Pension policy in developed countries:
Assessment of alternative reforms in response to population aging
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Policymakers in many industrialized countries think population aging represents a serious threat to their societies. They believe increases in the percentage of the population past retirement age must eventually impose intolerable burdens on workers and employers, since pensions and old age health insurance are largely financed with current taxes imposed on companies and active workers. According to a common view, either taxes or government debt will be pushed to unsustainable levels unless public programs are significantly overhauled to curtail retirement benefits.

This way of viewing the problem of population aging is incomplete because it treats aging within the narrow perspective of government budgets. Population aging also has several effects that reduce demands on public budgets. It has important effects on private spending of adult households that in the past would have supported more children. Some of these impacts represent offsets to the obvious effect of aging, which is to boost public spending for pensions and old-age health insurance.

Population aging is the result of two developments, lower birth rates and longer life spans. Holding constant the mortality rate, lower fertility inevitably raises the fraction of the population past any given age, including the retirement age. However, it also reduces the percentage of the population below a given age, such as age 20. Both the old and the young are dependent populations that derive most of their support from the current output of active workers. Rich societies finance much of the consumption of the aged through government-financed retirement programs, while most (though not all) of the consumption of the dependent young is financed out of private household budgets. Young labor force entrants also require public and private investments to equip them to earn as much as the current working-age population. Lower fertility reduces spending requirements for the young, a fact missed when observers focus narrowly on the budgets of government old age programs. The apparent crisis connected with population aging is partly an illusion stemming from a narrow focus on the spending needs of a handful of public programs. If analysts took account of the full range of private as well as public burdens, the increase in the dependency burden associated with population aging would appear more manageable.

Longer average life spans also increase the percentage of the population past a given age. If people value longer lives, this development unambiguously makes us better off, regardless of whether it increases the percentage of our lifetime income we must set aside to pay for consumption past the age of 65. If population aging represents a genuine crisis for present or future generations, it must be the case that those generations expect to suffer a loss in lifetime net income or in net income per year lived. This might occur as a result of excess net contributions to support younger or older generations. The paper will attempt to show the circumstances under which this outcome could occur, and it will consider appropriate short- and long-run policy responses to deal with the problem.

The analysis focuses on Japan within a cross-national policy context. Of all industrial countries Japan faces one of the biggest and most rapid increases in old-age dependency. Japan's birth rate is below the industrial-country average. In addition, over the past 60 years it has enjoyed unusually fast improvement in expected life spans, and the shortfall of Japanese births has not been offset by population inflows from immigration. Within the next three decades Japan will have one of the oldest populations in the industrialized world.

Old-age dependency burden
A common way to measure the burden imposed by the aged on the working age population is to calculate the ratio of old to the number of working age adults. Japan's National Institute of Population and Social Security Research (IPSS) performs its calculation of the old-age dependency ratio under the assumption that the working age population is between 15 and 64 years old (IPSS 2002). The IPSS calculations show that in 1950 there were 8.3 Japanese past age 64 for every 100 adults between 15 and 64 years.

The aged dependency ratio rose to 25.5 by 2000, and IPSS's central forecast implies it will reach 66.5 by 2050. Comparable estimates for the United States show an old-age dependency ratio of 12.5 in 1950, 18.8 in 2000 and 34.6 in 2050. The old-age dependency ratio will clearly rise much faster and to a much higher level in Japan compared with the United States.

Under very simple assumptions regarding the pension formula and work patterns among the young and the old, the trend in the old-age dependency ratio will parallel the trend in the payroll tax rate needed to finance retirement benefits. In a pay-as-you-go (or "paygo") pension program, the taxes imposed on current wage earnings are just high enough to pay for benefits provided to the retired population. Assuming all aged adults receive a pension and all working-age adults are employed, a balanced-budget rule in the pension program requires that current benefit payments must equal tax revenues:

(1) $\quad Pa_2 = \tau W a_1$

where

$P =$ Average pension benefit;

$W =$ Average Wage;

$\tau =$ Tax on wages;

$a_1 =$ Proportion of popultaion that is working age; and

$a_2 =$ Proportion of popultaion that is aged.

This implies that the tax rate needed to pay for old-age benefits is

(2) $\quad \tau = \dfrac{Pa_2}{Wa_1}$

In other words, the tax needed to maintain paygo pension solvency is the old-age dependency ratio times the ratio of the average benefit payment to the average wage. If a pension formula sets the average benefit payment so that it is a fixed percentage of the average wage, the paygo tax rate, τ, needed to support the pension program will vary over time in proportion to the old-age dependency ratio, a2/a1. An increasing share of the aged in the population will inevitably boost the percentage of earnings that must be set aside to pay for benefits to the elderly.

A rising old-age dependency ratio can be associated with other effects on public spending however. Partly offsetting higher spending needs for the dependent old is the shrinking need to provide support to the dependent young. Some of this burden is financed through public budgets, for example, as spending on schools and universities and as social assistance payments to help low-income families containing children. If spending for the young is partly financed by taxes imposed on earnings, the combined tax to pay for pensions and education will bear a less direct relationship to the old-age dependency rate than the relationship implied by equation 2. Of course, government transfers and other public spending are not provided only to the young or the old. Some working-age adults also derive support from government transfers. Nor are the taxes used to pay for transfers imposed solely on wages. Means-tested government transfers and most public health insurance benefits are financed out of general government revenues, which are derived from taxes on personal income, property, and consumption as well as on labor earnings.

If transfers are financed with a proportional tax on all factor income, that is, on all gross income from capital, property, and labor, the balanced-budget tax rate needed to pay for age-related transfers can be expressed as

(3) $\quad \tau = \dfrac{P_{TOT}}{W_{TOT} + R_{TOT}} = \dfrac{\sum a_i P_i}{\sum a_i (W_i + R_i)}$

where

$P_i =$ Average transfer benefit received by persons in age group i;

$W_i =$ Average labor income earned by persons in age group i;

$R_i =$ Average capital income earned by persons in age group i;

$\tau =$ Tax rate on total factor income, $F_{TOT} = W_{TOTO} + R_{TOT}$;

$a_i =$ Proportion of population in age group i.

Note that an age group's average factor income, F_i, is simply the sum of its average wage income, W_i, and average capital income, R_i. It is convenient to express the age profile of factor income by reference to the mean factor income received by the age group that

receives the highest factor income, say, F_M. M can be interpreted to mean "middle aged," since income from earnings and capital usually reach a peak when people attain middle age. If there are N age groups and we define $f_i = F_i/F_M$, then the age profile of factor income is indicated by the sequence $f_1, f_2, f_3, \ldots, f_M, \ldots, f_N$, where each f_i is the mean factor income in group i expressed as a fraction of the factor income received by a middle-aged person and $f_M=1$. Suppose that the average transfer benefit paid to a particular age group i is also measured relative to the mean factor income received by a middle-aged person. If $\beta_i = P_i/F_M$, we can re-write equation (3) as

$$(4) \quad \tau = \frac{\sum a_i p_i}{\sum a_i F_i} = \frac{\sum a_i \beta_i F_M}{\sum a_i f_i F_M} = \frac{\sum a_i \beta_i}{\sum a_i f_i}$$

The paygo tax rate needed to support the transfer system is therefore a function of the age distribution of the population, $\alpha_1, \alpha_2, \alpha_3, \ldots, \alpha_N$, the age profile of factor income, $f_1, f_2, f_3, \ldots, f_N$, and the relative generosity of transfer payments compared to average factor income of the middle-aged, $\beta_1, \beta_2, \beta_3, \ldots, \beta_N$. If the age distribution is skewed toward groups with low benefit payments and high factor incomes, the tax needed to finance paygo transfers will be low. As a graying population increases the proportion of people with high benefit requirements and low factor incomes, τ must rise.

