Chapter 1

Population aging and the generational economy: Key findings

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The goal of this study is to improve our understanding of how changes in population age structure are influencing national economies. Until recently changes in age structure were favorable for most countries as populations became increasingly concentrated in the working ages. For some countries in Asia and most in Africa, this trend continues today. But elsewhere—in the West, East Asia, and Latin America—the share of the working-age population is in decline or soon will be, as the share of the elderly population grows. Many concerns have been raised: bankruptcy for publicly funded health care and pensions systems, slower economic growth and possibly decline, unfair treatment of children vis-à-vis the elderly, the collapse of financial markets, and the burdening of future generations, to name a few.

Effectively addressing the economic challenges of population aging is especially difficult, for two reasons. The first is that countries cannot rely exclusively on their own experience because in any given country changes in population age structure are occurring for the first time. Hence it is essential to learn from societies that have been the first to experience the age transition. The second problem is that many issues are addressed in piecemeal fashion, relying on partial and incomplete data. This study addresses this problem by relying on a newly developed system of accounts, National Transfer Accounts. Of course, there are many outstanding studies of these issues, and we draw upon them; but many questions remain, and myths and misunderstandings persist about the economic implications of changes in population age structure.

The global age transition

On a global scale the age transition began around 1950. Although some Western countries experienced fertility transitions and population aging in the nineteenth and early twentieth centuries, the population age distribution hardly changed at the global level (Lee 2003b, p. 168). At mid-century, couples in many industrialized countries increased their childbearing, producing the so-called baby boom. In the developing world, couples also had larger families—not because fertility rose but because infant and child mortality declined (Figure 1.1). The share of children in the world's population increased substantially, reaching a peak in 1975, when there were 125 children under the age of 25 for every 100 adults 25 or older.

Beginning in the mid-1970s in many countries, working-age populations, those 25–59,[i] began to increase more in absolute numbers than the child population. This change was driven by two factors: women reduced their childbearing, and large cohorts of youth born during the 1950s reached the working ages. After 35 years, the second phase of the age transition has had a profound effect on population age structure. In
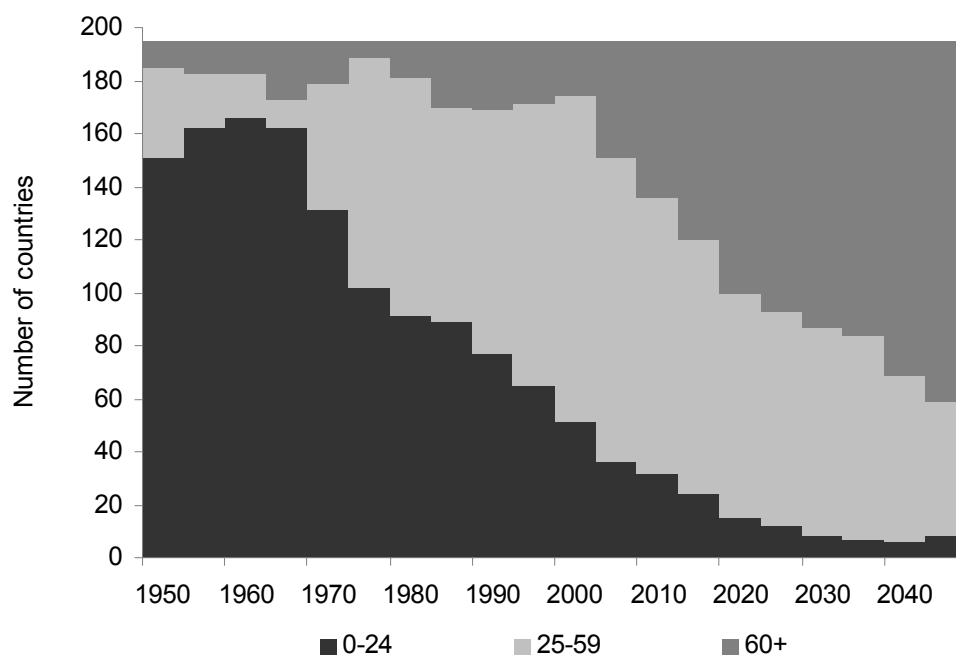
Figure 1.1   Distribution of 195 countries according to age group
(0–24, 25–59, or 60+) with the largest absolute increase in
population: 1950–2050 (projected)

Source: Calculated by authors using UN population estimates and
projections (UN Population Division 2009).

many countries the working-age population outnumbers the combined populations of
children and elderly. In China, for example, the working-age population is currently
about 700 million as compared with a combined child and elderly population of 650
million (UN Population Division 2009).[ii]

In many countries the boom in the working-age population is drawing to a close
and the future will be dominated by growth in the 60+ population. For the world as a
whole, those in the working ages currently outnumber those 60+ by 4 to 1. By 2050 the
ratio is projected to drop to 2 to 1. This third phase of the global age transition is
without precedent. Populations in the future will be much older than ever before in
human experience.

The third phase of the global age transition is being driven primarily by the
historical swings in fertility outlined above. Members of the large 1950 birth cohort
experienced their 60th birthday in 2010. They and the large cohorts that follow will fuel
the growth of the 60+ population. Because fertility has declined to low levels, cohorts
entering the working ages will be smaller than those that are departing. Growth in the
60+ population is also being fueled by gains in life expectancy. People in their 60s and
70s are much more likely to survive into their 80s, 90s, and even into their 100s than in
the past.

Important national and regional details cannot be neglected. Countries are at very different stages of the age transition because of differences in the timing and speed of fertility and mortality decline. The industrialized countries and several East Asian societies are furthest along in the transition, followed by those in Latin America (Figure 1.2). Many South Asian countries still have relatively young populations, and most African countries are in the earliest stages of the age transition.
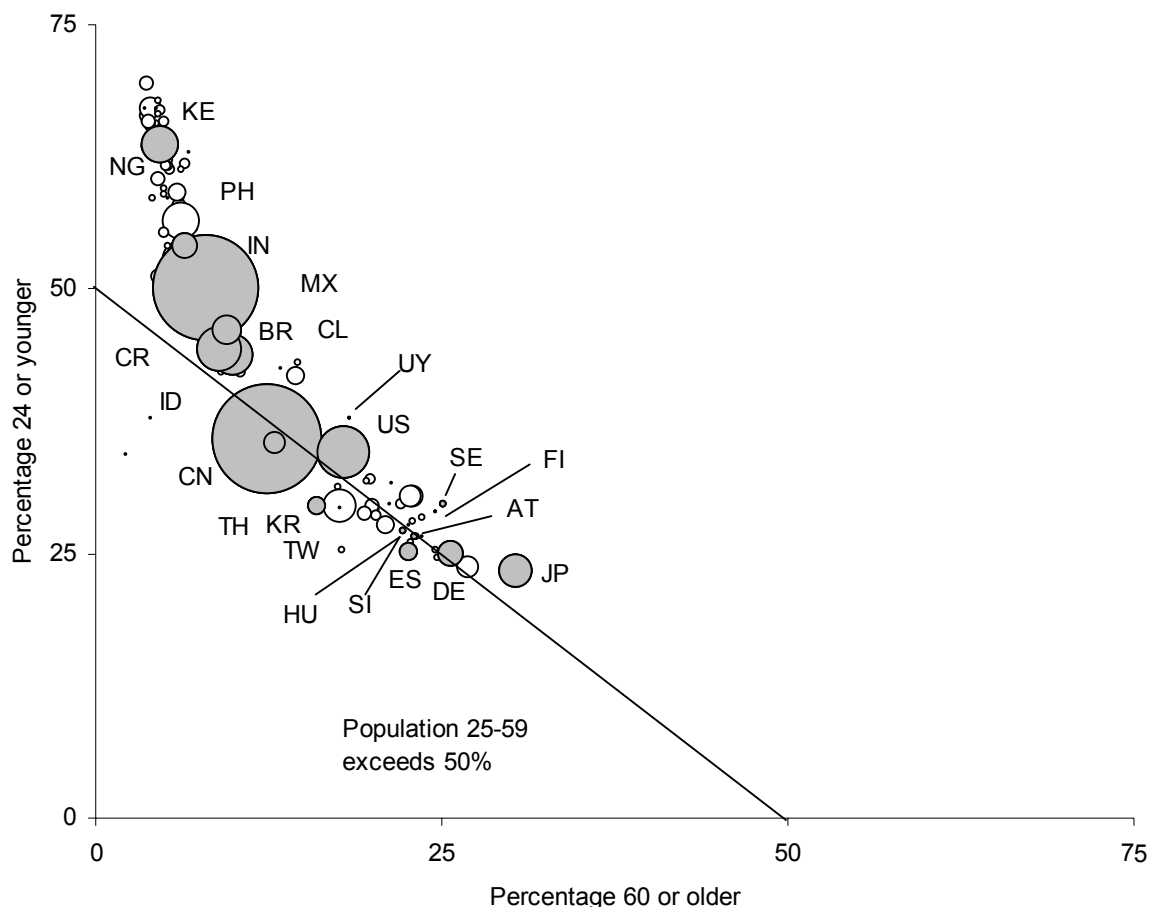

Figure 1.2   Age structure: 23 populations, 2010 (projected)

Source: UN Population Division (2009).

