

## Trends in retirement age in four countries, 1965–95

*The United States, Germany, Japan, and Sweden,  
all experienced a decline in the average age  
at which their workers retire and an increase  
in the duration of retirement*

Murray Gendell

**K**nowing the average age at retirement for a given population provides important information for administering and analyzing public and private pension programs. Yet, very little data are available on this topic. Indeed, aside from the Social Security Administration's time series of the mean age at initial award of the Social Security retirement benefit, there have been few efforts to measure the average age at retirement in the United States. Similarly, studies of retirement age trends in other countries have rarely sought to measure the average retirement age.

For this article, a cohort method of measuring the elderly's average age at exit from the labor force for specified periods has been used. The average age at exit from the labor force provides a reasonable indication of the age at which older workers retire. As such, it has provided a more precise measure of the trend in the average age at retirement in recent decades in the United States than, with the exception of the Social Security Administration's time series, has been previously available. The cohort method of measuring the average age at exit from the labor force also provides a more accurate description of the trend in the average age at retirement for women than did earlier studies, many of which relied on a cross-sectional analysis of changes in elderly women's labor force participation rates.<sup>1</sup>

Constructing a time series of the average age at exit from the labor force permits one to see not only the direction of the trend in retirement age, but also the magnitude and pace of its change. Doing so also enables one to estimate changes in

the average duration of retirement (life expectancy after exiting the labor force). The ratio of the average number of years of work (from working life tables) to the average duration of retirement has considerable relevance for financial planning in funded pension plans and systems, partly determining pension accumulation and disbursement. In pay-as-you-go systems, the support ratio (workers/pensioners) partly determines the balance between system receipts and expenditures, and the average age at exit from the labor force is a determinant of the support ratio. Thus, measuring the trend in the average age at exit from the labor force has considerable value for pension planning for individuals as well as organizations, public and private.

To be included in the study, countries had to have national household survey data on the labor force for at least the past two decades and for at least every fifth year. In addition, the data for each country had to be available for men and women separately and in 5-year age groups, with the 45-to-49-year group at the lower end, and preferably the 75-years-and-older group at the upper end. These criteria reduced the list of eligible countries considerably, but still left more than could be reasonably analyzed in this initial application of the method to international data. The analysis therefore is limited to a comparison of trends in the average age at exit from the labor force in Germany, Japan, Sweden, and the United States. These countries were chosen because some literature suggests that the average age at retirement in these countries varies considerably, with Sweden and Japan at the higher end, Germany at

Murray Gendell is senior research associate at the Center for Population Research, Georgetown University, Washington, DC.

the lower end, and the United States in the middle.

One objective of this article, then, is to look at trends in the average age at exit from the labor force for each country and determine if the results are consistent with this picture. To the extent that the cross-national data are comparable, the results would also provide more precise measures of the relative levels of the average age at exit from the labor force in these countries and the extent to which the levels have changed than are now available. Also, changes in the average duration of retirement are examined. Finally, this article attempts to assess the relative impact—if only broadly—of changes in the average age at exit from the labor force and in population aging on three measures of the elderly dependency burden: (1) number of persons aged 65 or older per 100 persons aged 15 to 64; (2) number of persons not in the labor force aged 65 or older per 100 persons in the labor force aged 15 or older (16 or older in Sweden and the United States); and (3) number of pensioners per 100 workers.

To get some idea, then, of the potential impact of these factors on the future financial status of the public pension systems in these countries, projections to the year 2030 of the dependency burden and of the balance between pension revenues and expenditures are presented. The analysis concludes with a brief description of some of the ways in which the governments of these countries are dealing with past and anticipated increases in the dependency burden, caused in part by declines in the age at which persons leave the labor force.

## Data sources and methodology

Because the analysis focuses on changes in the average age at retirement and at exit from the labor force in different countries, ideally the data used would be completely comparable. Unfortunately, that is rarely achieved. But by using only labor force data from household surveys conducted by the national governments of the respective countries, reasonable comparability has been achieved.<sup>2</sup>

Sample survey data rather than census data were used because they are available in 5-year intervals, are more comparable, and, in some cases, are superior in quality.<sup>3</sup> The data for Japan, Sweden, and the United States are annual averages derived from monthly or quarterly (in the early years in Sweden) data. The data from Germany are collected in a “microcensus” conducted during a single month each year (usually April or May) and thus are not annual averages.<sup>4</sup>

U.S. data are available in 5-year intervals, from age 45 to 75 and older. For Japan, data are available up to age 65 and older prior to 1975, and up to age 70 and older since. Census data were used to calculate the labor force estimates for the age intervals that were not available from sample data. For Sweden, where the upper age interval is 70 to 74, a similar technique was used.<sup>5</sup> The terminal age in Germany is 75 or older.

The method of measuring the average age at exit from the labor force requires the estimation of the age-specific number of net exits, as given by the equation

$$E = L1(1 - r2/r1)Ös, \quad (1)$$

where

$E$  is the estimate of the average annual number of net exits (or withdrawals) within a cohort during a particular period (5 years in this case),

$L1$  is the number in the labor force at the beginning of the interval,

$r2$  is the labor force participation rate for the same cohort at the end of the interval,

$r1$  is the labor force participation rate for a given age group at the beginning of the interval, and

$s$  is the 5-year survival rate for the cohort during the interval.

Previous studies have used a similar cohort method to study labor force changes. In his analysis of the 1963–83 period, Philip L. Ronces presented data for the United States in single years of age on the relative change each year in the cohort labor force participation rate  $(1 - r2/r1)$  of elderly men.<sup>6</sup> The Organization for Economic Cooperation and Development (OECD) calculated “net withdrawal rates”  $[(r1 - r2)/r1]$ , equivalent to  $1 - r2/r1$  for the 55-to-59-year-old cohort becoming 60 to 64 years old (in some cases, also the 50-to-54-year group becoming 55 to 59 years old) in many countries during the 1970s and 1980s.<sup>7</sup> In addition, Albert I. Hermalin and Bruce A. Christenson described essentially the same method for calculating “net transition rates,” using data from Thailand for the 1960s and 1970s.<sup>8</sup> None of these studies, however, attempted to use their measures to calculate the average age at exit from the labor force.