Figure 1. Stylized Distribution of Factor Incomes and Paygo Benefits, by Age


Factor income of
35-54 year-olds = 100
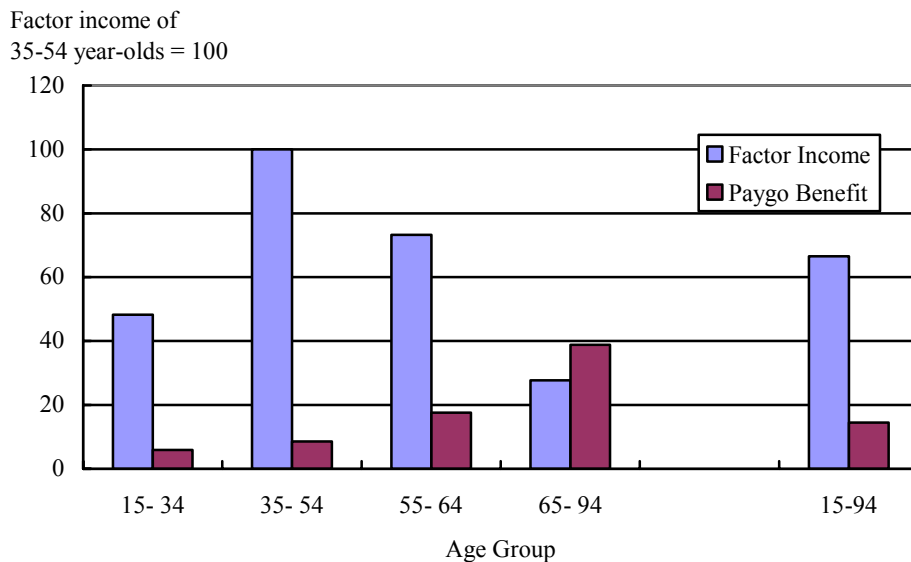
An illustration.
The effect of population aging can be illustrated with a simple example. Suppose the adult population is divided into four age groups: young adults (between ages 15 and 34), the middle-aged (between 35 and 54), the near-elderly (between 55 and 64), and the elderly (ages 65 and older). In addition, assume the age profiles of factor income and of paygo benefit payments follow the schedules shown in Figure 1. The age distributions of factor incomes and benefit payments in the figure are based on the average distributions in four countries where I was able to collect and verify information on the age distribution of government benefit

payments (Burtless 2004). The countries are Finland, Germany, the United Kingdom, and the United States. Both factor incomes and benefit payments are measured relative to the average factor income received by people between 35 and 54. The two bars on the right show the population average factor income (66) and average transfer payment (14)[1]. The implied tax rate needed to support paygo benefits out of factor incomes is thus about 21 percent (14x100/66). Given the pronounced tilt in the age distribution of factor incomes and benefit payments, it is obvious that shifts in the population age structure can affect average benefit payments, factor incomes, and the ratio of these two variables.

Figure 2. Impact of Population Aging on Tax Rate Needed to Finance Paygo Transfers (Initial tax rate = 100)
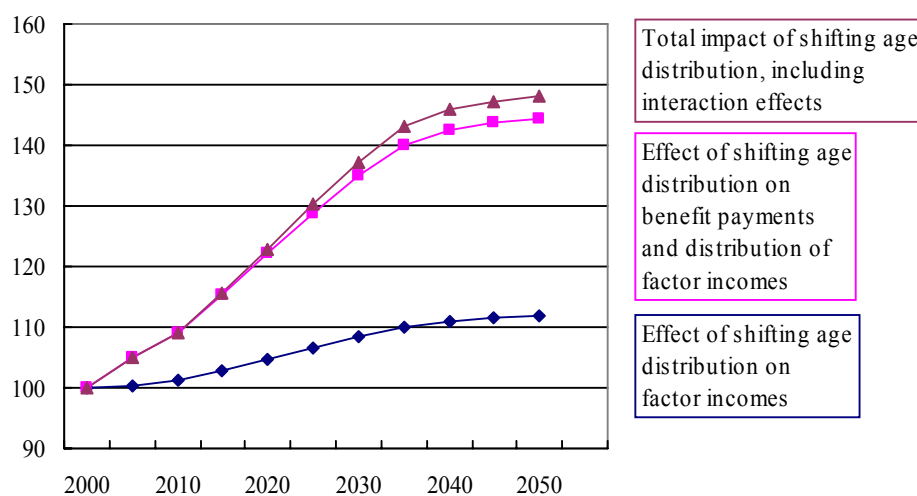
Source: Author's calculations as explained in text.

Consider the effects of a shift in the age distribution that mirrors the expected change that will occur in industrialized countries between 2000 and 2050. As a percentage of the total population, the population age 65 and older will increase from 18 percent to 33 percent over that interval[2]. If each age group had an identical factor income equal to the overall population average in 2000, the shift in the age composition of the population would have no impact on average factor incomes. Because the population will shift toward age groups that earn lower incomes, however, by 2050 the tax rate will have to rise 2.5 percentage points (about 12 percent) above the required level in 2000 in order to compensate for the lower factor incomes that will be earned by the older population. Similarly, if each age group received an identical average transfer payment, the shift in the age structure of the population would have no impact on the average transfer payment the government has to pay out. The actual age profile of benefit payments slopes upward with age, however, implying that the average transfer will have to rise. Because the population will shift toward age groups that receive larger benefits, by 2050 the tax rate must rise 7 percentage points (about 33 percent) to pay for higher average benefits. In addition, there is a small interaction effect between factor incomes and the benefit schedule that boosts the required tax rate a bit more. The total increase in τ needed to support paygo transfers between 2000 and 2050 is a little more than 10 percentage points, about 48 percent of the 2000 tax rate. Figure 2 shows the trend in τ between 2000 and 2050 under the assumption that the population age structure follows the trend predicted by the U.S. Census Bureau for a handful of industrialized countries. The figure also shows a decomposition of the tax rise between the part traceable to changes in the factor income distribution, the part due to higher benefit obligations flowing from the age profile of transfer payments, and the interaction effect. The bulk of the increase in required tax contributions is clearly due to the steep age profile of benefit payments.

Much of the cross-national literature on population aging focuses on the impact of a changing age structure on the burden of supporting an older population. As indicated in equation 4, however, the effect of aging also depends on the age distribution of factor incomes and the relative generosity of public transfers over the life cycle. If young people receive generous support under the transfer system, population aging may initially reduce tax burdens as the share of the population in young age groups declines (see Cutler et al. 1990; Burtless 2002). The young earn little income from wages and property, so a decline in fertility will initially reduce the relative size of an age group that has limited factor income and increase the relative importance of age groups with high labor or capital incomes. Two countries with an identical age

distribution and identical trends in the age structure may face very dissimilar trends in tax burdens. Differences in the age pattern of factor incomes or in the age pattern of transfer generosity can produce marked differences in the trend of τ, even when the population-average level of transfers compared with factor incomes is initially quite similar. To take a simple example, a nation that provides little public income support to young or middle-aged adults and offers generous support to the population past 65 faces a much steeper increase in taxes when old-age dependency rises than does a nation providing moderate income support to young, middle-aged, and elderly alike.

Policy responses
The estimates in Figure 2 imply that the proportional tax on factor income needed to pay for public transfer benefits will have to rise almost 50 percent between 2000 and 2050. This calculation assumes that paygo transfer programs will obtain revenues just sufficient to pay for contemporaneous benefit payouts. It assumes the benefit formulas for government transfers will remain untouched and the age distribution of factor income will also remain unchanged. Only one factor is assumed to change in Figure 2: The age distribution of the population will grow older.

