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Aging in Japan: Causes and Consequences
Part II: Economic Issues

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Abstract

This survey reviews current research on the impact of present demographic trends -- population aging combined with slower overall population growth -- on Japan's economic future. Among the conclusions that emerge are the following:

- Japan has been successful in combining rapid economic growth with a high degree of economic equality. However as its population ages its income distribution will become more unequal. But this will be due to a greater weight being given to the elderly where income is distributed most unequally. There is not likely to be any significant increase in inequality within age groups.

- Much of the research reviewed here has to do with the relationship between population aging and household savings in Japan. This research has tended (some might say narrowly) to confirm the relevance of the life cycle hypothesis, leading to the conclusion that population aging will reduce the household saving rate. There is unanimity that population aging will negatively affect government balances through the rising system dependency rate of the public pension system and, less significantly, rising health care costs. Thus, all projection exercises studied here have concluded that projected demographic trends will reduce the aggregate saving rate.

- Much less attention has been devoted to investment than to saving. All projection exercises reviewed here have concluded (or, perhaps more accurately, assumed) that the impact of demographic trends on investment will be less significant than their impact on saving, with the result that the current account surplus will diminish, and may eventually turn into a deficit.

- The traditional Japanese labor market system of lifetime employment, seniority-based compensation, and mandatory retirement at an early age is already coming under pressure due to aging of the labor force. The opportunity costs of distortions and institutional factors that affect the labor supply of women will rise as labor becomes scarce.

- Deceleration in the rate of labor force growth combined with diminishing returns to capital should be a powerful stimulus for intensified research and development activities in Japan. This activity should enable Japan to push back the frontier of industrial technology and achieve an acceleration in the rate of growth of labor and total factor productivity. That has not happened. In almost every sector and by almost every measure Japan's rate of productivity growth has been falling in recent decades.

- Pension reform has the potential to defuse the macroeconomic impacts of population aging, however, given the fact that 70 percent of the income of the elderly comes from the public pension system, the distributional impacts are likely to be large. In the past four-fifths of public pensions are wage-indexed. At that time pension system contribution rates were essentially delinked from productivity growth under current arrangements. Another way of looking at this is that, as population aging and productivity gains raised wage rates, pensions rise *pari passu* and contribution rates must rise as well.

About the Author

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Aging in Japan: Causes and Consequences
Part II: Economic Issues

David E. Horlacher

Introduction

There is widespread concern in Japan among economists, public officials and the public at large about the economic consequences of population aging. Such concern is a prudent response to a demographic inevitability. Not only will the population of Japan age significantly in future decades; it will age more rapidly than any country has ever done before. Japan is on the frontier of our knowledge of how workers, savers, investors as well as administrators of public health and pension plans must change so as to adapt to a rapidly aging population. These various decision-makers must find an economically viable path that citizens and governments in other aging nations may wish to follow.

In September 2000, the GDP of Japan was falling. It was lower than it was three years earlier and unemployment was at a three-year high.[1] In part, this situation may simply be a reflection of short-term deficiencies in aggregate demand. But it is possible that longer-term economic forces associated with population aging are already at work As Japan's labor force growth slows, there is less need for investment in new equipment. As the contribution rates of public pensions rise, less remains of personal incomes for saving and investment. As public policies lengthen the working lives of the elderly, the career opportunities for young people are diminished. The creativity, energy and vitality that young people bring to the workplace may be reduced or lost altogether.

When the Japanese children who are born this year are themselves elderly, they may well find themselves living in a nation that is continuing to grow smaller - and older. Will such a nation be able to make the necessary savings and be able to increase the labor productivity to the degree that will be needed to support those children in their old age?

This study will review the state of our knowledge on those questions.[2] It will be divided into three broad sections. This first section has examined the trends in Japan's demographic structure and the reasons why those trends may continue. The present section will examine the economic implications of population aging and proposed policies for addressing some of the key problems posed by population aging. The final section will examine the implications of increases in the absolute and proportionate size of the old age population for the welfare of the elderly themselves.

The present chapter is divided into six parts. The first part examines the effects of population aging on the size and growth rate of GDP and the distribution of income and wealth. The second part examines the likely effects of population aging on savings rates at household and national levels. It also considers the implications of

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[1] Paul Krugman, "End of ZIRP", *New York Times*, August 13, 2000.

[2] The present study is a component of a larger research effort by IIASA on the Socio-economic Impacts of Aging that is supported by the Economic Planning Agency, Government of Japan.

changing the saving rate for capital formation and foreign balances. The third section examines the effect of population aging on the stock of labor and human capital. Section four looks at trends in productivity growth. Section five covers the effects of population aging on pension and health systems, and the final section examines a number of economic demographic models that have been developed to project Japan's economic future and to conduct simulations of policies which might make that future brighter.

I.   GDP and the Distribution of Income and Assets

A.   Size and Growth Rate of GDP

In the three decades between 1965 and 1995, Japanese real GDP more than tripled to about 500 trillion yen (4.4 trillion dollars). By 2000, real GDP in 1995 prices had risen to 518 trillion yen (4.5 trillion dollars), (Government of Japan, 2001). However, the Japan Center for Economic Research (1998), projected that in the two decades between 2005 and 2025, Japanese GDP will decline by about 3 per cent.

Figure 1.1

GNP, Japan, 1970-1994
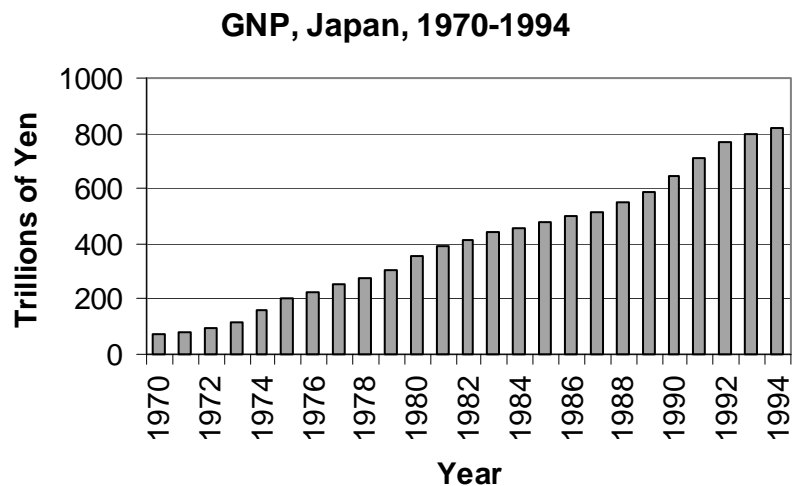
Source: Hayashi, Fumio (1997), Table 10.2.

Kosai, Saito and Yashiro (1998) divide the last century of Japanese growth into four periods. Prior to World War I, the average rate of growth was about 3 percent. After that war, the growth rate was slightly higher. Between the end of World War II and the mid-1970s was the period of most rapid growth (about 8 percent per year). This high growth period ended after Japan had caught up with the rest of the OECD countries technologically. Since the mid-1970s there has been a significant fall in the rate of growth of GDP. Figure 1.2 shows the long-term downward trend in the growth rates of Japanese GDP. The decade of the 1990s is often referred to as Japan's "Lost Decade". Compared to earlier periods, the growth rate of GDP has been very low or even negative during most of the 1990s (Figure 1.3). Though this may largely

reflect a short run problem of deficient aggregate demand, it may be due in part to long run aggregate supply problems created by the aging of the population.

Using a neoclassical modeling framework Yoshiro, Oshio and Matsuya (1997) considered the economic effect of population aging and projected just such a long run decline in the growth rate of Japanese GDP (Figure 1.4).

Figure 1.2

Annual Rates of Growth of GDP, Japan, 1905-2000
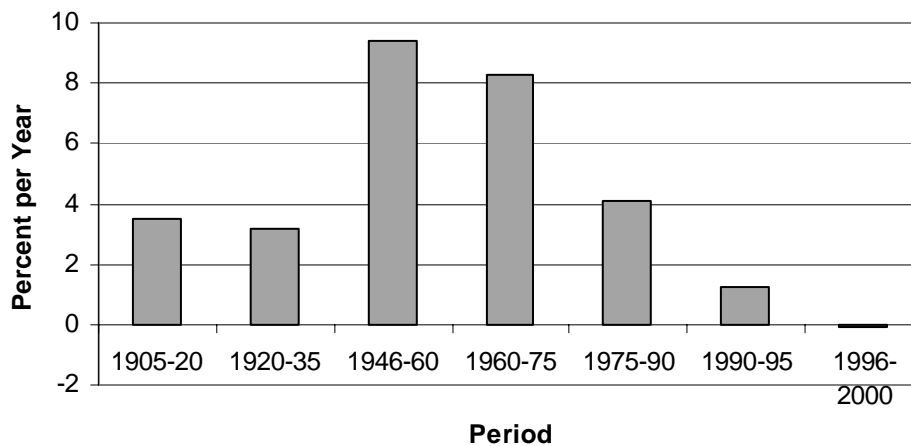
Source: Itoh (1996) Table 1 (data for 1905-1995), and The Japan Institute of Labor (2002), (data for 1996-2000).

In a closed economy, the effect of population aging (strictly speaking, increase in the ratio of the non-working elderly population to the working adult population) is reduced GDP per capita according to the simplest neoclassical growth model. The more substitutable capital is for scarce labor, the less the reduction. However, population aging is associated, with slowdown in total population growth, which has the impact of increasing GDP per capita, again in the simplest neoclassical growth model. Which effect dominates is an empirical question, however, most studies have estimated that the overall impact of projected population trends in rapidly aging countries will be to reduce GDP per capita. Whether these trends will reduce the welfare of the average individual is a much more complicated question.

Figure 1.3

**Annual Growth Rate of Nominal GDP, Japan,
1992-2001**
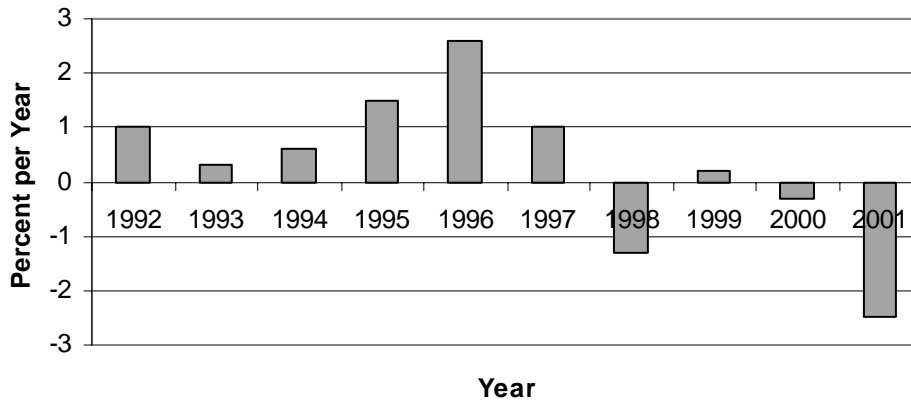
Source: International Monetary Fund (1999 page 4, 1992-1995) and The Japan Institute of Labor (2002), (data for 1996-2001).

Figure 1.4

**Projected Growth Rate of GDP, Standard
Case, Japan, 1995-2050**
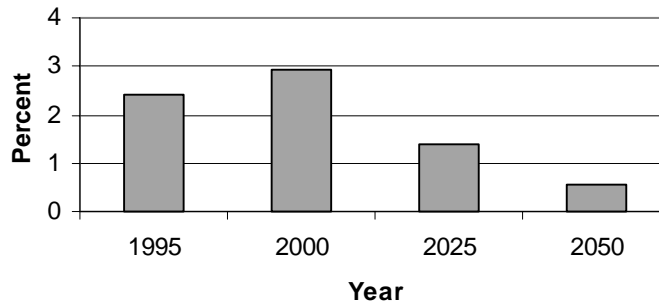
Source: Yashiro, Oshio and Matsuya (1997), Table 1.

B.   Income Distribution

The aging of a national population should cause increasing real wages as well as increasing inequality in the personal distribution of income. The first is a neoclassical response to increasing scarcity of labor as a result of relatively fewer persons in the prime working ages. The second is a compositional effect, as population shifts from age groups in which the distribution of income (derived mostly from wages) is relatively even to age groups in which the distribution of income (derived in large part from wealth) is relatively skewed.

Ohtake (1999) showed that the Gini coefficient in Japan (see his figure 1) fell (diminishing inequality) from about 0.31 in the early 1960s to just above .25 in 1970. This was a period of high economic growth. Since that time, there has been an upward trend (rising inequality), with the Gini coefficient reaching about 0.28 in 1997. He argues that approximately half of this increase can be attributed to the aging of the population. He finds that there has been little increase in inequality within age groups, i.e. that the increase in the Gini coefficient is a compositional effect as described above.

Among the other possible causes of inequality is the "bubble economy" of the 1980s that raised asset prices and therefore magnified inequalities in asset ownership. The bubble also increased wages in the finance and real estate industries more rapidly than other sectors. But this would not explain why inequality continued to increase after the bubble had burst.

Ohtake maintains that to properly measure income dispersion, the preferred measure should be dispersions in lifetime income, for which the dispersion in current consumption is a better proxy than dispersion in current income. In a study of consumption inequality, Ohtake and Saito (1998) found that inequality rises sharply among people aged 40 and older. At that age, unlucky persons who face unexpected dismissals, accidents, and illnesses must reduce their consumption.

C.   Distribution of Assets

In Japan, as in the United States, the largest asset in most households' portfolio is real property. Ohtake and Shintani (1996) have examined the effect of population aging on the Japanese housing market using the Mankiw-Weil model (Mankiw and Weil 1989) to estimate the demand for housing by age (see their figure 1). They find that the age profile of demand for Japan is quite different from that of the United States where the demand for housing peaks in the early thirties and declines gradually thereafter. In Japan, the profile peaks at about age 60 and then declines sharply. [3]

The large demand for housing at age 60 in Japan may be due to the fact that almost all large Japanese firms have set their mandatory retirement age at 60 and at that time, retirees receive large lump-sum payments with which they can purchase land and housing.[4] Other factors may also play a role. If the elderly had purchased urban land many years ago, that land would have appreciated, raising the demand for housing in old age. The inheritance tax on housing is lower than that for other assets; so older people with a bequest motive may buy housing to pass on to their heirs with lesser taxation.

Ohtake and Shintani found that, in the short run, population age structure has a significant effect on housing prices. By increasing the number of older persons in age groups with a high demand for housing, population aging raises housing prices, thus

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[3] There is also a small hump in the Japanese age profile at about age 20.

[4] The price of land relative to the price of housing is much higher in Japan than in most other countries. In the United States, the price of land is usually less than 3/4ths the price of the structure. In Japan, the price of the land is likely to be about 5 times the price of the structure paced on that land. (Ohtake and Shintani, 1996, p.191).

redistributing income from renters (the young) to proprietors (the elderly). Note, however, that this effect of age structure change must be considered in the broader context the slowdown in aggregate population growth, which would tend to reduce the price of housing. Moreover, in the long run, the authors found the supply of housing to be quite price-elastic; therefore, population change ultimately alters the quantity rather than the price of housing.[5]

II.   The Growth of Physical Capital Will Slow

The discussion of the influence of changing age structure on Japan's productive capacity will be divided into three parts. The first part will deal with the effect of aging on savings rates, the accumulation of wealth by households, the build up of the domestic capital stock and the acquisition of claims on other nations via a current account surplus. The second part will deal with the effect of aging on the size and composition of the labor force and its level of human capital. The third part will discuss aging and growth in total factor productivity.

A.   Savings Rates

Savings can be thought of as income less consumption. Alternatively, they can be thought of as the net increase in assets over time. The latter definition raises the question of how capital gains in existing assets such as houses or share prices should be treated.

Studies of savings rate vary according to the level of aggregation. Studies based on survey data generally consider the household savings rate. Studies based on aggregate data, whether time series or cross-section, are more likely to use the concept of private or national savings rates. The household savings rate is defined as the ratio of household savings to disposable income. The private savings rate is found by adding corporate savings (retained earnings) and after-tax earnings to the numerator and denominator of the household savings rate, respectively. The national savings rate is defined as the sum of household, corporate and government savings to national income.

Though household and national savings rates tend to move along similar paths, they do not always move in parallel and from time to time they diverge significantly. Figure 2.1 shows that national and private savings rates peaked around 1970 while the household savings rate peaked about five years later. It also shows that the household saving rate is less variable than the private or national saving rates.

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[5] This is the opposite of what Mankiew and Weil (1989) found for the United States. However it is consistent with what Englehardt and Poterba (1991) found for Canada.

Figure 2.1

Saving Rates, Japan, 1955-1985
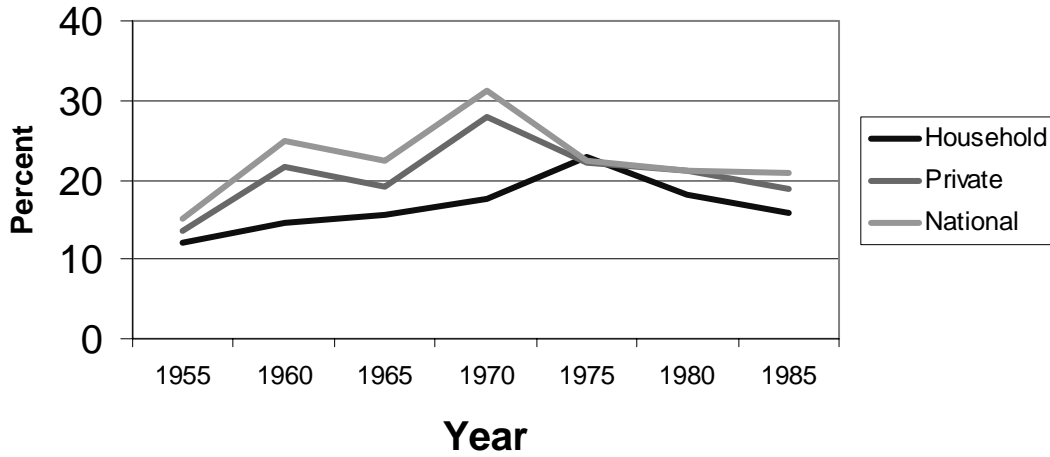
Source: Horioka (1999), Table 1.

1. *Levels and Trends in Savings Rates*

Currently Japan saves a little less than one-third of GDP. Figure 2.2 shows that the gross national saving rate, though still very high by international standards, reached its peak at about 1991 and has been falling since then (except for a small rise in 1996).

Figure 2.2

Gross National Saving Rate, Japan, 1984-1998
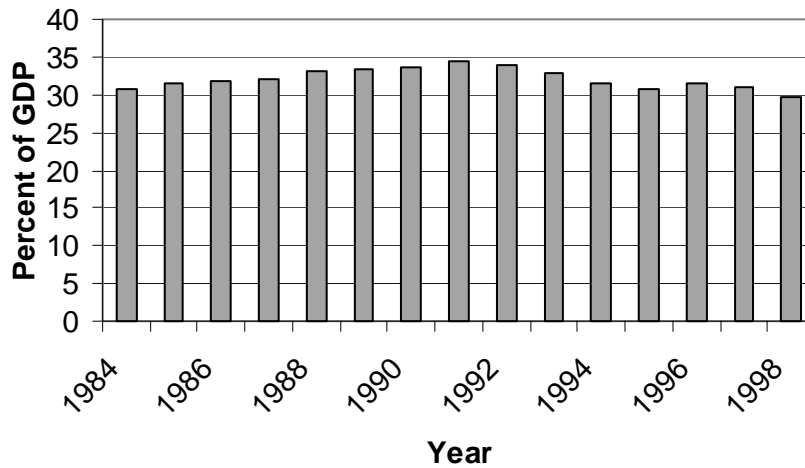
Source: Miranda (1999), page 4.

For several decades Japan has the highest gross national savings rates among the developed countries. Figure 2.3 shows that gross savings rates in Japan were considerably higher than those of either Germany or the United States for the period 1984-1993.

Figure 2.3

Gross National Savings Rates, Japan, Germany, U.S.A., 1984-1993
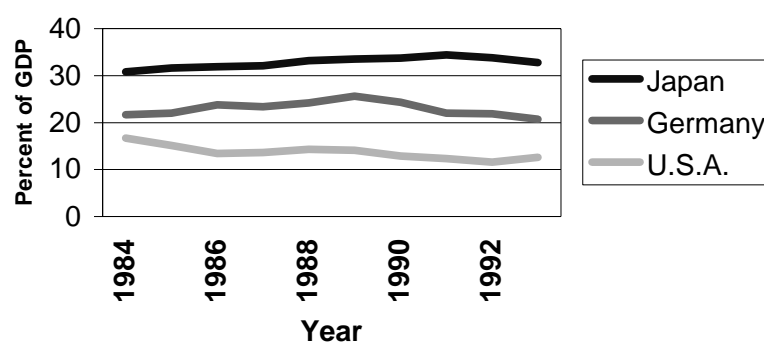
Source: Miranda (1999), Table 2-1.

2.   *Factors Influencing Future Savings Rates*

Factors directly related to population aging that are likely to reduce savings rates in Japan are: (1) the aging of the population, (2) the improvement in public pension replacement rates, (3) the accumulation of assets due to past saving, and (4) an increase in the retirement age. Other factors that might reduce savings rates in Japan are: 1) the decline in economic growth rates, and (2) the increased availability of mortgages and consumer credit. Factors directly related to population aging that are likely to increase savings rates in Japan are: (1) the decline in the labor force participation rates of the elderly, (2) increases in life-expectancy, (3) the fear of reductions in social security benefits, and (4) the continuation of the bonus system. The review of literature in the following section suggests that the factors favoring lower savings rates will outweigh these factors.

3.   *Research on Japanese Savings Rates*

In assessing the likelihood that population aging will lead to a significant decline in Japanese savings rates, three major questions must be explored. They are: (1) Are Japanese savings rates really that high? (2) Why were Japanese savings rates so high? and (3) What will happen to Japanese savings rates in the future?

(a) Are Japanese Savings Rates Really That High?

Hayashi (1986 and 1989) argued that Japanese savings rates are overstated relative to those of other industrialized nations, particularly the United States. His argument is based on the treatment of depreciation and government expenditure.

Hayashi (1986) cautioned that in comparing Japanese household savings rate with other countries, such as the United States, one should bear in mind that there are significant differences in the way that countries calculate savings rates[6]. The most important of these is the fact that in the Japanese data, depreciation is valued at historical cost while it is measured in replacement cost in the United States. This increases both measured income and saving, and thus apparent Japanese savings rates, in inflationary periods. That factor alone accounts for two or three percentage points of the difference between Japanese and U.S. household savings rates.

Dekle and Summers (1991) argued that in comparing U.S. and Japanese savings rates, Hayashi makes too great an adjustment for depreciation. His adjustments would imply that Japanese capital depreciates at three times the rate of American capital. They introduce a series from the OECD National Accounts, which divides US government spending into investment and non-investment components. They also point out that if the definition of household wealth includes land, then the Japanese household saving rates are more than twice the American rates.

In a rejoinder to Dekle and Summers, Hayashi (1991) defended his method of adjusting for depreciation. While agreeing that Japanese depreciation rates are high; he maintained that his figures were reasonable because a substantial part of the Japanese capital stock is owner-owned housing. He suggested that "the Japanese housing depreciation rate of about 9 percent is reasonable given that a large fraction of Japanese housing is made of paper and wood".

The national savings rate includes the savings of households, firms and government. In analyzing differences between Japanese and U.S. national savings rates, Hayashi (1989a) argued that much of the difference between the two rates is a "statistical illusion". The national accounts of the US treat all government spending as government consumption, while the Japanese national accounts treat some government expenditures as investment. In the United States, government saving equals the budget surplus. In Japan, government saving equals the budget surplus plus government investment spending. This makes government saving, hence national savings rates, appear to be much larger than they would using the U.S. system of national accounting. Furthermore, Japanese GDP would include the service flows from government physical assets, while the U.S, GDP would not.[7]

(b) Why Are Japanese Savings Rates so High?

Assuming that Japanese saving rates really were high, there must be an explanation for it. Much research has revolved around the life cycle hypothesis of Modigliani (1980) and others, which predicts that individuals will finance their consumption during retirement by dissaving. Hence, the primary motive for saving is to provide for one's retirement. In a stationary economy, the saving of the working age cohorts will exactly offset the dissaving of retirees with the result that aggregate

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[6] The U.S. National Income and Product Accounts have recognized government investment, and consequently government saving, since January 1996. However, Hayashi (1997b) maintains that those figures are not comparable to those in the Japanese accounts.

[7] Hayashi (1989) also observed that though the wealth to income ratio had been increasing much faster in Japan than the U.S., all of this difference could be explained by capital gains due to increasing land prices. When only reproducible wealth is considered, the U.S and Japanese wealth to income ratios were almost the same.

household saving will be zero. But if the labor force or productivity is growing, then the saving of workers will exceed the dissaving of retirees and there will be positive net household saving. The more rapid the growth of the labor force, the higher the savings rate.[8] If the life cycle hypothesis is true, population age structure is an important determinant of saving rates and the aging of the Japanese population may be expected to put downward pressure on saving rates.

Many of the challenges to the application of the life cycle hypothesis to Japan center on the empirical question of whether the elderly really do dissave as predicted by the hypothesis. In this section, we first look at evidence on this question before reviewing studies relating to the life cycle hypothesis.

[i] Do the Elderly Dissave in Japan?

There is considerable evidence that the elderly in Japan continue to save. Mason and Ogawa (2001) present a series of age-saving profiles beginning in 1970-74. Their age-saving profile for 1990-92 is shown in Figure 2.4. It shows a savings rate of about 17 percent for the 65 and older age group. In the 1980-84 and 1985-89 age profiles, the over 65 age group also had about a 17 percent savings rate. Yoshikawa *et al*. (2002, p. 8) provide an age profile of Japanese savings rates in 1999 (Figure 2.5). As would be expected, the savings rate peaks in the years between 50 and 59. More surprising is the fact that after age 60 the savings rate is still extremely high, almost 33 percent. This is almost twice the ratio found by Mason and Ogawa.

Hayashi, Ando and Ferris (1988) used data from the National Survey of Family Income Expenditure to investigate whether the elderly of Japan save or dissave. To do so they adjusted for the fact that those elderly who maintain separate households and are thus counted in the survey are systematically different from those elderly who join the households of their children and thus are not counted. They found that both the elderly in independent households and the elderly who live with their children continue to save in defiance of the life cycle hypothesis (see Figure 2.6).

Moreover Hayashi, Ando and Ferris found that there are substantial intra-family transfers from older to younger generations. This was clearly the case, because the assets of the young grow more rapidly than can be explained by their own savings rates. One source of these transfers is the independent elderly who save toward the end of their lives and then bequeath their wealth to their children. Even the elderly in extended families (i.e., three-generation households) continued to accumulate wealth. After the parents died, the extended family again became a nuclear family that inherited the wealth of the late parent.

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[8] Conversely, a declining labor force would result in a declining savings rate.

Figure 2.4

Savings Rates By Age Goup, Japan, 1990-1992
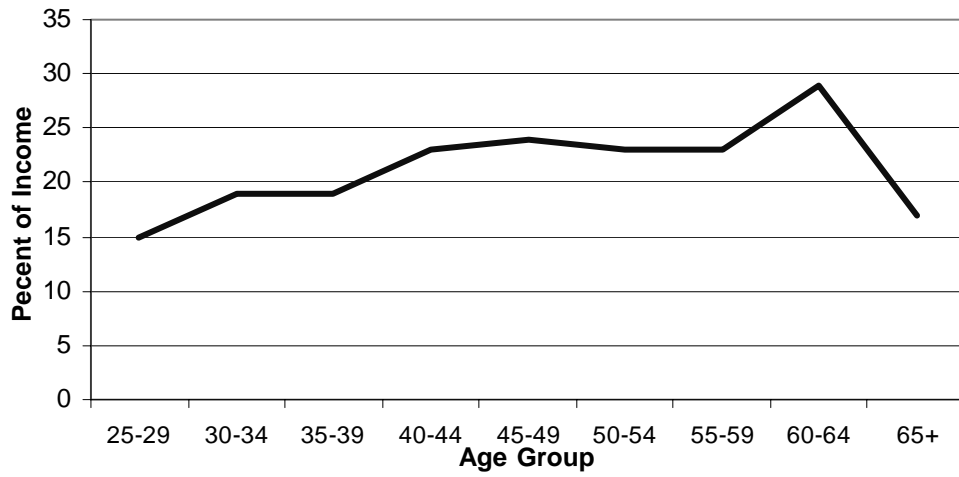
Source: Mason and Ogawa (2001) Figure 2.5.

