Sustainable Economic Policies in an Aging World

by

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Demographic change in the coming decades will take us into uncharted waters. In many countries life expectancy has reached historic highs and birth rates historic lows. The consequence will be populations which are old and declining. Just how large the changes will be are uncertain, but if birth and death rates remain at current levels changes in population size and age structure will be dramatic.

Should this be cause for alarm? A number of potential difficulties have been identified. The percentage of populations falling in the conventional working-ages will decline and dependency ratios will increase. Government programs that tax those in the working ages to provide health, long-term care, and retirement benefits to the elderly will become increasingly unsustainable. The value of homes, stock portfolios, and other assets may decline just when growing numbers of elderly are counting on these assets to fund their retirement years.

This paper examines the economic implications of population aging in light of new estimates and analysis of the inter-relationships between age and the economy based on the National Transfer Account (NTA) project. The NTA project is an international effort involving research teams from 25 countries coordinated by Ronald Lee, Director of the Center for the Economics and Demography of Aging and myself.[1] An important goal is to develop and apply a system for measuring economic flows across age groups – primarily from the working ages to the dependent ages, childhood and old age. These flows are a natural consequence of the economic lifecycle that characterizes all contemporary societies studied to this point. In all countries the flows are very large, but the systems for reallocating resources across age groups vary considerably from one country to the next. Some countries depend heavily on public transfers; other rely more on familial transfers; and still others place greater emphasis on lifecycle saving. A central thesis of this work is that economic effects of changes in population age structure depend in a critical way on the systems responding to the resource deficits that exist at younger and older ages. Effective policy responses are essential to sustaining standards of living in an aging world.

Is *homo sapiens* an endangered species?

Recent history of the human population is marked by remarkable growth in numbers. The world population has increased from approximately 1 billion in 1820 to well over 6 billion today and the most recent population projections anticipate that an additional 2.5 billion will be added by 2050.[2] Asia's population increase also has been dramatic. Its population was 1.4 billion in 1950 and is believed to now exceed 4 billion in 2007 (United Nations Population Division 2007). From a global perspective the human population is in no danger of decline for decades to come.

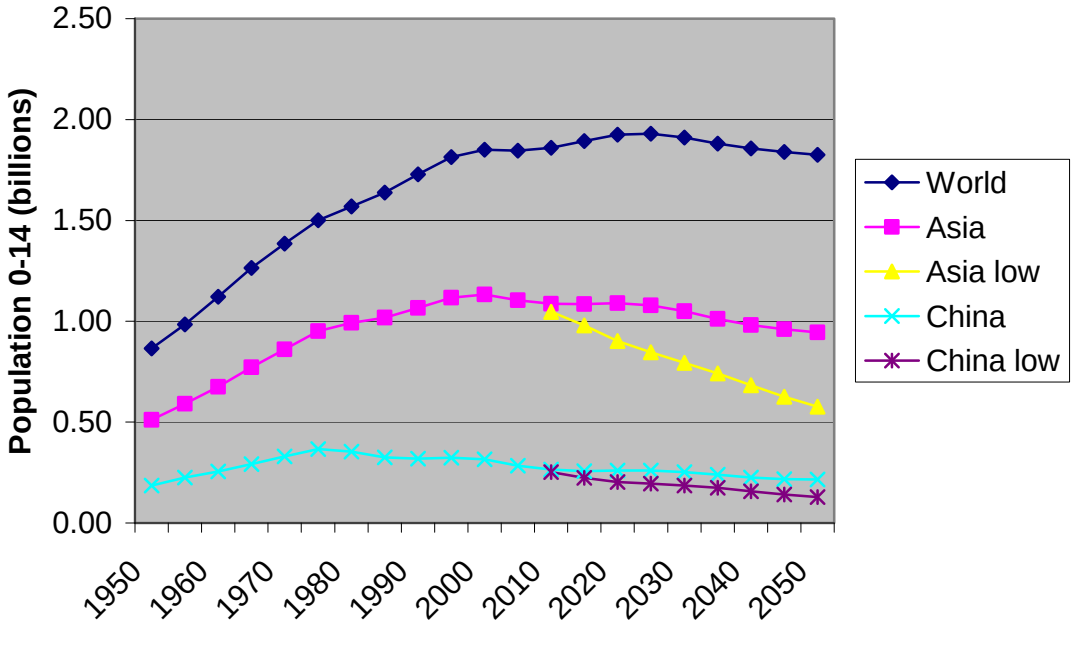
[1] More information about the NTA project is available at www.NTAccounts.org and Mason, A., R. Lee, et al. (forthcoming). Population Aging and Intergenerational Transfers: Introducing Age into National Accounts. Developments in the Economics of Aging. D. Wise. Chicago, NBER and University of Chicago Press.

[2] Medium projection of the United Nations Population Division 2007. All population estimates and projections in this paper are drawn from this source unless otherwise indicated.

A closer look at these numbers reveals, however, that important changes are underway. Of particular interest are trends in the number of children because children represent the future of any country. Children of today are the workers and parents of tomorrow, but the number of children has begun to decline in Asia. If the medium projection of the UN proves to be accurate the number of children in Asia will decline from 1.13 billion in 2000 to 0.95 billion in 2050 – a decline of 20 percent. Using the low fertility scenario of the United Nations, the number of children will decline to only 0.58 billion in 2050. Under these circumstances the number of children would decline by 45 percent and barely exceed the number of children living in Asia in 1950 (Figure 1).

In China the number of children (0-14 years of age) reached 370 million in 1975. The UN estimates that there were 280 million in 2005 and projects 220 million given the medium fertility scenario and 130 million given the low fertility scenario. If low fertility scenario comes to pass the number of children in China will decline by 65 percent between the peak year of 1975 and 2050.

Figure 1. Number of Children, 1950-2050



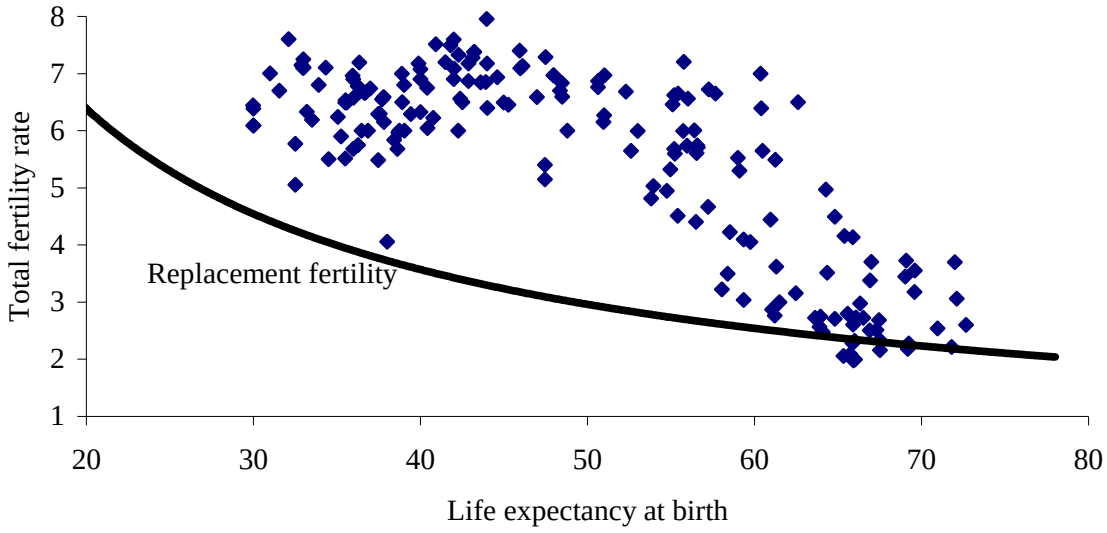
Why are fewer children being produced in Asia and many countries in the West? The trend reflects changes in the population of reproductive age and the rate at which they are producing children. In China, the percentage of the population in the childbearing ages has been rising since 1965. Currently close to 70 percent of the population is between the ages of 15 and 49. By 2050, however, only about 53 percent of the population is projected to be in the child producing ages given either the medium or the low UN fertility scenario. In a sense there is a cascading effect. Fewer children today means

fewer childbearing couples in the next generation and, hence, even fewer children in each subsequent generation.