The actual trend in future tax burdens will diverge from the path predicted in Figure 2 because one or more of these assumptions will turn out to be incorrect. The future age structure of Finland, Germany, the United Kingdom, and the United States will almost certainly differ from the forecast of the U.S. Census Bureau. Government transfers may be financed through borrowing as well as through a tax imposed on current factor incomes. Even more important, the age distribution of future transfers and future factor incomes will not be the same as the distributions observed in recent years. If government programs are reformed to force workers to wait longer before collecting old-age pensions or to become insured under old-age health insurance programs, the age profile of benefit payments will differ from the distribution displayed in Figure 1. Transfer benefits received after age 55 will be lower than assumed in the figure. The change in the structure of benefits could in turn affect the age distribution of factor income. People 55 and older may remain in the workforce longer, increasing their average factor income. Alternatively, they may save a larger

percentage of their earnings when they are under age 55, increasing their investment earnings when they are past age 55. Either of these behavioral changes would affect the age distribution of factor incomes so as to reduce the tax increase implied in Figure 2.

An alternative view of the dependency burden
The framework proposed in the previous section offers a natural way to compare old-age dependency burdens in industrialized countries and to assess alternative policy approaches to deal with aging. Unfortunately, the data requirements are demanding. I have not been able to assemble data on the age profiles of factor incomes and benefit payments in Japan. Unlike most other industrialized countries, Japan does not participate in the Luxembourg Income Study (LIS). The LIS collects and distributes micro-census income data organized at the household and personal level for about 25 countries. LIS data sets contain detailed information about a variety of public and private income sources, including wages and salaries, net income from self-employment, property income including interest, dividends, and rent, occupational pensions, means-tested benefits, and public retirement benefits. Without access to this kind of information, researchers must rely on income tabulations published by the government or by analysts who have access to the data.

Japan has published tabulations on employment and earnings by age, so it is possible to examine dependency burdens using a simpler framework than the one described above. Assume as in equations 1 and 2 that all transfer payments are financed with a tax on labor income. Assume also that the transfers are large enough so that non-working adults can consume as much as adults who work. Suppose an average child consumes α times the average adult's consumption, where $0 < \alpha < 1$. If total output is Y, then the average consumption of an adult is

$$(5) \qquad C = \frac{Y}{\alpha \sum_{i=0}^{19} A_i + \sum_{i=20}^{95} A_i}$$

where A_i is the number of people in age group i. People aged 20 through 95 are assumed to be adults. Most dependency measures implicitly assume that all working-age adults

are contributing to the support of people who are too young or too old to participate in the labor force. In fact, labor force participation rates are considerably below 100 percent, even among adults who are in the middle of their potential work careers. For example, the peak labor force participation rate in Japan occurs among adults between 45 and 54 years old, but even in this age group the participation rate is less than 85 percent. If the fraction of the population that works at each age, i, is λ_i and the longest lived person dies on his 95th birthday, then output is

$$(6) \qquad Y = W \sum_{i=0}^{95} \lambda_i A_i,$$

where W is the economy-wide average wage.

Suppose that all adults share equally in consumption, while all children receive identical consumption allotments equal to α times the adult share. This distribution pattern requires each worker to give up part of his output to support dependents, that is, to support nonworking members of the adult and child populations. The portion of the wage that each worker must sacrifice, τ, is one measure of the burden that aged and youth dependents impose on active workers:

$$(7) \qquad \tau_{Total} = \frac{W - C}{W}$$

$$= \frac{\sum_{0}^{19}(\alpha - \lambda_i)A_i + \sum_{20}^{95}(1 - \lambda_i)A_i}{\alpha \sum_{0}^{19} A_i + \sum_{20}^{95} A_i}$$

The dependency burden can be further divided into the parts that are due to the young ($i = 0,19$), nonaged adults ($i = 20,64$) and the old ($i = 65,95$):

$$(8a) \qquad \tau_{young} = \frac{\sum_{0}^{19}(\alpha - \lambda_i)A_i}{\alpha \sum_{0}^{19} A_i + \sum_{20}^{95} A_i};$$

$$(8b) \qquad \tau_{Nonageadult} = \frac{\sum_{20}^{64}(1 - \lambda_i)A_i}{\alpha \sum_{0}^{19} A_i + \sum_{20}^{95} A_i}; \text{ and}$$

$$(8c) \qquad \tau_{Elderly} = \frac{\sum_{65}^{95}(1 - \lambda_i)A_i}{\alpha \sum_{0}^{19} A_i + \sum_{20}^{95} A_i};$$

The intuition behind this measure of the dependency burden is straightforward. To the extent that the labor force participation rate of children falls below α or the labor force participation rate of adults falls below 100 percent, members of the age group will require greater support from people who are at work. The dependency burden rises along with the percentage of the population in age groups that have low labor force participation rates. It falls when low-labor-force-participation groups decline as a share of the total population.

Compared with very simple representations of the burden of population aging, the measure in equation 7 takes account of the burden of supporting children and non-aged adults who do not work for pay. However, unlike the more complete representation in equations 3 and 4 above, it ignores the fact that transfers can be supported with a tax on property and investment income in addition to a tax on labor earnings.

Obviously, the tax on wages needed to support transfers depends on $\alpha$the ratio of benefits provided to children relative to benefits provided to non-working adults. Cutler et al. (1990) estimated that the educational spending and consumption requirements of a child represent a little less than three-quarters of the consumption requirements of an adult, implying that $\alpha=0.75$. At the opposite extreme, we could assume that child dependents require virtually no support for their consumption, say, $\alpha=0.10$. Figure 3 shows the implications of alternative estimates of α on the Japanese dependency burden over the period from 1950 to 2050. For the historical period from 1950 through 2000 the estimates are based on reports from the Japanese census showing the age distribution of the population and from the International Labour Organization (ILO) showing labor force participation in 5-year age groups. The forecasts for years from 2000-2050 are based on the most recent IPSS population projections and the ILO labor force participation rate estimates for the year 2000. In other words, the forecast assumes that future labor force participation rates within age groups will remain unchanged at the levels observed in 2000.

Figure 3. Japanese Dependency Burden under Alternative Estimates of a, 1950 - 2050
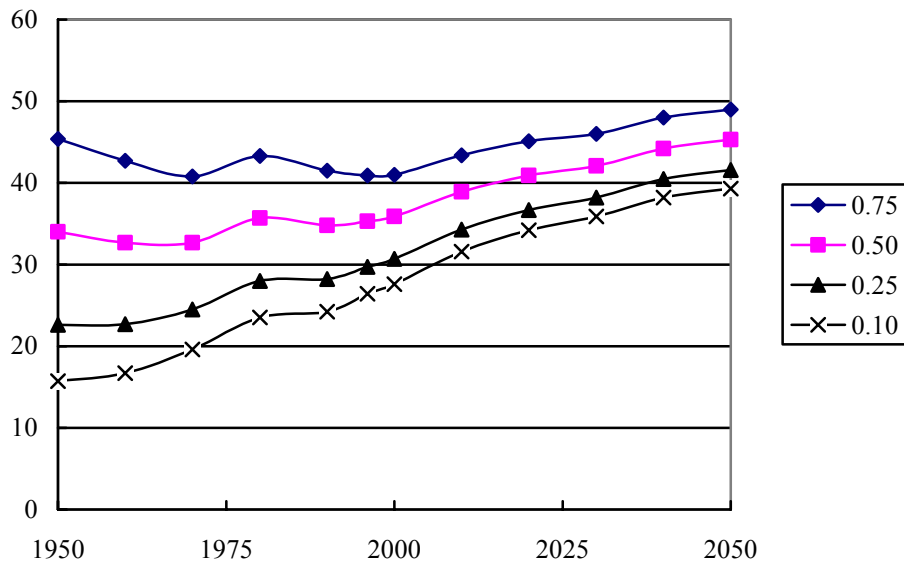
 Sources: Author's tabulations of IPSS population estimates and ILO labor force participation estimates as explained in text.