Equation (1) provides the estimated average annual number of net exits during each 5-year interval for each of six cohorts, aged 45 to 49 through 70 to 74 at the beginning of the interval, and aged 50 to 54 through 75 to 79 (proxied by data for those 75 and older) at the end of the interval. An interpolation procedure is needed to convert these estimates for the cohorts (45- to 49-year-olds becoming 50- to 54-year-olds, 50- to 54-year-olds becoming 55- to 59-year-olds, and so on) to estimates for age groups (50- to 54-year-olds, 55- to 59-year-olds, and so on).<sup>9</sup> The mean and median ages at labor force exit were calculated from the estimated numbers of net withdrawals in the six 5-year age groups, aged 50 to 79.

Another issue is whether to exclude the elderly unemployed from the labor force data—calculating the withdrawal rates for the elderly employed only, as the OECD has done.<sup>10</sup> The elderly unemployed usually find it difficult to find a job and often become discouraged and stop looking for work. The availability of alternative means of support also often facili-

tates their exit from the labor force. Nevertheless, in some countries “a substantial share of older job losers continue to search for work.”<sup>11</sup> It may be helpful, therefore, to calculate the average age at exit from the labor force on the basis of both the total labor force and the total employed.<sup>12</sup>

## Study results

*Average age at exit from the labor force.* Both the mean and median age at labor force exit have been calculated. Declines in the average age at exit from the labor force occurred among both women and men in each country. (See table 1.) However, the magnitude of the declines varied. Among men, the highest mean age in the late 1960s was in Japan, close to 67. In Sweden, the mean was about a year younger, and in Germany, the figure was about 65. The United States had the lowest mean age, at 64. The range of variation among the countries was 2.5 years.

By the early 1990s, the range had nearly doubled to almost 5 years because of the large decline in the mean age in Germany (more than 4 years) and the small drop in Japan (1.4 years). The large fall in Germany brought that country’s mean down to a little more than 60 years, about 2 years lower than in Sweden and the United States. In a recent study, Winfried Schmähl and others found that the average age at labor force exit in Germany in the early 1990s was below 60.<sup>13</sup> In an earlier study, Hans-Jurgen Krupp stated that it was below 59 for men in 1986.<sup>14</sup> Neither study said how much below, nor how the average was calculated.

Such figures are consistent with the indication in the OECD data that the employment-based average was lower in Germany in the 1980s than was the labor-force-based average. The indication is that for the cohort made up of 50- to 54-year-olds aging to 55 to 59 years during the 1980s (when unemployment was higher than in the 1970s), the OECD’s employment-based net withdrawal rates are much higher than the labor-force-based net withdrawal rates used here.

Agneta Kruse noted that in Sweden, “even though the legally-fixed retirement age is 65 years, the disability pension and partial pension are used to such an extent that the pension age is *de facto* about 62 years.”<sup>15</sup> The average age at exit from the labor force, whether the mean or the median, was nearly the same until the 1990s, whether it was based on labor force participation rates or employment rates.<sup>16</sup>

In the early 1990s, Sweden’s perennially low level of unemployment shot up to levels not seen since the 1930s, and the employment-based average age at exit from the labor force became 0.8 year lower than that based on the labor force participation rates among men, and 0.5 year lower among women. As a result, the labor-force-based averages for the early 1990s ranged from 62.0 to 62.4, while the employment-based averages ranged from 61.2 to 61.9.

**Table 1.** Trends in the mean, median, and first quartile age at labor force exit of elderly men and women in Germany, Japan, Sweden, and the United States, 1965–70 to 1990–95

Year	Germany	Japan	Sweden	United States
Mean age				
Men:				
1965–70 .....	64.7	66.6	65.7	64.1
1970–75 .....	64.1	66.3	64.9	63.4
1975–80 .....	62.8	65.8	64.3	63.0
1980–85 .....	60.6	64.7	63.7	62.9
1985–90 .....	60.5	64.8	63.5	62.7
1990–95 .....	60.3	65.2	62.0	62.2
1990–95 minus 1965–70 .....	-4.4	-1.4	-3.7	-1.9
Women:				
1965–70 .....	63.0	63.8	65.5	65.3
1970–75 .....	62.8	62.5	65.0	63.1
1975–80 .....	61.2	62.9	63.7	63.5
1980–85 .....	60.3	62.4	62.8	62.9
1985–90 .....	60.9	63.1	62.8	63.1
1990–95 .....	59.9	62.9	62.0	62.7
1990–95 minus 1965–70 .....	-3.1	-9	-3.5	-2.6
Median age				
Men:				
1965–70 .....	64.7	67.1	65.9	64.2
1970–75 .....	64.0	66.6	65.1	63.4
1975–80 .....	63.0	66.0	64.3	63.0
1980–85 .....	60.5	64.5	63.7	62.8
1985–90 .....	60.5	64.1	63.4	62.6
1990–95 .....	60.4	64.5	62.3	62.1
1990–95 minus 1965–70 .....	-4.3	-2.6	-3.6	-2.1
Women:				
1965–70 .....	62.6	63.8	65.0	64.5
1970–75 .....	62.5	62.2	64.5	62.9
1975–80 .....	60.9	62.7	63.5	63.2
1980–85 .....	59.9	61.9	62.9	62.7
1985–90 .....	60.6	62.5	63.0	62.8
1990–95 .....	59.7	62.4	62.4	62.6
1990–95 minus 1965–70 .....	-2.9	-1.4	-2.6	-1.9
First quartile age				
Men:				
1965–70 .....	61.5	62.1	62.0	60.5
1970–75 .....	60.9	61.5	61.7	59.6
1975–80 .....	59.6	61.1	61.2	59.1
1980–85 .....	57.1	59.7	60.9	58.9
1985–90 .....	57.2	60.1	60.7	58.8
1990–95 .....	56.9	60.8	58.5	57.8
1990–95 minus 1965–70 .....	-4.6	-1.3	-3.5	-2.7
Women:				
1965–70 .....	58.9	58.0	61.6	61.4
1970–75 .....	58.9	56.5	61.7	59.0
1975–80 .....	56.9	57.3	60.8	59.8
1980–85 .....	56.9	56.8	60.2	58.7
1985–90 .....	57.6	57.5	60.4	59.2
1990–95 .....	56.7	57.3	58.8	58.2
(1990–95) minus (1965–70) .....	-2.2	-.7	-2.8	-3.2

<sup>1</sup> Includes the net accessions to the labor force at age 50–54. If these are excluded, the median is 64.2. See Murray Gendell and Jacob S. Siegel, “Trends in retirement age by sex, 1955–2005,” *Monthly Labor Review*, July 1992, for additional information.