Notes: The area of a bubble is proportional to a population's size. Study populations are highlighted and labeled. See Figure 1.5 for the names associated with the abbreviations.

Population aging is expected to occur first and to be particularly severe in some higher-income societies, mostly in East Asia and Southern and Eastern Europe, because they have very low fertility rates. Population aging is expected to be more gradual in the US and Northern Europe, but growth in their older populations will be substantial nonetheless. Lower-income countries will also experience significant population aging

in the coming decades and will be confronting the same kinds of challenges faced earlier in higher-income countries.

The generational economy

Population age structure influences an economy for a simple reason. The economic behavior of individuals varies in systematic ways as they proceed through life. School attendance, childbearing, labor force participation, and productivity, saving, and consumption all vary with age. Thus the transition in population age structure influences the shares of the population that are in school, or working, or retired. Other things being equal, populations concentrated at ages with higher saving rates or greater wealth will have higher average saving rates or higher per capita wealth. Of particular importance in recent decades has been the increase in the share of the population in the working ages and thus productively employed. China, the Republic of Korea (South Korea), and Spain all benefit because more than half of their populations are concentrated in the working ages. In stark contrast, only one third of Kenya's population falls in the working ages, contributing to the low standard of living prevailing there (Figure 1.2). In the coming decades, however, economies will be increasingly influenced by the economic behavior of the elderly—whether they work, whether they spend down their wealth, and whether they make large demands on health care systems.

To fully understand the implications of population age structure, it is essential to look beyond these compositional effects. Changes in the number and behavior of one age group influence the economic circumstances and behavior of other age groups. Some of these effects are mediated by the marketplace. Rapid growth in the number entering the workforce may depress general wage levels. An increase in the older population, those most likely to own assets, may depress interest rates.

Many of the interdependencies across age groups or generations, however, are not mediated by the marketplace. Vast quantities of economic resources flow from one generation to another outside the marketplace. Within families, resources flow from parents to their dependent children or from adult children to their elderly parents. Governments tax prime-age adults to provide schooling to children, pensions to the elderly, and health care to everyone, especially the elderly. Age structure influences the size of the populations giving and receiving these flows, and thus changes in age structure have the potential for disrupting these economic structures.

The goal of this research effort is to provide a systematic and comprehensive approach to measuring and analyzing economic flows from a generational perspective. We begin by defining the generational economy:

> **Generational economy** *n* (1) the social institutions and
> economic mechanisms used by each generation or age group to
> produce, consume, share, and save resources; (2) the economic flows
> across generations or age groups that characterize the generational
> economy; (3) explicit and implicit contracts that govern
> intergenerational flows; (4) the intergenerational distribution of
> income or consumption that results from the foregoing.

Four economic activities are central to the generational economy: working, consuming, sharing, and saving. Work and its product vary over the lifetime of individuals in ways that depend on biology, culture, and institutions as well as on the desire or the need to consume. This gives rise to the economic lifecycle with extended periods at the beginning and the end of life when people consume more than they

produce. These periods are balanced, to an extent, by the working ages, during which people produce more than they consume.

Sharing and saving are essential counterparts to the economic lifecycle. These two economic mechanisms—and only these two—provide the means for filling the gaps between production and consumption for the young and the old. Sharing gives rise to intergenerational transfers that come in many forms. Taxpayers, who are heavily concentrated in the working ages, fund schools for children, pensions for the elderly and health care programs, which often provide services to the oldest members of our populations. Parents provide for their children, often with substantial assistance from grandparents. In many societies the elderly rely on their adult children for their material needs.

Saving is the means by which resources available at one age at one point in time become available at a later age at a later point in time. One kind of saving is lifecycle saving. Individuals can accumulate assets during their working ages and rely on those assets in retirement—using asset income and spending down their assets to fund their lifecycle deficit, the gap between consumption and labor income. By participating in employment-based pension plans, acquiring a home, building a business, and accumulating personal savings, workers accumulate lifecycle savings. Young adults can also use savings and the assets they generate to deal with lifecycle problems. They can borrow from older adults who have already accumulated assets. Examples of such behavior include the use of credit cards and student loans.

A more complex response to the lifecycle problem involves both sharing and saving. For many in the working ages, labor income is insufficient to fund their own consumption plus the transfers they make to children and the elderly. Asset income may fill the gap by funding transfers to others. In this way, both sharing and saving are used to meet the lifecycle needs of children and the elderly.

Producing and consuming: The economic lifecycle

An important objective of this research is to measure the four elements of the generational economy. We begin with the economic lifecycle, showing how producing and consuming vary over our lives. Many important details are discussed by Sang-Hyop Lee and Naohiro Ogawa in Chapter 5 on labor income and by An-Chi Tung in Chapter 6 on consumption. The per capita consumption and labor income profiles for each economy are shown in Chapter 6, Figure 6.1. Many chapters in Part III provide a richer explanation of the economic lifecycle and how it varies among the individual economies. Chapter 3 provides a more detailed discussion of the methods used to construct the profiles.

Important features of the economic lifecycle are illustrated in Figure 1.3 by comparing two countries: India (Chapter 26) and Germany (Chapter 16). The values in the upper two panels are per capita estimates of consumption and labor income measured in a comprehensive fashion. Consumption includes all public and private consumption. Labor income includes the earnings of employees who work in the formal sector plus the returns to labor of those who are self-employed or unpaid family workers. The labor income profiles reflect labor force participation, unemployment, hours worked, and wages. Consumption and labor income are both valued prior to the assessment of any taxes.
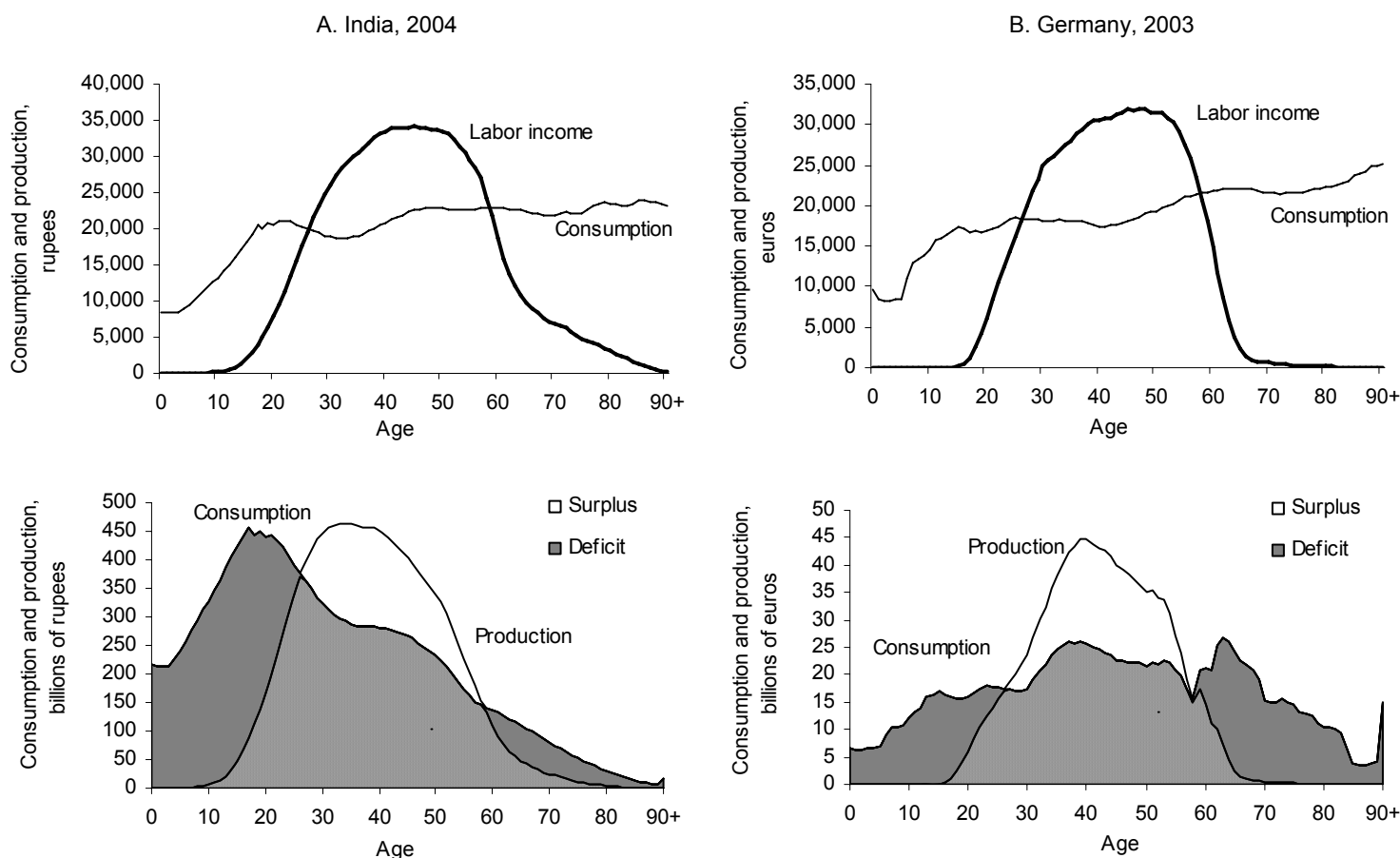
A. India, 2004