All four estimates of the future dependency burden displayed in Figure 3 show that Japanese dependency burdens will increase. However, the proportional growth in the dependency burden depends critically on whether Japanese children require large transfers from the working population. If these transfers are small (α=0.10), the Japanese dependency burden has risen without interruption since 1950 and will rise another 12 percentage points (about 42 percent) between 2000 and 2050. On the other hand, if transfers to children are large (α=0.75), the tax burden will only increase about 8 percentage points (20 percent) between 2000 and 2050. The intuition behind this result is straightforward. In 1950 the Japanese population contained a large number of children and relatively few non-working adults past age 65. More than one-third of Japan's population consisted of children under age 15. If these children required few resources to support (α=0.10), the overall dependency burden was small. The burden of supporting the non-working population has increased continuously as the cost of providing transfers to nonworking aged adults has risen. On the other hand, if we assume that support provided to children is costly (α=0.75), the steep decline in the importance of children in Japan's population between 1950 and 2000 led to reduced burdens on workers for

supporting non-working dependents. The dependency burden will grow in the future, but in 2050 it will be only 3.6 percentage points (8 percent) greater than the dependency burden in 1950.

Our evaluation of the relative importance of population aging in Japan and the United States also hinges on whether children are inexpensive or costly to support. Figure 4 shows the evolution of Japanese and U.S. dependency ratios under a low and a high estimate of the relative cost of supporting children (α=0.10 and α=0.75, respectively). Under either estimate the U.S. dependency burden was greater than the burden in Japan from 1950 to 1980. Until the 1980s, the Japanese population was younger than the U.S. population, and U.S. workers had to support a greater number of retired workers. In addition, labor force participation rates in the U.S. were noticeably lower than those in Japan, so American workers had to support a larger number of nonworking adults who were below age of 65. Participation rates are now similar in the two countries, but the population age structure of Japan is increasingly dominated by people in late middle age and past the age of 65. The U.S. population contains a larger proportion of children and young adults. Population forecasts of the IPSS and the U.S. Census Bureau suggest the divergence in population age profiles will widen over the next several decades. If children are relatively

inexpensive (α=0.10), this will mean the dependency burden of Japanese workers will increase steadily compared with the burden faced by U.S. workers. By 2050 τ will be almost 10 percentage points (or one-third) higher in Japan compared with the United States. On the other hand, if it is costly to support children (α=0.75), the future trend in the dependency ratio will be quite similar in the two countries (see the top two lines in Figure 4). Japanese workers will be burdened by growing support payments to the retired elderly, while a bigger (though declining) fraction of Americans' earnings will be devoted to supporting children and non-working young adults.

Figure 4. Japanese and U.S. Dependency Burdens under Alternative Estimates of a, 1950 - 2050
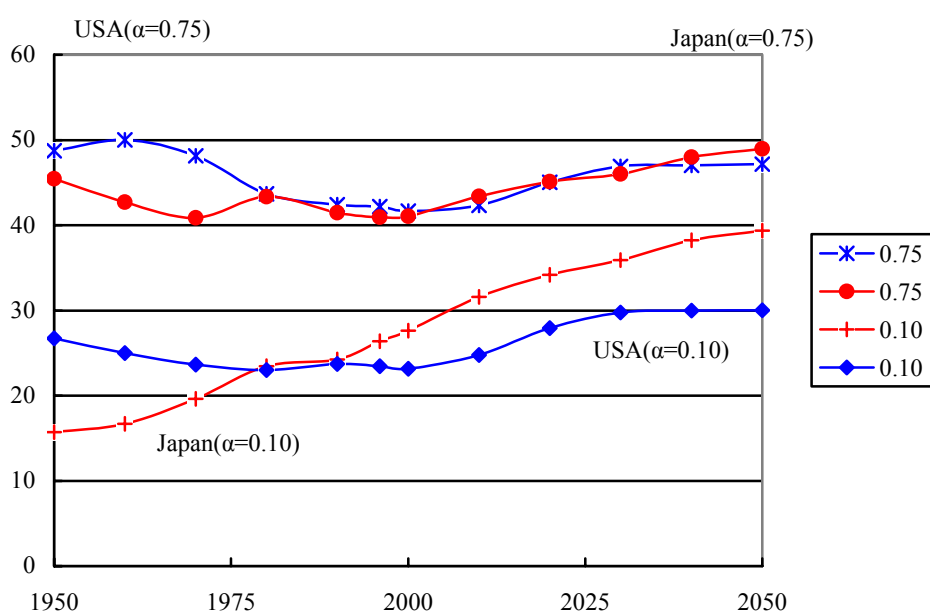
Sources: Author's tabulations of IPSS and U.S. Census Bureau population estimates and ILO labor force participation estimates as explained in text.

Most support for children's consumption comes from the private household budgets of the children's parents; relatively little comes from public budgets. In contrast, much of the consumption of the nonworking aged population is financed out of public budgets, from public pensions and old-age health insurance. Even if supporting children is relatively costly and Japanese and U.S. workers face similar future dependency burdens, different kinds of adjustments are needed to pay for the higher dependency costs in the two countries. Japanese and U.S. workers probably view tax contributions to support the retired elderly in a different light than they regard most transfers to the dependent young. Most voters regard public pensions to the elderly more favorably than they do spending on other kinds of government functions. Nonetheless, they regard public transfers in a much less favorable light than they do private transfers to nonworking dependents within their own families. Family breadwinners almost certainly derive greater satisfaction paying for the consumption needs of their close relatives and child dependents than they do in paying taxes to support the retirement of strangers. Even though breadwinners in rich countries have enjoyed sizable consumption gains from lower fertility, they do not view these gains as an offset to the higher taxes they must pay to support the retired elderly. The perceived problem of population aging may be a natural result of the different ways that rich societies provide support to their aged and nonaged dependent populations. Aged dependents receive public pensions and are supported through taxes, while most nonaged dependents are supported with private, within-family transfers. This should not obscure the fact that the true economic burden of supporting an

increasing number of aged retirees is partly offset by the steadily shrinking burden of

supporting children and dependent young adults.

Figure 5. Old-Age Dependency Ratios in G-7 Countries, 2000-2050
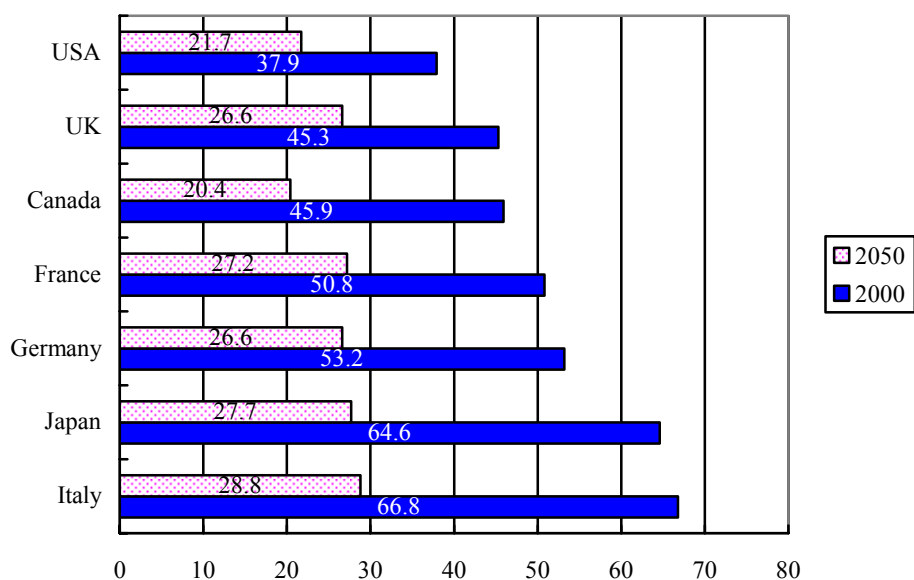
Source: Casey et al. (2003).

