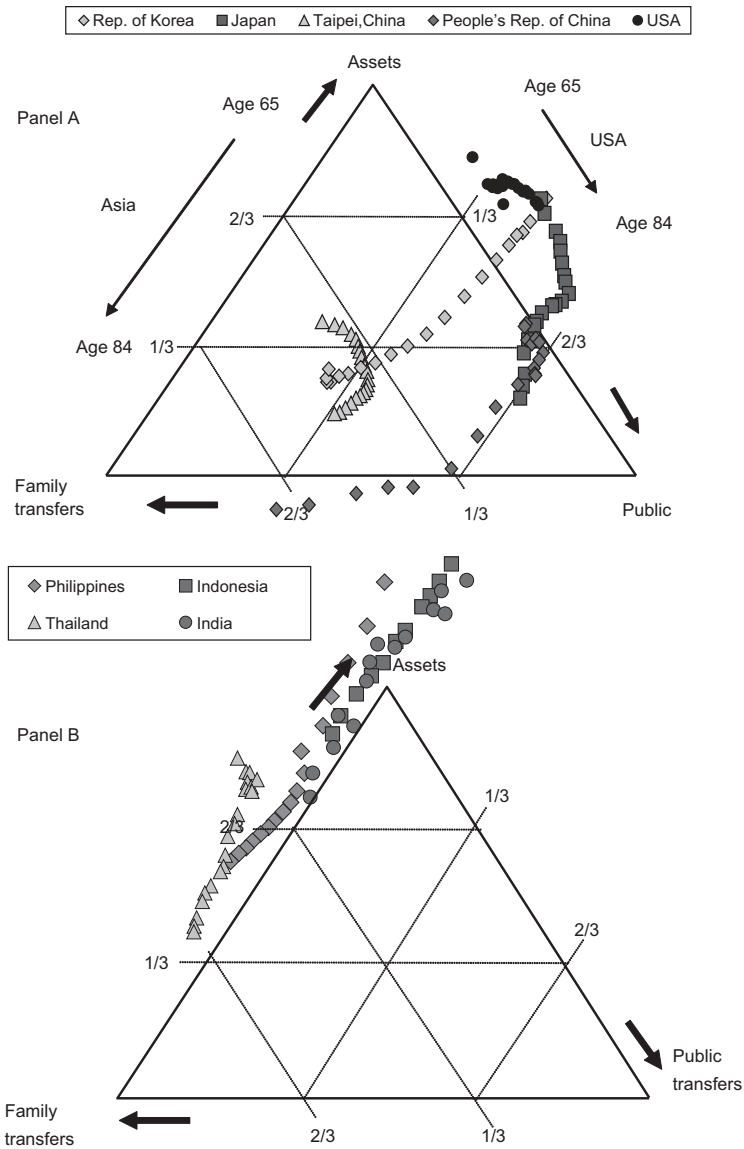
one of the gridlines implies that one source is constant at 1/3 or 2/3 of the lifecycle deficit while the other two vary. Some values lie outside, to the right of the triangle, indicating that net familial transfers to the elderly are negative, that is, they are giving more to their descendants than they are receiving from them.

There are interesting regional patterns in the support systems. Familial transfers for old age are much more significant in Asia than in the other economies. Familial transfers fund about 45 percent of the lifecycle deficit for the elderly in Taipei,China, 33 percent in Thailand, and slightly under 20 percent in PRC and Republic of Korea. In Japan and the Philippines, however, the elderly provide as much support to their children and grandchildren as they receive. India and Indonesia are distinctive in that their net private transfers are negative for those aged 65 and older.[4] Net familial transfers are quite small or negative in Europe, Latin America, and the US. No estimates are currently available for African countries.

In comparison with Europe and Latin America, the public sector is less important to the elderly in Asia, except as noted below. In the Philippines and Thailand, for example, net public transfers are zero – the elderly pay as much in taxes as they receive in benefits – while in Indonesia, the elderly pay somewhat more in taxes than they receive in benefits. None of these economies has large public pension programs or healthcare systems that target the elderly. In the Republic of Korea and Taipei,China, net public transfers are funding nearly 33 percent of the lifecycle deficits of the elderly. Social programs for the elderly are also similar in their net effect to those found in Mexico or the US, but they are relatively small in comparison with programs in Europe and South America. Among the Asian NTA economies, only Japan has large public transfers. The elderly in PRC and Japan rely more on public transfers than do the elderly in the US, but less so than the elderly in many European welfare states.

Assets are an important source of support in all Asian economies except the PRC and Taipei,China. In Indonesia and the Philippines, the elderly rely entirely on assets. Certainly some elderly in those countries depend on familial and public transfers, but as a group net transfers to the elderly are zero or negative, and asset-based reallocations are equal to or exceed the lifecycle deficit. Thailand's elderly also rely heavily on assets. In the PRC, asset-based reallocations are the lowest among the Asian economies studied.

Figure 5.4 provides an important summary of support systems for the elderly, but it masks very important details about the enormous variations in those systems. Figure 5.5 shows the reallocation system for ages 65 to 84 in eight Asian economies and the US by single year of age. In every case, people aged 65 are most dependent on asset-based reallocations. As



Note: Years of data are the same as those in Figure 5.3.

Source: NTA database, accessed 1 July 2011.

Figure 5.5 Support system by single year of age for People aged 65 to 84 in eight Asian economies and the United States

age increases, the importance of asset-based reallocations declines and is replaced to varying degrees by public transfers or by familial transfers. In general, the elderly of Asia rely much more on familial transfers as age increases; at the oldest ages, familial transfers are quite important in filling the gap between the lifecycle deficit and decreasing asset-based reallocation.

The comparison between the Republic of Korea and the US in Panel A is instructive. In the US, public transfers rise in importance for the older elderly primarily because of higher levels of publicly funded healthcare. Net familial transfers to the elderly are quite small and negative at every age in the US, while in the Republic of Korea, net public transfers do not increase at all with age. All of the substitution is between asset-based reallocations and familial transfers. At the oldest ages we even see an acceleration of this pattern, with both public transfers and asset-based reallocations declining in favor of familial transfers. The age patterns for the PRC, India, Indonesia, the Philippines, and Thailand (Panel B) are very similar to the pattern for the Republic of Korea.

The patterns for Japan and Taipei,China in Panel A are somewhat distinctive. In both economies, their declines in asset-based reallocations are matched by a combination of increasing familial transfers and public transfers. In Taipei,China, the rise in public transfers is more important among the young elderly, while familial transfers are more important among the older elderly. In Japan, the increase is fairly evenly balanced between the two forms of transfers, with a slight shift towards familial transfers among the elderly in their late seventies.

Decreasing asset-based reallocations for the very old is a common feature of the support systems in Asia and elsewhere. In most European countries, the age profiles are similar to the US profile, with asset-based flows declining in favor of public transfers. Latin American economies are similar to Asian economies in that asset-based flows decline in favor of familial transfers. The decline does not, however, appear to be a consequence of dissaving among the elderly; rather, the very old have fewer assets because they have transferred assets to their children, or they have accumulated less over their working lives because the lifetime labor income of the very old is low relative to the lifetime labor income of the younger elderly. The latter phenomenon is obviously linked with rapid growth in income in, for example, the PRC, the Republic of Korea, and Taipei,China. The PRC is also a special case because many elderly could not accumulate assets because private ownership was not allowed when they were young (Mason et al., 2010).

How support systems are likely to change in the future is a very important question about which there is relatively limited information. Time

series NTA estimates have been constructed for a few East Asian economies. In Japan, Republic of Korea, and Taipei,China, the importance of familial transfers has declined over time. Preliminary estimates based on more recent data suggest that net familial transfers to the elderly are now essentially zero in the Republic of Korea. In each of the East Asian economies, public transfers and asset-based reallocations have increased in importance as familial transfers have decreased (NTA database, accessed 1 July 2011). The causal mechanisms for these changes are unclear. The Republic of Korea and Taipei,China have both implemented more generous public pension programs. As these programs mature, net transfers to the elderly are likely to rise. In the absence of pension reform, these programs will be increasingly difficult to sustain in the face of the dramatic population aging anticipated in East Asia.

4. RELYING ON ASSETS

Assets provide the final backstop for individuals or families mobilizing resources to fund their needs. At some ages, labor income plus transfers received are insufficient to fund consumption, and the gap must be filled by asset income and, if necessary, by accumulating debt or by drawing down assets. At some ages, labor income plus transfers may exceed consumption plus transfers, and the surplus is saved. The lifecycle deficit – consumption less labor income – must equal net transfers plus asset-based reallocations – asset income less savings.

In the conventional lifecycle saving model, asset-based reallocations follow a simple age pattern: they are negative during the working years as individuals save some portion of their labor income and are positive in old age as individuals rely on asset income and draw down their savings to fund consumption. There are elements of this model that are supported by NTA estimates. In countries without extensive old-age transfer systems, the elderly do rely heavily on their assets to support themselves, but the available evidence from NTA data and from other studies is that the elderly do not dissave. With minor exceptions, they continue to save and often at surprisingly high rates. This is true for the elderly in Asia: they are relying on asset income but are not dissaving to support themselves.

Not all asset flows align with the model. Although some have speculated that the elderly in low-income settings might rely more on familial transfers than on assets, we do not find this to be the case in Asia. In fact, asset-based reallocations are particularly important to the elderly in some low-income Asian countries, for example, India, the Philippines, and Thailand. Consumption smoothing might also induce young adults whose

labor income is low relative to their anticipated lifetime labor income to go into debt to fund their current needs, though constraints on indebtedness may limit the extent to which this occurs. Among the Asian NTA economies we see some evidence of this behavior in Japan and possibly the Philippines.

Two other features of asset-based flows do not align well with the lifecycle saving model. First, the model assumes that working-age individuals accumulate assets by saving labor income. We find, however, that the asset income of younger adults is far too high to be consistent with exclusive reliance on the accumulation of labor income. Rather, a large share of the assets of young adults appears to be inherited or obtained through other forms of capital transfers. Second, working-age adults rely heavily on asset income. They may have high labor incomes, but they also have heavy financial obligations. They have to fund their own consumption, pay taxes that provide support for children and the elderly, and provide direct support to their dependent children and their elderly parents. Labor income is thus not sufficient to meet the financial burdens faced by working-age adults.

These observations must be tempered with caution because of the difficulties attached to interpreting age patterns of asset-based flows. First, asset-based flows occur within households, and there is no method to reliably assign asset income or savings to individuals within households. In the NTA, assets are assumed to be held by the household head; hence, asset income and savings are assigned to the age group of the head. Second, all estimates presented here are cross-sectional. Cross-sectional differences will reflect basic influences on behavior over the lifecycle but also great variations in the experiences of different age groups. Rapid economic growth and radical economic reform are examples of phenomena that can greatly influence the cross-sectional age pattern of assets and asset income. Third, asset-based reallocations and savings are balancing items in the NTA. Estimates are influenced by errors in estimating other NTA components, so asset-based reallocations and savings tend to be relatively noisy measures. For this reason we emphasize broad patterns more than details. Note that the age profiles of asset income are based directly on household survey data on property income and flows from owner-occupied housing. They are not calculated as a residual. The extent to which the elderly rely on assets therefore varies quite widely across countries.

As shown in Figure 5.4, the elderly in India, Indonesia, the Philippines, and Thailand, rely very heavily on assets to support their consumption. In East Asia, assets play a more important role for the elderly in Japan and the Republic of Korea and are somewhat less important to the elderly in PRC and Taipei,China. The situation in Asia is in stark contrast with

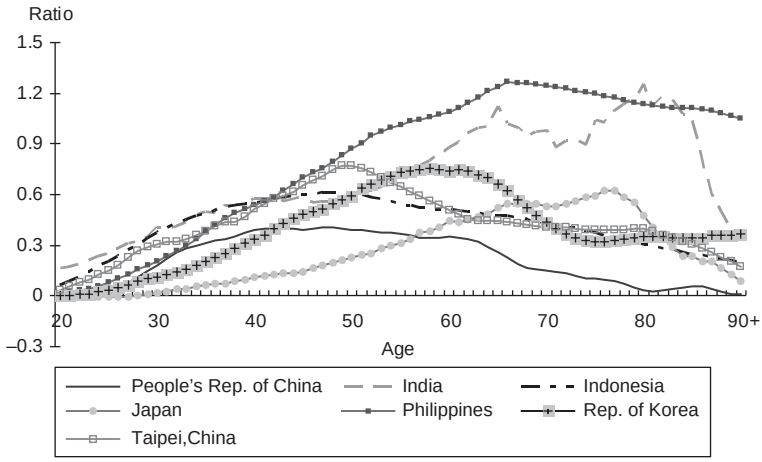
that in countries like Austria, Hungary, Slovenia, and Sweden, where the elderly rely almost exclusively on public transfers and very little on assets to fund consumption. Although the mix between public and private transfers is very different in East Asia and South America, the share of consumption funded by asset-based reallocations is similar. Mexico is quite distinctive among Latin American countries, with its heavy emphasis on assets and low reliance on public transfers to support its elderly.

Another important feature of asset-based reallocations is that in Asian economies the older elderly rely less on them and more on familial transfers than do the younger elderly (Figure 5.5). This is a very consistent finding across all Asian economies and is true of most of Latin America as well. We see a similar pattern to some extent in rich economies, with the older elderly relying more on public transfers instead of assets primarily because of the rise in the importance of publicly funded healthcare for the very old. This does not explain the phenomenon in developing Asian countries, however. One possible explanation is that the very old are outliving their resources and are forced to rely on family members. A second possibility is that the elderly may choose to live with their children because health problems increase dependency. A third possibility is that the very old were not able to accumulate wealth because wages were so much lower during their working years, so they depend more on their children and less on their own personal resources. This may be particularly true of the very old in the PRC as they would have been unable to accumulate assets because their working lives preceded economic reforms.

Figure 5.6 shows per capita private income from assets in seven Asian economies. The level relative to the mean labor income of persons aged 30–49 varies considerably from economy to economy. Private asset income is quite high in India and the Philippines and relatively low in the PRC, and is intermediate in the other four economies shown. By definition, private asset income is determined by both the value of assets held and the rates of return. The high asset income in the Philippines is similar to that in other low- and middle-income economies and may reflect high rates of return that incorporate risk premiums (Mason et al., 2011).

The age profiles of asset income will also reflect age variations in assets and rates of return in each economy. Rates of return could decline with age if older adults opt for low-risk, low-return investments, but there is little empirical evidence on this point. To the extent that asset owners expect to bequeath rather than consume their assets, rates of return would not be expected to decline with age. Our own view is that the age profiles of private asset income primarily reflect age variations in private assets rather than age variations in rates of return.

The age pattern of asset income follows the same general pattern in



Note: Expressed as ratio of average labor income 30–49. Years for data are the same as those in Figure 5.3.

Source: NTA database, accessed 1 July 2011.

Figure 5.6 Per capita private asset income by age in seven Asian economies

all countries rising from very low levels for young adults, reaching a peak, and then declining. The age at which the peak occurs, however, varies enormously. The earliest peaks are found in PRC, Indonesia, and Taipei,China, while the Republic of Korea and the Philippines have somewhat later peaks. There is a very late peak in Japan.

The rise in asset income is part of the normal accumulation in the lifecycle. Working-age adults save, they receive bequests and other capital transfers, and consequently they accumulate assets as they age. Obviously, if the rate of accumulation is higher, asset income will rise more steeply as any cohort ages. Because age profiles consist of different age groups at a point in time, the shape of the profile also depends on differences in the income histories of those different age groups. In rapidly growing economies, younger adults will experience much higher earnings at each age than older adults did. Given accumulation rates, younger cohorts will have higher asset profiles than older cohorts. The result is a cross-sectional asset income profile that rises more slowly, peaks at a younger age, and declines more steeply. The early peak found in a country like the PRC surely reflects the high rate of income growth over the last three decades.

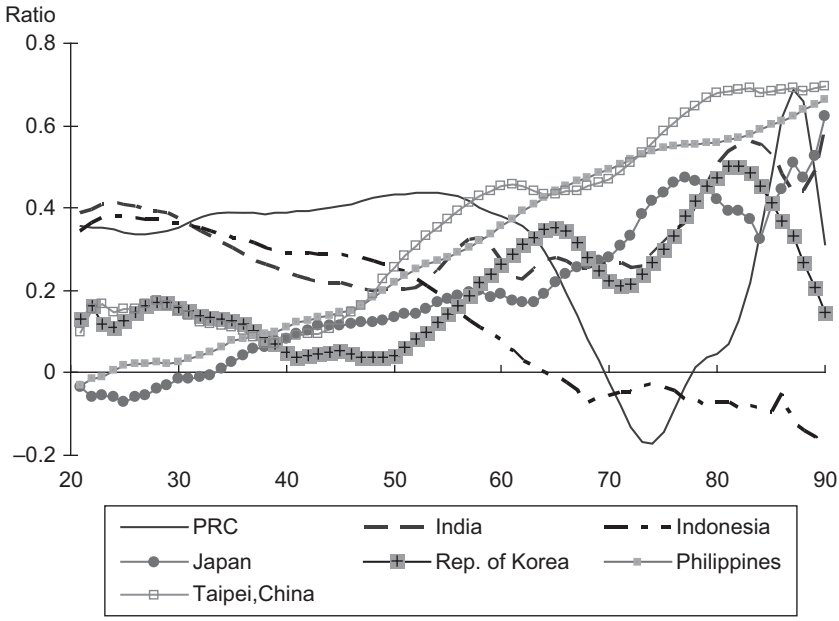
The decline in asset income could reflect two factors already discussed: rates of return that decline with age or cohort differences in the lifetime

earnings. Such a sharp decline could not, however, be explained by these factors. Drawing down assets in some form must be occurring, but we found little evidence of dissaving. Another form of drawdown is through capital transfers. In some societies there are substantial *inter vivos* intergenerational asset transfers, often at marriage. They tend to be poorly measured or not measured at all. To the extent that these transfers occur within households, they will generally not be measured in standard surveys. Substantial asset transfers may also occur with aging. Within households, ownership or control of economic assets may pass from one generation to the next; the exact timing of such transfers may be very difficult to pinpoint, but they occur when the position of household head transfers to a subsequent generation. The decline in assets in old age due to this mechanism may be real, or it may be an artifact of the estimation method. There is no clear way to know, given the information available.

In the lifecycle saving model, the age pattern of saving rates forms a hump, gradually rising until retirement and then falling. To observe the consistency of the evidence, we constructed private saving rates in Figure 5.7, calculated as private savings divided by private primary income. Private primary income was calculated as labor income plus private asset income. In general, labor income dominates primary income at younger ages, while private asset income dominates at older ages.

The age profile of saving rates during the working ages varies considerably from economy to economy. In India, private saving rates are very high and do not vary much with age. In the PRC, private saving rates are quite high except for people in their late sixties and seventies. In the Republic of Korea and Taipei,China, saving rates are much lower than in the PRC and India until people are in their forties. In Taipei,China, the saving rate declines for people in their thirties and then rises steeply beginning in the early forties. The pattern is similar in the Republic of Korea, but the rise doesn't begin until around age 50. In Japan and the Philippines, saving rates are very low and even negative during the twenties and then rise throughout the working ages, though more steeply in the Philippines than in Japan. The Indonesian pattern is distinctive, showing a gradual and then a relatively steep decline during the older working ages.

In only two instances do we see a steep decline in saving at old ages: PRC and Indonesia. In Indonesia, the saving rate is negative at old ages, while in the PRC it is negative during most of the seventies. In the other Asian economies, saving rates are generally quite high among the elderly and are consistently higher than the saving rates during the working ages. This is true of Japan, Philippines, and Taipei,China. In the Republic of Korea, we see fluctuations in saving rates with a significant decline after



Note: Years for data are the same as those in Figure 5.3.

Source: NTA database, accessed 1 July 2011.

Figure 5.7 Private saving as a proportion of private primary income for persons aged 21 to 90 and older in seven Asian economies

age 80; nevertheless, saving rates are higher at older ages than at working ages.

The age profiles of saving rates shown here are surprising given the commonly accepted view that the rates decline and even turn negative at older ages. There are actually relatively few estimates of the age profiles of saving, and those available do not support the conventional wisdom. Attanasio and Szekely (2000) constructed age profiles of household saving for four developing economies, including Taipei,China and Thailand. Only in Taipei,China did they find any evidence of a hump in saving, with the decline coming at a later age than that predicted by the lifecycle saving model. Deaton and Paxson (2000) also estimated the age profile of saving for Taipei,China and found that the rate rose steadily with age until the early sixties and then remained at a high level.[5]

The age pattern found for most Latin American economies for which we have estimates is similar to what we find in Asia. In Brazil, Chile,

Cost Rica, and Mexico, saving rates are higher at older ages than they are during working ages. The picture is a bit more mixed among rich countries. In a number of European countries for which estimates are available, private saving rates are quite high at older ages. The US is something of an exception in that saving rates decline from a peak at age 55 and are quite low after age 70, nearing zero or negative numbers at some ages.[6]

5. FISCAL EFFECT OF POPULATION AGE STRUCTURE

Changes in age structure have a strong effect on public finances due to the age patterns of public transfer inflows and outflows apparent from the figures presented above. Miller (2011) calculated the fiscal support ratio to assess the pressures on fiscal sustainability arising from public transfers. They held age-specific public transfer inflows and outflows constant while allowing the population age structure to change in accordance with historical estimates and projections. Table 5.2 shows the evolution of the fiscal support ratio for eight Asian economies and the US using the age profiles of public transfers in the NTA data sets. The effective number of taxpayers is calculated by weighting the population in each year using the age profile of per capita taxes paid. The effective number of beneficiaries is calculated using per capita benefits in the base year to weight the

Table 5.2 Fiscal support ratios (%): 1950–2050 in eight Asian economies and the United States

	1950	2010	2020	2030	2050	Year of most favorable age structure
PRC	89	100	97	89	82	2012
India	97	100	102	103	102	2028
Indonesia	79	100	106	110	108	2033
Japan	91	100	92	87	74	1976
Philippines	87	100	106	111	116	2050
Republic of Korea	76	100	97	89	80	2008
Taipei,China	68	100	100	94	78	2015
Thailand	66	100	104	104	104	2039
USA	99	100	96	92	89	2006

Note: Recalculated based on Miller (2011).

Source: NTA database, accessed 1 July 2011.

population age distribution. The ratio is set to 100 in the base year of 2010 so that all values are expressed relative to the fiscal position in 2010. As the population age distribution changes, the fiscal support ratio increases if the effective number of taxpayers rises relative to the effective number of beneficiaries, and declines if the effective number of taxpayers declines relative to the effective number of public transfer beneficiaries. The change in the fiscal support ratio indicates the relative size of the tax hikes or benefit cuts needed to return to the initial fiscal position.

It is not surprising that the fiscal impact of population aging is projected to be bigger in Japan than in the other Asian economies. Population aging combined with the current tax and benefit policies would lead to a 26 percent decline in the fiscal support ratio by 2050 in Japan. Thus, either taxes must increase, benefits must decrease, deficits must increase, or some combination of the three must occur. The PRC, Republic of Korea, and Taipei,China show somewhat smaller fiscal impacts with 18 percent to 22 percent reductions in the fiscal support ratio by 2050. India, Indonesia, the Philippines, and Thailand are projected to experience an increase in their fiscal support ratios because net transfers to the elderly are modest or in some cases negative, and because changes in age structure are partially concentrated at ages where net transfers are generally negative. For these four economies, changes in age structure will relax public sector budget constraints. The danger, of course, is that economies with favorable demographics will implement generous transfer systems that ultimately prove to be unsustainable.

Similar projections can be made for each component of public transfer inflows. Table 5.3 projects publicly funded health expenditures. The assumptions underlying these calculations are similar to the assumptions made for Table 5.2. The shapes of the age profiles of benefits are fixed over time, with their levels increasing at the same rate as the gross domestic product (GDP). The values for 2008 are the actual expenditures as a percentage of GDP for each economy. We use only two sets of profiles to project the estimates: low-income Asia and high-income Asia. Since the information on publicly funded expenditures on health is available, we can derive the benefits as shares of GDP resulting from the change in population age structure. Since the age profiles of publicly funded health transfer inflows sharply increase as the population ages, publicly funded health expenditures increase as the share of elderly in the population rises. Again, while data on healthcare expenditures are available for most Asian economies, a direct comparison is not feasible in large part due to different definitions of expenditures for health. The overall levels and trends within each economy are, however, comparable.

The tables assume that the shapes of the age profiles of publicly funded

Table 5.3 Actual and projected publicly funded healthcare expenditure as percentage of gross domestic product, 1995–2050

	Actual				Projected							
	1995	2000	2005	2008	1995	2000	2005	2008	2020	2030	2040	2050
Central and West Asia												
Afghanistan	–	2.29	2.12	1.58	1.61	1.60	1.59	1.58	1.58	1.59	1.61	1.67
Armenia	2.00	1.14	1.48	1.68	1.54	1.58	1.63	1.68	1.75	1.88	1.97	2.03
Azerbaijan	1.39	0.87	0.88	0.82	0.78	0.78	0.80	0.82	0.89	0.96	1.04	1.08
Georgia	0.27	1.20	1.92	2.68	2.49	2.55	2.60	2.68	2.84	3.01	3.13	3.19
Kazakhstan	2.95	2.12	2.52	2.26	2.18	2.18	2.21	2.26	2.35	2.48	2.62	2.74
Kyrgyz Republic	3.96	2.07	2.38	2.76	2.71	2.70	2.72	2.76	2.90	3.13	3.38	3.61
Pakistan	0.84	0.64	0.70	0.85	0.85	0.84	0.85	0.85	0.88	0.92	0.98	1.05
Tajikistan	1.29	0.95	1.14	1.37	1.39	1.36	1.36	1.37	1.43	1.52	1.64	1.77
Turkmenistan	1.86	3.21	2.02	1.07	1.05	1.04	1.06	1.07	1.15	1.24	1.35	1.44
Uzbekistan	3.60	2.52	2.28	2.47	2.44	2.41	2.43	2.47	2.67	2.91	3.16	3.39
East Asia												
China, People's Rep. of	1.79	1.77	1.82	2.05	1.87	1.92	1.99	2.05	2.27	2.47	2.65	2.73
Hong Kong, China	2.10	2.90	2.60	2.65	2.50	2.51	2.56	2.60	2.84	3.09	3.36	3.62
Korea, Rep. of	1.42	2.18	2.93	3.51	3.33	3.39	3.45	3.51	3.81	4.08	4.29	4.43
Mongolia	2.52	3.92	3.01	3.06	2.97	2.92	2.98	3.06	3.40	3.72	4.09	4.40
Taipei,China	3.33	3.43	3.76	3.84	3.42	3.56	3.72	3.84	4.55	5.28	6.01	6.61
South Asia												
Bangladesh	1.28	1.10	1.12	1.04	1.01	1.02	1.03	1.04	1.13	1.23	1.34	1.45
Bhutan	2.27	5.32	3.60	4.56	4.58	4.51	4.52	4.56	4.90	5.28	5.78	6.29

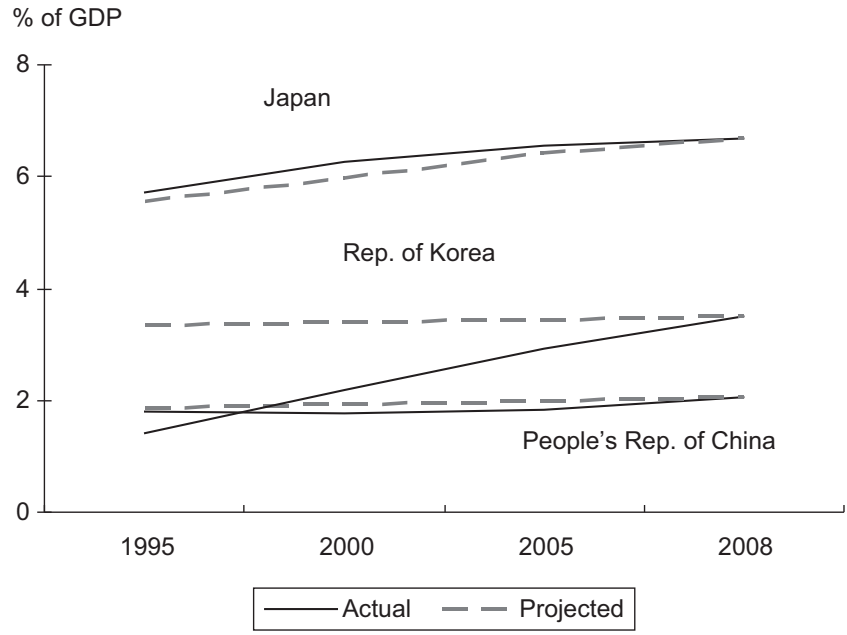
India	1.22	1.27	0.93	1.35	1.31	1.32	1.34	1.35	1.43	1.52	1.64	1.75
Maldives	3.35	4.07	6.14	8.38	8.33	8.18	8.22	8.38	9.30	10.23	11.42	12.52
Nepal	1.31	1.26	1.41	2.25	2.25	2.25	2.25	2.25	2.35	2.48	2.66	2.86
Sri Lanka	1.63	1.80	1.88	1.78	1.63	1.66	1.74	1.78	1.95	2.08	2.20	2.25
Southeast Asia												
Brunei Darussalam	2.29	2.60	2.18	1.96	1.86	1.88	1.93	1.96	2.15	2.35	2.51	2.64
Cambodia	1.08	1.29	1.53	1.25	1.26	1.24	1.24	1.25	1.34	1.41	1.51	1.62
Indonesia	0.64	0.72	1.00	1.23	1.15	1.18	1.21	1.23	1.33	1.45	1.57	1.66
Lao People's Democratic Republic	1.41	1.09	0.77	0.70	0.71	0.71	0.70	0.70	0.73	0.77	0.82	0.88
Malaysia	1.43	1.67	1.85	1.81	1.59	1.65	1.74	1.81	2.21	2.55	2.78	2.89
Myanmar	0.41	0.28	0.19	0.18	0.17	0.17	0.17	0.18	0.19	0.21	0.22	0.23
Philippines	1.36	1.63	1.43	1.27	1.23	1.24	1.26	1.27	1.35	1.43	1.53	1.63
Singapore	1.52	1.26	1.02	1.14	1.07	1.09	1.12	1.14	1.23	1.31	1.37	1.41
Thailand	1.66	1.91	2.29	3.01	2.72	2.85	2.94	3.01	3.30	3.57	3.75	3.82
Viet Nam	1.76	1.63	1.55	2.79	2.62	2.63	2.73	2.79	3.06	3.38	3.68	3.87
The Pacific												
Fiji	2.41	3.16	2.91	2.61	2.46	2.51	2.57	2.61	2.80	2.96	3.13	3.33
Micronesia, Fed. States of	8.82	7.68	11.80	12.02	11.87	11.85	11.98	12.02	12.51	13.22	14.02	15.21
Papua	2.74	3.26	3.68	2.57	2.52	2.54	2.55	2.57	2.64	2.75	2.89	3.05
Samoa	3.53	4.00	4.61	4.97	4.94	5.02	5.00	4.97	5.11	5.42	5.65	5.96
Solomon Islands	3.62	4.76	4.60	4.70	4.66	4.67	4.68	4.70	4.86	5.13	5.45	5.83
Timor-Leste	8.47	6.28	12.37	10.12	10.13	10.38	10.11	10.12	10.20	10.16	10.35	10.85
Tonga	2.60	3.30	3.02	3.22	3.12	3.14	3.20	3.22	3.22	3.35	3.51	3.66
Vanuatu	1.88	2.65	2.31	2.97	2.97	2.95	2.95	2.97	3.07	3.22	3.42	3.63

Table 5.3 (continued)

	Actual				Projected							
	1995	2000	2005	2008	1995	2000	2005	2008	2020	2030	2040	2050
Developed countries												
Japan	5.71	6.25	6.56	6.68	5.57	5.98	6.42	6.68	7.62	8.30	8.70	9.00
New Zealand	5.52	6.03	6.83	7.81	7.41	7.54	7.68	7.81	8.47	9.07	9.54	9.85
Australia	4.75	5.37	5.64	5.96	5.58	5.73	5.85	5.96	6.46	6.86	7.18	7.36

Note: The base year is 2008, hence, the projected values for 2008 are the actual expenditures as a percentage of GDP for each economy. For Hong Kong, China and Taipei,China, recent data from the Ministries of Health were used and 2006 values were used instead of 2008 values. These were calculated based on the assumption that the shapes of the age profiles of public health consumption do not change over time.

Source: NTA database, World Health Organization country statistics, United Nations (2009) and Council for Economic Planning and Development Statistics Database, accessed 1 July 2011, respectively.



Source: NTA database, accessed 1 July 2011.

Figure 5.8 Projected and actual publicly funded health expenditures for PRC, Japan, and Republic of Korea from 1995 to 2008

healthcare expenditures do not change over time, but as is evident in the Republic of Korea, it is possible that the profile can shift upward. It is also possible that it can shift downward, as Chile and some other Latin American and European countries are attempting to do through pension reforms (An et al., 2011).

Figure 5.8 documents the projected and actual expenditures on healthcare in the PRC, Japan and the Republic of Korea from 1995 to 2008. The projections present the effects of demographic change; hence, the difference between actual and projected spending can be attributed to factors other than population change such as an increase in the level of benefits holding GDP constant. In other words, GDP growth alone should not affect the results because the level of benefits is assumed to be constant regardless of changes in GDP or other macroeconomic factors. The results show that the actual and projected expenditures in Japan were very similar, suggesting that the increase in publicly funded healthcare spending during the period can be almost entirely explained by

the change in population structure. In contrast, the projected and actual changes for the Republic of Korea were quite different in that actual spending increased much more rapidly. For example, about 90 percent of the change in publicly funded health expenditures between 1995 (5.7 percent of GDP) and 2008 (6.7 percent) in Japan is explained by change in population structure, while the increase in the Republic of Korea for the same period (from 1.4 percent to 3.5 percent) is unrelated to changes in population age structure.

The rapid growth in government expenditures for the elderly in the Republic of Korea is confirmed by other sources of information as medical insurance benefits rose 15.3 percent per annum between 2000 and 2005 and public pension benefits grew by 9 percent annually during the same period. This sharp rise during a short time span is somewhat exceptional. One might argue that this change in the Republic of Korea could be due to year-specific macroeconomic swings that might have affected specific government expenditures; however, given that health and pension transfers are much less affected by short-run macroeconomic swings, the effect is likely to be due to a more fundamental change in the scope of public sector programs. Again, this is confirmed by other sources of information by age for the Republic of Korea. Specifically, there was a sharp increase in benefits for those over 55, owing to increases in public pension and medical insurance benefits. The sharp rise in public pension benefits for those aged 60–64 reflects a rise in the number of newly entitled national pension benefit recipients. Higher benefits for those aged 65 and older were mainly due to an increase in benefits paid out by occupational pensions. Recent changes in medical insurance policies also substantially raised the medical insurance benefits for the older age groups (An et al., 2011).

Changes in the Republic of Korea mirror a growing concern in many Asian countries that transfer programs will grow extremely rapidly due to increases in the number of elderly and due to changing patterns of public consumption that are mainly due to the rapid increase in per capita public transfers to the elderly. In other words, countries increase public transfers to their elderly populations as they get richer. Recently, some low-income countries have expanded public transfers as well. For example, in 2006, Indonesia expanded its social security system to include a national pension scheme for workers in both the formal and informal sectors (Maliki, 2011). The PRC is another example. In 2009, the government committed itself to building a universal public pension system in rural areas funded by individual premiums and government subsidies. Also in the PRC, public health insurance was available to urban employees in 1998, to rural citizens in 2003, and to urban citizens in 2007 (Li et al., 2011).

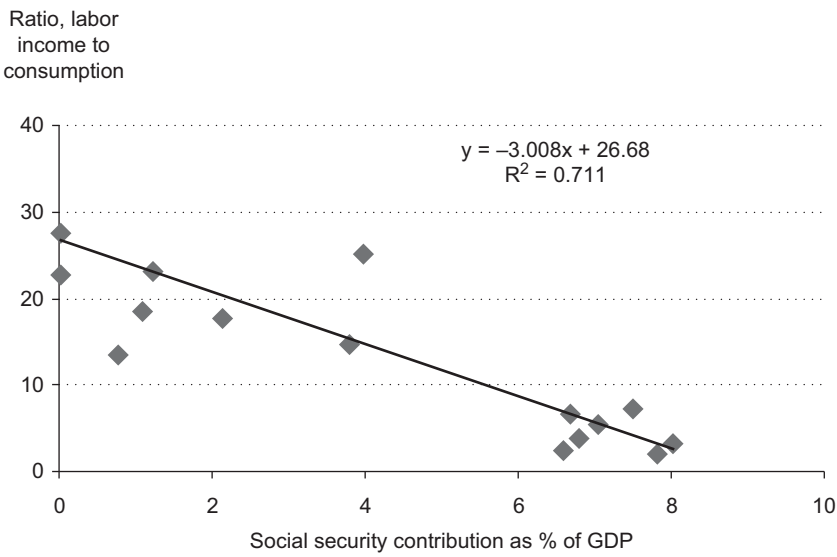
6. SUPPORT SYSTEMS AND THE RESPONSE TO POPULATION AGING

There are many important issues regarding the support systems in Asia that are closely related to rapid population aging in the region. Some of the issues are addressed by Mason and Lee (2011) in more detail. For example, transfers of wealth are closely related to intergenerational equity because they measure the shift of resources between current generations and future generations. They also address the emphasis on capital accumulation as a strategy for responding to population aging.

Another important issue is the future of support systems. Of particular concern in Asia is whether the decline in the familial transfer system will place greater demands on the public transfer system. Public pension programs definitely offer some advantages. They represent a politically acceptable means of providing an economic safety net for those older people who might otherwise experience substantial decreases in their standards of living. Public programs also allow pooling against investment risk and longevity risks.

On the other hand, public transfers potentially put pressure on budgets and may encourage early retirement or reduced saving. The NTA provide relevant evidence on these issues. The labor income for people aged 65 and older appears to correlate strongly with the amount of social contributions of employees, employers, self-employed individuals, and other unidentified sources as a percentage of GDP (Figure 5.9). Although these contributions are defined more broadly than pay-as-you-go social security contributions, this result is somewhat consistent with what Gruber and Wise (1999) suggest about the tradeoff between social security schemes and labor income.