The driving force behind the changes in the number of children and other important demographic events, however, is the decline in rates of reproduction. When fertility rates decline below replacement level, the population eventually begins to decline. Replacement fertility refers to births per woman over the reproductive span required to maintain the current population. If people only die when they are old, replacement fertility would be two births per woman. If infant and child mortality rates are high, replacement fertility is well above two births per woman. In a country with a life expectancy of 35, replacement fertility would be about four births per woman.

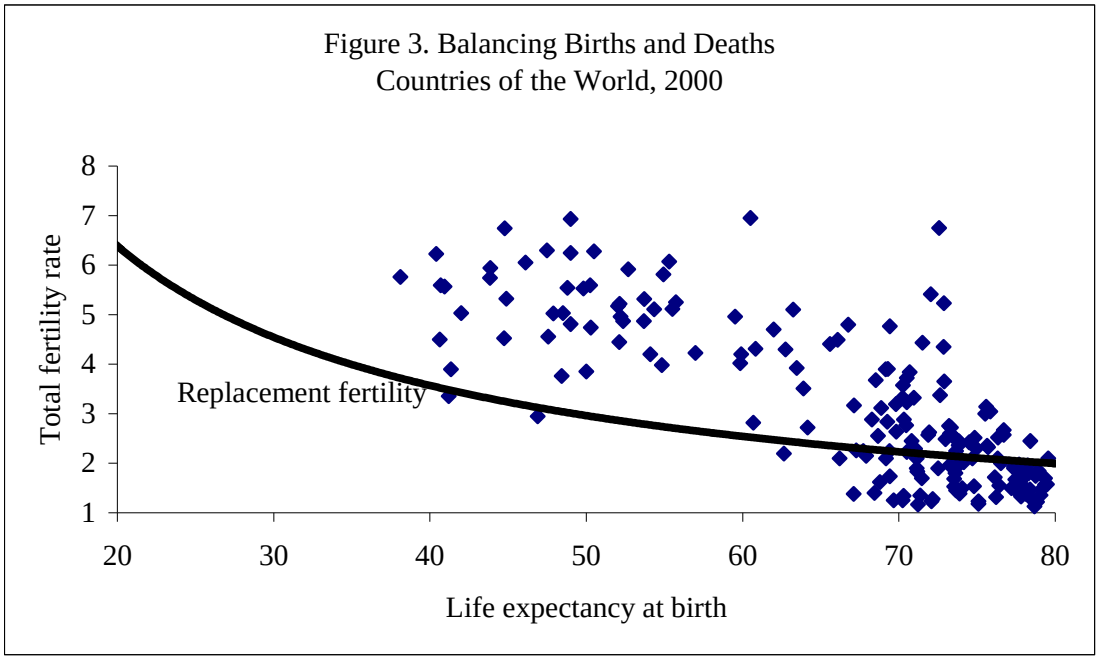
This balance between births and deaths is shown for 1950 for the countries of the world in Figure 2. With only a few exceptions the total fertility rate exceeded replacement fertility. In low income countries (those with a low life expectancy) the gap between the total fertility rate and replacement fertility was quite large on average. Women were averaging between five and eight births each. Among many high income countries (those with a high life expectancy) fertility was also higher than replacement fertility. Many of these countries were experiencing the well-known baby boom.

Figure 2. Balancing Births and Deaths
Countries of the World, 1950



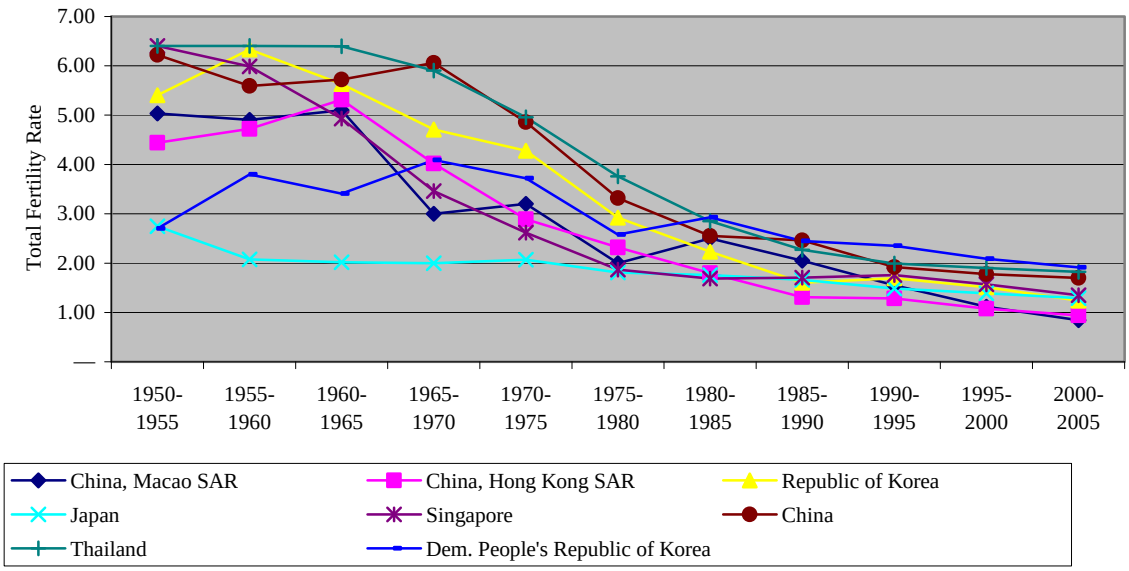
The situation in 2000 was very different (Figure 3). Of course life expectancy had increased enormously as compared with 1950, but the important point here is that the gap between replacement fertility and observed fertility had declined by so much. More over, in many countries below replacement fertility had emerged. Fertility rates were below

replacement level in 60 countries. Spain had the lowest fertility rate – 1.13 births per woman.



Low fertility is also becoming a familiar part of the Asian landscape. The total fertility rate is below replacement level in South and North Korea, Japan, Singapore, Thailand, and China and its SARs Macao and Hong Kong. In Taiwan, not included in Figure 4, the total fertility rate is also very low.

Figure 4. Fertility Trends, Asia's Low Fertility Countries



The significance of such low fertility may be difficult to grasp because its impact on population growth emerges slowly. Because the current age structure is so favorable to reproduction in most Asian countries, low fertility rates have had less impact on population growth. But as the concentration of the population in the reproductive ages declines, the impact of low fertility rates will be strong and difficult to reverse. To take an extreme example, a total fertility rate of one will eventually lead to a 50% decline in the population every generation (approximately every 30 years).