B. Germany, 2003

Figure 1.3   Economic lifecycles: per capita and aggregate consumption and production (labor income) by age for India (2004) and Germany (2003)

Note: Per capita values are shown in the upper two panels, aggregate values in the lower two panels. India is shown on the left, Germany on the right.

India and Germany have broadly similar per capita labor income profiles. However, child labor is much greater in India, the India profile peaks at a somewhat younger age, and labor income at old ages is more salient in India than in Germany. The per capita consumption profiles are also similar. Young children consume less than adults in both countries, primarily because the material needs of young children are less than those of adults. Consumption rises sharply as children age, driven in part by their consumption of public and private education. Consumption by adults is relatively flat in India whereas in Germany adult consumption increases significantly with age. The increase in Germany is primarily a consequence of health care spending. (Even sharper increases in consumption late in life are found in Japan, Sweden, and the US.) A surprising feature of the lifecycle profiles is that the ages that mark the deficit and surplus periods are so similar in India and Germany. In both countries those who are 26 or younger have a lifecycle deficit: their consumption exceeds their labor income.

Those who are 58 or older are in deficit in Germany, whereas those 59 or older are in deficit in India.

The two lower panels in Figure 1.3 show the aggregate values for consumption and labor income by all individuals at each age. The dominant influence of population age structure is apparent in the aggregate lifecycle graphs. In the country with the young population, India, the child deficit dominates, while in the country with the old population, Germany, the old-age deficit is much more prominent. Germany's population is also more heavily concentrated in the surplus ages than is India's, producing a larger aggregate surplus in Germany.

Sharing and saving: Economic flows across age

The lifecycle problem is quantified by comparing production and consumption at each age. Its solution is captured in two inter-age flows that arise from sharing and saving. First, countries can rely on net transfers to fund the lifecycle deficits of the young and the old. The surpluses shown in the lower panel of Figure 1.3 can be given to children and the elderly through either private or public institutions. Even a cursory examination of India or Germany reveals, however, that the total surplus is substantially less than the sum of the young and old deficits. In some countries, such as Mexico, Nigeria, and the Philippines, net transfers from the rest of the world augment transfers from those in the working ages; but in most countries these flows are modest. Relying on assets generates the additional resources required to fund lifecycle deficits.

The richer detail on inter-age flows provided by National Transfer Accounts is illustrated in Figure 1.4, using estimates for the US in 2003 (Chapter 15). Four inter-age net flows are documented: public and private transfers and public and private asset-based reallocations. Asset-based reallocations are equal to asset income (an inflow) less saving (an outflow). Asset income will be negative and generate an outflow if individuals are in debt. Dissaving (spending savings) will generate an inflow. Net transfers plus asset-based reallocations must equal the lifecycle deficit for each age group. This is an accounting identity that must hold (see Chapter 3).

Transfers are very important in the US. The lifecycle deficits of the young are funded by a combination of public and private transfers, with public transfers of greater importance for school-age children. Persons over the age of 65 (the age of eligibility for public pension and health care programs for the elderly) have positive net public transfers. These transfers rise very steeply at older ages in the US because of heavy spending on health care late in life. Net private transfers to the elderly are negative at all ages, including those who are 90 and older, because the elderly give more to their children and grandchildren than they receive. These values do not include bequests, for which reliable estimates are not yet available. If they were included, private downward transfers, those from the elderly to their children and grandchildren, would be much greater than shown here. Those who fall in the surplus ages (26–58) in the US have net transfer outflows, and public transfers are slightly larger in magnitude than private transfers.

Asset-based reallocations are close to zero for minors, who by definition cannot "own" assets, save or dissave, or have asset income.[iii] At all adult ages in the US, asset-based reallocations are positive. Young adults in the US generate asset-based inflows by accumulating private debt. Other asset-based inflows are generated by relying on asset income. For adults between the ages of 24 and 70 inclusive, private saving is positive although less than asset income.
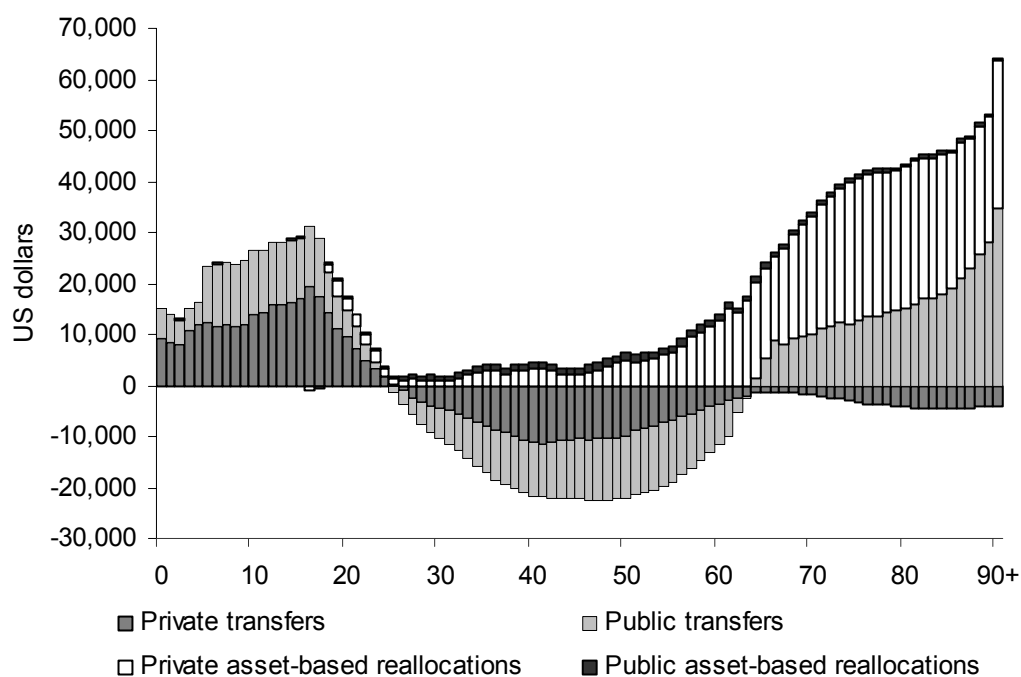
Figure 1.4   Funding the lifecycle deficit: United States, 2003
(per capita values)

How transfers and assets are used to meet lifecycle needs is one of the important topics addressed in this book. We describe the principles and methods of constructing estimates of public and private transfers by age in Chapter 3. In Chapter 7 Jorge Bravo and Tim Miller present and discuss comparative estimates of public transfers, and in Chapter 8 Ronald Lee and Gretchen Donehower examine private transfers. In Chapter 9 Andrew Mason, Naohiro Ogawa, Amonthep Chawla, and Rikiya Matsukura discuss how assets are used in the generational economy. Important findings are highlighted in the following sections; but before we proceed, a few words of caution are needed.

First, the results presented here are descriptive. They are not based on any particular causal model, nor can they be readily interpreted as supporting a particular causal model. Undoubtedly any of the patterns highlighted here are due to a variety of factors. The value of these results is in identifying important patterns that warrant further analysis and, in some cases, patterns that seem inconsistent with prevailing thinking.