The tradeoffs among old-age support systems can be better explained by examining the sources of financing the consumption of the elderly (Figure 5.10) using the NTA. The figure compares transfers, asset-based reallocations, and labor income. These cross-sectional calculations are treated as a synthetic cohort that is calculated using recent data on survival weights in the US. As virtually all consumption by children is financed by transfers, children are not represented. The figure shows that labor income is still an important source of funding consumption for people aged 65 and older in Indonesia (40 percent). In the Philippines, 29 percent of consumption for the elderly is supported by labor income, and in the PRC and India the figure is 23 percent. Note that the results are not direct consequences of different mortality rates because these results are conditional on survival. Work plays a small role in providing income for the elderly in Japan and Taipei,China, contributing about 10 percent in



Note: Social contributions also include actual or imputed contributions to social insurance schemes operated by governments.

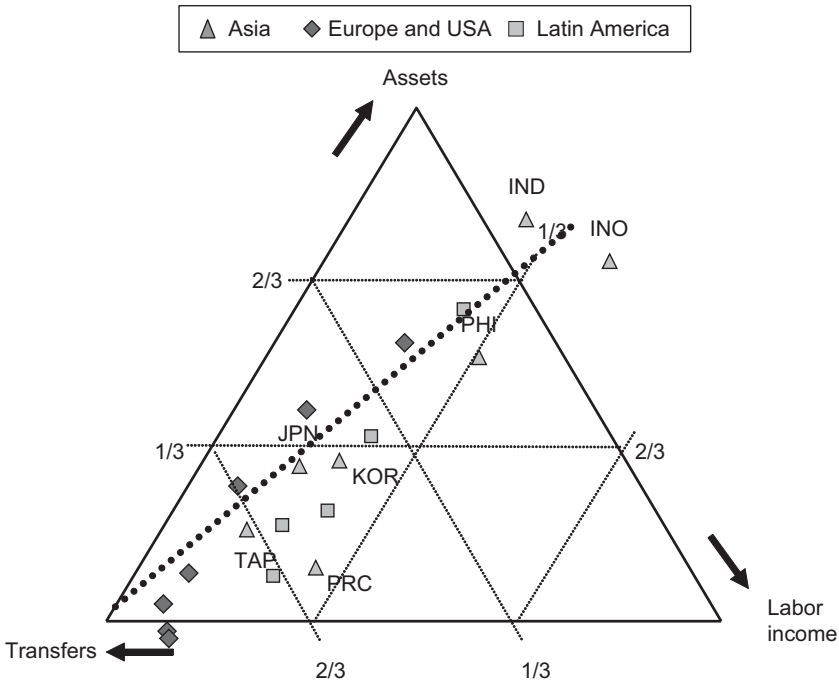
Source: Lee and Ogawa (2011).

Figure 5.9 Social security contributions as a percentage of gross domestic product and labor income as percentage of consumption for people aged 65 and older

the former and 8 percent in the latter. Work plays a much less important role for the elderly in all European countries, contributing less than 10 percent of consumption.

Transfers are more important in the PRC, Japan, Republic of Korea, and Taipei,China than in Indonesia and the Philippines and are, in fact, the most important source of funding consumption in Taipei,China, contributing 70 percent. Approximately 50 percent of consumption by the elderly is supported by transfers in Japan and Republic of Korea, while they play a very small role in the Philippines and are not a factor in India and Indonesia. Asset-based reallocations also vary significantly in Asia. They account for about 75 percent of consumption by the elderly in India and Indonesia, 56 percent in the Philippines, and about 35 percent in Japan and Republic of Korea. In the PRC and Taipei,China, asset-based reallocations account for only about 20 percent of funding. In the PRC in particular, high rates of savings offset asset income to some extent.

Regarding tradeoffs, a change in one source should be offset by a change



Notes:
These are synthetic cohort, calculated by using recent data on survival weights of the USA. PRC = People's Rep. of China; IND = India; INO = Indonesia; KOR = Rep. of Korea; PHI = Philippines; TAP = Taipei,China; JPN = Japan.

Source: NTA database, accessed 1 July 2011.

Figure 5.10 Sources of funding consumption for people aged 65 and older in recent years for 18 National Transfer Accounts economies

in another. This suggests two things. First, as the dotted line shows, the major tradeoff would be between relying on transfers and relying on assets. Second, relying more on assets is positively related with more labor income in old age, although the effect is not large.

7. CONCLUSIONS

Important changes are occurring in support systems in Asia. The elderly are relying less on support from their families than they did in the past, and a diminishing role for labor income will be inevitable in the region as

well. Whether countries rely on transfers or assets to fund the needs of a growing elderly population will depend on policies, culture, and institutions. Compared with Europe and Latin America, Asia has relied less on public pension programs, but healthcare for the elderly is increasingly costly and is often heavily subsidized by the public sector. If the needs of a growing elderly population are met through greater reliance on lifecycle saving, population aging will lead to an increase in assets, with favorable implications for economic growth.[7]

Heavy reliance on public support systems has disadvantages. In developed countries, public pension programs appear to have had a substantially negative effect on retirement. Pension programs have undermined work incentives by cutting the link between work effort and standards of living among the elderly. In addition, providing wide coverage may entail enormous administrative difficulties, particularly in low-income countries with large numbers of agricultural, self-employed, and casual workers. It is very difficult to collect pension payments in sectors where labor turnover is high and documentation is weak. On the other hand, given the importance of the family support system in Asia, some of the extra burden imposed by such policies could be shouldered by the families of the elderly.

Strengthening financial-sector infrastructure is crucial. This is not only a prerequisite for developing a public pension system, it will also allow and encourage workers to save more for retirement. The accumulation of capital is a somewhat longer-term phenomenon. Governments in developing Asia may have to respond to their citizens' needs as standards of living rise, so while public pension programs have been very modest to date, the demand for them will probably grow. In particular, the demand for healthcare will surely increase as economies develop and per capita incomes rise. Thus, governments will be increasingly faced with decisions about what types of pension and healthcare to provide and for whom, and about how to provide them efficiently. The policies that are formulated and implemented now will influence the well-being of people in Asia for decades to come.

NOTES

1. Public transfers are broadly measured here and include children's pro rata share of all public consumption in addition to education and healthcare spending that is more directly consumed by children.
2. This is a synthetic cohort value calculated by taking the ratio of the sum of age-specific per capita net private transfers from ages 0 to 19 to the sum of the lifecycle deficit, that is, consumption less labor income, from ages 0 to 19.
3. Authors' calculation based on NTA database.

4. Indonesia is not shown in Figure 5.4 because it is an outlier.
5. These two studies are not entirely comparable to the analysis presented here because they estimate age effects using panel data to control for cohort effects and because they analyze household rather than private saving.
6. Authors' calculations based on NTA database, accessed 1 July 2011.
7. A comparison of Asian countries under different scenarios was done by Mason et al. (2010).

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6. Demographic change, intergenerational transfers, and the challenges for social protection systems in the People's Republic of China

Qiulin Chen, Karen Eggleston, and Ling Li

1. INTRODUCTION

The People's Republic of China (PRC) is going through a remarkable economic transition and a rapid demographic transition at the same time. The transition from a centrally planned economy to a market-based economy is widely acclaimed for recent unprecedented economic growth, but the social strains accompanying that growth have become more widely recognized, such as the lagging development of the social protection system as the population ages. Demographic change and its interaction with family behavior and social policies will strongly shape both future economic growth and the sustainability of social support systems.

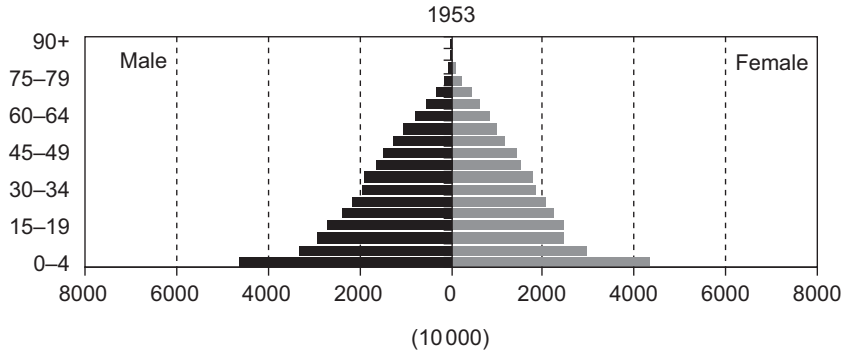
We analyzed the main challenges for the social protection system posed by the demographic transition in the PRC using the pension and healthcare systems as examples. Using estimates from the National Transfer Accounts (NTA) database for 1995 and 2002, we describe changes in economic lifecycle public transfers, inter-household transfers, and intra-household transfers. We discuss the three-way system of contributory basic pensions, individual accounts, and voluntary supplementary pensions in urban areas and the recently piloted pensions in rural areas, and we describe changing patterns in health expenditures using three waves of national health service survey data and discuss the relationship between those expenditures and healthcare systems compared with other NTA economies. We also explore some technical issues regarding how NTA health expenditure estimates compare with World Health Organization (WHO) estimates.

2. DEMOGRAPHIC CHANGE AND ECONOMIC TRANSITION

In 1949, the population of the PRC totaled 450 million; at just over 1.3 billion, it is currently the world's most populous nation. Demographic change has, however, been rapid. The total fertility rate (TFR) declined from around six in 1950–1955 to two in 1990–1995 (Banister et al., 2010), with a rapid decline in the 1970s prior to the beginning of the one-child policy (government policy switch from encouraging children to encouraging later marriage and fewer children). The TFR is now below replacement level, at about 1.7 births per woman.[1] The total dependency ratio declined by 38 percent during the past 30 years, primarily because of a reduction in the youth dependency ratio from 72.5 percent in 1965 to 30.2 percent by 2005 (Wei and Hao, 2010). Health improved substantially, with dramatic declines in mortality even prior to the economic reforms that contributed to the improvement of public health conditions, the control of communicable diseases, and improvements in living standards and education (Banister, 1987; Miller et al., 2011). Life expectancy increased from 69.9 in 1990 to 76.7 in 2010 for women and from 66.9 to 72.5 for men.[2]

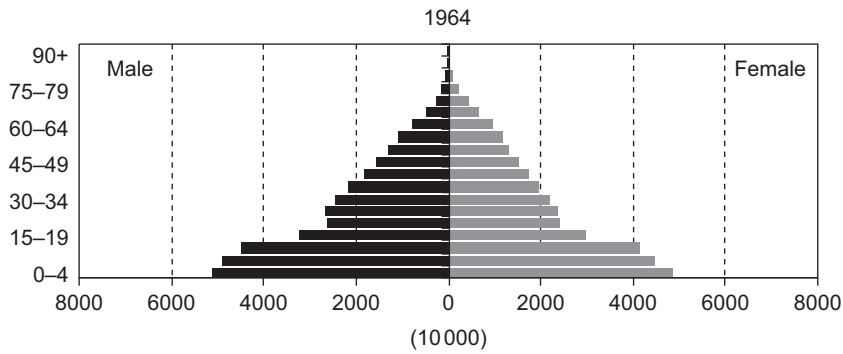
The PRC thus has undergone a rapid demographic transition from high mortality and high fertility to relatively low mortality and low fertility.[3] As a result, the age structure of the population has changed significantly in line with the commonly observed pattern of a decrease in the population of non-working young people and a decrease in total dependency followed by an increase in the population of non-working elderly that leads to an eventual increase in total dependency. This was the sequence in Japan and in the Republic of Korea and then in the PRC (Eggleston and Tuljapurkar, 2011).

The demographic challenges in the PRC include not only an increase in the proportion of elderly but also an uneven pace of change, both temporally (Figures 6.1a–6.1e) and geographically. There have been two baby booms. One followed the civil war and the establishment of the PRC in 1949 as reflected in the large 0–4-year-old base of the 1953 population pyramid (Figure 6.1a). The second boom came in the early 1960s after recovery from the Great Leap Famine (Banister, 1987; Lu, 2009). The echoes of these large cohorts as they matured into child-bearing years are reflected in the 2005 population pyramid (Figure 6.1e). Tuljapurkar et al., (2005) and Tuljapurkar (2011) note that population cohorts of different sizes can lead to large annual changes in the labor pool (representing 8–10 million people) that can challenge the stability of programs for training young workers and for providing pensions. Furthermore, spatial variations will amplify temporal variations (Eggleston and Tuljapurkar,



Source: PRC National Population Census 1953.

Figure 6.1a Population age structure in the People's Republic of China in 1953

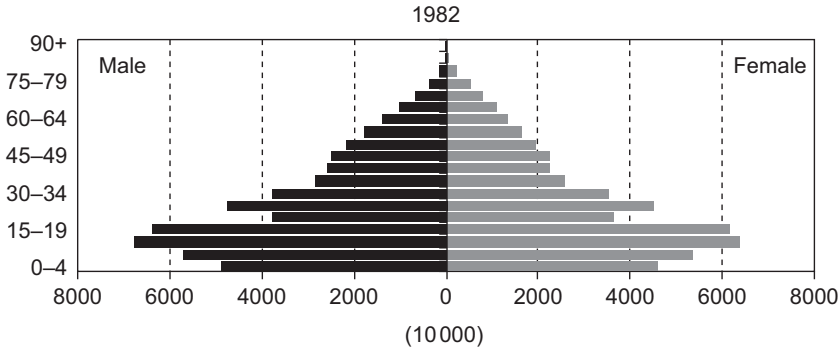


Source: PRC National Population Census 1964.

Figure 6.1b Population age structure in the People's Republic of China in 1964

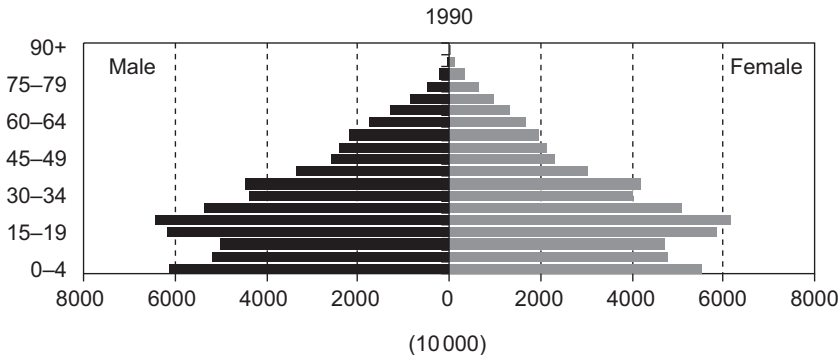
2011). An additional challenge that we do not focus on is the large gender imbalance in the population, with the sex ratio at birth starkly favoring boys over girls, leading to the prospect of millions of "forced bachelors" in coming decades.

Figure 6.2 shows projections of the age structure from 1995 to 2050, based on data from the 2000 census assuming a TFR of 1.65. The shift toward greater numbers in older age cohorts is salient. In contrast, the total population will level off and the cohorts in the younger working ages



Source: PRC National Population Census 1982.

Figure 6.1c Population age structure in the People's Republic of China in 1982

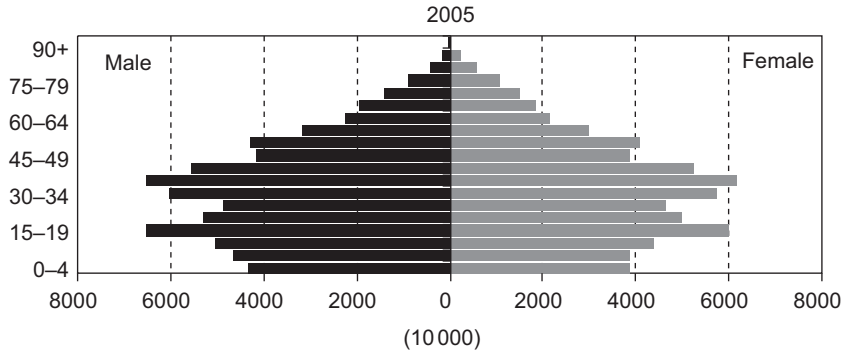


Source: PRC National Population Census 1990.

Figure 6.1d Population age structure in the People's Republic of China in 1990

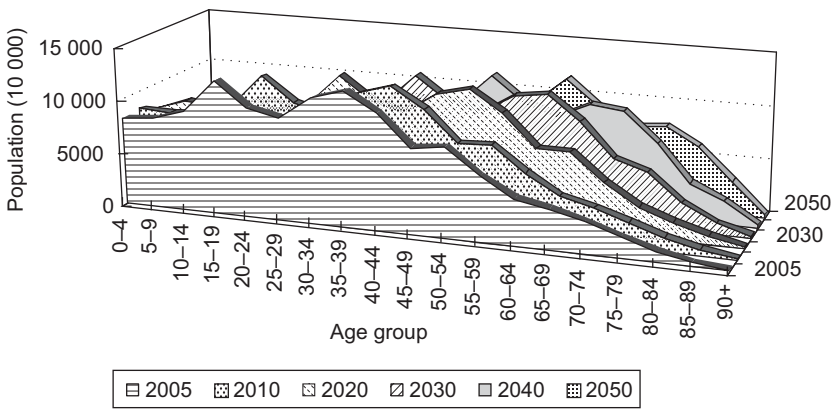
will shrink. According to United States (US) Census Bureau projections, the population in the PRC will reach its maximum in 2026, at slightly less than 1.4 billion. The 20–24 age cohort is peaking now, while the population aged 20 to 59 is expected to peak at 831 million in 2016 (US Census Bureau, 2009).

The dramatic decline in fertility in recent generations has left an imprint on family structure in the PRC. Like many developing Asian countries, the PRC was once a nation of large families and multi-generational



Source: 1% National Population Sample Survey 2005.

Figure 6.1e Population age structure in the People's Republic of China in 2005

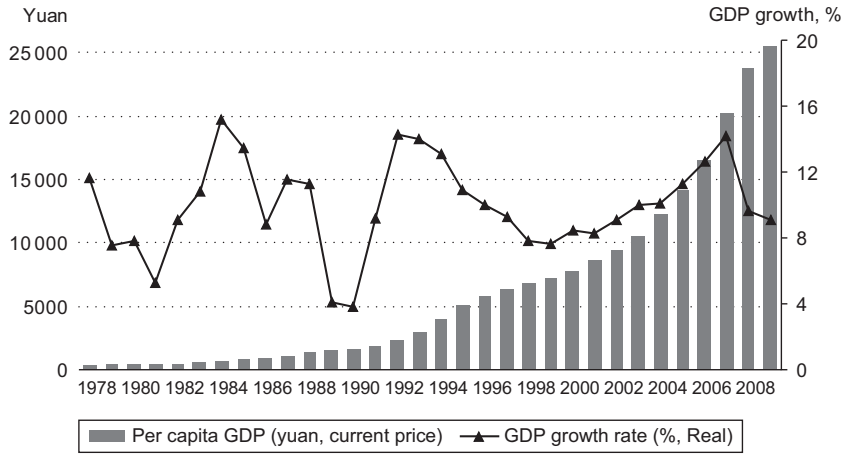


Source: PRC National Bureau of Statistics projected from 2000 census data assuming a TFR of 1.65.

Figure 6.2 Projections of the age structure in the People's Republic of China from 1995 to 2050

households. Now, especially in urban areas, the family structure is often characterized as "4-2-1": four grandparents, two parents, and one child. Several researchers have examined these changes in family structure and their implications for supporting the burgeoning elderly population (Zimmer and Kwong, 2003; Y. Wang, 2006).

During this demographic transition (and partly spurred by it), the PRC



Source: PRC Statistical Yearbook 2010 (Government of the PRC, National Bureau of Statistics, 2010).

Figure 6.3 Per capita gross domestic product and growth rate in the People's Republic of China from 1978 to 2008

has achieved unprecedented economic growth, with an average real gross domestic product (GDP) growth rate of 9.8 percent annually during the last three decades (Government of the PRC, National Bureau of Statistics, 2008). This has lifted millions out of poverty and made the PRC the second largest economy in the world in 2010, although per capita income has remained at middle-income levels (Figure 6.3).

The demographic transition has contributed to the recent rapid economic development in the PRC. The declining total dependency ratio in the early phase of the transition has led to what has been called the demographic dividend (Bloom and Williamson, 1998). Research has shown that this first demographic dividend contributed from 25 percent to 33 percent of the dramatic economic growth during the "East Asian miracle" (Bloom et al., 2000) and has significantly spurred recent economic growth in the PRC and India (Bloom et al., 2006). Wang and Mason (2008) estimate that between 1982 and 2000, about 15 percent of the unprecedented rapid growth in output per capita in the PRC stemmed from the first demographic dividend. Using 1989–2004 provincial data, Wei and Hao (2010) confirmed that economic growth was boosted significantly by changes in the demographic structure, especially the lower youth dependency ratio due to fertility declines, and that this effect was most prominent in provinces more open to market forces.

Both Banister et al. (2010) and Eichengreen et al. (2011) argue that the economic growth rate will soon slow to a less than break-neck speed primarily because the PRC has reached middle-income status and only to a smaller extent because of its demographic transition. Effective policies could dampen the potentially negative impact of population aging on economic growth and could foster what Mason and Lee (2006) term a second demographic dividend.

Some scholars have argued that the development of social protection systems has lagged behind that of the economy (Wang, 2003; World Bank, 2004; Wang, 2008) as new systems have not smoothly replaced the old mechanisms for redistribution and dependent support as the economy has changed. Institutional economic changes have included dismantling the collectives in rural communes, fiscal decentralization, reductions in public services provided by the state, the privatization of most public service units, and charging fees for basic services that were previously provided without out-of-pocket payments from consumers.

While the country's phenomenal economic growth has lifted millions out of absolute poverty, there has also been a rapid increase in income inequality (Gini coefficient rising to 0.497 by 2007 according to [People's Republic of] China Household Income Project (CHIP) data; Li, 2011). This has exposed many households to macroeconomic fluctuations as they struggle to pay for basic needs like healthcare and education. To address these problems, the government has put in place an expanding set of social protection systems including the *dibao* minimum income support system; social insurance for unemployment, work-related injuries, and maternity care; contributory pensions for workers in the formal sector expanded to rural areas; and social health insurance in both urban and rural areas.

3. CHANGING INTERGENERATIONAL TRANSFERS

3.1 The National Transfer Accounts Database

NTA offer a systematic approach to introducing age into national income and product accounts (NIPA) to describe intergenerational flows of resources in an economy. In NTA estimates, behavior over the economic lifecycle is summarized by the amount consumed at each age and by the amount earned through labor at each age. They describe how the young and the elderly support themselves in those periods when their consumption exceeds production and how sharing among different age groups allows families and societies to support people without current labor

earnings. By capturing the flows that support children and the elderly as well as the public and private transfers that working-age individuals make, NTA provide an empirical framework for studying how age structure impacts income, saving, and investments as well as intergenerational equity and poverty alleviation through asset-based reallocations and transfers.

In the NTA estimates, lifecycle inflows for each age, a, consist of labor income, $Y^l(a)$, the returns on capital, $Y^a(a)$, and transfer inflows from the public sector, $\tau_g^+(a)$ and the private sector, $\tau_f^+(a)$. Labor income includes wages and salaries earned by employees along with their fringe benefits as well as the value of labor of the self-employed. Labor income does not include the value of time in home production that is not market-based such as childcare; therefore, the contributions of women and the elderly (who often care for children and grandchildren) are underestimated. Labor force participation rates for women in the PRC are relatively high, but labor force participation is higher among men than among women at all ages, reflecting traditional gender roles.

Outflows consist of consumption, $C(a)$, saving, $S(a)$, and transfer outflows to the government, $\tau_g^-(a)$ and the private sector, $\tau_f^-(a)$. Consumption includes both private consumption and public consumption allocated to individuals. For every age group, the inflow and outflow should be balanced as shown in equation (6.1).

$$\underbrace{Y^l(a) + Y^a(a) + \tau_g^+(a) + \tau_f^+(a)}_{\text{Inflows}} = \underbrace{C(a) + S(a) + \tau_g^-(a) + \tau_f^-(a)}_{\text{Outflows}} \tag{6.1}$$

The difference between consumption and production at a given age – the lifecycle deficit – must be matched by asset-based reallocations, private transfers, and/or public transfers as shown in equation (6.2).

$$\underbrace{C(a) - Y^l(a)}_{\text{Lifecycle Deficit}} = \underbrace{\underbrace{Y^a(a) - S(a)}_{\text{Asset-based Reallocations}} + \underbrace{\tau_f^+(a) - \tau_f^-(a)}_{\text{Net Family Transfers}} + \underbrace{\tau_g^+(a) - \tau_g^-(a)}_{\text{Net Public Transfers}}}_{\text{Age Reallocations}} \tag{6.2}$$

With age profiles and information on the population age distribution, $N(a)$, we can generate levels of aggregate consumption and labor earnings for different age groups and the total population for a specific year. The

Table 6.1 CHIP data: 1995 and 2002 samples

Year	Rural		Urban	
	Individuals	Households	Individuals	Households
1995	34 728	6931	21 689	7996
2002	37 969	9200	20 548	6835

aggregate values are adjusted to equal their counterparts in NIPA, X^p_{NIPA}. We estimate age profiles from household survey data and specific statistical data, $\overline{X}^p(a)$, using an adjustment coefficient, β, as in equation (6.3).[4]

$$X^p(a) = \beta \overline{X}^p(a) N(a), \text{ where } \beta = X^p_{NIPA} / \sum_a \overline{X}^p(a) N(a) \tag{6.3}$$

We used nationally representative cross-sectional survey data from the 1995 and 2002 CHIP to construct age profiles for the NTA estimates (except the age profiles of public consumption). The project was conducted by the Chinese Academy for Social Sciences in rural and urban areas. Because their economic and social protection systems differ significantly, the samples were collected separately with distinct, albeit similar survey instruments. The households sampled were systematically selected to be representative of official household surveys conducted by the National Bureau of Statistics (Li et al., 2008) (Table 6.1). The data include information on general household and individual characteristics, individual income, household saving and assets, and household expenditures.

In the CHIP data, private health expenditures and education expenditures are available only for households and not for each household member. To overcome this limitation, we used the regression estimation methodology previously used by Mason et al. (2009) to allocate a household's private health and education expenditures among members.

For public education and health expenditures, we constructed age profiles using administrative data and other specific survey results. Specifically, we generated government education expenditures per student by allocating government expenditures to different levels of schools (based on data in the *Chinese Education Funds Statistical Yearbook*) according to the number of students enrolled in each level by age (using data from the *Chinese Education Statistical Yearbook*). We generated government health expenditures per capita for each age group by first allocating total government expenditures to different health sectors – hospitals, preventive services, maternal and child healthcare – based on data from the *Chinese Health Statistical Yearbook* and then allocating that spending according to patient age as deduced from the National Health Service Survey Report

Table 6.2 Data sources used for National Transfer Accounts 1995 and 2002 estimates in the People's Republic of China

NTA component	Content	Source
Population	Age structure for the rural and urban	*[The People's Republic of] China Population Statistics Yearbook*
Public consumption	NIPA	*[The People's Republic of] China Statistical Yearbook*
Public education	Government expenditure on education	*Finance Yearbook of [The People's Republic of] China*
Public health	Government expenditure on health	*PRC National Health Accounts Report*; Global Health Observatory Database
Private consumption	NIPA	*[The People's Republic of] China Statistical Yearbook*
Private education; private housing; others	Ratio to total individual consumption	CHIP survey data
Private health	Private health expenditure	*[The People's Republic of] China National Health Accounts Repor*t; Global Health Observatory Database
Labor income	NIPA	*[The People's Republic of] China Statistical Yearbook*
Wages, self-employed income	Ratio to total labor income	CHIP survey data
Benefit	Social security fund	*[The People's Republic of] China Labor Statistical Yearbook*
Tax	Tax revenue by classification	*Finance Yearbook of [The People's Republic of] China*

Note: CHIP = [The People's Republic of] China Household Income Project; NIPA = national income and product accounts; NTA = National Transfer Accounts.

(Government of the PRC, Ministry of Health, 1994 and 2004). For other, more general government health expenditures we assumed they were consumed equally by all age groups.

Table 6.2 shows the source of data used for each component of NTA estimates for 1995 and 2002 to make them consistent with the aggregate national accounts in the PRC (i.e., aggregate controls). Our primary

sources for data on NIPA include PRC statistical yearbooks for the relevant years. To this we added data from the financial statistical yearbooks, the educational funds statistical yearbooks, labor statistical yearbooks, and the *National Health Account Report* (China National Health Economics Institute, 2009). For detailed information on population size and age structure we used data from population statistical yearbooks that contain the age structure of the population in both rural and urban areas based on nationally representative sample surveys.

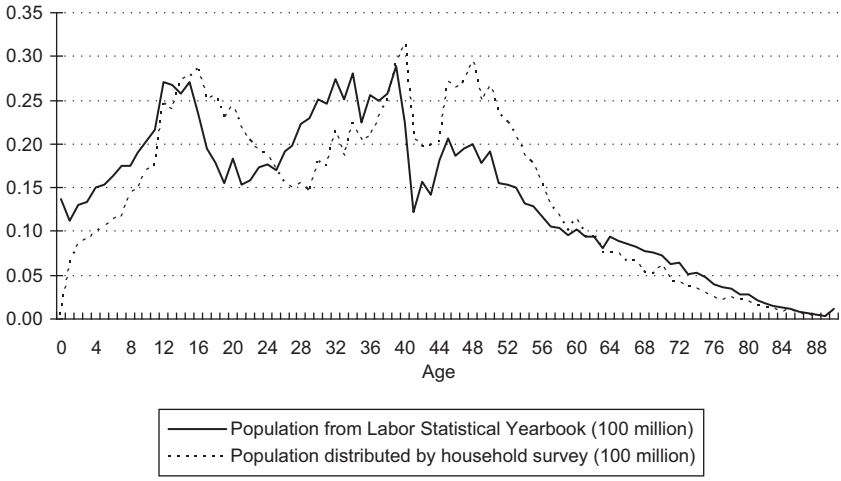
As mentioned previously, because of the large socioeconomic and institutional differences between urban and rural areas, the CHIP used separate surveys in rural and urban areas, but current NTA estimates are national. Therefore to complete the NTA estimates, we combined those from rural and urban areas in the following way. First, we estimated the urban and rural age profiles of NTA components separately based on separate urban and rural survey samples. Second, we generated national age profiles for each NTA component as weighted averages of the rural and urban profiles where the weights were the rural and urban populations in each age group according to the relevant population statistical yearbook. In analyzing these results, one should keep in mind that there are differences between the household survey data and the aggregate national data. For example, the age structure of the CHIP data differs slightly from that of the overall population based on the statistical yearbooks (Figure 6.4a), in that young children and the elderly are slightly under-represented. The age profiles for consumption and income weighted by these two age structures do not, however, show significant differences (Figure 6.4b).

3.2 Rural and Urban Differences in Estimated National Transfer Accounts Age Profiles

The huge rural–urban inequalities in the PRC are widely known; the rural and urban age profiles for consumption and income show these differences in stark detail (Figure 6.5). For both consumption and labor income, levels in rural areas are only about one-third of those of urban Chinese in similar age ranges. Working life – the age range in which income surpasses consumption – in rural areas is from 20 to 67 years, which is much longer than that in urban PRC (25 to 55 years). As a result, young people and the elderly in rural areas have higher labor incomes than those in urban areas.

3.3 Private and Public Intergenerational Transfers

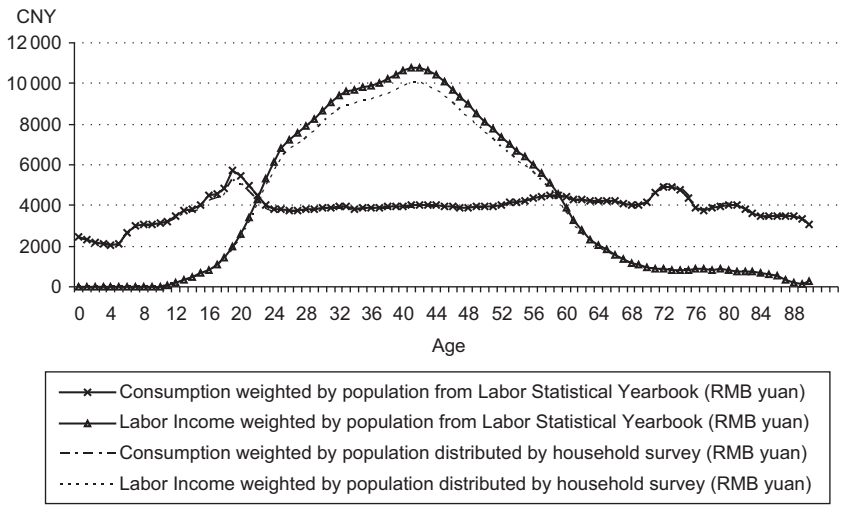
Figure 6.6 shows a graph of the distribution of labor income and consumption by age groups in 1995 and 2002, using constant prices in yuan in



Note: CHIP = [People's Rep. of] China Household Income Project.

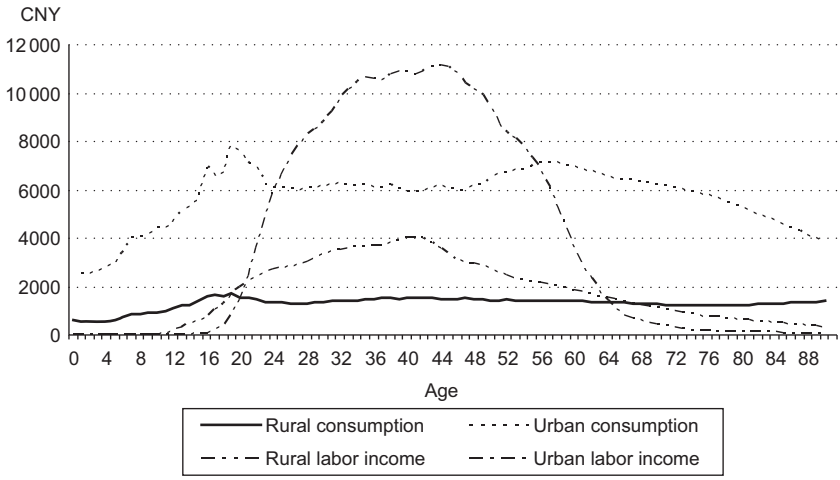
Source: Authors' NTA estimates.

Figure 6.4a Difference in age structures between CHIP data and Labor Statistical Yearbook data



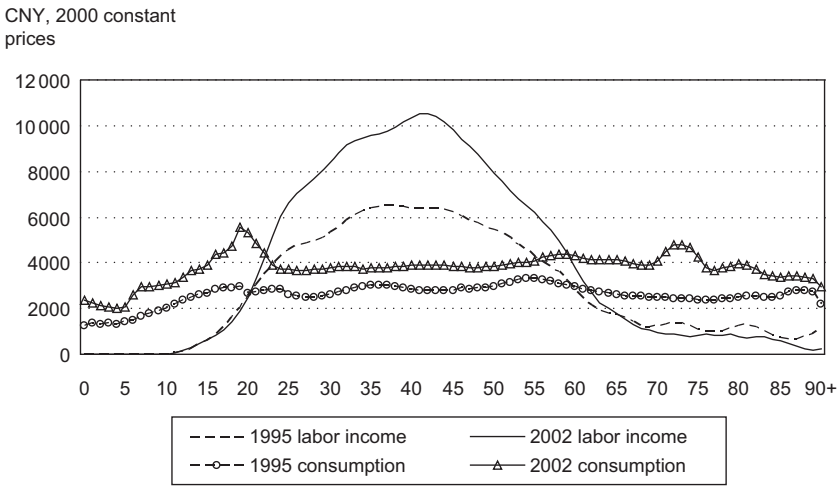
Source: Authors' NTA estimates.

Figure 6.4b Effects on estimated lifecycle deficit using different population weights by age group



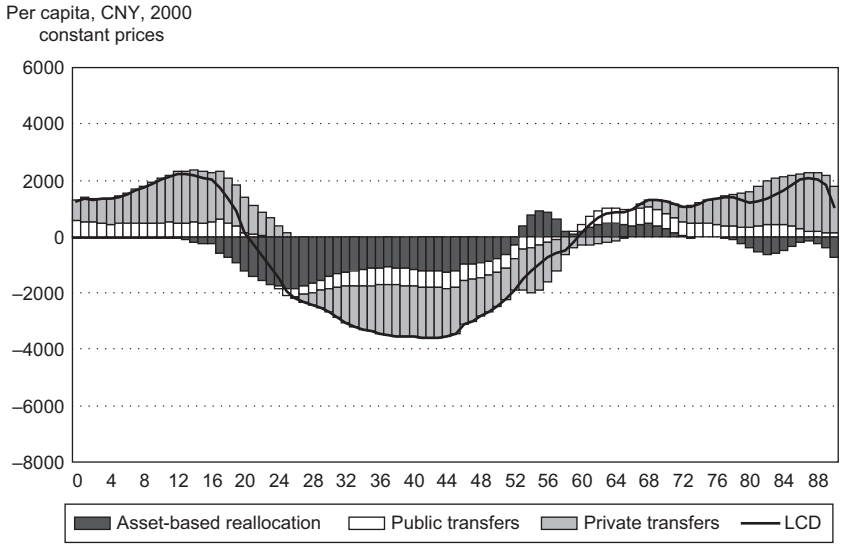
Source: Authors' NTA estimates.

Figure 6.5 Difference between rural and urban age profiles of income and consumption in 2002



Source: Authors' NTA estimates.