SOURCE: Calculated by author. See text for method.

In the late 1960s, the range of variation among women was the same as among men, 2.5 years. The highest levels were in Sweden (65.5) and the United States (65.3), not Japan (63.8). German women had the lowest level then (63.0 years) and in the early 1990s (59.9 years). This decline of 3.1 years nearly matched the drop of 3.5 years in Sweden. In the United States, the fall was about a year less than in Sweden. The mean age fell the least in Japan, not quite a year. The widespread practice in Japan of the reemployment of those who retire from their career jobs is "one of the reasons for the remarkably high participation rate of older workers at present."<sup>17</sup>

Among men, the median and mean ages of labor force exit were about the same in all countries except Japan. (See table 1.) The decline in the median in Japan (2.6 years) was nearly twice that of the country's mean (1.4 years) because the median was greater than the mean in the late 1960s, but smaller than the mean in the early 1990s. The age distribution of the exits was skewed to the left at first, but by the 1980s, it had gradually become skewed to the right.<sup>18</sup>

Among women, the medians and means were about the same with few exceptions. In Japan, the age distribution of the exits displayed no skewing in the late 1960s, indicating that the mean and median were the same. By the early 1990s, however, the distribution had slowly become skewed to the right, and the mean was 0.5 year greater than the median, accounting for all of the difference between the two averages in the size of the decline (0.9 year for the mean and 1.4 years for the median).

Among Swedish women, however, the initial right skewing gradually diminished and the distribution became skewed to the left by the late 1980s and early 1990s. As a result, the drop in the mean (3.5 years) was substantially greater than the drop in the median (2.6 years). As for women in the United States, the greater decline of the mean (2.6 years) than of the median (1.9) is completely attributable to the large difference (0.8 year) between the two averages in the late 1960s.

*Timing and pace of change.* Virtually all of the decline in the average age at retirement in Germany occurred by the early 1980s. Most of the change occurred in the 10-year period between the early 1970s and the early 1980s. Among Japanese men, there appears to have been a drop in both mean and median averages until the 1980s, followed by a reversal in the early 1990s. Most of the drop occurred between the early 1970s and the early 1980s.

Among Japanese women, a fairly large drop in mean and median averages occurred between the late 1960s and early 1970s, but the averages have remained essentially flat since. Means calculated from Japanese census data are similar to the survey means throughout the time series for women, but for men the means deviate considerably at times.

The census data indicate a decline of 2.7 years in the mean

among Japanese women between 1960–65 and 1965–70. With a further drop of 1.3 years over the next 5-year period, these data suggest a very large fall in the mean of about 4 years between the early 1960s and the early 1970s, followed by essentially no change thereafter. Such an apparently large and abrupt decline during the 1960s needs to be supported by more evidence before it can be accepted. It does, however, indicate the potential value of a longer time series than is presented in this study.

The longer time series available for U.S. data underscores the value of knowing what happened prior to the late 1960s. Since the early 1950s, most of the drop in the median age (from about age 67) in the United States among both women and men took place in the 1950s and 1960s.<sup>19</sup> In the series presented in this study, there was a sharp drop in both mean and median averages among American women between the late 1960s and early 1970s, followed by little change since.

Among men in the United States, there has been a fairly steady fall in the mean and median averages. To what extent was the apparent drop among men (0.5) and women (0.4) between 1985–90 and 1990–95 affected by a major change in 1994 in the Current Population Survey questionnaire and collection procedure? The indications are that the changes in the mean and median age at exit from the labor force may have modestly raised the labor force participation rates of elderly men and women in 1994, and presumably in 1995 as well.<sup>20</sup> This would tend to reduce cohort percent declines and hence the number of estimated exits. Depending on the age distribution of the reduced estimates of exits, the effect of the change could have raised or lowered the average age at exit.

Without more age-specific estimates of the impact of the 1994 changes on the elderly's labor force status than are presently available, it is not possible to determine the direction of the effect. If the changes raised the average age at exit from the labor force, then the observed decline underestimates the actual decline. This would mean that the leveling off of the long-run decline that took place during the 1980s was only temporary and that the decline had resumed, and had markedly done so.

If, however, the changes lowered the average age at exit, then the real decline would have been small or nil, and the leveling trend of the 1980s would have essentially continued through the first half of the 1990s. In any case, despite assertions that the long-run decline has begun to turn around, these data do not show any sign of a reversal.

The Swedish data indicate a fairly continuous decline in the mean and median ages at retirement among both men and women since the late 1960s. (The official retirement age was lowered in 1976 from 67 to 65, but the labor force participation rates of men had begun falling prior to that date.<sup>21</sup>) As noted above, the early 1990s was an extremely difficult period for the Swedish economy, with unemployment reaching extraordinary levels. It is not surprising, therefore, that exit rates rose sharply during the early 1990s among men who were under age 60 in 1990.

The increases in the exit rates among the women of that age were not as great as for men. The mean age at exit among men dropped by 1.5 years between the late 1980s and early 1990s, somewhat less according to the median (1.1 years). The fall in both averages among women during the same period was only half as large. Yet these recent declines do not account for most of the drop in the average age at labor force exit since the late 1960s. The decline was under way by 1970. A longer time series might reveal even earlier declines.

Data on the first quartile age show how young a large proportion of workers have been when they withdrew from the labor force. (See table 1.) Even in the late 1960s, one-quarter of working men and women are estimated to have stopped working as early as age 58 (Japanese women) and no later than age 62 (men in Japan and Sweden). By the early 1990s, the range had fallen to about 57 to 59 years, except among Japanese men (about 61 years). It appears that there was a drop in the first quartile age of Japanese men to a low of 59.7 years in 1980–85, but a reversal in the following periods raised this figure by more than a year.<sup>22</sup>

Furthermore, except in Japan, there were significant increases in the percentage exiting the labor force at age 50–54. (See table 2.) Except for women in Japan and men in the United States, less than 5 percent exited at this age in the late 1960s. By the early 1990s, 9 to 14 percent of all exits were at age 50–54, except for men in Japan, where the proportion was close to zero (0.5 percent). There also were generally substantial declines between the late 1960s and early 1990s in the percent of exits at age 70 and older.