Figure 2.5

Saving Rates By Age Group, Japan, 1999
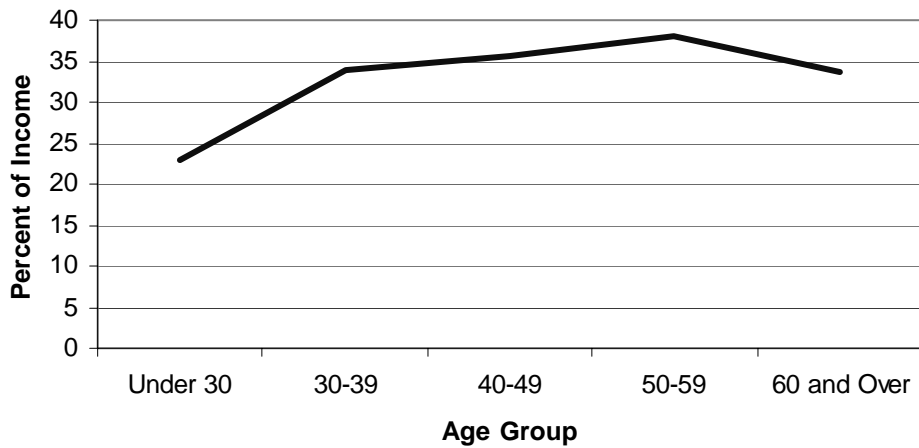
Source: Yoshikawa *et al.* (2002), Figure 4.

Figure 2.6

**Saving/ Income Ratios by Age of
Household Head, Japan, 1985**
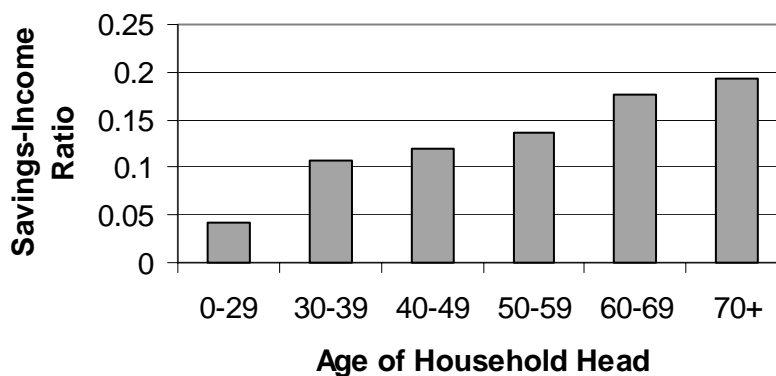
Source: Ando et al, 1995, Table 1.

The conclusions reached by Hayashi, Ando and Ferris were reinforced by the findings of Dekle (1990) and Ando *et al.* (1995). Dekle (1990) analyzed a small sub-sample of the Survey on the Living Behavior of the Aged which had data on the assets owned by the elderly as individuals, as opposed to household totals. He found that wealth of individuals increased with their age and that the elderly were saving about 20 percent of their disposable incomes.[9] Using data from the National Survey of Family Incomes and Expenditures for 1985, Ando *et al.* (1995) found that families headed by married couples aged 60 and 70 earned sizeable incomes and continued to save. Older individuals who have retired tend to become part of younger households.[10]

Horioka (1989), a strong supporter of the life-cycle explanation of saving, argued that the elderly do dissave and the failure of household data to show this is due to defects in the data. This view was largely shared by Meredith (1995) and Yashiro (1997). Meredith (1995) observed that studies, which infer dissaving from the age profile of household assets in a single period often, give misleading results, for two reasons. First, the poor elderly are often absorbed into their children's households and these are the households most likely to dissave. Second, the fact that older households have lower assets than younger ones in a given year may reflect cohort-wide differences in lifetime incomes (hence wealth accumulation) rather than asset decumulation.

Using data from the 1990 Annual Report on the Family Income and Expenditure Survey, Meredith looked at retired and non-retired elderly separately. He

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[9] Dekle (1990) warned that his results might be the result of children paying the expenses of their parents or simply an artifact of small sample size.

[10] In the survey used by Ando *et al.*, the person earning the highest income is designated the household head.

found that the retired elderly have living expenditures that exceed their disposable incomes by 21 percent, even before adjusting for unearned income[11]. The working elderly, by contrast, save about 17 percent of their income. Hence, when people retire, their incomes fall much faster than their consumption and they dissave. When the working and retired elderly are added together, elderly households, as a group, dissave about 3.5 percent of their income. In contrast, working age households, on average, save 25 percent of their income.

Horioka *et al.* (1996), like Meredith (1995), found that the employed elderly are indeed saving. Some previous studies were inconclusive because they were based on aggregate rather than household data. Other studies may have been misleading if they calculated saving behavior from cross-sectional age wealth profiles or failed to control for the employment status of the elderly. Horioka *et al.*'s analysis avoided these defects. It used household level data from the "Survey on Financial Asset Selection of Households" conducted in December 1992 and looked at savings flows that were not subject to the cohort effect. The Survey provided information on employment-status, age of the household head and living arrangements. Horioka *et al.* found that though the average flow of savings in the case of an employed aged household head is "positive and large", the average flow of savings in the case of a retired aged household is "negative and large," as predicted by the life cycle hypothesis.

Yashiro (1997) also concluded that the elderly as a group do indeed dissave. However, household studies tend to look at only the one-third of the elderly who maintain independent households, i.e. the households most likely to save. But about two-thirds of the elderly population are dependent on their children and are not included in household studies of elderly savings behavior. When this factor is taken into account, as it was in Yashiro and Maeda (1993), then the elderly do dissave as predicted by the life cycle theory.

[ii] Do Dependency Rates Explain Japanese Saving Rates?

If the life cycle hypothesis is true, then aggregate data should reveal an inverse relationship between saving rates and dependency rates, or their equivalent, the share of the population that is elderly. Horioka claims that the data confirms the existence of this inverse relationship while Bosworth, Burtless and Sabelhaus (1991) disagreed with him.

Horioka (1989) found that low dependency ratios were major explanations of Japan's historically high rate of household saving. Using cross-section data from 21 OECD countries for the period 1975-1984. He found that all of the coefficients of the variables related to the life cycle hypothesis were significant and had the correct signs. In fact, the coefficients were larger than those estimated by Modigliani and Sterling (1983).

Considering the relative contribution of each variable to determining the saving rate, he concluded that the most important factor was the relatively low old-age dependency rate in Japan. It explained fully half of the difference between the Japanese and U.S. saving rates. The difference explained by the young-age dependency ratio was only one fourth as large as the difference explained by the old-age dependency rate. Horioka also found that omitted variables such as culture, tax

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[11] Seventy percent of their income was social security benefits.

incentives, the availability of consumer credit, the importance of bonus income and the distribution of income and wealth together explained only about a tenth of the difference between U.S. and Japanese saving rates.

Using time series data for Japan, Horioka (1991) found that that the pattern of savings rates over time could also be explained by trends in the young-age and old-age dependency rates. Until the early 1970s, the decline in young age dependency was relatively rapid while the increase in old age dependency was relatively slow, causing the savings rate to shift upward. After that, the old age dependency ratio increased more rapidly than the young age ratio declined. The result was a decline in the saving rate.

Horioka (1991) used national accounts time series data to investigate the determinants of trends in Japanese household, private and national savings rates. He included as independent variables two dependency ratios, the old-age dependency ratio (AGE) and the young-age dependency ratio (DEP) He found that "a one percentage point increase in AGE lowers the saving rate (however defined) by at least one percentage point while a one percentage point increase in DEP lowers the saving rate by at least 0.3 percentage points."

He concluded that while the rapid rise in Japanese saving rates in the immediate post-War years could be explained by the rapidly declining young-age dependency ratio, the decline in saving rates since the 1970s is due to the rapid increase in the old-age dependency ratio. Hence, Japan's relatively high savings rate compared to other developed countries could be explained by its low total dependency ratio.

Using cointegration methods, Horioka (1997) analyzed the effect of Japan's age structure on the household saving rate for the 1955-1993 period. He found that both young age dependents and old age dependents have a significant negative effect on the household saving rate.[12] It follows that Japan's current high household saving rate was due in part to the young age structure of the population and therefore the rate will decline as the population ages.

Bosworth, Burtless and Sabelhaus (1991) dissented from the findings of Meredith and Horioka. They attempted to measure the effect of demographic changes on Japan's aggregate saving rate by examining differences in age- specific savings rates. Holding the saving rate of each age group constant, they changed the population shares to get the aggregate savings rate. From this exercise they concluded that the differences in age-specific savings rates were so small that changes in the population structure would not significantly affect the aggregate saving rate (Meredith, 1995).

[iii] Does the Bequest Motive Explain Japanese Saving Rates?

An important modification of the basic life cycle explanation of household savings is the addition of a role for bequests. At least one-third of family wealth in Japan consists of assets acquired through inheritance (Barthold and Ito 1992).

Hayashi (1986) stated that: "bequests are probably the most important factor behind Japan's high saving rate." However, he also recognized that while the older generation is saving to make bequests, the younger generation might be increasing its

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[12] In his analysis he uses the ratio of the population 19 and under to the population 20-64 as his measures of the young age dependency ratio.

spending in anticipation of receiving a bequest. He notes that, "The high value of land passed on by the older generation to the younger one is mostly the result of capital gains, not accumulated savings."[13]

Using data from the 1986 Basic Survey on the Life of the People (BSLP), Ohtake (1991) found "the elderly without living children decumulate their assets faster than those with living children by 3 percentage points a year."[14]. In the case of housing, the elderly without living children decumulate housing assets faster than those elderly who have living children by 5 percentage points. He concludes that since the bequest motive explains some part of the Japanese saving rate, the aging of the population will not cause as steep a decline in the savings rate as would be predicted by the simple life-cycle model without a bequest motive.

There is considerable dispute over the reasons why Japanese elders leave bequests to their adult children. If the reasons are parental altruism or an unexpectedly early demise, this would weaken the support for the life cycle hypothesis, but if bequests are simply being used to extract more services from one's children, then it is a form of delayed consumption spending and thus consistent with that hypothesis.

Horioka *et al.* (1996) examined the attitudes towards bequests of aged household heads and their children. Respondents had three options: they could say (1) that a bequest should be left, no matter what, (2) that a bequest should be left only if the children provide assistance, and (3) it is not necessary to leave a bequest. About one-third responded that a bequest should be left no matter what, a reply consistent with the altruistic bequest model and thus the dynastic savings model of Barro (1974). The response of the other two-thirds is consistent with the life cycle model. In the case of the selfish bequest motive (option 2), the bequest can be thought of as dissaving in the form of a deferred payment to children for services rendered. Horioka *et al*. found that elderly household heads with a bequest motive were more likely to be residing with their children, and that the likelihood of receiving a bequest seemed to motivate children to take better care of their parents. This supports the view that most bequests are used to "finance one's living expenses during old age".

Based on a variety of evidence, Horioka (2002) concluded that in Japan (and the United States), most bequests are motivated by selfish strategic or exchange motives. (Such selfish bequests, are really deferred payment to children for support during old age, and thus, are consistent with the life cycle hypothesis).

Tachibanaki (1996, p.98) points out that bequest motives may have strong but offsetting effects on future savings trends among the Japanese elderly and their adult children. Future generations that expect to inherit great wealth, especially land and houses, are less likely to have a strong incentive to save. Currently many elderly individuals hold a high level of wealth. Hence, the average bequest per household head will be relatively large and, because the younger generations will expect relatively large inheritances, they will save less. Because of the aging of the population, the proportion of households making bequests will increase while the proportion of households eligible to receive bequests will decline. That will both

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[13] One reason that most bequests are in the form of housing assets is that the inheritance tax rates are lower for that class of assets.

[14] Ohtake also found that the elderly over the age of 60 dissave about 2 percent of their bequestable wealth each year.

increase the likelihood of receiving a bequest and will increase the average size of the bequest. As the Japanese population ages, young people will be less likely to commit themselves to a regime of compulsory savings.

(c) What Other Factors Might Explain Japanese Saving Rates?

Factors related to population aging, other than dependency rates, that are likely to have influenced savings rates in Japan are (1) the high labor force participation of the elderly, (2) the immaturity of the public pension system and (3) the increasing life expectancy at retirement. (Horioka (1989) found that household saving is inversely related to retirement age, and directly related to the average span of life after retirement.)

[1] Factors Directly Related to Population Aging

The fact that Japan has a very high labor force participation among males aged 65 and over and that households whose head is employed have a high propensity to save might help to explain the high rate of savings in Japan. However, younger households might save less in an economy where they know that they will continue to receive employment income when they are elderly (Horioka 1990). Hence, the high labor force participation of the aged may raise the saving of the elderly while at the same time it reduces the saving of younger households, with little net effect on the overall household saving rate.

In an economy where population or productivity is growing, the adverse effect of high labor force participation of the elderly on the saving of younger households is likely to outweigh the positive effects on the savings of the elderly. Modigliani and Sterling (1983), found that the high labor force participation by the elderly in Japan lowered the private saving rate by more than 8 percentage points. In his study, however, Horioka found that the coefficient of elderly labor force participation was not significant. In the 21st century, this effect, if significant, should be reversed. The population of Japan will be declining and so the saving of the elderly workers should exceed the dissaving in younger households. That would slow the decline in the Japanese saving rate.

High labor force participation rates by the elderly puts downward pressure on saving by young workers since they know that they will be able to maintain consumption in old age by continuing to work. On the other hand, the maturing of the pension system is likely to cause the labor force participation rate of the elderly to decline. Earlier retirement should increase Japan's saving rate.

The age of formal retirement is 60, which is low compared to some OECD countries. However, many employees in Japan continue to work after formal retirement, though usually at lower pay rates, in order to maintain their living standards. Horioka (1989) did find evidence indicating that Japan's low (formal) retirement age contributed to the high saving rate. This would suggest that efforts to alleviate potential labor shortages by increasing the mandatory retirement age to 65 might adversely affect capital accumulation by reducing the household savings rate.

Prior to 1973 the Japanese social security system had a very low replacement rate compared to most developed countries. This helps to explain the high labor force participation of the elderly. It also increased the need for precautionary saving and required a higher level of saving to meet retirement expenses. This implies that the strengthening of Japan's public pension system will reduce Japanese savings rates.

Dekle (1990) found that the increase of household social security wealth did not displace private saving. Hayashi (1986) found that younger cohorts actually increased their savings in response to the 1973 increases in old-age pension benefits (see discussion of the social security system below). This could be explained in terms of Barro's (1974) intergenerational altruism model. An alternative explanation is that the need for an increase in benefits was widely publicized and made working age households more cognizant of the need to save for retirement.

When Horioka (1989) examined the impact of social security pensions on household saving, he found that the coefficients of social security benefits were not significant.[15] He concluded that: "the total effect of social security on saving is negligible, not because the wealth replacement effect and the induced retirement effect roughly offset each other; but because both effects are negligible".

Since the mid-1970s, savings rates have declined and this may be due to the increase in social security benefits. On the other hand, survey evidence seems to indicate that an increasing proportion of households cite saving for old age as their motive. Takayama (1990) used data from the 1979 and 1984 National Survey of Family Income and Expenditure to examine the relationship between public pensions, personal saving and retirement. Contrary to Horioka's results, he found that the Japanese public pension system reduced the overall savings rate of workers' households by 12 percent. His conclusion was that the public pension program in Japan increased the average propensity to consume of active generations and thus discouraged personal saving in Japan.

Yamada, Yamada and Liu (1992) employed annual Japanese time series data to test whether social security wealth depressed personal savings rates. Using a life cycle model, they tested the "benefit effect" (public pensions substitute for private savings) and the "retirement effect" (public pensions encourage early retirement). Contrary to Horioka's results, they found that both effects of social security wealth are statistically significant.[16] However, the benefit effect is stronger than the retirement effect by a factor of six, therefore, the net effect of increasing social security benefits is to reduce the household saving rate. It follows that the recently enacted reductions in replacement rates should put upward pressure on savings rates.

The life cycle hypothesis predicts that the saving rate will vary positively with life expectancy at retirement since one's savings must last over a longer time period. Since the life expectancy of the Japanese population at older ages is increasing, this should put upward pressure on the saving rate.

[2] Factors Not Directly Related to Population Aging

In addition to those factors directly related to population aging, there is a long list of other factors that are likely to determine future trends in the Japanese saving rate. Among them are: (1) the slowing of the growth rate of income (2) a decline in risk aversion (3) a loosening of liquidity constraints (3) a weakening in the bonus

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[15] For fixed retirement age, expected social security income would substitute for private savings, on the other hand, if the availability of social security led households to retire earlier, the lengthened retirement span would encourage private saving. The first is the "benefit effect," the second is the "retirement effect."

[16] They also found that the social security wealth variables have a negative effect on labor force participation.

system of employee compensation (4) government subsidies for saving, (5) the desire to restore recently fallen wealth-income ratios and (6) the weakening of cultural values that favor high savings. Most of these factors are putting downward pressure on savings rates. Exceptions are increased government incentives for saving and a desire to restore recently fallen wealth-income ratios.

[a] Income Growth

A number of hypotheses link Japan's high saving rate to its rapid rate of economic growth. One of these, the permanent income/life cycle hypothesis, asserts that the increases in Japanese income were not expected and were therefore considered to be transitory income and saved. Though this explanation might have been relevant in the early post-war years, later such increases should have been considered permanent and therefore a smaller portion of those increases would be saved. A related explanation is the habit persistence hypothesis. It suggests that the Japanese were slow to adjust their consumption to their growing incomes, whether transitory or permanent.

A study by Modigliani and Sterling (1983) using cross-country data, confirmed the strong empirical relationship between Japan's economic growth and its a high rate of saving. They concluded that income growth was the most important cause of the nation's high personal saving rate. During the 1960-1970 period, the high rate of saving in Japan could be chiefly explained by the rapid rate of growth of disposable income.

Although cross-country studies have tended to confirm explanations of Japan's high saving rates based on rapid income growth, time series studies have not been equally supportive. The following criticisms have been leveled against the growth rate hypothesis: (1) it explains the high rate of saving but not an increasing rate, (2) it does not explain the increase in savings rate in 1974 when the growth rate declined sharply, and (3) it does not explain why there was only a moderate decline in savings rates after 1974 even though there was a sharp decline in the growth rate of income.

Recent savings rates have been similar to those experienced about 1970, even though the growth rate is much lower. To explain this, it has been suggested that households have increased their target financial assets-to-income ratio. Reasons for this include an increase in uncertainty because of the rapid increase in life expectancy, the long-term decline in the growth rate of labor productivity, the reduced employment opportunities for older workers and the decline in the financial condition of the social security system. It is this uncertainty that has kept savings rates high in spite of much lower growth rates of income. It follows that a decline in growth rates of income associated with population aging may not result in proportionate declines in Japanese savings rates (Mason and Ogawa, 2001, p. 61).

[b] High Degree of Risk Aversion

Surveys indicate that the most often cited motive for saving in Japan is precautionary. This would also explain the prevalence of (unintended) bequests as elderly households maintain precautionary reserves as protection against the risk of unusual longevity.

Another source of risk is self-employment. The ratio of income earned by the self-employed to total income is higher in Japan than in most developed countries. The saving rate is higher among the self-employed than among employees due to a greater degree of uncertainty and the need to save for business reasons. However, the

importance of the self-employed declined even while savings rates were rising. This suggests that the prevalence of self-employment may not have been an important determinant of Japanese savings rates.

Still another explanation for the importance of precautionary savings in Japan is the high probability of natural disasters (Bronfenbrunner and Yasuba, 1987). Earthquakes and other natural disasters are quite common in Japan and the high density of the population makes it more vulnerable to such disasters. This increases uncertainty and induces the Japanese to save a higher proportion of their incomes.

In addition to casting doubt on the life cycle hypothesis, the findings of Hayashi, Ando and Ferris (1988) also cast doubt on the precautionary motive as an explanation for the high savings rate in Japan. They observed that elderly single persons, in particular, should be saving to protect against excess longevity or catastrophic illness. But elderly singles are not savers, while those elderly who are married (and likely to have children) are savers. Hence, they concluded that the bequest motive is a better explanation for saving by the elderly than the precautionary motive).[17]

[c] Liquidity Constraints

The life cycle hypothesis assumes that individuals can base their lifetime consumption patterns on their expected lifetime wealth. To do this households must be able to borrow against that expected future wealth. Rarely are households actually able to do so. Among the liquidity constraints historically faced by Japanese households are the lack of consumer credit, the lack of housing credit and the receipt of lump-sum bonuses. We look at each of these in turn.

At one time, Japanese consumers had to save in advance to make major purchases such as land, housing and consumer durables.[18] Hence, liquidity constraints might explain some part of Japan's high saving rate. But Horioka (1990, p. 68) points out that if consumer credit had been available, there would have been no decline in household saving in equilibrium because the repayment of consumer debt is equally a form of household saving.

In a stationary economy, households would spend more in later years because of this early constraint and this would exactly offset the reduced consumption of younger households. But in an economy where population or productivity is increasing, the decline in the consumption of young households would exceed the increase in consumption by older households and the saving rate would increase as a result of these borrowing constraints. Now that the Japanese population is declining, borrowing-constraints on younger households should result in more-than-offsetting spending by older households, with the result that savings rates should be depressed.

Using survey data linking household saving behavior and intentions to buy a house, Horioka (1988) found that housing-related saving was important from the point of view of individual households. From the aggregate point of view, the presence or absence of housing credit would be irrelevant, since if loans were available, there

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[17] Yoshikawa *et al*. (2002, p. 2) report that a recent Bank of Japan survey showed that bequest motives were weak and most saving by the old is for precautionary reasons.

[18] A related explanation is that young people would keep larger precautionary balances if they knew that they could not borrow to meet unforeseen emergencies.

would be a commensurate increase in saving by paying off the housing loans, the same argument alluded to above.[19]
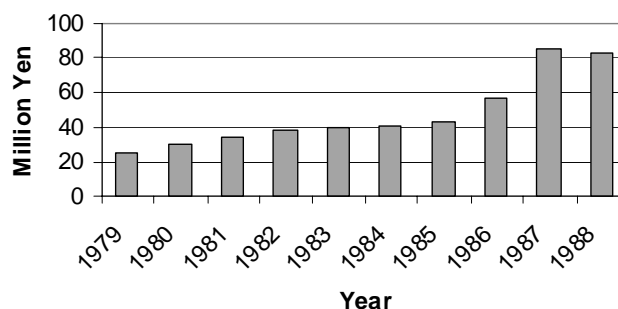
Horioka found that saving for house purchases accounts for from 4 to 7 points of the gross saving rate. However, the depreciation of housing assets has been greater than gross housing-related saving. Thus housing-related saving is a very important component of total savings from the point of view of individual households during their accumulation phase, but does not contribute to savings at the aggregate level when balanced against depreciation of the housing stock.

Sato (1987) suggested that rapid urbanization may have contributed to Japan's high saving rate. Since the parents of the migrants typically remained in the rural areas, they did not sell their homes. Thus, the children were forced to save in order to buy homes in the urban areas. Urbanization also contributes to the trend toward nuclear families, which further expands the demand for new housing and increases housing-related saving.

Figure 2.7 shows the rapid rise in the prices of housing in Tokyo in the 1980s. Yoshikawa and Ohtake (1989) examined the relationship between land prices and the saving rate. They note that from 1986 to 1987, land prices in Tokyo more than doubled. Using data on some 54,000 households using the National Survey on Family Income and Expenditure, they divided the sample into those who chose to rent a house throughout life and those who chose to buy and occupy a house. For potential owners, the saving rate was found to be an increasing function of the price of land. For renters, no significant relationship was found.[20]

Figure 2.7

Average House Price, Tokyo, Japan, 1979-1988

Source: Tachibanaki (1996), Table 7.9.

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[19] Horioka found that the high level of housing prices did increase the level of housing-related saving.

[20] Wives in those households that plan to purchase a house were found to be more likely to work outside the home. For households planning to purchase a house, there was a significant positive relationship between the labor supply and the price of land. There was no significant relationship in the case of renters.

As the Japanese population ages, it will also grow smaller, this may reduce demand for housing and thus the price of housing. A fall in prices should encourage couples to save to buy their homes thus increasing the saving rate.

In Japan, full-time workers are likely to receive annual bonuses equal to more than two month's salary. Ishikawa and Ueda (1984), using time-series data, found that the bonus system was an important contributor to high savings rates in the late 1960s and 1970s because the marginal propensity to save (MPS) out of bonus income was almost twice the MPS out of ordinary wage income (0.6241 versus 0.3355). Thus, the bonus based compensation system may have contributed about 3 percentage points to Japan's household savings rate.

The propensity to save out of bonuses might be high because they are regarded as transitory income. However, households have come to expect bonuses and can calculate their likely value with great accuracy. Hence, saving out of bonus income is not very well explained by the permanent income hypotheses; but rather by "bounded rationality". Households may find it too costly to calculate optimal saving behavior and so adopt a rule of thumb that in normal times one should save about half of bonus income. Furthermore, it is more convenient to save a lump sum bonus than to save a little from every paycheck. Though still widespread, the bonus system is weakening. If that trend continues, it is likely to put downward pressure on Japanese savings rates.

[d] Government Policies

In the past, there were numerous tax incentives to promote saving. In 1875, the government established the postal savings system in order to promote saving among the public. During the Second World War, the government actively promoted saving. In a number of cases, interest was exempt from taxes. Though most of these tax incentives were abolished in 1988, it had very little effect on the saving rate (Horioka, 1990, p. 72). In Japan, interest paid on housing loans as well as other consumer loans is not tax-deductible. This may encourage saving in advance of purchases by raising the after-tax interest rate.

The effects of such promotional measures on savings rates are very difficult to measure (Horioka, 1990). It is likely that the Government of Japan will continue to encourage households to save. To the extent that these efforts are effective, there should be some upward pressure on savings rates.

[e] Restoring the Wealth-income Ratio

The Second World War resulted in the destruction of much of Japan's housing wealth, while postwar hyperinflation reduced the value of financial assets. Thus households may have saved in order to return to their desired wealth-income ratio.

The wealth adjustment or target wealth hypothesis suggests that the Japanese were saving to maintain their wealth-income ratios in the face of rising incomes. If the Japanese were intent on maintaining this ratio, they would increase their savings rates in proportion to the increase in the growth. This approach would imply that if incomes were to fall due to population aging, saving rates would also fall.

[f] Culture and Tradition

The fact that saving rates were high in Japan even when incomes or the growth in incomes were quite low argues in favor of cultural factors. However, the fact that the secular trend of saving rates has not declined, even though the force of tradition has weakened in other areas, casts doubt on this explanation. The fact that Korea,

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which shared many of Japan's cultural traditions, had (up until recently) low savings rates also tends to argue against cultural explanations.

(d) Will Aging Cause Japanese Savings Rates to Fall?