Figure 6.6 Labor income and consumption in 1995 and 2002



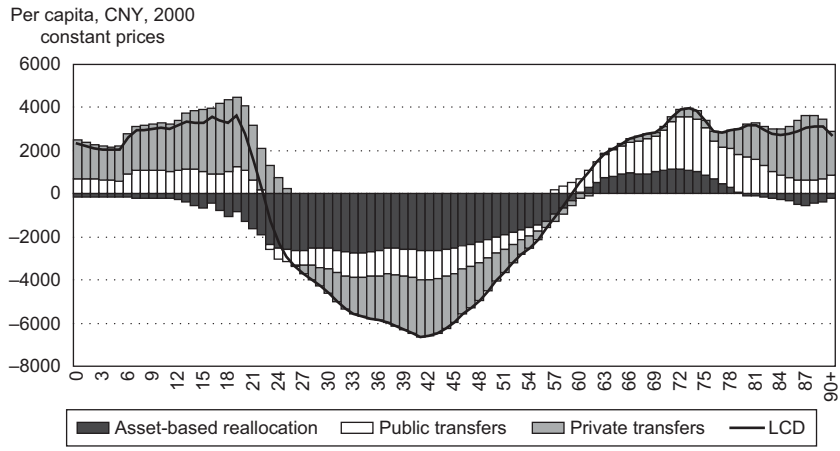
Note: LCD = lifecycle deficit.

Source: Authors' NTA estimates.

Figure 6.7a Financing the lifecycle deficit in 1995

the year 2000. We see that consumption is relatively flat and is comparatively low relative to income, reflecting the high saving rate in the PRC. The peak labor income increased substantially between 1995 and 2002, as high economic growth would suggest. There was also greater expenditure in the 18–24 age range compared to 1995, reflecting an increase in tertiary education expenditures. Lower labor income for the elderly in 2002 suggests that they are relying more on transfers and asset-based reallocations.

Figures 6.7a and 6.7b show the financing of the lifecycle deficit in 1995 and 2002, respectively. A comparison of the two panels shows several patterns of change. First and perhaps most obviously, the values of consumption and income (in 2000 constant prices) increased substantially between 1995 and 2002, reflecting the rapid economic growth in the PRC. Also evident is the rather substantial gap between consumption and income in the peak earning years and the fact that the increase in labor earnings between 1995 and 2002 outpaced the increase in consumption. As noted above, these patterns clearly reveal the high saving rate in the PRC, an important foundation of economic growth and a prominent factor in global macroeconomic imbalances. Some of this is precautionary saving



Note: LCD = lifecycle deficit.

Source: Authors' NTA estimates.

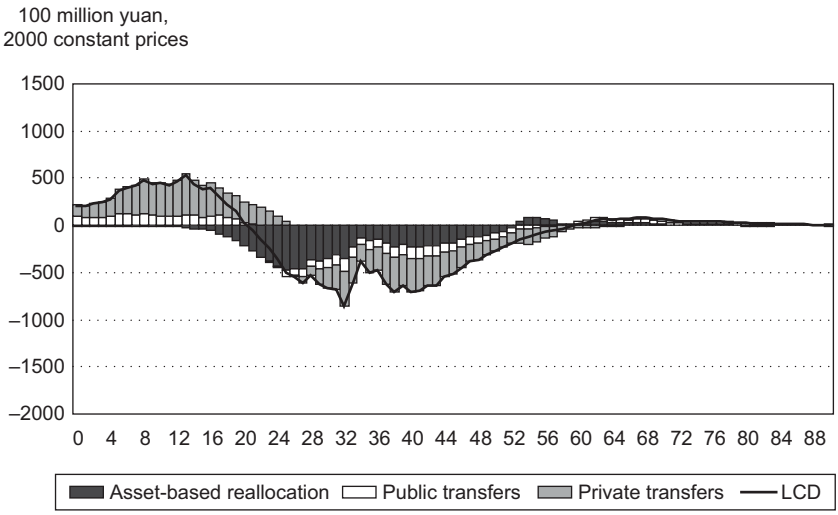
Figure 6.7b Financing the lifecycle deficit in 2002

against a need for healthcare that the fledgling social protection system is still developing to meet.

Figures 6.7a and 6.7b also show the decomposition of the lifecycle deficit into its three components: asset-based reallocations (a negative number indicates savings in excess of asset income), net public transfers, and net private transfers (negative values indicate that a given age group is giving more than it is receiving). Private transfers played a large role in funding the lifecycle deficit in both 1995 and 2002. Asset-based reallocations also played a non-trivial role, mostly in the form of savings that start at a relatively young age on a per capita basis.

Public transfers were relatively modest in 1995 (Figure 6.7a). They reflect public education and other public services such as immunizations and infrastructure allocated for children; negative transfers among the working-age population (who pay taxes and social security contributions); and modest support for the elderly in the form of pensions and other public transfers (such as healthcare which expanded greatly *after* 2002).

Between 1995 and 2002, private transfers to support children increased substantially (Figure 6.7b). The age pattern of support shifted slightly as well, reflecting in part greater investment in higher levels of education. Compared with transfers to support children, growth between 1995 and 2002 in private transfers to support the elderly was more modest. Public transfers had also grown substantially by 2002, especially in support for



Note: LCD = lifecycle deficit.

Source: Authors' NTA estimates.

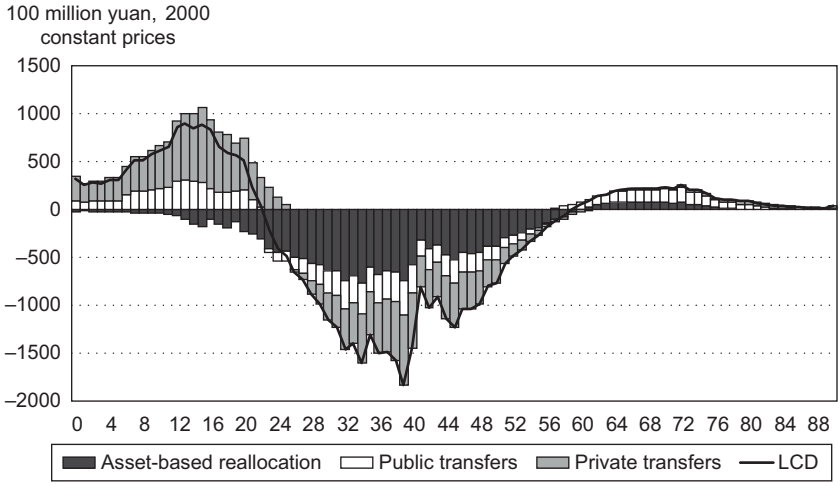
Figure 6.8a Aggregate population lifecycle deficit in 1995

the elderly, while private transfers did not play a large role in supporting the elderly until quite advanced ages. This pattern reflects the fact that while familial transfers to support the elderly are still important, they are becoming less so, while the prominence of public transfers in supporting retirement is growing. This is a pattern common to many countries around the world with similar experiences of economic development and population aging, such as Japan between 1984 and 1994 (Ogawa et al., 2009).

Figures 6.8a and 6.8b adjust the lifecycle deficit to reflect the total population and show the much higher proportion currently in the younger ages relative to retirement years, although this pattern will change with continued population aging. Quite prominent as well are the dips in peak earnings, reflecting the smaller total population born during and surviving the Great Leap Famine (1958–1961) relative to the large cohort born after the famine, that is, those aged 34–37 in 1995 and aged 41–44 in 2002. These differences in cohort size were also evident in the age pyramids in Figures 6.1a–6.1e.

3.3.1 Lifecycle transfers for education, health, and other support

Economic theory (Becker and Barro, 1988) suggests that investment in human capital can offset reduced fertility rates to maintain a productive



Note: LCD = lifecycle deficit.

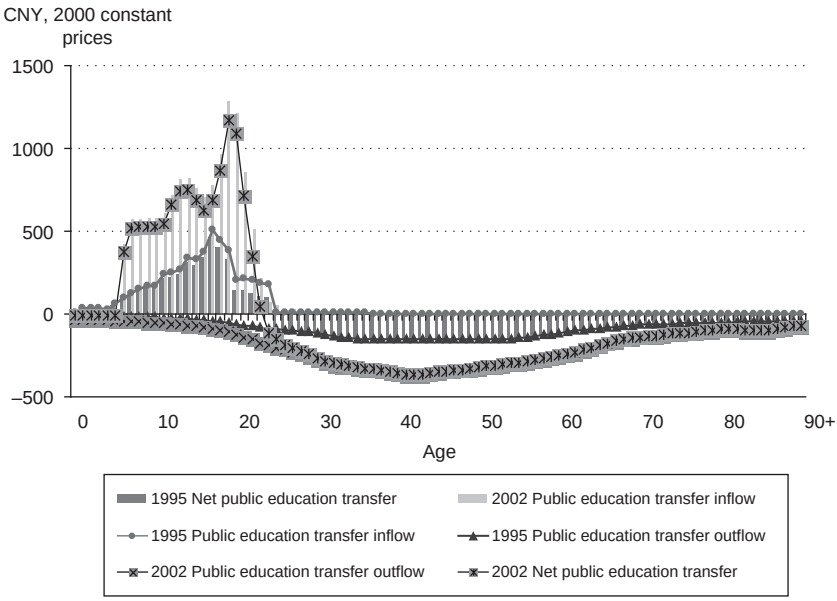
Source: Authors' NTA estimates.

Figure 6.8b Aggregate population lifecycle deficit in 2002

workforce. Chinese society traditionally places a high value on children's education. Expenditures on education, including both public transfers (Figure 6.9a) and private transfers (Figure 6.9b), have clearly increased recently, especially in the senior high school and college ages. However, NTA data indicate that the overall investment in education relative to other middle- and high-income countries remains modest. Addressing the urban–rural and rich–poor disparities in educational access in the PRC will no doubt be a key challenge for sustaining economic growth and addressing social inequalities that could undermine social stability.

Age profiles for expenditures on health and medical care, in contrast, show that public transfers have grown most for the elderly, as reflected in Figure 6.10a (for public transfers), while private transfers have also increased substantially for children and adolescents (Figure 6.10b). Later NTA survey estimates no doubt will show a substantial increase in public transfers for healthcare since government-subsidized health insurance began for rural residents in 2003 and for non-working urban residents in 2007, along with substantial supply-side investments in clinics and hospitals as part of the 2009 national health reform.

Figure 6.11 shows the age profile of public transfers for pensions in 2000 constant prices and reveals a substantial increase by 2002. Nevertheless,

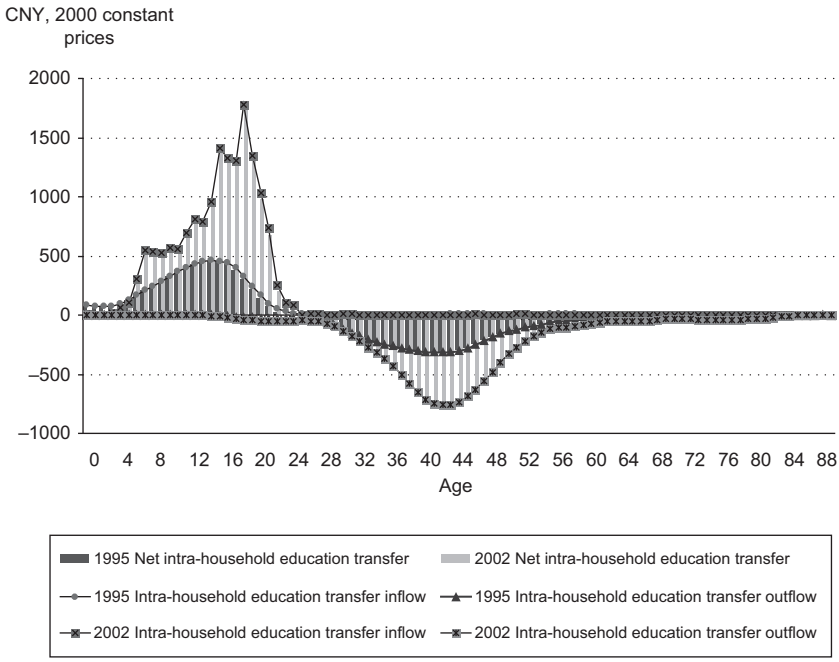


Source: Authors' NTA estimates.

Figure 6.9a Lifecycle public transfers for education in 1995 and 2002

pensions remain a modest form of financial support for the majority of the elderly, as demonstrated in Figure 6.12.

As one would expect, Figure 6.12 shows that the share of support from labor income decreases with age and is higher in each age group in 1995 than in 2002. This pattern in part reflects the continuing urbanization of the population and the decreasing prevalence of people working in agriculture to quite advanced ages, although population aging is still proceeding more rapidly in many rural areas given the outflow of young people to seek work in urban areas. Reliance on private transfers to support the elderly is quite prominent and increases with age, while asset-based income is modest and decreases with age. Since many of the elderly had little opportunity to accumulate private assets during their peak working years in the previous centrally planned economy, it is not surprising that few rely heavily on asset-based income for old age support, especially the older elderly. Public pensions and publicly financed healthcare accounted for only 20 percent of support for those aged 60 or older in 1995 but increased to 40 percent by 2002. Overall, assets and public transfers are growing as sources of support for the elderly, allowing them to rely less on



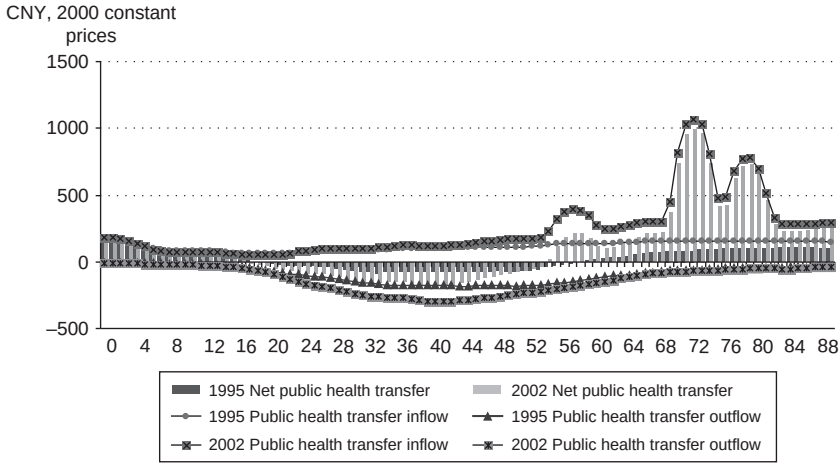
Source: Authors' NTA estimates.

Figure 6.9b Lifecycle private transfers for education in 1995 and 2002

labor income, while familial support remains an important, albeit declining source.

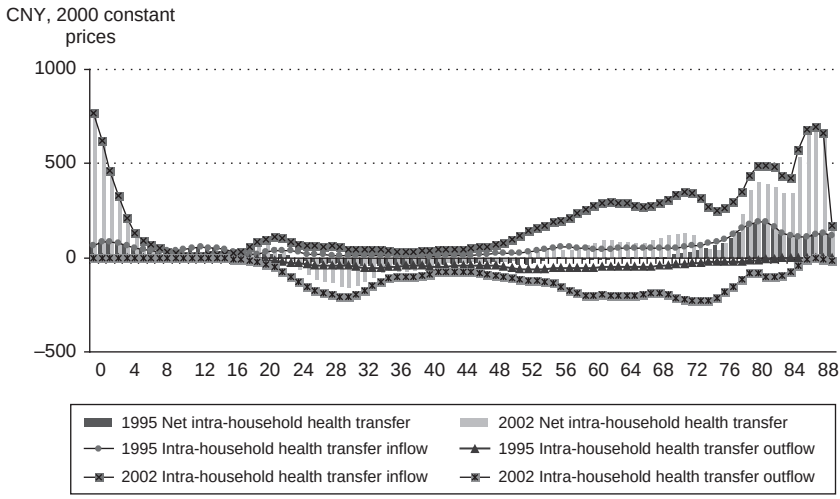
3.3.2 Changes in the lifecycle deficit in the People's Republic of China and some Asian economies

By examining the ages during which an individual's labor earnings exceed consumption, NTA estimates provide an economically compelling way of measuring working life in various countries and how it changes over time. The "cutting age" for becoming a net producer increases with increases in educational attainment. The corresponding cutting age for "retirement" depends on the labor force participation of the elderly, on formal retirement policies, and on incentives embedded in the pension and familial support systems of each country. Figure 6.13 shows that between 1995 and 2002, the cutting age for becoming a net producer in the PRC increased from 20 to 23, which is consistent with the preceding figures showing increased investment in higher education. The age for turning from a net producer to a net consumer remained 60 years;



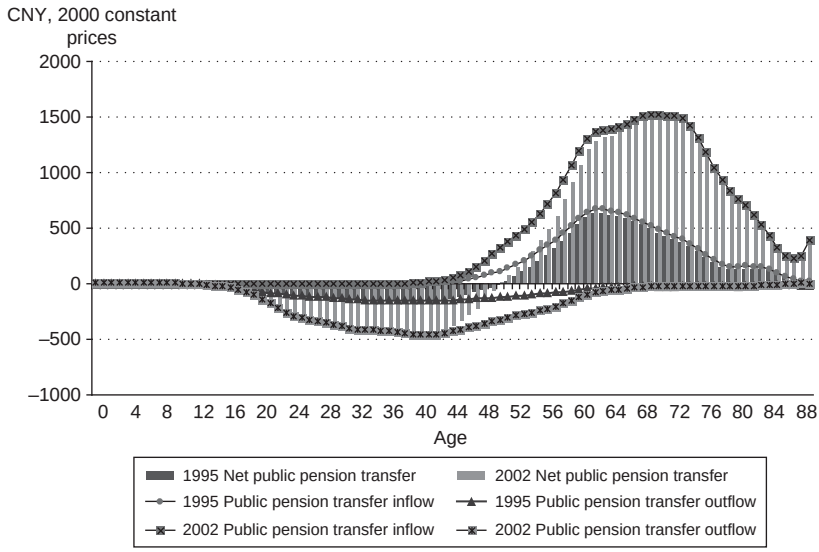
Source: Authors' NTA estimates.

Figure 6.10a Lifecycle public transfers for healthcare in 1995 and 2002



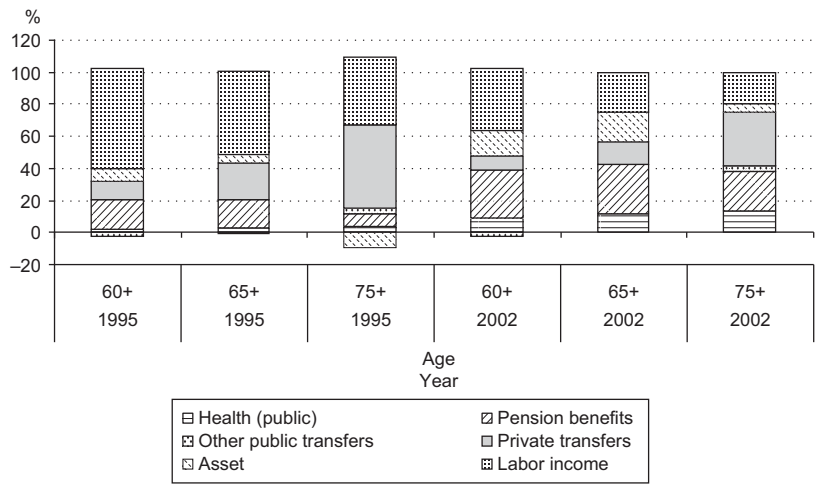
Source: Authors' NTA estimates.

Figure 6.10b Lifecycle private transfers for healthcare in 1995 and 2002



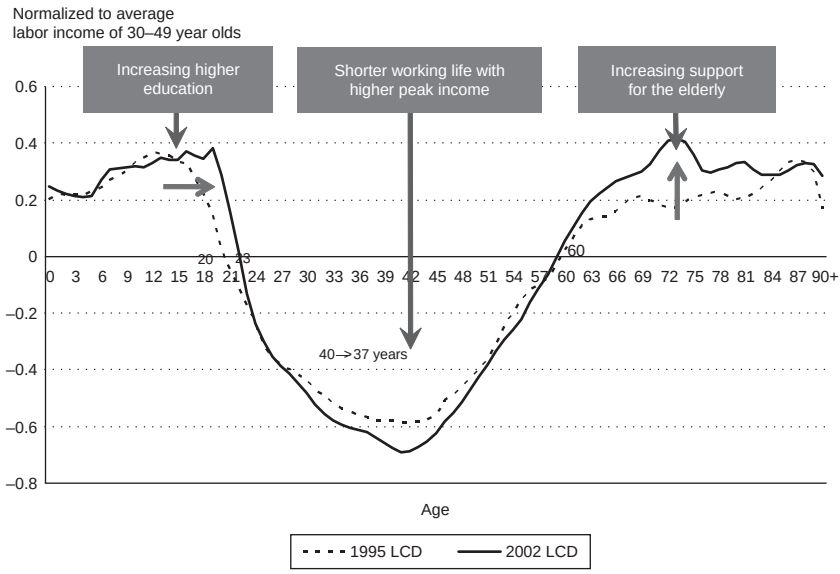
Source: Authors' NTA estimates.

Figure 6.11 Lifecycle public transfers for pensions in 1995 and 2002



Source: Authors' NTA estimates.

Figure 6.12 Financial support for old-age consumption at various ages in 1995 and 2002



Note: LCD = lifecycle deficit.

Source: Authors' NTA estimates.

Figure 6.13 Changes in the lifecycle deficit between 1995 and 2002 in the People's Republic of China

therefore, the average working life span decreased from 40 years to 37 years.

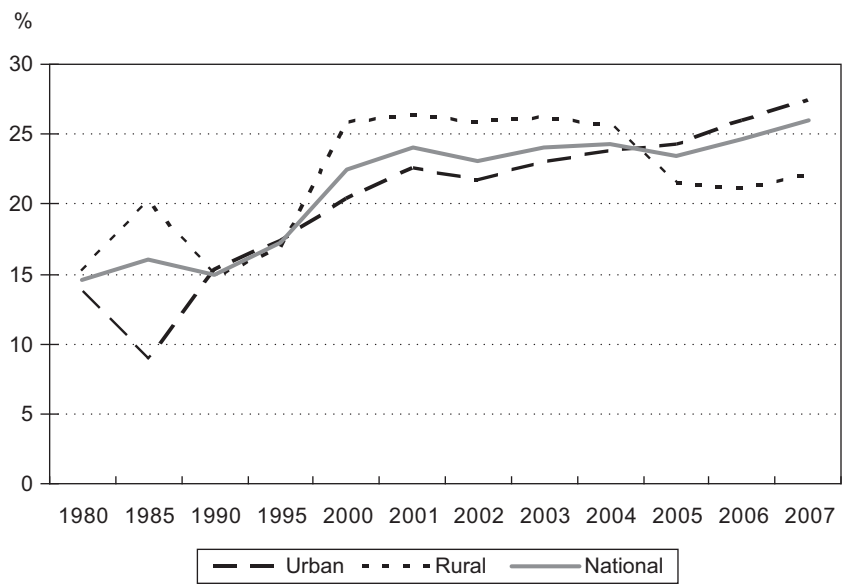
This tendency to shorter working lives (despite increasing longevity) is far from unique to the PRC, as is shown in Table 6.3. The years of working life (as defined by the cutting ages in the NTA) have decreased in Indonesia and Thailand as well. In fact, the working life of 37 years in the PRC is longer than that of many other countries including India, Indonesia, Japan, the Republic of Korea, Thailand, and the US.

Although we acknowledge that there are many limitations to the data upon which the NTA estimates are based, we think it unlikely that data refinements would substantially increase per capita consumption patterns by age in the PRC. Indeed, the PRC is well known for having very high saving rates that have increased during the reform era (Figure 6.14) and remain at extremely high levels compared with most other middle- and high-income countries (Figure 6.15). These high saving rates have contributed to rapid capital formation and figure prominently in any discussion

Table 6.3 Lifecycle deficit cutting ages for working life in selected countries

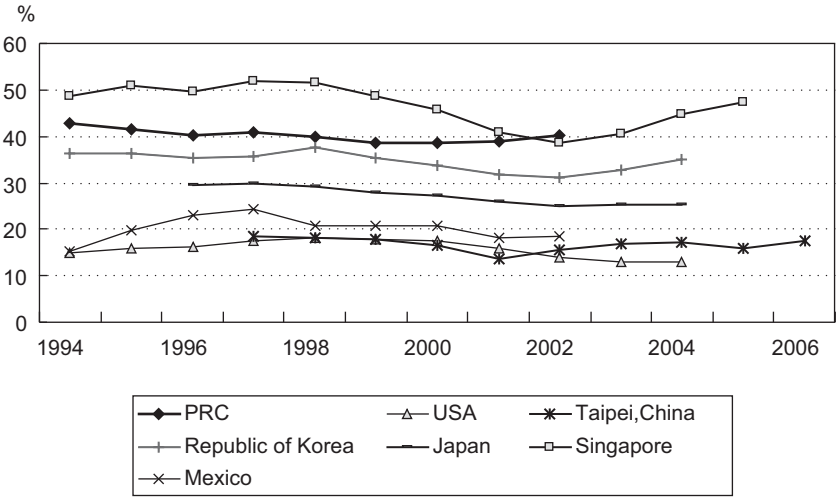
Lifecycle Deficit	Cutting ages		Working Life (years)	Lifecycle Deficit	Cutting ages		Working Life (years)
PRC 1995	20	60	40	Thailand 1996	25	59	34
PRC 2002	23	60	37	Thailand 2004	26	58	32
Japan 2004	26	60	34	Indonesia 1999	28	59	31
Republic of Korea 2000	24	56	32	Indonesia 2005	29	58	29
United States 2003	26	59	33	India 1999	27	63	36
Philippines 1999	27	60	33	India 2004	27	59	32

Source: Data from NTA website, accessed 20 March 2011.



Source: Li Shi (2011).

Figure 6.14 Saving rates in the People's Republic of China from 1980 to 2007 nationwide and separately for urban and rural areas



Source: United Nations System of National Accounts, accessed 20 June 2008.

Figure 6.15 International comparisons of saving rates

of future economic growth and the development of the country's social protection system.

4. CHALLENGES FOR THE SOCIAL PROTECTION SYSTEM: PENSION AND HEALTHCARE POLICIES

4.1 Pensions

Old-age support systems differ across countries, but there are some regional patterns, such as a larger role for net familial transfers in Asia compared with Europe, Latin America, or the US (Mason and Lee, 2011). In the PRC, the elderly have long relied on familial support, especially in rural areas, which is one of the factors behind the desire for male heirs and the large and growing gender imbalance (Li, 2007). The government has attempted to establish pension systems to supplement, if not eventually supplant, reliance on offspring for old-age support, but this effort is in many ways still nascent, especially in rural areas, and familial support remains paramount. Clearly there is much room for improvement as the system develops to meet the core objectives of any pension system: consumption smoothing, insurance, income redistribution, and poverty relief (Barr and Diamond, 2010).

4.1.1 The basic pension system in urban areas

As in other social security systems, old-age insurance in the PRC consists of multiple levels and features large disparities across sectors and geographic areas. In urban areas, the government-run "basic old-age insurance system for enterprise employees" dominates. Enterprise employees who have reached retirement age and who have paid their share of the premiums for 15 years or more are entitled to collect a monthly stipend consisting of two parts: a basic pension and a personal account. Although there are regional variations, the basic pension is typically about 20 percent of average monthly wages in the previous year and the personal account is 1/120 of the total accumulated (11 percent of an employee's wage is deposited every month). In 2003, the monthly basic pension for enterprise retirees was 621 yuan on average, and the number of people participating in the scheme reached 155.06 million. In addition to the basic pension (which addresses poverty alleviation and insurance goals) and individual accounts (that link pensions to earnings and thus support replacement rates), urban residents can purchase voluntary pensions. This three-part system provides a good basis for continued pension reform and is lauded by experts as "a major accomplishment" (Barr and Diamond, 2010).

The retirement and pension system for employees of government agencies and public institutions was originally funded directly from the government budget as a defined benefit based on earnings at the end of the career. Ever since the 1990s, some localities have begun experimenting with reforms to finance pensions through a contributory system similar to that for other urban employees in the formal sector. By the end of 2003, some 11.99 million employees and 2.58 million retirees had participated in such pilot programs.

4.1.2 Financing pension obligations

As the aging of the population accelerates, the government is using multiple channels to finance pension obligations. Generally contributions are required from both enterprises and employees, but it is important to remember that this is a nominal distinction only. Formal economic analyses of the true incidence of contributions, both for pensions and for health insurance, unfortunately are virtually non-existent.[5] Generally the premiums nominally paid by enterprises do not exceed 20 percent of the total wage bill of the enterprise, with the specific proportions determined by local governments. Individual employees generally pay 8 percent of their wages as pension contributions, while self-employed individuals pay about 18 percent of the average wage in their localities. In 2003, the basic pension contribution paid by enterprises nationwide totaled 259.5 billion yuan.

In addition to contributions by employers and employees, government

subsidies play a role. In 2003, state budgets at all levels contributed 54.4 billion yuan to basic old-age insurance funds, representing 17.33 percent of the total contributions paid by the enterprises. The national social security fund the government decided to create in 2000 manages funds acquired from state shareholding, from stock assets, funds from the central budget, funds raised by other means approved by the State Council, and investment returns. By the end of 2003, it had accumulated over 130 billion yuan; however, most localities are running deficits, so individual accounts are "empty" in the sense that current contributions are used to finance current benefits as a pay-as-you-go-system despite the original intent to fund individual accounts.

There is much debate about "empty accounts" in the PRC (D. Wang, 2006) and how they undermine the credibility of the original pension benefit design. It is important to realize, however, that notional individual accounts with proper actuarial accounting are not inherently bad, and indeed have been adopted as a supplement to basic pensions in several countries. Barr and Diamond (2010) recommend retaining individual accounts in the PRC but implementing them as notional, defined-contribution accounts rather than fully-funded accounts or empty accounts. As such, workers would receive statements of the contributions and interest accumulated in their accounts guaranteed as a government obligation. The pensions paid from individual accounts would be partially funded through a centralized fund (Barr and Diamond, 2010).

4.1.3 Pension coverage in urban and rural areas

Pension coverage is still limited primarily to formal-sector employees in urban areas. The remaining population has relatively little coverage especially in rural areas where individual saving and intra-household transfers continue to play key roles in supporting the elderly. Unlike the pension system for urban employees that dates back to 1952, rural residents had no pension plans until 1986, when some villages in Jiangsu and Zhejiang provinces set up pilots. In 1991, the Ministry of Civil Affairs advocated running rural pension pilots starting in Shandong Province. The "Basic Scheme of Rural Pensions at the County Level (Trial Implementation)" in 1992 was the first formal indication of these preliminary explorations and initially outlined the blueprint of the country's rural pension system. By the end of 1995, 1608 counties in 30 provinces had introduced this system, and 6.12 million farmers (14.2 percent of the rural population aged 20 to 60) had voluntarily participated and contributed 6.2 trillion yuan. From 1995 to 1997, the number of participating counties grew to 2123, and more than 8.2 million rural residents were covered (a 9.47 percent participation rate). This rural pension system reached its peak around 1999, accumulating an

18.4 trillion yuan surplus and then rapidly shrank to 1887 counties in 2004 (a 32.6 percent reduction compared with 1999) and 5.389 million participants, because of serious problems with the fund's administration.

These pilots mainly financed their pension funds from individual contributions and only partly from collective allowances. The State Council tried to popularize commercial insurance plans in rural areas in 1999 but quickly gave up as the premiums were evidently beyond the reach of most of the rural population. In 2002, the 16th National Congress of the Communist Party of [the People's Republic of] China set up targets to establish a system combining pension plans, health insurance, and subsistence allowances in rural areas and thus began to develop rural pension systems again.

By the end of 2003, some 54.28 million people had joined the old-age insurance program in rural areas, with 1.98 million farmers drawing pensions. In 2004 in some rural areas, the government also began to experiment with a system that supported and rewarded households that practiced family planning by having only one child or two girls. Each member of such a couple can receive a minimum of 600 yuan a year from the age of 60 until the end of his or her life, provided jointly by the central and local governments.

In 2009, the government issued the "State Council Guidance for New Rural Pension Pilots" (*Guowuyuan Guanyu Kaizhan Xinxing Nongcun Shehui Yanglao Baoxian Shidian de Zhidao Yijian*) effective on 1 September. The aim was to safeguard the livelihoods of the rural aged by establishing a "basic, wide, flexible and sustainable" pension system with the following requirements: (1) financing and payment standards must correspond to rural socioeconomic capacity; (2) individuals (or households), communities, and governments must share financial responsibility; (3) enrollment must be voluntary; and (4) the central government determines only the basic principles and main policies while local governments autonomously formulate their specific plans and administer their own pension funds.

This system calls for financing from individual contributions, collective subsidies, and government allowances and is intended to be a combination of pay-as-you-go and funded systems similar to the urban pension system. The goal is to gradually expand to full coverage by 2020.

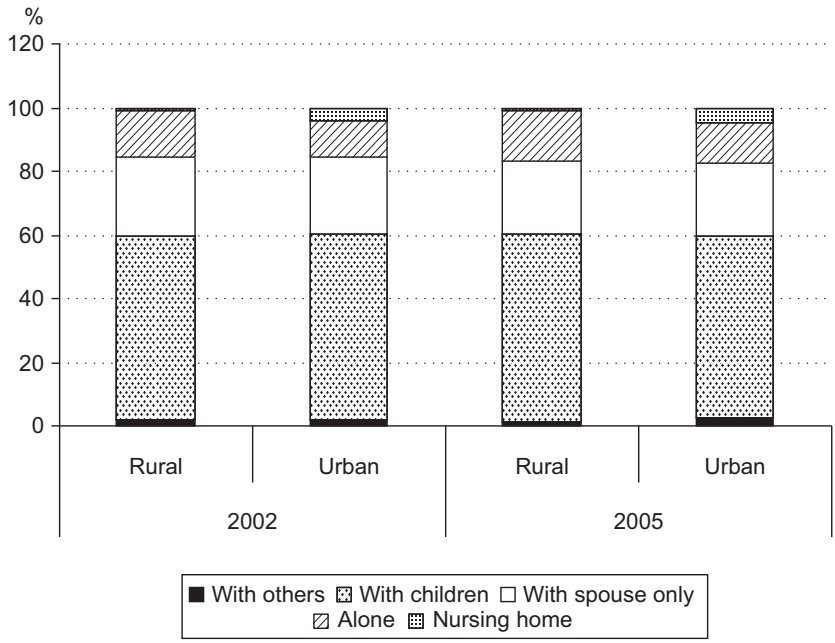
4.1.4 Private transfers to the elderly: familial support

The PRC does not currently have nationwide census data on familial support for the elderly; however, the National Aged Population surveys by Peking University in 2002 and 2005 provide valuable data for evaluating it based on a sample size of 15 638. Table 6.4 and Figure 6.16 show living arrangements for the population aged 65 and older. In 2005, the majority lived in the same household as their offspring (59.14 percent in rural areas and 57.04 percent

Table 6.4 Living arrangements of the elderly in the People's Republic of China in 2002 and 2005 (%)

	2002 Total	2005 Total	2002 Rural	2002 Urban	2005 Rural	2005 Urban
With offspring	64.46	64.06	57.99	58.03	59.14	57.04
With spouse only	15.69	17.9	24.36	24.42	23.18	23.2
Alone	13.45	13.41	14.64	11.71	15.39	12.78
In a nursing home	4.61	2.7	1.22	3.82	1.22	4.5
With others	1.79	1.94	1.79	2.02	1.07	2.48

Source: Authors' calculations using data from the National Aged Population Survey (Peking University, 2002 and 2005).



Source: Authors' calculations using data from the National Aged Population Survey (Peking University, 2002 and 2005).

Figure 6.16 Living arrangements of the elderly (aged 65+) in the People's Republic of China in 2002 and 2005

Table 6.5 Main source of financial support for the elderly (aged 65+) in 2002 (%)

	Urban	Rural	Total
Pension	37.8	5.5	19.9
Spouse	2.4	1.9	2.1
Child(ren)	43.8	69.0	57.8
Grandchild(ren)	3.9	6.0	5.0
Other relative(s)	0.4	0.7	0.6
Local government or community	5.8	4.2	4.9
Self-supported	3.9	11.3	8.0
Other main source of support	2.1	1.3	1.7

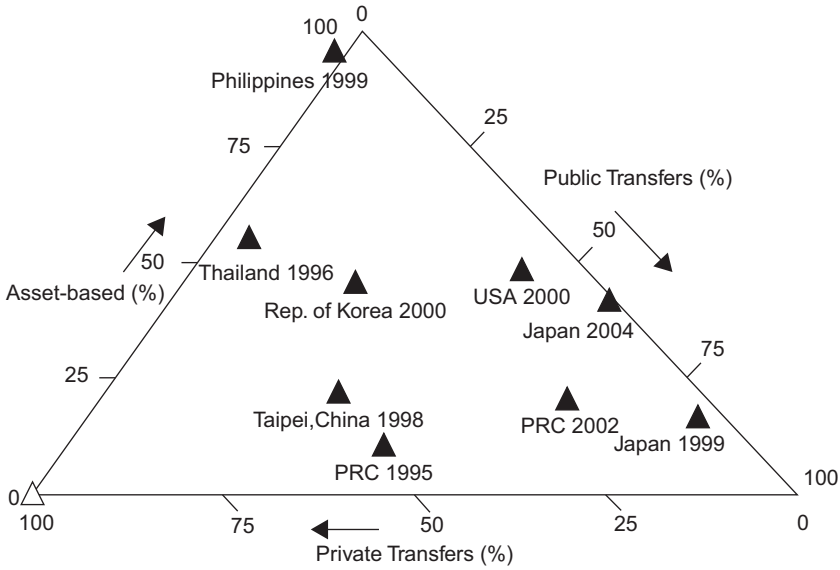
Source: Authors' calculations using data from the National Aged Population Survey (Peking University, 2002 and 2005).

in urban areas), while only 1.22 percent and 4.5 percent, respectively, lived in nursing homes; the percentage living with offspring changed little between 2002 and 2005. These data reveal that familial support for the elderly, a long-standing tradition, continues to play a key role. Recent evidence, however, suggests that family and household structures have been changing greatly (Zeng and George, 2000) as lower fertility has reduced the number of potential relatives with whom the elderly can reside.

People often take it for granted that the rural elderly are more likely to live with offspring while the urban elderly are more likely to live independently, but the data from the survey do not support this assumption as the percentage living with offspring did not vary significantly between rural and urban areas. Based on this data, we may infer that intra-household transfers are the main channel of support for the elderly, which is supported by the data in Table 6.5.