*The duration of retirement.* As measured by life expectancy at the average age of labor force withdrawal, the average duration of retirement increased substantially in all four coun-

tries over the 25-year period from 1965–70 to 1990–95. (See table 3.) The absolute, but not relative, gains were greater for women than for men, roughly 5–7 years versus 4–6 years.

The largest increase over the period took place in Japan, while the smallest took place in the United States. With gains of 6.5 or 6.9 years (depending on whether the mean or median is the measure of the average age at retirement), the duration of retirement (life expectancy after retiring from the labor force) of Japanese women increased by more than 40 percent. The number of years added to the retirement period of Japanese men was between 1.0 and 1.5 years less than that of their female counterparts, but because their retirements were much shorter than women's as of the late 1960s, their gain was proportionately greater (about 50 percent).

The changes in Germany were similar to those in Japan. Men had somewhat smaller (though still substantial) absolute gains than did women (5.3 years versus 5.6 years). Nevertheless, the increases in the duration of men's retirements were relatively greater (43 percent versus about 34 percent). By the early 1990s, the average length of retirement in all four countries varied little. Among men, the range was 16.2 to 17.8 years, and among women, it was 21.1 to 22.6 years. These figures suggest that the ratio of work years to years in retirement is approaching 2 to 1 in these countries.

As noted earlier, most of the decline in the median age at labor force exit in the United States since the 1950s occurred by the late 1960s. As a result, the duration of men's retirement increased from 12.0 years in 1950–55 to 17.4 years in 1990–95. This gain of 5.4 years expanded men's retirement by 45 percent. The comparable change for women was from 13.6 years to 21.1 years, a rise of 55 percent. Thus, over the 40-year period since the early 1950s, the duration of retirement grew in the United States by about 50 percent. Yet, in the 25 years since the late 1960s, the proportional increase in duration in Japan and Germany (for men) was nearly as great.

The gain in retirement years is, of course, the result of both the drop in the average age at retirement and the rise in longevity. The increase in life expectancy at age 65 between 1965–70 and 1990–95 is useful in determining the relative influence of these two factors. (See table 4.) When compared with the data on the decline in the mean age at exit, it is clear that earlier retirement accounted for most of the increase in the duration of retirement among German and Swedish men. The reverse is true for men and more so for women in Japan, where the gain in longevity was the major contributor.

For the remaining populations—women in Germany and Sweden and both men and women in the United States—a closer balance exists than in the other populations. A more careful calculation than that presented here is needed to judge which factor was more influential. Even so, there would still be less difference between the two factors in the extent of their influences than in the four populations described above,

**Table 2.** Percent of labor force exits of men and women aged 50–54 and 70 or older in Germany, Japan, Sweden, and the United States, 1965–70 and 1990–95

[In percent]

Age and year	Germany		Japan		Sweden		United States	
	Men	Women	Men	Women	Men	Women	Men	Women
<b>Aged 50–54 years:</b>								
1965–70 ...	3.1	5.2	4.4	12.3	4.2	<sup>1</sup> -3.9	7.1	<sup>1</sup> -4.3
1990–95 ...	10.9	11.6	.5	14.1	10.5	9.3	11.9	11.1
<b>Aged 70 or older:</b>								
1965–70 ...	11.5	11.2	32.9	22.7	20.9	17.4	13.9	15.7
1990–95 ...	1.0	2.1	21.7	18.5	2.6	.5	8.8	12.8

<sup>1</sup>The negative sign means net *accessions* rather than net exits.

SOURCE: Calculated by author. See text for method.

**Table 3.** Years of life expectancy at the average age at labor force exit of elderly men and women in Germany, Japan, Sweden, and the United States, 1965–70 to 1990–95

Characteristic	Germany		Japan		Sweden		United States	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
<b>Men:</b>								
1990–95 .....	17.6	17.5	16.2	16.8	17.8	17.6	17.4	17.4
1965–70 .....	12.3	12.3	11.2	10.9	13.5	13.4	13.5	13.5
<b>Change:</b>								
Years .....	5.3	5.2	5.0	5.8	4.3	4.2	3.9	3.9
Percent .....	43.1	42.3	44.6	53.2	31.9	31.3	28.9	28.9
<b>Women:</b>								
1990–95 .....	22.2	22.4	22.2	22.6	21.8	21.5	21.0	21.1
1965–70 .....	16.5	16.9	15.7	15.7	16.0	16.4	16.2	16.8
<b>Change:</b>								
Years .....	5.7	5.5	6.5	6.9	5.8	5.1	4.8	4.3
Percent .....	34.5	32.5	41.9	44.1	36.3	31.1	29.6	25.6

SOURCE: Official life tables for Germany—1966–68 and 1991–93; Japan—April 1967–March 1968 and April 1991–March 1992; Sweden—1966–70 and 1990–94; and United States—1967 and 1972.

**Table 4.** Life expectancy at age 65 and proportions of men and women in Germany, Japan, Sweden, and the United States surviving to age 65

Characteristic	Germany		Japan		Sweden		United States	
	Men	Women	Men	Women	Men	Women	Men	Women
<b>Years of life expectancy at age 65:</b>								
1990–95 .....	14.3	18.0	16.4	20.4	15.6	19.3	15.4	19.2
1965–70 .....	12.1	15.0	12.2	14.8	14.0	16.4	13.0	16.4
<b>Change:</b>								
Years .....	2.2	3.0	4.2	5.6	1.6	2.9	2.4	2.8
Percent .....	18.2	20.0	34.4	37.8	11.4	17.7	18.5	17.1
<b>Proportion surviving:</b>								
1990–95 .....	.760	.879	.829	.914	.824	.897	.748	.855
1965–70 .....	.681	.813	.711	.814	.768	.857	.641	.795
Change in proportion ...	.079	.066	.118	.100	.056	.040	.107	.060

SOURCE: Official life tables for Germany—1966–68 and 1991–93; Japan—April 1967–March 1968 and April 1991–March 1992; Sweden—1966–70 and 1990–94; and United States—1967 and 1992.

in which it is clear which factor dominates.<sup>23</sup>

The changes in the proportion of the population surviving to age 65 illustrate how declining mortality rates not only increase the duration of retirement, but also enhance the proportion of the population that reaches retirement age. (See table 4.) As the data reveal, gains ranged from 4 percentage points to nearly 12 percentage points. By the early 1990s, in all four countries, according to period-life tables, no less than 75 percent and as many as 91 percent of the births survived to age 65. The gains undoubtedly will continue, but the extent and pace of the increases are uncertain.