Generational burdens

The analysis so far has focused on the dependency burden borne by active workers at a particular point in time. From this perspective, the burden of population aging can be summarized by the implicit tax paid by active workers to support child and adult dependents who do not work. This framework does not fully capture the influence of changing population structure on successive generations, for it fails to measure the lifetime net benefits that individuals derive from membership in a relatively large or relatively small generation. Individuals receive transfers when they are children and, if they survive to join the work force, eventually provide for their own support and contribute toward the support of others. If an individual retires in old age, he again becomes dependent on support from others. Depending on the relative size of the working-age and dependent populations over the course of an individual's life, workers may be net tax payers or net transfer recipients during their lifetimes. It is natural to ask how variations in fertility and mortality affect the net transfers received by successive generations.

In another paper (Burtless 2002) I suggested that the dependency burden faced by any particular generation could be measured by the ratio of lifetime consumption

enjoyed by the generation compared to the lifetime gross wages earned by the generation. Favored generations enjoy lifetime consumption that exceeds their lifetime earnings, while less favored generations consume less than their lifetime earnings. The lifetime consumption of a generation is financed out of transfers received when some or all of its members are outside the work force plus the after-tax earnings received when members of the generation are at work. Fluctuations in the birth rate and reduced mortality have complicated effects on the lifetime tax burden faced by successive generations[3]. It is clear, however, that a generation that enters the workforce when fertility rates begin to decline enjoys a favorable situation. Because fertility is declining during its early working years, the burden of supporting children is reduced. Moreover, a reduced fertility rate has no immediate impact on the burden of supporting the aged. Compared with earlier generations, the low-fertility generation faces a smaller burden of supporting the young and an unchanged burden of supporting the elderly. Lower fertility rates must eventually increase the ratio of retired aged to active workers, but this development will not be reflected in support burdens for twenty or more years. When the old-age dependency ratio eventually

rises, workers must set aside a larger percentage of their wages to support the elderly. Small generations that enter the workforce several decades after a drop in the fertility rate will face higher tax rates to finance old-age transfers throughout their careers. The ratio of lifetime consumption to lifetime gross earnings will be less favorable than the ratio enjoyed by the first low-fertility generation. Whether the ratio is less favorable than the ratio faced by high-fertility generations depends on the rate of wage growth and the relative cost of supporting aged versus child dependents. A crucial point, however, is that a generation which enters the labor force when fertility starts to decline will be more favored than generations entering earlier or later.

Policy responses: An evaluation
In the remainder of the paper I focus on policy responses that can alter the trend in old-age support burdens. These burdens will rise in all the major industrial countries because of low fertility and rising longevity. Figure 5 shows OECD estimates of the 2000-2050 change in the dependency ratio for the G-7 countries (Casey et al. 2003). The OECD defines the old-age dependency rate as the ratio of people 65 and older divided by the number who are between 20 and 64 years old. Its projections imply that the old-age dependency ratio will increase by between 16 and 38 percentage points over the next half century. Japan, which already has the second highest dependency rate among these countries, will see the experience the second largest increase in old-age dependency burden.

One approach to rising old-age dependency is to encourage demographic trends that change the future age distribution of the population. This can be accomplished either by encouraging higher fertility or allowing greater immigration, policies aimed at increasing the relative size of the future working-age population. Of the two policies, the first one is the hardest to implement. It will also initially worsen the total dependency burden. Many countries have tried to encourage higher birth rates, but the results have seldom been impressive. The highest birth rate in the industrial world is that of the United States, a country that has no explicit policies to induce higher fertility. The short-run effect of higher fertility is to boost the dependency costs of supporting children, so the benefits of this policy will not be apparent for a couple of decades. In contrast, a higher

immigration rate immediately reduces the dependency burden if immigrants are selected from working-age applicants. Countries differ in their willingness to accept immigrants, however, so this policy is only feasible in societies where immigration is welcome or at least tolerated.

If countries cannot alter the future age structure of their populations, they face three basic options in managing the future costs of old-age support programs. They can increase the contributions of active workers or boost general taxes in order to pay for higher benefit payments. They can reduce monthly pensions and health insurance benefits below the levels promised in current law. One variant of this policy is to increase the earliest age at which benefits can be claimed, reducing to zero the pensions paid to the "young elderly." Finally, governments can encourage higher employment rates among groups that currently have low or moderate participation rates. One population with a low employment rate is the aged. In some countries, adult women also have low participation rates.

The leading industrial countries have adopted policies that combine all three of these approaches. With respect to pension policy, national governments have increased contribution rates to the public programs, overhauled pension schedules to reduce promised future benefits, and introduced new features in public pension and old-age unemployment programs to encourage employment after the early or standard retirement age (Kalisch and Aman 1998; Casey et al. 2003).

Advance funding
In addition, a number of countries have attempted to shift the funding basis of pensions away from pay-as-you-go financing toward greater capital funding. Note that this shift does not reduce the burden of paying for old-age pensions in the short run, although it may have an indirect effect on dependency burdens in the long run. Active workers must still bear the burden of financing paygo pensions promised to the retired elderly. In addition they also contribute to a voluntary or mandatory funded pension plan that will pay for part of their retirement income when they reach old age. Any reductions in the future old-age dependency burden occur because pensions from the paygo system will be gradually reduced below the amounts promised under the old schedule. The future reduction in the old-age dependency burden

occurs because of the cut-back in the paygo pension, but this can take place with or without a shift toward capital funding. A political argument in favor of capital funding is that this shift may help persuade young workers to accept reforms in the paygo pension formula that will substantially reduce their benefits compared with the paygo pensions received by current retirees. The reduction in the future old-age dependency burden is achieved because young workers accept a smaller paygo pension, but they might be unwilling to accept the benefit cut unless policymakers can point to a new and reliable source of retirement income.

Shifting the retirement system away from paygo financing and toward capital funding could boost national saving, thus increasing the future flow of national income. This is a cherished goal of many proponents of capital funding, but it will require a consumption sacrifice in the near term. The sacrifice could be accomplished by reducing the consumption of active workers or of retired pensioners. Workers' consumption could be cut as a result of the requirement that workers increase their combined contributions to the old and new pension systems. If their payroll contributions to the paygo system are left unchanged and if they must contribute to a new capital-funded pension system, they will have less net income with which to pay for their current consumption. Workers' saving will rise and their current consumption fall. Retirees' consumption can be cut by requiring them to accept immediate benefit cuts under the paygo system. Because lower contributions will be needed to pay for current pensions, active workers can divert some of their payroll taxes into a new capital-funded pension system. Reform plans that do not impose a near-term consumption sacrifice, either on workers or on retirees, will not achieve a higher saving rate.

Some of the issues connected with moving toward capital funding are highlighted in the current U.S. debate over social security reform. President Bush has proposed that active workers be allowed to divert part of their social security contributions into new defined-contribution pension accounts. This would shift the U.S. system away from paygo funding and toward capital funding. In the kind of system favored by the president, workers would be free to decide how their contributions are invested, at least within broad limits. Workers' retirement savings would build up in private investment accounts until workers reached the retirement age,

became disabled, or died. At that point, funds would be distributed to surviving dependents or converted into a life annuity. The president has pledged that social security benefits for people who are already retired or within a few years of retirement will not be cut. Presumably, workers who divert some of their social security contributions into new individual retirement accounts would lose part of their promised social security pensions, but the amount of benefit cut has not been determined.