Clearly, families are the main sources of financial support for the elderly in both urban and rural areas, and while 37.8 percent of the elderly depended on pensions as their main financial source in urban areas, only 5.5 percent did so in rural areas – a significant disparity. It is also important to note that 11.3 percent of the elderly in rural areas were self-supporting, which is consistent with our estimates of the age–labor income profile for rural areas in Figures 6.4 and 6.5, which show a relatively smooth "peak" and continued labor income into advanced ages. In addition, National Aged Population Survey data also indicate that 26.3 percent of rural elderly and 18.2 percent of urban elderly do not have enough financial support to cover their living costs, which is a high proportion (not shown).

Given the large scale of rural-to-urban migration for work, how are



Source: NTA website, accessed 20 March 2011.

Figure 6.17 Sources of financial support for the elderly (65+) in selected Asian economies

migrant adult children supporting their elderly parents who stay behind in rural areas? While more research is needed, recent studies have shed considerable light on this important issue.

Shuzhuo Li, Xiaoyi Jin, and Marcus Feldman (2011) examined how the mass outflow of rural labor has not only accelerated aging in rural areas but has also had an impact on familial support for the elderly. Analyzing longitudinal data from Anhui Province as well as data on rural–urban migrants in Shenzhen City in Guangdong Province, they found that the tradition of elder care and change coexist in rural PRC. Migrant children are able to provide their parents with better economic support but with less direct care and emotional support. Migration also places additional burdens on grandparents in terms of childcare and agricultural fieldwork, which affects their health and well-being.

Figure 6.17 compares sources of financial support for the elderly in the PRC and selected Asian economies based on recent NTA estimates. At the apex of the triangle is asset-based reallocations while the bottom two vertices show reliance on private transfers (to the left) and public transfers (to the right). The numbers along each side indicate the mix

of the three sources that each economy uses to support the elderly. The Philippines shows a high reliance on asset-based reallocations while Japan has relied on public transfers, although that decreased between 1999 and 2004 in favor of assets. In 2000, the US showed a mix of assets and public transfers, with little reliance on private transfers. Other economies show a substantial reliance on familial transfers. The position of the PRC changed significantly from 1995 to 2002, with private transfers decreasing from about 50 percent to about 25 percent of elderly financial support. Over the same period, reliance on public transfers and on assets increased modestly. We anticipate that reliance on assets and public transfers has increased further since then and will continue to do so as the elderly cohorts have opportunities to accumulate assets.

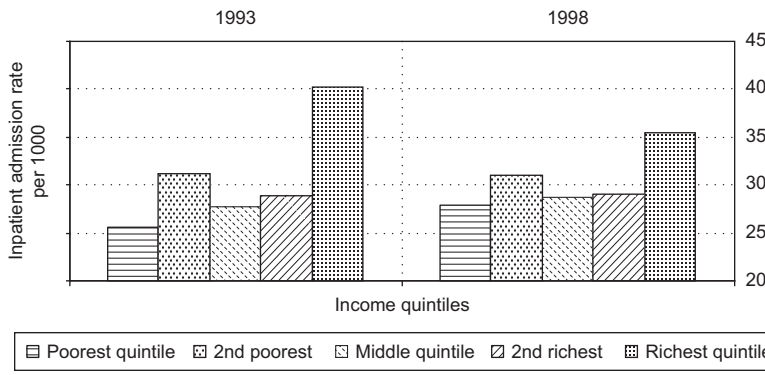
4.2 Healthcare

4.2.1 Healthcare reform since 1980

The healthcare delivery system in the PRC is quite extensive in both urban and rural areas. In 2003, the number of beds per 1000 population was 2.35, a figure that increased by 14.4 percent during the 1980s and by 3.9 percent during the 1990s. There are 1.868 million doctors in total and 1.48 doctors per 1000 population. In the first half of the 1980s, the number of doctors per 1000 population increased by 13.7 percent, while in the second half the number increased by 15.8 percent. During the 1990s, the number was comparatively stable.

Public hospitals owned by states and local governments account for 93.31 percent of hospital beds and employ 94.23 percent of health professionals. All public hospitals are classified as non-profit organizations. The number of private hospitals is growing gradually.

Since the 1990s, the government has decreased subsidies to public hospitals and adopted explicit or implicit policies allowing them to generate profits from user charges to cover their own expenditures. Government subsidies accounted for 30 percent of expenditures of public hospitals in the 1980s but account for just 10 percent at present. As a result, an oversupply of profitable services like high-tech diagnostics and procedures and profitable medications has become common, while basic services are not necessarily of high quality nor accessible to all. As in many countries, healthcare expenditures have grown rapidly, exceeding the growth rate of per capita income.[6] In fact, the high healthcare spending burden is considered to be one of the most serious social and economic problems in the PRC.[7] Evidence suggests that the lower-income population is most severely affected since they utilize fewer services (Figure 6.18), despite having a higher burden of ill health.



Source: Ministry of Health's Third National Healthcare Service Survey 2003 (Government of the PRC Ministry of Health, 2004).

Figure 6.18 Access to healthcare in rural areas in 1993 and 1998

4.2.2 Basic medical insurance system for urban employees

The government has responded to the issue of high out-of-pocket expenses in part by expanding health insurance coverage to pool risk and prevent poverty caused by illness. In 1998, the government reformed the basic medical insurance system for urban employees, creating municipal insurance pools to replace the previous company-based arrangements. This system combines individual medical saving accounts with a social health insurance risk pool and is managed by local governments. By the end of 2003, some 109.02 million people had participated in the program, including 79.75 million employees and 29.27 million retirees.

The basic program covers all employers and employees in urban areas, including the retired. The funds come mainly from premiums paid by employees (2 percent of wages) and employers (6 percent of the total wage bill), though we are not aware of any rigorous study quantifying the true incidence of paying health insurance premiums. Retirees are exempted from paying premiums. The individuals' premiums and 30 percent of the premiums paid by the employers generally are allocated to personal accounts; the remaining 70 percent goes into the social risk-pooling fund.

Outpatient treatment fees are mainly paid from the personal account, while inpatient expenses are paid mainly by the social risk-pooling fund. The minimum benefit level is, in principle, about 10 percent of the average annual wage of local employees, and the maximum reimbursement is about four times that average. Therefore, urban insurance does not cover

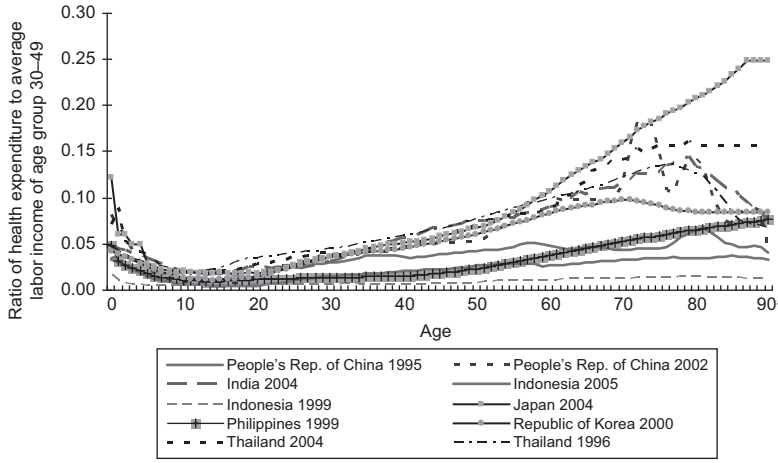
catastrophic spending but rather caps the insurer's liability, leaving households at risk for the largest medical bills. This insurance design, while not optimal, does keep premiums down and coverage relatively wide.

4.2.3 The new cooperative medical scheme for rural residents

Before 1978, the communes in rural PRC provided healthcare through a three-tiered "cooperative medical system" that organized barefoot doctors and provided other medical services managed and financed by commune welfare funds. Thus the system served the dual role of supplier and collector of insurance funds. After economic reforms in agriculture, the system collapsed as communes collapsed.

In 2003, the government began to implement the "New Cooperative Medical Scheme" in rural areas. Insurance is voluntary for households while risk pooling and benefit design are done locally, so there are wide variations across the country, depending on the socioeconomic status of the locality. Originally, the premium was just 50 yuan a year, of which 40 yuan was subsidized by central and local governments, the remaining ten yuan coming from the individual. Benefit levels have subsequently increased although they are still modest. The insurance covers mainly inpatient medical expenditures and some outpatient expenditures. As the funding scale is low, the insurance benefit is limited. The main characteristics of the new scheme include: (1) strengthened government financial support; (2) increased access to medical aid for the poor by coordinating with anti-poverty policies (e.g., *dibao*); (3) increased risk pooling for counties; and (4) a focus on insurance for catastrophic illnesses.

This program has been rolled out nationally and has now achieved nearly universal coverage, representing probably the most rapid expansion of insurance in world history. Since it is voluntary, adverse selection is potentially a problem, though it has been a comparatively minor one to date given strong incentives for local governments to keep enrollment high. Secondly, the administrative costs of collecting premiums are high as they must be collected household by household rather than as payroll deductions, and because the premiums and government subsidies are low, the reimbursement rate is also low. The average co-payment by the individual is still as high as 50 to 70 percent. Moreover, to ensure sustainability, the government will need to address important issues of payment incentives for providers and increasing "value for money" in the health sector including revising incentives for government-owned hospitals and their employees so that their financial and professional goals are better aligned with the social goal of quality healthcare at a reasonable cost.



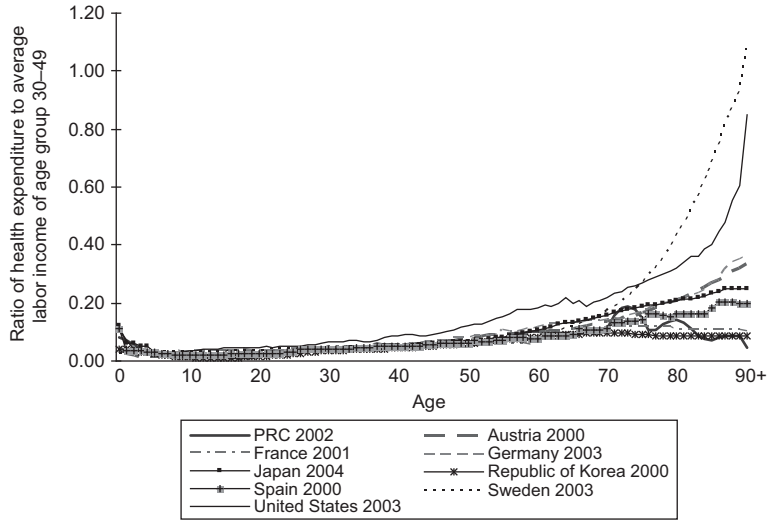
Source: Authors' calculations using NTA estimates and the NTA website, accessed 30 April 2011.

Figure 6.19 Health expenditures in selected Asian countries in various years

4.2.4 An international comparison of lifecycle health expenditures

Economic theory and international experience would suggest that expanded insurance coverage and increased incomes in the PRC would have led to increased healthcare expenditures per capita, perhaps disproportionately so among the elderly as that cohort grows and the burden of disease shifts from communicable to chronic, non-communicable diseases. Figures 6.19 and 6.20 show the patterns of health expenditures by age in the PRC compared with those in other countries. We do indeed see a rise in health spending in the PRC between 1995 and 2002 in Figure 6.19, with the largest increases among those aged 50–80. In the 1990s, health spending by age was relatively flat into old age in the PRC as it was in Indonesia, in sharp contrast with the rising spending with age evident in countries like Japan, Sweden, and the US after the turn of the century (Figure 6.20). In 2002, the spending profile in the PRC became more like Japan's in 2004, albeit still at a much lower level and increasing far less steeply with age even when normalized by the average labor income of the age group 30–49 in each country.

Finally, we compared the NTA estimates of the share of public financing in total health expenditures with that reported in the Global Health Observatory Database, the main repository for health statistics of the



Source: Authors' calculations using NTA estimates and the NTA website, accessed 30 April 2011.

Figure 6.20 Health expenditures in the People's Republic of China and Organization for Economic Co-operation and Development countries in various years

WHO (http://www.who.int/gho/en/). As shown in Table 6.6, while the estimates of the public/private shares in health expenditures are quite similar for many countries, there are also notable discrepancies. Moreover, the differences are not consistently of the variety that one might expect from comparing household survey estimates (from the NTA) with those supplied by governments with adjustments for international consistency (WHO estimates). Some NTA estimates found a much higher level of public health spending than WHO did (for example, by 17 percent for Brazil and 25 percent for India) while other NTA figures underestimated public spending relative to the public–private ratio reported by WHO (for example, by 3 percent for Germany, 12 percent for Japan, 21 percent for Senegal, 42 percent for Uruguay, and 43 percent for Thailand in 2004). Overall, the correlation coefficient between the two series is 0.636. Further investigation of these differences is warranted, especially when interpreting public and private transfers for health generated by NTA estimates across countries over time.

Table 6.6 National Transfer Accounts and World Health Organization estimates of public and private expenditures on health

Country	Year	Share of public health expenditure (%)	
		From NTA estimates	From the WHO Global Health Observatory database
Austria	2000	75.71	76.80
Brazil	1996	57.98	40.50
Chile	1997	47.26	47.10
PRC	1995	51.20	51.20
PRC	2002	35.83	37.10
Costa Rica	2004	78.16	70.40
France	2001	79.68	79.40
Germany	2003	75.50	78.70
Hungary	2005	72.92	72.30
India	2004	47.92	22.50
Indonesia	2005	42.55	45.80
Japan	2004	69.41	81.70
Philippines	1999	41.60	44.20
Senegal	2005	33.99	55.30
Slovenia	2004	79.89	73.00
Republic of Korea	2000	46.99	44.90
Spain	2000	75.98	71.60
Sweden	2003	90.46	82.50
Thailand	1996	20.95	47.20
Thailand	2004	21.93	64.90
Uruguay	2006	31.62	74.10
United States	2003	44.11	43.90

Source: NTA website and the WHO Global Health Observatory Database, http://www.who.int/gho/en/, both accessed 30 April 2011.

5. CONCLUSIONS AND POLICY DISCUSSION

The PRC is aging. As this accelerates, the number of elderly people will become very large and will reach a peak in the 2030s. The country faces numerous challenges to sustain its economic development during what is referred to as its third stage of social and economic transformation. Arguably, this stage is different from the previous two, that is, the socialist transformation initiated in the 1950s and the transition from central planning to a market-based economy, which started in 1979. The current

transformation started in approximately 2003 but is especially well articulated in the current Twelfth Five-Year Plan that emphasizes balancing economic development and social development, achieving a "harmonious society" through improving people's lives, and happiness. Unfortunately, the NTA estimates described in this chapter end in 2002 and thus do not reflect the latest policies and trends. The direction of change nevertheless appears clear. Achieving a balance between sustained growth and social inclusiveness will be a challenging task in the years ahead.

Many observers are concerned about support for the elderly and the potentially negative impact of population aging on the future economic growth of the PRC. Some characterize the situation as not only a crisis but a crisis that has to date been mishandled by policymakers: "The aging of [the People's Republic of] China's population represents a crisis because its arrival is imminent and inevitable, because its ramifications are huge and long-lasting, and because its effects will be hard to reverse" (Wang, 2010); "[the People's Republic of] China's slow recognition and inaction in the face of its impending demographic crisis – inaction that persists despite appeals by almost all the country's population experts to phase out the one-child policy – reflect policy makers' lack of understanding of the changing demographic reality" (Wang, 2010).[8] In contrast, Banister et al. (2010) emphasize that there are many reasons to believe that the economy *will* respond effectively to this demographic transition and that the government will continue to establish resilient policy and institutional responses that maintain development momentum even as the growth rate declines – an almost inevitable consequence of reaching middle-income status.

We see an element of truth in both views but lean towards cautious optimism. The demographic future of the PRC will indeed be quite different from its recent past, and the challenges of an aging population with a relatively low per capita income in such a populous country are daunting. The trajectory for the PRC over the coming decades will be determined to a large extent by its policy responses. "To continue to have both economic growth and support an elderly population, it is necessary to have policies that encourage work effort, higher rates of savings and investment, and greater investment in human capital" (Mason and Lee, 2011). It is in effective policy response that the government can learn from the experiences of many other countries and from its own newfound determination to seek more balanced, inclusive growth.

We must also not forget the diverse ways in which the elderly continue to make substantial contributions to younger generations. The experiences of other rapidly aging countries with strong familial support traditions, such as Japan and the Republic of Korea, suggest not only that a second demographic dividend is possible but also that the elderly provide

ongoing support to their families in ways that are not often recognized in the crisis rhetoric of population aging. For example, Naohiro Ogawa, Amonthep Chawla, and Rikiya Matsukura (2011) found that with regard to intra-familial transfers in Japan, the age at which an average individual shifted from a net giver to a net receiver increased dramatically from 64 in 1984 to 77 in 2004. The authors argue that the elderly should be considered latent assets rather than liabilities in contemporary Japanese society because during Japan's so-called "lost decade", the elderly played a crucial role in providing financial assistance to their adult offspring and their grandchildren.

In contrast, in the PRC the opportunities of the current elderly to accumulate private wealth during their prime working ages were severely constrained (therefore our lack of systematic data on bequests is unlikely to be a severe limitation). The elderly nevertheless make substantial contributions to family well-being as, for example, caregivers for grandchildren. In fact, in rural areas the elderly often are the sole caregivers for children left behind by parents who have migrated to urban areas. Improved health presumably makes this role possible for a longer period and for a broader range of families. These intra-familial transfers by the elderly to their offspring are not accounted for in the intergenerational transfers discussed in this chapter since, as mentioned previously, current NTA estimates do not include non-market household activities such as childcare.

On balance, the sheer number of older Chinese will still present a formidable challenge in the country's quest to achieve a relatively well-off (*xiao kang*) society with balanced development. Without a more robust social protection system, many of the elderly will be left without adequate support, fueling the wide economic disparities that currently characterize the nation. On the other hand, an overly generous system can impede chances to generate a second demographic dividend. Thus, while the tradition of familial support for the elderly has merits, policymakers need not overly fear the transition away from it. "If countries rely to a significant degree on assets to fund retirement, population aging will lead to greater wealth . . . and higher standards of living . . . The evidence suggests that East Asian countries are following this track . . . with low reliance on public transfer systems" (Mason and Lee, 2011). As the world's most populous country, trends in the PRC will shape those of the region and the world.

A vital component of such a transition is establishing a viable pension system not exclusively based on pay-as-you-go public transfers and flexible enough to address poverty alleviation and income redistribution as the PRC continues to urbanize and develop. Since the saving rate is already quite high, there are reasons to suggest that adopting a fully funded pension system is currently not optimal. Barr and Diamond (2010) argue

that, "limited pension accumulation rather than full funding better suits conditions in [the People's Republic of] China today." They recommend notional accounts, expanding the contributory pension system to all large firms in both rural and urban areas, and introducing a nationwide, tax-financed "citizen's pension" based on age and residence to everyone except those with a significant pension from the mandatory system, similar to pension systems in Australia, Canada, Chile, the Netherlands, and New Zealand.

The effects of aging will have specific gender impacts as well. The traditional reliance on male children for old-age support will no doubt continue to erode with the large-scale migration of the rural population and its long-term low fertility and with increased financial support from migrant daughters (Li et al., 2011). The economic impact of reductions in the working-age population can be partly offset by greater female labor force participation and less gender discrimination (see for example discussion in Banister et al., 2010). As is true around the world, women in the PRC have a longer life expectancy than men and therefore can expect to spend a part of their retirement without a spouse.[9] For men, the poorest economic strata will increasingly find it difficult to marry given the large gender imbalance in the PRC; Maria Porter (2010) argues that there will be a particular need to address the care requirements of unmarried elderly men in rural areas in the future. A citizen's pension would be especially attractive for supporting women and unmarried men, especially in rural areas. Wise policy decisions to invest in the human capital of the next generation, to shore up safety nets for the vulnerable, and to develop a sustainable system of old-age support can lay the foundation for continued economic growth and more balanced socioeconomic development.

NOTES

1. According to the United States (US) Census Bureau, fertility was estimated to have been 2.2 in 1990, 1.8 in 1995, and less than 1.6 since 2000 (US Census Bureau, 2009).
2. The figures are from the US Census Bureau (retrieved from life tables on April 2011).
3. For a more detailed discussion on the transition of PRC demography, please see Judith Banister (1987), Andrew Mason (2002), and Feng Wang (2010).
4. For more details on NTA estimation methodology, please see Lee et al. (2008) and Mason et al. (2009).
5. "In a market economy, it is inappropriate to attach too much importance to whether pension contributions are paid by the employer or the worker, because mandatory social security contributions or payroll taxes imposed on employers have the effect of reducing the wages they offer workers." (Barr and Diamond, 2010, p. 8).
6. The per-outpatient-visit fee grew from an average of 10.8 yuan in 1990 to 126.9 yuan in 2005, while the consumer price index only doubled during the same period.
7. A survey conducted in 2003 by the Ministry of Health found that 48.9 percent of patients

who "should" see a doctor chose not to and that over 70 percent of them reported that this decision was because of the high price of healthcare.

8. Concern also arises because of the potential impact of disparities on social stability. Reports of public disturbances including protests, demonstrations, picketing, and group petitioning totaled 74 000 in 2004 and 87 000 in 2005 (Lum, 2006). Whether this trend is related to demographic change and its associated social challenges is not entirely clear.
9. In 2010, the probability of surviving to age 65 was 85.28 percent for women compared with 77.78 percent for men (according to life tables for the PRC maintained by the US Census Bureau).

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7. Demographic dividends for India: evidence and implications based on National Transfer Accounts

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1. INTRODUCTION

The missing link in the debate on the impact of population on economic growth is the effect of age structure (Bloom and Williamson, 1998). During the demographic transition from high fertility and high mortality to low fertility and low mortality, the age structure of the population undergoes unprecedented changes from a broad-based pyramid tapering at the top, to a shrinking base with an enlarged middle and a gradually expanding top. The age structure of a population has economic ramifications as children and the elderly consume more than they produce, while those in the prime working ages support not only their own consumption but also that of the economically dependent segments of society. Countries with shrinking numbers of children and large shares of working-age people can raise their rates of economic growth. This is referred to as the first demographic dividend or as the window of economic opportunity (Lee and Mason, 2006).

Bloom et al. (2000) and Mason (2001) attributed East Asia's economic miracle to a major transition in the region's age structure. Using cross-country panel data, Bloom and Canning (2004) have shown a positive and significant relationship between the growth rate of the share of the working-age population and economic growth, but only if the economy is open. In studies based on Bloom et al.'s (2003) approach, the ratio of the working-age population to total population, labor productivity, human capital, the saving rate, trade policies and other variables determined the long-term growth of per capita income. An important result in these studies is the positive impact of the ratio of the working-age population, which captures the age structure transition. This offers empirical evidence for the positive impact of the demographic transition on economic growth. Further, they concluded that the potential for the demographic dividend can be realized in countries that can provide an environment for economic

development. Mason (2006) suggested that each country in the Asia and Pacific region should act now to harvest the first demographic dividend.

In the later stages of the demographic transition, the working-age population starts declining and the relative share of the old-age population gradually increases; this stage of population aging can provide yet another avenue to boost the economies of developing countries. Lower fertility motivates saving in the prime working years of the economic lifecycle to support old-age consumption and retirement security, thus providing a second demographic dividend. Studies that have shown strong links between national saving rates and age structure include those by Fry and Mason (1982); Mason (1988); Higgins (1998); Kelley and Schmidt (1996); Deaton and Paxson (1997); Lee et al. (2000); (2001); and Bloom et al. (2007).

The National Transfer Accounts (NTA) developed by Mason et al. (2006) offer a systematic approach to introducing age into national income and product accounts (NIPA) to describe intergenerational flows of resources in an economy. This approach defines the growth rate of per capita income as a product of labor productivity and the support ratio, where the support ratio is equal to the ratio of effective producers to effective consumers. Support ratios are computed from the age profiles of per capita labor income and consumption. Furthermore, the approach distinguishes between the economic benefits from the first demographic dividend – the positive impact of the growth of the support ratio on the growth rate of per capita income given productivity – and the second demographic dividend – positive economic growth from accumulating wealth and from capital deepening. Mason (2005) obtained estimates of the first and second demographic dividends for a number of countries and suggests potentially varied dividends in terms of timing, duration, and magnitude. Studying demographic dividends in the context of East Asian economic development with an emphasis on Japan, Mason and Kinugasa (2008) made the observation that in countries that encourage capital accumulation as a means of meeting retirement needs, aging can serve as a fundamental force for creating a wealthier and more prosperous society. Ogawa et al. (2009) associated Asia's changing demographic landscape with the first and second demographic dividends.

The economic implications of the growing working-age population in India have been the focus of studies by Navaneetham (2002), Lal (2006), Chandrasekhar et al. (2006), James (2008), and Desai (2010). Navaneetham did a regression analysis of the growth rate of the gross domestic product (GDP) on changes in the share of different age cohorts in the population by controlling for selected macroeconomic indicators. The sample comprised eight South and Southeast Asian countries, including India, from 1960 to 1990. The results were varied; in India, however, none

of the estimated coefficients was statistically significant. Lal (2006) did a regression analysis of GDP growth rates and found that age structure had an impact, but the theoretical framework was not adequate to reveal the first and second demographic dividends. Chandrasekhar et al. (2006) provided supportive evidence for the need to enhance employability in terms of educational attainment and healthcare in order to take advantage of the windows of the opportunity offered by the transition in the age structure. James (2008) described prerequisites for harvesting demographic dividends and found a positive association between the growth of the working-age population and household saving, but did not provide estimates of demographic dividends citing methodological challenges and a lack of adequate data. Desai (2010) looked at the labor force participation rates of women by years of schooling and household income quintile and inferred that India is unlikely to realize its demographic dividends to the fullest extent unless significant strides can be made to increase their participation.

In general, these studies refer to economic factors that influence the realization of demographic dividends but do not provide a basis for estimating and analyzing those dividends. Recently, Aiyar and Mody (2011) assessed the dividend in various Indian states, Choudhry and Elhorst (2010) looked at the demographic transition and economic growth in the People's Republic of China (PRC), India and Pakistan, and Bloom et al. (2010) studied the effects of population health and demographic change in the PRC and India.

Policymakers have highlighted India's advantageous age structure in recent public documents. For instance, the Eleventh Five Year Plan (Government of India, Planning Commission, 2008) emphasizes that India will have, "a unique 25-year window of opportunity called India's demographic dividend" (p. 90). Demographic dividends have also become the subject of researchers, but no quantitative estimates are available, and the stated period of the window of opportunity is not supported by empirical or any other sort of evidence. This lack of verifiable evidence on the period and magnitude of the demographic dividends is a gap policymakers must address when setting priorities for human resource and capital investment to harvest the economic benefits of the demographic transition. Using NTA, this study is an attempt to fill this gap by quantifying the demographic dividends for India and by indicating their implications for equity issues.

2. THE DEMOGRAPHIC TRANSITION IN INDIA

The preliminary results of the 2011 census set India's total population at 1.21 billion (Government of India, Office of the Registrar General of India, 2011), an increase of 180 million over the last ten years. By 2026,

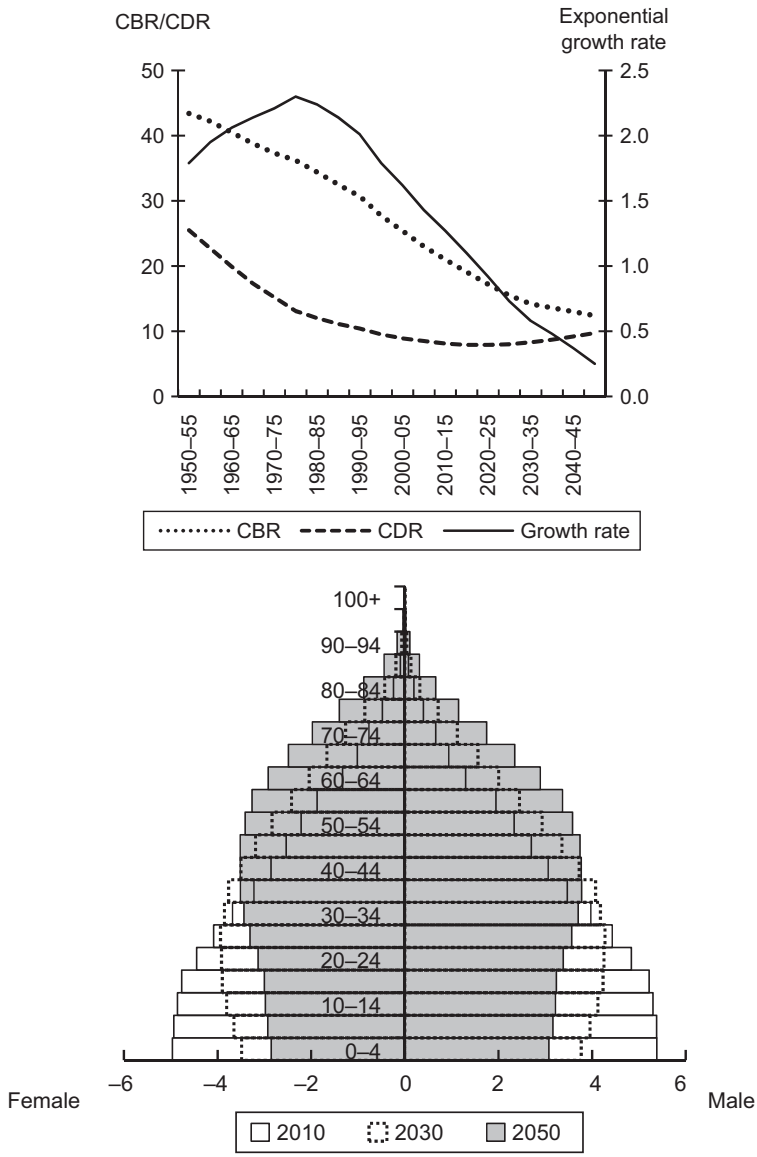
the projected total population will be 1.40 billion, mainly due to (a) an increase in life expectancy at birth for males and females from 65.8 and 68.1 years respectively in 2006–2010 to 69.8 and 72.3 years in 2021–2025 and to (b) a decline in the total fertility rate (TFR) from 2.6 to 2.0. The annual exponential growth rate was above 2 percent between the late 1970s and the mid-1980s, the period of the greatest decline in the death rate, while the birth rate was still 30 per 1000 population.

The implications of the demographic transition on age structure are evident for the population under 20 years of age as the share in the total population of this age group fell from 51 percent in 1970 to 41 percent in 2010 and is projected to decline to 22 percent in 2050. At the same time, the share of the total population under 60 marginally increased from 5.5 percent in 1970 to 8 percent in 2010 and is projected to reach 22 percent in 2050. The large decline in the share of the population under 19 years of age has been associated with a substantial rise in the proportion of the working-age population (19–59 years) from 43 percent to 51 percent from 1970 to 2010, and is projected to be a maximum of 56 percent in 2045. Figure 7.1 shows the demographic and age structure transition in India.

It is evident that the age structure of India's population is likely to undergo remarkable transitions leading to a decline in the relative share of children and an increase in the share of the elderly and working-age populations.

India is often considered as a collection of many countries held together by a common destiny, thus this overall scenario conceals regional variations across states. The north–south demographic divide in terms of pace of fertility and mortality declines and age-structure transition has been the focus of Bose (1996 and 2006), Bhat (2001), Visaria and Visaria (2003), Mitra and Nagarajan (2005), Chandrasekhar et al. (2006), Aiyar and Mody (2011) and Dyson (2010). Table 7.1 shows key demographic indicators and age structure transitions in major states. It is evident that there is a convergence in mortality in terms of annual deaths per 1000 with figures in single digits for all states and in life expectancy at birth (e_o^o) which is the highest in Kerala at 74 years and the lowest in Madhya Pradesh at 58 years, while most of the major states have crossed the 60-year threshold. However, the demographic gap among states in terms of annual births per 1000 population and annual infant mortality per 1000 live births is glaring.

In 1971 there was variation among states in the percentage of the population in the 15–59 and 60 and older age groups, but this seems to converge gradually in 2026, smoothing out regional differences. Thus in the long run in the later stages of the demographic transition, the relative sizes of the working-age and elderly populations in the national aggregate are unlikely to conceal regional differences.



Note: CBR = crude birth rate; CDR = crude death rate.

Source: Constructed from United Nations (2009).

Figure 7.1 Demographic and age structure transition in India

Table 7.1 Demographic indicators and age structure transition in major states in India

States	Demographic rates 2009[1]			e^o_o[2] (2002–2006)	Age composition (%)			
	BR	DR	IMR		1971[3]		2026[4]	
					15–59	60+	15–59	60+
Andhra Pradesh	18.3	7.6	49	64.4	51.7	5.3	65.5	14.2
Assam	23.6	8.4	61	58.9	48.4	4.7	64.9	11.0
Bihar	28.5	7.0	52	61.6	51.5	5.9	64.1	11.2
Gujarat	22.3	6.9	48	64.1	51.7	5.3	65.4	13.7
Haryana	22.7	6.6	51	66.2	48.0	5.8	67.0	11.4
Himachal Pradesh	17.2	7.2	45	67.0	51.6	7.2	65.5	14.7
Tamil Nadu	16.3	7.6	28	66.2	56.5	5.7	64.2	17.1
Kerala	14.7	6.8	12	74.0	62.6	6.2	63.0	18.3
Madhya Pradesh	27.7	8.5	67	58.0	50.5	5.8	63.6	11.0
Maharashtra	17.6	6.7	31	67.2	52.9	5.7	65.7	12.9
Orissa	21.0	8.8	65	59.6	51.6	6.0	65.1	13.8
Uttar Pradesh	28.7	8.2	63	60.0	46.1	6.8	61.3	9.8
West Bengal	17.2	6.2	33	64.9	51.7	5.3	65.4	14.2

Notes:
1. DR = Death Rate, BR = Birth Rate, IMR = Infant Mortality Rate: source = Office of the Registrar General of India (2006).
2. e^o_o = life expectancy at birth.
3. Source = census 1971.
4. Source = Office of the Registrar General of India (2008).

3. ECONOMIC GROWTH AND SOCIAL POLICIES

The history of economic growth in India was disappointing for more than a quarter of a century. During the 1950s, GDP grew at nearly 4 percent annually, but from 1965 to 1975 the average dipped to just 2.6 percent. With the population growing at 2.3 percent per annum, this meant a per capita income growth rate of just 0.3 percent (Panagariya, 2008). Bhagwati (2007) noted that the weak growth performance during that period while the saving rate doubled was due to disappointing productivity. The late 1960s and the 1970s are widely considered as a period of stagnation, largely due to decelerating industrial growth. To bail out the economy, the government began to introduce fiscal incentives and to liberalize imports removing licensing restrictions for selected industries and rationalizing tariffs. India then moved from a path characterized by a "Hindu rate

Table 7.2 India's sector growth performance 1970–2002

		(% per year)		
	Total GDP Growth (%)	Sector Growth of GDP		
		Agriculture	Industry	Services
1970–1972 to 1980–1981 (average)	3.2	2.0	4.0	7.2
1981–1982 to 1990–1991 (average)	5.7	3.8	7.0	6.7
1991–1992	1.3	−1.1	−1.0	4.8
1992–1993	5.1	5.4	4.3	5.4
1993–1994	5.9	3.9	5.6	7.7
1994–1995	7.3	5.3	10.3	7.1
1995–1996	7.3	−0.3	12.3	10.5
1996–1997	7.8	8.8	7.7	7.2
1997–1998	4.8	−1.5	3.8	9.8
1998–1999	6.5	5.9	3.8	8.3
1999–2000	6.1	1.4	5.2	9.5
2000–2001	4.0	0.1	6.6	4.8
2001–2002	5.4	5.7	3.3	6.5
1992–1993 to 1996–1997 (average)	6.7	4.6	8.0	7.6
1997–1998 to 2001–2002 (average)	5.4	2.3	4.5	7.8

Note: Growth rates for 2001–2002 are projections of the Ministry of Finance based on partial information. GDP = gross domestic product.

Source: Economic Survey 2001–2002 (Government of India, Ministry of Finance, 2002).

of growth" below 3 percent to a credible level of 5 percent to 6 percent annually in the early 1980s. Individual states determined tax reductions, deregulation, and other policies.

In 1991, the economy suffered a severe balance of payments crisis, a deceleration in agricultural output, and uneven performance in manufacturing (Table 7.2). The government undertook major economic reforms including establishing the private sector's role as a leading engine of growth; placing greater reliance on market forces; and opening the economy to international trade, foreign investment, and foreign technology (Ahluwalia, 2005). These fiscal responses to the crisis were major liberalizations on both the domestic and international fronts (Panagariya, 2008), which helped accelerate the GDP growth rate to 7.8 percent in 1996–1997 and then maintain it at an average of approximately 6 percent thereafter.

Since the structural changes in 1991, the economy as a whole is much more integrated with that of the rest of the world – the current account is fully open while the capital account is substantially so (Acharya and Mohan, 2010). Furthermore, the change has been marked by remarkable macroeconomic and financial stability. The link between economic growth and poverty alleviation in Indian is, however, not so clear in view of the persistence of widespread poverty; the inability of the government to ensure the basic needs of housing, sanitation, adequate healthcare, and universal education; and the poor quality of education. When it comes to international comparisons of public expenditures on health as a percentage of GDP, India is near the bottom. Expenditures on health were 1.23 percent of GDP even in 2004–2005 and remain at this level to date, as shown in Table 7.3. As part of the National Rural Health Mission: 2005–2012, the government has proposed raising public expenditures on health to 2–3 percent of GDP. The private sector has helped to fill some of the vacuum left by the public sector.

Education is a concurrent subject in the Indian constitution which means that both the state and the central governments can legislate in this area. In its public statements, the government is committed to raising public expenditures for education to 6 percent of GDP from the current level of 2.6 percent set in 2005–2006.