Second, the results are cross-sectional, comparing different age groups at a single point in time rather than tracking cohorts as they proceed through life. The patterns we observe in the data reflect the effects of age as well as cohort differences. Thus considerable care must be exercised in interpreting the patterns we see.

Third, the estimates are approximations. Their reliability is affected by the accuracy of the national income and product accounts, administrative records, and survey data on which they are based. Moreover, some of the methods employed are simple and yield only rough approximations. Hence, it is important to focus on broad patterns rather than on minor details.

That said, some interesting and surprising patterns emerge from the analysis. In the rest of this chapter we highlight some of the key findings, noting that many important issues are treated more fully in the following chapters.

The support ratio and the challenge for the working-age population

If standards of living are to be sustained, the working-age population must generate sufficient resources to fulfill three important responsibilities. The first is to provide for its own material needs, the second is to fund public and private transfers to children and the elderly, and the third is to save enough to fund its own future retirement needs. The transition in population age structure described above bears directly on the challenges that working-age adults face in meeting these economic responsibilities. The standards of living of all depend on the success with which the working-age population meets these challenges.

The effects of changing age structure depend on features of the economic lifecycle, because the ages at which people are productive and the ages at which consumption demands are greatest vary from setting to setting. The support ratio (SR)—that is, the ratio of the effective number of producers to the effective number of consumers—is a summary measure of population age structure that incorporates how production and consumption vary by age. The effective number of producers weights the population at each age by multiplying by the normalized labor income at each age using the profile for that economy. In a similar fashion, the number of consumers weights the population at each age using the consumption profile to adjust for age-related differences in "needs" or "tastes." More details about the construction of the support ratio are provided in Chapter 3 and on the NTA Website.

An intuitive interpretation of the support ratio is that it measures the effect on consumption of changes in population age structure while holding constant other factors—work effort, interest rates, assets, saving, and net transfers from the rest of the world. Each percentage-point increase in the support ratio allows a percentage-point increase in consumption at every age, all other things being equal. An increase in the support ratio is often referred to as a demographic dividend. In the same way, however, a decrease in the support ratio leads to a decrease in consumption, all other things being equal.

The support ratios for the NTA economies are reported for 1950 to 2050 in Appendix Table A.1 at the end of this volume. Figure 1.5 depicts the trends in the support ratio. The economies are ordered with those having early demographic transitions at the top. Changes in the SR over five-year periods beginning in the indicated years are indicated by ▬ for declines and by ▲ for increases. In every economy except Japan, the SR declined for at least 15 years between 1950 and 1975. The SR began to increase at different times and for varying durations, but every economy has experienced or is experiencing a prolonged increase in its SR. The industrialized economies have all peaked—most of them during the 1990s and some, such as the US and Spain, more recently. Most East and Southeast Asian economies, Japan aside, have just reached their peak or will soon do so. Many Latin American economies will peak within the next ten or 15 years. India's SR will not peak until 2040; and the Philippines, Nigeria, and Kenya will have rising support ratios through 2050.

Germany (DE) -24
Finland (FI) -14
Japan (JP) -23
Austria (AT) -21
United States (US) -10
Sweden (SE) -12
Slovenia (SI) -26
Thailand (TH) -12
South Korea (KR) -24
China (CN) -14
Taiwan (TW) -28
Spain (ES) -25
Hungary (HU) -16
Chile (CL) -9
Costa Rica (CR) -6
Brazil (BR) -8
Mexico (MX) -1
Indonesia (ID) 3
Uruguay (UY) 0
India (IN) 10
Philippines (PH) 13
Nigeria (NG) 36
Kenya (KE) 25

1950   1970   1990   2010   2030   2050
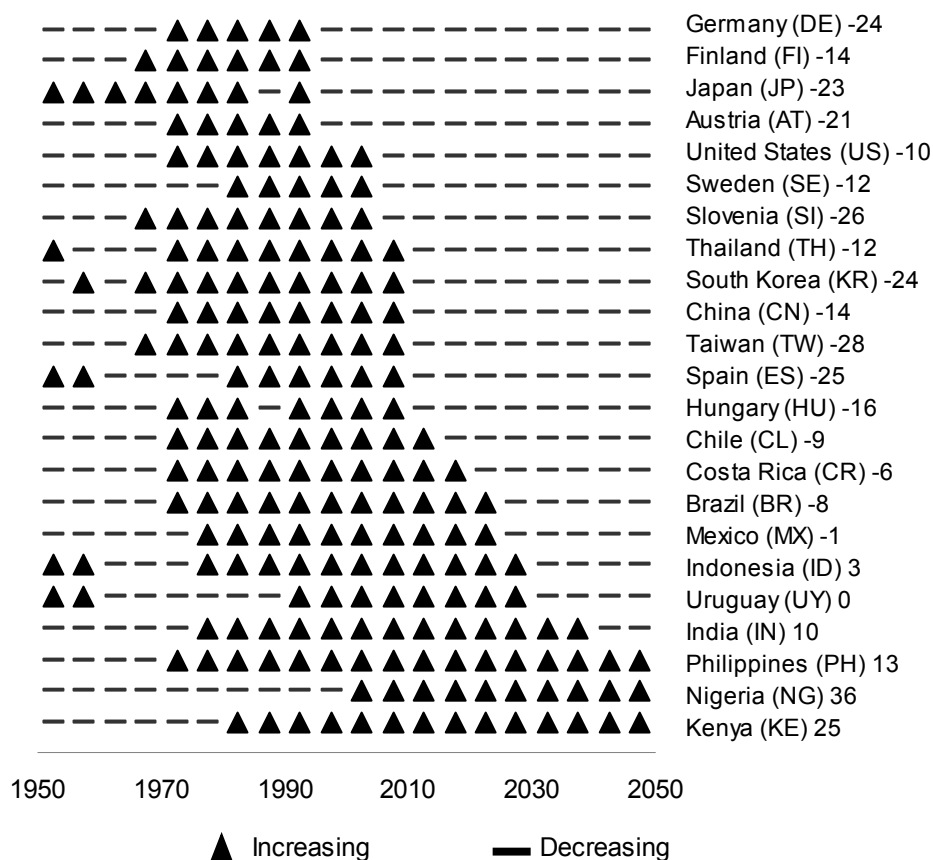
▲ Increasing   ▬ Decreasing

Figure 1.5   Recorded and projected trends in the support ratio (SR): 23 economies, 1950–2050 (projected)

Notes: The symbols representing increasing and decreasing trends correspond to the change during the five-year period following the indicated year. The economies are ordered from highest to lowest on the basis of the year in which the SR peaked. The percentage decline in SR between 2010 and 2050 is reported to the right of each name and abbreviation.

The African economies are projected to experience very substantial gains in their support ratios, with increases of 36% in Nigeria and 25% in Kenya between 2010 and 2050. Declines will be most precipitous, exceeding 20%, in three Asian economies (South Korea, Taiwan, and Japan) and four European economies (Spain, Austria, Germany, and Slovenia). In comparison with them, changes elsewhere appear to be modest. In the US, for example, the SR is projected to decline by 10%. A change of this magnitude is serious, substantially exceeding the decline in per capita consumption in the United States during the current economic crisis. Moreover, low SR levels are expected to persist for many years.[iv]

One of the main objectives of this study is to delve more deeply into how changes in population age structure influence an economy. Changes in the support ratio indicate the considerable importance of population age structure, but they are not the

entire story. Population age structure also influences other features of the economy that may enhance the favorable effects of a rise in the support ratio and mitigate the adverse effects of a decline in the support ratio. This is a topic to which we shall return repeatedly in the chapters that follow. Chapter 2 provides the conceptual foundation needed for a more comprehensive understanding of the influences of population age structure. Chapter 4 draws lessons by using NTA estimates to compare the diverse ways in which societies are responding to population aging, described in much greater detail in the comparative chapters in Section II and the chapters about individual societies in Section III. Two general issues of particular importance are summarized in the next two sections of this chapter: how the age transition is affecting spending on children and how it is influencing support systems for the elderly.

Children: Consumption and human capital

Children are costly, but they are also valuable. The future of any society depends on its children and whether they are educated, healthy, and prepared to compete in an increasingly globalized world. In this section we summarize evidence presented in later chapters about how children's consumption varies across economies, the extent to which that spending is concentrated on human capital (health and education), and the roles of the state and the family in channeling economic resources to children.