Will this kind of reform produce an increase U.S. national saving? Probably not anytime soon. The diversion of payroll taxes into individual retirement saving accounts will certainly boost the household saving of worker families, but it will also deprive the social security system of taxes. This will reduce the current social security surplus and increase the federal government deficit. The drop in government saving will exactly offset the increase in household saving, producing no net change in the overall U.S. saving rate. The reform suggested by President Bush does not require a consumption sacrifice from current workers, because payroll withholdings for the old and new retirement systems are exactly the same as under the old system. And it does not require a consumption sacrifice from retirees, because their retirement benefits are left unchanged. Thus, the president's reform plan is unlikely to achieve one of the principal goals of advocates of capital funding, namely, a higher national saving rate[4].

From an economic perspective, the shift away from paygo funding and toward capital funding offers the possibility of increased future consumption among both workers and retirees. The pool of resources for future consumption cannot be assumed to remain constant. It can rise or fall depending on today's choice of pension funding policy. Current workers can fund a greater part of the cost of their own pensions by increasing their contributions into a retirement plan. If the contributions are saved and used to finance the accumulation of additional capital, the result will be an expansion of the resources available to pay for consumption by future workers and retirees.

In neoclassical growth theory, increased saving is one of the few mechanisms that can boost future aggregate income. Larger accumulations in the retirement system could raise a nation's capital stock or foreign asset holdings and thus increase future national income. Over the next several decades, nations

with aging populations would still be forced to spend a rising percentage of their national income on pensions, but they would pay for these obligations out of a larger economic pie, leaving a bigger slice for future workers. From the point of view of pension fund contributors, advance funding is also a way to increase the rate of return on their contributions. Part of each worker's retirement benefit would be financed out of earnings on capital investments, and the rate of return on these investments will probably be higher than the return obtainable in a paygo retirement program.

As we have seen, however, a shift in pension finance from paygo funding to capital funding does not automatically produce higher national saving. The only way this can be accomplished is to reduce, at least temporarily, the consumption of workers or retirees. This implies that to achieve higher saving the national pension system must be overhauled to cut paygo benefits or increase combined contributions to the unfunded and capital-funded parts of the system. Lower benefits will reduce the consumption of retirees; higher contributions will reduce consumption of active workers.

Figure 6. Old-Age Pension Spending in G-7 Countries, 2000-2050
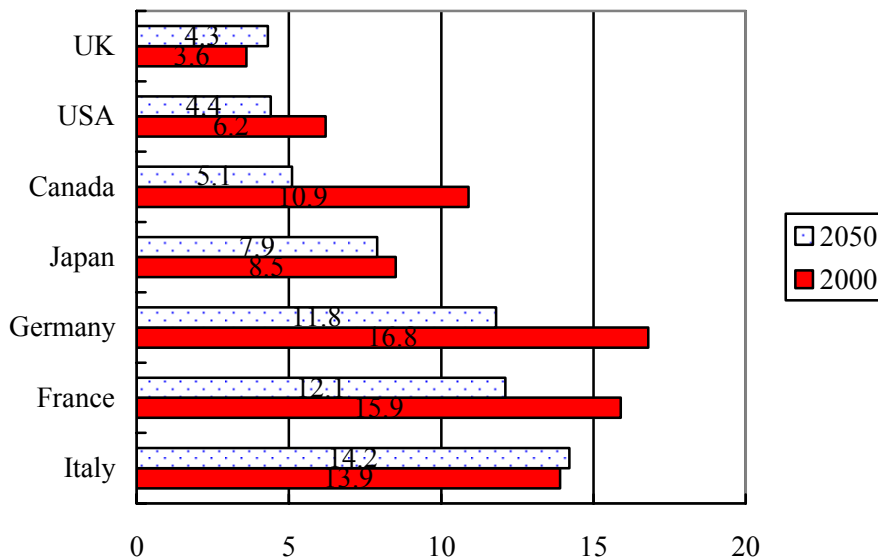
Source: Casey et al. (2003).

Benefit cuts

The most common policy response to rising old-age support burdens is to reduce the benefits promised by public pension programs. This can be accomplished with sudden, across-the-board benefit cuts that apply to current pensioners, but abrupt policy shifts of this kind are rare in democracies. In nearly all public pension systems, workers born in the same year who have similar earnings records expect to receive similar retirement benefits. They also expect benefits to be similar to those received by workers who are only a few years older. Because of political constraints on legislators, the public pension formula can only be changed very slowly and usually after protracted political debate. Since both contributors and beneficiaries have a voice in this debate, changes in contribution and

benefit formulas tend to reflect a compromise between the interests of the two groups. The effects of unanticipated economic developments are rarely if ever borne by a single cohort. They are spread across a number of cohorts through gradual changes in contribution rates and benefit levels.

Gradual benefit cuts can eventually produce big reductions in pension spending, however. Figure 6 shows OECD estimates of the fraction of GDP that will be devoted to public pension spending in the G-7 countries over the period from 2000 to 2050 (Casey et al. 2003). The forecast for 2050 takes account of the effects of changes in the age structure of the population, in the public pension formula, and in eligibility requirements for pensions. Measured as a fraction of GDP, public pension spending will increase in every G-7 country

except the United Kingdom and Italy. In most countries, however, it will increase by proportionately less than the old-age dependency ratio. In Japan, for example, the OECD expects pension outlays to climb from 7.9 percent of GDP in 2000 to 8.5 percent of GDP in 2050. Over the same period Japan's old-age dependency ratio will increase from 28 percent to 65 percent.

Figure 7. Decline in Average Old-Age Pension Relative to Real Average Wage, 2000-2050

% benefit cut /a/
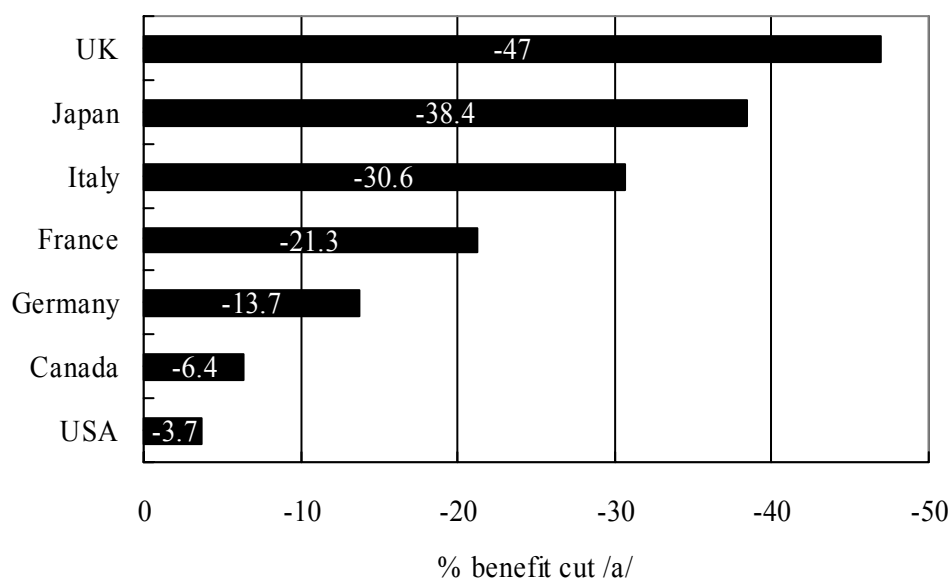
/a/ Percent decline in the ratio of the average old-age pension over the average

Source: Casey et al. (2003).

In most countries the slow anticipated growth in pension spending is the result of reforms in the pension formula and eligibility conditions that will curtail the future growth of public benefits. Figure 7 shows the OECD estimates of the expected decline in real pensions relative to average wages in the 50 years after 2000. It contains estimates of the drop in the ratio of average real pension payments to average real wages in the G-7 countries (Casey et al. 2003; Dang et al. 2001). This is roughly equivalent to the drop in the pension replacement rate scheduled under current law. Public pension replacement rates are expected to fall 30 percent or more in Italy, Japan, and the United Kingdom. In Britain the decline in average benefits is so large that public pension spending will actually shrink as a percentage of GDP. Benefit reductions will be achieved as a result of changes in the indexing formula linking pension payments with wage or price change, increases in the number of earnings years used to calculate pensions, or increases the age of eligibility for unreduced pensions.