#### What the data mean

Has the variation in the average age at retirement (as mea-

sured by the average age at exit from the labor force) been about what was expected, with Japan and Sweden at the upper end, Germany at the lower end, and the United States in the middle? It is likely that the indications of such a variation in the literature were based on trends in men's labor force participation rates. The findings for men are fairly consistent with this picture, except that the considerable decline among Swedish men left them in the intermediate position (along with men in the United States) by the 1980s and 1990s. Also, the average age at retirement of German men was not at the lowest level until the early 1980s.

The relative standings were different for women. In the late 1960s, the average age at retirement was around 65 in Sweden and the United States, but between 63 and 64 in Germany and Japan. The sharp drop in the average age at retirement in

Germany during the 1970s and the early 1980s, which affected women as well as men, brought the average age at retirement of German women down to about 60, where it remained thereafter. This level has been substantially below the level of 62 to 63 of the women in the other three countries, where it has been since the early 1980s.

From the late 1960s to the early 1990s, the average duration of retirement increased considerably—somewhat more for women than for men. Japan and Germany had the largest increases, while the smallest was in the United States. In four of these eight populations (women and men from each of the four countries), it was quite clear which of the two contributing factors was the major determinant. Among women and men in Japan, it was the rise in longevity; among men in Germany and Sweden, it was the drop in the average age at retirement. In the other four cases, the balance of influence was more evenly divided.

*The elderly dependency burden.* What impact have these changes had on the elderly dependency burden in the recent past? In the advanced industrial countries, the ratio of retirees to those working has risen, reducing the balance of the income and outgo of public pension systems. Most of these systems are of the pay-as-you-go type.<sup>24</sup> In a pay-as-you-go scheme,

$$cwe = bp, \tag{2}$$

where

- c* = the contribution rate,
- w* = the average wage,
- e* = the number employed,
- b* = the average pension benefit, and
- p* = the number of pensioners.

Equation (2) can also be written as

$$p/e = cw/b. \tag{3}$$

Thus, as the system dependency ratio (*p/e*) rises, in order to maintain the equilibrium of the system, the right side of the equation has to increase correspondingly. One way that can happen is for the average wage to rise. If a rise does not occur or is insufficient, then the contribution rate has to rise or the average benefit has to fall (or both) enough to balance the increase in the dependency ratio.

Declines in the average age at retirement tend to raise the system dependency ratio by increasing the number of pensioners and reducing the number of workers. (Actually, the extent to which nonworkers are pensioners and pensioners are nonworkers varies from country to country, but the relationship generally holds.) The aging of a population, because of declines in fertility and mortality, also tends to raise the system dependency ratio. A common indicator of population aging is the change in the proportion of elderly in the population.

If we add the data on population aging in recent decades in

these four countries to what the findings are regarding the decline in the average age at retirement and the increase in the elderly's longevity, we can broadly characterize the changes in these three factors as follows:

	<i>Germany</i>	<i>Japan</i>	<i>Sweden</i>	<i>United States</i>
Decline in average age at retirement (late 1960s-early 1990s) .....	Very large	Small	Modest to large	Small to modest
Increase in life expectancy at age 65 (late 1960s-early 1990s) .....	Modest	Very large	Small to modest	Modest
Increase in percent 65 or older (1960-90) .....	Modest	Very large	Modest to large	Modest

This suggests that between the 1960s and the 1990s, the elderly dependency burden rose least in the United States and the most in Japan, with Germany and Sweden in between. This is confirmed by the data in table 5, which are based on two measures of the elderly dependency burden. One measure (elderly dependency burden-1) is based simply on changes in the age structure, and is considered a crude measure.<sup>25</sup> The other measure (dependency burden-2) seeks to provide a more refined characterization of the burden of supporting the elderly who are economically inactive. Interestingly, it provides essentially the same picture of change in the elderly dependency burden in Germany and the United States as the cruder measure. For Japan, however, the more refined measure indicates a considerably larger increase in the elderly dependency burden than does the cruder measure. Unfortunately, the lack of a refined measure for Sweden as of the 1960s obviates a comparison of the rate of change in the two measures for that country.

What is expected in the future? It is virtually certain that these populations will continue to age (even if the extent and pace of change is uncertain), in part because of increases in longevity. Because so few studies measure and track the average age at retirement, no projections are available. Even without such data, the widespread expectation of continued increases in the elderly dependency burden has led the major international agencies, such as the International Monetary Fund, OECD, and World Bank, to build models to project the impact of the anticipated changes in the relevant demographic and economic factors.<sup>26</sup> Some of the results of a recent International Monetary Fund projection are discussed below.

In table 6, one of the two measures (dependency burden-1) is defined the same as in table 5. The definition of the other

measure, dependency burden-3, is different from that of dependency burden-2. Sufficiently detailed information is not provided in the source to clearly ascertain the difference between the two measures. The denominators of the two measures are similar (roughly, the number of workers); the numerators, however, differ in that dependency burden-2 uses the number of persons aged 65 years and older who are not in the labor force, while dependency burden-3 uses the number of "pensioners."

For a variety of reasons—including, for example, that many people draw pensions before reaching age 65, and that some pensioners remain in the labor force—the numerator can be greater in dependency burden-3 than in dependency burden-2, as is seen by comparing the two measures. This is especially true in Japan, even when allowing for the possibility of increases in dependency burden-2 between 1990 and 1995.<sup>27</sup>

The difference between the two measures in table 6 is that dependency burden-1 is an indicator of the *potential* elderly de-

pendency burden in a population, whereas dependency burden-3 is a measure of the *actual* pension system dependency ratio. For reasons similar to those stated above, dependency burden-3 is greater than dependency burden-1 in all four countries. However, our interest here is in the anticipated rate of change of the elderly dependency burden, rather than in its level. In that respect, the two measures correspond closely for Sweden and the United States, but not for Japan. For Germany, the two measures are projected to change at the same rate between 2010 and 2030, but at a different rate between 1995 and 2010. (See table 6.)

The 1995–2030 period divides roughly into two halves. Both measures show slower growth in the first half, except in Japan, where the anticipated pace of change is swifter prior to 2010 than after. Very little growth in the elderly dependency burden is projected between 1995 and 2010 in Sweden and the United States, providing a period in which to prepare for the large growth projected to occur later. The projected growth will be especially strong in the United States when the baby-boomers retire.