Consumption by children is discussed in a comprehensive fashion by An-Chi Tung in Chapter 6, but some important features of their consumption are summarized in Table 1.1. The table is based on synthetic cohort estimates constructed by cumulating per capita values for single years from age 0 through age 24. The synthetic value of consumption can be interpreted as the total consumption by an individual from birth to age 25, given consumption at the prevailing average age-specific rates. Comparison across economies is facilitated by normalizing labor income; consumption is divided by the average annual labor income of individuals in the 30–49 age range in each economy. A value of 10 means that raising a child from birth to age 25 requires 10 times the annual labor income of a prime-age adult.

The choice of age 25 as the cutoff for childhood is dictated primarily by the substantial amount of education spending on those in their early 20s. Moreover, the typical age at which individuals are producing as much as they are consuming is around age 25 in all economies, although labor income of those under age 25 is substantial (Chapter 5). If we average their income across all economies, we find that children can fund a little less than 20% of their consumption. There is some tendency for labor income among the young to be more salient in lower-income countries (China, Kenya, and Indonesia) than elsewhere, but the tendency is not strong. In Nigeria, however, labor income is very low for young adults because of poor employment opportunities (Chapter 25); and in high-income Austria, labor income among young adults is very high because the educational system is closely integrated into occupational training and employment (Chapter 11). In general, labor income among the young is lower in economies with high human capital spending than in those where such spending is low.[v]

The economies in Table 1.1 are arrayed from those with the lowest child consumption to those with the highest. The variation is substantial and driven by multiple factors. Consumption per child is low in high-fertility economies (Kenya, Nigeria, India, and the Philippines) and high in low-fertility economies (South Korea, Japan, and Taiwan). But there are a few very anomalous cases that require some

Table 1.1 Consumption by children (ages 0–24), synthetic cohort values: 23 economies, around 2000

Economy or region	Consumption (0–24)			Health and education (0–24)		
	Total	Public share	Private share	Total	Public share	Private share
Kenya	7.4	26.0	74.0	2.5	13.2	5.5
China	8.6	33.3	66.7	4.4	6.6	18.3
Uruguay	10.5	27.6	72.4	10.6	16.2	17.8
Nigeria	10.7	10.8	89.2	9.4	2.0	21.0
India	11.8	20.5	79.5	6.4	3.4	3.4
Germany	12.0	40.7	59.3	12.1	25.4	3.2
Hungary	12.0	54.2	45.8	9.6	30.3	2.8
Austria	12.3	44.1	55.9	12.4	29.6	2.5
Slovenia	12.7	48.8	51.2	14.2	38.0	4.2
Spain	12.8	39.0	61.0	10.7	26.8	4.7
US	12.9	39.0	61.0	17.8	22.9	10.3
Costa Rica	12.9	28.3	71.7	11.1	20.3	5.7
Finland	12.9	50.8	49.2	11.3	27.1	1.7
Sweden	13.0	58.3	41.7	20.1	43.9	1.8
Philippines	13.4	21.7	78.3	4.9	8.5	9.7
Thailand	13.4	31.1	68.9	10.0	19.0	7.0
Brazil	13.8	34.6	65.4	12.3	14.6	11.7
South Korea	13.9	30.2	69.8	9.0	14.9	16.2
Chile	14.0	25.6	74.4	9.1	14.5	7.4
Indonesia	14.1	18.3	81.7	4.0	9.9	6.0
Japan	14.7	41.0	59.0	13.1	27.1	9.7
Taiwan	16.1	32.4	67.6	10.8	13.9	19.3
Mexico	16.3	23.4	76.6	7.5	14.9	6.1
All economies (23)	12.7	33.9	66.1	10.2	19.3	8.5
Africa (2)	9.1	18.4	81.6	5.9	7.6	13.3
E. Asia excl. China (3)	14.9	34.5	65.5	11.0	18.6	15.1
S. and S.E. Asia (4)	13.2	22.9	77.1	6.3	10.2	6.5
Latin America (5)	13.5	27.9	72.1	10.1	16.1	9.7
Europe & US (8)	12.6	46.9	53.1	13.5	30.5	3.9

Note: Health and education consumption are normalized on the per capita labor income of persons aged 30–49. Shares are expressed as a percentage.

explanation. China, for example, has relatively low fertility but low child consumption as well (Chapter 22). This reflects the very low levels of consumption at all ages, not just consumption by children. Consumption at all ages is very high in Mexico relative to labor income of those aged 30–49 because of the substantial remittances from family members working in the United States (Chapter 13).

Children's consumption in all the European economies falls near the average value of 12.5, below the US, the economies of East Asia, and Brazil and Chile. This is interesting, given that at least some of the European countries have fertility rates that are quite low and the widely accepted view that spending per child will be higher in low-fertility countries (Becker 1960). Austria, Germany, and Spain all have total fertility rates that are significantly below those in the US, Brazil, or Chile. Within Europe, the highest child consumption is found in the highest-fertility societies of Sweden and Finland, not the low-fertility societies. The economies of East Asia, China excluded, stand out for their high levels of child consumption. Of course, fertility is very low in Japan, Taiwan, and South Korea, slightly less than in the low-fertility European countries. The contrast between Japan and Germany is quite interesting. Both have total fertility rates of 1.3 and have the oldest populations of the societies analyzed. Yet children's consumption in Japan is 22% greater than in Germany.

On average, one third of child consumption consists of public consumption. Some of these goods and services, especially public education and health care, are unambiguously targeted at children. Other public goods and services, such as public diplomacy, benefit children but are not particularly targeted at them. There is considerable variation in the level of public consumption, ranging from a low of 11% of total child consumption in Nigeria to a high of 58% in Sweden. Apart from Sweden, the public share exceeds half of total child consumption in Hungary and Finland. In general, the public role is greatest in high-income, industrialized societies. The public role is least important in lower-income countries, with no obvious regional effects other than what might be explained by differences in income levels.

The variation in human capital consumption is very substantial. A particularly striking comparison is between China and Taiwan. Total child consumption in China is about one half of that in Taiwan, but China's per child human capital consumption is only 20% of Taiwan's. Keep in mind that we have directly controlled for differences in labor productivity between the two economies. In general, however, the societies with high rates of human capital spending are those with low fertility and high income. Spending on human capital is high in Europe, the US, and especially East Asia (excluding China).

Europe relies heavily on the public sector to fund human capital spending. The public share ranges from 85% in Spain to 96% in Sweden. The public sector is less important in the US, at 71% of total human capital spending. In East Asia (excluding China), however, the public share is only 53% of total human capital consumption. Human capital spending is high in East Asia, except China, because families there spend so much on the education of their children. In low-fertility Europe, governments spend a great deal on human capital.

The close relationship between human capital and fertility—and hence between human capital and population age structure—is one of the most important findings to emerge from this study (Figure 1.6). The finding is discussed in more detail in Chapter 2, but it deserves highlighting here. There is a strong trade-off between human capital spending and fertility. Societies with low fertility are spending much more on health

and education per child than other societies. This holds for cross-sectional data of the form presented here, but also for time-series data that are available for Japan, Taiwan, and South Korea (Ogawa et al. 2010) and the US (Lee and Mason 2010).
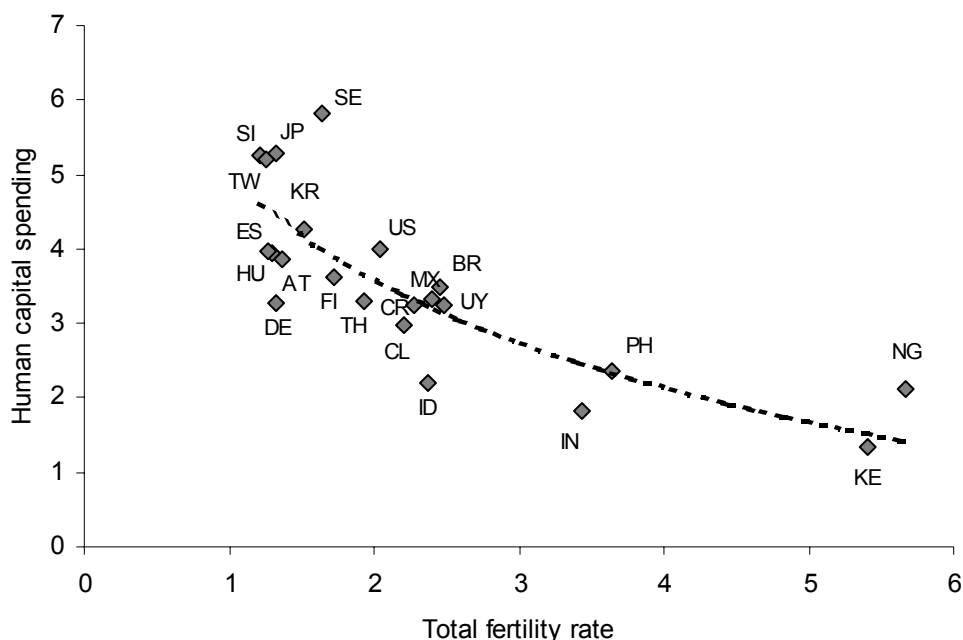

Figure 1.6 Trade-off between human capital spending and fertility: 22 economies around 2000

Note: See Figure 1.5 for the names associated with the abbreviations.