It does not make sense to impose proportionate benefit cuts on all pensioners. Public pensions are the main source of income for most retirees, and are particularly important for the aged who are in the bottom half of the income distribution (Börsch-Supan and Reil-Held 1998). Because many of the elderly have incomes that are only slightly above the poverty line, the government cannot reduce public pensions at the bottom of the income scale without increasing poverty. Old-age poverty is already a serious problem in several G-7 countries (Figure 8). Poverty is especially high in the three countries planning to make the biggest cuts in pensions. Legislatures should be very cautious before enacting proportional across-the-board reductions.

Some proposals for scaling back pensions emphasize some form of means-testing to spare the low-income elderly from big benefit cuts. Both Canada and the United Kingdom already have significant income testing of their basic state-provided pension. Means-testing public pensions on the basis of retirees' current income can certainly reduce costs. By

imposing a high tax on asset and private pension income, however, the policy also discourages workers from saving privately for their own retirement, either in a household saving account or in occupational pension schemes. A means test that affects a large percentage of middle- and high-income retirees could substantially reduce private saving.

Means-testing raises other concerns. It can deprive the basic state pension system of crucial political support by changing the attitudes of high-income workers and retirees, who currently support the system but who would receive sharply lower benefits under a means-tested system. It may induce some retirees to shift assets to their children in order to avoid the means test. Finally, it could encourage over-investment in assets, such as housing, that provide a stream of in-kind income that is not covered by the means test.

Figure 8. Poverty among Aged Persons in G-7 Countries, 1992-1997

Percent of elderly population in poverty /a/
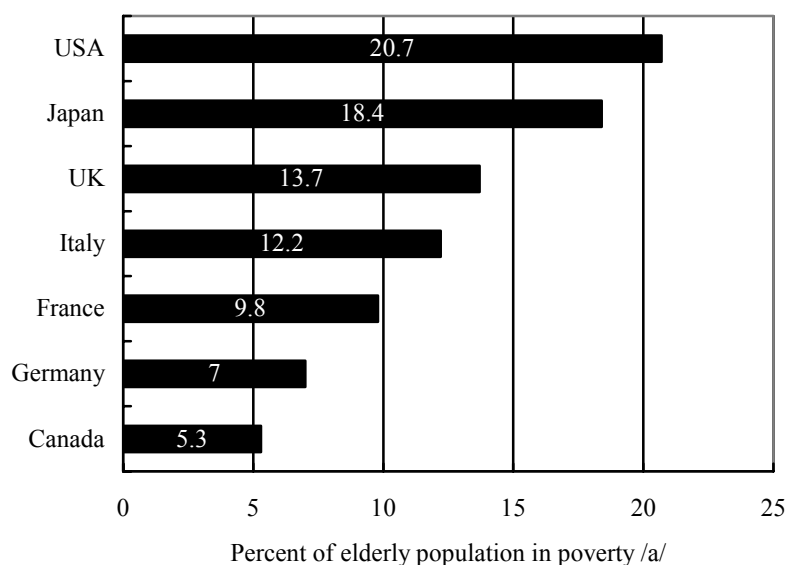
/a/ A household is classified as poor if its income, adjusted for household size, is less than 50 percent of the median size-adjusted income in the country

Source: Smeeding and Williamson (2001).

Incentives to encourage employment
The prospect of sharply higher pension costs has made policymakers mindful of the possible effects of pensions on labor force participation. Over the past four decades the labor force participation rate of people over 60 has fallen in almost all OECD countries. Participation rate declines were particularly noticeable among men, and the falloff in participation began among men as young as age 50. Among 50-54 year-olds, declines in participation among men have been more than offset by participation rate gains among women, so the overall activity rate in this age group has typically decreased in recent years. At older ages the drop in labor force participation among men is often larger than the increase among women, implying in many countries that overall labor force participation has fallen among people 55 and older. In all countries except Sweden the decline in activity rates of 60-64 year-old men has been greater than the rise among 60-64 year-old women, so total participation in the age group has declined.

One reason for earlier labor force withdrawal was the increased generosity of programs that replace lost earnings when older workers leave their jobs. Jobless workers past age 50 are now more likely to qualify for generous unemployment and disability benefits, and larger percentages of older workers are eligible for an early pension. The impact of pension incentives has been intensively studied in recent years. Surveys by the OECD and National Bureau of Economic Research have uncovered sizeable effects of disability and pension programs and special unemployment benefits for older workers on the activity rates of people past age 55 (Blöndal and Scarpetta 1999; Gruber and Wise 1999; Duval 2003).

Figure 9. Japanese Dependency Burden with Faster Growth in Labor Force Participation, 1950 - 2050

τ (Percent of contemporaneous wage)
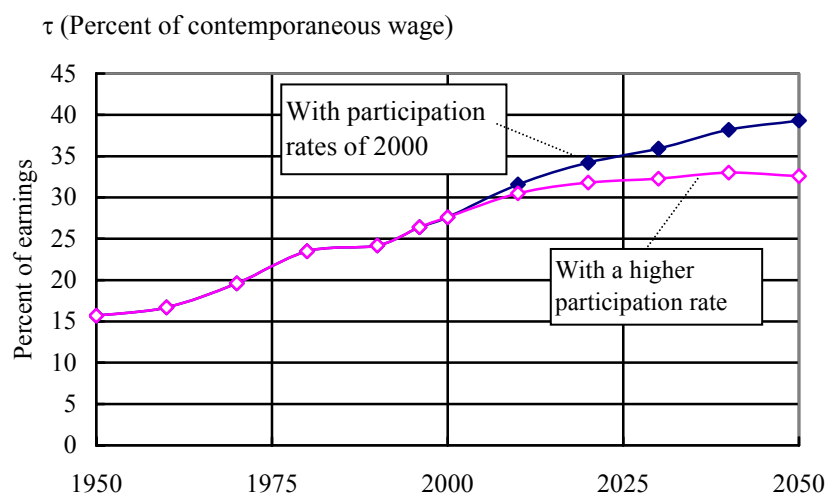
Note: The dependency burden, τ, is calculated under the assumption that support costs for children are 10% of those for adults (α = 0.10).

Sources: Author's tabulations of IPSS population estimates and ILO labor force participation estimates as explained in text.

Researchers who have recently examined cross-national differences in pension incentives generally find they have predictable and significant effects on labor force withdrawal.   Countries with early pension ages, generous income replacement, and heavy implicit taxes on earnings in old age tend to have earlier exit from the labor force than countries with pension systems that provide fewer work disincentives. An OECD survey of pension reform shows that a large number of countries, including Australia, Italy, Japan, and the United States, have changed the incentives in their pension systems to discourage early retirement or encourage pension recipients to continue working while collecting a pension (Casey et al. 2003). Whether these changes will have a big effect on labor force participation at older ages remains to be seen.

Some OECD countries, including Japan, have comparatively low labor force participation rates among adult women. Compared with female participation rates in France and the United States, for example, the participation rate of Japanese women between 25 and 44 is about 12 percentage points lower. If the female participation rate were increased to the rate observed in high-participation OECD countries, Japan could reduce the dependency burden on active workers.