**Table 5.** Change in two measures of the elderly dependency burden in Germany, Japan, Sweden, and the United States, 1960 and 1990

Year	Germany		Japan		Sweden		United States	
	Dependency burden-1 <sup>1</sup>	Dependency burden-2 <sup>2</sup>	Dependency burden-1 <sup>1</sup>	Dependency burden-2 <sup>2</sup>	Dependency burden-1 <sup>1</sup>	Dependency burden-2 <sup>2</sup>	Dependency burden-1 <sup>1</sup>	Dependency burden-2 <sup>2</sup>
1960 .....	16.0	<sup>3</sup> 22.8	9.5	7.3	17.8	–	15.4	17.4
1990 .....	21.7	<sup>3</sup> 31.3	17.1	17.5	27.6	<sup>4</sup> 37.0	19.1	<sup>5</sup> 21.9
Ratio: 1990/1960 .....	1.36	1.37	1.80	2.40	1.55	–	1.24	1.26

<sup>1</sup> Number of persons aged 65 or older per 100 persons aged 15–64.

<sup>2</sup> Number of persons *not in* the labor force aged 65 or older per 100 persons *in* the labor force aged 15 or older (16 or older in Sweden and the United States).

<sup>3</sup> Data are for 1962 and 1992. The 1992 figure was obtained by linear interpolation between the 1990 and 1995 microcensus data.

<sup>4</sup> The ratio of retired pensioners to the labor force in 1985.

<sup>5</sup> Estimated by linear interpolation between 1985 and 1995.

NOTE: Dash indicates data not available.

SOURCE: Data for dependency burden-1 are from *Aging in OECD Countries* (Paris, Organization for Economic Cooperation and Development, 1996), p.102. Dependency burden-2 data for Germany and Japan are from government reports on sample survey data on the labor force; data for Sweden are from Agneta Kruse, "An Aging Population, Public Expenditure and the Pension System in Sweden," in Christer Lundh, ed., *Demography, Economy, and Welfare* (Lund, Lund University Press, 1995), table 8; and data for the United States are from Jacob S. Siegel, *A Generation of Change: A Profile of America's Older Population* (New York, Russell Sage Foundation, 1993), table 7.23.

**Table 6.** Projected trends in two measures of the elderly dependency burden in Germany, Japan, Sweden, and the United States 1995–2030

Year	Germany		Japan		Sweden		United States	
	Dependency burden-1 <sup>1</sup>	Dependency burden-3 <sup>2</sup>	Dependency burden-1 <sup>1</sup>	Dependency burden-3 <sup>2</sup>	Dependency burden-1 <sup>1</sup>	Dependency burden-3 <sup>2</sup>	Dependency burden-1 <sup>1</sup>	Dependency burden-3 <sup>2</sup>
1995 .....	22.3	43.5	20.3	38.5	27.4	38.5	19.2	23.8
2010 .....	30.3	50.0	33.0	47.6	29.1	40.0	20.4	24.4
2030 .....	49.2	83.3	44.5	55.6	39.4	55.6	36.8	40.0
Ratio: 2010/1995 .....	1.36	1.15	1.63	1.24	1.06	1.04	1.06	1.03
Ratio: 2030/2010 .....	1.62	1.67	1.35	1.17	1.35	1.39	1.80	1.64

<sup>1</sup> Number of persons aged 65 or older for every 100 persons aged 15–64.

<sup>2</sup> Number of pension beneficiaries per 100 pension contributors. The reciprocal of this ratio is reported in Sheetal Chand and Albert Jaeger, *Aging*

*Populations and Public Pension Schemes* (Washington, International Monetary Fund, 1996).

SOURCE: Chand and Jaeger, *Aging Populations and Public Pension Schemes*, tables 1 and 6.



The elderly dependency burden is also projected to accelerate sharply in Germany in the second half, following a significant rise in the first half. Japan's pension system dependency burden is anticipated to increase by 24 percent by 2010, and by about 17 percent thereafter. These projections suggest that Japan faces a greater challenge in the next 10 to 15 years than subsequently, whereas in the other three countries, the greater challenges are in the period following 2010.

The pace of anticipated change in the elderly dependency burden in these four countries is consistent with the projection of the balance between pension revenue and expenditures. (See table 7.) The range in the contribution rates as of 1995 is large, with Germany at the high end (22.8 percent) and Japan at the low end (5.6 percent). The United States, with a rate of 9.7 percent, is closer to Sweden (12.3 percent) than to Japan, but far below Germany.

Despite Germany's high contribution rate, the projection indicates a sharp rise after 2010 in the share of gross domestic product devoted to pension expenditures. As a result, the previously small negative balance will increase more than tenfold. As for Sweden and the United States, the share of gross domestic product taken by pension expenditures is projected to fall slightly until 2010 and then rise, with the balances remaining positive until after 2010. Even by 2030, however, the negative balances in these two countries are anticipated to be much smaller than those in Japan and Germany.

*Responses to the dependency burden.* In the past, efforts to encourage early retirement and lower the average age at retirement often were undertaken to lower the unemployment rates. Countries facing expected increases in their dependency burden, however, may be reluctant to adopt policies aimed at raising the average age at retirement due to high levels of unemployment. Has this happened in recent years in Sweden and Germany, where unemployment levels have been high? Apparently not in Sweden, but there appears to have been an effect in Germany, at least to some extent.

In Sweden, legislation enacted during the early 1990s has modified the pension system with a view toward encouraging workers to retire later. The pension payment, for example, will be lower than in the past for workers who retire at age 65, but the pension replacement rate will remain unchanged for those retiring at age 67. Also, the earliest age of eligibility for an age-based pension has been increased from 60 to 61. Eskil Wadensjö provides a description of these and other changes, which he judges "will doubtless act as incentives for people to retire later." He also points out that "other changes will doubtless be introduced over the next few years since several government committees are currently working in the area of social insurance and labour market legislation."<sup>28</sup>

In Germany, efforts have been made to raise the average age at retirement, in light of the growing recognition that early

**Table 7.** Projections of pension expenditures and balance of public pension funds for Germany, Japan, Sweden, and the United States, 1995–2030

[In percent of gross domestic product]				
Country	1995	2000	2010	2030
<b>Germany:</b>				
Expenditures .....	10.0	11.1	11.0	18.4
Balance of revenue and expenditures .....	.2	–.9	–1.3	–14.9
<b>Japan:</b>				
Expenditures .....	5.7	6.5	7.5	8.9
Balance of revenue and expenditures .....	1.1	–.4	–4.1	–10.9
<b>Sweden:</b>				
Expenditures .....	8.5	8.2	8.1	9.2
Balance of revenue and expenditures .....	1.3	.4	.2	–3.0
<b>United States:</b>				
Expenditures .....	4.4	4.3	4.2	7.4
Balance of revenue and expenditures .....	.8	1.1	1.7	–2.2

NOTE: These projections assume that contribution rates (as a percent of wages) as of 1995 remain constant. These rates are: Germany—22.8; Japan—5.6; Sweden—12.3; and United States—9.7.