Japan is one country in Asia which has experienced low fertility for a sustained period. Fertility reached replacement level in 1959 and dropped significantly below replacement in the late 1970s. Currently the total fertility rate is about 1.3 births per woman. The UN projects that Japan's population in 2050 will be smaller by 25 million under their medium fertility scenario and by 40 million under their low fertility scenario.

Is *homo sapiens* an endangered species? Perhaps not, but an extended period of population decline appears to be almost certain. In almost all advanced industrialized countries rates of reproduction are below replacement level. Why fertility rates are so low, under what circumstances they might rise to replacement level, and how policies can facilitate that outcome are important questions with few answers.

Low Fertility and Population Aging

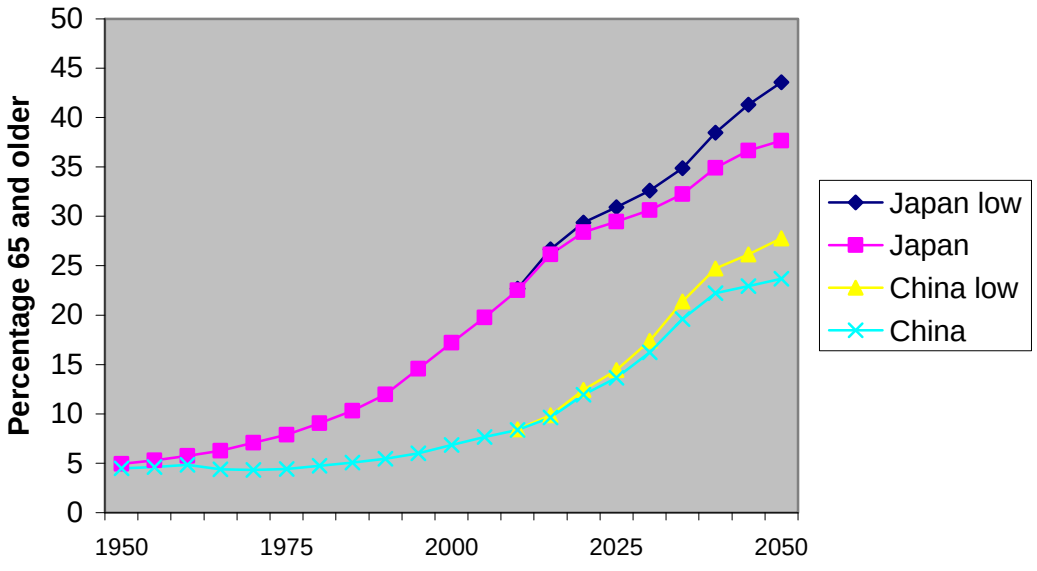
Low fertility has profound implications for population age structure. If successive generations are replacing themselves, leaving aside the effects of mortality, the result is a uniform age structure – each generation will be of equal size. Fertility above replacement

level leads to a young age structure. Sub-replacement fertility, if it persists, will lead to an old age structure. The effects of low fertility are reinforced by the steady improvements in survival rates at old age.

Population aging has been a relatively gradual process in the West because changes in fertility and mortality have been relatively gradual. Aging in Asia has been relatively rapid because both fertility rates and mortality rates have declined very rapidly. Exactly how rapidly Asia will age depends to a great extent on how fertility rates change about which there is a great deal of uncertainty. There is little uncertainty, however, that Asia's population will age.

In 2005 Japan had the oldest population in the world followed by Italy and Germany. One in five Japanese were 65 or older. UN projections anticipate that by 2050, about 40% per cent of Japan's population will be 65 or older. If fertility recovers, aging will be a little less rapid. If fertility remains low, aging will be a little more rapid. China's population is much younger than Japan's but is expected to age very rapidly. In 2005 about 8 percent of China population was 65 or older. By 2050 around one-quarter of China's population is projected to be elderly (Figure 5).

Figure 5. Population Aging, China and Japan



The Economic Lifecycle and the First Demographic Dividend

Population age structure has important economic implications because of the lifecycle that dominates our economic lives. We go through an extended period of childhood possible only because of the large transfers received by children from adults acting either in their role as parent (or grandparent) or in their role as taxpayer. In contemporary societies lives end with an extended period of old-age dependency. Again this is possible

only because of social and economic institutions that enable the elderly to consume substantially more than they produce through their labor.

In the NTA system the economic lifecycle is quantified by two age profiles – per capita consumption and per capita labor income. These are comprehensive measures. Consumption includes not only private consumption but also public consumption, which is undertaken by governments on behalf of individuals. Labor income includes all forms of remuneration to employees and estimates of the value of labor of self-employed workers including unpaid family workers.

The economic lifecycle in Figure 6 is an average profile for a group of developing countries. The two profiles have been normalized by dividing by the average of labor income for persons of age 30-49. This is done to facilitate comparisons across countries with vastly different levels of development and different currencies. A value of 0.6 for consumption means that per capita consumption at that age is 60 percent of the average labor income of a person in the prime working ages of 30-49. Likewise a value of 0.4 for labor income means that per capita labor income at that age is 40 percent of the average labor income of a person in the prime working ages.[3]

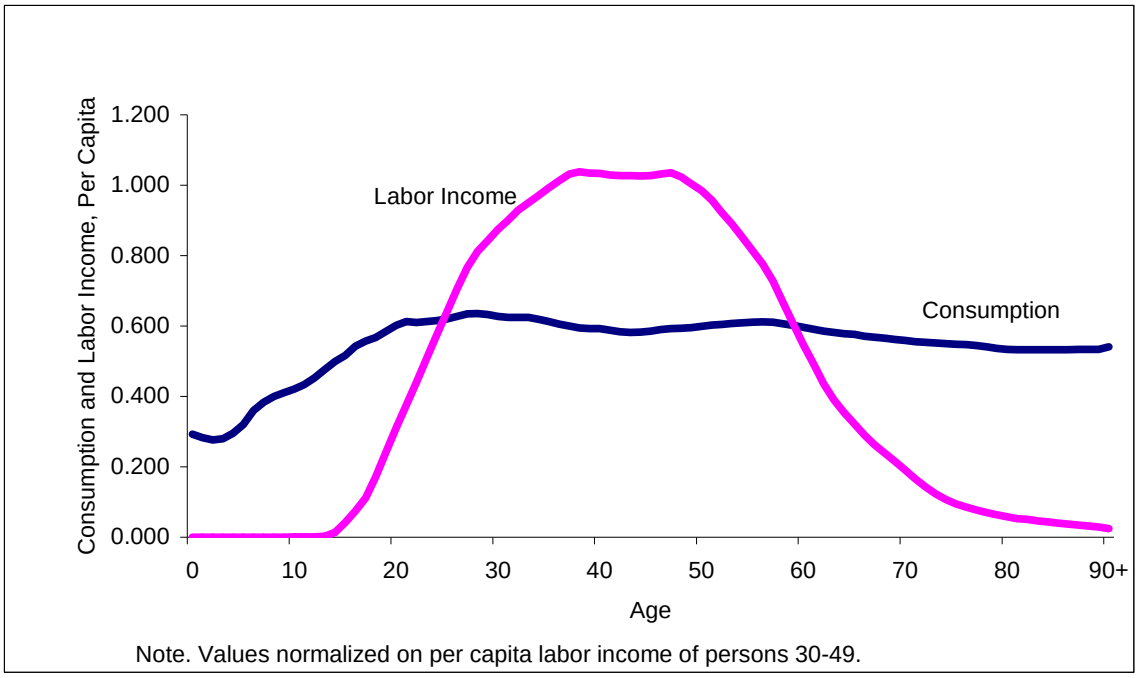


Figure 6. The Economic Lifecycle, Developing World Profile. Source: (Lee and Mason 2007).