Various researchers made alternative projections either by using the saving rate of each age group and estimates of the population by age group or by using simulation techniques. All the studies found that Japan's savings rate would decline in the 21st century; although there was no agreement on the amount of the decline.[21]
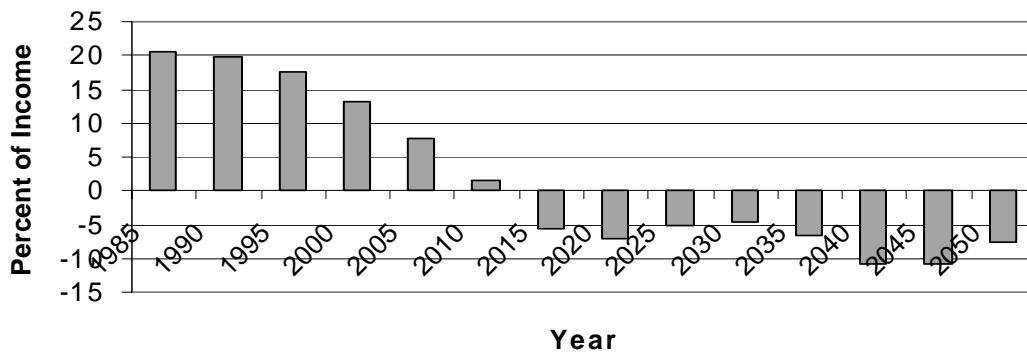
[i] Horioka

Horioka (1989) estimated the impact of age structure on the personal saving rate and used the resulting coefficients along with population projections by age to project future trends in the saving rate. He projected that that there would be a long-term decline. The saving rate would reach negative levels early in the 21st century and fall to levels between -10 and -20 percent of personal income throughout the first half of the century (see Figure 2.8).

In a later projection, Horioka (1991) was even more pessimistic. A comparison of Horioka's 1989 and 1991 projections of the personal savings indicates that in the 1991 projection the savings rate would generally be lower by about 5 percent of GDP (Figure 2.9).

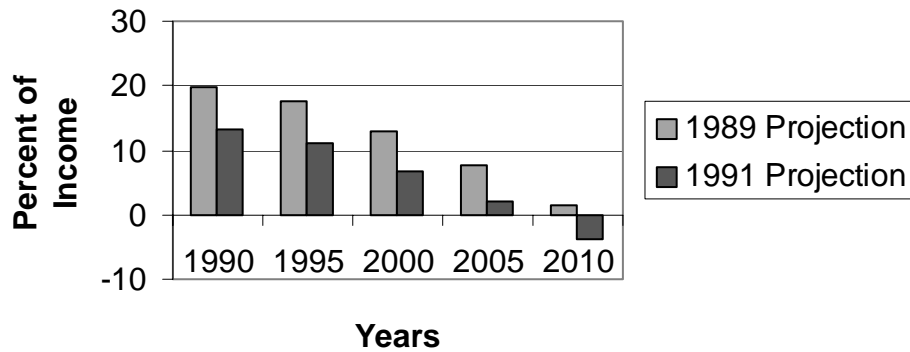**Figure 2.8**

Projected Personal Savings Rates, Japan

Source: Horioka (1989) Table 7.

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[21] See Horioka (1997) for a discussion of the findings of these alternative studies.

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Figure 2.9

Projections of Rates of Personal Savings, Japan, 1990-2010

Sources: Horioka (1989), " Table 7, and Horioka (1991), Table 3.

[ii] Ando *et al.*

To make projections based on households, Ando *et al. (*1995) used the population projection model and 1992 population projections provided by the Institute of Population Problems of Ministry of Health and Welfare to create distributions of family structures. Ando *et al.* concluded that the declining birth rate in Japan will first cause the saving rate to rise and then decline (see Figure 2.10), but this decline will be less than is generally believed.

Using the low fertility assumption,[22] Ando *et al.* projected that the savings rate in 2020 would be slightly higher than in 1985 even though the proportion of the 70 and over population had increased from 6 to 20 percent. They found that the higher saving of middle-aged couples more than offset the increase in the proportion of the oldest group of individuals and families, thus increasing the aggregate saving-income ratio.

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[22] Subsequent events have shown the low-fertility variant to more correctly predict fertility trends in the 1990s.

Figure 2.10

Savings-Income Ratios, Japan, 1985-2050
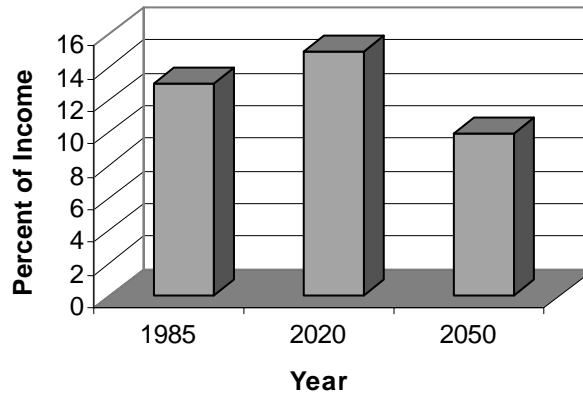
Source: Ando, Morro, Cordoba and Garland (1995), pp. 199-200.

By the year 2050, the share of children in the population is no longer declining very much while the share of persons 70 and above is rising rapidly. The result is that the saving-income ratio drops from 15 to 10 percent because the average number of dependent adults in families will have increased and these elders will account for a larger share of income.

These projections were made, under the assumption of constant productivity growth, and may therefore overstate savings. The authors suggested that it would be more reasonable to assume a decline in the rate of growth of productivity and hence the rate of growth of household incomes. If incomes grow more slowly, savings rates would likely fall because of habit persistence in consumption.

[iii] Meredith (1995b) and Yashiro *et al.* (1997a)

These studies involved the application of simulation models to study the effects of pension reform. We will we discuss them at greater lenghth in Section VI below. Both models predicted significant declines in household and aggregate saving rates as a result of population aging.

Meredith (1995) constructed a model to examine the long run implications of population aging for the Japanese economy as well as the impact of the 1994 pension reforms. The model was initialized using household survey data from the 1990 Family Income and Expenditure Survey to calculate the savings rates of specific age groups. His model showed that were it not for the 1994 public pension reforms, there would have been a substantial decline in the household saving rate, from over 20 percent in 1990 to only 10.4 percent in 2030 (see Figure 2.11).

Meredith found that though the 1994 social security pension reforms would have little effect on the path of private saving during the period from 2000 to 2020, their impact on the public sector savings would quite significant. Without the 1994 reforms, public savings would have declined from a little less than 10 percent of GDP

in 2000 to minus 8.5 percent in 2020. With the 1994 reforms, however, public saving was projected to remain positive.

Figure 2.11

**Projection of Household Saving
Rates, Japan, 1990-2030**
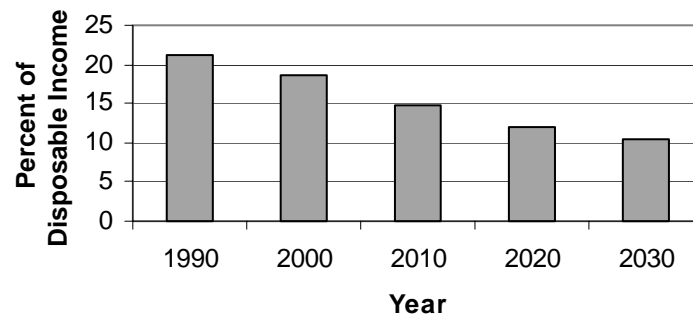
Source: Meredith (1995a), p. 41.

In order to analyze the macroeconomic effect of population aging in Japan, Yashiro Oshio, and Matsuya (1997) constructed a three sector neoclassical macroeconomic-demographic model. Their saving function was based on the life cycle hypothesis. Hence, the saving rate was inversely related to the old-age dependency ratio and per capita social security benefits. The old-age dependency ratio was calculated as the ratio of people over age 65 to the total labor force (rather than the working-age population). Thus, it was possible to capture the effect on saving that results when an increase in pension benefits reduces the LFPRs of the elderly. Increasing social security contribution rates would reduce saving by workers. Increasing social security benefit rates would reduce dissaving by retirees.

The baseline scenario assumed that the 2000 pension reforms have not taken place. In that scenario, the saving rate first rises slightly (see Figure 2.12), then falls precipitously. The model was then used to simulate the effects of a set of reforms that were quite similar to those actually adopted in 2000. Not surprisingly, given the strong negative impact of population aging on the aggregate saving rate in the model, the implementation of pension reform has a large positive effect on the national saving rate (see Figure 2.13). Population aging still causes the savings rate to fall; but the pension reform slows the decline, increasing the saving rate in 2050 from 3 to 15 percent of GDP.

Figure 2.12

Projected Savings Rate, Japan, 1995-2050
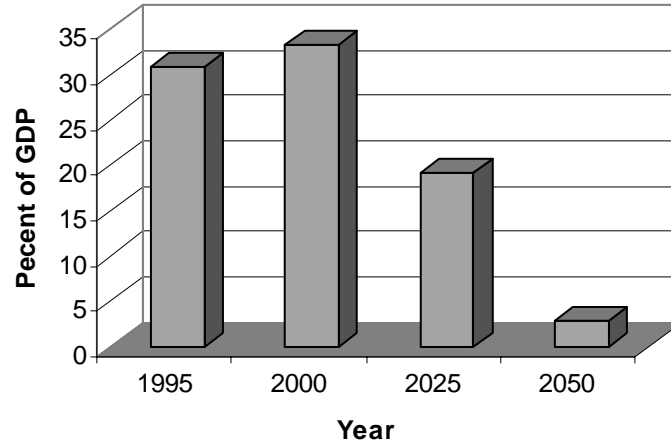
Source: Yashiro, Oshio and Matsuya (1997), Tables 1 and 4.

Figure 2.13

**Projections of National Savings
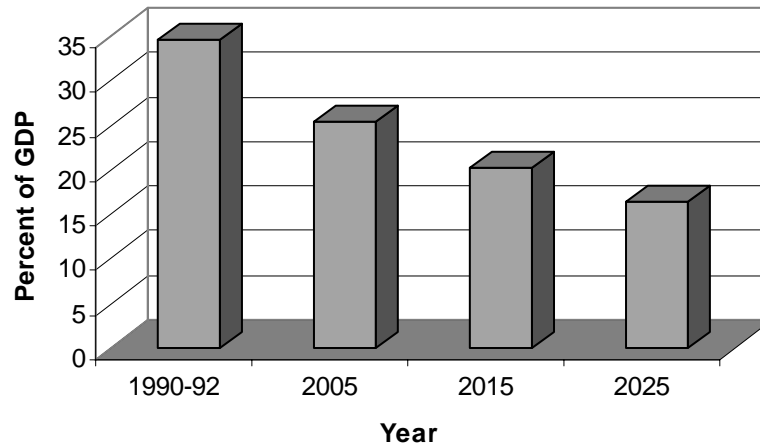Rates, Japan, 1995-2050**
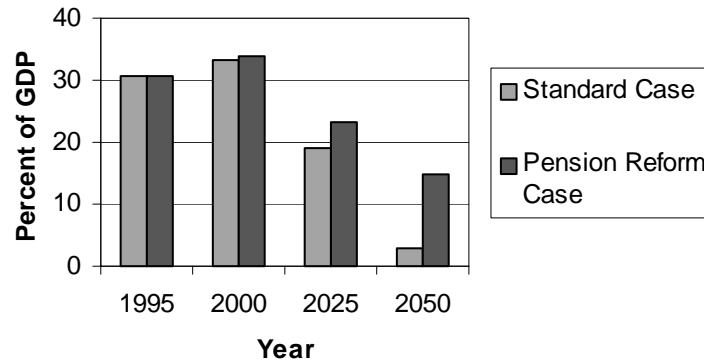
Source: Yashiro, Oshio and Matsuya (1997), Tables 1 and 4.

Williamson and Higgins (2001) also project that increasing old age dependency rates in Japan will cut savings rates in half over the next quarter century (see Figure 2.14). Their projection for 2025 is very similar to that of Yashiro *et al.*

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Figure 2.14

Savings Rate, Japan, 1990-2025

Source: Williamson and Higgins (2001), Table 5.7.

B.   Consequences of a Falling Savings Rate

A reduction in the saving rate should cause a reduction in the wealth-to-income ratio, a reduction in the rate of domestic investment and a decline in the rate of accumulation of net foreign assets. This section will deal with each of those consequences in turn.

1.   *Wealth to Disposable Income Ratio*

Between 1955 and 1987, Japanese households greatly increased their wealth to disposable income ratio (see Figure 2.15). This has been the result of their high savings rate and the rapid increase in the prices of land and securities. Since that time both rates of saving and asset values have fallen.

2.   *Investment*

In general, the impact of population aging on investment demand has been little discussed in comparison with its impact on the supply of savings. Yashiro (1993) points out that the aging of population will have opposing effects on investment. On the one hand, a declining labor force may stimulate the demand for labor-saving investment. On the other hand, investment may be discouraged by the decline in profit rates due to the reduced labor supply and the higher interest rates that will result from lower savings rates. A slowing of labor force growth will also reduce the need for capital widening (equipping new workers with the pre-existing average amount of capital per worker).

In their 1997 model, Yashiro, Oshio and Matsuya, projected that population aging would lead to a decline in domestic investment, and this decline could not be slowed by pension reform (see Figure 2.16).

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Figure 2.15

Ratio of Total and Non-Land Wealth to Disposable Income, Japan, 1955-1987
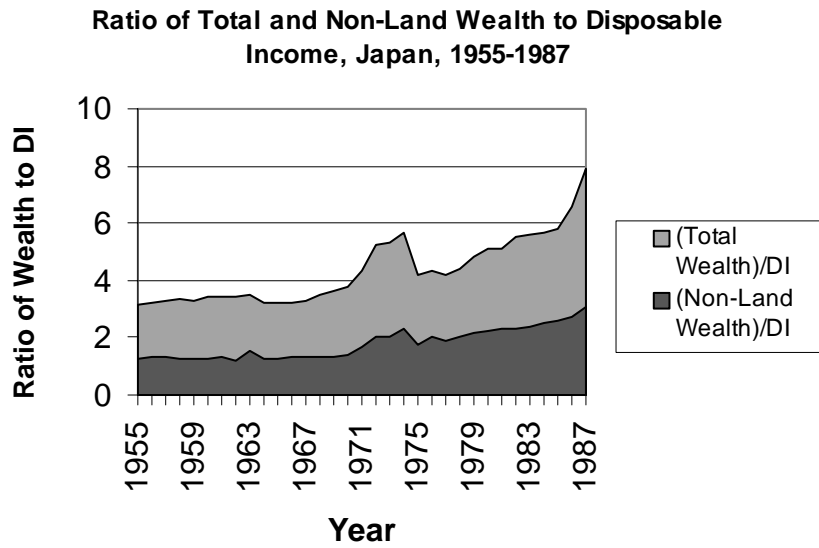
Source: Dekle, and Summers (1991).

Figure 2.16

Projection of Investment as a Share of GDP, Japan, 1995-2050
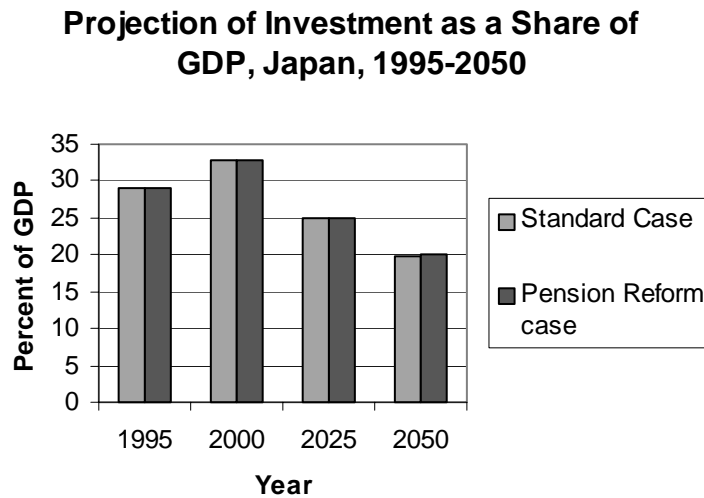
Source: Yashiro, Oshio and Matsuya (1997), Tables 1 and 4.

Williamson and Higgins argue that domestic investment is even more sensitive to old age dependency than is savings. They project that population aging will cause domestic investment to fall even faster than savings over the next quarter century (see Figure 2.17).

Figure 2.17

**Savings Rate and Investment Rate, Japan,
1990-92 to 2025**
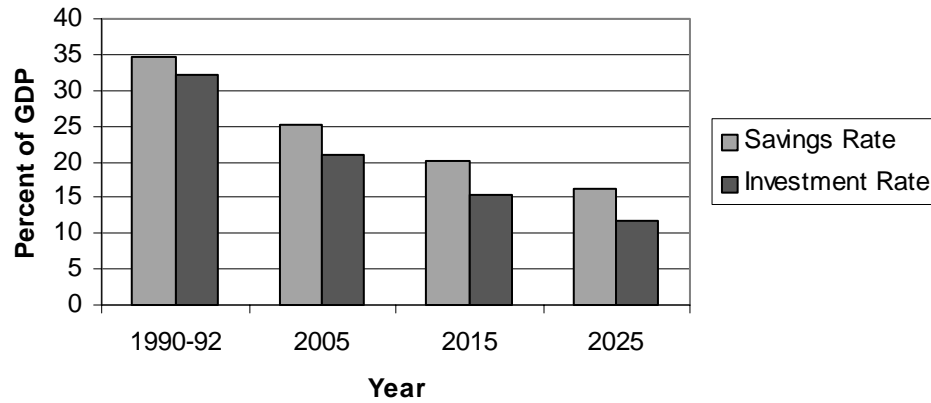
Source: Williamson and Higgins (2001), Table 5.7.

Japan's current account surplus accounts for about 2.5 percent of GDP (Figure 2.18). Because Japan has been running a current account surplus for several decades, it has experienced a significant growth in the ratio of its net foreign assets to GDP (Figure 2.19).

As a matter of accounting, the ultimate effect of population aging on the current account balance will depend on the size of the decline (presumably) in domestic investment relative to the decline (presumably) in savings. If the decline in savings is greater, Japan's external balance will fall, since the current account balance relative to GDP is equal to the domestic saving rate minus the investment rate:

CAB/Y = (DOMESTIC SAVING)/Y - (DOMESTIC INVESTMENT)/Y.

Horioka (1997) notes that, while there is widespread agreement that Japan's saving rate will decline in the future because of the rapid aging of its population and a variety of other factors, there is less agreement on the impact of aging on the current account balance.

Those who have studied this question, Noguchi (1987), Auerbach *et al.* (1989) and Masson and Tryon (1990), all find that, to some degree, a decline in Japan's investment rate will offset the decline in Japan's saving rate. But the decline in the former will ultimately outweigh the decline in the latter and that Japan's current account surplus will eventually become a current account deficit.

Figure 2.18

**Current Account Balance as a Percent of GDP,
Japan, 1992-2000**
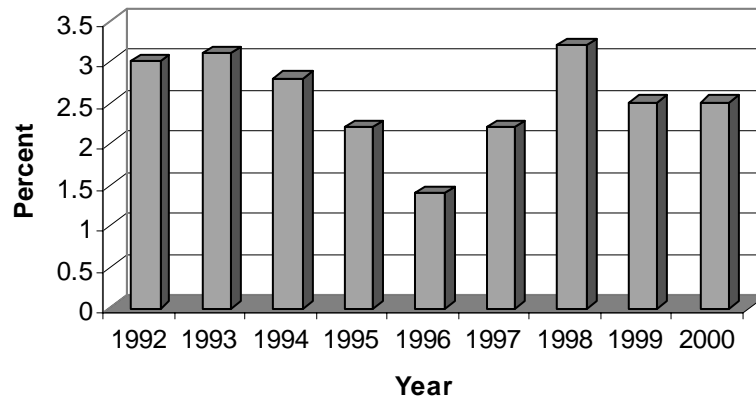
Source: International Monetary Fund (1999), page 4 (1992-1998),
Government of Japan (2001) Table 10.4 (1999-2000).

(a) There will be a Deficit in Japan's Current Account

Noguchi (1989) used simulation analysis to project both saving and investment rates. He found that the share of GDP accounted for by investment would decline until 2015 because of the decline in labor force associated with a shrinking working-age population. During the period 1995 to 2015, the decline in investment will exceed the decline in savings and the current account surplus will grow. These projections are consistent with recent history (see Figure 2.18). After 2015, the decline in saving would again exceed the decline in investment, with the result that the current account surplus will shrink and turn negative after 2025. These results are broadly consistent with an earlier study by Noguchi (1987), which also predicted that the current account would go into deficit about 2015.

In a multi-county simulation analysis, Masson and Tryon (1990) found that over the period 1995-2025, the Japanese private savings rate would decline by 4.3 percentage points and the public saving rate would decline by 1.6 percentage points, while the investment rate would fall by only 1.8 points, hence the current account/GDP ratio would fall by 4.0 percentage points. In the process of declining by this much, the current account balance would be negative by 2000 and would continue to fall until at least 2015. Data from recent years do not back up this forecast (see Figure 2.18).

In the model of Yoshiro, Oshio and Matsuya, increasing old age dependency rates have a much greater negative effect on savings rates than investment rates. Therefore, in the absence of the 2000 pension reforms, their model projected that there would be a current account deficit (see Figure 2.19) which by 2025 amounts to more than 17 percent of GDP, as compared to a surplus of 1.9 percent of GDP in 1995.

Figure 2.19

**Projection of Current Account as a
Percentage of GDP, Japan, 1995-2050**
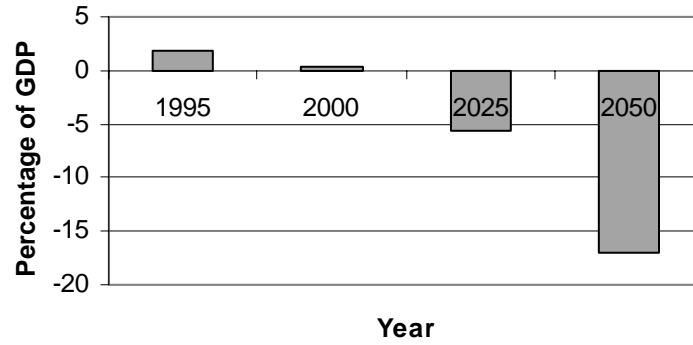
Source: Yashiro, Oshio and Matsuya (1997), Table 1.

By significantly raising national savings while having little impact on investment demand, their assumed pension reform (that was similar to the actual 2000 pension reform) will cause a substantial improvement in the current account balance. The current account deficit in 2050 would be 5.3 percent of GDP, only a third its size without the reforms (see Figure 2.20).

Figure 2.20

**Projections of the Current Account Balance as a
Percent of GDP, Japan, 1995-2050**
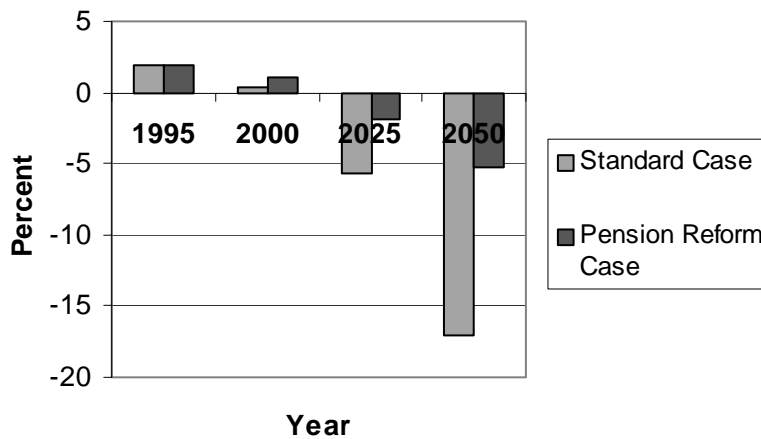
Source: Yashiro, Oshio and Matsuya (1997), Tables 1 and 4.

(b) There Will Be a Surplus in Japan's Current Account

Auerbach *et al.* (1989) used a simulation model to project Japan's current account surplus. They found that Japan's current account surplus would reach a peak of 5.6 percent of GNP in 1990 and then gradually decline until 2030, at which time the balance would be negative. After that time, Japan's current account would gradually move back to the positive range, reaching a long run level of 2.3 percent of GDP.

Hamada and Iwata (1989) used a multi-country economic growth model to predict the future net foreign asset positions of Japan and her major trading partners under the assumption that then-recent trends in saving rates were extrapolated. Their model predicted that in the long run, Germany and Japan would own 38 percent of U.S. assets and Japan's foreign capital would be almost as large as its domestic capital stock. They then explored what would happen if the Japanese household saving rate declined from 20 percent to 10 percent in 2019 as a result of population aging. Growth in the capital stock in Japan would obviously be slower because of the lower saving rate. Japanese net foreign assets in the United States would peak in the mid-2010s at a value equal to 22 percent of the U.S. capital stock, as opposed to 38 percent in the baseline scenario (see Figure 2.21).
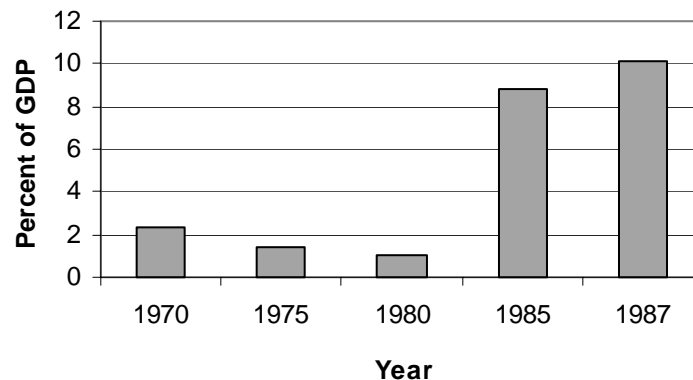
Figure 2.21

**Net Foreign Assets as a Percent of
GDP, Japan, 1970-1987**

Source: Hamada, Koichi and Iwata Kazumasa (1989), Table 1.

Higgins and Williamson (1996) observed that the effect of population ageing on investment was not identical to its effect on saving. Higher youth dependency has a greater negative effect on saving than on investment, thus inducing capital imports. On the other hand, increasing old age dependency has a greater impact on investment than saving. Hence, they project that population aging will lower the investment rate in Japan by more than it will lower the saving rate. It will "not become a nation of old people unable or unwilling to find resources to export capital". In fact, they argue that the current account balance of Japan is likely to grow as the share of the elderly in the total population increases.

As described above, Williamson and Higgins (2001) predicted that between 1990-1992 and 2025 the Japanese saving rate would fall by 18 percentage points while the investment rate would fall by 20 per cent. Hence, the share of the current account balance (CAB) in Japan's GDP will increase from 2.5 percent in 1990-92 to 4.5 percent in 2025 (Figure 2.22).

At this point, there seems to be no consensus on the effect that population ageing will have on the future stock of Japan's foreign or domestic capital.

Figure 2.22

Actual and Projected Current Account Balance As A Share of GDP, Japan, 1990-2025
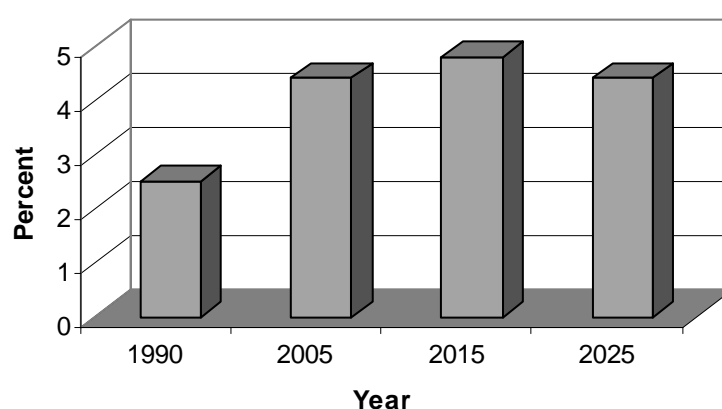
Source: Williamson and Higgins (2001), Table 5.7.

III. The Supply of Labor and Human Capital May Fall

1. The Growth of the Labor Supply

Japan's most rapid economic growth occurred in the latter half of the 1950s and 1960s, when the labor force was growing rapidly and therefore was relatively young. In the post-baby boom era, the Japanese labor force was growing at about the same rate as the working age population and faster than the total population due to the low level of fertility (Figure 3.1). The result was that employers could draw on a large stock of well-educated young workers who were willing to work for relatively low wages. The lower wages paid young workers, combined with their high levels of education, powered Japan's economic growth.