SOURCE: Sheetal Chand and Albert Jaeger, *Aging Populations and Public Pension Schemes*, tables 6 and 7.

exit from the labor force raises labor costs (via increases in contribution rates) and jeopardizes the viability of the pension system, and that a labor shortage may develop.<sup>29</sup> Partial pensions, for example, were legislated in 1992 in the hope that, with the earnings from a part-time job, workers would be willing to stay in the labor force longer than they had been. So far, however, little use has been made of this option because of a broad consensus that the early exit of the elderly was better than the unemployment of the young. In addition, a strong preference for early retirement had developed by then.<sup>30</sup>

Nevertheless, these authors contend that although gradual retirement generally has not been accepted up to now, "the indications are . . . that the situation is about to change."<sup>31</sup> Also, the age at which a full pension is provided will gradually rise to 65 between 2001 and 2012. Early retirement will still be an option, but no earlier than at age 62. The only persons who will be able to stop working at age 60 are the disabled. However, the reduction in the pension payment for retiring before 65 is only 0.3 percent per month, well below the actuarially fair amount. Hence, this disincentive to early retirement is weak.<sup>32</sup>

In Japan, the growth rate of the labor force dropped sharply between the 1980s and 1990s, resulting in a labor shortage. The rate is expected to continue falling during the first decade of the next century, with labor force growth eventually even becoming negative.<sup>33</sup> The shortage has occurred despite the efforts of the government and business to increase the supply

of labor (along with demand-reducing measures), including efforts to keep the elderly in the labor force. The government has provided subsidies to firms, for example, to encourage them to employ and retain elderly employees. Also, legislation enacted in 1994 will gradually raise the age at which Japanese workers will receive full basic pension benefits from 60 to 65 over the 2001–2013 period.<sup>34</sup>

John G. Bauer concluded “that the recent trend toward later retirement [as judged from the upturn in the labor force participation rates of the elderly in the late 1980s and early 1990s] is a response to labor scarcity and increasing life expectancy, and I expect the trend to continue.”<sup>35</sup> Noriyuki Takayama, however, after presenting a detailed description of recent legislation aimed at raising Japan’s average age at retirement, says that careful analysis of its implications belies the initial impression of its effectiveness.<sup>36</sup> Moreover, despite the decline in the growth rate of the labor force, unemployment has risen considerably during the recession of 1998. If economic conditions do not improve appreciably, the desire to keep the elderly in the labor force may weaken.

In the United States, the main features of the 1983 amendments concerning Social Security retirement benefits will begin going into effect in a few years. Economists who have

estimated the effect of these amendments’ incentives for delayed retirement and disincentives for early retirement have concluded that little will change. However, the potential impact of these incentives and disincentives on the pension plans of employers is unclear.<sup>37</sup> “. . . [I]f the pension plan provisions were changed to correspond to the Social Security changes, the effect would be very large.” In addition, “although not contemplated by current legislation, an increase in the Social Security early retirement age clearly would have a substantial effect on the early retirement rates of a large number of employees not covered by a pension plan.”<sup>38</sup>

Whatever course the trend in average age at retirement may follow in the years ahead, the data suggest that the United States may be in the best position of the four countries to prepare for the projected future increases in its system dependency ratio. Its elderly dependency burden is currently lighter than that of the other countries. That burden is anticipated to rise very little in the next 10 to 15 years. A substantially smaller percentage of its gross domestic product is now allocated to public pension expenditures, compared with the other countries, and that difference is projected to continue. Finally, the U.S. economy has been more vigorous in recent years than the economies of the other countries. □

## Footnotes

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<sup>1</sup> See Murray Gendell and Jacob S. Siegel, “Trends in retirement age by sex, 1950–2005,” *Monthly Labor Review*, July 1992, pp. 22–29; and Murray Gendell and Jacob S. Siegel, “Trends in Retirement Age in the United States, 1955–1993, by Sex and Race,” *Journal of Gerontology: Social Sciences*, May 1996, pp. S132–S139.

<sup>2</sup> In its international comparisons, the Bureau of Labor Statistics (BLS) publishes comparable data on many standard labor force measures for each of the countries in this study, as well as several others. For these comparisons, adjustments are made to each country’s published data to provide measures approximately consistent with U.S. definitions and standards. See *BLS Handbook of Methods*, Bulletin 2490 (Bureau of Labor Statistics, April 1997), pp. 111–21.

<sup>3</sup> See Gendell and Siegel, “Trends in retirement age by sex,” and “Trends in retirement age in the United States.”

<sup>4</sup> The extent of seasonal variation and its effect on this analysis have not been determined.

<sup>5</sup> For Japan, the 1965 and 1970 labor force figures for ages 65 to 69, 70 to 74, and 75 and older were calculated by assuming that the age distribution in the survey data was the same as it was in the census data. Estimates for the 1975–95 period for ages 70 to 74 and 75 years and older were calculated similarly. For Sweden, estimates for age 75 and older were made by assuming that the ratio for those 75 and older to those 70 to 74 in the survey was the same as in the census.

<sup>6</sup> See Philip L. Ronen, “Using the CPS to track retirement trends among

older men,” *Monthly Labor Review*, February 1985, pp. 46–49.

<sup>7</sup> Organization for Economic Cooperation and Development (OECD), *The Transition from Work to Retirement*, Social Policy Studies 16 (Paris, OECD, 1995). For more on the OECD, see their official website: <http://www.oecd.org>

<sup>8</sup> Albert I. Hermalin and Bruce A. Christenson, “Census-Based Approaches for Studying Aggregate Changes in Characteristics of the Elderly,” *Asian and Pacific Population Forum*, summer 1992, pp. 35–42 and 58–62.