[3] More information about the economic lifecycle is available in Lee, R. D., S.-H. Lee, et al. (2007 forthcoming). Charting the Economic Lifecycle. Population Aging, Human Capital Accumulation, and Productivity Growth, a supplement to Population and Development Review 33. A. Prskawetz, D. E. Bloom and W. Lutz. New York, Population Council. Also see www.ntaccounts.org.

The shapes of the age profiles in Figure 6 confirm our basic understanding of the economic lifecycle. Labor income is concentrated during a relatively short span of life while consumption is much more evenly spread across age groups. Consumption by children is less than consumption by adults reflecting physiological differences, although in some East Asian countries consumption by children exceeds consumption by prime age adults because of high levels of spending on education. The young and the old are consuming far more than they are producing through their labor. Prime-age adults, in contrast, are producing far more than they consume. A surprising feature of the profile is the short period during which people are producing more than they are consuming. The age at which young people begin to produce as much as they consume is late, in the mid-twenties, and the age at which they no longer produce as much as they consume is early, in the late fifties.

The per capita or individual economic lifecycle is not independent of the age distribution of the population, however. The lifecycle deficits of children and older adults are financed entirely or in part by transfers from those in the working ages. If a large share of the population is concentrated at ages with a lifecycle surplus, intergenerational transfers can be correspondingly large and, hence, per capita consumption can be higher. But if the share of the population in the dependent ages is large, then any lifecycle surplus must be spread over more "dependents" and consumption must be less.

An important influence of age structure can be analyzed by considering a highly stylized economy in which all lifecycle flows consist of transfers from the working ages to the dependent ages. Importantly ruled out for the moment is saving, i.e., workers do not accumulate assets used to finance consumption during their retirement. To demonstrate the implications of changing age structure, consider three important cases that occur over the demographic transition.

- Young populations: early in the demographic transition; large lifecycle deficit at young ages and large economic flows from the working ages to children.
- Middle-aged populations: middle of the demographic transition; concentration at working ages leads to relatively large lifecycle surplus and smaller economic flows to children or the elderly.
- Old populations: end of the demographic transition; large lifecycle deficit at old ages and large economic flows from the working ages to old ages.

These three cases are illustrated using the population of the United States in 1850, a very young population, the projected population for China in 2015, a population with a large working-age population, and the projected population for Japan in 2080, an old population. The cases are constructed using the per capita labor income profile used in Figure 6 and the per capita consumption profile adjusted so that total labor income and total consumption are in balance.

The aggregate economic lifecycle for the three cases are shown in Figure 7. The aggregate labor income profile and the "benchmark" aggregate consumption profile are constructed using the per capita profile in Figure 6. However, the "final" consumption

profile is higher or lower than the benchmark profile as required to satisfy the social budget constraint that aggregate consumption cannot exceed aggregate labor income.

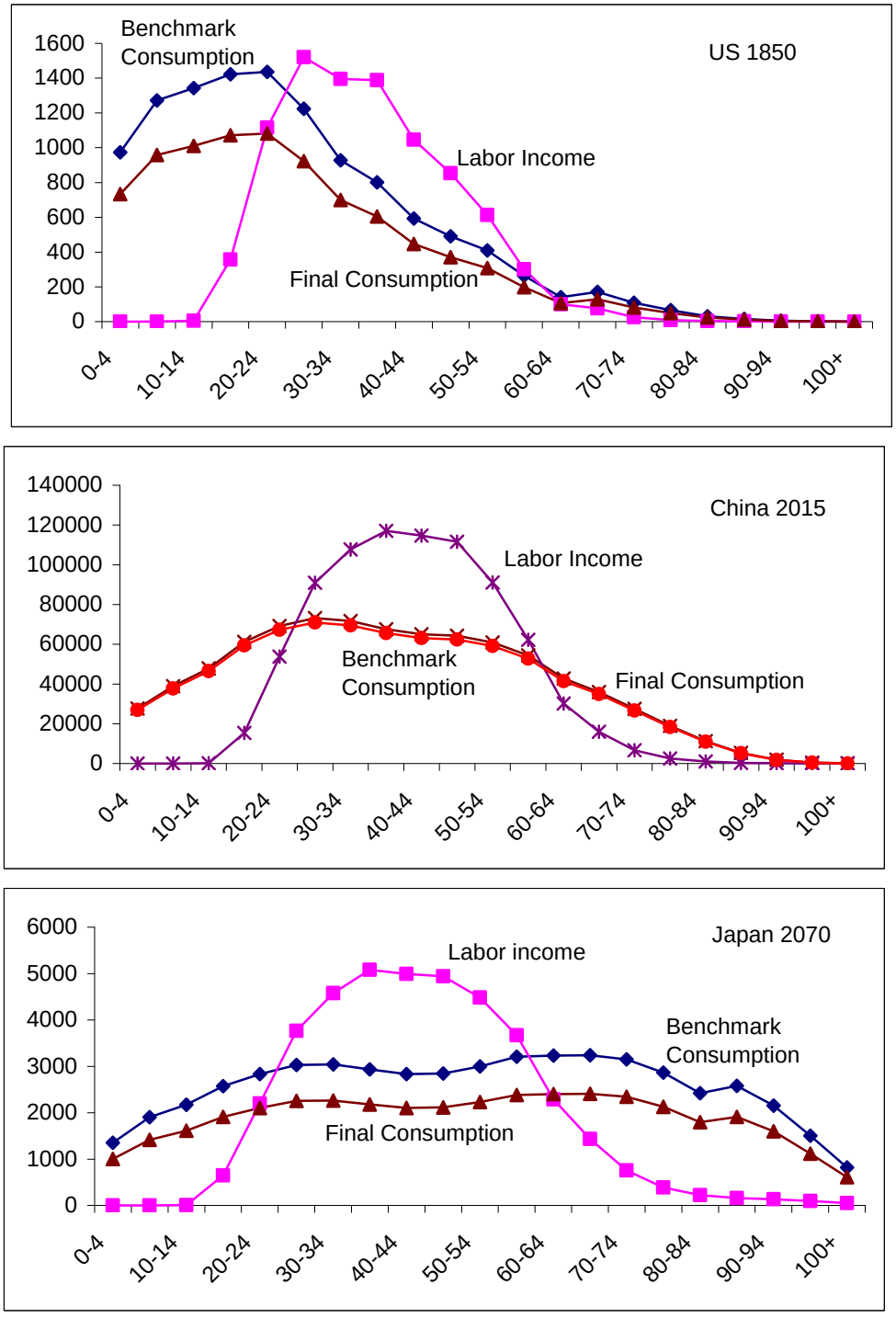


Figure 7. Aggregate Consumption and Labor Income by Age, Consumption-Loan Economies, Three Cases.

Given the age structure of the US population of 1850, the benchmark per capita consumption profile cannot possibly be sustained out of labor income. Transfers to children would greatly exceed the surplus of workers. A proportionate decline in consumption at every age by 25% would be sufficient to satisfy the social budget constraint that aggregate consumption cannot exceed aggregate labor income.