Around 1995 the population aged 15 through 64 and the labor force began to decline.[23] In the years to come, the labor force will shrink and it will continue to age. Yashiro (1997) projects that labor force growth will be negative in the 2000-2010 period and will fall even further in the 2010-2020 period (Figure 3.2).

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[23] In 1998, the male labor force peaked at 40.3 million. The female labor force peaked one year later at 27.7 million. (Government of Japan, 2001, Table 4.1).

Figure 3.1

Population and Labor Force, Japan, 1960-2000
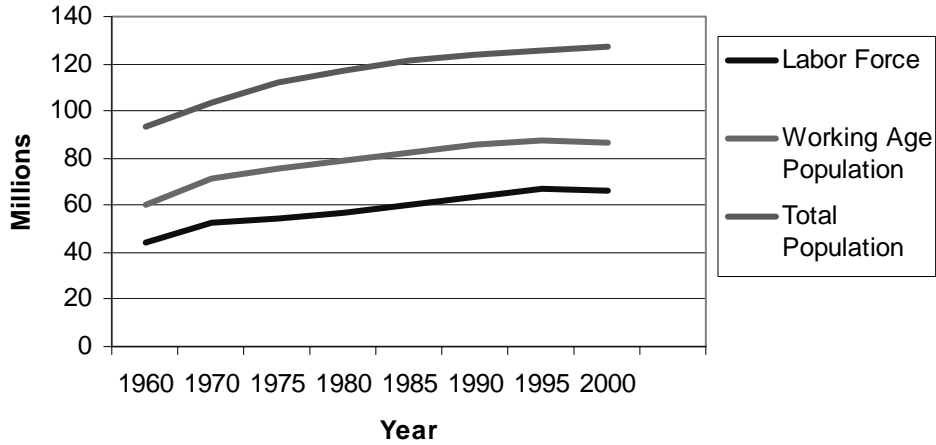
Source: National Institute of Population and Social Security (2002a), Tables 1 and 17.

Figure 3.2

Labor Force Growth Rates, Japan, 1980-2020
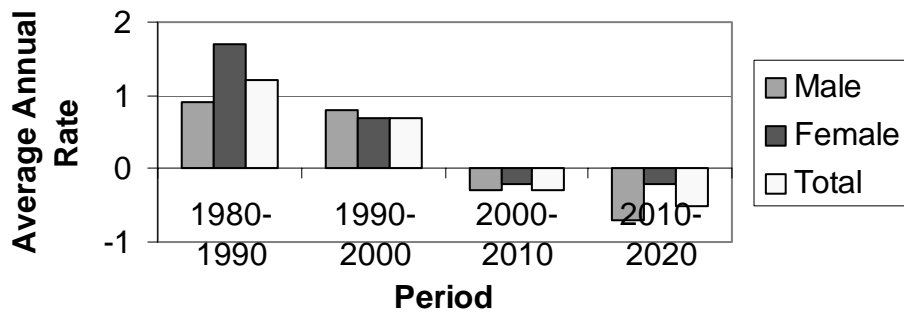
Source: Yahiro (1997), Table 1.

The decline in the size of the labor force understates the reduction in the labor component of Japan's productive capacity. The unemployment rate has been climbing since 1970 (Figure 3.3) It is now at levels which are comparable to the United States and the United Kingdom, though considerably below the levels of Germany and France (Figure 3.4).

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Figure 3.3

Unemployment Rate, Japan, 2000
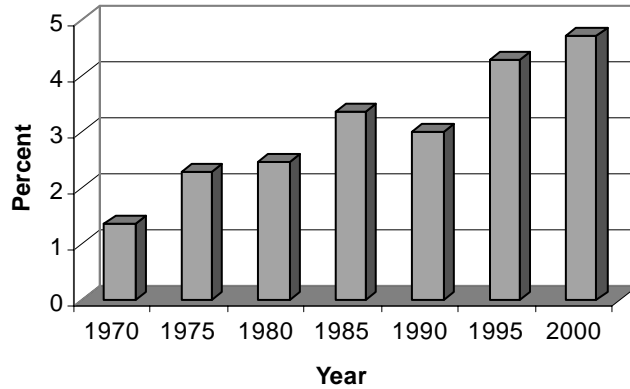
Source: National Institute of Population and Social Security (2002a), Table 17.

Figure 3.4

Unemployment Rate, OECD Countries, 2000
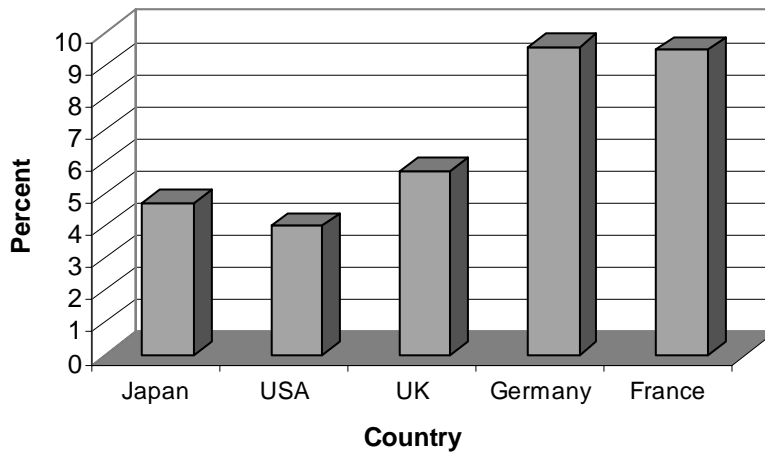
Source: The Japanese Institute of Labor.

The unemployment rate reached a record high of 5.6 per cent in December 2001. For elderly males, the unemployment rate was even higher. Figure 3.5 presents shows that in 2000, the unemployment rate for males aged 60 to 64 was almost 11 percent. The situation for elderly women is not so serious, though female unemployment does rise again at age 60 through 64 (Figure 3.6).

Figure 3.5

Male Unemployment Rates by Age, Japan, 2000
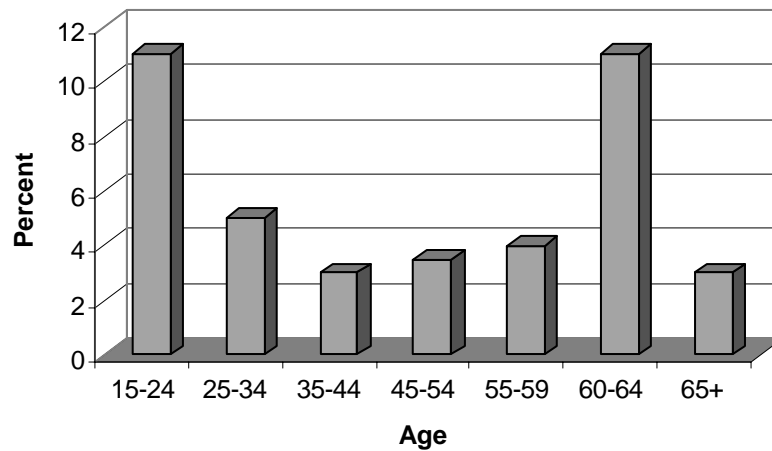
Source: Government of Japan, 2001, Figure 4.5.

Figure 3.6

Female Unemployment Rates by Age, Japan, 2000
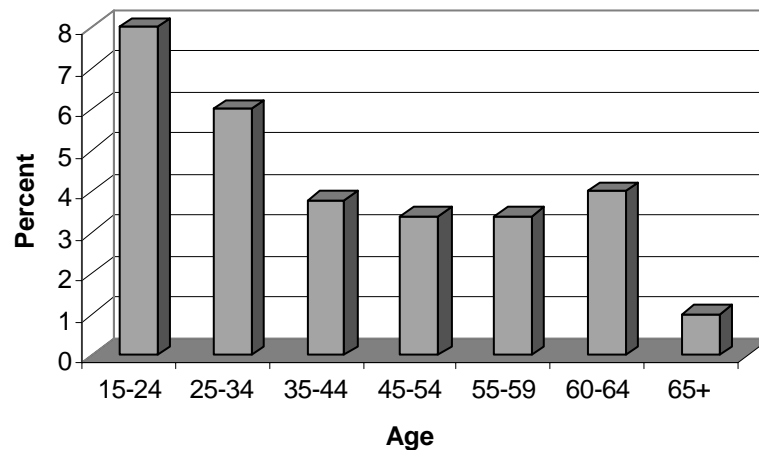
Source: Government of Japan, 2001, Figure 4.5.

Genda *et al*. (2002) decomposed contributions to the unemployment rate by age group. They found that the contribution of male workers aged 60 to 64 has been increasing since 1974. Now their contribution to total unemployment rate is as large as that of the 20-29 age group because workers face high unemployment rates after mandatory retirement.

Though the unemployment rates of these elderly Japanese workers are relatively high, the aging of the Japanese labor force has had little effect on the overall

unemployment rate. While the increase in the older work force raises the overall unemployment rate, the decline in the younger work force lowers it. The two effects offset one another.

A further reduction in the effective labor input is occurring through the steady decline in the average numbers of hours worked per month. In 1990, the average Japanese employee worked 172 hours per month. In 2000 that figure had fallen to 154 hours, a reduction of more than 10 percent in a decade (Figure 3.7).

Figure 3.7

Average Hours Worked Per Month, Japan, 1990-2000
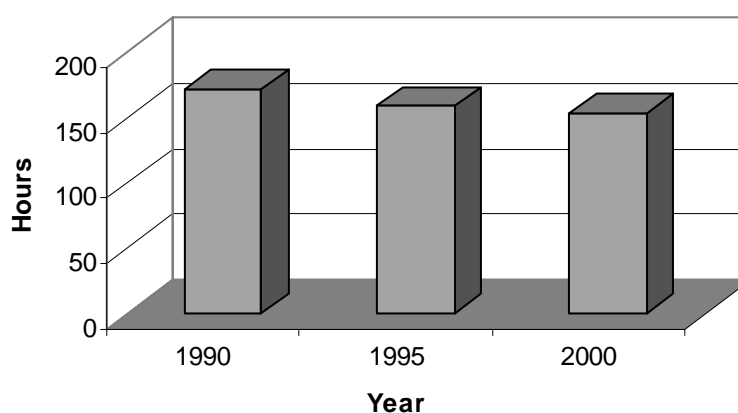
Source: Government of Japan, 2001, Table 4.6.

2.   *The Composition of the Labor Force Is Changing*

The composition of the Japanese labor force has been undergoing a great deal of change. There are fewer self-employed and family workers and more employees. There are fewer workers in primary and secondary sectors and more in the service sector. Finally, there are fewer junior high school graduates and more high school and college graduates. These changes will be discussed below.

(a) The Proportion of Employees is Rising

Workers in Japan are classified as unpaid family workers, self-employed or employees. The proportion of the labor force accounted for unpaid family workers, as well as the self-employed, has fallen for both males and females, while the proportion of employees has risen.

Between 1950 and 2000, the proportion of workers who were self-employed fell from about 26 percent to about 11 percent; while the proportion who were paid employees went up from about 39 percent to 83 percent. The major source of the increase in paid employees was the large decline in the proportion who were family workers, from 34 percent in 1950 to only 5.5 percent in 2000 (Figure 3.8).

Figure 3.8

**Distribution of the Labor Force by Type of Worker,
Japan, 1950-2000**
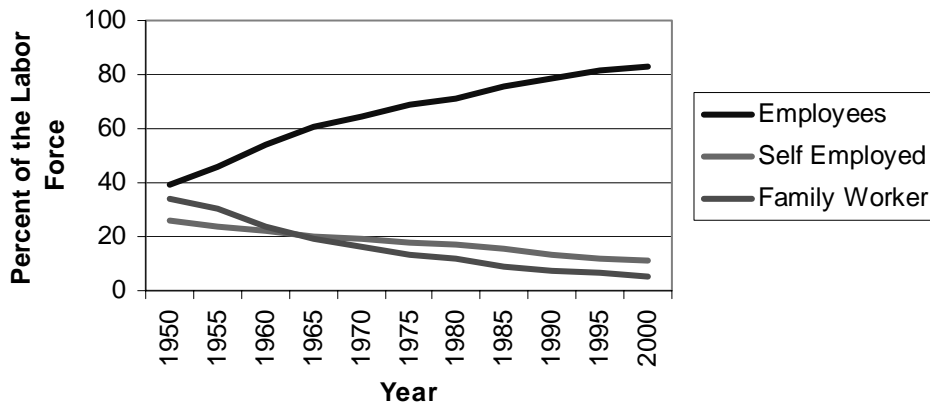
Source: National Institute of Population and Social Security Research (2000a), Table 21.

(b) Most Employment Will Be In the Tertiary Sector

Between 1950 and 2000 there was a major shift in the sectoral composition of employees. In 1950, almost half of all employees were in the primary sector (see Figure 3.9). By 2000 this figure had fallen to only 5 percent. During this period, there was moderate growth in the secondary sector, from about 22 percent in 1950 to about 34 percent in 1975 and then falling back to 30 percent by 2000. The most rapid growth was in the tertiary sector, which more than doubled its share of total employment from 30 percent in 1950 to 64 percent in 2000.[24]

(c) Distribution by Levels of Human Capital

(i) Education

In 1960, only 60 percent of Japanese students went on to high school. By 1983 this percentage had reached 93 percent (Furuya and Clark, 1994, p. 2). Between 1970 and 1988, the proportion of males in the labor force who had not completed junior college was more than cut in half, from about 47 percent to about 23 percent (Figure 3.10). At the same time the proportion of male workers who had completed college or university had almost doubled to 26 percent.

There was a comparable increase in the quality of the female labor force. The number of females who had not completed junior high school was almost cut in half

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[24] The rapid shift of employees from the primary to the tertiary sector resulted in rapid rural-urban migration as well.

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between 1975 and 1988 and the proportion that finished college or university more than doubled (Figure 3.11).

According to Furuya and Clark (1994), it was this rapid increase in educational attainment that made it possible for Japanese manufacturers to introduce robotics and microelectronics in the 1970s and 1980s.

Figure 3.9

Sectoral Distribution of Employed Persons, Japan, 1950-2000
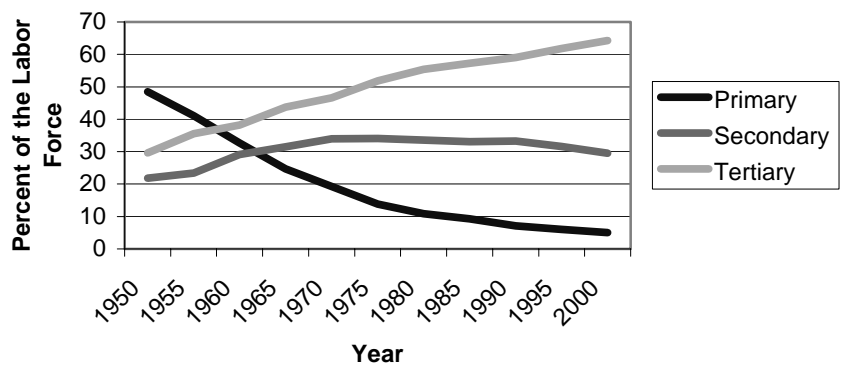
Source: National Institute of Population and Social Security Research (2000a), Table 19.

Figure 3.10

Distribution of Male Labor Force by Highest Level of Education Attained, Japan, 1970-1988
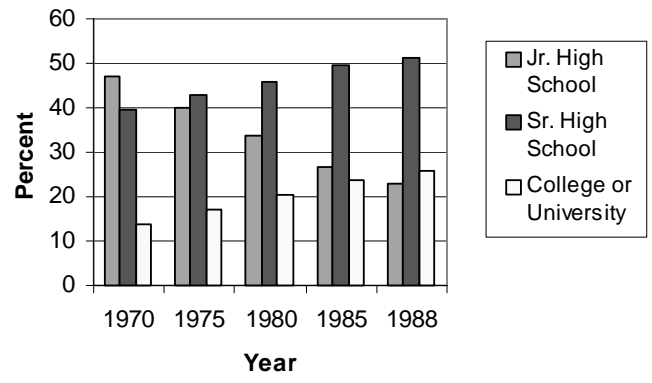
Source: Furuya, and Clark (1993), Table 7.1.

Figure 3.11

**Distribution of Female Labor Force by Highest
Level of Education Attained, Japan, 1975-1988**
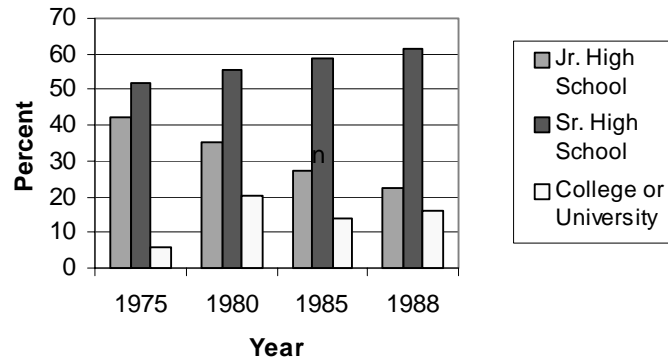
Source: Furuya, and Clark (1993), Table 7.1.

(ii) On-the-job Learning

An important source of human capital formation is investment in training of employees at the level of the firm. The longer workers are retained in the firms, the longer the useful life of the stock of human capital and thus the greater the return on the initial investment. During the period 1970-1988, average male job tenure increased from about 9 years to nearly 13 years (Figure 3.12). In the same period, average female job tenure increase from 4.5 to more than 7 years.

In part, increasing job tenure may be due to an aging of the labor force, since older workers generally have greater job tenure.[25] But this was due to other factors as well, because the average tenure increased for all age groups of men over 30 (Furuya and Clark, 1994, p. 212).

The increase in job tenure by all but the youngest workers could be explained by human capital theory. As both workers and their employers invest in human capital that is specific to the firm, there will be lower turnover rates. An alternative hypothesis can be called a theory of implicit long-term employment contracts. To reduce worker turnover, the firm pays workers less than their productivity in the early years of their employment. In return, the firm guarantees the employees that if they are diligent and remain with the firm, they will receive wage raises based on seniority and late in their careers they will receive more than their productivity.

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[25] The average job tenure for men aged 50-59 rose from about 15 years in 1970 to about 20 years in 1988.

Figure 3.12

Average Job Tenure by Sex, Japan, 1970-1988
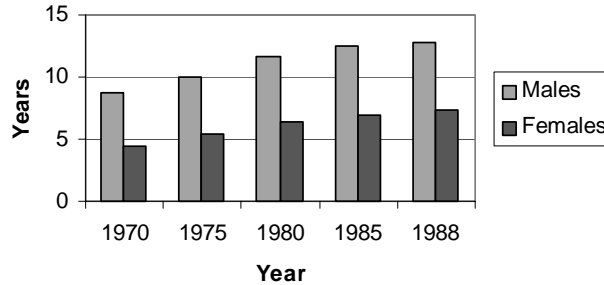
Source: Furuya, and Clark (1993), Table 7.2.

3. *Most Labor Force Participation Rates Are Falling*

When one looks at the distribution of labor force participation by age, the pattern for males is a flat inverted U (Figure 3.13). Because a significant number of women leave the labor force to rear children and then return later in life, the age profile of female labor force participation is "M-shaped" (Figure 3.14).

Figure 3.13

Labor Force Participation Rates, By Age, Males, Japan, 2000
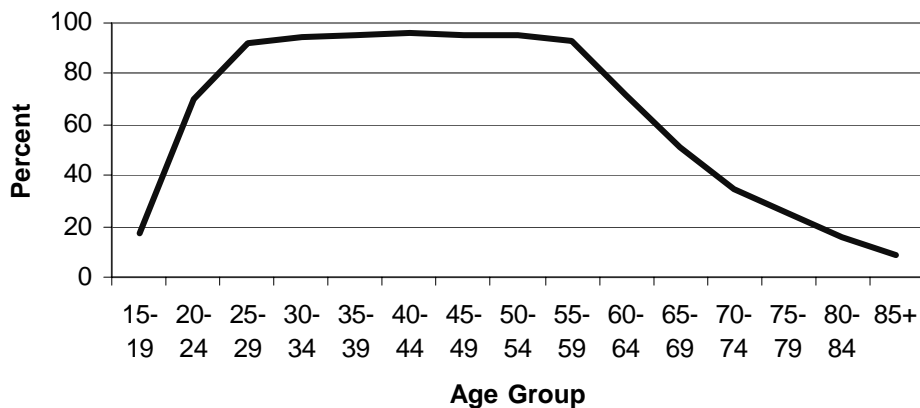
Source: National Institute for Population and Social Security Research (2001a) Table 18.

Figure 3.14

**Labor Force Participation Rates, By Age, Females,
Japan, 2000**
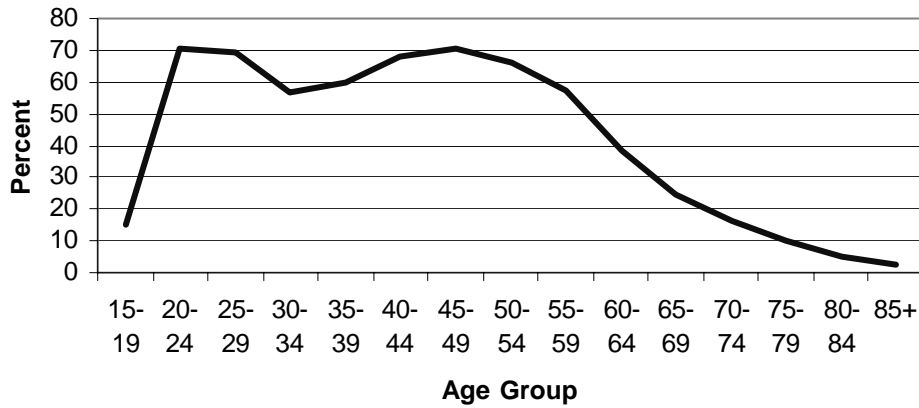
Source: National Institute for Population and Social Security Research (2001a)
Table 18.

Chiefly as a result of economic development, but also as a result of changes in household composition, education and social welfare systems, there have been significant declines in the labor force participation rates (LFPRs) of the elderly, both men and women. But in the prime working ages (20-54), there has been a divergence in LFPR trends between men and women. The LFPR of men fell, while that of women rose.

(a) Labor Force Participation

The labor force participation rates of men aged-15-and-over has been falling over the last four decades. It declined from about 85 percent in 1960 to about 75 percent in 2000. The LFPR of adult women fell from about 51 percent in 1960 to about 47 percent in 1980 and recovered to 48 percent in 2000. Thus the gap between male and female participation rates narrowed from 35 percentage points in 1960 to 25 percentage points in 2000 (see Figure 3.15).

Yashiro *et al.* (1997b) predicted that in the 21st century, the LFPRs of each age group of women will increase, in part because of cohort effects as young women with high labor force attachment move up the age ladder. Nonetheless, the overall female LFPR will decline because of a change in the age structure of the female population towards age groups with lower LFPRs (i.e., a greater share of the female population will be in the older age groups, which have lower LFPRs). This compositional effect will outweigh the favorable cohort effects; unless the labor force participation of elderly men and women can be increased.

Figure 3.15

**Labor Force Participation Rates, Age 15 and Above,
Japan, 1960-2000**
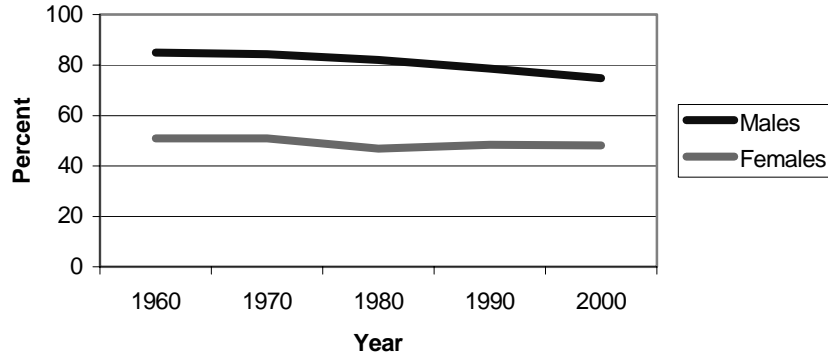
Source: National Institute of Population and Social Security Research (2000a),
Table 18.

(b) The Labor Force Participation of Most Young Adults Will Decline

Because of an increase in schooling, there was a significant decline in the LFPRs of young men in both the 15-19 and 20-24 age groups (see Figure 3.16). In relative terms, the decline is much more rapid for the youngest age group, from about 52 percent in 1960 to little more than 17 percent in 2000. However, there was also a significant fall in the participation rates of males aged 20-24, from 88 percent in 1960 to 70 percent in 2000.

Figure 3.16

**Male Labor Force Participation Rates, Aged 15-24,
Japan, 1960-2000**
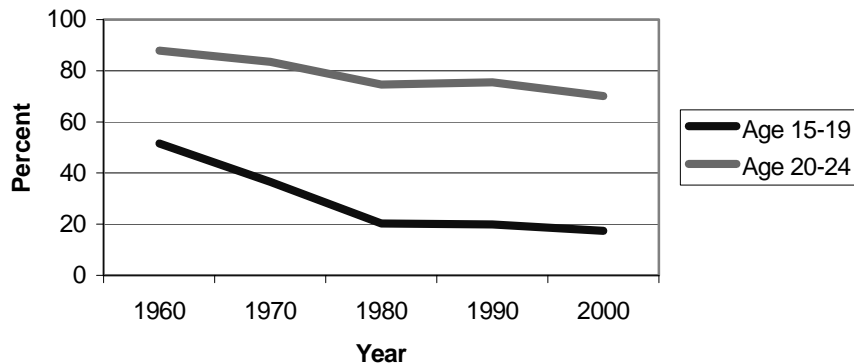
Source: National Institute of Population and Social Security Research (2000a),
Table 18.

As in the case of males, there was a very steep decline in the participation of school age females (15-19), from 50 percent in 1960 to 15 percent in 2000 (see Figure 3.17). Unlike the case of males, however, there was no decline of participation rates among females aged 20-24; indeed, there was a slight increase over time.

Yashiro *et al.* (1997b) noted that between 1975 and 1995, the overall LFPR of adult women increased modestly, from about 46 percent to about 50 percent. However, there was a very substantial increase in the LFPR of women aged 25-29, from 42.5 percent to 66.4 percent. Among the reasons for the rise in participation by the 25-29 age group was the declining portion that was married. However, the LFPR of married women aged 25-29 increased as well, due to (1) better day care facilities, (2) shorter working hours, and (3) rising wages. (These issues are discussed in an earlier paper in this series under the socio economic causes of fertility decline.)

MacKellar *et al.* (2002) report that a 1997 survey by the Japanese Ministry of Public Management sought to identify persons who would like to work but are unable to do so for reasons such as a lack of adequate childcare. They found that about 20 per cent of women aged 25 to 40 fell into this category. Based on this information, a scenario analysis showed that if these women were brought into the Japanese labor force by gradually reducing the discouraged worker effect, the decline in the Japanese labor force could be delayed until 2025.

Figure 3.17

Female Labor Force Participation Rates, Aged 15-24, Japan, 1960-2000

Source: National Institute of Population and Social Security Research (2000a), Table 18.