There are six pension benefit schemes in India: civil service; employees' provident fund organization; public sector enterprises; occupational pension or superannuation; voluntary tax advantage saving; and the unorganized sector. Under the civil service schemes, employees of central, state, and local governments are entitled to receive non-contributory, unfunded, defined benefit pensions on retirement as well as contributory provident funds and lump sum gratuity payments based on length of service. Provident fund schemes finance retirement pensions for workers in the organized, non-public sector. The public sector enterprise scheme is a contributory pension system largely for employees in insurance companies, the Reserve Bank of India, public sector banks, electricity boards and oil companies, and is managed by the enterprises concerned. Occupational pension schemes are employer-sponsored, largely defined contribution schemes that are not statutory, which provide additional post-retirement income to employees on a regular basis. The liabilities are met by setting up trust funds. Voluntary tax advantage schemes are small saving schemes with incentives for tax rebates. The unorganized sector schemes serve the poor through social assistance programs at both the central and state levels (Asher, 2006).

The 1950s and 1960s witnessed the launch of public assistance schemes by state governments for persons facing virtual destitution. The then

Table 7.3 Trends in social service expenditures by governments (central and state governments combined) in India from 2005 to 2011

Items	2005–2006 Actual	2006–2007 Actual	2007–2008 Actual	2008–2009 Actual	2009–2010 (RE)	2010–2011 (BE)
	10 million rupees					
Total expenditure	959855	1109174	1316246	1595110	1909380	2071147
Expenditure on social services	202672	239340	294340	380269	476351	522492
i) Education	96365	114744	129366	161360	204986	235035
ii) Health	45428	52126	63226	73898	90700	99738
iii) Others	60879	72470	101992	145011	180665	187719
	As percentage of GDP					
Total expenditure	25.99	25.83	26.40	28.57	29.15	26.29
Expenditure on social services	5.49	5.57	5.91	6.81	7.27	6.63
i) Education	2.61	2.67	2.59	2.89	3.13	2.98
ii) Health	1.23	1.21	1.27	1.32	1.38	1.27
iii) Other	1.65	1.69	2.05	2.60	2.76	2.38

Note: BE = budget estimate, RE = revised estimates.

Source: Economic Survey 2011 (Government of India, Ministry of Finance, 2011).

undivided state of Uttar Pradesh was the first to introduce an old-age pension scheme in 1957. Other states then introduced old-age pension schemes, but the timing varied (A.B. Bose, 2006).

- 1960–1969: Andhra Pradesh, Chandigarh, Haryana, Himachal Pradesh, Karnataka, Kerala, Punjab, Rajasthan, Tamil Nadu, West Bengal.
- 1970–1979: Bihar, Dadra and Nagar Haveli, Delhi, Goa, Daman and Diu, Gujarat, Jammu and Kashmir, Lakshadweep, Madhya Pradesh, Mizoram, Nagaland, Orissa, Tripura.
- 1980–1989: Andaman and Nicobar Islands, Arunachal Pradesh, Assam, Maharashtra, Manipur, Meghalaya, Pondicherry, Sikkim.

The pension systems were not backed by statutory rights granted to the elderly; rather, they were established by administrative orders and were therefore discretionary in character. State governments have determined the criteria for old-age pensions based on minimum ages ranging from 60 to 70 years for domiciled residents (usually for three or four years), and restricted to the destitute, defined as persons not capable of doing remunerative work, with no source of income, no assets, and no family members/relatives to support them. The Seventh Finance Commission (1979–1980 to 1983–1984) took a more liberal view and recommended that the ceiling for old-age pensions be raised to 60 rupees (Rs) per month, from the Rs25 to Rs45 that the states were paying. The number of persons eligible for old-age pensions was restricted to 0.1 percent of the total population.

Until the middle of the Ninth Plan (1992–1997), old-age pension schemes were treated as the sole domain of state governments. In 1995 the national government launched the National Old Age Pension as a major component of the National Social Assistance Programme, but it was not meant to take over state responsibilities. Under the national scheme, the central government pays beneficiaries older than 65 years of age Rs75 per month.

In view of the growing concerns regarding inadequate old-age income security and financial provisions for retirement, in 1999 the government commissioned the Old Age Social and Income Security report to examine policy questions. The focus of the report, which was submitted in January 2000, was the unorganized workforce, and the key features and recommendations were the following:

- Establish a new pension system based on the concept of individual retirement accounts (IRAs).

- Individuals should be able to access and operate IRAs from "points of presence" to be located all over the country. These could include bank branches and post offices, among others.
- Professional fund managers should be appointed to manage the funds. The committee also recommended a choice of three types of funds: safe income, balanced income, and growth.
- There should be a cap on administrative and fund management costs, and a limited number of managers should be selected, potentially based on competitive bidding on overall charges.
- On reaching retirement age, individuals would be required to convert the balance in their IRAs into regular pensions. The pension annuity would be purchased from a life insurance company.

4. DEMOGRAPHIC DIVIDENDS IN THE NATIONAL TRANSFER ACCOUNTS FRAMEWORK

India is a federal economy, so (a) revenue and expenditure functions and (b) regulatory functions are divided among central, state and local governments. As per the constitution, government activities are assigned to the union list, the state list, or the concurrent list. Social sectors such as education, health, and social security are included in the concurrent list; hence, both the national and state governments have regulatory functions in these sectors, and their combined expenditures and consumption are relevant for NTA purposes.

The economic system of India is characterized by the coexistence of the public and private sectors in the production and consumption of goods and services including the ownership, management, and financing of social and economic sector activities. This implies that NTA public and private sector frameworks are relevant. Furthermore, India is an open economy because its borders are open for international trade in goods and services as well as for international production (for example, labor and capital). In fact, an increase in openness has been an important factor in the globalization of the Indian economy. Thus, external account transactions are of importance for India's economic growth, which implies that the NTA open economy approach to estimating aggregate control variables is relevant.

The total dependency ratio – the ratio of children and the elderly to the working-age population – is conventionally used to capture the economic implications of a changing age structure. This is a purely composite indicator and does not reflect variations in values of earnings and consumption by age. This limitation is overcome in the NTA based on the economic

lifecycle approach (Mason et al., 2006). The economic lifecycle of an individual is characterized by the age pattern of labor income and the consumption of private and public goods and services, and typically shows that populations concentrated in working ages can support a higher level of consumption than populations concentrated in the dependent ages for whom consumption exceeds income. This lifecycle deficit (LCD) of the dependent age groups is financed by age reallocations in terms of intergenerational transfers and asset-based reallocations. The NTA flow account identity, consistent with the national income identity, provides an empirical basis for computing LCDs and age reallocations.

In the NTA framework, the first demographic dividend is quantified and assessed in terms of the economic support ratio (ESR) or ratio of effective number of producers (L) to effective number of consumers (N). That is,

$$L/N = \sum_{a=0}^{w} \gamma(a)\, P(a, t) / \sum_{a=0}^{w} \phi(a)\, P(a, t) \tag{7.1}$$

Where, $P(a, t)$ is the population aged a at time t, and $\gamma(a)$ and $\phi(a)$ are the age patterns of labor income and consumption respectively. The age patterns of labor income and consumption – the parameters of the economic lifecycle in the definition of the ESR – clearly have an edge over ad hoc measures such as the total dependency ratio. A standard measure of the economic growth of an economy is income per capita and can be decomposed as:

$$Y/N = (L/N) * (Y/L). \tag{7.2}$$

It is a measure of per capita income adjusted for age variations in consumption and is a product of the ESR and income per worker, that is, labor productivity. Income per effective worker is intended to capture many factors such as level of technology, human and physical capital, natural resources, and political and economic institutions (Lee and Mason, 2007). In growth terms, we have:

$$gr(Y/N) = gr(L/N) + gr(Y/L) \tag{7.3}$$

where *gr* stands for growth rate. Given productivity, the period of the positive growth rate of the ESR in the demographic transition is the first demographic dividend.

The first demographic dividend is transitory and phases out with increases in the elderly population and fewer births to replace the

working-age population in the later stages of the demographic transition. The prospect of a second demographic dividend depends on two main factors. First, some of the economic benefits of the first demographic dividend are likely to be invested in human capital through intergenerational transfers and capital deepening. This will lead to an increase in output per worker. Second, the prospects of a longer life and an extended period of retirement will motivate individuals to save and accumulate more wealth. Saving and wealth accumulation for consumption in retirement intensify with fewer children to support due to fertility declines. In the near absence of an adequately funded public transfer program in India to support retirement, the demand for wealth may undoubtedly rise in the years to come.

Several empirical studies following Yaari (1965) have provided evidence that an increase in life expectancy leads to a higher saving rate (Zilcha and Friedman, 1985; Yakita, 2001; Bloom et al., 2003; Kageyama, 2003; and Kinugasa, 2004). This accumulation of wealth to finance future consumption in excess of future labor income can lead to a second demographic dividend (Mason, 2005). Computing the second demographic dividend in India in this chapter follows the macroeconomic framework and simulation approach in Lee and Mason (2007). In this framework, the second demographic dividend is analyzed in terms of the income index $(y/\overline{y}_l)$ and the consumption index $(c/\overline{y}_l)$. The income index is income per equivalent consumer relative to income, and the consumption index is the consumption per equivalent consumer relative to income per equivalent consumer. Equivalent consumer is the adult equivalent number of consumers in the population. The two indices measure the extent to which income and consumption per equivalent consumer rise relative to income under the assumption that productivity changes due to technological innovations only. If individuals save and accumulate assets during the demographic transition, the income and consumption indices would behave exactly as the ESR does. In the later stages of the transition, however, with fewer children to support and the near absence of publicly funded support in India, people have to save during their working lives to finance consumption after retirement. This makes the indices of income and consumption different and higher than the ESR in the real world. The second demographic dividend measured in growth terms is the difference between the rate of growth of the income index or the consumption index and the rate of growth of the ESR.

4.1 Data Requirements, Sources, and Assumptions

Age patterns of consumption of public and private goods and services and labor income have to be consistent with NIPA. Macro aggregate controls

Table 7.4 Macro aggregate controls for labor income and consumption by sectors in India in 2004–2005 (10 million rupees)

Consumption by sector	Public	Private	Total
Education	60 505	38 221	98 726
Health	74 441	80 895	155 336
Others	184 152	1 537 401	1 721 553
Macro-control for labor income			1 546 099

Source: National Accounts Statistics 2008 (Government of India, Central Statistical Organization, 2008).

for consumption of public and private health, education, and other services for the financial year 2004–2005 were compiled from the national account statistics (Government of India, Central Statistical Organisation, 2008). Macro aggregate controls for labor income are the sum of compensation for employees (including net compensation of employees from the rest of the world) and mixed income. The aggregate controls in 2004–2005 are given in Table 7.4.

Micro data on labor income and the consumption of health, education, and services (for example, food, non-food, housing, infrastructure) in the public and private (household) sectors are required for charting age patterns of labor income and consumption by sector in the Indian economy. The India Human Development Survey (Desai et al., 2008) conducted in 2004–2005 is the source of micro data on labor income from wages, salaries, and self-employment and household expenditures on education, healthcare, food, non-food items, house rent, money borrowed, household credit, enrolment status of children by public/private educational establishments, and treatment of individuals for minor and major illnesses. The survey is nationally representative, covering 200 000 individuals from over 41 000 households spread over 1503 villages and 971 urban neighborhoods using a multi-stage, stratified sampling design adopted specifically for it. The medium variant projections of the United Nations (UN) (2009) for India were the source for age structure transitions and the basis for quantifying the demographic dividends. The UN projection assumed a decline in the TFR to 1.85 and in the infant mortality rate to 23, and an improvement in life expectancy to age 77.9 by 2050.

The basic data used in the simulation exercise were age patterns of per capita consumption and labor income. For this simulation we assumed that two-thirds of children's costs were supported by familial transfers and that one third was met through public transfers. Additionally, we

Source: Authors' calculations.

Figure 7.2 Economic lifecycle for India 2004–2005

assumed that the share of familial intergenerational transfers and public transfers to support the population aged 60 and older was constant during the simulation period, that there was a risk-free discount rate of return of 3 percent, a depreciation rate of 3 percent, and a rate of return of 6 percent on assets declining linearly to a steady-state interest rate of 4.42 percent in 2300. These assumptions are broadly in line with NTA results on intergenerational transfers (Ladusingh and Narayana, 2011) and with the macroeconomic parameters of economies that experienced demographic dividends in the course of their demographic transitions (Lee and Mason, 2006).

4.2 Economic Lifecycle

The age profile of per capita labor income shown in Figure 7.2 reflects a number of distinctive features. It is an inverse, broad U-shaped curve which shows that earning potential is low at early ages, that labor income increases steeply until about 35 years of age then steadily increases between 36 and 59 years of age and thereafter declines rapidly with advancing age. The existence of child labor is apparent with the early age of entry into the workforce and marginal share of labor income of young persons. The

tapering income profile of the elderly is indicative of their low wages as many are self-employed farmers or work in the informal sector.

The age pattern of per capita consumption is the combined profiles of per capita consumption of education, healthcare, and services computed separately by public and private contributions (Ladusingh and Narayana, 2009; 2011). The profile also exhibits interesting features, particularly for school-age consumers and at older ages. Per capita monthly consumption increases sharply from about four years of age till it attains an early peak at about 19 years, showing a huge investment in education, and continues to increase up to 26 years, the age of completion of education. The consumption profile crosses the income profile at 25 and 60 years of age, which mark the average ages of entry into the labor force and of retirement respectively. During the 35 years of economically gainful activities, per capita consumption rises concomitantly with the rise in per capita labor income and continues to rise even post retirement due to healthcare costs but then drops in the very old age groups. This implies that retirement does not compel individuals to curtail consumption, because the bulk of employment is in informal sectors with no formal age of retirement. An important, noticeable feature of the age pattern of per capita consumption is that the elderly support an average consumption nearly at par with that of those in the prime working ages. This suggests intergenerational equity and is also a reflection of reallocations of resources across age groups through saving and liquidating income and assets.

4.3 The Lifecycle Deficit and Intergenerational Reallocations

The LCD of persons younger and older than working age occurs because they consume more than they produce; it is covered through private (inter- and intra-household) transfers, public transfers in cash or in kind net of taxes, and private and public asset-based reallocations.

Table 7.5 shows labor income, public and private consumption by sector, LCD, public and private transfers, and asset-based reallocations by decades for accounting year 2004–2005. The consumption of private and public health, education and services by persons under 30 years of age and 65 years and older exceeds their labor income. These two age groups respectively make up 51.5 percent and 6.5 percent of total consumption. The opposite is true for people in the working-age groups 30–49 and 50–64 years. Those aged 30–64 years accounted for 42 percent of total consumption. Children and the elderly mainly consume education and healthcare respectively.

The existence of child labor and the continuation of economically gainful activities by the elderly emerge from the fact that the contributions

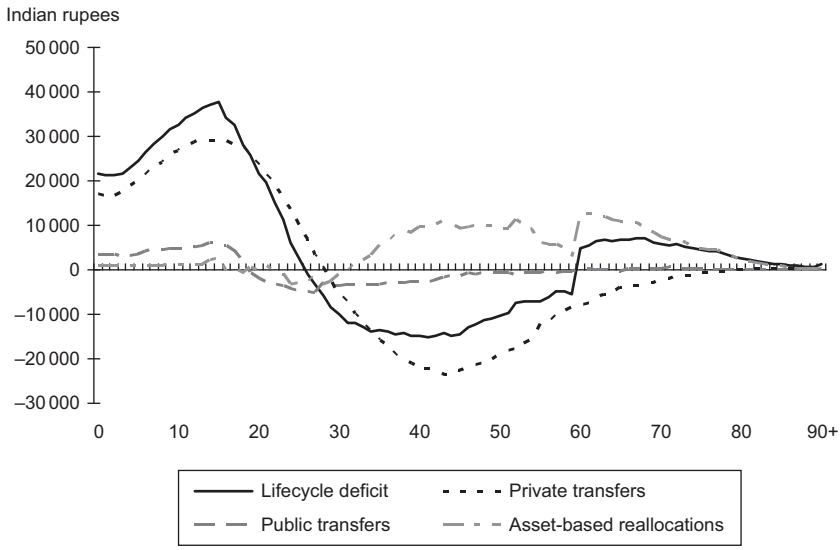
Table 7.5 Aggregate labor income, consumption, lifecycle deficits, and age reallocations by decades in India (2004–2005) (10 million rupees)

	Total	0–19	20–29	30–49	50–64	65+
Lifecycle deficit	429 516	583 062	58 499	−267 329	−39 687	94 971
Consumption	1 975 615	640 114	377 019	572 539	256 732	129 211
Public	319 098	159 705	41 492	66 958	32 177	18 766
Education	60 505	58 905	1600	0	0	0
Health	74 441	20 737	7742	21 931	14 292	9739
Other	184 152	80 063	32 150	45 027	17 885	9027
Private	1 656 517	480 409	335 527	505 581	224 554	110 446
Education	38 221	31 798	6423	0	0	0
Health	80 895	12 767	8678	26 271	19 584	13 595
Other	1 537 401	435 844	320 426	479 310	204 971	96 851
Labor income	1 546 099	57 052	318 520	839 868	296 419	34 240
Age reallocations	429 516	583 062	58 499	−267 329	−39 687	94 971
Asset-based Reallocations	395 527	20 038	−16 922	142 122	135 357	114 932
Net Asset-Based Income	1 067 028	46 986	151 226	440 934	257 469	170 414
Less: net savings	671 501	26 948	168 148	298 811	122 112	55 482
Public transfers	0	81 138	−35 904	−45 406	−5006	5178
Private transfers	33 989	481 886	111 325	−364 045	−170 038	−25 139
Inflows	1 213 290	498 342	246 997	264 478	122 272	81 200
Outflows	−1 179 301	−16 456	−135 672	−628 523	−292 310	−106 339
Inter-household	33 989	2705	4952	10 695	8894	6743
Inflows	36 458	2829	5401	11 685	9518	7025
Outflows	−2469	−124	−449	−990	−625	−282
Intra-household	0	479 181	106 372	−374 740	−178 932	−31 882
Inflows	1 176 832	495 514	241 596	252 793	112 754	74 176
Outflows	−1 176 832	−16 332	−135 224	−627 533	−291 685	−106 058

Source: Authors' calculations.

of children under 20 years of age and of the elderly 65 years and older to total labor income were 3.7 percent and 2.2 percent respectively.

Figure 7.3 indicates that intergenerational public and private transfers and asset-based reallocations are the primary means of financing the LCD of children and the elderly. Private transfers, particularly intra-household from members with disposable income and assets, are very important in India. Private and public transfers accounted for 82.6 percent of intergenerational reallocations to support the LCD of the population under 20 years of age. Contrary to popular belief, the elderly in India do not get



Source: Authors' calculations.

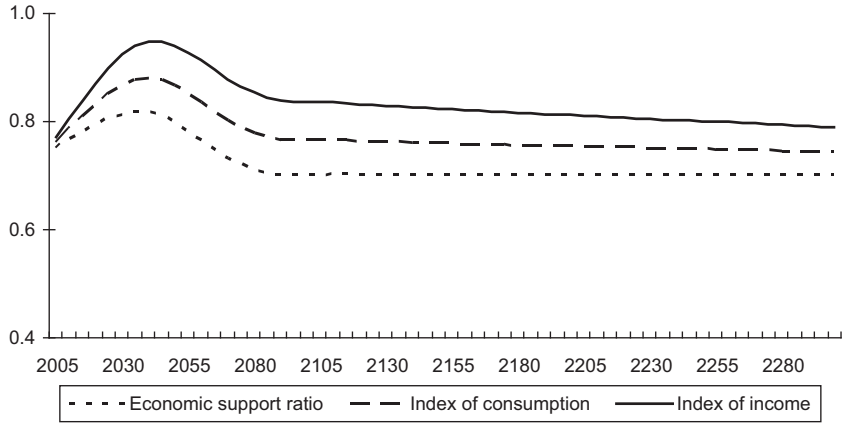
Figure 7.3 Aggregate lifecycle deficit, asset-based reallocations, and private and public transfers in India in 2004–2005

monetary support to finance their LCD from their children and/or grandchildren. The net private transfer for those 65 years and older is negative, indicating that they themselves are supporting the LCD of other household members. Public transfers to children under 20 years of age and to people aged 65 and older accounted for 14 percent and 5.5 percent of their respective LCDs. The aggregate net public transfer is zero as revenues from taxes, interest, and services balance out expenditures. The elderly finance their own LCDs largely from asset-based reallocations.

5. DEMOGRAPHIC DIVIDENDS

In the NTA framework, the first demographic dividend is quantified in terms of the ESR, while the second dividend is studied in terms of the income index ($y/\overline{y}_l$) and consumption index ($c/\overline{y}_l$) described in the preceding sections. The key inputs for the simulation to generate the ESR and indices of income and consumption are the age patterns of labor income and consumption depicted in the economic lifecycle in Figure 7.2.

Figure 7.4 shows trends in the estimated values of ESR (L/N), the

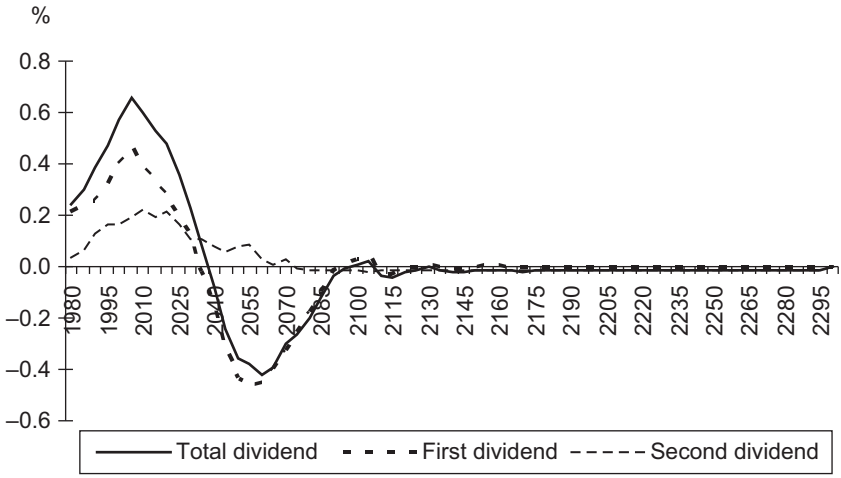


Source: Authors' calculations.

Figure 7.4 Economic support ratio, consumption index, and income index for India from 2005 to 2295

income index $(y/\bar{y}_l)$ and the consumption index $(c/\bar{y}_l)$. The trend for the ESR is positive and rises until 2035, indicating an increase in the number of effective workers per effective number of consumers. It increases from a value of 0.750 in 2005 to 0.819 in 2035, registering an annual increase of 0.51 percent. It is thus evident that there is rapid economic growth during the later working ages in the middle stage of the demographic transition. The first demographic dividend results in an increase in income per effective consumer by 9.1 percent in India from 2005 to 2035, given the age patterns of labor income and consumption shown in Figure 7.2. The transitory nature of the first demographic dividend is evident from the declining trend in the ESR after 2035, the starting point of the dwindling working-age population and the gradual increase in the share of the elderly population. The effective number of workers per effective number of consumers starts declining in 2035 from its peak, but still remains above its level in 2005 until 2070.

In order to chart saving and asset accumulation – the key factors in the second demographic dividend – we compared the trend in the income and consumption indices with that of the ESR. The levels were more or less the same in 2005, but after this point the income and consumption indices rose more sharply than the ESR, and the gap between them was pronounced. The gap between the consumption index and the ESR was 1 percent in 2005 and widened to 6 percent in 2035, and the annual increase in the



Source: Authors' calculations.

Figure 7.5 Annual growth rate of demographic dividends in India from 1980 to 2295

consumption index during the period was 0.51 percent. The consumption index continued to remain above the ESR throughout the demographic transition. Had there been no second demographic dividend, the ESR and the consumption index would have been the same, as there would have been no rise in income per effective consumer, and the economy would have been devoid of capital deepening by way of asset accumulation and saving. The reason for the higher values of the consumption index even after the first demographic dividend phases out is that people are able to support higher levels of consumption as a consequence of increased income per effective consumer. This way the transitory first dividend is converted into a permanent second dividend that contributes an increase of 15.8 percent in income per effective consumer during the transition period 2005–2035. The gain in income per effective consumer from both the first and second demographic dividends during this period is thus 24.9 percent.

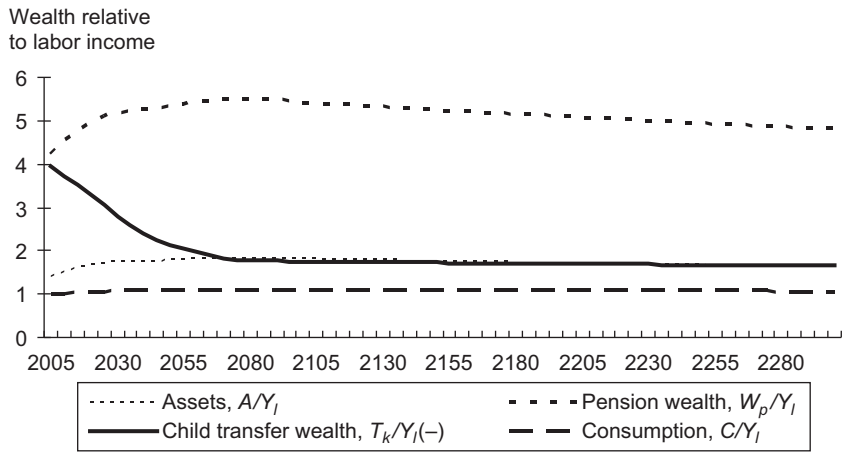
The second demographic dividend measured in growth terms is the difference between the rate of growth of the income index ($y/\overline{y}_l$) or the consumption index ($c/\overline{y}_l$) and the rate of growth of the ESR (Lee and Mason, 2007). Figure 7.5 shows trends in the growth rates from the first, second, and total demographic dividends. The growth rate of the ESR turns negative in 2035, indicating the phasing out of the first demographic dividend. At this stage, while the ESR begins to decline and turn negative,

the second demographic dividend with some overlapping remains positive. The peak in the growth rate of the second dividend is attained when the growth rate of the first dividend starts declining for the reasons highlighted above. When the first demographic transition phases out in 2035, the annual rate of growth of the ESR becomes negative.

The annual rate of growth of the second demographic dividend exceeds that of the first in 2035 and remains positive until it hits zero in 2070. On the whole, income per equivalent consumer increases by 44.7 percent from 1980 to 2035. As the second demographic dividend gains momentum when the first demographic dividend starts phasing out, the contribution of the second dividend is expected to dominate, particularly after 2040. These results closely correspond to those for Asia in UN calculations (2007). Using the NTA framework to study the demographic transition and changing age structures in the Economic and Social Commission for Asia and the Pacific region and their impact on demographic dividends, Ogawa et al. (2009) have found that for the region as a whole the period of first demographic dividend is 1973 to 2023, and for India it is 1975 to 2045. What emerges from our results is that India is predicted to enjoy the benefits of the first dividend until 2035.

Many scholars, including Mason (2006), have suggested that to meet the challenges of population aging, developing countries like India should earnestly invest the first demographic dividend in human resources and institutions to build a viable asset-based retirement system. An important macroeconomic consequence of an aging population is the manner in which wealth is distributed and behaves over time during the transition. The components of wealth to consider are child-rearing transfers ($T_k/Y_l(-)$), pension wealth (W_p/Y_l), assets (A/Y_l), and consumption (C/Y_l) relative to income shown in Figure 7.6 in terms of present values of future child-rearing costs, pension wealth, assets, and consumption respectively.

Child-rearing costs in terms of relative wealth transfers to children were about four times annual labor income in 2005 and declined to 2.4 and 1.8 times in 2035 and 2070 respectively. The decline in child-rearing costs in the late transition period is because fewer children are born when fertility rates are low. The relative cost still remains high because per-child consumption is expected to rise as the number of children falls. Pension wealth and assets rise substantially until 2070, coinciding with the second demographic dividend. Pension wealth is 4.2 times annual labor income in 2005 and rises to 5.5 times in 2070; the corresponding rise in assets is from 1.4 to 1.8 times annual labor income in this period. The demand for pension wealth is weak in the initial stages of the demographic transition due to a combination of factors, including high child-rearing costs, the



Note: A/Y_l = assets, W_P/Y_l = pension wealth, $T_k/Y_l(-)$ = child-rearing transfers and C/Y_l = consumption, all relative to labor income.

Source: Authors' calculations.

Figure 7.6 Components of wealth accumulation relative to income in India from 2005 to 2295

predominance of young workers who are yet to start accumulating wealth for retirement, and a lack of incentives to save.

Bloom et al. (2010) note that a higher share in the working-age population is a supply-side opportunity for a potential economic boom but also acknowledge that this potential depends on how the extra workers are employed. This implies that the first demographic dividend does not arise merely because the working-age population increases. NTA-based calculations of the first demographic dividend capture contributions of public and private institutions and the policy environment through aggregate controls and age profiles of consumption and income variables and incorporate them in the computation of support ratios. Nevertheless, the constancy of cross-sectional age profiles of income and consumption throughout the computation is a limitation of the NTA approach.

6. MET AND UNMET CHALLENGES

From 2004 until 2010, India's average quarterly GDP growth was 8.40 percent, reaching a historical high of 10.10 percent in September 2006 and a record low of 5.50 percent in December 2004; the economy has

posted an average growth rate of more than 7 percent in the decade since 1997 (Government of India, Ministry of Finance, 2011). India's diverse economy includes traditional village farming, modern agriculture, handicrafts, a wide range of modern industries, and a multitude of services. Services are the major source of economic growth, accounting for more than 50 percent of India's output while employing less than 33 percent of its labor force.

In a study of patterns and causes of economic growth in India, Basu and Maertens (2007) observed that while the Indian population has more than doubled since the 1960s, GDP has increased more than eightfold since then and gross domestic capital formation increased from 22.5 percent to 33 percent of GDP from 1980 to 2005. Bosworth and Collins (2007) broke the economic growth rate of India down into production, physical capital, land, education, and a residual called total factor productivity (TFP). The results of this study showed that the annual rate of change in output per worker increased from 3.3 percent in 1960–1973 to 5.8 percent in 1980–2005, while output per worker increased from 1.3 percent to 3.8 percent in 1960–1980 and 1980–2004. They concluded that post-1980 growth was associated more prominently with an increase in TFP. India's saving rate as a percentage of GDP has risen from 10 percent in the 1950s to 29.1 percent in 2004–2005, of which saving in the household sector constituted 1.9 percent and 10.3 percent respectively (Ladusingh, 2009). Though there is disagreement on the extent of poverty reduction from economic growth, Bhaskar and Gupta (2007), citing official estimates made by the planning commission, have mentioned that the percentage of the population below the poverty line fell from 37 percent to 27 percent in rural areas and from 33 percent to 24 percent in urban areas, and that overall it fell from 36 percent to 26 percent.

Of major concern in India's growth paradigm are the widespread economic and social inequalities and the poor status of human development. These include the absence of food security for a significant proportion of the population; the inability to ensure basic needs of housing, sanitation, and adequate healthcare to the population as a whole; the continuing inability to ensure universal education and its poor quality; and the slow pace of increased access to education and employment across different social groups and women in particular (Ghosh, 2008). Seen in this light, inclusive growth is a mirage. The growth rate in agriculture, which accounted for 18 percent of GDP in 2008, declined from 3.8 percent in 2006 to 2.6 percent in 2007, while the growth rate of industry, the major driver of the economy constituting 29 percent of GDP in 2008, slowed marginally in the same period. The unemployment rate in rural India as a whole increased from 5.63 percent in 1993–1994 to 7.21 percent in 1999–2000 (Ghosh, 2008).

7. SUMMARY AND CONCLUSIONS

Using the NTA framework, this chapter estimates and offers evidence for the positive macroeconomic implications of the age structure transition in India as quantified in the first and second demographic dividends. The estimates are based on the ESR and the consumption index. The ESR translates the economic lifecycle as a measure of the first demographic dividend in terms of effective numbers of producers per consumer. Age patterns of per capita labor income and of consumption of public and private goods and services capture underlying individual preferences, intergenerational transfers, public policies, and market orientation. The ESR replaces the ad hoc total dependency ratio as a refined measure of the first demographic dividend. As the estimates of per capita age patterns of labor income and consumption are population weighted and constrained by macro aggregate controls, the ESR captures the economy of a country in a broader perspective.

The first demographic dividend predominates from 1980 to 2035, but from 2035 onwards it dwindles and the second demographic dividend gains prominence. The total dividend for India remains stable until 2070 as first dividend transfers to children relative to labor income gradually decline, while pension wealth and asset accumulation relative to income steadily rise.

The link between the demographic dividends and income growth is policy dependent. The first dividend is in part the consequence of the growing working-age population and can be realized only if employment opportunities expand to keep pace. The second dividend arises largely because prime working-age adults have to save to support longer retirements. To reap the economic gains of the potential second dividend, however, an environment conducive to accumulating assets is required. This is reflected in some of the policies and programs in India's Eleventh Five Year Plan. Our results offer strong empirical justification for strengthening these policies and programs as they will help to accomplish the plan's national economic growth target rate of 9 percent.

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8. Population aging, economic growth, and intergenerational transfers in Japan: how dire are the prospects?

Naohiro Ogawa, Sang-Hyop Lee, Rikiya Matsukura, An-Chi Tung, and Mun Sim Lai

1. INTRODUCTION

Global population growth has been steadily slowing down since the second half of the 1960s primarily due to an almost universal reduction in fertility. From 1965 to 1970, the number of countries with fertility rates below replacement (a total fertility rate (TFR) of less than 2.1 children per woman) was eight, but that number swelled to 76 from 2005 to 2010. Although more than half of these low-fertility economies were developed, the number of developing economies with below-replacement fertility increased at a phenomenal rate from 0 to 31 in the four decades under consideration. Currently, approximately 50 percent of the world's population lives in an economy with below-replacement fertility.

Because Asia is the most populous region in the world, with 60 percent of the world's inhabitants, the majority (57 percent) of the population living below replacement fertility now resides there (United Nations, 2009). It is worth remarking that only 3 percent of Asia's population resided in countries with below-replacement fertility between 1965 and 1970, but the share grew to 25 percent from 1990 to 1995, when the People's Republic of China's (PRC) fertility rate fell below replacement level. It is projected that half of Asia's population will be residing in societies with below-replacement fertility by 2012 and that this proportion will reach 80 percent in the late 2020s, when India is projected to attain below-replacement fertility (United Nations, 2009). It should also be noted that the number of Asian economies below the replacement level has increased remarkably over time. From 1965 to 1970, there was only one such country (Japan), but from 2005 to 2010, the number increased to 17 and

included the PRC, Hong Kong, China, the Democratic People's Republic of Korea, Japan, Macao, Mongolia, the Republic of Korea, Sri Lanka, Singapore, and Thailand. At present, five Asian economies – Hong Kong, China, Republic of Korea, Macao, Singapore, and Taipei,China – are classified in the category of lowest-low fertility, that is, with a TFR below 1.3. In fact, East Asia's fertility is now the lowest in the entire world (Jones et al., 2009; Retherford and Ogawa, 2009).

Along with the rapid decline in fertility, there have been marked improvements in mortality in Asia. The Japanese postwar experience is a particular case in point. When Japan joined the Organisation for Economic Co-operation and Development (OECD) in 1964, it had the lowest life expectancy at birth among member countries, but had achieved the highest by the early 1980s. At present, 26 economies in Asia have life expectancies that exceed 70 years for both sexes. In East Asia, Hong Kong, China, Japan, and Macao have already surpassed the 80-year level.

As a result of these dramatic, rapid fertility and mortality declines over the last several decades in Asia, we have witnessed a relative increase in the number of elderly and a relative decrease in the number of young people, leading to rapid population aging. East Asia's population aging has been the fastest and most pronounced on the continent as the total dependency ratio defined as {[(0–14) + (65 and older)]/(15–64)} reached its peak value (0.758) in 1964, after which its projected long-term trend shows a U-shaped pattern, reaching its trough value (0.403) in 2011. This implies that in East Asia as a whole, the share of the working-age population has been increasing from 1965 to date, but the end of that growth period is now quickly approaching. The 47 years of continuous growth of the working-age population have had a very direct and favorable impact on per capita economic growth, a phenomenon called the first demographic dividend.

The rate of population aging in Japan has been by far the highest in Asia; in 2005 it became the oldest nation in the world, surpassing Italy, and then the population began to decrease (Ogawa, 2011a). These demographic developments have caused a great deal of concern in various spheres of Japanese society. Rapid population aging has already put serious financial pressure on the social security system, pressure that will increase in the future, and the government has tried to shift some of the costs of the system back to families. In business circles, entrepreneurs have been concerned about the recent declining trends in the labor force and in saving rates because, taken together, they suggest that Japan's economy is likely to grow at a slower pace in the future than it did during much of the postwar period.

We analyzed the impact of rapid population aging on the socioeconomic

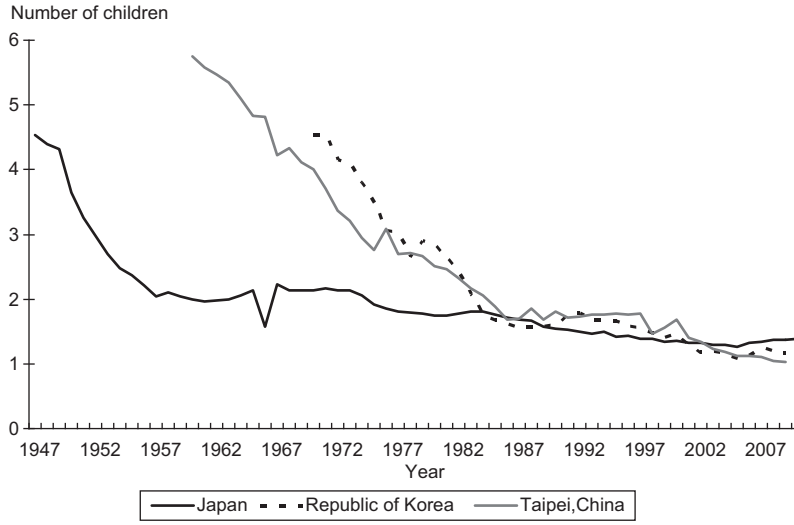
system in Japan during the late 1990s and early 2000s as the Japanese experience can serve as a baseline for discussing important public policy issues related to population aging in other Asian societies. To that end, we compared the Japanese case with the experiences of her neighbors: the Republic of Korea and Taipei,China. It should also be borne in mind that Japan has still retained some traditional values relating to familial responsibilities, so the Japanese model may be of relevance to policymakers in Asia's developing regions who want to combine the best of traditional and modern approaches to support the elderly.