The projected age structure for China in 2015 is much more favorable to maintaining higher standards of living. In 2015 the shares of the child and old-age populations combined are at historic lows and, hence, labor income can support a much higher level of consumption than in a very young population – about 2% higher than benchmark consumption.

The final case is the projected age structure of Japan. Again sustainable consumption is lower by 26% as compared with benchmark consumption. In this case the low level of consumption can be traced to the large population at older ages.

It is striking that the "penalty" imposed by a very young population is virtually identical to the "penalty" imposed by a very old population. This result is not peculiar to the three particular cases selected here. In general, the demographic transition leads to swings in the age structure that produce swings in consumption. Consumption is first depressed by a young age structure, then favored by the middle-aged age structure, and finally depress by an old age structure. Often the sustainable level of consumption at the end of the demographic transition is very near the sustainable level of consumption early in the demographic transition given the simplifying assumptions made here.

The economic impact of changing age structure has been noted by many scholars and is often called the *demographic dividend* (Bloom and Williamson 1998; Bloom, Canning et al. 2002; Bloom and Canning 2003; Lee 2003; Lee, Mason et al. 2003; Lee and Mason 2007). My own work, often in collaboration Ronald Lee, refers to this effect of age structure as the *first demographic dividend* (Mason 2005; Mason and Lee 2007). The application of these ideas to China may be of particular interest to the Shanghai Forum (Wang and Mason 2007; Wang and Mason 2008 forthcoming).

The swings in age structure in China and other Asian countries have been very dramatic as compared with Western countries, for example, because life expectancy and fertility rates have changed so rapidly. Of particular importance is the unprecedented speed of fertility decline. Using the economic lifecycle presented in Figure 6, the impact of the first demographic dividend can be traced for China from 1950 to 2050 (Figure 8).

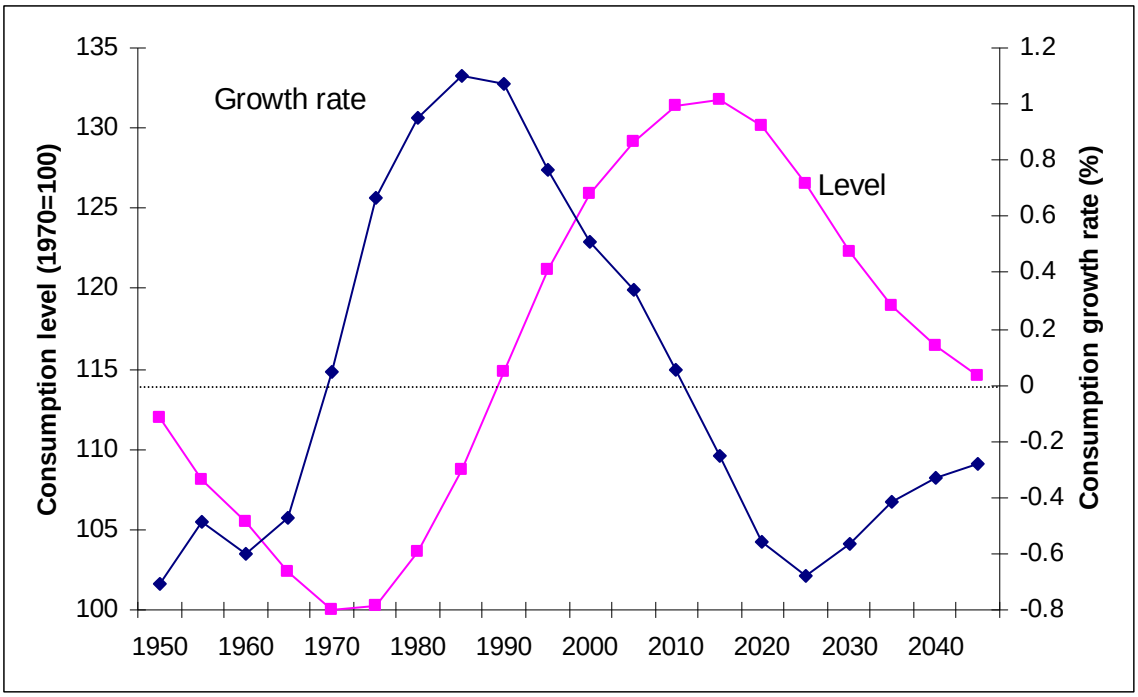


Figure 8. The First Demographic Dividend in China. Level and growth rate of consumption possible in a pure transfer economy. Based on UN population projections (medium scenario) and the average lifecycle for four developing countries.

The increase in the child population depressed consumption in China between 1950 and 1970. During the next forty years 1970-2010 China realized its first demographic dividend. The working age population adjusted for age differentials in productivity grew more rapidly than the consuming population adjusted for age differentials in consumption. The effect was to increase the level of per capita consumption by over 30%. The peak effect occurred between 1980 and 1995 when per capita consumption grew by more than 1% per year on average because of the first demographic dividend.

The positive effect on growth has peaked in China and will soon decline. Growth for 2010-15 will be essentially zero and negative thereafter. By 2050 the favorable effects of the first dividend will have dissipated entirely as compared with the situation in 1950.

The Second Demographic Dividend

The first dividend captures an important effect of changing age structure, but the simple analysis presented above is incomplete because it only considers how changes in age structure influence the relative numbers of workers, not their productivity. Moreover, there is no consideration of non-labor income such as returns to capital and other assets. The second demographic dividend arises because changes in age structure influence the accumulation of wealth and capital. Given the appropriate policies aging can lead to a sustained increase in standards of living that persist after the first demographic dividend has long disappeared (Mason and Lee 2006).

One important possibility is that population aging is accompanied by an increase in human capital because of the trade-off between the number of children and investment in the human capital of children. A key element in Becker's seminal work on fertility is that economic growth leads to a substitution between the quantity of children and the quality of children (Becker 1991). If Becker's hypothesis is correct, low fertility cohorts will be small but they may be unusually productive due to their enhanced human capital. As a consequence aggregate and per capita economic growth will be more rapid than would otherwise be expected. This is an important issue that we are beginning to explore in our work (Lee and Mason 2008), but in the current paper I will emphasize the impact of age structure for saving, investment, and physical capital.

In the pure transfer economy, as used in the previous section, the needs of dependent generations are met entirely through transfers from workers. In reality the transfer mechanism plays a role, but accumulating assets through lifecycle saving is an alternative means by which the material needs of the elderly are satisfied. To the extent that societies rely on saving economic growth is enhanced. If saving is invested abroad, national income is greater. If saving is invested in the domestic economy, wages grow more rapidly and GDP is greater. In either case, economic growth will be greater if saving rates are raised.[4]

How aging will influence capital accumulation and economic growth can best be considered by addressing two separate questions. The first question is how population aging influences aggregate pension wealth broadly conceived as the value of all flows on which the elderly rely to meet the gap between consumption and labor income during old-age. Aggregate pension wealth includes assets and transfer wealth, the value of net transfers to and from the elderly. Transfer wealth includes public transfer wealth, the present value of net public transfers for pension programs, health care programs, long-term care and other public services and cash transfers to the elderly. Transfer wealth also includes familial and other private transfers to and from the elderly. For an individual familial transfer wealth is the present value of anticipated transfers during old-age received from family members less the present value of anticipated transfers made to older family members.