Figure 3.18

**Female Labor Force Participation Rates,
Aged 25-29, Japan, 1960-2000**
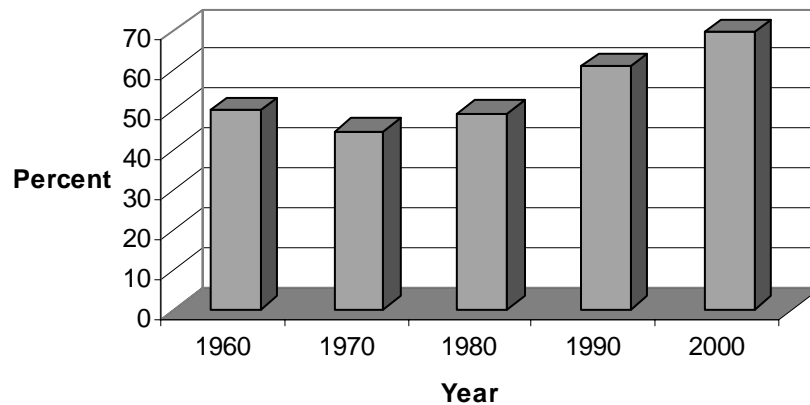
Source: National Institute of Population and Social Security Research (2000a), Table 18.

In response to the Equal Employment Opportunity Law (EEOL) in 1986, large firms created two alternative career tracks for incoming college graduates, the general track and the management track. Almost all men entered the latter while only about 10 percent of women did. (About 50 percent of women who are university graduates entered the management track.) (Rebick, 2001, p. 126) Nevertheless, the EEOL was very important to many young Japanese women and inspired them to achieve higher levels of educational attainment.

Upon retuning to work after childbearing, university educated women prefer specialist or highly skilled careers as opposed to managerial careers. As population aging proceeds and labor shortages begin to appear, firms will find it necessary to provide better employment opportunities for women, including the right to reemployment after taking leave to care for young children. It is likely though that these women will find themselves in specialized posts rather than line management positions.

(c) The Labor Force Participation of the Elderly Is Falling

Figure 3.19 shows that the LFPRs of elderly Japanese men are quite high compared to those of other OECD countries. Nevertheless, there has been a significant decline in the LFPRs of both men and women in the 60-64 and older age groups.

Between 1960 and 2000, the decline was from 83 to 72 percent in the case of males aged 60-64 (see Figure 3.20). In the case of males aged 65-69 the decline was even more rapid, from 70 percent in 1960 to about 60 percent in 1990. The LFPR of the 70-74 age group fell more or less in parallel with that of the other two age groups, from 52 percent in 1960 to 35 percent in 2000.

Figure 3.19

Labor Force Participation Rates of Older Males, Selected OECD Countries, 1996
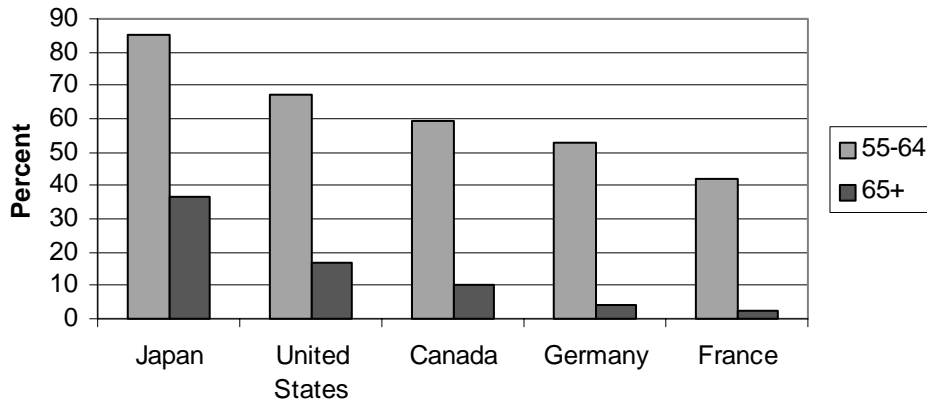
Source: OECD (1998) *Labor Force Statistics*.

Figure 3.20

Male Labor Force Participation, Aged 60-74, Japan, 1960-2000
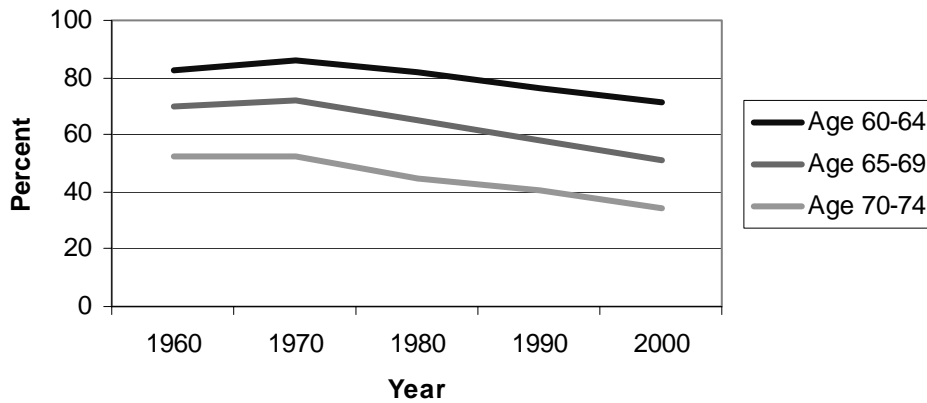
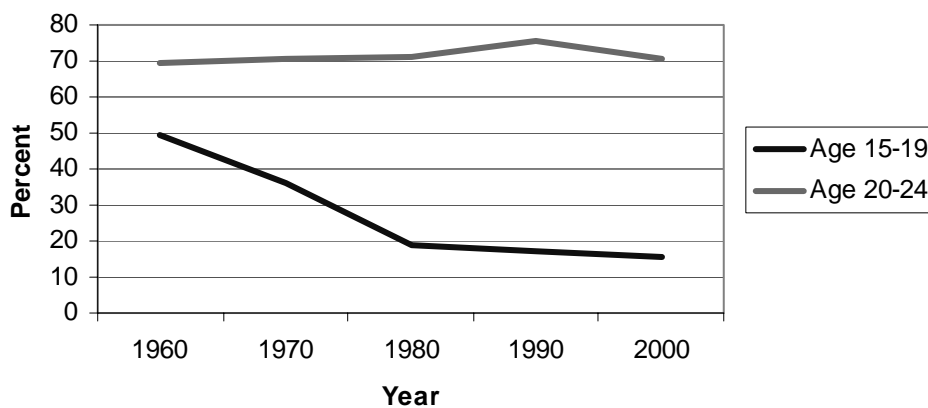Source: National Institute of Population and Social Security Research (2000a), Table 18.

Yashiro *et al.* (1997b) suggested that the labor force participation of older workers may rise as a result of the immediate increase in the age of eligibility for the basic pension to 65 and the gradual increase of the age of eligibility of the earnings related pension to 65, as well as the general reduction in pension benefits. The government is also promoting increased labor force participation of the elderly by

eliminating earnings tests for the receipt of earnings related pensions and by providing a wage supplement to low wage earners in that age group.[26]

Among older female workers there has been no decline in the LFPR of the 60-64 age group. The LFPR of females aged 60-64 was 39 percent in 1960 and it was the same in 2000. However, in the 65-69 age group there was a significant decline in labor force participation (see Figure 3.21). Between 1960 and 2000, the decline was from 31 to 25 percent. For women aged 70-74 the decline was also pronounced, from 21 percent in 1960 to about 16 percent in 2000.

Figure 3.21

Female Labor Force Participation, Aged 60-74, Japan, 1960-2000
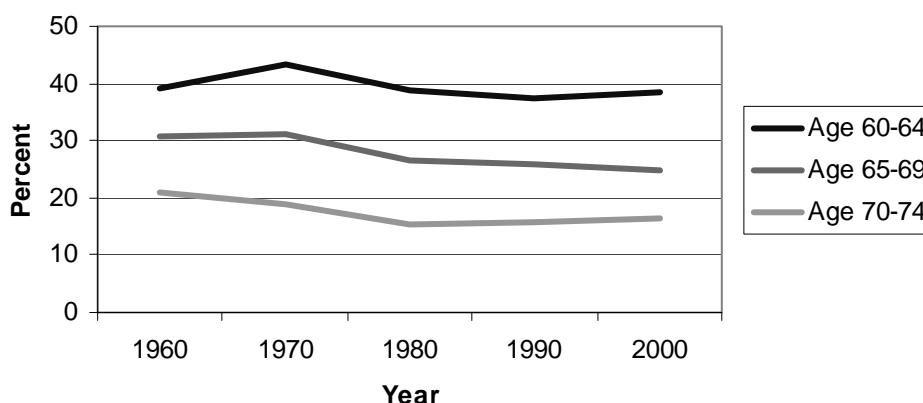
Source: National Institute of Population and Social Security Research (2000a), Table 18.

4. *Institutional Factors Affecting Labor Supply and Demand*

Historically, the distinguishing features of the Japanese labor market were a seniority-based wage system and lifetime employment.[27] Lifetime employment provided workers with job stability and employers with high levels of effort and low turnover. However, commitment to lifetime employment was linked to mandatory retirement at a relatively early age.[28]

Another characteristic of the Japanese labor market was the bonus system, with bonuses sometimes amounting to one-quarter of total compensation. The bonus system was closely linked to the implicit contract that firms would continue to provide

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[26] Without this wage supplement, it was sometimes financially advantageous for the elderly to collect unemployment benefits, rather than work for a greatly diminished wage.

[27] This system was largely limited to male workers. Female workers were generally part time workers who stopped working either at marriage or after the arrival of the first child.

[28] This is consistent with the implicit contract model of Lazear (1979)

employment (to long-term workers) even during economic downturns. The original intent was that, during times of deficient demand, bonuses (and thus total compensation) could be cut rather than cutting employment of full time workers. [29]

A third, and exceedingly important, institutional aspect of the Japanese labor market is that it is largely closed to international migration. In this section we will discuss these three institutional factors.

(a) Seniority-based Wages

In the past, the low fertility had been an advantage because it promoted investments in education. Now it means that Japanese firms must find a way to manage an aging labor force. In such a situation, the seniority based wage system will likely lead to higher labor costs and thus slow the rate of economic growth. Alternatively, the pressures of an aging labor force will force firms either to abandon the seniority wage system or, if they retain it, flatten age-earnings profiles.

Figure 3.22 below was taken from the Statistical Handbook of Japan (2001). It shows the age profiles of contractual earnings for Japanese men and women in 1999.[30] The profile for men is much steeper and reaches a peak around age 55. The profile for women is less steep and reaches its peak about a decade earlier. For both men and women, the age profiles are steepest in the largest firms and grow flatter with a decline in firm size.

Figure 3.22

Monthly Contractual Earnings by Size of Enterprise (1999)
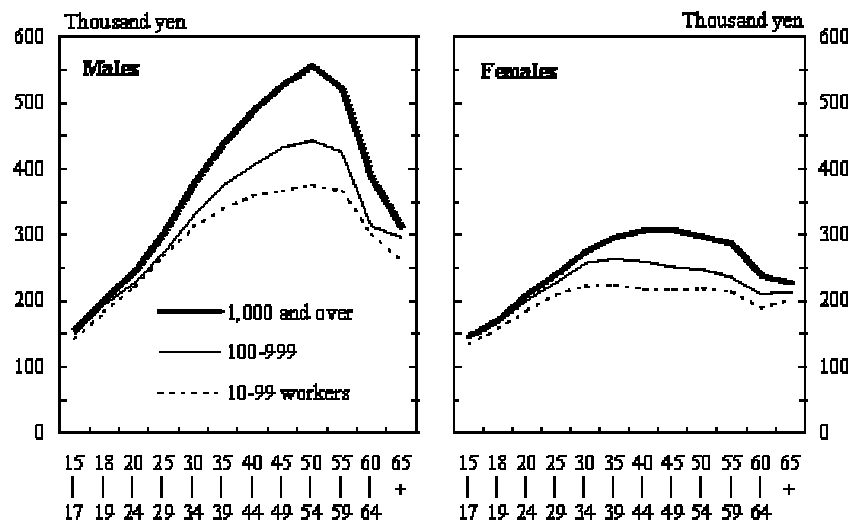
Source: Ministry of Health, Labour and Welfare.

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[29] Since a smaller proportion of women workers are full-time employees, fewer women are eligible for bonuses.

[30] Contractual earnings do not include bonuses.

Itoh (1996) has suggested that the system of seniority-based wages, which is perhaps more strongly in evidence in Japan than in any other developed country, may have worked well when the labor force or productivity was growing rapidly. At that time a large pool of younger workers who were receiving less than their productivity were supporting deferred payments to a smaller group of older workers who were receiving more than their productivity warranted. "In this way," he writes, "the lifetime employment system with seniority based wages can be thought of as a type of pay-as-you go company pension system."

Ohtake (1999, p. 9), however, argues that the seniority system can be justified both by human capital theory and the incentive theory. In the former, the seniority system is justified by the increasing productivity of older workers due to their accumulation of skills. The incentive theory maintains that employers defer paying workers their full productivity to give them a strong incentive to remain with the firm and to be diligent. Despite their divergent points of view, both authors agree that firms will be forced to bow to the changing age structure of the labor force by allowing age-earnings profiles to flatten.

Since older workers are being paid more than their productivity, employers have a need for mandatory retirement. Clark and Ogawa (1992) found that that the age of mandatory retirement is younger in firms where the age-earnings profiles of workers are steeper. This would tend to confirm the implicit contracts hypothesis. The policy of Japanese firms to rehire workers at lower wages after mandatory retirement is also consistent with this model.

(b) The Official Retirement Age

More than 70 percent of Japanese firms will allow some workers to continue working past the mandatory retirement age or will re-employ workers in lower status jobs at lower pay. As a result, Japan has the highest LFPR of older men among the OECD countries (see Figure 3.19) in spite of its mandatory retirement policies. On average, men work about five years after mandatory retirement, receiving wages 20 to 40 percent below their pre-retirement wages. It is this reduction in wages that has made it economical for employers to continue employing elderly workers.

In 1974, about two thirds of Japanese firms had mandatory retirement policies. By the 1990s, that proportion had risen to more than 99 percent, as more and more small firms had adopted these policies. Furuya and Clark (1994, page 223) report that, in 1988, almost 90 percent of firms with 30 or more employees enforced a mandatory retirement policy. Perhaps surprisingly, at the same time that mandatory retirement has been spreading, the mandatory retirement age has been rising. In 1974 the typical mandatory retirement age for men was 55 (or younger). By 1989, most firms had set their mandatory retirement age at 60 (or older). By the year 2000, that figure had risen to more than 99 per cent (Ohtake and Yamaga, 2002).

The Japan government had urged firms to raise the age of retirement in order to stabilize pension and medical costs. Yet Ogawa and Clark (1996) reported that firms resisted doing so because of the higher costs that would be incurred by retaining older workers under the current seniority-based compensation system. Where firms have raised the mandatory age of retirement, they have also (1) introduced early retirement programs, (2) increased the rates at which they transfer workers to subsidiaries and other firms, (3) made greater use of policies that allow firms to rehire workers after retirement at lower wages, and (4) changed their pattern of

compensation to reduce the cost of older workers. The latter changes have included adding merit pay considerations to their wage setting and simultaneously reducing the size of longevity increases. [31] Figure 3.23 indicates that the age-wage profile for university graduates in large manufacturing firms is gradually becoming less steep.

Figure 3.23

Ratio of Older to Younger Wage Rates, University Graduates in Large Manufacturing Firms, Japan, 1970-1990
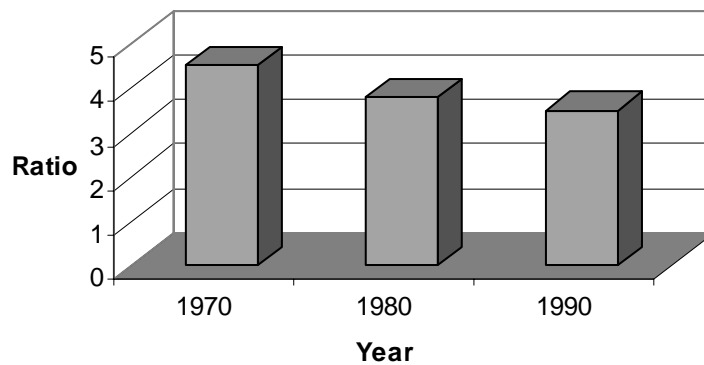
Source: Rebick (2001), Figure 5.2.

Hori (1993) claims that these new policies have to some degree adversely affected the morale of workers and thus the team-oriented methods used by many Japanese firms. A related problem with extending the age of retirement is that the final lump sum severance payment made to Japanese workers depends upon the years of service and final earnings, both of which are likely to be increased by extending the age of retirement.

In general, labor force participation among the elderly is positively correlated with wages and education. More than 60 percent of men aged 60 and over with university degrees remained at work as compared to 39 percent of those who had only completed junior high school.

Currently, employees can begin receiving public pensions at age 60; but this will gradually increase to age 65. This will pose serious difficulties for workers who are subject to mandatory retirement at age 60 and who may be unable to find re-employment. To encourage re-employment of such workers, the government of Japan is offering subsidies of various sorts.

Continued employment of elderly workers should not only benefit workers, but also alleviate the shortage of new workers as labor force declines. During the

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[31] Raising the age of retirement has led to flatter wage profiles, particularly for university graduates. If the mandatory age of retirement is gradually extended to age 65, it will probably be accompanied by side agreements calling for wage cuts after age 60 (Rebick, 2000, p. 131).

current recession in Japan, there is no concern about the lack of new entrants to the labor force. In the future, however, this will be a major concern of firms. At that time it may be necessary to adopt one or more of the following approaches: (1) invest in labor-saving technologies, (2) better utilize female workers, and (3) allow more immigration.

(c) International Migration

Sakuragawa and Makino (2002) found that an increase in the flow of young migrants to Japan would encourage economic growth. Migration would increase the supply of unskilled workers relative to skilled workers thus raising the relative wage of the latter. This should serve as an incentive for young workers to invest in more human capital and this should promote economic growth.

Goto (2002) used a simple computable general equilibrium (CGE) to empirically analyze the effects of migration, foreign direct investment and trade liberalization as means of improving the economic welfare of Japan and several developing countries of East Asia including China, Indonesia, Korea, Malaysia, the Philippines and Thailand. The results derived from the model indicated that migration from other East Asian countries would increase welfare in those countries but lower it in Japan. In the case of trade liberalization, the welfare increases in other East Asian countries is much larger than in the case of increased emigration to Japan. Furthermore, trade liberalization substantially increases the welfare in Japan.[32]

We can conclude from this review that the supply of labor in Japan is likely to fall rapidly in future decades. Not only is the working age population shrinking, hours worked per month and labor force participation rates are also declining. Furthermore Japan can no longer assume that its labor force will be fully employed. Since the labor supply is likely to fall and the rate of capital formation is likely to stagnate, the chances for maintaining economic growth in the 21st Century depend crucially on accelerating the rate of growth of productivity.

IV. The Growth of Total Factor Productivity Is Slowing

This section will examine the importance of productivity growth to the long-term economic future of Japan. It will look at recent trends in productivity growth and review some evidence concerning the relationship between an aging labor force and productivity decline.

Kosai, Saito and Yashiro (1998) pointed out over the last century, the proportion of Japanese growth due to increases in Total Factor Productivity (TFP) had risen from 20 to 47 percent.[33] They then described a macroeconomic model they constructed to show how increasing the efficiency of the economic system might

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[32] The international mobility of capital, like international trade, can be a substitute for the mobility of labor. Goto examined the effect of increased foreign direct investment by Japan in the other countries of East Asia. His results indicated that the welfare of Japan would increase because its capital would earn a higher rate of return but the welfare of the receiving countries would decrease.

[33] They took issue with Krugman's (1994) assertion that the growth of Japan (and other East Asian nations) was driven by capital accumulation rather than technical advance.

largely offset the effects of population aging and allow sustained economic growth in the face of a declining population.

Using country macroeconomic and demographic data from the period 1947 to 1996, they estimated the model and used the results to project the course of the Japanese economy up to 2025. Fertility was determined by such factors as the ratio of women's to men's employment and the availability of childcare services. The capital-labor ratio determined labor productivity, which then determined male and female employment. Savings depended, in part, on the age structure of the population and in part on the labor force participation rates of women. These rates were a function of the wage rate and fertility, assuming a negative relationship between maternity and labor supply.

In their first scenario, a tightening labor market was assumed to lead to efficiency gains similar to those observed in the late 1980s. Under these assumptions, GDP stabilized after 2010. In a second scenario, they assumed that the negative effect of fertility on female labor force participation is reduced.[34] That led to increased employment, and a less dramatic fall in the saving rate. The GDP continued growing after 2010 at the rate of about 1 percent per annum. The authors concluded from this exercise that by increasing the efficiency of markets and increasing the employment of women, Japan can continue to grow in spite of a falling population.

Neoclassical theory would predict that in the face of an increasing scarcity of labor, firms would seek to employ their labor more efficiently. Thus a decline in the labor supply should be accompanied by an increase in both labor productivity and total factor productivity. A cross-national study by Cutler *et al.* (1990) seemed to confirm this prediction.

Curiously, this does not seem to be the case in Japan. Productivity grew most rapidly in the 1960s when the labor force was growing rapidly. Conversely, the current slowing of labor force growth has been accompanied, not by an increase, but by a steady decline in the growth of various measures of productivity. Ito (1996) provided estimates of productivity growth for three periods, 1960-71, 1971-80 and 1981-1982. Figure 4.1 shows that between 1960 and 1992 the rate of productivity growth has declined in all sectors of the Japanese economy.[35]

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[34] Among the methods they suggested for reducing the negative effect of women's employment on fertility were: more participation of men in home production and lowering the barriers that discourage women with small children from re-entering the labor market.

[35] The decline is especially rapid in non-tradeables where Japan does not face international competition.

Figure 4.1

Growth Rate of Productivity, Japan, 1960-1992
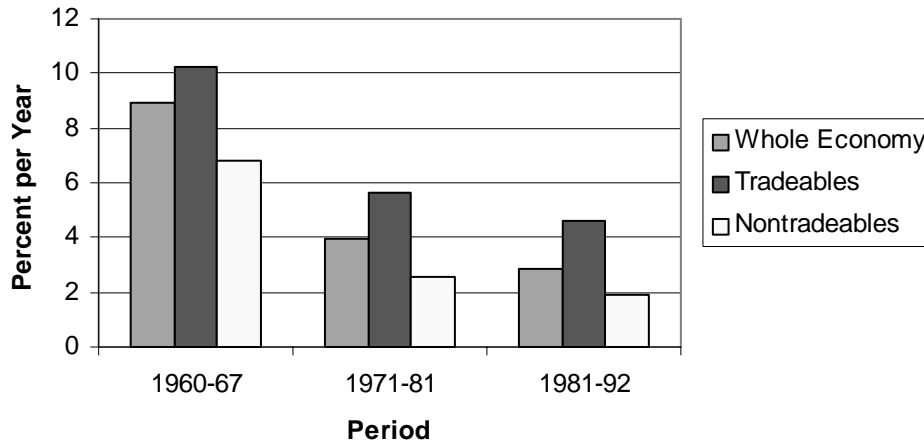
Source: Itoh (1996), Table 3.

Hayashi and Prescott (2002, p. 55) claimed that the productivity factor was the major determinant of the Japanese economy in the 1960 period, one in which there was a "growth miracle". From 1983 to 1990, Japanese total factor productivity grew at about 2.4 per cent per year. However, as labor force growth declined, the growth of productivity also fell precipitously, descending to 0.2 per cent per year in the period 1991-2000 (Hayashi and Prescott 2002).

They decomposed the sources of the growth of income per person aged 20-69 into four components, (1) a 2 percent trend growth rate, (2) productivity growth, (3) growth of the capital stock, and (4) labor force growth. In the period 1960-1973, productivity growth contributed 4.5 percentage points of the unprecedented 7.2 percent annual growth rate or almost two thirds of the total. But during the decade of the 1990s, often called Japan's "Lost Decade", the productivity factor subtracted 1.7 percentage points, leaving the annual growth rate at a miserable 0.5 percent per year (Figure 4.2).

Wolf (2001) presents a slightly different picture of the decline in the Total Factor Productivity in Japan (Figure 4.3). Unlike Hayashi and Prescott, he calculated that TFP actually rose in the decade of the 1980s. But he also found that in the first half of the 1990s, TFP had fallen to levels below that of the 1970s. In his analysis of the growth of labor productivity in manufacturing, Wolff also found that there had been a continuing decline in labor productivity (Figure 4.4).

Figure 4.2

**Growth Rate of Output Per Person Aged 20-69
and Productivity Contribution, Japan, 1960-2000**
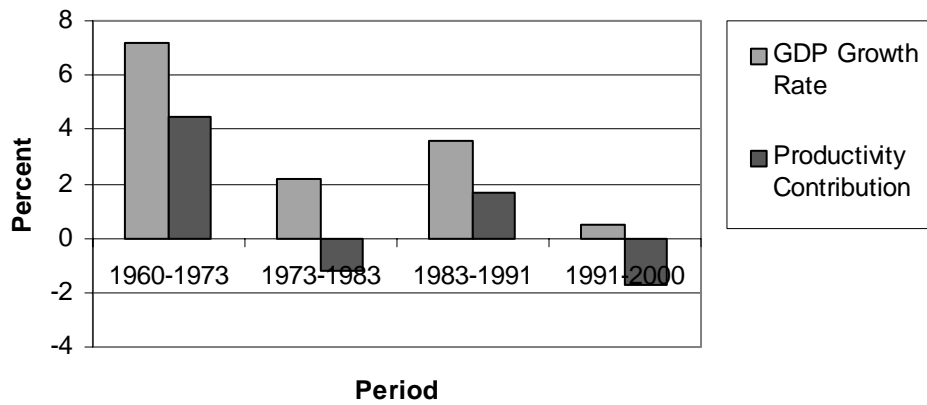
Source: Hayashi and Prescott (2002), Table 5.

Figure 4.3

**Annual Growth Rates of Output and TFP, Japan,
1970-1994**
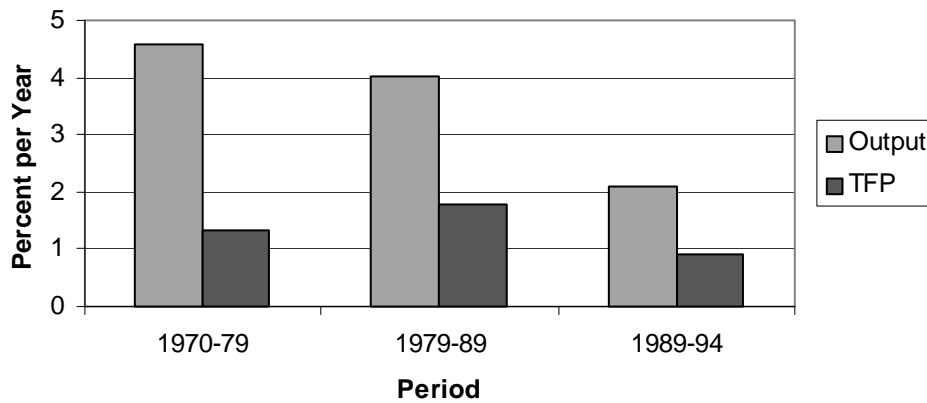
Source: Wolff (2001) Tables 8.7 and 8.8.

Figure 4.4

**Annual Growth Rates of Output and Labor
Productivity in Manufacturing, Japan, 1970-1994**
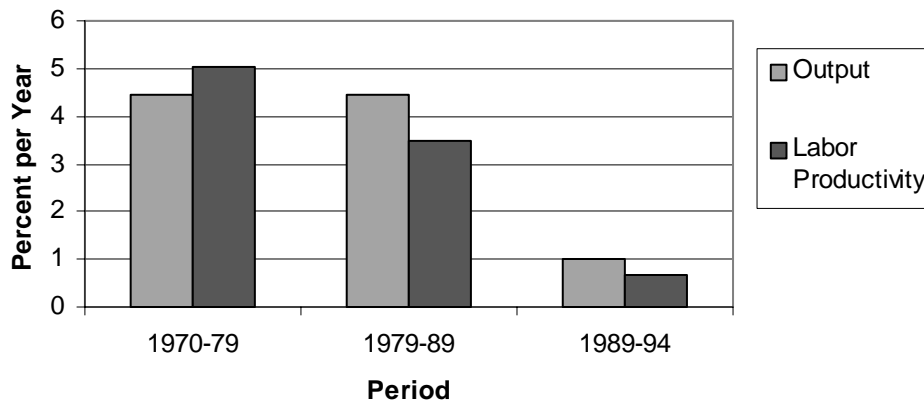
Source: Wolff (2001), Tables 8.4 and 8.5.