To see how much difference a higher labor force participation rate would make, I have calculated the Japanese dependency burden under alternative assumptions about future labor force participation.   Figure 9 shows the trend in the dependency rate under the definition implied by equation 7 above[5]. For years between 1950 and 2000, the dependency burden is calculated using contemporaneous labor force participation rates within age groups. Thus, the estimates show the actual evolution of the dependency burden under the definition in equation 7. For years after 2000 the dependency burden is calculated under two different assumptions about future participation.   The heavy line shows the evolution of the dependency burden if Japanese labor force participation rates within 5-year age groups remain unchanged compared with their levels in 2000.   The lighter lower line shows the dependency burden if participation rates in most age groups past age 20 rise gradually to a higher rate. For people between 20 and 24 and age 60 and older I assume that participation rates rise gradually to the highest rate observed for the age group during the 50 years before 2000. Under this assumption, all of the declines in labor force participation among people between 20 and 24 and age 60 and older that have occurred over the past 50 years would be reversed. For people between 25 and 44 I

assume that Japanese participation rates will rise to the current levels observed in France or the United States, depending on which country has the higher participation rate in the age group. Both France and the United States have higher participation rates among 25-to-44 year-olds because French and American women are more likely to be in the workforce than their Japanese counterparts. (Japan has the highest participation rates in age groups 45 and older.) In every age group where the participation rate is predicted to rise, participation rises steadily over the entire 2000-2050 period.

Under these assumptions the dependency burden will rise, but it will increase much more slowly than it would if Japanese participation rates remain unchanged. If participation rates remain unchanged, the dependency burden would rise 11.7 percentage points (about 42 percent) between 2000 and 2050. However, if the trend toward earlier retirement were reversed and if female participation rates rose to levels now common elsewhere in the OECD, the dependency burden would grow only 5 percentage points (about 18 percent). These calculations imply that an increase in the Japanese labor force participation rate could substantially reduce the extra dependency burden resulting from an older population[6]. The participation-rate increases I have assumed do not seem completely implausible. They rest on the assumption that participation rates past age 60 will return to a level that was observed during the past 50 years and that female participation rates will rise to the levels now observed in France and the United States.

Conclusions

The analysis in the first part of the paper suggests that the extra burdens connected with population aging are smaller than commonly supposed. To be sure, population aging implies that the tax rate needed to support the retired elderly must rise, a fact which has been emphasized in most popular discussion. But this extra burden will be at least partly offset by a reduced need to provide support to the young, who will become less numerous relative to the active workforce than has been the case in the past. Even if adults provide only modest consumption support to the dependent young, the large drop in the youth dependency ratio implied by current birth rates will offset some of the extra burden of supporting a larger retired population. The

extra burden of an older population would be smaller still if labor force participation rates among the working-age and elderly populations can be increased.

A couple of factors may account for widespread pessimism concerning the support burdens implied by current demographic trends. First, the rich countries have already derived much of the consumption benefit to be gained from a lower youth dependency rate, but they have not yet experienced the full impact of higher old-age dependency burdens. Recent generations of active workers and retirees have enjoyed the consumption advantages associated with a rising ratio of lifetime consumption to lifetime wages, but future workers will face the inevitable unwinding of part or all of this advantage. If future wage and population growth rates are low or negative, future workers may have to transfer more to the retired elderly than they can ever expect to receive themselves as transfers in old age. Disregarding the considerable improvement in their own life span compared with that of earlier generations, future generations may consider themselves worse off than earlier generations that had the opportunity to consume more than they produced during their lifetimes.

There is a second reason for pessimism. Many analysts believe the public and private transfers needed to support an aged adult are much larger than those needed to support a dependent child. For example, Cutler et al. (1990) estimated that the medical and non-medical consumption needs of a person older than 64 are 1.76 times those of a child. Even under this assumption, however, the extra dependency burden of a larger elderly population will be substantially offset by a relatively smaller population of dependent children. Moreover, the ultimate burden of old-age support does not depend on the amount of support needed to make an aged adult as well off as a nonaged adult. It depends on the actual level of support provided to the aged. It may be the case that an aged adult requires twice as much income as a nonaged adult to satisfy the same medical and non-medical consumption needs. However, if society enforces a distributional rule that provides less pensions and health insurance than this, the retired elderly must accept a consumption allotment that does not fully satisfy their consumption needs. There is no evidence that OECD countries provide enough support to their retired elderly so that

the average income of the elderly is greater than that of nonaged adults. The best evidence is that the equivalent income of the elderly in rich societies is approximately equal to or slightly less than the income of the nonaged (Bosworth and Burtless 1998).

Even though the total dependency burden is growing less than commonly supposed, it is nonetheless rising. Since most nations can do little to boost fertility or immigration rates, they must deal with the impact of rising dependency by hiking pension contributions, reducing retirement benefits, or increasing the percentage of adults who work. From the 1940s through the 1980s, the most common response to higher old-age dependency burdens was to increase taxes. During that period national governments liberalized public retirement systems in order to increase the real value of average pensions. The explicit goal of these reforms was to improve living standards among retirees and their dependents so that they might approach the living standards enjoyed by the working-age population. By the end of the 1980s most OECD countries came close to accomplishing this goal. Poverty rates among the elderly were sharply reduced, and most wealthy countries had achieved rough parity in the disposable incomes received by their aged and non-aged populations. The equalization of incomes received by the aged and non-aged is one of the great success stories of post-war social policy. To protect this achievement, national governments increased contribution rates and subsidized public pensions with large transfers from the public budget.

Faced with looming deficits in their pension accounts in the 1990s, national governments began to scale back future benefit promises. With few exceptions, rich nations have decided to reduce future pensions in order to keep their systems affordable. If Britain, Italy, and Japan stick to the pension formulas adopted in recent years, public pensioners in 2050 will obtain a much lower wage replacement rate than the one enjoyed by pensioners who retired in 2000. There is a danger these cuts will lead to increased poverty rates among the aged and disabled. In countries where old-age poverty rates are already high, including Italy, Britain, Japan, and the United States, policymakers should be concerned that poorly structured benefit cuts will make poverty an even worse problem for the elderly.

Some governments have revised pension eligibility rules and payment formulas to encourage work in later life. Incentives for early retirement have been reduced, and disincentives that kept pensioners from holding jobs have been trimmed or eliminated. These reforms reduce the old-age dependency burden in two ways. They decrease the percentage of old people who are collecting a pension, and they increase the size of the earnings base that helps support pensions.

Policymakers in several countries show growing interest in shifting from a paygo retirement system to a partly or fully capital-funded system. This kind of reform holds promise of speeding economic growth if it lifts national saving. As we have seen, however, many plans to introduce capital funding will not generate higher saving. The main advantage of a new capital-funded system is that it may help persuade young workers to accept smaller pensions from the traditional unfunded system, thus reducing the future old-age dependency burden.

Notes

[1]The population average factor income and benefit payment are derived using age group weights that reflect the average age distribution of the four countries in 2000.

[2]These estimates reflect the unweighted average population trends in Finland, Germany, the United Kingdom, and the United States as predicted by the U.S. Census Bureau (2004).

[3]The tax burden refers to the total burden of supporting non-working dependents over the taxpayer's lifetime. Other measures of the lifetime tax burden refer only to the taxes needed to support public spending and redistribution through the government (Auerbach and Kotlikoff 1987). These measures ignore the burden imposed by within-family transfers to support non-working relatives, including children and unemployed adults.

[4]At the time this was written, President Bush had promised to propose a plan for diverting social security contributions into individual retirement accounts, but he had not yet suggested a detailed plan. Several alternative plans are described in President's Commission to Strengthen Social Security (2002).

[5]The calculation assumes that the support cost of children is 10 percent of the support cost for non-workings adults, that is, $\alpha = 0.10$.

[6]If we assume a higher value of α, say, $\alpha = 0.75$, the increase in the expected dependency burden is smaller than it is when $\alpha = 0.10$ (see Figure 3). Moreover, a rise in the Japanese labor force participation rate would eliminate an even bigger fraction of the increase than is the case when $\alpha = 0.10$.

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