Aggregate pension wealth is influenced by population aging in a number of important ways. First, age structure has a compositional effect on aggregate pension wealth. Pension wealth varies substantially over the lifecycle. Pension wealth is small or even negative for those who are first entering the labor force. Pension wealth for those who are at or near retirement is especially large. Thus, pension wealth is larger for a population with a large concentration in the later working and early retirement ages. Second, increases in adult longevity lead to an increase in aggregate pension wealth. The elderly are living longer throughout the world and, as a consequence, spending a larger part of their lifetimes as retirees. More pension wealth must be accumulated to finance a longer retirement period. A third consideration is more complex. Changes in population age structure will also influence per capita consumption at older ages. In the simple analysis presented above per capita consumption at all ages is depressed as the share of

[4] It is possible for countries to save too much, but we do not observe this in practice.

the population at old ages increases. This result follows from the assumption that the shape of the age-consumption profile does not change over time. It is possible, however, that consumption by the elderly will fall or rise relative to consumption by working-age adults and children. If population aging induces an increase in consumption by the elderly relative to consumption by other age groups, then pension wealth must rise relative to the fixed consumption profile case. If population aging induces a decline in consumption by the elderly relative to consumption by other age groups, then pension wealth must decline relative to the fixed consumption profile case.

The second question about how aging will influence capital accumulation is whether lifecycle pension wealth consists of assets or private and public transfers. In the polar case considered in the previous section, the pure transfer economy, asset accumulation would play no role and aging would lead only to an increase in transfer wealth – familial, public, or both – but not to an increase in assets or capital. In the pure lifecycle saving model, aging would lead only to an increase in assets and, hence, to capital or foreign assets. Neither of these polar cases is realistic. Conditions vary widely across countries, but transfers and asset accumulation play an important role everywhere. This is a point to which we return below.

The potential importance of the second demographic dividend can be assessed using simulation techniques. The results presented here are based on a general equilibrium model using detailed population data for China and the economic lifecycle for the developing world.[5] The paths shown in Figure 9 conform to alternate assumptions about the relative roles of transfers and assets in meeting the lifecycle needs of the elderly. The high scenario assumes that two-thirds of lifecycle wealth consists of assets and one-third of transfer wealth. The low scenario reverses these shares assuming that one-third consists of assets and two-thirds of transfer wealth.

Under the high scenario until the early- or mid-1980s the pension wealth and assets required to meet the lifecycle needs of the elderly are quite modest. In 1980 the ratio of assets to labor income is 1.0. Thereafter, the simulated demand for pension assets grows quite dramatically – doubling before 1990, again before 2000, and eventually again. By 2045 the simulated demand for assets is eight times aggregate labor income. Note that the projected 8-fold increase is in wealth relative to labor income, which is also growing.

In 1985 and earlier assets are similar under either growth scenario. Thereafter, however, the high and low scenarios diverge quite substantially. Assets reach only 2.2 times labor income under the low scenario.

[5] Technical details about the simulation model are available in Mason, A. and R. Lee (2007). Transfers, Capital, and Consumption over the Demographic Transition. Population Aging, Intergenerational Transfers and the Macroeconomy. R. Clark, N. Ogawa and A. Mason, Elgar Press.

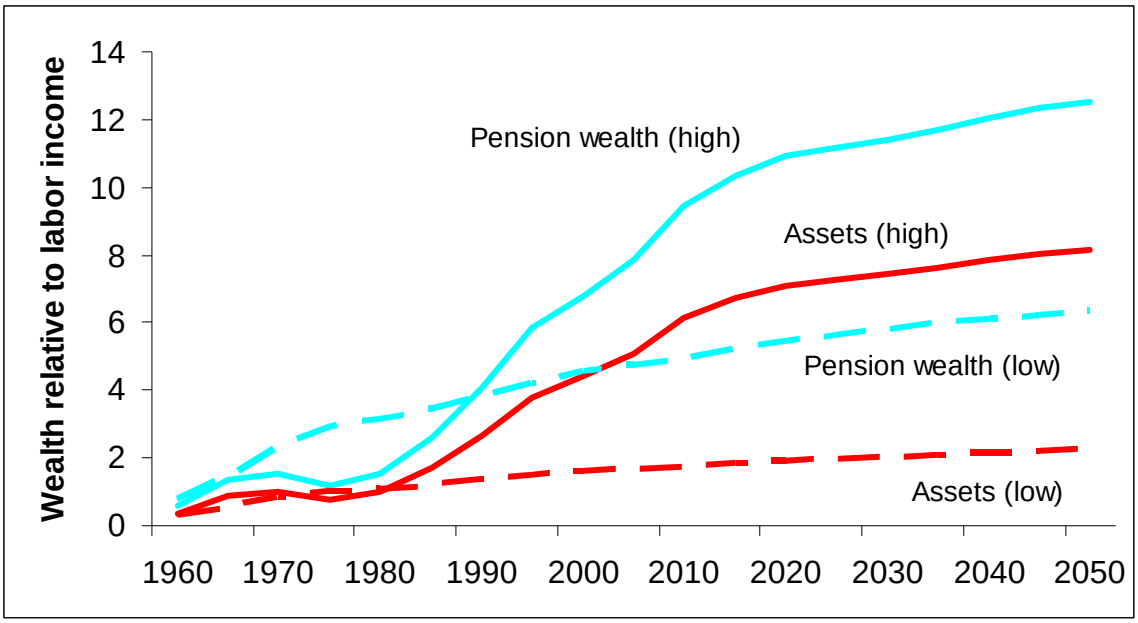


Figure 9. Pension wealth and assets relative to labor income, China's population and economic lifecycle for developing world, technological change of 2% per annum, open economy. High scenario: two-thirds of lifecycle pension wealth consists of assets. Low scenario: one-third of lifecycle wealth consists of assets. For a detailed description of the simulation model see Mason and Lee (2007).

Consumption provides a bottom line basis for comparing these scenarios (Figure 10). No impact is felt until population aging leads to an increase in assets in the mid-1980s. For a period consumption is lower under the high asset scenario because residents must consume a smaller fraction of their income and save more. The benefits from the high asset scenario emerge later starting around 2015 when consumption is appreciably higher under the high asset scenario. By 2050 per capita consumption is higher by more than 25% because of the high asset scenario. Although not shown in the figure, the gains in consumption persist indefinitely into the future.

Two important points require emphasis. The first is that population aging can lead to a second demographic dividend because it stimulates the demand for pension wealth. The second point is that the higher demand for pension wealth can be satisfied by greatly expanding public transfer programs. Realizing the second dividend, however, requires that the higher demand for pension wealth be satisfied through higher saving and the accumulation of capital.