The trade-off is important because it implies that, although low-fertility countries will have fewer workers in the future, those workers will have benefited from greater investment in their human capital. This phenomenon is widely ignored in discussions about the implications of population aging for economic growth. That is unfortunate because what matters is not the number of workers but what they can produce, which is determined by both the number of workers and their productivity.

The elderly, transfer systems, and wealth

Despite great differences among countries in health care, income, financial systems, and public programs, the elderly consume much more than they produce in every society that we have studied. Historically, this has not always been the case. In traditional, hunter-gatherer societies, adults consumed more than they produced into their 60s and 70s—if they managed to live that long (Lee 2003a). But in contemporary societies—whether we are talking about Sweden or Kenya, Japan or Indonesia—the elderly maintain their standard of living by drawing on resources well beyond what they earn.

The labor income and consumption profiles for each of the 23 NTA economies, presented in Chapters 5 and 6, support this generalization and provide details about

variations among individual societies. The diminished role of labor income at old ages is documented in Figure 1.7, which shows labor income as a percentage of consumption at key benchmark ages (55, 60, 65, and so on). At age 55 labor income exceeds consumption in 17 (almost 75%) of the 23 economies. The change between ages 55 and 60 is dramatic. Sixty-year-olds are producing as much as they are consuming in only two (less than 10%) of the 23 economies. By age 65 a lifecycle deficit is universal, and in many economies it is large. In most, labor income is less than 40% of consumption.
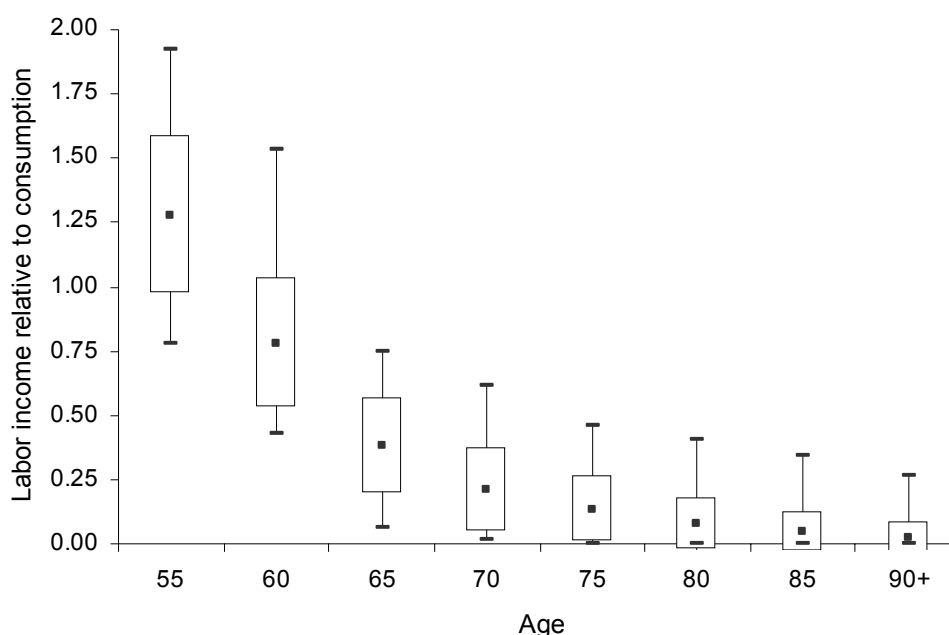

Figure 1.7   Labor income as a proportion of consumption at exact ages 55, 60, … 90+: 23 economies around 2000

Note: Boxes mark +/− one standard deviation around the mean. Whiskers mark maximum and minimum values.

The existence and size of the old-age deficit can be explained by many factors. Failing health and disability play a role by driving down productivity, encouraging withdrawal from the labor force, and, in some high-income economies, raising spending on health and long-term care. Features of public pensions and tax systems can greatly undermine work incentives at older ages (Gruber and Wise 1999, 2001). Older workers may have relatively low earnings because they are employed in low-productivity sectors and because they have lower educational attainment than young workers. In the final analysis, however, significant lifecycle deficits at old ages are possible only because the elderly can depend on transfers and asset-based reallocations to support their consumption.

The support system for the elderly, the means by which their lifecycle deficit is funded, can be effectively described as consisting of three components: public transfers, private transfers, and asset-based reallocations. Depending on the country, the

elderly benefit from public pension programs, publicly funded health care and long-term care, and other cash and in-kind transfer programs. Of course, depending upon the particulars of the tax system, the elderly help fund these programs. Private transfers are dominated by intrahousehold flows between the elderly and co-resident family members. The third source of support for the elderly is their assets: personal savings, stocks and bonds, a business or farm, and owner-occupied housing, to name important examples.

      To document how the old-age support system varies across societies, we compare public transfers, private transfers, and asset-based reallocations as a "share" of the lifecycle deficit of those 65 and older.[vi] The shares are conveniently represented by a triangle graph that nevertheless requires some explanation (Figure 1.8). Each of the three vertices of the triangle represents exclusive reliance on one of the three funding sources, with the other two being zero. Any movement toward one of these vertices represents an increase in the share of that source. 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 one third or two thirds of the lifecycle deficit while the other two vary. Points lying outside the triangle indicate that one or more of the components are negative. This occurs frequently because net private transfers to the elderly are often negative; that is, the elderly provide more to their descendants than they receive from them.
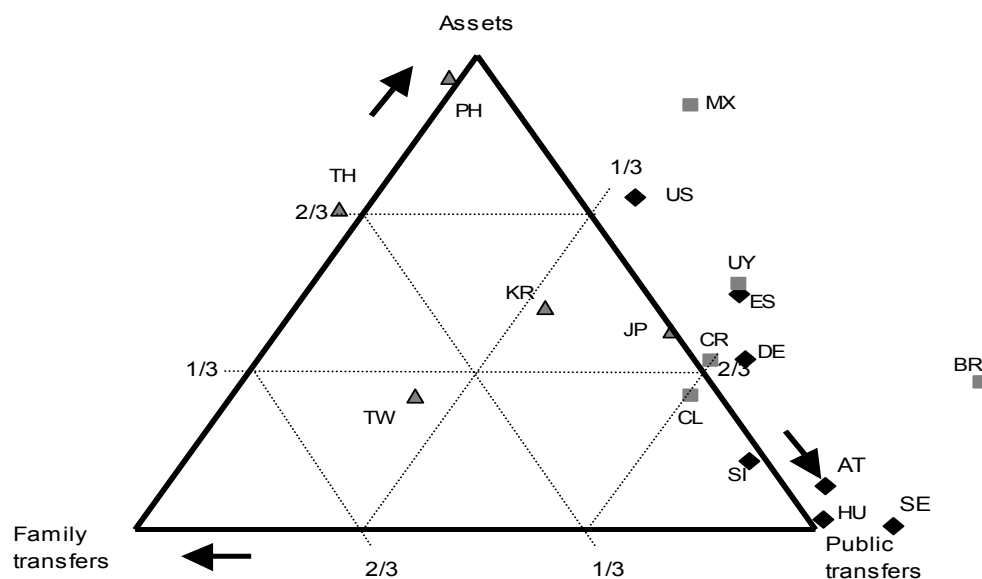

Figure 1.8   Funding sources for persons 65 and older, measured as shares of the lifecycle deficit: 17 economies around 2000

Note: See Figure 1.5 for the names associated with the abbreviations.

Net familial transfers are an important source of support for the elderly in only a few Asian economies: South Korea, Taiwan, and Thailand. In Taiwan and Thailand, net family transfers represent about one third of the lifecycle deficit of the elderly, and in South Korea net family transfers account for roughly 20%. In many countries (Chile, Costa Rica, Japan, the Philippines, Slovenia, Spain, and Sweden), net familial transfers are close to zero or negative. In a few countries (Brazil, Mexico, the US, and Uruguay) the elderly provide substantially more support to their descendants than they receive.