Is the aging of the Japanese labor force responsible for this productivity decline? At a time when there is a rapid introduction of digital technologies, there is concern that an aging labor force might be a major impediment to efforts to accelerate the rate of technological progress. However, a study of the information technology sector did not support the "inflexible old worker hypothesis" (Nishimura *et al*., 2002). There was no correlation between the rate of technological progress and the ratio of old workers in total labor inputs.[36]

Since population aging in Japan will surely slow the rate of capital formation and bring about an absolute decline in the effective labor input to production, Japan's only real hope for avoiding economic stagnation was an offsetting increase in labor and total factor productivity. Though neoclassical theory would predict that there would be just such an increase in efficiency, trends in Japanese productivity seem to be moving in the opposite direction. Unless Japan can engineer a complete turn around in its productivity outlook, economic stagnation is inevitable. Such a turnaround would be no small order. Japan is already on the technological frontier and has little opportunity to acquire technology from other countries. If productivity is to grow rapidly, Japan must take the lead in advancing industrial technology.

V. The Pension and Health Systems

This section will first discuss the Japanese social security system as a whole. It will then examine its two largest components, the pension and health insurance schemes. Not only are these programs vitally important to the welfare of the elderly

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[36] Their study concludes that investment in information technology would be an effective way to counter the perspective shortage of young workers because of population ageing

population of Japan, they are also major determinants of whether the government's accounts are in surplus or deficit. Thus they are major determinants of the national savings rate.

In the future, the national saving rate may fall precipitously because of deficits in these schemes. This was not always the case. In 1995, Meredith (1995, page 46) maintained that the seeming fiscal health of the Japanese government was due to large surpluses in the social security accounts. He argued that, absent the 1994 reforms, population aging would have caused these to deteriorate rapidly. The ratio of pension benefits to GDP would have gone from 5 percent of GDP in 1995 to 13 percent in 2020 and medical spending would have risen by 2 percentage points of GDP. The social security surplus would have been eliminated about the year 2000, and the deficit would have been 9 percent of GDP by 2020.

A.   The Social Security System

The Japanese social security system has three major components: medical care, pensions and welfare. Measured by expenditures, public pension schemes are the most significant component of the system. However if regular medical care insurance is added to public health expenditures and health care for the elderly, the total medical component of social security is already larger than the pensions component (Figure 5.1).

Figure 5.1

Social Security Expenditures, Japan, 1997
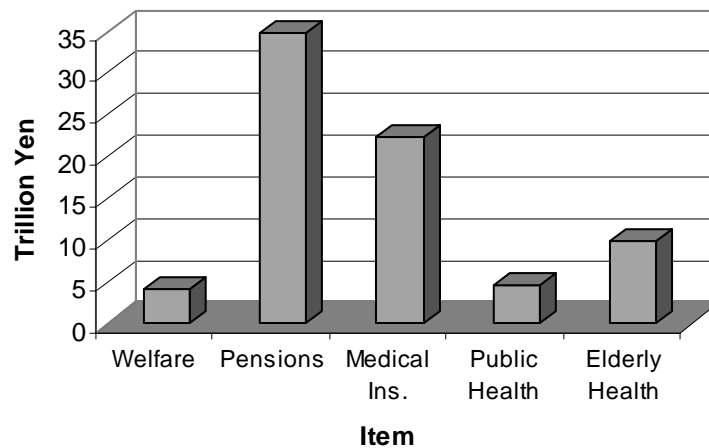
Source: Government of Japan (2001) Table 13.1.

The economic impact of the social security system is enormous. In fiscal year 2002, social security contributions equaled 15.5 percent of National Income. (The Japan Institute of Labor) Together, social security contributions and income taxes removed about 38 percent of National Income from household purchasing power that might otherwise have gone to private consumption spending or saving. Figure 5.2

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shows the combined burden of social security contributions and the income tax has remained relatively constant since 1985 because the growth in the social security share has been largely offset by a decline in the income tax share.

Compared to that of other OECD countries, the combined burden of tax and social security contributions is still quite low in Japan (figure 5.3). It is slightly higher than the combined burden in the United States; but it is considerably lower than that of the United Kingdom, Germany and France.

Figure 5.2

Ratio of Income Tax and Social Security Contributions to National Income, Japan, 1985-2000
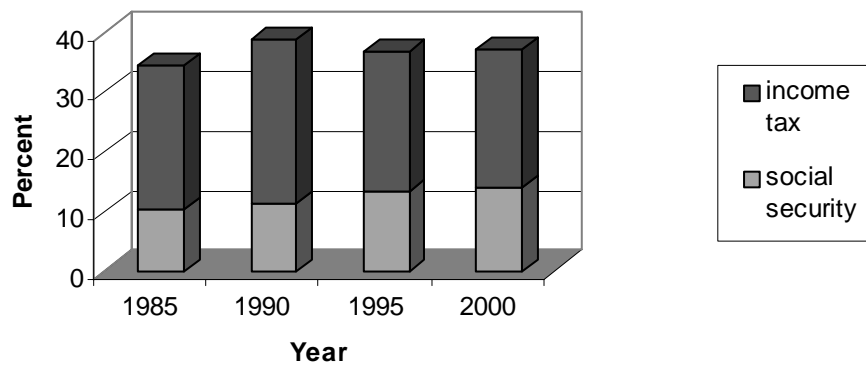
Source: The Japan Institute of Labor (2002).

Figure 5.3

National Burden Rates, OECD Countries, 1997-2000, (Percent of National Income)
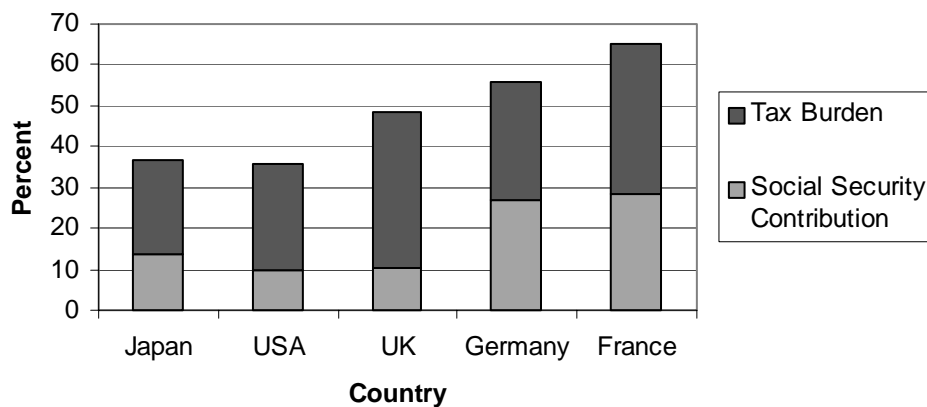
Source: Government of Japan (2001), Table 13.2.

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Contributions to Social Security are projected to rise from 13 percent of national income in 1993 to 21 percent in 2025 (Figure 5.4).[37] If the other tax payments are added to that, the total should rise from 40 percent of national income in 1993 to 56 percent in 2025. Three quarters of this increase would be due to increases in social security contributions (Ogawa and Retherford, 1997, pp. 68).

Figure 5.4

Social Security Contributions and Taxes as a Percent of National income, Japan, 1970-2025
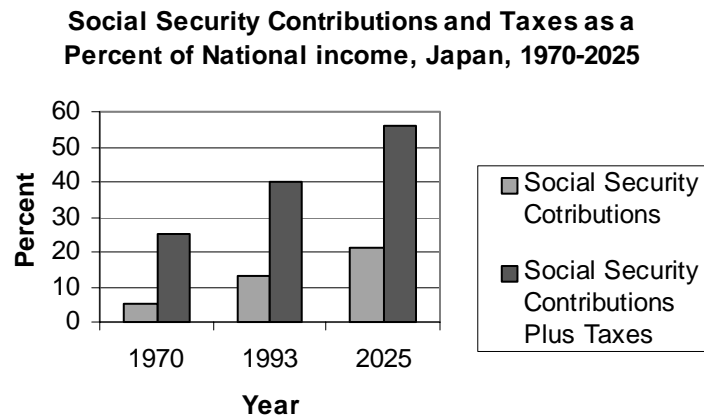
Source: Ogawa and Retherford (1997), Figure 2.

The effect of the Social Security program as a whole is to raise the per capita family income of those aged 65 and above while lowering that of individuals in younger age groups. However, much of the increased real income of the elderly comes in the form of medical benefits.

Public Pensions

Public pensions amounted to 12 percent of national income in 2002. This figure is projected to reach 16 percent by 2025 (Takayama, 2002, p. 3).

Yashiro *et al.* (1997b, p. 7) point out that Japan's public pension system began as something close to a fully funded scheme in which contributors accumulate savings to be withdrawn after retirement. But over time, the public pension system evolved into a pay as you go system in which current benefits are financed by current contributions.[38]

The Japanese pension system has two tiers. The first tier, or National Pension Scheme (NPS), is a public program that provides residents older than 65 with a flat pension.[39] It covers about 80 percent of the working age population and has almost 70

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[37] Looked at from the perspective of total costs, Social Security absorbed 22.5 percent of GDP in 2002 and will absorb 32.5 percent by 2025 (Takayama, 2002, p.3).

[38] At present, the pension systems have substantial trust funds to cover temporary deficits.

[39] The NPS achieved almost universal coverage in 1986 when it was extended to self-employed workers.

million participants. This is the only plan for farmers, the self employed, the unemployed, students and non-working wives. The second tier, or Employee Pension Insurance (EPI), is for salaried workers and covers about 32 million private sector employees.[40]

In addition to the public pension system, retirement income is provided by Employee Pension Funds (EPS), which are private corporate pension funds. These funds are one of three types of corporate pension schemes. The other two are the tax exempt pension programs and individual firm pension programs. The Employee Pension Funds cover about 36 percent of all employees. There are also 5 Mutual Aid Association Schemes (MAAS) which cover about 6 million public employees, such as teachers. The purpose of these schemes is to top off the public pensions and ensure that retirees will receive a higher level of benefits.

The Tax (exempt) Authorized Pensions allow employers to deduct its contributions from income when calculating corporate profits taxes. About one third of employers participate in this scheme. However, these schemes will be phased out over the next decade.

In addition to public pensions, defined contribution plans have been allowed since October 1, 2001 (Takayama, 2002). These plans do not permit employees to make contributions. Employer contributions on behalf of each employee are deductible up to about US $3,600 per year if the employer has no other pension plan.[41] Furthermore, a hybrid, similar to US cash balance plans, has been authorized since April 2002.

Ninety percent of Japanese firms offer private retirement packages of some sort. Of these firms, 90 percent provide a lump sum retirement bonus.[42] In the case of a worker who has worked a full career with the firm, that lump- sum payment usually amounts to a little less than four years' salary.[43]

(a) Contributions

The NPS requires a fixed contribution of 13,300 yen (about 115 Euros) per month. It was scheduled to rise to 26,400 yen (about 190 Euro) by 2021. However as a result of the 2000 pension reforms, the flat rate contribution should peak at 18, 200 yen (about 160 Euros).[44]

Everyone between the ages of 20 and 59, except salaried workers, must contribute to the NPS.[45] The spouses of salaried workers are exempt from contributing if their annual income is below 1.3 million yen (about 11,000 Euro). As discussed above, this is a strong disincentive to the labor force participation of married women.

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[40] Though the plan covers private sector employees, it is publicly managed.

[41] They are deductible up to US$1,800 for companies that also sponsor a defined benefit plan.

[42] About half of the workplaces in Japan offer only this type of private retirement benefit.

[43] A full term with a firm would be 38 years for a college graduate and 42 years for a high school graduate.

[44] These target contribution rates are expressed in 1999 prices.

[45] Low income persons (about 20 percent of subscribers) are partially or totally exempt from paying premiums to the NPS.

The NPS is a pay as you go scheme where current benefits are paid out of current contributions. At present, contributions are supplemented by a one third subsidy from the government. This subsidy will be raised to one half of expenditures by 2004.

One reason for the deterioration of the finances of the basic public pension scheme is the fact that a large proportion of those who are legally required to contribute to the National Pension Scheme either do not enroll in the scheme or do not pay their required contributions. There are a variety of estimates concerning the magnitude of the problem. Horioka, (2001, p. 107) estimates that one sixth of those required to contribute do not do so. According to Takayama (2002, p. 5) in 1999, nearly 50 percent of those who should have been contributing to the NPS were not paying into the system.

In October 1996, the EPI contribution rate was 17.35 percent of monthly wages and bonuses.[46] Based on the 1997 population projection, this rate was scheduled to rise to about 28 percent in 2025. As a result of the more pessimistic 2002 projection, the rate would have risen to 32 percent of wages. However, the 2000 pension reforms cut benefits and as a result, this rate should go only to about 25 percent.

In firms that have Employee Pension Funds (EPS), the employees contribute 1.6 percent of their wages and employers contribute 1.6 percent.

(b) Benefits

The age of eligibility to receive benefits from the NPS is 65. For the EPI and EPSs, the eligibility age is 60 for males and 55 for females. But there will be a gradual increase in the eligibility age from 60 to 65 by 2013.

A retiree who belonged only to the NPS would receive only a basic pension. The pension of a retiree who contributed for the maximum number of years would be 67,000 yen (about 580 Euro) per month. However, the average monthly benefit under the NPS is only 49,000 yen (about 425 Euros).

A retiree belonging to any other pension scheme would receive both a basic pension from the NPS and an earnings-related pension from the scheme to which he or she belonged. In the case of an employee who contributed for the maximum period to the EPI scheme, the earnings-related component would amount to 30 percent of average monthly earnings. The average monthly benefit for participants in the EPI is 177,000 yen (about 1,500 Euros). This would be equal to about 56 percent of the average salary in 1999. As a result of the 2000 reforms, however, there will be a gradual reduction of 20 percent in overall lifetime benefits.

Total NPS plus EPI benefits for a typical retired male salaried worker amount to about 70 percent of average pre-tax monthly earnings and about 80 percent of average after tax earnings. However, if bonuses are included in the denominator, public pensions will replace about 50 percent of pre-tax salary and about 60 per cent of after tax salary.

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[46] The employer pays half of this.

(c) Financing Pensions

One third of NPS basic pension benefits are financed by subsidies from the general accounts of central government. The government does not directly subsidize the EPI system, however, employer and employee contributions to those plans are tax deductible. In principle, benefits are taxed. However, there is a large deduction for pension benefits, so they remain largely untaxed.

In 1973, there was a belief that Japan, having made great material progress, should give more attention to improving the quality of life. Benefit levels were increased so as to make the replacement rate about 60 percent, a level comparable to the major developed countries. However, the newly expanded pension system quickly ran into trouble and a set of adjustments was made in 1986. Measures taken included: (1) an increase in contribution rates, (2) mandatory coverage of employees' spouses in the NPS, (3) imposition of a forty-year participation minimum in order to qualify for the full NPS pension, and (4) partial unification of the various public pension systems into the current two-tiered system.

By 1994, there had been another serious deterioration of system finances and a new round of reforms was implemented. They called for gradually raising the starting age at which salaried workers are eligible to receive the NPS basic pension to age 65.[47] Pension benefits were to be indexed to after tax wages and public health insurance premiums were to be deducted from benefits.[48] A special levy on bonuses was instituted and pensioners were prevented from drawing pension and unemployment benefits at the same time. The benefit formula was adjusted to discourage early retirement.[49] However, even after instituting these cost-containment measures, the 1994 reforms called for public pension premiums to rise from 14.5 percent of regular wages in 1994 to 29.05 percent of wages in 2025.

The purpose of the 1994 reform was to ensure that there would be adequate reserves even at the peak period of population aging. However, the reforms were not nearly sufficient to meet the demands placed on the pension system by Japan's rapidly aging population. Yashiro *et al*. (1997b) warned that the large stock of assets in the pension system would be exhausted well before the peak in system dependency ratios.[50] In the absence of further reforms they projected huge deficits in the pension fund balances by 2050 (Figure 5.5).

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[47] Employed workers would still be able to start drawing the earnings-related component of their pension at age 60.

[48] Since taxes are expected to rise over time, the impact is expected to be to reduce the rate of growth of benefits.

[49] To encourage fertility, workers on parenting leave were excused from paying social insurance premiums.

[50] For example, the Ministry of Health and Welfare using the 1992 demographic projections and assuming a 2 percent growth rate of GDP, a 2 percent inflation rate and a 5.5 percent long term interest rate, projected that there would be a surplus in the EPI pension fund through 2050. However, the effect of using the 1997 population projections is that a deficit begins to accumulate after 2030 in both the earnings-related and basic pension funds.

Figure 5.5

Projection of Pension Fund Balances, Japan, 1995-2050
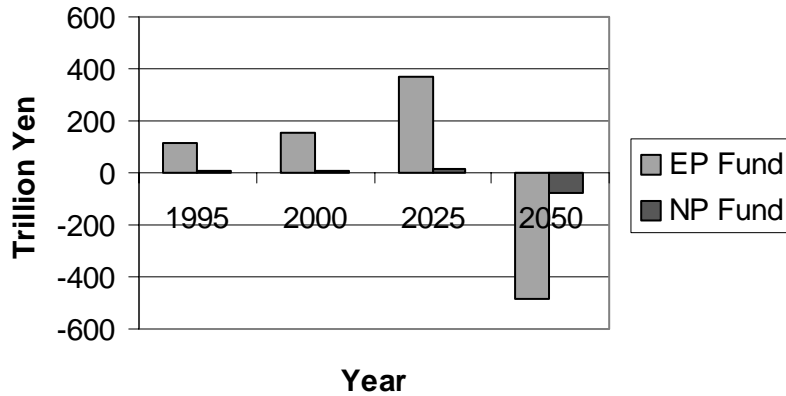
Source: Yashiro, Oshio and Matsuya (1997) Table 1.

Eventually it became clear to everyone that the 1994 pension reforms were not enough to restore the Japanese Social Security program to an actuarially sound basis. In March of 2000, the Japanese Diet enacted an additional set of reforms that would cut lifetime pensions by about 20 per cent (Mulheisen and Faruqee 2001). Benefit levels were cut by 5 per cent and there was a gradual increase in the age of eligibility for the earnings-related pensions from 60 to 65. Most importantly, pensions were to be indexed to consumer prices rather than disposable incomes (wages). However, Mulheisen and Faruqee argue that further benefit cuts or contribution rate increases will be needed to prevent the depletion of pension fund assets.[51]

The 2000 reforms to the Japanese public pension scheme called for indexing both the basic and the earnings related pension schemes to prices instead of wages. This was the most important element of the pension reform scenario investigated by Yashiro, Oshio and Matsuya (1997). The impact of this change can be gauged by comparing their projected replacement ratios, with and without pension reform. If pensions had continued to be indexed to wages, the net replacement rate in 2050 would have exceeded 50 percent of after tax income.[52] By indexing pensions to prices, the net replacement ratio will be cut to less than 20 percent [53](Figure 5.6).

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[51]A report by the Finance Ministry found that the total value of Japan's pension liabilities now equals about $4.4 billion or about one year's GDP (Takinawa 2000).

[52] The gross replacement ratio refers to pre-tax income.

[53] The authors point out that although pensioners have a lower replacement rate under the Pension Reform Case, they will have paid less taxes when they were young and could thus save more

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Figure 5.6

Projected Replacement Ratios, Japan, 2050
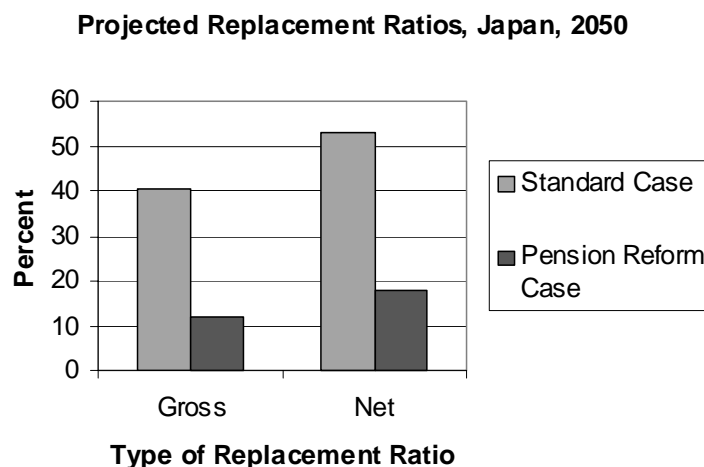
Source: Yashiro, Oshio and Matsuya (1997) page 24.

Since even the 2000 reforms may not be adequate to meet the pension obligations to a rapidly growing population of retirees, various options for reducing outflow and increasing revenues of the pension system have been proposed. One way to cut benefits is to link them to average life expectancy. The actuarial value of benefits would be maintained; but the monthly payments would be reduced to take into account increasing life expectancy. Another option is to raise the age at which individuals become eligible for benefits under the basic plan (the NPS) from the current level of 65 years to 67 years.

The main drawback of these strategies is their adverse impact on the standard of living of the elderly. In 1999, pension payments accounted for roughly 60 percent of the income of elderly households and about half of such households rely solely on public pensions for support (Masuda and Kojima, 2001, p.45).[54] An additional problem cited by Okunishi (2001) is that an extension of the eligibility age for receiving a full pension may raise the already high unemployment rate of the elderly.

A number of proposals have also been made to increase contributions. They include: (1) taxing lump-sum retirement payments and (2) requiring dependent spouses of employees to make contributions. Tachibanaki (2002) suggested that the income of the basic pension scheme could be increased by replacing social security contributions with revenues from a consumption tax. These changes, however, do away with long-entrenched advantages are certain to be politically difficult to implement.

(d) Distributional Effects of the Pensions System

The Program Dependency Ratio (PDR) for a public pension program is defined as the ratio of beneficiaries to covered workers. As the various plans mature,

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[54] Only four percent of their income comes from transfers from other family members.

the PDRs will increase. The evolution of PDRs for the two largest public pension plans, the NPS and the EPI are shown in Figure 5.7.

Figure 5.7

Program Dependency Rate, Public Pension Programs, Japan, 1970-2025
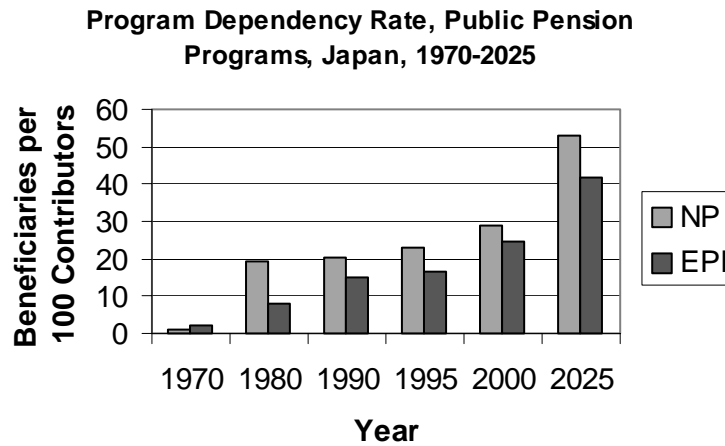
Source: Endo, and Katayama (1998), Table 5-6.

In 1993 there were 23 beneficiaries from the NPS for every 100 contributors. By 2025, that figure should more than double to 53 beneficiaries per 100 contributors. Unlike the NPS, where the age for receiving a pension is already 65, the age of eligibility of the EPI is rising toward age 65. Thus the PDR of the EPS, which was 16.8 percent in 1995, will "only" rise to 42 percent in 2025.

Because of the rapid rise in program dependency rates, cohorts born before 1950 will receive benefits that are much greater than their lifetime contributions (Hatta and Oguchi, 1997). The older the cohorts, the greater the excess of benefits over contributions. Conversely, cohorts born after 1950 will receive less in benefits than their lifetime contributions.[55,56]

The ratio of lifetime benefits received divided by lifetime contributions (adjusted for inflation) will decline from 4.34 for the 1925-1929 birth cohort to 1.04 for the 1960-1964 birth cohort (Figure 5.8). This redistribution from younger to older generations has two sources. First, in the expansion of benefits that occurred in 1973, those who were too old to contribute the required number of years were made eligible for generous benefits regardless. Second, given the pay as you go nature of the system and rapid population aging, there are relatively few workers per retiree and therefore benefits must be cut or contribution rates for younger workers must be raised.

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[55]The Economic Planning Agency places the cutoff date later, in 1965.

[56] Current public pension beneficiaries on average have only contributed 30 percent of the benefits they have received (Takayama,1992) as reported by Yashiro (1997) p. 254.

Figure 5.8

**Ratio of Social Security Wealth to Contributions
By Birth Years, Japan**
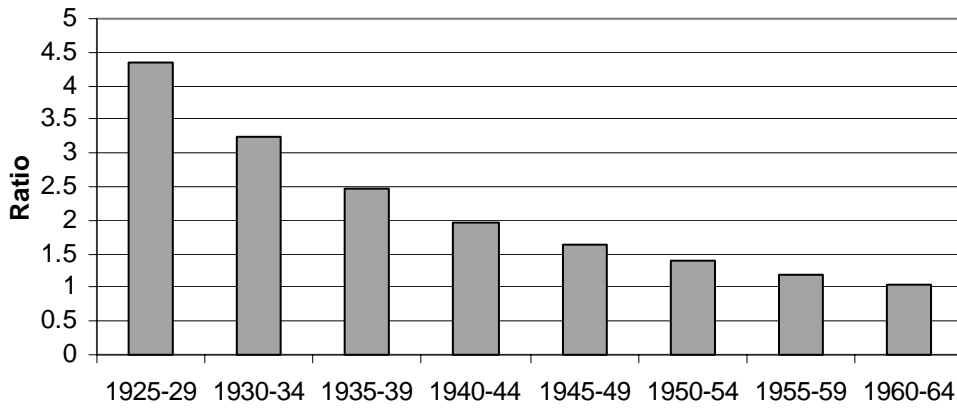
Source: Takayama (1990) Table 10.

In Figure 5.9, Masanobu and Kojima (2001) show that in 1998, the effect of Japan's pension programs was to redistribute income to those aged 60 and above, and especially those age 65 and older who would have had quite low incomes otherwise. Though these benefits to the elderly come at the expense of all younger Japanese, that cost is quite evenly allocated among the generations.

Figure 5.9

**Effect of Social Security on Per Capita Family
Income By Age, Japan, 1996**
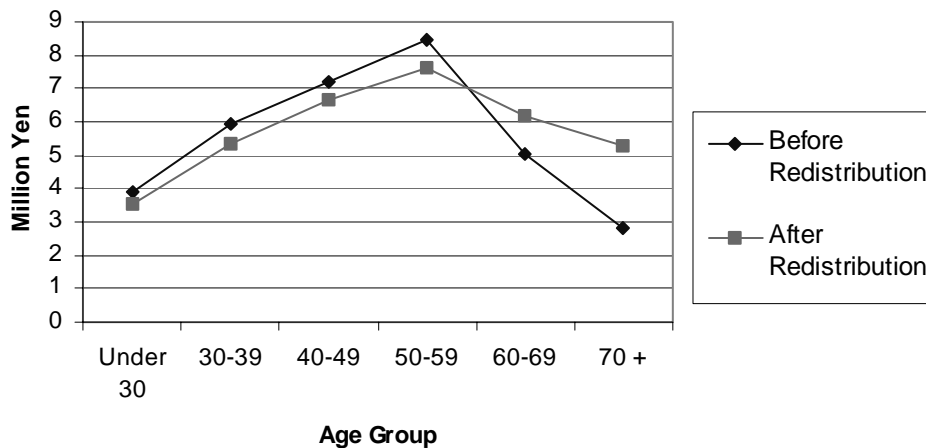
Source: Masanobu and Kojima (2001), Table 2.