We drew heavily on findings recently obtained from the international, collaborative National Transfer Accounts (NTA) project. A fuller explanation of the basic NTA concept, the assumptions used in computations, and the definitions of other key variables are available on the NTA website (http://www.ntaccounts.org).

2. JAPAN AS A FORERUNNER OF POPULATION AGING IN EAST ASIA

Japan's demographic transition began in the early part of the twentieth century with a gradual reduction in fertility that accelerated dramatically immediately after World War II (Hodge and Ogawa, 1991) when, after a short baby boom from 1947 to 1949, the TFR declined by more than 50 percent from 4.54 to 2.04 children per woman in 1957. It is worth noting that a reduction of this magnitude over a ten-year period was the first such experience in the history of mankind. This was followed by only minor fluctuations around replacement level until the first oil crisis occurred in 1973. Thereafter, Japan's TFR started to fall again, and by the mid-1990s it was below 1.5 children per woman. In 2005, it plummeted further to 1.26, the lowest in the postwar era, before it rebounded slightly to 1.39 in 2010. If fertility were to remain constant at the present level, each successive generation would decline at a rate of approximately 35 percent. This post-1973 decline is often referred to by some demographers as Japan's second demographic transition (Ogawa and Retherford, 1993; Retherford and Ogawa, 2006; Ogawa et al., 2009c).

Although Japan's fertility decline in the 1950s was the earliest to occur and the largest in magnitude, both the Republic of Korea and Taipei,China reached below-replacement fertility in the mid-1980s, as depicted in Figure 8.1. In 2009, the TFR for the Republic of Korea was 1.15; the corresponding figure for Taipei,China was 1.03. These three economies have recently been making strenuous efforts to boost marital fertility but have had only limited success (Retherford and Ogawa, 2009).

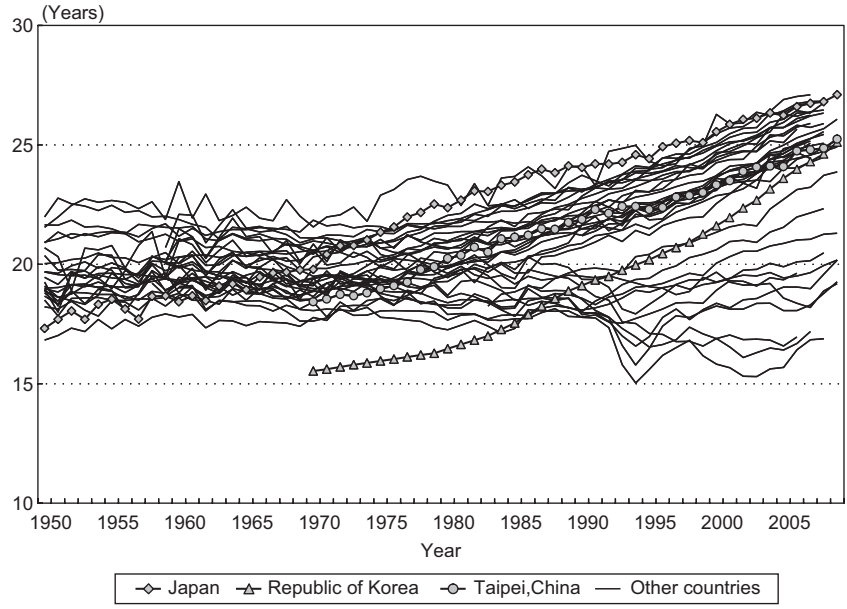


Sources: Japan: Government of Japan, Ministry of Health, Labour and Welfare (various years, a); Republic of Korea: For 1970–1990: Jun (2005). For 1991–2009: Statistics Korea (various years, Press release 'Birth and death statistics' and 'Birth statistics'). Taipei,China: Council for Economic Planning and Development (2010a).

Figure 8.1 Total fertility rates for Japan, Republic of Korea, and Taipei,China

East Asia's very low fertility has attracted a great deal of attention both inside and outside the region. In contrast, a relatively limited amount of attention has been paid to the rapid declines in mortality over the past several decades. Japan is again a good illustration. In 1960, life expectancy at birth in Japan was 65.3 years for men and 70.2 years for women, the lowest among OECD members at that time (Mason and Ogawa, 2001), but by the mid-1970s, life expectancy for both sexes was among the highest. In 2009, male life expectancy at birth reached 79.6 years, the second highest in the world following Qatar (81.0 years), and female life expectancy rose to 86.4 years, the highest in the world followed by Hong Kong, China (86.1 years). The corresponding figures for the Republic of Korea and Taipei,China for females were 83.8 and 82.3 years, respectively, and for males were 77.0 and 76.0 years. Further mortality reductions may be expected to play an increasingly important role in population aging in these economies.

In the past several decades, life expectancy at age 55, when people are inclined to make concrete retirement plans, has improved to a substantial



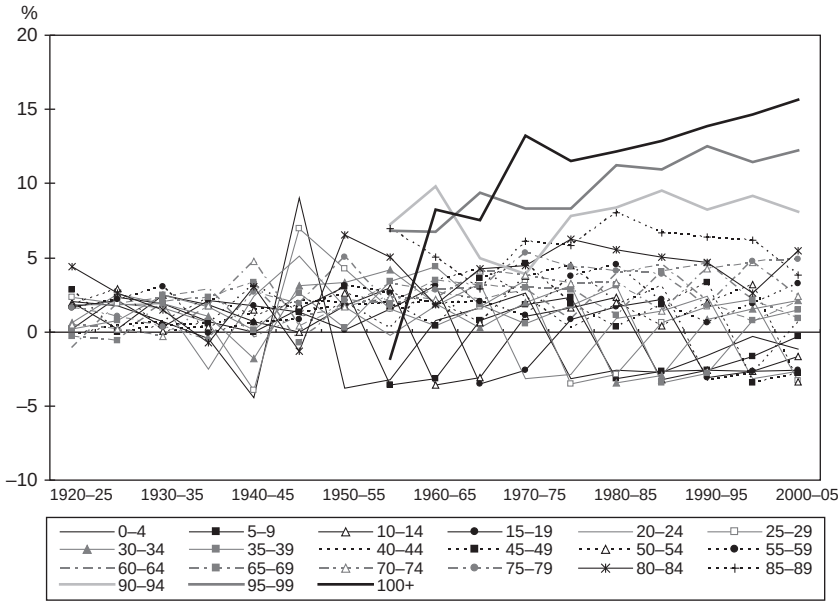
Sources: Human Mortality Database, University of California, Berkeley (USA), and Max Planck Institute for Demographic Research (Germany) (n.d.); Korean Statistical Information Service (n.d., a).

Figure 8.2 Male life expectancy at age 55: international comparison

extent in East Asia. Using data for 38 countries, we plotted changes in the life expectancy of men at age 55 from 1950 to 2009 in Figure 8.2. Life expectancy in Japan, the Republic of Korea, and Taipei,China rises almost linearly and is high by international standards. More importantly, Japan has consistently recorded the highest level of life expectancy at age 55 since the mid-1970s. At present, the level for Japanese males is the third highest in the world.

Because of long-term declines in mortality at various ages, the number of centenarians has been increasing at an annual rate of 13 percent since the early 1970s, which makes them the fastest growing segment of the entire Japanese population, as shown in Figure 8.3.

Japan is also now in the fourth stage of the epidemiological transition, the stage in which the onset of degenerative diseases is delayed. At present, cancer, heart disease, and cerebrovascular disease are the major sources of mortality, but unlike many developed countries where heart disease is the number one killer, cancer has been the leading cause of death in Japan since 1981, and Japan still has one of the highest death rates from

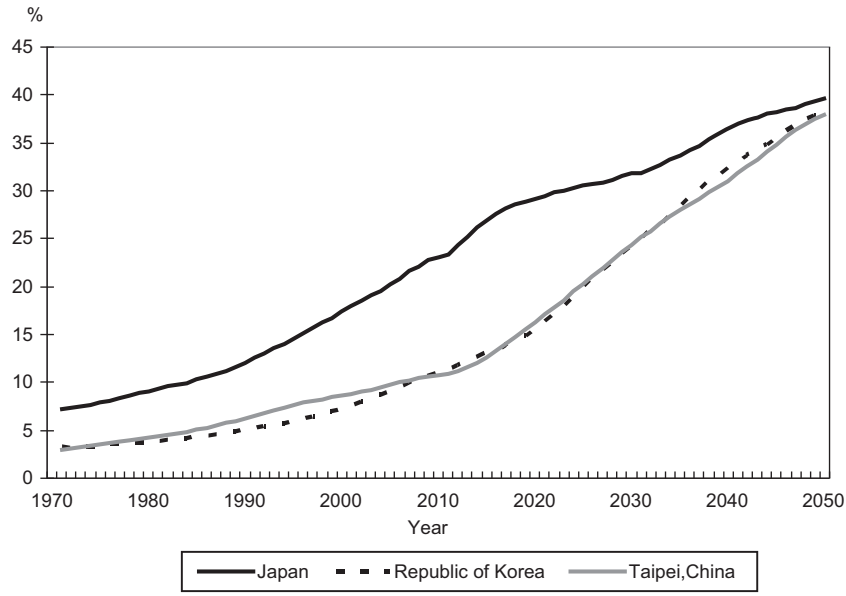


Source: Government of Japan, Statistics Bureau (various years, a and b).

Figure 8.3 Annual growth rate of population of Japan in five-year age groups

cerebrovascular disease among the industrialized nations. Elderly survivors of this disease often tend to be paralyzed to a certain degree, which partially accounts for the prevalence of bedridden elderly in Japan. In the past few decades, the burden on family members or home helpers providing in-home care for them has been a formidable social and economic issue in Japanese society.

As a consequence of this demographic transition, the age structure of the Japanese population has shifted to a pronounced degree. The proportion of those aged 65 and older increased from 5 percent in 1950 to 20 percent in 2005 and to 23.1 percent in 2010. More importantly, the transition occurred at an unprecedented rate (Ogawa and Retherford, 1997; Ogawa et al., 2010). Although Japan's elderly population reached 10 percent in 1984 and was the last to do so among industrialized nations, Japan became the first industrialized country in which the elderly comprise more than 20 percent of the total population. The length of time required for the increase from 10 percent to 20 percent was only 21 years. Compared with Norway and Sweden, Japan is aging approximately three times faster.



Sources: Japan: Government of Japan, Statistics Bureau (various years, a and b) and National Institute of Population and Social Security Research (2007); Republic of Korea: Korean Statistical Information Service (n.d., b); Taipei,China: Council for Economic Planning and Development (2010a, 2010b).

Figure 8.4 Proportion of the elderly (65+) in Japan, Republic of Korea, and Taipei,China

Figure 8.4 compares population aging in Japan with that in the Republic of Korea and Taipei,China from 1971 to 2050. As can be clearly seen, Japan is the most aged of the three throughout the entire period, though population aging in the other two economies is projected to accelerate in the first half of the twenty-first century, and, although not shown in the graph, is likely to overtake Japan just after 2050.

The elderly populations are aging in all three economies as well. In Japan, for instance, the proportion of those aged 75 and older in the population aged 65 and older is expected to grow from 41 percent in 2000 to 62 percent in 2050. A close examination of this result and of country-specific data from a population projection prepared by the United Nations (2009) reveals that Japan's 75 and older population in 2021 is likely to be the highest in the world and that the country will maintain that position until 2038. This is likely to have a substantial effect on the pattern and level of demand for healthcare. Corresponding figures for the Republic of Korea

are 32 percent in 2000 and 58 percent in 2050, and for Taipei,China they are 35 percent in 2000 and 57 percent in 2050. These reflect faster rates of aging than those in Japan.

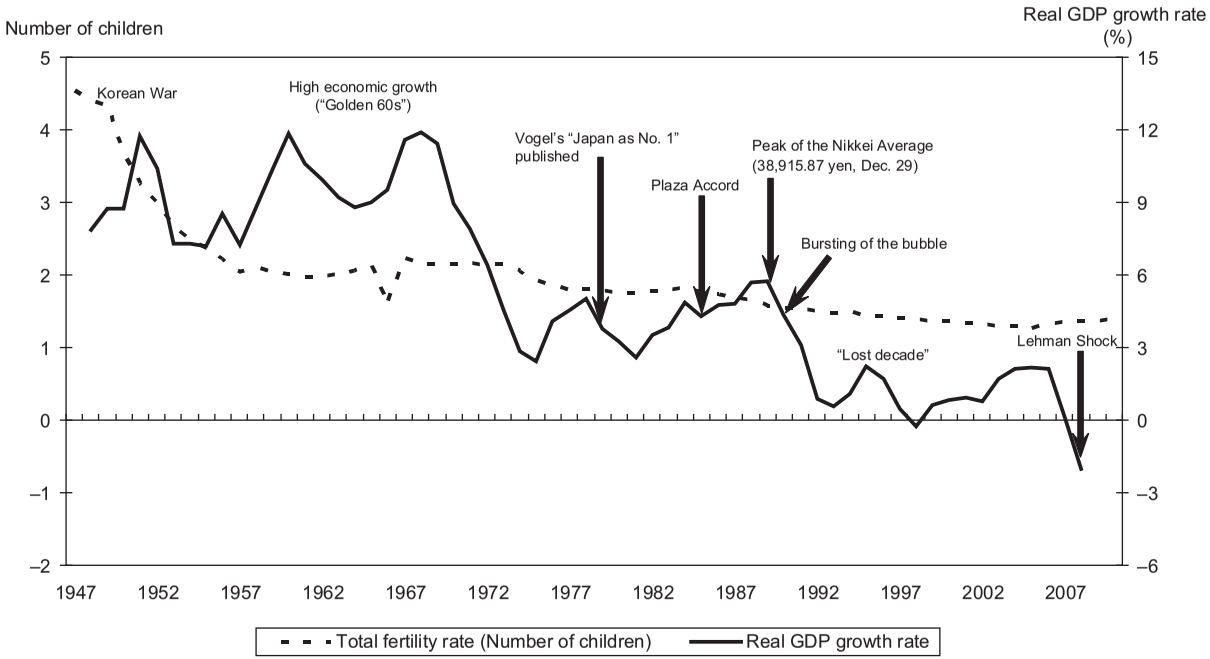
To gain insights into the potential for in-home care for the elderly, we often use the familial support ratio which relates the female population aged 40–59 to the total population aged 65–84 (Ogawa and Retherford, 1997), as in all three economies it is usually middle-aged women who care for older family members at home. In Japan, the value of this index was 1.30 in 1990 and 0.65 in 2010, a decline of 50 percent in 20 years, and is projected to be 0.58 in 2025 and 0.41 in 2050. This indicates that the potential for familial support for the elderly will diminish rapidly, starting in 2007 when the baby-boom cohort disappears from the 40–59 age group. The declining trend in the familial support ratio points to the likelihood that the traditional extended family system will weaken over time. The government started the Long-Term Care Insurance (LTCI) scheme in 2000 to alleviate the burden on family members caring for elderly parents at home, but the number of households without any caregivers is projected to rise at an astonishing rate, so the effectiveness of this scheme is likely to be increasingly limited over time.

Corresponding values for the familial support ratio in the Republic of Korea are 1.74 in 2000, 0.88 in 2025 and 0.40 in 2050, and for Taipei,China are 1.48, 0.90, and 0.46, respectively. The potential for familial support in the Republic of Korea would thus be slightly lower than that for Japan in 2050.

3. ECONOMIC GROWTH AND THE LABOR FORCE

Japan's postwar economic growth has been as spectacular as its demographic transformation has been. At the end of World War II, the Japanese economy was severely damaged, but its productive capacity recovered to prewar levels by the end of the 1950s. As indicated in Figure 8.5, during the 1960s Japan's real gross domestic product (GDP) grew at a phenomenal rate of about 11 percent per annum facilitated by an abundant, high-quality labor force, advanced technology from developed countries, and a favorable international trade market (Ogawa et al., 1993). From the second half of the 1960s to the end of the 1990s, numerous Japanese development economists repeatedly pointed to these factors as keys to Japan's "Golden 60s". Since the turn of the century, however, attention has been directed to the significant role played by the unprecedented decline in fertility that followed the postwar baby boom.

In 1973, the first oil crisis hit Japan without much warning. This external



Note: GDP = gross domestic product. The real GDP growth rate values in this graph present a three-year moving average.

Sources: Real GDP growth rate: Government of Japan, Cabinet Office (various years, a); TFR: Government of Japan, Ministry of Health, Labour and Welfare data, various years.

Figure 8.5 Real gross domestic product growth and the total fertility rate in Japan from 1947 to 2010

shock triggered a restructuring of the Japanese economy; consequently, economic growth was much less impressive than in the 1960s. In the 1980s, the average annual growth rate of real GDP was 4.2 percent.

In the mid-1980s, the Japanese economy entered into a bubble phase, and many Japanese firms purchased properties in the United States (US) and elsewhere. In 1989, the Nikkei average was at an all-time high, and government tax revenues increased substantially with the introduction of the 3 percent consumption tax and increased corporate profits. It did not, however, take long for the bubble to burst. The investment boom ended abruptly in the second half of 1990, and a number of leading banks and other financial institutions went into bankruptcy. Government tax revenues dropped dramatically, and government debt accumulated at an unprecedented rate. Japan's debt crisis has become the worst among developed countries. Accumulated government debt amounted to $10.5 trillion in 2010 or to approximately twice the size of the country's GDP. Moreover, Japan's international competitiveness deteriorated very quickly. In the early 1990s, the Japanese economy ranked 1st, but in 2010 it ranked 27th behind Singapore (1st), Hong Kong, China (2nd), PRC (18th), and the Republic of Korea (23rd) (International Institute for Management Development, 2010). In addition, the household saving rate decreased from 7.9 percent in 2000 to 3.3 percent in 2008.

One of the major reasons for Japan's poor economic growth in the 1990s was a series of inappropriate macroeconomic measures implemented by the government after the bubble burst. The government regarded the country's sluggish economic performance as a part of a business cycle, and increased government spending to boost the country's economy, without much success. It took several years to realize that more drastic restructuring policies were needed to make the economy more competitive in international markets. Because of the delayed policy responses to globalization, some economists call the 1990s "Japan's lost decade" (Yoshikawa, 2002). Only in early 2002 did the economy finally enter a period of slow but steady growth that persisted until the Lehman Shock in September 2008. To make the situation worse, in March 2011 Japan was hit by a magnitude 9.0 earthquake followed by a catastrophic tsunami and a nuclear accident. At the time of the writing of this chapter, it was virtually impossible to predict accurately how and when these difficulties would be resolved. Because of its very slow adjustment to globalization, some economists have suggested in recent years that Japan is now in its second lost decade (*The Economist*, 2009). In contrast, the Republic of Korea coped swiftly with the various problems arising from the Asian financial crisis in 1997 by adopting economic policies based on International Monetary Fund (IMF) demands and thus achieved success in a relatively short period of time.

In Taipei,China, the impact of the Asian financial crisis was much milder than it was in the Republic of Korea.

The labor force in Japan has been shrinking since 1998, and population aging has been advancing quickly. In response, a number of changes have been under way in the labor market since the 1990s. For instance, Japan's unique practice of lifetime employment and the seniority-oriented wage system that constitute the core of Japan's "corporate paternalism" have become increasingly serious stumbling blocks to making the Japanese economy more competitive. One of the principal obstacles to raising the mandatory retirement age is related to the wage system, as postponing retirement leads to larger wage bills. To cope with this problem, many businesses, particularly large-scale enterprises, have been gradually modifying the system by introducing performance-based elements. The other deterrent to extending the retirement age is the lump-sum severance benefits that are basically a function of duration of service. In 2009, a male employee with a university education and more than 38 years of service received severance pay equivalent to 41 times his final month's salary. Recently such grants have been incorporated into pension benefits provided by employers, but severance pay attracted a great deal of attention as the 6.9 million baby-boom generation (born 1947–1949) approached retirement age in 2007. Because of their sheer numbers and the amount of their severance pay, financial markets, not only in Japan, have been affected to a substantial degree. Many financial institutions, banks, and life insurance companies now offer a variety of portfolio plans to retiring baby boomers. A serious problem associated with the exodus of the baby boomers from the labor market is the loss of a giant pool of experienced workers, so employers are trying through a variety of measures to keep them on the payrolls. With very low fertility and sluggish economic growth, the task is not easy.

In so far as the labor force participation rate among the elderly is concerned, Japan stands apart from other industrialized nations. In 2008 according to the International Labour Organization (ILO), the labor force participation rate for Japanese men aged 65 and older was 30 percent, while in developed countries in Europe it was less than 10 percent and in the US it was 22 percent. Older Japanese women are also more likely to continue working than older women in Europe but almost as much as their counterparts in the US. It should also be noted that labor force participation in the Republic of Korea is considerably higher than in Japan, regardless of sex (ILO, n.d.).

The female labor force participation rate in Japan also differs considerably from that of many industrialized nations. In most, the rate has risen sharply during the past few decades, but in Japan the rate for women

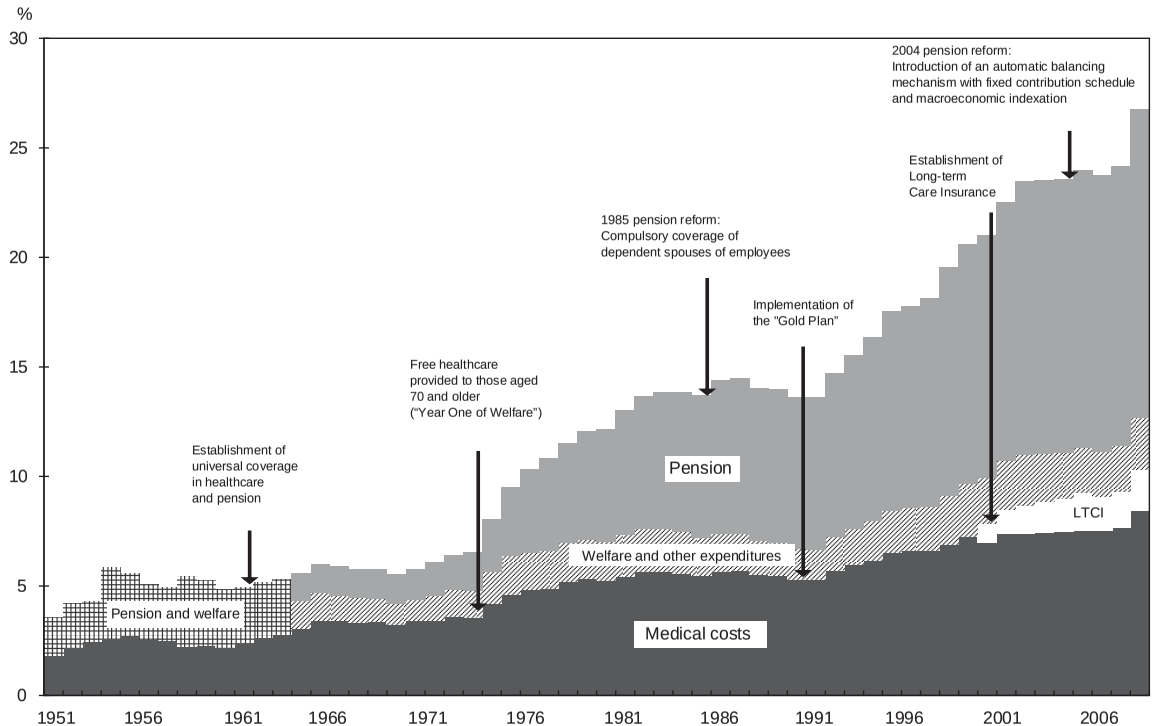
aged 15 and older fell from about 51 percent in the mid-1960s to about 46 percent in the mid-1970s, and then rose to about 49 percent in 2010 (Government of Japan, Statistics Bureau, 2011). The lack of a trend in the Japanese female labor force participation rate is due to offsetting trends in different types of participation as well as to the sensitivity of their participation to economic fluctuations such as the oil crisis of the early 1970s and the bursting of the bubble economy in the 1990s. This supports the frequently heard claim that Japanese female workers are marginal and that their wages are notoriously low. It should be stressed, however, that due to the diminishing supply of male workers in absolute terms beginning in 1998, the demand for female workers, both full time and part time, has been on an upward trend, particularly in service and retail/wholesale industries (Matsukura et al., 2007).

It is also worth noting that an increasing proportion of male and female Japanese young people aged 15–34 are choosing alternative working lifestyles. Two terms frequently used to describe young persons who are not formally employed are *freeters* and NEETs. Persons classified by the government as NEETs are completely outside the labor force, while *freeters* are engaged in temporary or part-time employment. The increasing proportion of young people who choose not to seek permanent, full-time jobs after graduation or who decide to quit their first job is causing considerable concern among policymakers. From 1982 to 2002, the proportion of *freeters* rose from 1.9 percent to 7.4 percent, while the proportion of NEETs remained virtually unchanged at 1.6 percent. In 2002, this meant that 2.5 million *freeters* and 0.5 million NEETs, a total of 9 percent of the population aged 15–34, were outside the formal employment system. *Freeters* and NEETs still remain a serious problem in the labor market.

4. PUBLIC SUPPORT SCHEMES

4.1 Welfare Programs in the Three East Asian Economies

Starting in the late 1950s following postwar trends in Europe, Japan was the first of the three East Asian economies to move toward building a welfare state during the initial stages of its miraculous economic growth. As described in Figure 8.6, Japan established universal pension and healthcare schemes in 1961, though expenditures for social security were only 5 percent of national income that year. Toward the end of the period of rapid economic growth, however, resources allotted for social security benefits began to increase substantially. Thus it is widely believed



Source: National Institute of Population and Social Security Research (2010).

Figure 8.6 Social security expenditures as a percentage of national income in Japan from 1951 to 2008

that Japan's welfare state really started in 1973, the so-called "Year One of Welfare". In that year, the elderly aged 70 and older became entitled to free healthcare services, and in 1974, social security expenditures rose to 8 percent of national income.

After the first oil crisis in 1973, the annual growth rate of real GDP was negative in 1974. This proved to be the tipping point in economic growth, as shown in Figure 8.5. The Japanese welfare state was therefore established during the worldwide stagflation of the 1970s, which gave rise to the shift in policy emphasis from the welfare regime to the employment regime that has affected the Japanese economy and the welfare system in the past three decades (Takegawa, 2005; 2009). One of the consequences of that shift was the abolition of free healthcare for those aged 70 and older in 1983 due to financial constraints; Japanese people are still concerned about employment and social welfare.

In contrast, the government of the Republic of Korea expanded welfare in the late 1990s after the Asian financial crisis. Under the slogan of "productive welfare", the Kim Dae Jung administration (1998–2003) followed IMF recommendations and carried out a series of social reforms that rapidly transformed the country into a welfare state (Lee, 2004). The National Medical Insurance Scheme was established in 1989, and the National Pension Insurance Scheme was expanded to cover all citizens in 1999. In contrast to Japan, the Korean welfare state was shaped by the welfare regime coupled with the "workfare regime" rather than by the "employment regime".

Although social spending relative to GDP in both Japan and the Republic of Korea has been trending upwards in the past few decades, compared with other countries with similar levels of per capita GDP both still have relatively low levels of social spending (Takegawa, 2009). One explanation may be the relatively low maturity level of old-age pension programs, particularly in the Republic of Korea. Another factor could be the persistence of multigenerational living arrangements and a high incidence of intergenerational familial transfers in East Asian economies, the basis for the terms "welfare orientalism", "Confucian welfare state", and "East Asian regime". Although this implies that Japan and the Republic of Korea belong to the same welfare state regime, the social and economic policy orientations of the two governments were completely opposite in the late 1990s, so the welfare state in the Republic of Korea is not the same type as that in Japan (Takegawa, 2005).

In Taipei,China, there have been major expansions of welfare arrangements for the elderly, including important developments in old-age income maintenance schemes, long-term care systems, and healthcare schemes. These public programs have advanced through a series of political

confrontations and competition among different political parties (Fu and Lu, 2009). Compared with Japan and the Republic of Korea, the development of social policy in Taipei,China is more seriously affected by the balance of power among political parties and by election results. This is one of the principal reasons why the old-age income maintenance schemes were finally implemented only in 2008 while the National Health Insurance Scheme was implemented as early as 1995.

These East Asian experiences in building welfare states suggest that starting dates, the international context, and local circumstances are decisive factors in determining the paths they will take (Takegawa, 2009). More importantly, the future direction of the welfare programs in each of these three economies will be affected by their past developments.

4.2 A Brief Outline of Japanese Social Security Programs

Universal pension and healthcare schemes were instituted in 1961 (Figure 8.6). As mentioned earlier, since 1973, "Year One of Welfare", Japan's social security system has grown considerably, increasing from 5 percent of national income in 1961 to 27 percent in 2008 (National Institute of Population and Social Security Research, 2010). Japan's social security system encompasses old-age pension schemes and health plans as well as the Long-term Care Insurance Scheme and some other smaller programs. The share of social security expenditures accounted for by the two main components has changed substantially over time. Pension and health benefits accounted for 22 percent and 57 percent respectively of total expenditures in 1965, and 53 percent and 32 percent of total expenditures in 2008 (National Institute of Population and Social Security Research, 2010). The shift toward pension benefits has occurred mainly because of population aging, the maturation of the pension system, and major changes in health plans intended to rein in mushrooming costs. Another reason is that pension benefits are more affected by population aging than health benefits are, inasmuch as health benefits are provided to the entire population regardless of age.

Public pension schemes were initially established for specific occupational groups, with some covered earlier than others. Currently there are six different public pension schemes. Two of these, the Employees' Pension Scheme and the National Pension Scheme, cover approximately 90 percent of the workforce. The employee's scheme was established in 1941 while the national scheme was established in 1961 for workers not covered by other public pensions. Thus, 1961 marks the onset of universal pension coverage for workers in Japan.

A major difference between the two is that paid employees working for

a firm with at least five regular workers belong to the employees' scheme, whereas farmers, other self-employed workers, employees of small firms with fewer than five regular workers, and certain other categories belong to the national scheme. The two schemes also differ in levels and methods of contribution. In the employees' scheme in 2011, 16.4 percent of a worker's total annual earnings, including bonuses, went to the government, evenly split between the employee and the employer. In the national scheme, the government collects a flat contribution from members, most of whom are self-employed. In 2011, this contribution was 15020 yen (about $188) per month. Because of lower contributions, benefits paid to national scheme recipients are considerably lower than those paid by the employees' scheme, but in both, benefits have been automatically linked to changes in the consumer price index only since 1999.

When Japanese pension schemes were initially established, they were organized under the principle of reserve financing. As the social security system evolved, however, the reserves could not cover current benefit payouts, thus requiring the government to shift to pay-as-you-go financing by gradually increasing subsidies from general tax revenues. Unlike reserve financing, pay-as-you-go financing is directly affected by the age composition of the population, so reserve funds accumulated in the past have been diminishing in recent years as the proportion of the elderly has increased. The employees' scheme reserve funds are a salient example. Moreover, various calculations have shown that intergenerational equity considerations will become an increasingly divisive social issue as population aging accelerates in the next few decades (Ogawa and Retherford, 1997). Due to such gloomy long-term prospects, an increasing proportion of the population enrolled in the national scheme is discontinuing contributions: 42 percent of the participants did so in 2010, and in Okinawa Prefecture, the worst of all, 64 percent of participants are not making contributions at present.

In order to maintain financial solvency, Japan's pension schemes have been periodically reviewed and reformed. A major pension reform was carried out in 2004 to address sustainability, which in effect meant reducing benefits to a considerable extent. To accomplish this, the 2004 pension reform built in an adjustment factor called "macroeconomic indexation" to reflect longer lifespans and a drop in the number of contributors and earnings. As a result, the replacement rate for the employees' scheme declined considerably. According to the OECD, it is currently 36 percent of the average earnings of a male worker, which is lower than the average for OECD members at 61 percent (OECD, 2011).

In 2007, the government's decades-long careless handling of pension records came to the attention of the public and became a serious political

issue. It was estimated that records for more than 50 million contributors could not be identified, mainly due to the fact that an incredible number of errors had been committed in the process of converting the original handwritten documents to a computer format. Because there are still more than 20 million persons who cannot receive pension benefits, Japan's public pension system may be drastically changed, depending on how this political issue is settled in the years to come.

The second major component of social security benefits is health benefits. Five separate major plans exist, and again, coverage has been universal since 1961. The Association-Managed Health Insurance Plan, the Government-Managed Health Insurance Plan, and the National Health Insurance Plan are the major ones, and together they cover 87 percent of the population. Employees of large-scale enterprises are enrolled in the association plan, and employees of small and medium-sized businesses are enrolled in the government plan. Persons not covered by other existing plans are enrolled in the national plan. The age structure of members is older in the national plan than in the other plans, primarily because a large proportion of its members are self-employed small business owners and farmers.

In 2008, the medical plan premium was as high as 7.4 percent of a worker's earnings for the association plan and 8.2 percent for the government plan (Health and Welfare Statistics Association, 2010). The premium is split between the employee and the employer, and the government provides small subsidies to cover administrative and management costs. For the national plan, a different premium is collected from each household depending on its annual income and assets.

Because of its lower premium rates and older age composition, the financial foundation of the national plan is weak compared with those of the other four plans and has required heavy government subsidies. To ease the financial burden on the government, the other four plans have been required to make contributions to it since 1984 to compensate for differences in age composition. As a consequence, the financial situation of the association plan, which has the youngest age composition, has been rapidly deteriorating. Various proposals to integrate the five plans into one unified plan are currently under discussion.

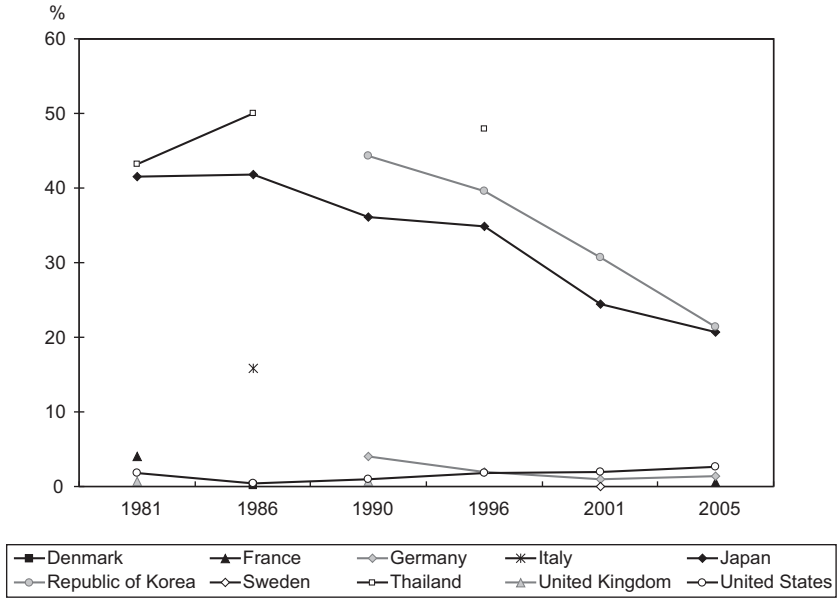
At present, Japan's ratio of social security benefits to its national income is still lower than that of most European countries, but numerous simulation exercises suggest that it will grow considerably over the next few decades. How much will taxpayers be required to contribute to the social security system over the next 25 years? The Japanese government has been very concerned about this issue and has been trying to shift some of the costs of the social security system back to families.

5. FAMILIAL SUPPORT NETWORK AND CAPACITY

Although Japan's current demographic and economic situations are similar in many ways to those of other industrialized countries, there are also some important differences that relate to the legal status of the elderly and to family organization (Hodge and Ogawa, 1991; Ogawa and Retherford, 1993; 1997). Let us first discuss the legal status of the elderly. Most industrialized nations, particularly in Europe, have abolished legal requirements for providing care to needy parents (Hashimoto, 1984; Gibson, 1992). In Japan, however, the responsibility of children to care for their aged parents is stated in the new Civil Code of 1948. Article 877 stipulates that those in a lineal relationship, as well as siblings, are responsible for supporting and caring for each other, and under special circumstances, third-degree relatives may also be required to furnish support. This legal family responsibility is often invoked and enforced (Gibson, 1992).

The legal status of the elderly was even stronger in prewar Japan. The old civil code, which was heavily tinged with Confucian beliefs, included the primary power of family heads over arranged marriages and inheritance by primogeniture (Kendig, 1989). These laws provided a powerful base for reinforcing traditional family relations based on intense obligations between individuals in direct lineal descent (Sano, 1958) and gave primacy to the continuity of the household. In such patrilocal households, the son and his wife were subordinate to his parents. These traditional family values were further reinforced by a culture of deep sensitivity to social approval, a strong motivation throughout life to relieve oneself of indebtedness to others, and absolute duties to parents (Benedict, 1946). The revision of the code in 1948 removed the predominant legal power of family heads. It was designed to reshape traditional culture to better fit a more modern social structure consonant with individual rights and economic progress (Kendig, 1989). However, Japan's traditional family values and practices are still widely prevalent though they have changed substantially in the last few decades as a consequence of rapid urbanization and industrialization coupled with an extraordinarily fast demographic transition.