Net public transfers vary widely in importance. In the Philippines and Thailand, net public transfers are essentially zero, with the elderly paying as much in taxes as they are receive in benefits. Net public transfers fund roughly one third of the old-age deficit in Mexico, South Korea, Taiwan, and the US; one half in Uruguay; and two thirds in Costa Rica, Japan, and Spain. Well over two thirds of the old-age deficits are funded by public transfers in Austria, Chile, Slovenia, and Sweden. In Brazil, net public transfers are about one third larger than the lifecycle deficit, and the excess is transferred to younger family members.

The elderly in Mexico, the Philippines, Thailand, and the US rely most heavily on assets. In Taiwan, where familial transfers are dominant, the elderly rely on assets to a much smaller degree. In Austria, Brazil, Chile, Slovenia, and Sweden, where public transfers dominate, assets play a very limited role.

There are interesting regional patterns in the support system. Public transfer systems are most important in Europe and Latin America and least important in developing Asia. Among industrialized economies, public transfers to the elderly are less important in Japan and the US than in European economies.

The values in Figure 1.8 are averaged across all persons 65 and older and conceal important differences between younger and older elderly. The elderly in almost every economy rely less on assets at older than at younger ages. They fill this resource gap with public transfers in the US and European economies, but with familial transfers in Asia and Latin America. Among the oldest old in both Latin America and Asia, familial transfers are very important, but at no age are they important in the US or Europe.

An inviting interpretation of the declining reliance on assets is that the elderly spend down their assets as they age, but this interpretation appears to be wrong in almost every society. With rare exceptions, the elderly are not dissaving (Chapter 9). The older elderly have less wealth because they had low labor income during their working years, which they earned further in the past, and they were never able to accumulate as much wealth as younger elderly. This cohort effect is particularly strong in the rapidly growing economies of East Asia. In some countries, such as the US, the relative importance of asset-based reallocations is declining because of large increases in in-kind transfers for health and long-term care late in life.

One of the most important policy issues in aging societies is whether support for the elderly through transfer systems should be reduced or, in the case of public PAYGO pension programs, phased out entirely. Many governments have implemented significant pension reform and others are considering similar measures. Chile reformed its pension system in the early 1980s, moving to a system that mandates the accumulation of pension assets and phases out reliance on public transfers. The transition process is very long for pension reform, but in the absence of further reform Chile will move from its current position in Figure 1.8 toward asset-based reallocations and away from reliance on public transfers. An alternative approach has emphasized

maintaining existing reliance on public transfer systems while adjusting taxes and benefits in response to the fiscal strains from population aging and other forces. In the US, for example, public transfers to the elderly through the health care system are increasingly significant, in part because of population aging and in part because of rising health care costs.

The policy discussion emphasizes public transfers, but in some societies the role of private transfers is also part of the policy debate. Of particular concern is that the decline in the familial transfer system will place greater demands on the public transfer system or undermine standards of living for the elderly. The cross-sectional evidence presented here supports the view that familial transfers will become less important as a consequence of development and related factors. We see that in Japan, for example, net private transfers to the elderly are essentially zero. Time-series estimates (not presented here) confirm that net familial transfers to the elderly in Taiwan, South Korea, and Japan have declined quite substantially during the last 20 to 30 years.

The debate about the reform of transfer systems is particularly heated because of disagreement about its likely effects. Those who favor reduced reliance on transfers believe that people will respond by postponing retirement or saving more, or both. This would result in stronger economic growth and higher standards of living for all. Those who favor continued reliance on transfer systems believe that the benefits of delayed retirement are illusory because they undervalue the benefits of leisure in old age. They believe that reduced reliance on transfer systems will lead to lower standards of living and greater poverty among the elderly. There are many other aspects of the policy debate besides these particular issues, but they figure prominently in many discussions.

These issues are not easily resolved, and the data currently available from National Transfer Accounts cannot resolve them. Nonetheless, it is instructive to compare economies that differ in their reliance on net transfers to the elderly, drawing on the analysis described in more detail in Chapter 9. We use a simple approach that is intended as a descriptive device, not as a structural or causal model. First, we construct synthetic cohort estimates of consumption, labor income, transfers, and asset-based reallocations to the elderly for each economy for which complete estimates are available. The method for constructing synthetic cohorts is described in Chapter 3. The basic idea, however, is to control for the effects of societal differences in age structure. We combine the age-specific economic variables with a common population age distribution to calculate, for example, the average lifetime consumption by those 65 and older. Second, we regress each component of the generational economy—consumption, labor income, and asset-based reallocations—on net transfers to the elderly. The results have a ready interpretation, because an increase in net transfers to the elderly must lead to an equal increase in consumption, or an offsetting and equal decline in labor income, or an offsetting and equal decline in asset-based reallocations, or a combination of the responses that total to the change in net transfers.

Regression coefficients and standard errors are presented in Table 1.2. The analysis is based on only 17 observations, and as a consequence the coefficients are estimated with a low degree of accuracy. The results indicate that, on average, for the economies covered in our study, an additional dollar in net transfers to the elderly is associated with elderly consumption being raised by 15 cents (not statistically significant), labor income being lowered by 23 cents, and asset-based reallocations being lowered by 62 cents. The largest trade-off is between transfers and asset-based reallocations, although the tradeoff between transfers and labor income is substantial.

Table 1.2   Coefficients from regression of lifecycle components of adults 65 and older on net transfers to adults 65 and older: 17 economies around 2000

Lifecycle component	Coefficient	Standard error
Consumption	0.15	0.15
Labor income	-0.23	0.06
Asset-based reallocations	-0.62	0.12
Asset income	-0.24	0.46
Saving	0.38	0.41

Note: All variables are synthetic cohort estimates. The 17 economies are Austria, Brazil, Chile, Costa Rica, Germany, Hungary, Indonesia, Japan, Mexico, Philippines, Slovenia, South Korea, Spain, Sweden, Taiwan, United States, and Uruguay.

If we take these results at face value, two important points must still be addressed. The first is that the decline in asset-based reallocations can be realized in two ways with very different implications. One possibility is that the elderly have lower asset income in high-transfer economies. This would be the case if saving incentives during the working years were undermined by large transfer programs, as postulated by Feldstein (1974). In that case the elderly would have lower assets and lower asset income. Another possibility, however, is that the elderly save more in high-transfer economies. In this instance, the effect of greater transfers would be to increase bequests (Barro 1974).

The final two rows in Table 1.2 extend the analysis to show that, on average, the asset income of the elderly is lower in societies with larger transfer systems and that their saving is greater, but neither coefficient is estimated with sufficient accuracy to reach any conclusions about the consistency of the cross-societal pattern with alternative theories. Even if the coefficients were significant, the results are purely descriptive. Many other factors could account for the patterns.

A second point that must be considered is that all of the comparisons across economies control for level of development by normalizing on the labor income of prime-age adults. This is a partial analysis and does not address the effects of capital on the productivity of labor. If high-transfer economies have lower capital, labor productivity will be lower and standards of living will be depressed beyond the effect captured in Table 1.2. To consider these kinds of issues requires a more comprehensive approach, as discussed in Chapters 2 and 4.

Myths, realities, and policy

For the last four decades, changes in population age structure have been broadly favorable. In many countries declining birth rates have pushed down the share of the child population and pushed up the share concentrated in the working ages. Rising support ratios can add 0.5% to 1% per year to the growth rate of per capita income or consumption per equivalent consumer in developing countries over a period of four to six decades. At the end of this process, standards of living can be boosted by as much as 40%. Countries in the industrialized world experienced similar, but more modest, demographic dividends reflecting lower fertility following their post–World War II baby booms.

The favorable changes in age structure have spilled over into many economic realms. They have eased public finances because the resources of taxpayers have increased in relation to the needs of beneficiaries. Public programs have grown under favorable terms. Changes in age structure have had similarly favorable effects on family finances. With the exception of a few rich industrialized countries, families bear most of the cost of childrearing, and these costs have declined in many countries as birth rates have fallen.

For about half of the countries in the world, changes in population age structure continue to be favorable during the first decade of the twenty-first century. This phase of the age transition will soon end in Indonesia, Brazil, Mexico, Chile, and other Latin American countries. In India, the Philippines, and the countries of Africa, the trends in population age structure will be favorable for several more decades. For these countries, two broad sets of policy issues are important.

The first is how to capture the potential benefits that arise from the demographic dividend. In this context, the low level of labor income among young adults in many countries is an important factor (Chapter 5). The transition into the labor force is especially difficult in Nigeria, for example, but many other countries face this problem. The gains from the demographic dividend can be substantially delayed and diminished if young people lack job skills or if good employment opportunities are not available. Austria is an example of an industrial nation with an early transition from school to work through its apprenticeship system, but this advantage comes at the cost of low rates of tertiary education.