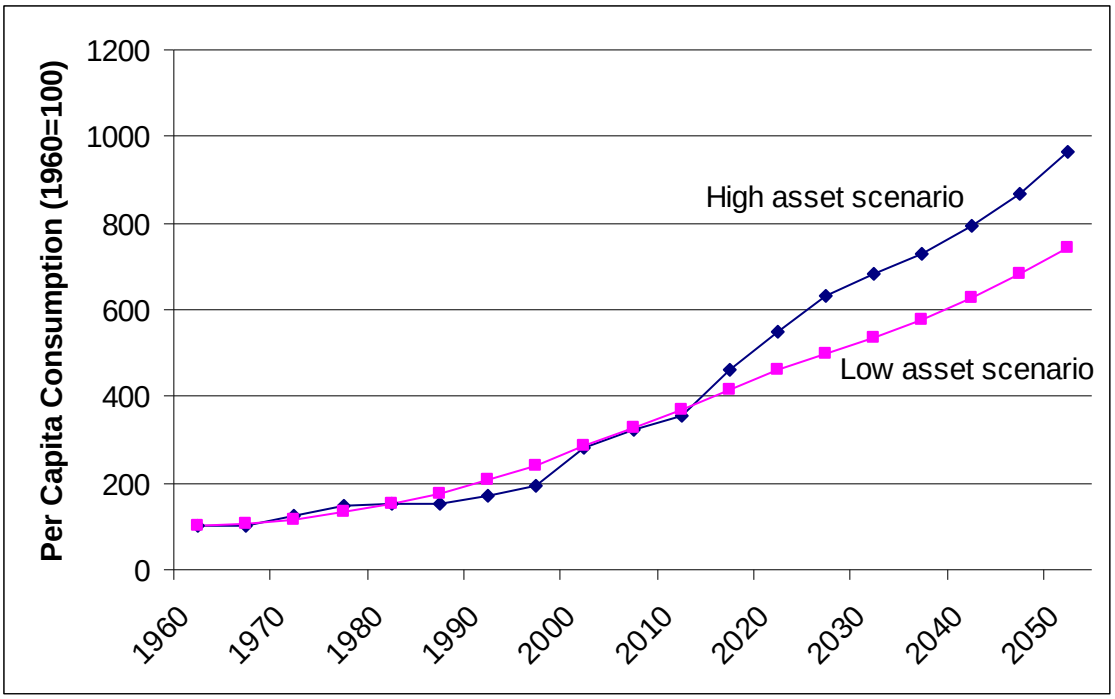


Figure 10. Per Capita Consumption (1960=100). High and low asset scenarios. See Figure 9 for more details.

Economics Flows Across Age Groups

The gaps between consumption and labor income are very large and can exist only because of important social and economic institutions that enable economic flows from one age group to another. In almost all societies the family is the key institution responsible for channeling resources from adults (parents and grandparents) to children. The public sector plays an important role here, as well. Public schools and publicly-funded health care are important to children in most countries, but children are also the beneficiaries of other public services that are not specifically targeted at them.

Transfers are also an important mechanism for filling the gap between consumption and production by the elderly. Here the role of the family is less pervasive. Familial transfers between adult children and the elderly are relatively unimportant in Western countries as compared with Asia and Latin America. The direction of familial transfers in Asia and Latin America is difficult to judge, however, because so many transfers occur within extended households.

The direction of public transfers is much easier to discern. Many European and Latin American country have relied on generous public pension programs that generate large transfers from workers to the elderly. Japan and the US have substantial programs but theirs are somewhat less generous than found in Europe and Latin America. This is a very active area of reform, however, and many countries curtailed public transfer programs as they have begun to consider the difficulty of sustaining these programs in the face of population aging.

Trends and policies with regard to health care and long-term care also have very important implications for public transfers to the elderly. In the United States, health care spending is particularly large, growing rapidly, and closely linked to age. In other countries, as well, health-related public transfers to the elderly are substantial. Finland, Japan, and Sweden are examples of countries for which NTA estimates are available for which this is true.

A third important mechanism for shifting resources from working ages to old age is saving. Workers can accumulate assets and rely on asset income and dis-saving during old age to fill the gap between consumption and labor income. The means by which this is accomplished are varied. In some countries, Singapore being a prime example, governments mandate the accumulation of assets in preparation for retirement. Other countries rely more on employment-based pension systems or independent saving by individuals with varying incentives, protections, and restrictions imposed by governments.

Financial systems are used to a more limited extent to fund the lifecycle deficit of children. In principle, children could support themselves by accumulating debt that they would repay during their working years. In the US more young adults are entering the workforce encumbered by student loans. For the most part, however, legal and social constraints limit the extent to which children can rely on the accumulation of debt to finance their consumption.

A fundamental objective of the National Transfer Account project is to construct comprehensive estimates of all economic flows from workers to children and to the elderly identifying the economic systems on which countries rely. This work is in a relatively early stage and estimates for only a few countries have been constructed. Work for China is underway and will soon be completed.[6] Estimates for Taiwan have been completed, however, and may be of particular interest to participants in the Shanghai Forum.

The estimates are based on income and product accounts for Taiwan, administrative records on key public programs, and a detailed survey of family income and expenditure.[7] Estimates for 1998 by single year of age for those 65 and older are summarized using a ternary or triangle graph which documents the three components used to fill the gap between consumption and labor income at each age. Those components are familial transfers, public transfers, and assets – either asset income or dis-saving (Figure 11).

[6] Estimates for China are being constructed by a research team led by Professor Li Ling and based at the China Centre for Economic Research, Peking University.

[7] A detailed description of the data and results are available on www.ntaccounts.org. The estimates was a collaborative effort of An-Chi Tung, Mun-Sim Lai, and myself. The project is based at the Institute of Economics, Academia Sinica, Taipei, Taiwan.

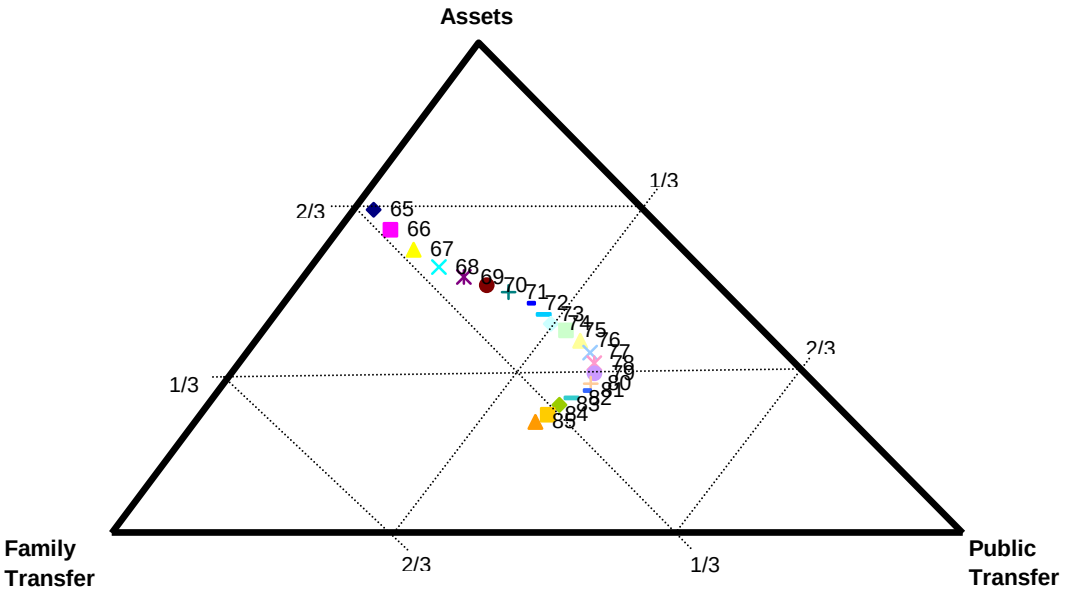


Figure 11. Shares of assets, family transfers, and public transfers in lifecycle deficit, Taiwan, 1998, by single years of age 65-85. Source: (Mason, Lee et al. forthcoming) and www.ntaccounts.org.