Let us now turn to Japan's changing family organization. Multigenerational households are still fairly popular in Japan though they are not the most common living arrangement and have declined in recent years (Ogawa and Ermisch, 1996; Ogawa and Retherford, 1993). According to the 2005 round of the International Survey of Lifestyles and Attitudes of the Elderly (Government of Japan, Cabinet Office, various years, b), the proportion of the elderly aged 65 and older living in three-generation households was 21 percent. In contrast, the corresponding



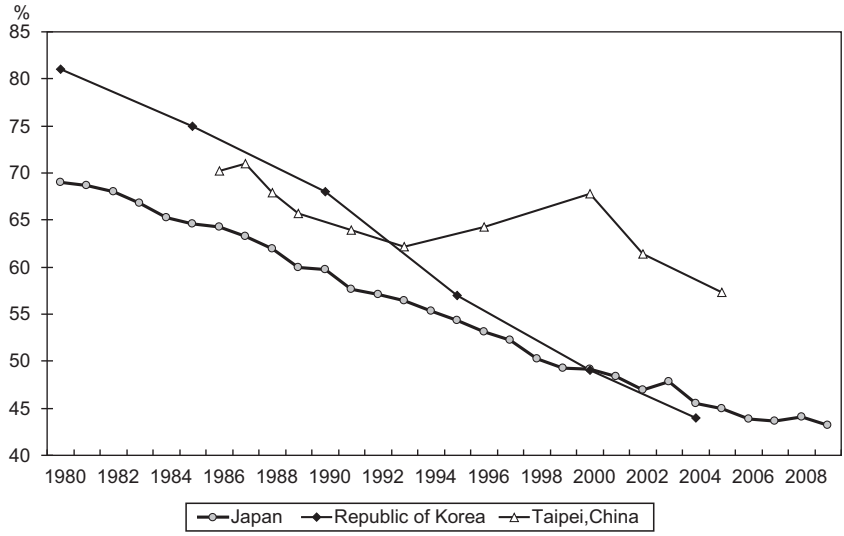
Source: Government of Japan, Cabinet Office (various years, b).

Figure 8.7 International comparison of persons aged 65 and older living in three-generation households from 1981 to 2005

figures were only 3 percent in the US and 1 percent in Germany and France (Figure 8.7). It should be stressed, however, that due to rapid demographic shifts and to changing lifestyles, the figure for Japan has steadily declined over the past two decades from 42 percent in 1981 to 36 percent in 1990. Although the Japanese government often views co-resident households as a unique asset that could be tapped to offset the adverse effects of population aging on the sustainability of the social security system, the validity of this view has become increasingly questionable as population aging advances.

As displayed in Figure 8.8, the proportion of those aged 65 and older co-residing with their adult children in Japan declined from 70 percent in 1980 to 43 percent in 2009. Similar downward trends are observed in both the Republic of Korea and Taipei,China.

Obviously, as population aging advances, the number of elderly who need intensive healthcare is expected to increase rapidly. In Japan as well as in other East Asian economies, a substantial proportion has been and will be looked after at home by their adult children, particularly unemployed, middle-aged women. One of the modeling exercises undertaken by the



Sources: Japan: Government of Japan, Ministry of Health, Labour and Welfare (various years, b and c); Republic of Korea: Howe et al. (2007, p. 12); Taipei,China: Fu and Lu (2009, p. 91).

Figure 8.8 Percentage of persons aged 65 and older co-residing with their children in Japan, Republic of Korea, and Taipei,China from 1980 to 2009

Nihon University Population Research Institute clearly shows a dramatic rise in this burden; however, this is likely to change drastically depending on the future availability of both public support services through social security programs such as the Long-term Care Insurance Scheme and long-term care institutions. The degree to which the elderly will receive care through Japan's traditional familial support network is also contingent on future demands for female labor and on the future commitment of women to provide care. In view of the financial constraints on the government, the recent trend in female paid employment (Ogawa and Clark, 1995; Ogawa and Ermisch, 1996; Ermisch and Ogawa, 1994), and the rapid shift in familial support (Ogawa and Retherford, 1993; Retherford et al., 1999), the outlook for providing home-based care for infirm elderly Japanese is rather bleak.

5.1 Measuring Two Demographic Dividends

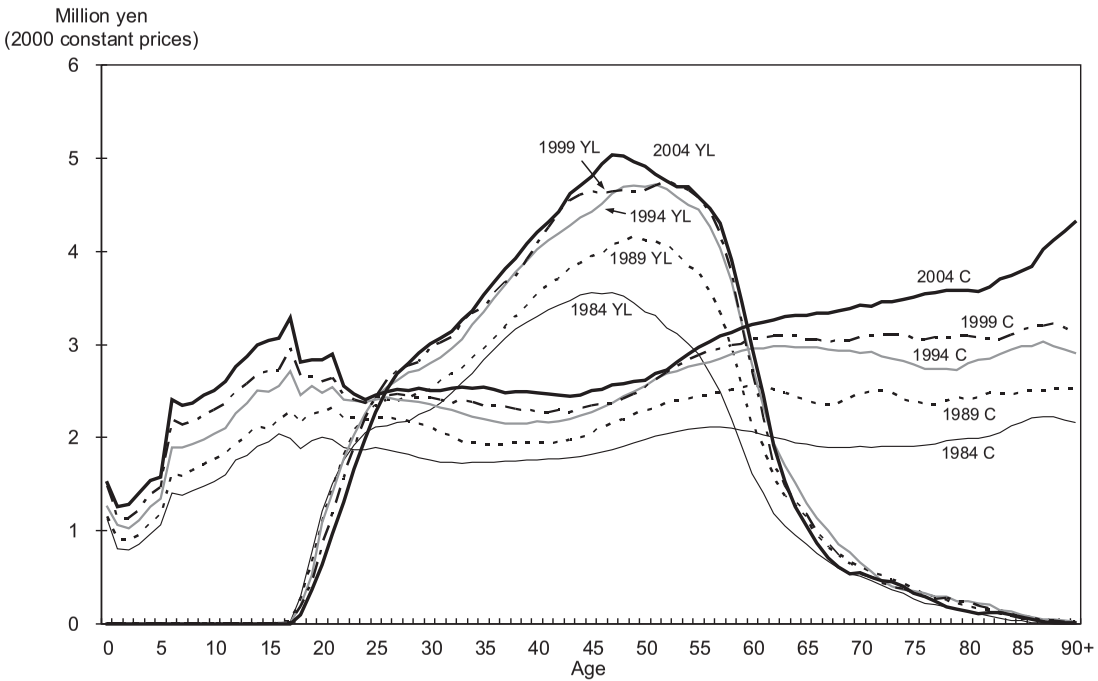
One of the important links between demographic change and economic growth is the role of demographic dividends (Mason, 2001; 2007; Mason

and Lee, 2006). To calculate the first demographic dividend for Japan, we estimated the age-specific profiles of consumption and production in contemporary Japan in the private and public sectors combined for five years – 1984, 1989, 1994, 1999, and 2004 – using private sector information from the National Survey of Family Income and Expenditure from 1984 to 2004 of the Statistics Bureau of Japan and public sector information from various government publications. The results are expressed in terms of 2000 constant prices and are in Figure 8.9. The age profiles of per capita consumption rose almost continuously from 1984 to 2004, particularly at younger and older ages. Deserving particular attention is the emergence of an upward-sloping consumption curve for the age group 65 and older in 2004. This is accounted for by the implementation of the Long-Term Care Insurance Scheme in 2000.

By applying the results for the most recent year (2004) as statistical weights, we calculated the annual growth rates of output per effective consumer and per effective producer from 1920 to 2050. The results are in Figure 8.10. Japan's first demographic dividend – the difference between the annual growth rate of output per effective consumer and the annual growth rate of output per effective producer – was positive from 1949 to 1982. The magnitude was extremely large during the rapid economic growth of the 1960s and the early 1970s, as discussed earlier.

For a comparison, we applied the age profiles of consumption and labor income estimated in the most recent available NTA data for the PRC, Japan, Republic of Korea, and Taipei,China to the 2008 United Nations' population projections and computed the timing of their first demographic dividends. As shown in Figure 8.11, not only the timing but also the duration of the first dividends in these economies are substantially different. In the Republic of Korea it ended in 2009, while in the PRC and Taipei,China it will end in 2017 and 2019, respectively.

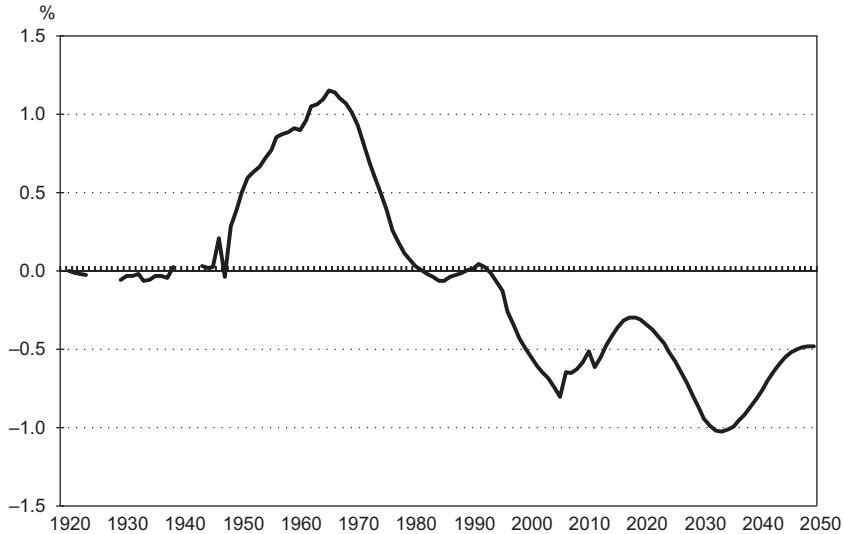
The first demographic dividend is inherently transitory, but the same demographic forces that ended it lead to a second dividend, that is, the second dividend arises in response to population aging. While the first dividend is purely computational, the second dividend is affected not only by the proportion of elderly persons relative to younger persons, but also by the extent to which consumers and policymakers are forward looking and respond effectively to demographic changes anticipated in the years ahead (Mason, 2007; Ogawa and Matsukura, 2007; Ogawa et al., 2010). When life expectancy increases, for example, the impetus to accumulate wealth does also and leads to an increase in income. This implies that if capital accumulation rather than familial or public transfer programs dominates age reallocation systems for supporting the elderly, population aging may yield a second demographic dividend in the form of higher



Note: YL denotes labor income, while C denotes consumption.

Source: Authors' calculations.

Figure 8.9 Age-specific profiles of per capita consumption and production in Japan from 1984 to 2004



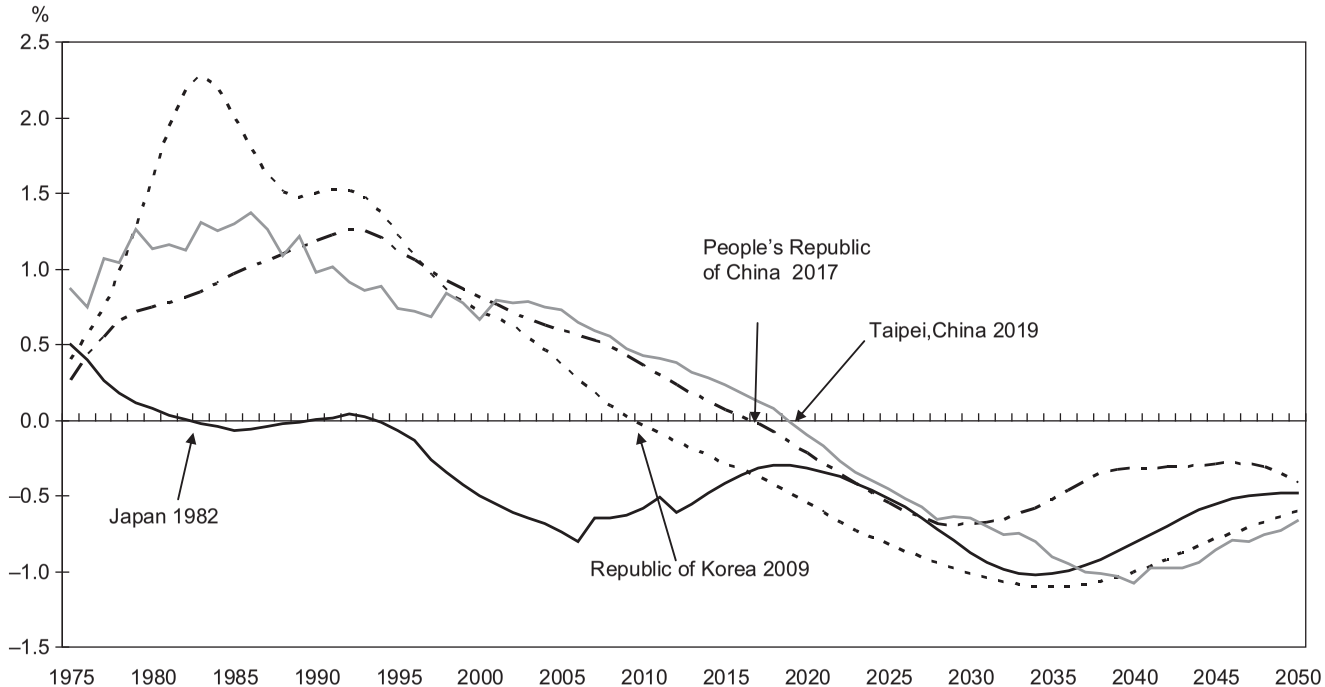
Source: Authors' calculations.

Figure 8.10 First demographic dividend in Japan

rates of saving and the capital intensification of the economy (Mason, 2007).

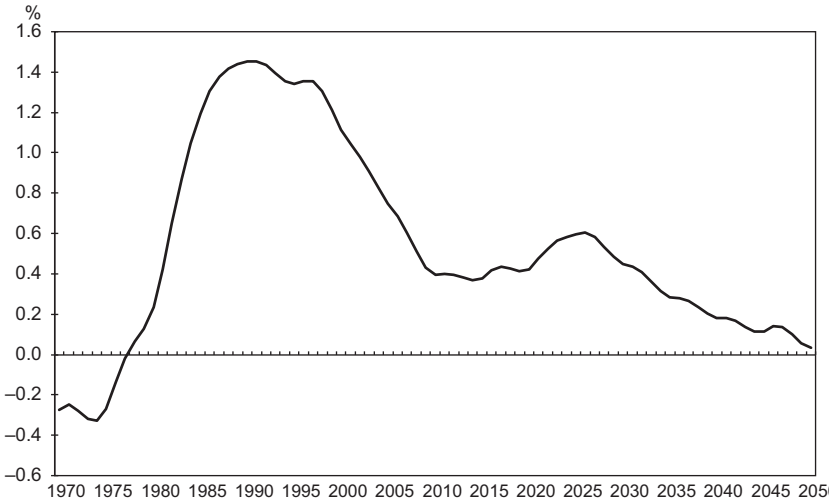
Compared with the first dividend, measuring the amount of the second dividend is considerably more difficult, in part because the accumulation of wealth is intrinsically forward looking. We followed methodology used in previous studies (Mason, 2007; Ogawa et al., 2009a) to estimate the second demographic dividend in Japan from 1970 to 2050. The results are in Figure 8.12. The dividend increases remarkably between the late 1970s and the early 1990s, but around the turn of the century begins to fall substantially with a pronounced trough in the 2010s followed by an upsurge in the 2020s and 2030s. These oscillations are mainly attributable to rapid shifts in age composition in the early part of the twenty-first century, primarily because the second generation of baby boomers will be 50 and older and is expected to commence accumulating wealth for their long retirements.

Combining the first and second demographic dividends in Figure 8.13, we show the change in the effect of the total demographic dividend on real GDP growth for Japan from 1970 to 2008. The impact of the second demographic dividend (particularly during the bubble economy) was quite substantial.



Source: Authors' calculations.

Figure 8.11 Timing of first demographic dividend in People's Republic of China, Japan, Republic of Korea, and Taipei,China



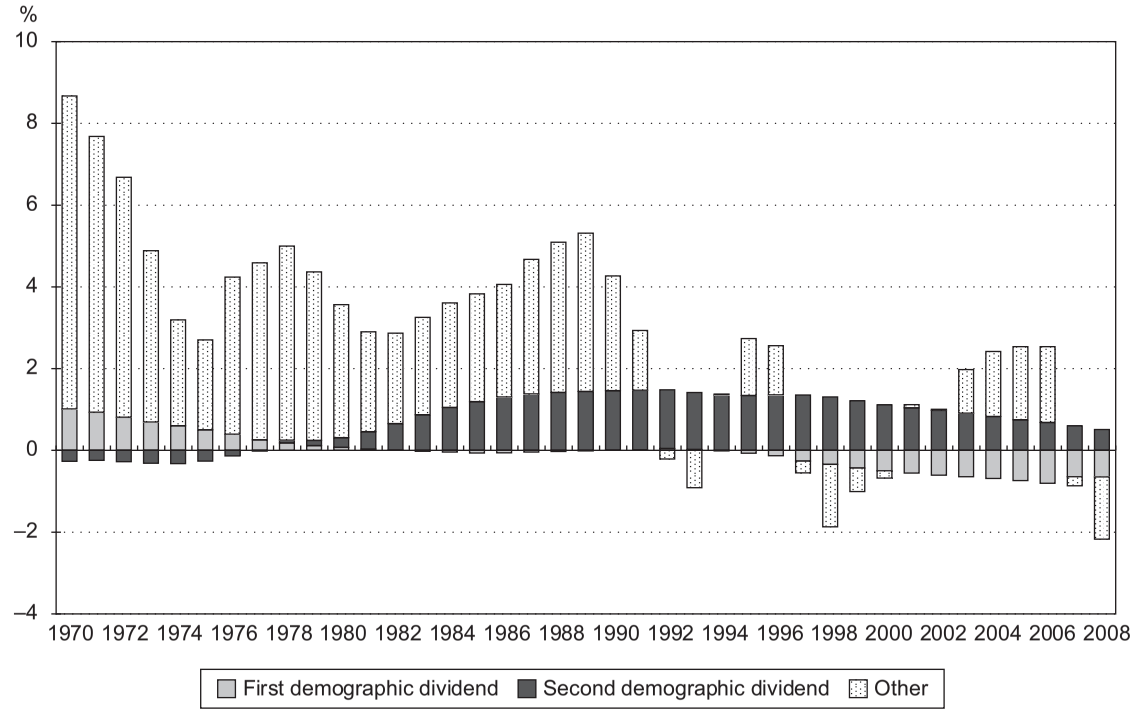
Source: Authors' calculations.

Figure 8.12 Second demographic dividend in Japan

Figure 8.14 plots the age profiles of people aged 60 and older who held real and financial assets in Japan in 1999 using the 1999 round of the National Survey of Family Income and Expenditure. In addition, we computed the present value of their expected future public pension benefits. The detailed procedure and assumptions used are available in Ogawa and Matsukura (2007).

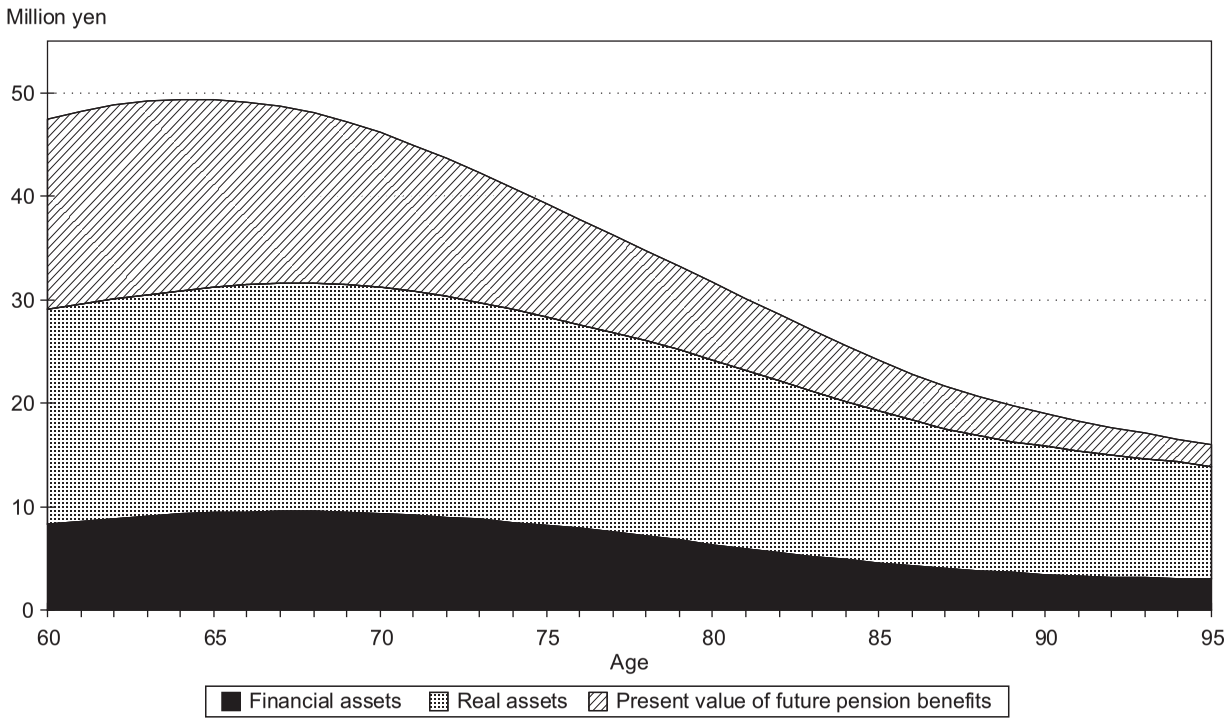
Figure 8.14 indicates that the Japanese elderly are wealthy. At age 60, the total amount of assets an average person owned was almost 50 million yen, or $0.6 million. In fact, they are wealthier than this graph shows because private pensions and various types of familial transfers are not included. It is interesting to observe that real assets were the biggest component of wealth throughout retirement, so liquidating them is a crucial decision for very old persons, particularly those who are living alone. This indicates substantial potential for developing various financial schemes such as reverse mortgages.

Attention should also be drawn to the fact that the Japanese preference for owning land changed considerably during and after Japan's "lost decade". According to the National Opinion Survey on Land Issues conducted by the Ministry of Land, Infrastructure, Transport and Tourism, the proportion of those aged 60 and older who thought that land was a better asset than financial assets such as savings and securities



Source: Authors' calculations.

Figure 8.13 Effect of demographic changes on economic growth in Japan from 1970 to 2008



Source: Authors' calculations.

Figure 8.14 Age profiles of assets and pension wealth transfers in Japan in 1999

declined from 63 percent in 1994 to 32 percent in 2005 and then bounced back to 44 percent in 2009. The proportion again dropped abruptly to 33 percent in 2010 (Government of Japan, Ministry of Land, Infrastructure, Transport and Tourism, various years). According to a report released by the OECD (2008), however, 71 percent of the population aged 20 and older had no knowledge about investments in equities and bonds, 57 percent had no knowledge of financial products in general, and 29 percent had no knowledge about insurance policies, pensions, and taxes. This suggests that the elderly Japanese need more information regarding investment opportunities.

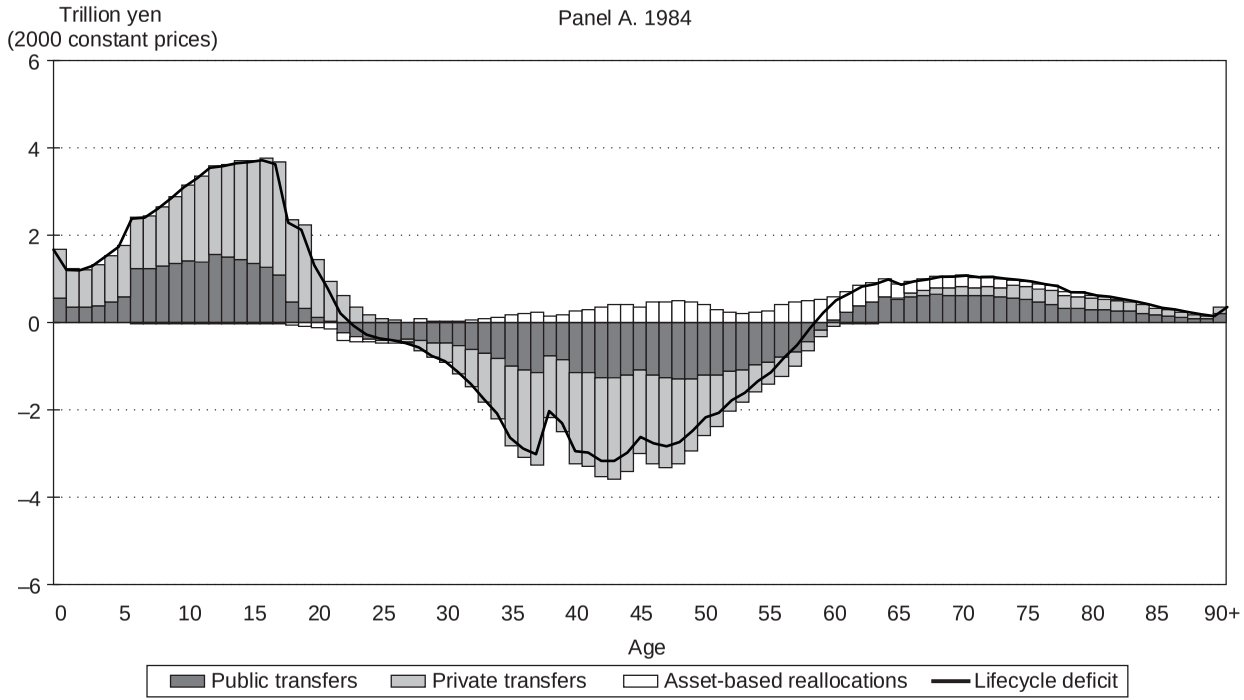
Data gathered in a nationwide survey in Japan in 2010 revealed an important connection between financial literacy and investing in human capital. According to the survey, over half the workers aged 40 to 59 believed that they needed additional training and skills to continue working at their current jobs, to have good prospects for promotion, and to be competitive for new employment after they left their career jobs. Furthermore, the demand for further training was influenced by the level of financial literacy (Clark et al., 2010). This is not surprising since investing in human capital requires that an individual understand the costs and benefits associated with the allocation of time and resources.

5.2 Lifecycle Deficits and Reallocations

In this section transfers are divided into net public transfers and net private transfers comprising bequests and *inter vivos* transfers. The terms "familial transfers" and "private transfers" are used interchangeably and the estimated totals are adjusted on the basis of national income and product account (NIPA) values. Labor income, however, does not exactly correspond to its NIPA counterpart because the income of the self-employed includes returns on labor and capital. We allocated two-thirds of this income to labor and one-third to capital.

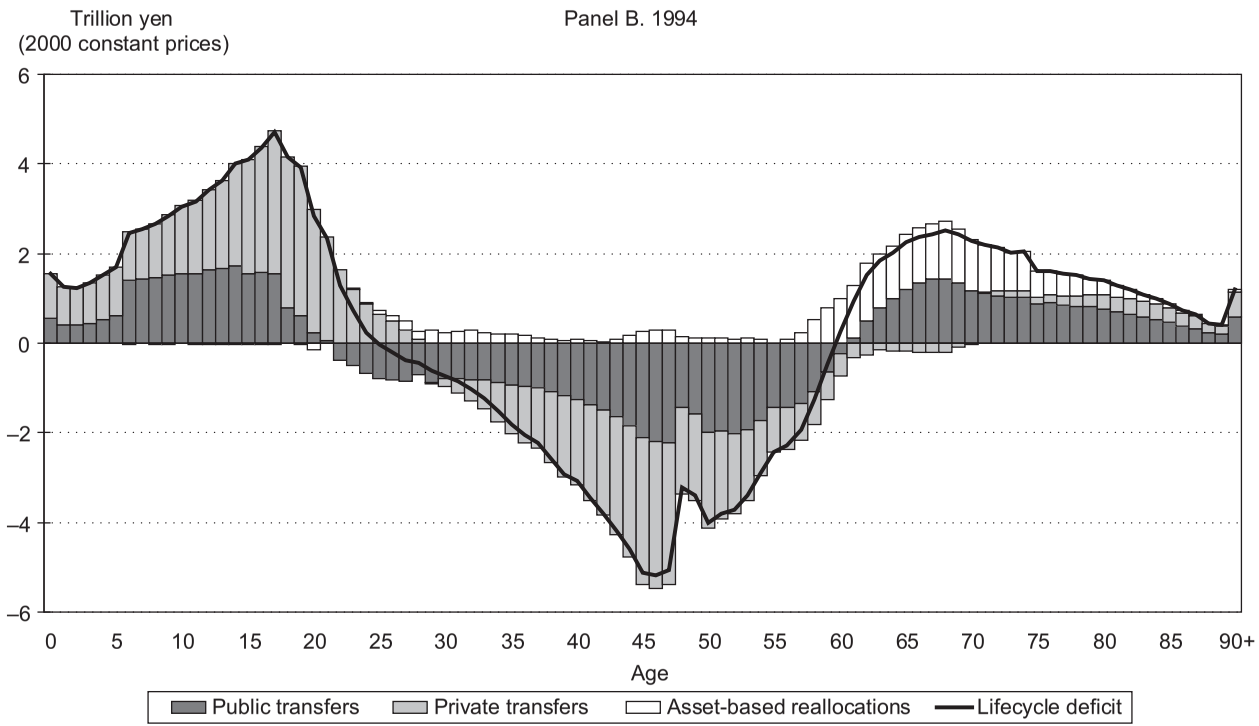
Figure 8.15 presents the changing pattern of asset-based reallocations, net public transfers, and net private transfers in Japan from 1984 to 2004. All values are measured in terms of 2000 constant prices on an annual basis. Panel A illustrates the age reallocations for 1984, panel B for 1994, and panel C for 2004.

There are several important points to be noted with respect to Figure 8.15. First, the three panels clearly show the impact of the rapid growth in transfers as net total transfers to the elderly aged 65 and older tripled. Net public transfers grew 4.4 times in real terms, while net familial transfers dwindled to 10 percent. Asset-based reallocations have become extremely



Source: Authors' calculations.

Figure 8.15 Changing patterns of three forms of age reallocations in Japan from 1984 to 2004


Trillion yen
(2000 constant prices)
Panel B. 1994
6
4
2
0
–2
–4
–6
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90+
Age
Public transfers
Private transfers
Asset-based reallocations
Lifecycle deficit

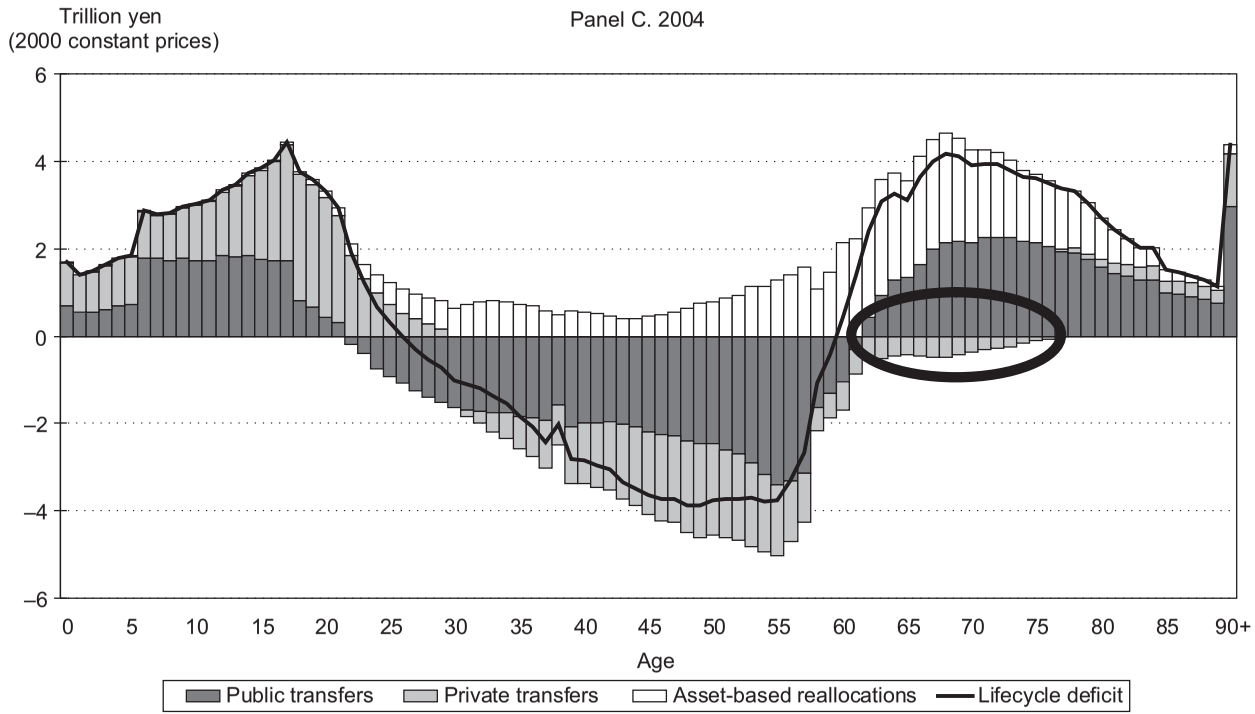


Figure 8.15 (continued)

important among the elderly and increased tenfold in real terms between 1984 and 2004 though net public transfers dominated in 2004.

Second, despite the shrinking young population, the total amount of net transfers to those aged 0–19 grew by 11 percent in the two decades, and the composition of net transfers changed considerably. From 1984 to 2004, the amount of net public transfers to this age group increased by 37 percent in real terms, while net familial transfers declined by 6 percent. Because the young do not own many assets, no distinctive change in the role of asset-based reallocations was observed.

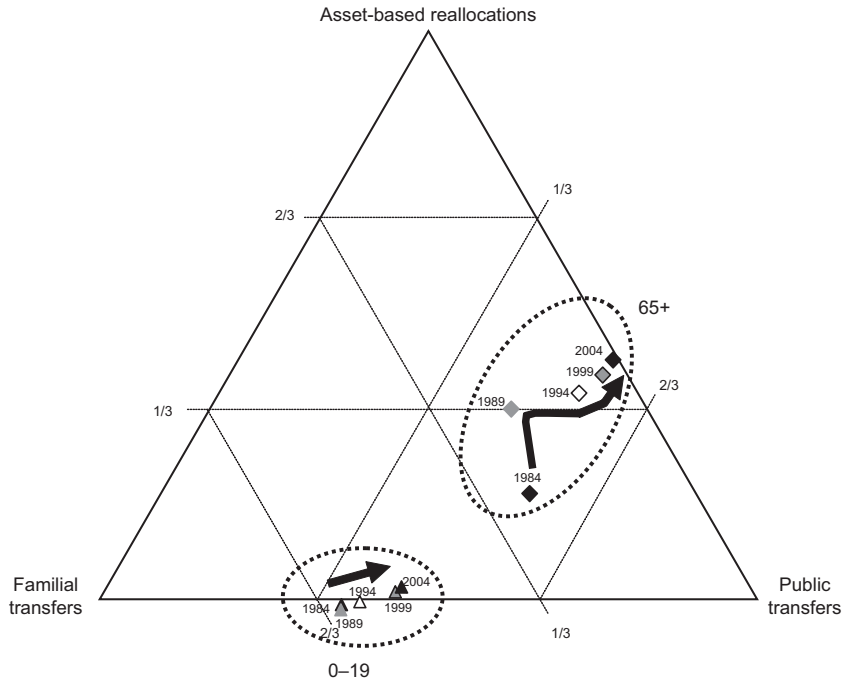
Third, though relevant tables are not shown, on a per capita basis the relative growth of net public transfers to both the elderly and the young increased to an equal extent, that is, they doubled, over the period in question. More importantly, while the amount of net familial transfers to the young rose by 36 percent, there was an 86 percent decline for the elderly.

Fourth, in general the working-age group 20–59 received no net public transfers, and the peak age of their tax burden tended to shift to older ages, which reflects the influence of population aging. In 2004, the peak of the tax burden occurred at approximately age 55, while earlier the peak occurred between ages 40 and 50. It should be emphasized, however, that on a per capita basis, the peak of the tax burden remained relatively stable in the vicinity of age 55 during the time period.

Fifth, although asset-based reallocations occur in both the private and public sectors, the private sector has consistently dominated. Furthermore, a positive value for asset-based reallocations implies that people receive asset income in excess of their savings. In 2004, for instance, positive values reached their peak when people were in their sixties and were comprised largely of returns on private assets (for example, property income). In contrast, the small negative asset-based reallocation values at young ages in 1984 occurred mainly because public savings exceeded public asset income.

Sixth, and most importantly, net familial transfers are negative among the relatively young elderly. As displayed in panel C, this phenomenon was particularly pronounced in 2004 among those in their sixties and seventies. This implies that the financial assistance they provided to their adult children and/or grandchildren exceeded the assistance they got from them. It is also worth noting that the amount of these negative net familial transfers rose during Japan's lost decade when the unemployment rate was very high and labor income hardly grew at all in both nominal and real terms.

Figure 8.16 shows changes over time in the importance of net public transfers, net familial transfers, and asset-based reallocations in financing the lifecycle deficits of Japanese elderly. The importance of asset-based



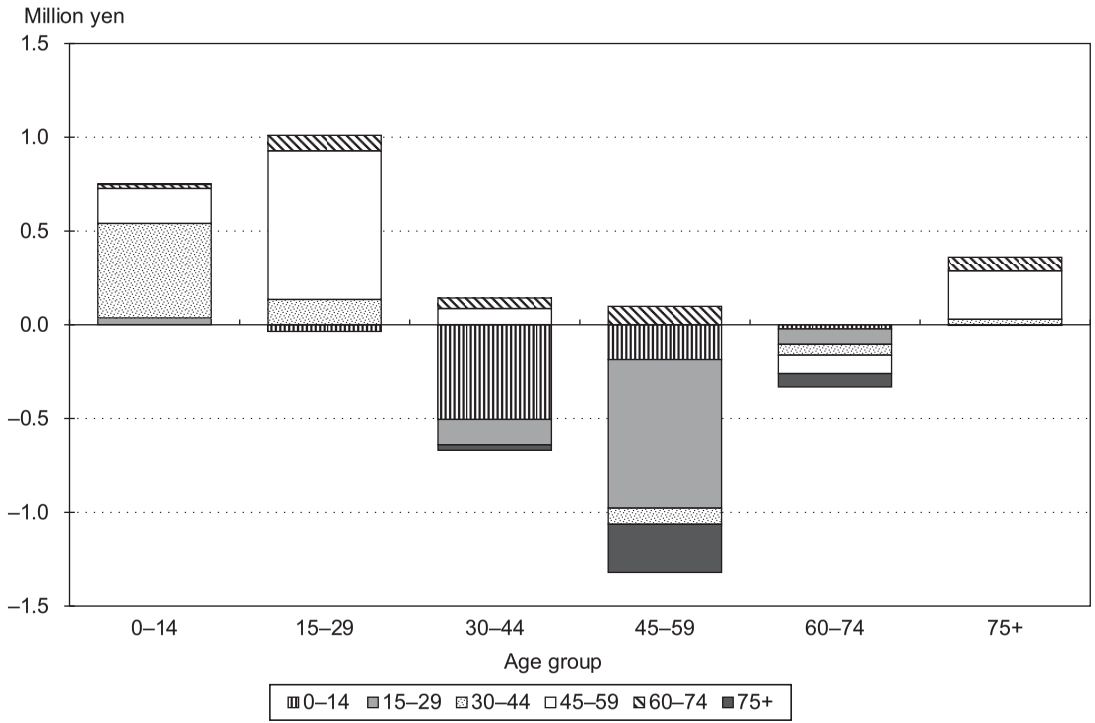
Source: Authors' calculations.