The second issue for young countries is how to lay the groundwork for sustaining high standards of living when changes in age structure are no longer favorable—that is, how to realize what we have described elsewhere as a second demographic dividend (Chapter 2; Mason and Lee 2007). A common misunderstanding is that young countries can postpone addressing aging issues, but nothing could be further from the truth. We return to this point below.

For about half of the world—the United States and the countries of Europe and East Asia—the economic support ratio has peaked and is beginning to decline as the share in the working ages drops and the share of the older population rises. The pace and extent of population aging will vary greatly, depending on the history of fertility change and its current levels, with severe aging expected in East Asia (China, Taiwan, Japan, and South Korea), in Germany, and in Southern and Eastern Europe (Spain, Austria, Slovenia, and Hungary in our study).

Another common misunderstanding is that population aging is primarily a consequence of longer life expectancy. Longer life expectancy is playing a role, but low fertility is the primary factor. This misunderstanding inevitably leads to emphasis on policies that address growth in the number of elderly and the burden that they impose on others. The most widely discussed solution to population aging is that, because the elderly are living longer, they should work longer. Pushing back the age of retirement is undeniably an important possibility to consider. As we see in our study, labor income among the elderly is low in the developing world and very low throughout the rich, industrialized world (Chapter 5). Other studies have shown that poorly designed pension and tax systems create strong incentives to retire early. Many countries have mandatory retirement provisions. Policies that remove barriers to employment and enhance the productivity of older men and women are an essential part of any effective response to population aging.

However, understanding the dominant role of low fertility in population aging points us toward three other possible solutions. The first and most obvious is that we can encourage couples to have more children. If low fertility continues and countries begin to experience substantial depopulation in addition to severe population aging, we believe that raising birth rates will become a centerpiece for public policy. Up to this point such policies have had limited effect in many countries, but there are some indications that childbearing will respond to policy. The second possible approach is to relax policies restricting immigration. This helps in two ways. Immigrants themselves tend to be young adults who will work and pay taxes for many years. Moreover, many immigrants are in the reproductive ages and often have higher birth rates than the native population. Immigration can reduce the severity of population aging, but its role is limited. To offset the effects of population aging would require immigration on a scale that is both impractical and politically unacceptable. Given that population aging is a global phenomenon, immigration policy is a short-term solution at best.

A third approach is to enhance the productivity of smaller cohorts of children by investing in their human capital. We show here that there is a very strong trade-off between the number of children and investment in their human capital, a quantity–quality trade-off (Chapter 8). Thus future cohorts of taxpayers will have fewer members, but they will be more educated and more productive. Under plausible conditions, enhanced human capital can totally offset the decline in the support ratio (Lee and Mason 2010).

Whether population aging will undermine economic growth depends, as well, on the responses of saving, investment, and capital. Countries vary greatly in the extent to which the elderly rely on assets to fund their consumption. Population aging will lead to an increase in assets and capital per worker in countries that rely on assets to fund old-age consumption (Chapter 2). Reinforcing this finding is evidence that the elderly have relatively high asset income and continue to save throughout their lives in most countries (Chapter 9). The idea that population aging is anathema to the accumulation of capital and other assets is a myth.

The view that population aging will bankrupt public programs for the elderly is an oversimplification. Population aging will unquestionably lead to an increase in the number of beneficiaries relative to the number of taxpayers. Hence, per capita benefits must decline or per capita contributions must increase—or both. Aging will mean significant adjustments to, but not the elimination of, public programs for the elderly (Chapter 7).

The family is an important support system in much of world, but it is not a solution to the pressures of population aging on public transfer systems. The elderly in Asia rely most heavily on the family for financial support. But population aging will place great strains on any transfer system; and the family support system is as vulnerable as the public support system, and in some ways even more vulnerable (Chapter 8).

An important feature of our study is the comprehensive approach that incorporates, with the exception of bequests, all intergenerational transfers—both public and private, and to children as well as to the elderly. Policymakers and the public focus far too much on public transfers to the elderly. Relatively little attention is given to how support for the elderly compares with spending on public education and health care for children. By comparison, private transfers to children on the part of parents and others are virtually ignored. Our calculations of total transfers combine all

of these. Taking this comprehensive approach reveals a fundamental change across all societies (Chapter 4). Throughout history, transfers have flowed downward on net, from older to younger. Transfer systems were used by current generations to pass their own economic resources on to future generations. Population aging, reinforced by changes in the economic lifecycle and transfer systems, has led to a steady decrease in the strength of this downward pattern. The direction of transfers has reversed direction in the rich nations with the oldest populations, including Japan, Germany, Austria, Slovenia, and Hungary. In these societies, transfer systems are used by current generations to claim the resources of future generations. In the absence of significant reform, the direction of transfer flows will be reversed in many other countries as well by 2050.

The direction of transfers provides an important measure for judging whether fertility is too low and population aging too severe. When transfers flow downward, under the conditions described in Chapter 2, lower fertility and older populations enhance standards of living. When transfers flow upward, higher fertility and younger populations are beneficial. When the direction of transfer flows is balanced, variations in fertility and population aging make little difference to standards of living.

This broad trend in transfers encompasses wide variation across aging societies, with the most extreme changes in the direction of transfers occurring in Europe and Latin America and more modest changes taking place in the United States and East Asia. In addition to identifying countries most affected by population aging, calculations of transfer wealth point to programs that will experience the most pressure from population aging (Chapter 4). The results are not always obvious beforehand. Some countries have very small public programs. Some programs, such as health care, may on net transfer either upward or downward, depending on the population age distribution of the country and on the focus of the government programs. Combined government programs in the US, for example, on net transfer downward, not upward, as one would expect, given the focus of policy concern.

Among the most striking results from National Transfer Accounts are the clear signs of cooperation across generations. The economic flows through both the public and the private sectors are enormous (Chapters 7 and 8). Generational differences in per capita consumption are much smaller than would be the case in the absence of these transfers. The consumption age profiles for most Third World countries are quite constant across adult ages, indicating that on average the elderly are not suffering as a group. In most rich industrial nations, the elderly consume far more than younger adults, although much of their consumption is in the form of health care and long term care for the very old. So, overall, the NTA suggest that in both rich and poor countries average consumption by elderly people is not too low in relation to that of other age groups.

In some countries the concern is that the elderly are consuming too much and that, as a consequence, children are consuming too little. The evidence on this point is mixed. Per capita spending on health and education for children is much higher than in the past (Chapter 8). Total consumption by children as compared with that by the elderly is quite low in some countries—for example, in Brazil, Nigeria, and the United States (Chapter 6).

Although many of these issues seem most salient in rich, aging societies, countries in the developing world will soon face population aging and at relatively low levels of development. The difficulties this will raise have less to do with income, per

se, and more to do with the development of institutions that are essential in aging societies. Good governance is critical because governments are often heavily involved in providing essential support to the elderly, but also very important in providing the human capital investments that fuel future increases in productivity. Well-functioning, transparent financial systems are essential to the accumulation and management of assets on which the elderly depend. Poor financial literacy is a serious problem in rich countries, but even more so in countries where general literacy is still low. Countries that fail to anticipate population aging, for example, may adopt large-scale public pensions and other transfer programs that are unsustainable and difficult to reform. All policy responses to population aging that involve advance saving and prefunding are most effectively implemented decades before population aging actually begins, while the future elderly are still in their early working years.

Many important general lessons are to be learned from the comparative analysis presented in the next two sections of this book. Designing effective policy, however, is a complex, detailed, and inherently country-level task that is best carried out one country at a time. Many of the country chapters in Part III provide important insights about policy issues in each setting.

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[i] We refer to those under age 25 as the child population, those 25–59 as the working-age population, and those 60+ as the elderly population. The choice of these age categories is based on age profiles of consumption and labor income described below.

[ii] All the demographic data in this chapter are drawn from UN Population Division (2009) unless otherwise indicated.

[iii] Public asset-based reallocations for children are possible in countries in which children pay taxes. This occurs most frequently in countries that rely on consumption taxes. Chapters 3 and 9 provide more details.

[iv] In some economies the overall change between 2010 and 2050 is projected to be relatively small because increases over the next few decades will be cancelled by declines that follow. The importance of the support ratios for individual economies is best judged by consulting economy-specific estimates presented in the appendix.

[v] The correlation between the two series is −0.51.

[vi] The shares must sum to 1 by definition, but they need not be positive. Negative transfer shares indicate that the elderly are giving more than they are receiving. If the elderly are saving all of their asset income plus some of their labor income, the share for asset-based reallocations will be negative; but we do not observe this outcome for any country.

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