The public pension system also redistributes incomes within generations in three ways: (1) benefit formulae favor the wealthy, (2) spouses of salaried workers are exempt from contributions, yet receive significant benefits, and (3) contributions are based only on salary and semi-annual bonuses, even though a significant part of an employed person's income may come from the retirement bonus. In any given older cohort, the amount by which benefits exceed contributions is positively related to the size of the benefit. Spouses of salaried workers receive a supplementary benefit for the period between when the primary beneficiary turns 60 and when the spouse turns 65 (after which the spouse receives the basic pension). When the primary beneficiary dies, the spouse will receive three fourths of the primary beneficiary's earnings related benefits. Prior to 2000, contributions were based on salary rather than total compensation. That favored those, such as full time workers and workers in larger firms, who are likely to receive a greater part of their incomes in the form of bonuses. The lump-sum retirement payment is still exempted and thus the system continues to favor those who receive large retirement payments.

(e) Impact of the Pension System on Labor Supply

When they reach age 60, the better employees often have the option of continuing work for the same company or a subsidiary; but at a considerably lower wage. If they do so, they may lose a part of their pension, because public pensions are subject to an earnings test until the worker reaches age 65 (Yashiro, 1997). If there are any earnings at all, benefits are reduced by 20 percent. If monthly earnings are above 220,000 yen (about 2,000 Euro), benefits are reduced by 50 percent of these extra earnings. Benefits are reduced by 100 percent for any earnings over 340,000 yen (about 3,400 Euros per month). These earnings tests are likely to reduce the labor force participation of older workers, because an older worker can often earn more by retiring and collecting pension benefits or unemployment benefits than he could by continuing to work at a reduced wage.

Because dependent spouses of employees are exempt from making social security contributions as long as their incomes are below a certain amount, wives often limit their participation in the labor force to part-time employment. Horioka (2001, p. 107) reports that about 12 percent of wives reduce their working hours to stay below this amount. Overall there is little doubt that the Japanese pension system is contributing to the decline in the labor force participation of women and the elderly.

B.   The Health System

Total medical care expenditures (both public and private) were at about 6 percent of national income in 1982 and 7.1 percent in 1995 (Yashiro, 1997, p. 256). By the year 2000, health care expenditures had reached $300 billion or about 8 per cent of GDP (Pearson 2002). Per capita medical expenditures grew at 5.5 per cent per annum between 1980 and 1997 and they are projected to grow by an additional 40 percent over the next three decades (Iwamoto 2002).

Medical care costs of the elderly are growing at the rate of 9 percent annually. According to the Ministry Health, Labor and Welfare (2002) "this is the key driver of the increase in medical expenditure." Figure 5.10 shows the rapid growth of total medical care expenditures in Japan and medical care expenditure for the "aged" (persons aged 70 and over) since 1985. Figure 5.11 shows that during this period, the

proportion of medical expenses accounted for by the "aged' has been increasing as well.

Figure 5.10

Medical Care Expenditures, Japan, 1985-1998
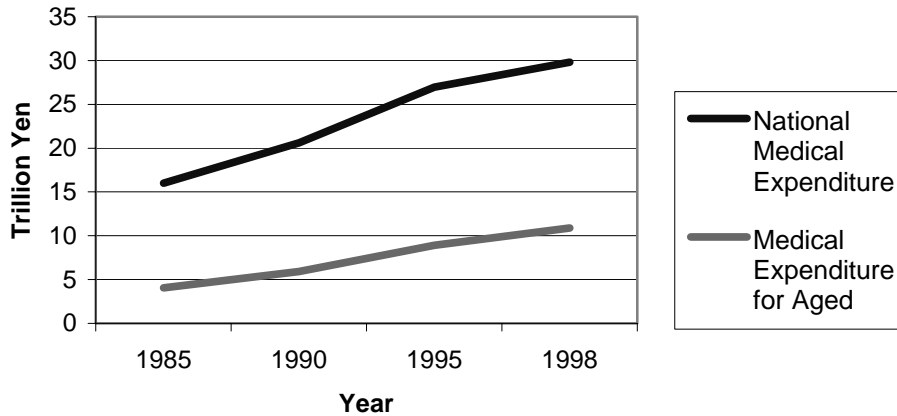
Source: Government of Japan (2000), Table 13.5.

Figure 5.11

Medical Expenditure for the Aged as a Percent of Total Medical Expenditure, Japan, 1985-1998
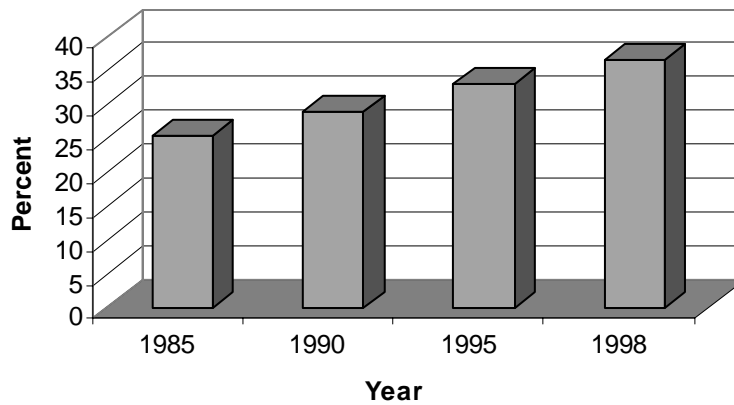
Source: Government of Japan (2000), Table 13.5.

(a) The Role of Population Aging in Rising Health Costs

Figure 5.12 shows that the share of the elderly in total health care costs has risen from about 14 percent in 1975 to 31 percent in 1995. By 2025, the elderly will account for half of total costs. The "old old" (70 and over) are estimated to account for 25 percent of medical spending (Yashiro 1997, p. 256 and Pearson, 2002). The

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lifetime medical expenditure of the average Japanese is about $17,000. About half of this is spent after age 70 (Yomiuri 2001). Patients, who are over age 65, use more than 3 times as much medical care as other individuals (Yashiro, Oshio and Ii 1997).

Figure 5.12

**Share of Elderly in Health Costs,
Japan, 1975-2025**
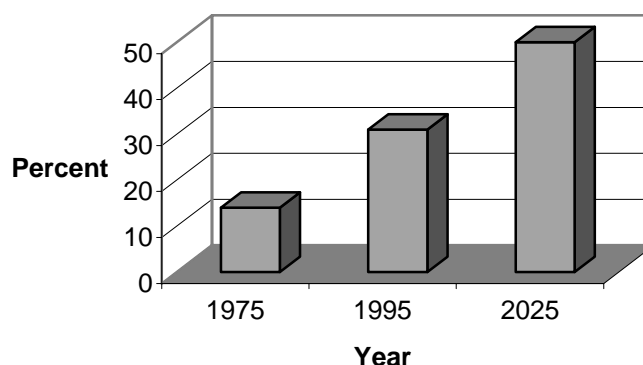
Source: Takayama (2002).

For the population as a whole, the annual cost of medical care was 240,000 yen (2,100 Euros) per capita in 1998. In the same year, the per capita medical expenditures of persons aged 70 and over was more than three times as much, 800,000 yen (7,000 Euros) (Government of Japan, 2001, Chapter 13). Takayama (2000) reported that in 1999, the annual medical costs of persons over 65 were 8.3 times the cost of those between 14 and 44 years old (Figure 5.13). Consequently the elderly, who made up only 17 percent of the population, accounted for 51 percent of aggregate medical expenses.[57]

Some observers give much less weight to population aging as a cause of rising medical expenditures in Japan. An analysis of the relative contribution of population growth, population aging and other factors (such as cost increases) to rising medical expenditure led Endo and Katayama (1998) to conclude that the role of demographic factors is small relative to other factors.

Iwamoto (2002) assessed the contribution of population aging by varying the age structure while keeping the per capita the medical costs of each age group constant. He found that only about one fourth of the annual growth rate was due to population aging. The major source of higher costs is not the elderly as a group, but rather the bed-ridden elderly, which consists disproportionately of the "old old".

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[57]While most of this reflects the greater need for medical care among the aged, some of it also reflects the fact that this group can receive care for a very low fee.

Figure 5.13

Annual Cost of Medical Care By Age Group, Japan, 1999
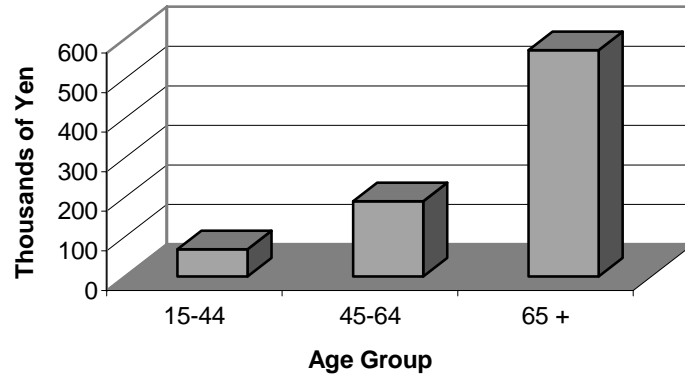
Source: Takayama (2002), p. 8.

The number of bedridden elderly, 2 million in 1953, is projected to increase to 5 million in 2025.[58]A large portion of the frail elderly are found among those aged 80 and above, a vulnerable age group that has been growing rapidly. It constituted almost 4 percent of the Japanese population in 2000. By 2050, persons aged 80 and older are projected to comprise more than 15 percent of the population (Figure 5.14).

Figure 5.14

Proportion of the Population Aged 80 and Older, Japan, 1950-2050
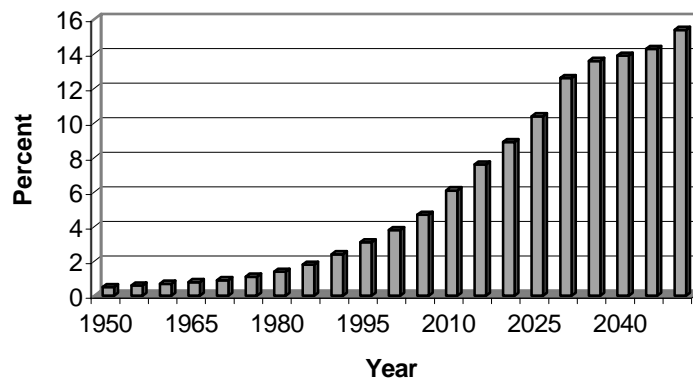
Source: United Nations (2002) World Population Prospects, Population Database.

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[58] According to projections of the Ministry of Heath and Welfare.

Though most of the health costs are met by the national government, elderly-related expenditures, such as medical, long-term care costs are met in part by municipalities. Hoshino and Nakazato (2002) project that as a result of rural-urban migration, the proportion of the elderly is likely to remain low in Japan's major cities. However, in most rural areas, this migration will result in a high proportion of the elderly. Hence, these areas will find it difficult to fund long term health care for the elderly out of local revenues.

(b) The Medical Finance System

There are five main medical plans in Japan and together they cover almost the entire population.[59] The three largest plans are the Association-managed Health Insurance Plan (AHIP), which covers the employees of large enterprises; the Government-managed Health Insurance Plan (GHIP), which covers employees of small- and medium-sized firms, and the National Health Insurance Plan (NHIP), which covers the self employed, proprietors of small businesses, and farmers. Members of the AHIP tend to be young; members of the NHIP tend to be old.

The premiums for the AHIP and the GHIP are 8 percent of workers' earnings, divided equally between employers and employees. Premiums for the NHIP are collected directly from households and are varied according to the enrollees' assets and income. In general, these premiums have not been sufficient to cover the costs associated with the NHIP's older age structure. Hence, government and the other health plans have subsidized the NHIP.

In 1990 the "Golden Plan" was instituted to reduce the demand for medical services by improving social services for the elderly and their families and by providing long-term care services (Japan Aging Research Center 1996). The major thrust of the Golden Plan is to improve home-based care for the elderly by improving three types of services: (1) home-helpers, (2) short-term stay facilities, and (3) elder day care centers.[60] Golden Plan services are paid for by national and local governments. Families pay little or nothing.

Starting in April 2000, Japan implemented a system of Long-Term Care Insurance. It covers the long-term care of the elderly, which was previously provided partly through the health insurance system and partly by welfare measures. There are two types of insured, those who are aged 65 and over and those between the ages of 40 and 64. Municipalities will collect premiums from those in the first category through deductions from pensions. Premiums for the second category will be paid along with health insurance premiums. These premiums will be scaled according to income.

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[59] Medical care costs are paid directly to providers by the government. Patient co-payments vary from 10 to 30 percent of costs.

[60] In the early 1990s Japan had only 360 home-helpers per 100,000 elderly persons, as compared to more than 5,000 in Sweden (Ogawa, and Retherford, 1997, p.70). Japan was, on the other hand, well supplied with short-term-stay services. Elder day care centers were to be increased 17 fold by the year 2000.

The cost of the long-term care insurance program will be paid by insurance premiums (45%), a government subsidy (45%), and the co-payments of users (10%).[61] If the municipal government has determined that the applicant is disabled, the system may provide nursing home care; but the emphasis will be on in-home care. The cost of the insurance will be about $20 a month rising to about $35 a month in 2010.

C.   Welfare

The elderly are provided with a variety of welfare programs. In 1995, those programs absorbed about 2 percent of national income. However, the implementation of the new public long-term care insurance program will significantly decrease welfare spending. The program to provide long-term care should reduce the demand for hospitalization and thereby slow the growth of medical spending as well.

In 1973, the Japanese greatly increased the generosity of their social security system. In part, this reflected a desire to be like other modern industrial nations. In part, it was an admirable effort to share with older generations the rewards that young people were harvesting in the market place as a result of the physical and human capital given to them by the elderly. Though the pension and health systems they put in place were sustainable in the context of the existing age structure, it was not consistent with the emerging trends toward delayed marriage, low fertility and an aging population. Since that time there have been three major reforms of the pension system, raising contributions and lowering benefits in an attempt to make the social security system consistent with the economic and fiscal consequences of population trends. Each time the speed of population aging was underestimated and the reforms ultimately proved inadequate.

Absent large-scale international migration to Japan, it is virtually certain that the dependency ratios of its various pension and health programs will grow rapidly in the next half century. The only way to lighten the heavy burden that must be borne by the working age populations of the future will be to greatly increase their productivity. This will require a reversal of current trends in saving rates and productivity growth, a task made more difficult because those trends are also the effects of population aging.

VI.   Economic-Demographic Models of Aging in Japan

This section will review a number of macroeconomic-demographic models that have been developed to assess the effect of population aging on the Japanese economy. The first part considers three overlapping generations (OLG) neoclassical general equilibrium models that were applied to several countries, including Japan. The second section considers five models which were built specifically to examine the demographic situation facing Japan and some of the policy options.

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[61] According to Matsuda and Kojima (2001, p. 46), the costs are distributed as follows: government (50 percent), insurance premiums from the working population (33 percent) and insurance premiums from the elderly (17 percent). Since the elderly make a 10 percent co-payment on the services they receive, the Matsuda-Kojima breakdown must refer to the 90 percent of medical expenses remaining after co-payments are made.

A.   Overlapping Generations Models

In 1989 Auerbach *et al.* published an OLG simulation model that was applied to four countries including Japan. In 1998, Hviding and Merette modified the Auerbach *et al.* model in order to analyze four different types of pension reforms and applied it to the OECD countries including Japan. A year later Fougere and Merette published a model based on that of Hviding and Merette that showed the effect of allowing workers to invest in human capital. These three models and the result of their use in simulations are described below

1.   *Auerbach, Kotlikoff, Hagemann and Nicoletti (1989)*

In order to study the effects of population aging in four OECD countries, including Japan, Auerbach, Kotlikoff, Hagemann and Nicoletti (1989) modified an economic-demographic simulation model developed by Auerbach and Kotlikoff (1987, Ch. 11). To make the model resemble the study countries more closely, they added bequests, technical change, international trade and government consumption expenditures that are linked to the age structure of the population.

The model consisted of three sectors. The household sector was made up of 75 overlapping generations. These generations include children (aged 1-20), and adults (aged 21-75). Each year, the 75 year-olds die and new children are born. Children are supported by their parents. After they reach 21, they are self-supporting and give birth to an exogenously determined number of children. From age 21 to 41, they support these children. At an endogenously determined age, individuals chose to retire. At age 75, individuals bequeath their wealth equally to their children and die.

In the production sector there is a single Cobb-Douglas production function. Capital is homogeneous; but the efficiency of labor varies according to age. There is an exogenously determined rate of time-augmenting technical change. It is also assumed that a seniority wage system is in effect and that wages rise faster than age-specific productivity.

Government expenditure has four parts. One part benefits the whole population. The other three parts are targeted to specific age groups, namely young people (aged 0-24), working age people (age 25-64), and the elderly (aged 65+). For each age group, total expenditure is found by multiplying age-specific per capita expenditures by the number of people in the age group. Tax rates are determined by expenditures.

The social security system is a pure pay as you go system in which annual payroll tax rates are adjusted to cover that year's benefit payments. These benefits will depend on the replacement rate, prior earnings and the legal age of retirement (not the actual age of retirement).

The model was calibrated to approximate the number of births that would reproduce the projected age distributions from 1960 to 2050 as closely as possible. In the case of Japan, the projected proportion of the elderly did not track the OECD projections very well (see Figure 6.1).[62] This may be due to the assumption that in the

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[62] In order to replicate the Japanese savings rates it was necessary to assume a negative rate of time preference (-0.4 percent)

Auerbach *et al.* model that everyone dies at age 75. In the case of Japan, a large and rapidly growing share of the population is above the age of 75.

Figure 6.1

Projections of the Proportion of the Population Aged 65+, Japan, 1980-2050
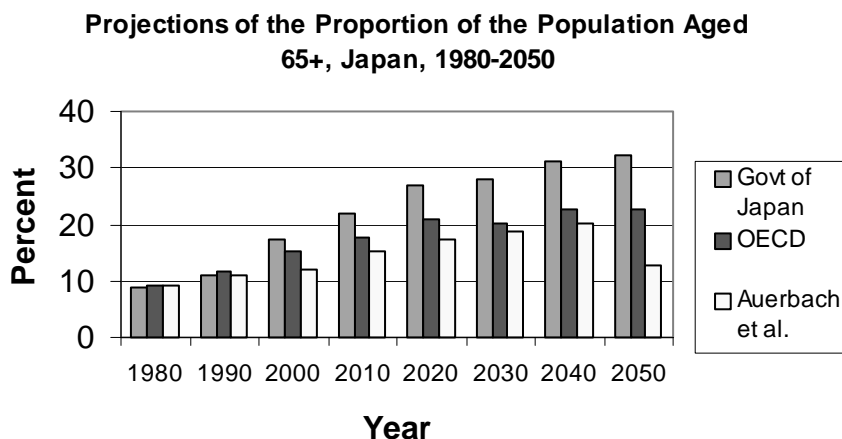
Source: Auerbach Kotlikoff, Hagemann, and Nicoletti (1989), Table 2.

In the base scenario, the Japanese net national savings rate fell by 18 percentage points between 1990 and 2030, a steep decline which the authors attribute to rapid population aging. Despite lower savings, the capital-output ratio rises, leaving Japanese workers with a higher after-tax wage in 2050 than 1985.

The authors then simulated the "pure effect" of aging. In that simulation the old age pension replacement rate (average benefits to lifetime earnings) remained constant while fiscal expenditure grew with the economy. They found that population aging would significantly reduce national saving, the real wage rate and the current account. However, the burden on those who must support the growing dependent elderly population is moderated by the fact that real wages for the working population are likely to rise and other types of taxes are likely to fall.

Auerbach *et al.* simulated a policy that would cut per capita spending on retirees in proportion to the increase in the number of retirees. This would result in a 2.2 percent reduction in the consumption tax by 2050. They also simulated an increase in the age of eligibility for retirement pensions. This would significantly lower the contribution rate, as would lowering benefit levels. Finally, Auerbach *et al.* simulated the opening of the economy to foreign trade and investment. They note that as population ages in a closed economy, the rate of return to capital falls, thus discouraging saving. In the open economy case, capital can go abroad, preventing a fall in interest rates and maintaining the incentive to save. In the case of Japan, in particular, opening the economy increases savings significantly. The result is large outflows of capital from Japan and resulting surpluses in Japan's current account.

2. *Hviding and Merette (1998)*

Hviding and Merette (1998) constructed an OLG model to examine the macroeconomic effects of aging in seven countries. They also analyzed the macroeconomic effects of four different types of pension reform in the context of

ageing populations. They wished to determine whether specific pension reforms might significantly reduce the need to raise taxes in OECD countries. The four reforms were: (1) gradually abolish the public pension system over 50 years, (2) cut the replacement rate by 20 percent, (3) cut the government debt to GDP ratio by 20 percentage points through increases in the wage tax, and (4) increase the effective retirement age by four years.

Their OLG general equilibrium model was similar (but not identical) to that of Auerbach *et al*. (1989). There were 15 generations living at one time. Each generation lived 15 four-year periods. A single individual represented each generation. That individual was assumed to be rational, forward looking, with no liquidity constraints and acted in accord with the life cycle hypothesis

Unlike Auerbach *et al*., Hviding and Merette had an exogenous labor supply and included a bequest motive for saving. As in the case of Auerbach *et al*., the economy produced a single good using a Cobb-Douglas production function. In the Hviding- Merette model, the pension system was consolidated with the government and financed by general taxation. The economy was closed; so investment equaled domestic saving. The working age population determined labor supply and the retired age groups determined the size of pension expenditures. Savings, consumption, capital accumulation and interest rates were all endogenous.

In the baseline scenario, the public sector debt-GDP ratio was assumed to be constant. Balance was achieved by varying the wage-income tax. The TFR was set to reproduce the projected rise in the old-age dependency ratio for the period 1950 to 2050. After 2050 it was assumed that the TFR would slowly converge to the replacement rate.

The effect of ageing in Japan was an increase of 25 percentage points in the wage tax. There was also a significant drop in the national saving rate[63]. Despite lower savings, the capital-output ratio rose and the rate of return to capital declined.

The effects of the proposed reforms, were not large enough to outweigh the economic impacts of Japan's rapidly aging population. Since the simulated reforms were overwhelmed by the effects of population aging, the only way to prevent dramatic increases in future taxes would be to make drastic cuts in benefits.

3. *Fougere and Merette (1999)*

The Hviding-Merette model may have overestimated the negative effects of aging because the neoclassical production function does not allow any spillover effects from investment in human capital. Therefore, Fougere and Merette (1999) extended the earlier model by incorporating human as well as physical capital. Individuals can increase their stock of human capital, and thereby their lifetime wage profile, by remaining outside the labor force and going to school. The opportunity cost of investing in human capital is current wage income and the returns to investment in human capital are the discounted sum of wage revenues. Thus, it pays to invest in human capital when young. At older ages, by contrast, individuals prefer to acquire physical assets that can be sold during retirement. Hence, the young go to school and do not work, the middle aged work and save, while the elderly neither work nor save. Those who acquire human capital can pass on a part of that capital to future

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[63] It reached a low of about 16 percent in 2050.

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generations. Hence, it is possible to accumulate human capital (knowledge) indefinitely, thus raising the "effective' labor supply.

Fougere and Merette assumed the same path of the TFR, as did Hviding and Merette (1998). In their model, as in those reviewed above, the "pure effect" of population aging is to reduce the real return on physical capital. At the same time, the present value of future wages is increased, with the impact that young individuals invest more in human capital while the middle-aged generations supply more labor. Though the labor supply falls at first due to human capital formation, the effective labor supply ultimately increases as this human capital becomes available. Economic growth is stimulated and per capita output goes up. Japan and Italy, which received the largest demographic shocks and experienced the largest declines in per capita income as a result of population aging, ultimately experience the highest rates of growth of the countries studied.

Because young people respond to fertility decline by investing in their own human capital, the wage-tax base increased and there was a smaller reduction in the savings rate. Economic growth increased in the long run despite a decline in the physical capital stock because of an increase in human capital. Fougere and Merette conclude that population aging will stimulate investment in human capital and this could increase economic growth.

The conclusions of Fougere and Merette were contradicted by Sakuragawa and Makino (2002) who also developed an OLG model in which human capital is the engine of growth. However, in their model the aging of the Japanese labor force will lead to a reduction in the accumulation of human capital and thus will deter economic growth. A rise in the ratio of older workers to younger workers (as a result of declining fertility) will lead to a rise in the relative wage of younger workers. The increased opportunity cost associated with acquiring human capital will thus discourage younger workers from delaying their entry into the labor force.

B.   Models Specifically Developed to Study the Japanese Economy

Several models of the Japanese economy have been constructed to examine the effect of the aging of the population on the economy and particularly, the effect of the public pension system. Among these are the models by Meredith (1995) and Yashiro (1997) that are described in this section. Other models to be discussed are those of Miles and Cerny (2002), Mulheisen and Faruquee (2001) and MacKellar *et al.* (2002).

1.   *Meredith (1995)*

Using the demographic data derived from the 1992 Ministry of Health and Welfare projections, Meredith (1995) constructed a model to examine the long run implications of population aging for the Japanese economy.

The core assumption of the Meredith model is that the desired capital-output ratio will increase as the relative price of capital goods falls. This effectively incorporates the neoclassical assumption that as labor becomes relatively scarce, firms substitute towards capital. Private consumption is determined by wealth, which is defined as the discounted value of labor income plus social security benefits less the discounted value of taxes and social security contributions plus the stock of financial and physical wealth. The share of income devoted to consumption is also assumed to

depend on the dependency rate. Public saving will depend on policies to deal with the deficits associated with population aging.

(a) The Baseline Scenario

The model was initialized using household survey data from the 1990 Family Income and Expenditure Survey to calculate the savings rates of specific age groups. Assuming that: (1) total factor productivity will continue to grow at the rate expected for the 1990s and, (2) the labor force participation rate of the working age population will remain roughly constant, Meredith found that the potential growth rate declined from about 2.5 percent in the 1990s to about 1.5 percent in 2025. He foresaw a substantial decline in the household saving rate, from over 20 percent in 1990 to only 10.4 percent in 2030 (see Figure 6.2).

Meredith constructed the baseline scenario on the assumption that the 1994 public pension reform, described in Section V, did not take place. The alternative scenario consists of calculating the impacts of the reforms. Absent reform, Meredith projects that total spending on social security would have risen from 12 percent of GDP in 1994 to 22.5 percent of GDP in 2020. During that period, the share of contributions in GDP would have remained at 9.5 percent. Hence, the overall social security balance would have shifted from a 3.5 percent of GDP surplus in 1995 to a 12 percent of GDP deficit in 2020. In order to keep the debt stock constant in the absence of pension reform, the government of Japan would have to raise revenues (or reduce outlays) by 6.5 percent of GDP.

Figure 6.2

**Projection of Household Saving
Rates, Japan, 1990-2030**
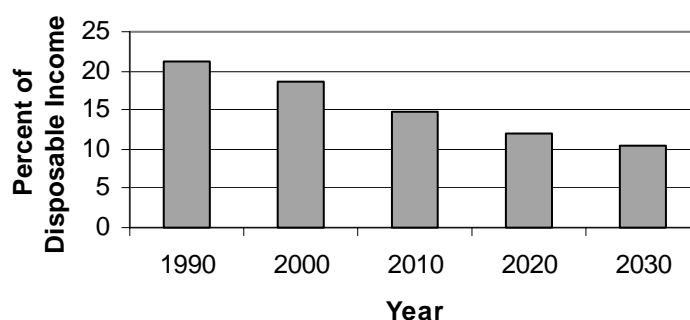
Source: Meredith (1995a), p. 41.

(b) Policy Simulation

The 1994 social security pension reforms were designed to raise contributions from their present level to 14.5 percent of GDP by 2020 while reducing pension payments. Despite having significant impacts on the pension system, Meredith finds that the 1994 reform would have little effect on the path of private saving during the period from 2000 to 2020. Impacts on the public sector balance and current account are, however, quite significant. Absent the 1994 reforms, public savings would

decline from a little less than 10 percent of GDP in 2000 to –8.5 percent in 2020. With the 1994 reform, public saving was projected to remain positive. Since investment demand is driven mostly by the desired capital-output ratio, pension reform has little impact on investment. As a result, the current account deficit, projected to be about 20 percent of GDP absent reform, is estimated to be only 5 percent of GDP in the pension reform case (see Figure 6.3).