The importance of a particular source is judged by how close it is to the point of the triangle. A point at the triangle labeled "Family transfer", for example, would indicate that all of the lifecycle deficit, the gap between consumption and labor income, was met through family transfers. The intersection of the grid lines in the center of the triangle mark the point at which the three components are equal to one-third of the total and thus of equal importance.

What was the situation in Taiwan? In 1998 those who were 65 years of age received virtually no net public transfers. No doubt they were receiving public benefits – pensions, health care, and other public goods and services – but they were paying taxes essentially equal to the benefits received. About one-third of their deficit was met through family transfers and about two-thirds was met by relying on assets.

Age has a very substantial impact on the system of support, however. As we look at successively older individuals we see that they are relying increasingly on public transfers and decreasingly on assets. Family transfers were a somewhat smaller share for those in their 70s than those in their 60s. Those in their 80s are relying to an important degree on all three sources: assets, family transfers, and public transfers. Of the three, however, public transfers are most important for them. At the oldest ages, family transfers are increasing in importance as asset income continues to decline.

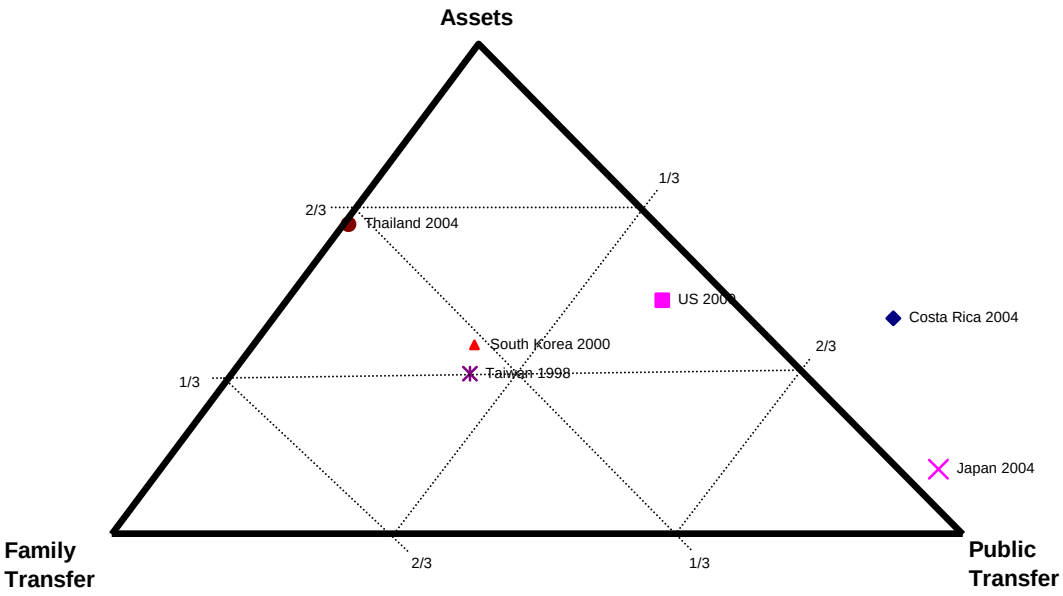


Figure 12. Shares of assets, family transfers, and public transfers in lifecycle deficit, selected countries, 65+. Sources: Costa Rica (Rosero-Bixby and Robles forthcoming); Japan (Naohiro Ogawa and Rikiya Matsukura www.ntaccounts.org); South Korea (An et al., www.ntaccounts.org); Taiwan (Mason, Lee et al. forthcoming) ; Thailand (Amonthep Chawla www.ntaccounts.org); US (Ronald Lee www.ntaccounts.org.

Similar information is available for a limited number of countries for which National Transfer Accounts have been constructed. The average for those 65 and older is plotted in Figure 12 and the great diversity is quite apparent. South Korea is similar to Taiwan with a relatively balanced system of support. In Thailand, the elderly rely for two-thirds of their support on assets and for one-third on family. Net public transfers to the elderly are essentially zero.

Net familial transfers are not a source of support on average for the elderly in the US, Costa Rica, and Japan. It is well known that financial transfers between adult children and the elderly are relatively small in the US. Moreover, co-residence rates are low in the US so that intra-household transfers are also small. The situation is very different in Costa Rica and Japan, however. Transfers flow in both directions in these countries – from adult children to parents and from parents to their adult children. The

downward transfers in Japan outweigh the upward transfers to a modest degree and hence net familial transfers to the elderly are negative. In Costa Rica downward transfers are substantially greater than upward transfers. Net public transfers are substantial in both countries exceeding two-thirds of the gap between consumption and production. Thus, downward familial transfers are to an extent compensating adult children for their very substantial public transfers to the elderly.

Of the six countries portrayed in Figure 12, all but Japan are relying on assets to fund between one-third and two-thirds of their lifecycle deficits. This is the range explored in the simulation analysis presented above. For countries in the upper part of that range, capital accumulation will be stimulated to a greater degree by population aging. Those countries relying on familial support, Thailand, South Korea, and Taiwan, are most likely to see those systems strained by population aging. And those countries relying most on public transfers, Japan and Costa Rica, will be most vulnerable to fiscal strains as a result of population aging.

Concluding Remarks

Population aging is frequently viewed as an object of concern. That rapid population aging will occur around the world is virtually certain as life expectancies continue to rise and as fertility rates drop to or remain at low levels. How rapidly populations will age is uncertain, however. Experts disagree about the likely course of life expectancy. Some anticipate steady increases in the future while others believe that life expectancy will level off at a high level. More importantly no one can forecast with confidence how much fertility rates will drop in China, India, and other developing countries. Nor can we reliably forecast whether fertility rates will recover from the low levels we currently find in many industrialized countries.

The implications of population aging for the economies of the world are also difficult to judge. Among the concerns are a decline in the share of the population in the working ages, a decline in the demand for assets and asset prices, and a decline in the number of taxpayers relative to the number of beneficiaries. The important message in this paper, however, is that significant population aging may be accommodated if sound economic policies are adopted.

First, the economic lifecycle is susceptible to policy. In particular, the years of high labor productivity can be extended to later ages. Many countries have policies that work against this – mandatory retirement ages and tax and pension policies that reduce work incentives among older adults. Eliminating the barriers and disincentives to work and reducing the gap between consumption and production by older adults is one important way to accommodate population aging.

Second, the economic "contribution" of new generations of workers will depend on their productivity as well as their numbers. Total labor product and the tax base of each new generation – and their ability to support older generations – will decline more slowly and perhaps not at all if investment in human capital offsets the decline in the number of

children. Who should bear the cost of human capital investment? In countries where transfers to the elderly are primarily a family obligation rather than a public one, the incentives for parents to invest in their children may be sufficient. As public transfers begin to dominate familial transfers, however, investment in the human capital of younger generations becomes a more important public concern.

A third issue, emphasized in this paper, is the connection between population aging and investment. Population aging leads to a substantial increase in the demand for capital if assets constitute an important component of the retirement "portfolio". Excessive reliance on transfers, either public or familial, will undermine this connection and destroy the possibility of a second demographic dividend. Public policy must do more than avoid excessive reliance on transfer programs, however. Governments and the private sector must strengthen institutions that allow and encourage individuals to accumulate personal wealth and achieve economic independence during their retirement years. Such policies will benefit the elderly and allow countries to sustain higher standards of living for all generations.

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