Figure 8.16 Funding the lifecycle deficit of the elderly (65+) and the young (0–19) in Japan, 1984–2004

reallocations grew, while that of net familial transfers declined substantially over the 20-year period. As for net public transfers, the value for 1989 is obviously off the smooth time trend. There are two factors accounting for this irregularity. First, a 3 percent consumption tax was introduced in April of that year, and second, that was the peak year of the bubble economy, so government revenue from corporate taxes increased phenomenally.

Figure 8.17 further substantiates the financial support the younger elderly have provided to their families as all age groups received positive net intra-household transfers from the 60–74 age group.

According to a nationwide survey by the Nihon University Population Research Institute in April 2007, the proportion of respondents in their forties who had received financial assistance from their parents in the previous 12 months was approximately 50 percent higher than the proportion who had provided financial assistance to their parents. This suggests that



Source: Authors' calculations.

Figure 8.17 Net per capita annual intra-familial transfers among broad age groups in Japan in 2004

Table 8.1 Changes in crossing ages for net public and familial transfers in Japan from 1984 to 2004

Net public transfers			Net familial transfers		
	Young	Old		Young	Old
1984	21	60	1984	27	64
1989	21	60	1989	27	64
1994	21	61	1994	29	70
1999	21	61	1999	29	74
2004	22	61	2004	30	77

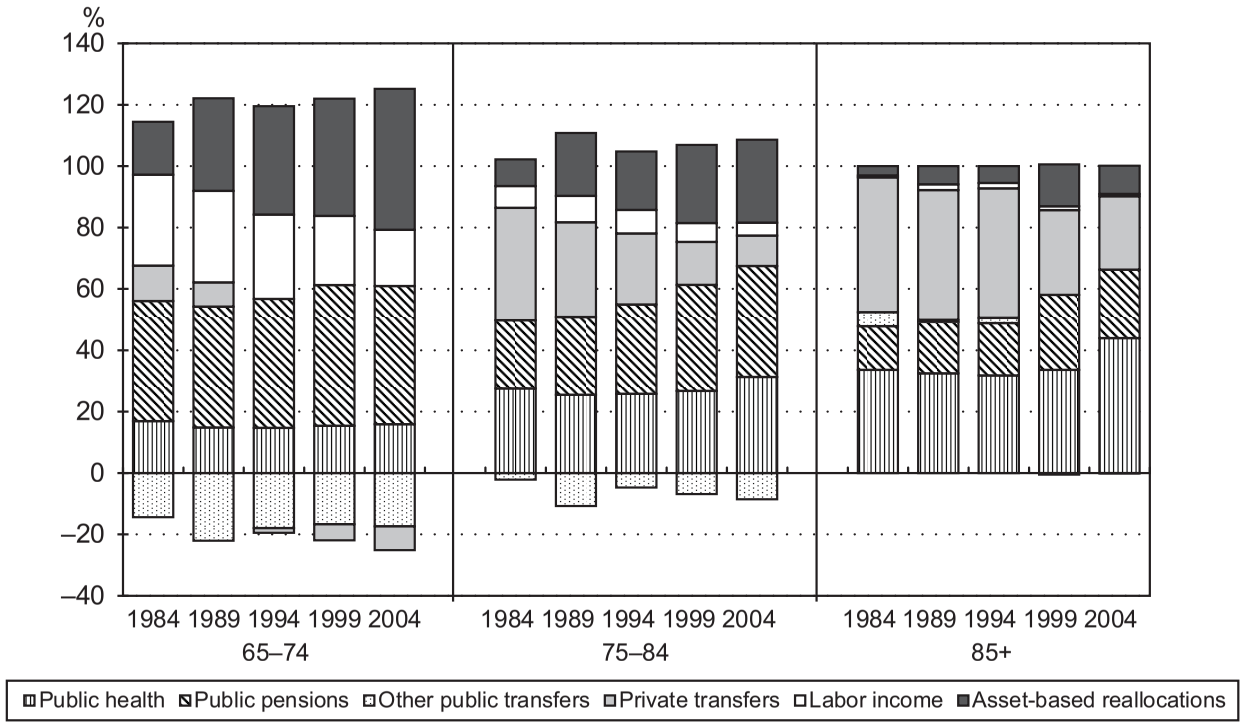
Source: Authors' calculations.

the Japanese elderly are still playing a vital role in financing their offspring when they need it. So while older persons in Japan are often considered to be liabilities, they are actually acting as a safety net in contemporary Japanese society.

Table 8.1 shows that net familial transfers to the elderly became positive at age 64 in 1984 and 1989 and then at 70 in 1994, 74 in 1999, and 77 in 2004. These dramatic upward shifts seem to be closely related to improved pension benefits due to the maturation of the pension schemes. It is also interesting to note the change in the age at which net public transfers to the elderly become positive. In contrast to familial transfers, the age rose from 60 to only 61 during the 20-year period, which indicates that Japan's mandatory retirement age has changed very slowly over time.

The table also shows an upward shift in the age at which net familial and public transfers to the young become negative. From 1984 to 2004, the age for public transfers rose only slightly from 21 to 22 years, while the corresponding figure for familial transfers increased more substantially from age 27 to 30. Regarding public transfers, ages 21 and 22 correspond to the age of completing higher education. These changes in the crossing ages for net transfers indicate that public sector responses to rapid socioeconomic and demographic shifts in Japanese society have been very tardy, while the speed and magnitude of familial responses have been much faster and greater.

In Figure 8.18 we plotted changes in the pattern of financing consumption among the three elderly groups (65–74, 75–84, and 85+) from 1984 to 2004. The role of public pensions became increasingly important, while familial transfers became less significant over time. Surprisingly, in 1994–2004 the share of net familial transfers in financing consumption among those aged 65–74 disappeared, although a substantial proportion



Source: Authors' calculations.

Figure 8.18 Changes in patterns of financing the elderly in Japan from 1984 to 2004

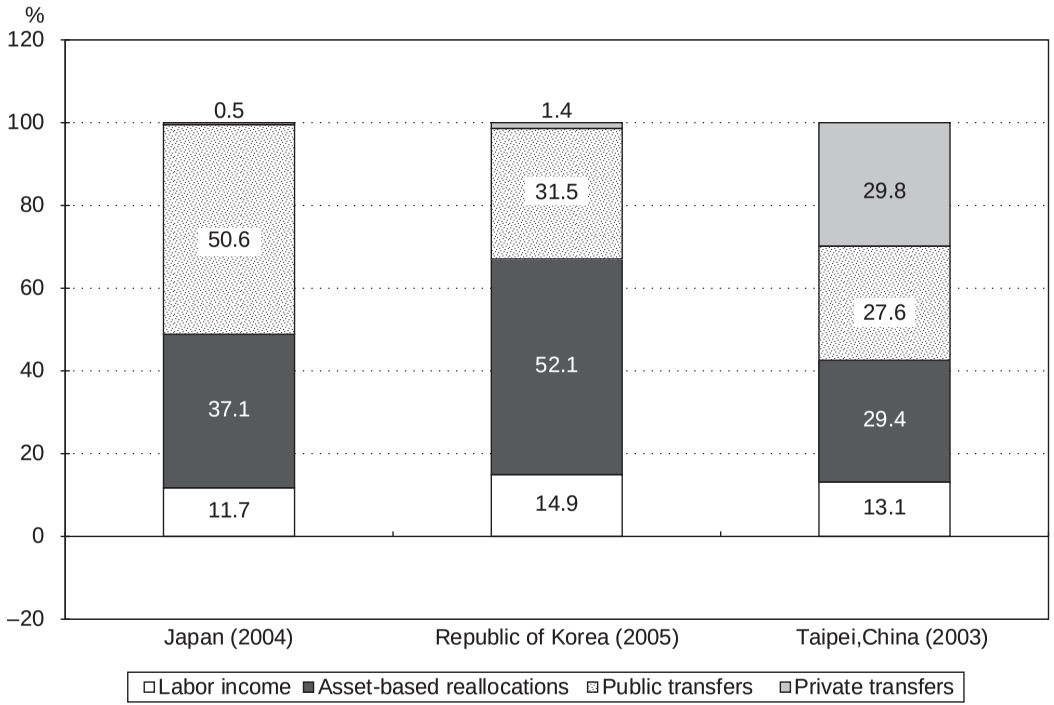
of this age group was still co-residing with their adult children. It should be emphasized, however, that the inflow of familial transfers is still significant among those aged 85 and older. This may be largely due to the fact that they receive a relatively limited amount of pension benefits as a result of their shorter contribution periods, and because of the predominance of women in this very old age group.

For all three groups, the share of asset-based reallocations grew substantially over time, especially in the 65–74 age group where it increased from 17 percent in 1984 to 46 percent in 2004. This is consistent with the data in Figure 8.15. The share of public transfers for healthcare also increased for all three groups especially between 1999 and 2004, which supports the rise of per capita consumption among the elderly depicted in Figure 8.9. Figure 8.18 also shows that the share of labor income is considerable in the youngest group, which is consistent with the high labor force participation rate among the elderly in contemporary Japan.

Figure 8.19 compares the pattern of financing consumption among the elderly aged 65 and older in Japan, Republic of Korea, and Taipei,China in the most recent annual data that were available. A few points of interest emerge. First, the proportion of public transfers is the largest in Japan, at more than 50 percent, which is consistent with our earlier comparison of welfare programs in the three economies. Second, familial transfers in Taipei,China finance almost 30 percent of the consumption of the elderly, compared with 1.4 percent in the Republic of Korea and 0.5 percent in Japan. Third, the Republic of Korea leads in asset-based reallocations, at 52.1 percent.

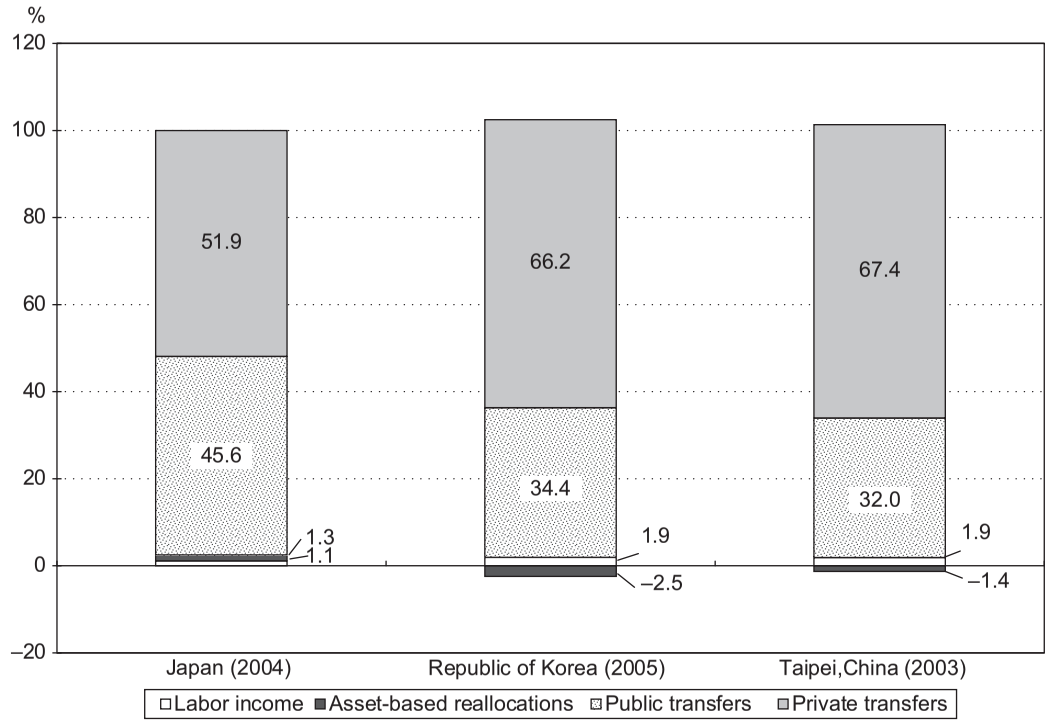
Figure 8.20 charts the same data for the population aged 0–19. In all three economies, more than 50 percent of consumption is financed by private transfers. Thus this age group is a considerable financial burden on the family budget.

A recent study (Ogawa et al., 2009b) showed that the costs of raising children, particularly for healthcare and education, have been one of the most important determinants in lowering fertility in East Asia and Thailand, while earlier studies (for example, Takegawa, 2005) showed that the costs of maintaining the elderly have been rising in aging Asia, particularly in East Asia. The question is, do the resources going to the young crowd out those going to the elderly? We computed on a time-series basis the number of years of prime working-age (30–49) labor income needed to finance the per capita lifecycle deficit of a child and of an elderly person in Japan (1984–2004), Republic of Korea (1996–2005), Taipei,China (1981–2005), and Thailand (1981–2004) in Figure 8.21. In Japan, the cost of raising a child rose from 9.64 years of labor income in 1984 to 13.02 years in 2004, while the corresponding figures for an



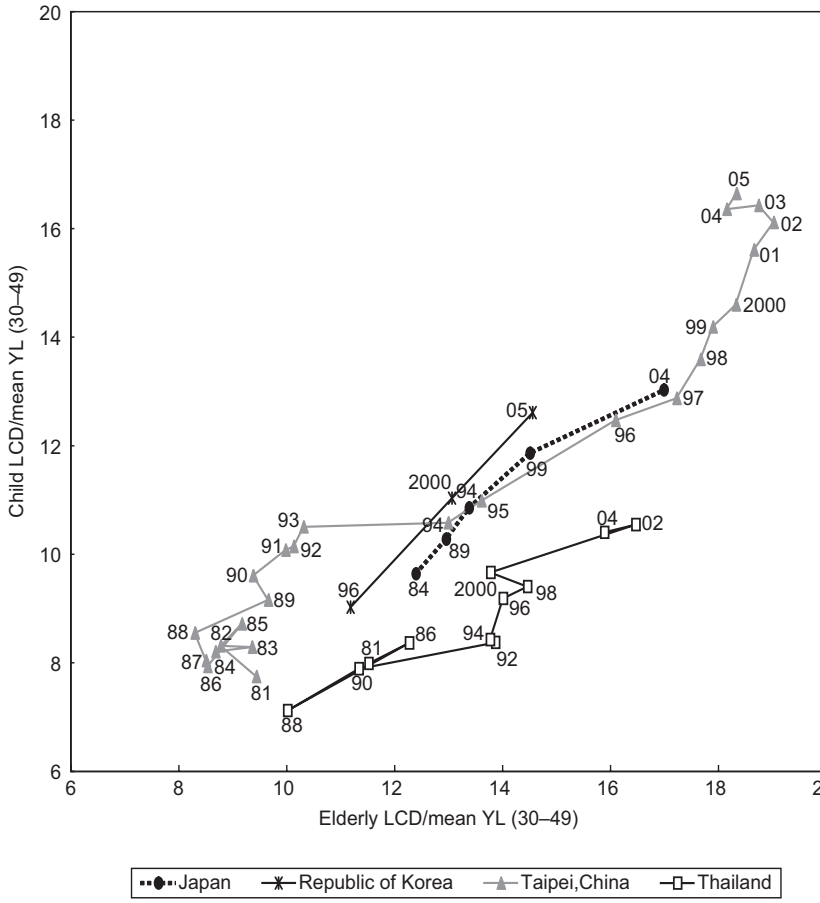
Source: Authors' calculations.

Figure 8.19 Patterns of financing the elderly (65+) in Japan, Republic of Korea, and Taipei,China



Source: Authors' calculations.

Figure 8.20 Patterns of financing the young (0–19) in Japan, Republic of Korea, and Taipei,China



Note: LCD = lifecycle deficit; YL = labor income.

Source: Authors' calculations.

Figure 8.21 Relationship between costs for children and the elderly in Japan, Republic of Korea, Taipei,China, and Thailand

elderly person increased from 12.39 years to 16.98 years. In the Republic of Korea, children's costs rose from 9.03 years of labor income in 1996 to 12.61 years in 2005, while those of the elderly grew from 11.18 years to 14.56 years. In Taipei,China the change for both children and the elderly was substantial, from 7.75 years of labor income for a child in 1981 to 16.65 years in 2005, and from 9.43 years for an elderly person to 18.33 years, while in Thailand, children's costs increased from 7.99 years in 1981

to 10.40 years in 2004, while those of the elderly were 11.51 years in 1981 but grew to 15.88 years in 2004.

Figure 8.21 indicates that there is no crowding-out of costs between the two age groups in these four economies as the costs grew in the same direction.

6. SUMMARY AND FUTURE PROSPECTS

Japan's demographic landscape in the twenty-first century is extremely gloomy. In the hope of raising marital fertility to alleviate the burden of rapid population aging on the economy, the Japanese government has formulated and implemented a series of pro-natalist programs and policies since the early 1990s (Ogawa and Retherford, 1993; Retherford and Ogawa, 2006). Despite these strenuous efforts, the country's fertility remains very low. Judging from past experience in many industrialized countries in the West, there is no panacea for restoring fertility to replacement levels, and in view of the results of various recent opinion surveys on importing unskilled foreign workers to Japan, it seems safe to say that a large-scale immigration policy is a rather remote possibility. In fact, the use of immigration measures is inconceivable in contemporary Japanese society (Ogawa, 2011b). Instead, the effective use particularly of the second demographic dividend, which is likely to remain substantial for the next few decades, appears to be an attractive policy option for Japan to place its future economic growth on a steady path.

How can Japanese elderly persons make use of their accumulated assets and wealth? Depending upon where they invest their financial resources, Japan's future economic growth is likely to vary considerably. If the elderly have sufficient knowledge about financial markets, they may invest their accumulated assets possibly even outside Japan in the dynamically growing PRC economy and thus bring financial gains back to Japan. To facilitate such international transactions, proper institutional and legal arrangements need to be developed to protect elderly investors.

In contemporary Japan, the elderly are generally considered as liabilities, but our analyses indicate that they will become powerful assets for keeping the country on a sound and steady growth path in the years to come. In the past decade, they have also been informally playing the role of social safety net in providing financial assistance to their adult children and/or grandchildren when needed. In addition, as discussed elsewhere (Ogawa and Matsukura, 2007), the number of healthy elderly persons in Japan is expected to increase significantly in the future, and their educational attainment will be higher than that of the elderly in the past. In

other words, Japan's future elderly will possess a substantial proportion of both the country's human and financial resources.

Another policy option Japan can pursue to maintain future economic growth is to invest in human capital. In East Asia, the basic tradeoff between the quantity and quality of children concerns costs defrayed by parents, but public spending on children also plays an important role. Investing in children through appropriate public policies can reduce the costs of child rearing and can encourage higher fertility. Apart from government subsidies, costs can also be reduced by creating more stable full-time job opportunities for young workers. Furthermore, hourly labor productivity can be improved by upgrading the curriculum at all levels of the education system as well as by better vocational training.

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9. Summary of key findings and main policy recommendations

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The following summary sheds light on developing Asia's main demographic trends and their implications for the region's growth and old-age support systems. On the basis of those findings, we propose a number of policy options that will help to sustain growth and provide economic security for the elderly.

1. SUMMARY OF KEY FACTS AND FINDINGS

- **Asia is going through a demographic transition.**
  Population aging – an increase in the share of the elderly population over time – is occurring across all of developing Asia and not just in the newly industrialized economies (NIEs) but in those at lower levels of income and development as well. For the region as a whole, favorable demographics will be a less significant source of economic growth in the future.
- **There is a great deal of demographic diversity in the region.**
  The level and speed of the demographic transition vary considerably from country to country. Broadly speaking, there are three demographic profiles: (1) countries at advanced stages of aging, like the Republic of Korea and Singapore; (2) countries in the middle of aging, like the People's Republic of China (PRC) and Thailand; and (3) countries still at the early stages of the demographic transition, like India and the Philippines. Even countries in the advanced stages will become much older than they are today.
- **Many countries will continue to experience the first demographic dividend.**
  In relatively young countries like Bangladesh, India, Indonesia, Pakistan, and the Philippines, working-age populations will grow relative to dependent populations, and favorable demographic conditions should persist for at least the next 15

years. The exact size of the first demographic dividend depends on age patterns of labor income and consumption, but it is significant.

- **The first demographic dividend will diminish over time.**
  Even in these young countries, however, the dividend will decline over time. Although the demographic transition is in its early stages, it is nevertheless under way and the countries are gradually evolving toward older populations. The demographic window of opportunity is larger and will last longer than elsewhere, but it is nevertheless beginning to close.
- **Over time, Asian populations will become increasingly concentrated at older ages, where labor income is quite modest.**
  In part this reflects low levels of employment at older ages, but it also reflects low wages and productivity for older working adults. Furthermore, in some high-income Asian countries, low incomes are often matched with high consumption among the elderly. Even in middle- and low-income Asian countries, the elderly are consuming far more than they are producing through labor, as is true in other countries at similar levels of development.
- **Population aging could serve as a drag on economic growth over the coming decades**.
  This is because the effective number of workers will decline relative to the effective number of consumers. East Asia faces the most serious problems. In the Republic of Korea, for example, the support ratio is expected to decline by 0.8 percent annually over the next 40 years. In the absence of compensating changes, standards of living there will fall by more than 25 percent between 2010 and 2050.
- **The demographic dividend will give way to a demographic tax in a growing number of Asian economies.**
  In economies at advanced stages of demographic transition, the overall impact of the transition on economic growth may be negative, even in this decade. These include Hong Kong, China, the Republic of Korea, and Singapore. In countries like the PRC and Thailand, the transition from demographic dividend to demographic tax is likely to take place in the next decade.
- **Population aging will put a heavy strain on public transfer systems.**
  Old-age transfer systems are relatively underdeveloped in many Asian countries so the effects of population aging will be smaller than in Japan, Europe, or Latin America, but the effects will still be large. In a "business as usual" simulation, transfer wealth (or implicit debt) would range from 90 percent of total labor income in

Pacific island nations to 240 percent of total labor income in East Asia by 2050.

- **Population aging will lead to a substantial accumulation of pension assets in Asia.**
  For the Asian Development Bank's developing member countries as a whole, given their low income profiles, pension assets will rise from 1.2 times total labor income to 2.1 times total labor income in 2030, and to 2.7 times total labor income in 2050. Given current patterns of old-age consumption, production, and transfers, the total demand for pension assets will increase very substantially over the coming decades, rising from $27 trillion in 2010 to $157 trillion in 2050.
- **Asian economies vary quite widely in their old-age support systems, but there are patterns that are unique to the region.**
  In general, the familial transfer system is more important in many Asian economies than elsewhere. Intra-family transfers finance about 45 percent of the lifecycle deficit for the elderly in Taipei,China, 33 percent in Thailand, and about 20 percent in the PRC and the Republic of Korea. Public transfer systems are smaller in Asia than in Latin America. The extent to which the elderly rely on assets, however, varies considerably across Asia.
- **Many Asian countries are changing their old-age support systems.**
  The importance of old-age support systems will increase substantially in the coming years because population aging is expected to be rapid. Intra-family support is weakening across Asia as a result of socioeconomic changes and will play a smaller role in the future, while public transfers are likely to play a greater role. Projections based on current systems suggest that public transfers will not be terribly onerous for many Asian countries compared with those in Europe or Latin America. Whether this remains true will depend on decisions made by policymakers.
- **As the support system changes, each component will have a big impact on the other components.**
  Too much reliance on public transfers may reduce labor income and saving. Given the limited role of labor income and intra-family transfers, Asia's elderly must rely on accumulating assets if public transfers are maintained at lower levels than elsewhere. Relying on asset-based reallocations rather than transfers will help create capital-intensive economies that can maintain standards of living.

2. POLICY RECOMMENDATIONS

2.1 Population Policy

Developing Asia is in the midst of a region-wide demographic transition toward older populations, but demographic trends, in particular the fertility trends that lie at the heart of the transition, can be influenced by government policy. Given Asia's demographic diversity, however, there is no one-size-fits-all population policy; the policies should be tailored to demographic circumstances.

- **Societies in advanced stages of the transition should consider pursuing pro-natalist policies to revive fertility rates.**
  Hong Kong, China and the Republic of Korea are following in Japan's demographic footsteps and have already reached advanced stages of population aging. Exceptionally rapid aging can have far-reaching adverse economic and social consequences. Since the root cause of rapid aging is sharp declines in fertility, reversing or slowing those declines is the primary policy response. Specific policies include fiscal incentives that encourage childbearing and provide a supportive overall environment, for example, more and better childcare. Opening up to immigration can also help to offset fertility declines as the experience of Singapore shows.
- **Economies in the middle of the transition should carefully reassess outdated population policies that may lead to exceptionally rapid population aging (see suggestion in preceding section).**
  In places where the demographic transition is well under way but where aging is not yet advanced, there is a need to reassess population policies. It is important to remember that just a generation ago Asian countries were grappling with the problem of overpopulation. In response, some countries implemented birth control policies to curtail fertility and population growth rates. The PRC's one-child policy is the most well-known example. Given the region's rapidly changing demographic landscape and the risk of exceptionally rapid population aging, birth control policies that contributed to growth in the past may exacerbate population aging in the present. They need to be reassessed.
- **Economies in the early stages of demographic transition (or just younger ones) may need to retain population policies that seek to limit population growth.**
  It is far too early to contemplate pro-natalist policies in these countries. For much of developing Asia, the level and speed of population

aging is still at a low level and is therefore not an immediate concern. Again, population aging is a relatively new trend in Asia, and until a few decades ago the region's demographic concerns centered on too many rather than too few people. Indeed in some of the region's countries in the early stages of aging, there may be a case for introducing or retaining policies that seek to control fertility. The following link might be helpful: http://www.unfpa.org/swp/2004/english/ch1/index.htm.

2.2 Capturing the Demographic Dividends

Even younger Asian countries like India and the Philippines should start preparing for the fundamentally different demographic landscape they will face in 2050, but their more immediate priority is to fully capitalize on their potential demographic dividends. What adds a sense of urgency is our finding that even for younger countries, the demographic windows of opportunity will not last forever.

- **Younger Asian countries should adopt appropriate policies and institutions to reap the demographic dividends.**
  Asian countries at the early stages of demographic transition stand to gain substantial demographic dividends, but they are neither automatic nor guaranteed. Younger countries need to implement appropriate policies and institutions to transform potential dividends into actual dividends. Examples include strong education systems that turn youths into productive workers and flexible labor markets that do a good job of matching employers with workers. The failure to take advantage of potential demographic dividends will result in substantial economic and social costs, including high unemployment rates among the youth.
- **Younger Asian countries can learn valuable lessons from older Asian countries.**
  Younger Asian countries do not need to look far to find examples of countries that have successfully leveraged large and growing working-age populations into rapid economic growth. The economic success of the NIEs, the members of the Association of South East Asian Nations and the PRC, is to a large extent the result of channeling their youthful workforces into productive activities, especially labor-intensive, export-oriented manufacturing. Younger countries would benefit from concrete lessons about policies and institutions in education and labor markets that enabled older countries to reap their dividends.

2.3 Overall Economic Reform

Population aging adds urgency to a number of economic reforms that are desirable in and of themselves for developing medium- and long-term growth. In order for demographic change to serve as a catalyst for overall reform, the general public must be aware of demographic trends and their implications.

- **Asian governments should inform the general public better about demographic trends and their implications for economic growth and old-age support.**
  Even in older Asian economies, there is a lack of public awareness about these issues, and awareness is even lower in younger Asian countries, where population aging seems remote and distant. It is a government's responsibility to prepare for the fundamentally different demographic landscapes that will emerge across the region by 2050. The first step is to raise public awareness to empower both the public and private sectors to take measures to sustain growth and to prepare better for old age. Governments should consider setting up agencies or permanent inter-agency task forces that specialize in demographic issues, especially in economies in the advanced and middle stages of the transition.
- **Key economic reforms will be critical.**
  Heightened public awareness of demographic trends and their economic effects should give impetus to a number of key reforms that are very important for Asia's long-term growth and development. Building sounder and more efficient financial systems is desirable in and of itself, but population aging heightens the need to invest the region's savings more productively. In particular, investing the large and growing pool of pension assets will benefit from the development of long-term capital markets, especially bond markets. Similarly, population aging raises returns on improving the productivity of workers, which calls for education reform and human capital investments. The need for better workers is more urgent when there are fewer of them. Yet another example is flexible, effective labor markets that can provide jobs for both young and old workers.

2.4 Old Age Support

In addition to sustaining growth, the other strategic challenge posed by population aging is providing economic security for Asia's large and

growing elderly population. Our analysis indicates that public transfers will have to play a bigger role in old-age support in the future due to the decline in familial transfers. It is important that public transfers are sustainable and do not compromise the region's growth potential.

- **Developing Asian countries must build up strong national pension systems.**
  Despite the region-wide demographic transition to older populations, many economies do not yet have efficient, effective national pension systems. Even the mature pension systems in the region suffer from a wide range of problems. Pension reform that ultimately delivers affordable and sustainable systems with adequate benefits for a wide segment of the population is an urgent region-wide priority for old-age economic security. Pension reform must eventually be integrated with broader social security reform that addresses the other needs of the elderly, particularly healthcare, in a sustainable way that promotes both economic security and economic growth.
- **Governments should help individuals to make sound financial decisions for retirement.**
  The first step toward adequate old-age support, especially in younger countries, is to raise public awareness about the need to save for retirement. In younger countries, many people are simply ignorant of the need to prepare for old age, in part due to low incomes but also due to a lack of awareness. Relatively easy measures such as simplifying procedures for contributing to pension systems may raise compliance rates. Even in older, higher-income countries, surprisingly large numbers of people make questionable financial decisions about retirement savings. Although financial education and literacy are critical, governments should try to provide a broader overall environment in which individuals are better informed and have stronger incentives to make sound financial decisions. This is a relatively inexpensive way for governments to strengthen old-age support.
- **Increases in public transfers to the elderly must be kept sustainable and should not significantly weaken the incentives of individuals to save for old age.**
  Precisely because public transfers have played a smaller role in old-age support in Asia relative to the advanced economies and Latin America, there is greater scope for increasing them in the future as the region grows older because Asia is not burdened with a legacy of unsustainable public transfers that ultimately benefit neither the young nor the old, and depress growth. Experience has shown

that inappropriate policies and institutions are politically almost impossible to reverse once they become entrenched. As a relative latecomer to public transfers, Asia has a great opportunity to build up a robust, efficient, and resilient old-age support system based on a healthy mix of individual responsibility and social risk pooling. As the role of public transfers increases, it is vital that the region designs and runs pension and social security systems in a financially sustainable way that does not dampen individual incentives to save. The large pool of savings to invest represents Asia's most promising tool for sustaining growth in the face of aging. Provident funds that mandate individual savings like those in Malaysia and Singapore are probably not necessary in light of Asians' natural propensity to save. What is called for instead is an appropriate mix of individual risk bearing and social risk pooling in old-age support systems.

2.5 Elderly and Female Labor Force Participation

In developing Asia as elsewhere, there is a widespread tendency to view the elderly as a burden rather than as an asset. In fact, rising living standards and improving healthcare mean that Asia's elderly are potentially more productive than ever before, but realizing that potential requires appropriate institutions and policies. Likewise, unemployed women represent another large pool of untapped human resources.

- **Old-age dependency must be de-institutionalized.**
  While the root cause of Asia's population aging is the sharp drop in fertility, an additional cause is the marked rise in life expectancy. Not surprisingly in light of the region's rapid growth and development, today's Asians are living much longer and are healthier than they were one generation ago. This means that the concept of working age has to be redefined and updated. Retirement ages that made sense 30 years ago make much less sense today. The obvious policy implication, especially in countries in the advanced and middle stages of the transition, is to raise the retirement age or to remove it altogether, though this may achieve very little in the absence of flexible, functioning labor markets. Furthermore, governments may need to step in with active labor market policies to remove employer prejudice and discrimination against older workers.
- **Population aging strengthens the case for training and retraining older workers.**
  Our analysis indicates that in Asia the low labor income of older individuals is only partly due to the fact that relatively few of them

are employed. The other major cause is their low productivity and hence low wages. Therefore, there is a case for governments to promote investment in the human capital of older workers. Training and retraining older workers will not only be beneficial for the workers themselves but will also augment the quantity and quality of the workforce. It should, however, be recognized that to some extent, the low productivity of older workers reflects the more fundamental problem of discrimination against them in higher productivity jobs.

- **Population aging strengthens the case for promoting female participation in the workforce.**
  The participation of women in the labor force in Asia is visibly lower than in comparable economies. In Japan and the Republic of Korea, for example, their participation rate is lower than that of most other OECD countries. Governments can take various measures to encourage employers to hire more women and to encourage more women to look for work. For example, more and better childcare facilities and generous maternity and paternity leave can have a positive effect on female participation. Although it is possible in principle to promote female workforce participation without reducing fertility, in practice there is likely to be a tradeoff between the two.

2.6 Regional Cooperation and Integration

The great demographic diversity in Asia means that each country must pursue a set of policies and institutions tailored to its unique demographic circumstances, but there are a number of opportunities for the region to leverage its demographic diversity through intra-regional cooperation and integration. In addition to sharing knowledge, immigration and investment offer potentially large returns.

- **Demographic diversity supports more open and free cross-border movements of workers.**
  There is plenty of scope for mutually beneficial labor flows between the two demographic faces of Asia, that is, the old countries, like Japan, and the young countries, like the Philippines. There is a growing shortage of workers in old Asian countries which will only become more acute in the coming years as aging proceeds. Geographical proximity and cultural affinity in some cases make intra-Asian labor movement a promising area for cooperation. Malaysia and Singapore have, for example, relied on foreign

workers to alleviate their labor shortages. Even in ethnically homogeneous countries like Japan and the Republic of Korea, where foreign workers have not been an option, attitudes are changing and there is a growing receptiveness. Sending countries can take measures to develop the skills that are in demand in the host countries.

- **Demographic diversity supports intra-Asian financial integration.** Demographic diversity has significant implications for the pattern of saving and investment across Asia. In principle, older countries with a growing pool of retirement savings are a good fit with younger countries with large pools of workers and productive investment opportunities. For example, using the PRC's abundant savings to finance India's huge infrastructure investment needs seems like a win–win situation. Promoting more free and open movement of investment and capital within the region – intra-Asian financial integration – would certainly facilitate such mutually beneficial transactions; however, whether or not Chinese firms invest in Indian infrastructure ultimately depends on India's investment climate. Intra-Asian financial integration should not detract policymakers from the more immediate task of domestic financial sector development, in particular the development of sound and efficient long-term bond markets.

2.7 Capitalizing on Asia's Advantages to Prepare for the Demographic Transition

Many of the region's economies are still relatively young, which leaves them with sufficient demographic space to prepare for the future. Fiscal space and the related asset of freedom from legacies of unsustainable public transfers are other key factors that favor the region in its quest to overcome demographic challenges.

- **Younger countries should start to prepare their economies and old-age support systems for a much grayer future.** The time for younger Asian countries to start preparing for 2050 is now. Policies implemented today will influence the behavior of young workers today and hence their preparation for retirement 40 years from now. Fortunately, many of the policies and institutions that will better prepare countries for aging are desirable in and of themselves, though building up strong pension systems is not an obvious policy priority for younger countries. Again, the first step in pursuing such longer-term objectives is for governments to raise public awareness of demographic trends and their implications.

- **Asian governments should use their fiscal space to adjust for a grayer future.**
  By and large, Asian governments have more fiscal space than their counterparts in the advanced economies, as reflected in key indicators such as the ratio of public debt to GDP. This is the result of a tradition of fiscal prudence and enabled the region to unleash the massive fiscal stimulus that jump-started its V-shaped recovery from the global economic crisis. There is no a priori reason why Asia cannot or should not use its fiscal space to meet a medium- and long-term structural challenge like population aging. There is a lot of scope for government spending to make a useful contribution in this context. For example, pension reform often entails large transition costs to move from an unsustainable existing system to a more sustainable new one. Those costs are typically financed by the government.

Index

AGING, ECONOMIC GROWTH, AND OLD-AGE SECURITY IN ASIA

Population aging is perhaps the single biggest economic and social obstacle confronting Asia's future. The region-wide demographic transition towards an older population is fundamentally reshaping the demographic landscape, and is giving rise to two key socio-economic challenges. This timely book provides an in-depth analysis of these challenges and presents concrete policy options for tackling them.

First, the expert contributors argue, Asia must find ways to sustain rapid economic growth in the face of less favorable demographics, which implies slower growth of the workforce. Second, they contend, Asia must find ways to deliver affordable, adequate, and sustainable old-age economic security for its growing elderly population. Underpinned by rigorous analysis, a wide range of concrete policy options for sustaining economic growth while delivering economic security for the elderly are then presented. These include Asia-wide policy options – relevant to the entire region – such as building up strong national pension systems, while other policy options are more relevant to sub-groups of countries.

This stimulating and informative book will be of great interest to academics, students, and researchers with an interest in Asian studies, economics generally, and, more specifically, public sector economics.

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ISBN 978-1-78195-230-6

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