One of the more important insights from Meredith's work concerns the limited sensitivity of his model to productivity growth. When pensions are linked to real wages (as were over four-fifths of public pension benefits in Japan) population aging raises contribution rates regardless of productivity growth, because higher productivity, if in evidence, simply translates via higher wages into higher pensions. A corollary is that, if pension are linked to wages, the future burden of transfer payments to the elderly is much more closely linked to the age structure of the population than to the rate of economic growth.

Figure 6.3

Projected Shares of Public Savings and the Current Account in GDP, Japan, 2020
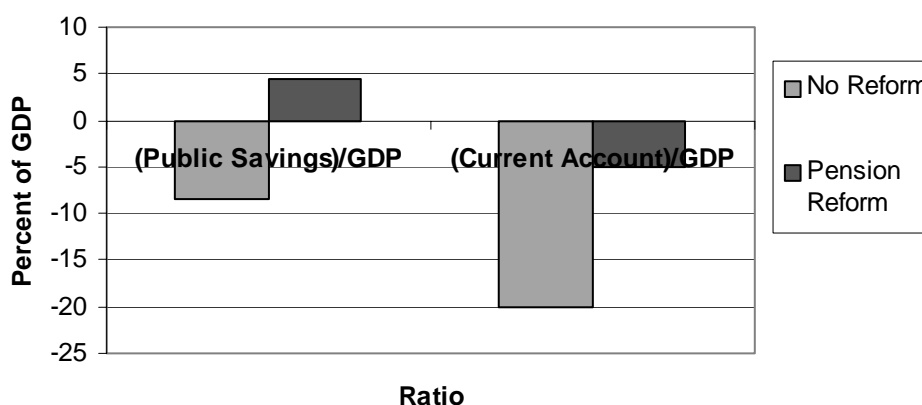
Source: Meredith (1995a), p. 50.

2.   *Yashiro et al. (1997b)*

In order to analyze the macroeconomic effect of population aging and simulate various policies to deal with those effects, Yashiro Oshio, and Matsuya (1997) constructed a three sector neoclassical macroeconomic-demographic model. The model, which was designed to examine long-term supply-side aspects of aging, consisted of three interrelated sectors: (1) the macroeconomic sector, (2) the labor supply sector, and (3) the public finance sector.

The macroeconomic sector of the model determined production, savings, gross investment, and interest rates. The equations were estimated using annual data from 1975 to 1994. In this model there was no optimization by households or firms. Labor force was determined in the labor supply sector and the growth rate of the price level was endogenous. The model used a Cobb-Douglas production function in which

output depends on the labor force, the capital stock and total factor productivity. Total factor productivity was assumed to grow at an annual rate of 1.6 percent. Investment included business, government and residential investment. Business investment depended on profits and real interest rates.

An important assumption is that increasing social security contribution rates reduces profits and thus investment and the rate of labor productivity growth. This is tantamount to assuming that supply is elastic with respect to the wage rate in the labor market and demand is price-elastic in the product markets, so firms are unable to pass along social security contributions either to workers in the form of lower wages or to consumers in the form of higher product prices.

Yashiro *et al.*'s saving function was based on the life cycle hypothesis. Hence, the saving rate was inversely related to the old-age dependency ratio and per capita social security benefits. Since the old-age dependency ratio was calculated as the ratio of people over age 65 to the total labor force, saving declined when an increase in pension benefits reduces the LFPRs of the elderly. Increasing social security contribution rates would reduce saving by workers.

The real interest rate is determined by the marginal productivity of capital. Any excess of saving over investment demand is invested abroad. In the opposite case; net foreign assets are drawn down. Public spending, taxation, debt service payments and pension contributions and payments determine the fiscal balance.

The labor supply sector projected the growth of the labor force by type of attachment to the labor market (full time vs. part time), age group and sex.[64] It began with 1997 population estimates and then took into account the effect of social security policies on LFPRs (especially for female and elderly workers), assuming that labor force participation of the elderly would decline if pension benefits were increased.

The government sector was divided into the social security fund and all the rest of government, including central and local governments. The social security fund received transfers from the rest of government. The fund was divided into two parts, the pension system and the health care system. In the health care sub-sectors, both expenditures and contributions were determined by national income.

(a) The Baseline Scenario

Among the assumptions made by Yashiro and his colleagues on constructing their baseline scenario were:

- There is a gradual rise in the age of eligibility for earnings-based pensions to 65 years.

- Pensions are indexed to net (after-tax and social security contribution) wages.

- The consumption tax automatically adjusts to offset changes in the government fiscal balance.

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[64] Yashiro *et al.*'s regression results showed that women's LFPRs are much more sensitive to wages (net of social security taxes) than men's. Women's LFPRs are also sensitive to the share of children aged 0 to 5 cared for in nurseries.

The authors estimated that total labor force would fall from 68 million in 2020 to 55 million in 2025 and then to 40 million in 2050. The participation rate of individuals over 60 declines steadily because of the improvement in pension benefits. The average adult female labor force participation rate falls from 50 percent to 37.3 percent in 2050.

Prior to performing policy analysis simulations Yashiro *et al*. did a sensitivity analysis. The assumed rate of TFP growth was increased to 2.0. This increased the inflow into the earnings-related pension trust fund as a result of higher wages**.** But the more rapid growth of GDP had negative effects on the basic pension-related trust fund since contributions are fixed while benefits are wage-indexed. This confirmed Merdith's finding that wage indexation practically guarantees that, given population aging, pension benefits will rise as a share of GDP regardless of trends in productivity and economic growth. With the wage bill fixed as a share of GDP, as in a neoclassical model, this ensures that contribution rates must rise.

(b) Policy Analysis Simulations

Yashiro *et al*. undertook a variety of policy simulations to gauge the effect of various additional reforms to the pension system. Among them was putting an end to wage indexation. They found that, if fully implemented, this reform would more than offset the projected deficit in the two pension funds.

Other possible reforms that they simulated were: raising age of eligibility for earnings-related pensions to age 65 and requiring non-working dependent spouses to contribute to the basic pension system. Yashiro *et al*. combined the three main reforms -- abolishing wage indexation on both pension schemes, raising the eligibility age to 65, and requiring contributions from dependent spouses.-- into a scenario they called "Pension Reform Case". These were the major reforms that were legislated in 2000.

When compared against the baseline scenario, which was called the "Standard Case", the combined burden of tax and social security contributions was reduced in 2050 from 56.6 percent of national income to 48 percent of National Income (see Figure 6.4)). Social security contributions are reduced from 21.4 percent to 16.7 percent of national income (Figure 6.5). At 16.7 percent, the rate of social security contributions would be approximately the same as it is today.

By 2050, pension reform significantly increases the growth rate of GDP (see Figure 6.6), primarily because of the reduction in benefits resulted in increased labor force participation of the elderly and because pension reform is estimated to have a large positive effect on the national saving rate.

Figure 6.4

**Projections of the Share of National Income Going to
Taxes and Social Security Contributions, Japan,
1995-2050**
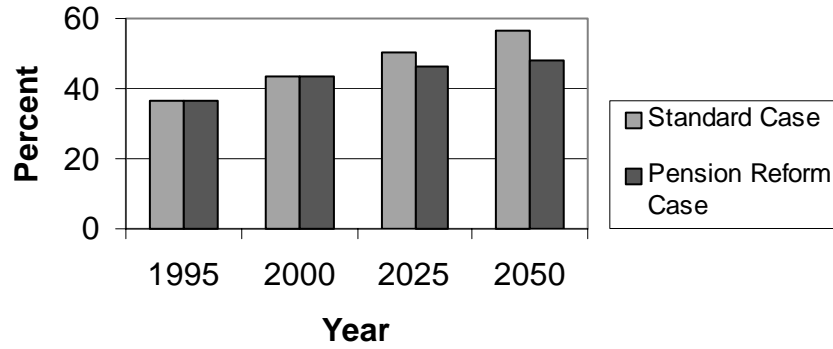
Source: Yashiro, Oshio and Matsuya (1997), Tables 1and 4.

Figure 6.5

**Projections of the Share of Social Security
Contributions in National Income, Japan, 1995-
2050**
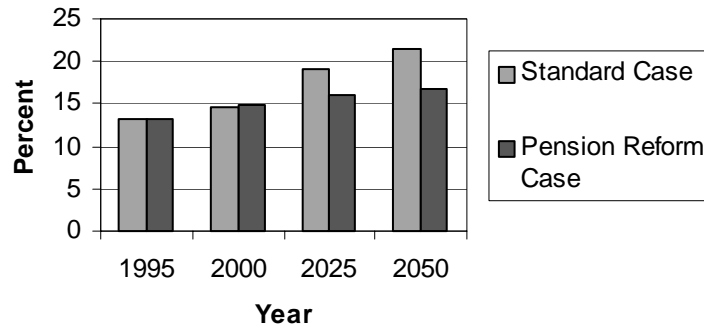
Source: Yashiro, Oshio and Matsuya (1997), Tables 1 and 4.

Figure 6.6

**Projections of the Annual Growth Rate of GDP,
Japan, 1995-2050**
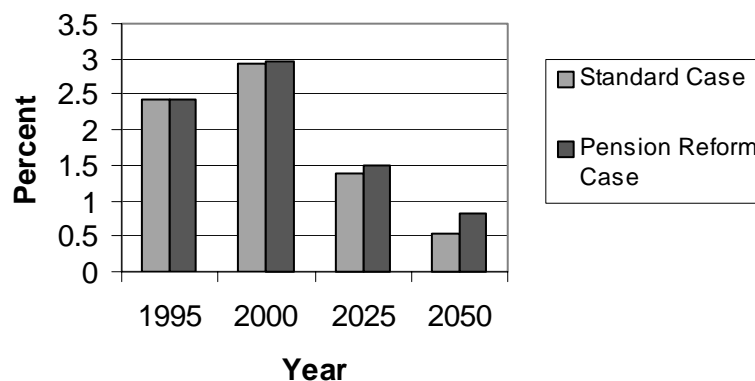
Source: Yashiro, Oshio and Matsuya (1997), Tables 1 and 4.

3.   *Miles and Cerny (2002)*

Like Yashiro, Oshio and Matsuya, Miles and Cerny (2002) used an OLG model to investigate the implications of pension reform in Japan during a period of population aging. They developed three reform scenarios: (1) keep the replacement rate at 50 per cent; (2) keep the contribution rate at 17.5 per cent and (3) gradually lower the replacement rate to 10 per cent by 2040. They found that if the replacement rate were kept at 50 per cent, the contribution rate would have to double to 35 per cent by 2040. Conversely, if the contribution rate were held at 17.5 per cent, the replacement rate would have to be cut in half by 2040.

By 2040, the highest level of average consumption is attained by reducing the replacement rate to 10 per cent (assuming that workers will fund their own retirement). However, different age groups will be affected differently by the transition from a pay as you go system to one of funded pensions. Those who retired in 1999 and those who will be born after 2030 will gain. However those who would retire in 2030 would lose because they would have to bear the double payment burden of the transition to funded pensions.

Miles and Cerny also found that most of the extra savings that would be generated by a transition to funded pensions would be invested in Japan. Hence the capital-labor ratio would rise and the rates of return on investments would fall. However, the increased capital-labor ratio would increase labor productivity and real wages of Japanese workers. The gains to future generations resulting from higher wages would more than offset the losses from lower investment returns. If the extra Japanese savings were sent abroad, there would be smaller gains from the transition to funded pensions.

4.   *Mulheisen and Faruquee (2001)*

Mulheisen and Faruquee (2001) used the IMF world economic model (MULTIMOD) to assess the implications of population aging and decline in Japan.

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They found that real GDP would fall by a cumulative 20 per cent over the next century compared with the baseline scenario where population is stationary. Projected demographic trends will result in an annual reduction in Japan's GDP growth rate of one half of a percentage point between 2025 and 2075. Because of the ageing of the workforce and the differences in productivity across age groups, per capita GDP would be about 5 per cent less than if the population had been stationary.

Both savings and investment would fall in proportion to the fall in GDP but savings and investment rates would remain about the same. Hence, the current account balance would remain positive so long as there was no increase in government deficits.

Their simulations of the public sector indicated that the contribution rate for the main wage-based employee pension system would increase from 17.5 per cent to almost 30 per cent by 2050. Medical contribution rates would have to rise by a similar proportion due to the rise in old-age medical expenditures.

5.   *MacKellar et al. (2002)*

MacKellar *et al.* (2002) constructed a partial equilibrium economic-demographic growth model to study the linkages between Japanese population dynamics, its macroeconomic, pension and health systems and the intergenerational distribution of income. The outcome of their baseline scenario was "demographic-based economic stagnation". The aggregate savings rate and the growth rate of per capita GDP declined. The capital-output ratio increased. The rate of return on capital declined and the current account balance shifted from positive to negative. Real wages rose while the rate of return on capital fell. These gains for the working age population were offset, however, by increased pension and health insurance contribution rates. In particular, the public pension contribution rate rose from 17.7 per cent in 1995 to 41.1 percent in 2050. The contribution rate for the health and long-term care systems rose from 7.8 per cent to 13 per cent in 2050.

Among their findings was that increased immigration would have little effect on the financing of social insurance because it would have a limited effect on the age structure. They also found that the pension and health system were more sensitive to changes in mortality than fertility in the short run and more sensitive to changes in fertility than mortality in the long run.

Discussion (by Landis MacKellar)

This survey has reviewed current research on the impact of present demographic trends -- population aging combined with slower overall population growth -- on Japan's economic future. This discussion will attempt to elicit a few conclusions that might inform the direction of future research.

While so much attention is paid to the impact of population aging on the capital stock, it is the labor force that is most directly affected by population aging. More than in any other OECD economy, the Japanese labor market has been characterized by lifetime employment, seniority-based compensation, and mandatory retirement at an early age. It will be, and is already proving to be, difficult to maintain such a system in the face of a rapidly aging labor force. There are already signs that compensation practices are changing and that practices are evolving to keep older

workers on the job. However, it should also be remembered that the Japanese labor market is highly segmented. Many workers -- part-timers, the self-employed, workers in small enterprises and, above all, women -- are not part of the lifetime employment system. Authors have identified a number of factors, ranging from the tax system to the pension system to lack of day care facilities for children to the lack of help with home-care of the aged, which inhibit the labor force participation of women. Some authors have suggested that general efficiency gains, plus measures to address disincentives to female labor force participation, could essentially neutralize the expected negative impact of demographic trends on the economy.

In traditional economic growth theory, population aging, by reducing the supply of labor, causes firms to substitute capital for scarce labor, leading to increases in the capital-output ratio and corresponding declines in the rate of return to capital. In a general equilibrium model, the latter would cause saving rates to fall so that the economy's reduced need for capital would be matched by a lower level of investment. GDP per capita is reduced by aging in the simplest neoclassical growth model -- and all the empirical studies reviewed here call for deceleration in Japanese per capita GDP growth -- but the impact on the welfare of a representative individual is an exceedingly complex question.

From a distributional point of view, aging raises the rate of return to labor, redistributing income from *rentiers* to workers and from old to young. It also redistributes population from age groups where the distribution of income and wealth is relatively even to age groups in which it is relatively skewed. There is already evidence of this compositional effect operating in Japan, but it is not clear whether this should be regarded as a source of policy concern. Given the outlook for Japan's public pay as you go pension system (see below), the mix of contribution rate increases and benefit cuts employed to achieve balance will be a major determinant of the impact of aging on the intergenerational distribution of income.

So far as it goes, this is a straightforward story. Among the complicating factors that present themselves are the relationship between population age structure and saving rates, open-economy aspects, and the implications of including human capital. All of these must be considered in light of the fact that, at the same time that the population is aging, its overall growth is decelerating.

In reverse order, the impact of population aging on human capital formation of the young is a relatively recent concern. Some researchers have raised the possibility that population aging, by raising the real wage rate, might induce young cohorts to invest in more human capital, resulting eventually in a better-qualified labor force and enhanced productivity. A problem with this view is that it seems intuitively just as likely that young cohorts might eschew higher education on the argument that their lifetime earnings look attractive even without it. The substitutability between old and young workers is at the heart of this question, and this is likely to differ according to skill-level.

Open-economy aspects have been more intensively studied. Research such as that done in the context of the OECD's *Maintaining Prosperity in an Ageing Society* project has concluded that, although investing abroad (in capital-poor countries) can alleviate the costs of aging somewhat (GDP is lowered but GNP is raised by net factor payments in excess of the returns that would have been available at home), the effect is modest.

Much of the research reviewed here has to do with the relationship between population aging and household savings in Japan. In an economy characterized by the life cycle model of consumption, the household saving rate will decline as a result of population aging. While some researchers have questioned whether the elderly in Japan dissave as predicted by the life cycle hypothesis (LCH), most evidence shows that the *retired* elderly actually do dissave. One reason for the apparently high saving rate of the elderly is that some studies have concentrated on households as the unit of analysis. Elderly heads of household consist disproportionately of persons who are still working or well to do, while elderly non-heads of household are likely to have been absorbed into their children's households.

If the LCH is valid, then evidence should reveal an inverse relationship between the elderly dependency ratio and the household saving rate. Studies by Horioka based both on cross-sectional and time series evidence have confirmed that there is such an inverse relationship.

Major alternatives to / modifications of the LCH include the bequest motive and the role of liquidity constraints. In the simple life cycle models, all bequests are accidental. Yet approximately one-third of wealth in Japan is received via inheritance, especially housing wealth (because of the advantageous tax treatment of housing bequests). Survey evidence suggests that only one third of respondents have a genuine altruistic bequest motive (selfish bequests, if considered as deferred payment to children for support during old age, are consistent with the LCH). Even if the bequest motive were a significant factor, it is not clear that aggregate household savings would be high as a result, as younger households might save less in anticipation of a bequest.

Consumer credit has traditionally been scarce in Japan, so households were forced to accumulate in order to make major purchases. Mortgage credit is also scarce, and saving for residential investment is reported in survey evidence to be a major motive for saving. In equilibrium, though, any decrease in saving due to freer availability of credit would be offset by debt repayment, which is a form of saving. In the case of housing, when saving for housing purchase (or, equivalently, the paying down of mortgage debt) is balanced against rapid depreciation of the housing stock, it is not clear that the residential sector is a net source of capital to the economy.

Other explanations for Japan's high saving rate have included cultural factors, risk aversion, habit persistence, rebuilding of wealth ratios after the war, and so on. None of these add up to a consistent, parsimonious explanation for Japan's apparently high saving rate. The role of demographic factors in determining household savings is either unclear or speculative in most of these alternative views.

Given the relative paucity of strong alternatives and the conceptual and computational simplicity of the model, most projections of the Japanese saving rate have been based one way or another on the LCH. Researchers looking into the impacts of demographic trends on the economy are, perhaps naturally, attracted to the LCH because it tells an intuitively appealing story about economic-demographic linkages.

All studies reviewed here project that the Japanese household saving rate will decline, although there is not unanimity on the size of the decline. In all these models, the aging of the Japanese population is a significant factor underlying the decline in household savings.

While the impact of population aging on household savings is ambiguous, there is no disagreement that population aging will put pressure on government fiscal balances, mostly through the pension and health systems. Thus, all studies reviewed here project that the aggregate saving rate in Japan will decline.

While the literature on population aging and saving is large, that on population aging and investment is small. Most authors agree, or implicitly accept, that aging is likely to have a greater negative impact on saving than on investment demand. Therefore, a common feature of the macoeconomic macroeconomic projections reviewed here is a decline in Japan's current account surplus, often to the extent of turning into a deficit. This implies that the aging of Japan's population will have not just domestic, but international economic consequences.

The impact of aging on government savings is mediated mostly through the pension and health systems, whose structure we have reviewed. The public component of this system underwent a major expansion in 1973 and, in effect, policy makers have been trying to rein it in ever since. The round of reforms, undertaken in 1994, still requires a doubling of contribution rates, from 14.5 percent in 1994 to over 29 percent in 2025, despite reductions in benefits. The most recent reforms in 2000 substantially reduced benefits and projected future contribution rates.

One point that emerges from several analyses is that, prior to the 2000 reforms four-fifths of Japanese public pension payments were indexed to real wages, leaving the system highly vulnerable to adverse demographic trends. Under conditions of population aging, if pensions are linked to prices, then wage-based contribution rates need not increase so long as productivity grows at a sufficient rate. If pensions are linked to wages, however, productivity growth, translated into higher wages, has a ratchet effect on pensions, therefore aging must inevitably lead to higher contribution rates.

Several of the studies reviewed here simulate the effects of pension reform. They agree in finding that strong policy measures can go far towards neutralizing the impacts of projected demographic trends both on the pension system and, through it on the macroeconomy. They do not, however, contain enough age detail to look at impacts on intergenerational distribution. Presumably, given, for example, the changes in the replacement ratio simulated by Yashiro *et al.* (1997b) and the fact that the public pension system accounts for 70 percent of the income of the elderly, these changes would be very large.

A gap in the studies reviewed here relates to the health sector, which recently accounted for about 7 percent of GDP and is projected to rise as the population ages. The impact of the elderly is accounted for mostly by high spending among the bedridden elderly, who consist disproportionately of the "old," the fastest growing segment of the population. While moral hazard is a problem in the Japanese health sector as elsewhere, it is to be doubted whether it is a major factor in the case of this important sub-population. There is a widely acknowledged over-reliance on hospital care for the elderly chronically ill in Japan. The so-called "Golden Plan" initiated in the early 1990s is a major policy effort to expand the number of nursing home beds, make home care freely available, build elder day-care centers, etc.

Annex 1: Studies of the Determinants of Japanese Savings

Researcher/Article	Date	Data Used	Model Used	Findings
F. Modigliani, and A. Sterling "Determinants of National Saving and Wealth with Special Reference to Social Security-Cross Country Tests"	1983			
F. Hayashi "Why is Japan's Saving Rate So Apparently High?"	1986			Japanese savings rates are overstated relative to US savings rates because Japan calculates depreciation on the basis of historical cost. This accounts for 2 or 3 percentage points.
T. Ishikawa "Saving and Labor Supply Behavior of Aged Households in Japan"	1988	1976-77, 1979-80, 1983-84 Family Savings Surveys	Probit equation explaining the choice of employment and a saving ratio equation	Employment promotes saving. Employed households save 4 times as much as those not employed.
F. Hayashi, A. Ando and R. Ferris, "Life Cycle and Bequest Savings: A Study of Japanese and U.S. Households"	1988	The 1979 and 1984 rounds of the National Survey of Family Income Expenditure		The elderly in independent and merged households continue to save.
C. Horioka "Saving for Housing Purchase in Japan",	1988	Various Surveys	Saving-Housing	Housing saving is not an important explanation of the savings rate
C. Horioka "Why is Japan's Private Savings Rate So High?"	1989	21 OECD Countries 1975-1984	Life Cycle Savings-Cross Section	AGE and DEP are the most important variables

F. Hayashi **"Is Japan's Saving Rate High?"**	**1989**	**Annual Reports on the National Accounts**	**Not applicable**	**Substantial part but not all of the savings difference between the US and Japan are due to the way they compile their National Accounts**
P. Heller **"Aging, Savings and Pensions in the Group of Seven Countries: 1980-2025"**	**1989**		**Coefficients of previous studies used to project private savings. Constructs age-specific consumption weights**	
Yoshikawa and Ohtake **"An Analysis of Female Labor Supply, Housing Demand and Saving Rate in Japan'"**	**1989**	**National Survey on Family Income and expenditure (NSFIE)**	**3 period life cycle model**	**Savings and female LFP is influenced by housing prices**
R. Dekle **"Do the Japanese Elderly Reduce Their Total Wealth? A New Look at Different Data",**	**1990**	**Survey on Living Behavior of the Aged (LBC)**	**None**	**Wealth of the elderly increases with age. Data seems to support a bequest motive. Elderly save 20 percent of their income.**
P. Masson and Tryon **"Macroeconomic Effects of Projected Population Aging In Industrial Countries",**	**1990**	**Time series 1969-1987 pooled**		**Effect of 1 percent Change in YDR = -1.10** **Effect of 1 percent Change in ODR= -1.10**
N. Takayama **"How Much do Public Pensions Discourage Personal Saving and Induce Early Retirement in Japan?"**	**1990**	**1979 and 1984 National Survey of Family Income and Expenditure**	**Estimated consumption function from cross-section data**	**Pension system reduces savings of working household by 12 percent**

C. Horioka **"Why is Japan's Household Saving Rate So High? A Literature Survey**	**1990**	**Not applicable**	**Not applicable**	**Literature Review**
B. Bosworth, G. Burtless and J. Sabelhaus **"The Decline in Saving: Evidence from Household Surveys"**	**1991**		**Used age-specific consumption rates**	**Age structure was not an important explanation of savings rates**
C. Horioka **"The Determinants of Japan's Saving Rate: The Impact of Age Structure of the Population and Other Factors"**	**1991**	**National Incomes Accounts of Japan 1956-1987**		**Coefficients of AGE and DEP were negative. They were the most important variables.** **Effect of 1 percent Change in YDR = -.30** **Effect of 1 percent Change in ODR= -1.13**
Fumio Ohtake **"Bequest Motives of Aged Households in Japan"**	**1991**	**1986 Basic Survey of the Life of the People**		**Elderly Dissave 2 percent / year**
Yamada, Yamada and Liu **"Determinants of Saving and Labor Force Participation of the Elderly in Japan"**	**1992**	**Annual Time Series data 1950-1982**	**Life Cycle**	**Social Security Wealth depressed Personal saving and caused earlier retirement**
G. Meredith **"Demographic Change and Household Saving in Japan"**	**1995a**	**Annual report on the 1990 Family Income and Expenditure Survey**	**Life Cycle model**	**Working elderly save 17 percent of their income. Retired elderly dissave 21 percent of their income. The elderly as a whole dissave about 3.5 percent of their income.**

G. Meredith. **"Alternative Long-Run Scenarios"**	**1995b**			
A. Ando, Moro, J. P. Cordoba and G. Garland **"Dynamics of Demographic Development and Its Impact on Personal Saving: Case of Japan"**	**1995**	**National Survey of Family Incomes and Expenditures for 1985 and 1992 population projections, Institute of Population Problems, Ministry of Health and Welfare.**	**Life Cycle**	
Horioka **"Future Trends in Japan's Saving Rate and the Implications Thereof for Japan's External Imbalance",**	**1996**	**Survey on Financial Asset Selection of Households (1992)**	**Tabular Analysis**	**Elderly employed tend to save** **Elderly unemployed tend to dissave** **Saving for a bequest is really a way of acquiring services from children**
Horioka **"A Cointegration Analysis of the Impact of the Age Structure of the Population on the Household Saving rate in Japan"**	**1997**		**Cointegration**	**AGE and DEP are the most important variables**

Annex 2: Economic-demographic Models of Aging in Japan

Modeler(s)	Date	Data	Type of Model	Findings
K. Hamada and K. Iwata	1989		Multi Country Solow growth model	Japan's high saving rate would result in ownership of a large part of the US capital stock
Meredith	1995			The effects of proposed 1994 changes in the pension system were examined.
K. Hviding and M. Merette	1998	OECD Data	General Equilibrium-Overlapping Generations	Effect of Population Aging Overwhelms Effect of policies to Ameliorate is effects. Significant Fall in Savings Rates and rise in Wage Income Tax Rate.
Y. Kosai, J. Saito and N. Yashiro	1998	Macro data 1947-1996	Macroeconomic-Demographic	Technological advance can offset many harmful effects of population aging
Fougere and Merette	1999	Same data as Hviding and Merette	General Equilibrium-Overlapping Generations	Effects of Population Aging can be partially by the young. They can give up some potential wage income and acquire more human capital.

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