<sup>9</sup> To do this, the Karup-King third-difference formula for oscillatory interpolation was used. For background on this method, see Henry S. Shryock, Jacob S. Siegel, and associates, *The Methods and Materials of Demography*, condensed edition by Edward G. Stockwell (New York, Academic Press, 1976). Also, an example is given in Gendell and Siegel, “Trends in retirement age by sex.” Further information about the nature, application, and validity of this measure of the average age at retirement, including its limitations, is provided in Gendell and Siegel, “Trends in retirement age in the United States.”

<sup>10</sup> OECD, *The Transition from Work to Retirement*, ch. 2, especially p. 14.

<sup>11</sup> *Ibid.*, p. 49.

<sup>12</sup> Although that has not been done in this article, on the assumption that unemployment is a significant mode of exit from the labor force for the elderly, some indications are presented below of the impact on the average age at exit from the labor force produced by a substantial increase in unemployment.

<sup>13</sup> Winfried Schmähl, Rainer George, and Christiane Oswald, “Gradual Retirement in Germany,” in Lei Delsen and Geneviève Reday-Mulvey, eds., *Gradual Retirement in the OECD Countries: Macro and Micro Issues and Policies* (Aldershot, England and Brookfield, VT, Dartmouth Publishing, 1996), p. 76.

<sup>14</sup> Hans-Jurgen Krupp, “Social Change and the Development of the Finan-

cial Situation of the Social Security System in the Federal Republic of Germany,” in B.A. Gustafsson and N. Anders Klevmarken, eds., *The Political Economy of Social Security* (Amsterdam and New York, Elsevier Science Publishing, 1989), p. 16.

<sup>15</sup> Agneta Kruse, “The Pension System,” in Tommy Bengtsson, ed., *Population, Economy, and Welfare in Sweden* (Berlin and New York, Springer-Verlag, 1994), p. 112.

<sup>16</sup> The employment-based averages were usually lower than those based on labor force participation rates, but the differences were usually 0.1 or 0.2 year, and occasionally 0.3 year.

<sup>17</sup> Isao Shinowada, “Gradual Retirement in Japan: Micro Issues and Policies,” in Delsen and Reday-Mulvey, eds., *Gradual Retirement in the OECD Countries*, p. 160.

<sup>18</sup> How much of this change and the one among women (see below) are due to estimation error is difficult to judge. As described earlier, the data for the labor force and the labor force participation rates for ages 65 to 69, 70 to 74, and 75 years and older were estimated for 1965 and 1970 and for the ages 70 to 74 and 75 and older for the succeeding dates.

<sup>19</sup> See Gendell and Siegel, “Trends in retirement age by sex,” and “Trends in retirement age in the United States.”

<sup>20</sup> See Howard N Fullerton, Jr., “The 2005 labor force: growing, but slowly,” *Monthly Labor Review*, November 1995, p. 35; and Anne E. Polivka and Stephen M. Miller, “The CPS after the redesign: refocusing the economic lens” (unpublished manuscript, Bureau of Labor Statistics, 1995).

<sup>21</sup> Eskil Wadensjö, “Gradual Retirement in Sweden,” in Delsen and Reday-Mulvey, eds., *Gradual Retirement in the OECD Countries*, pp. 26–27.

<sup>22</sup> It should be noted again, however, that estimation error may have influenced some of the apparent results for men and women in Japan.

<sup>23</sup> Because the values of both factors change over time, one cannot account for the change in the length of retirement (calculated as the life expectancy at the average age at retirement) simply by adding the change in the average age at retirement to the change in life expectancy at a specified age (such as age 65, as used here). But when the magnitude of the change in one of the factors is considerably greater than the magnitude of the change in the other, it is clear which factor has had the greater impact.

<sup>24</sup> Sheetal Chand and Albert Jaeger, *Aging Populations and Public Pension Schemes*, Occasional Paper 147 (Washington, International Monetary Fund, 1996).

<sup>25</sup> Although the definition based on changes in the age structure alone often is used as a broad measure of the elderly dependency burden, it generally is regarded as crude.

<sup>26</sup> See, for example, Peter S. Heller, Richard Hemming, and Peter W. Kohnert, *Aging and Social Expenditure in the Major Industrial Countries, 1980–2025* (Washington, International Monetary Fund, 1986); Robert P. Hagemann and Giuseppe Nicoletti, “Population Ageing: Economic Effects and Some Policy Implications for Financing Public Pensions,” *OECD Economic Studies*, spring 1989, pp. 51–96; Alan J. Auerbach, Laurence J. Kotlikoff, Robert P. Hagemann, and Giuseppe Nicoletti, “The Economic Dynamics of an Ageing Population: The Case of Four OECD Economies,” *OECD Economic Studies*, spring 1989, pp. 97–130; World Bank, *Averting the Old Age Crisis: Policies to Protect the Old and Promote Growth* (New York, Oxford University Press, 1994); Chand and Jaeger, *Aging Populations and Public Policy Schemes*; and OECD, *Ageing in OECD Countries* (Paris, OECD, 1996).

<sup>27</sup> Had it been available for the 1960–90 period, dependency burden-3 instead of dependency burden-2 would have been used in table 5.

<sup>28</sup> Wadensjö, “Gradual Retirement in Sweden,” p. 36.

<sup>29</sup> See Klaus Jacobs and Martin Rein, “The Future of Early Retirement: The Federal Republic of Germany,” in John Myles and Jill Quadagno, eds., *States, Labor Markets, and the Future of Old-Age Policy* (Philadelphia, Temple University Press, 1991), pp. 262–63; and Schmähl and others, “Gradual Retirement in Germany,”

<sup>30</sup> Schmähl and others, “Gradual Retirement in Germany.”

<sup>31</sup> *Ibid.*, p. 91.

<sup>32</sup> *Ibid.*, p. 80.

<sup>33</sup> John G. Bauer, “How Japan and the Newly Industrialized Economies of Asia are Responding to Labor Scarcity,” *Asia-Pacific Population Research Report*, 3 (Honolulu, East-West Center, 1995).

<sup>34</sup> See Linda G. Martin, “The Graying of Japan,” *Population Bulletin*, July 1989, pp. 1–40; and Isao Shinowada, “Gradual Retirement in Japan: Micro Issues and Policies” and Noriyuki Takayama, “Gradual Retirement in Japan: Macro Issues and Policies,” in Lei Delsen and Geneviève Reday-Mulvey, eds., *Gradual Retirement in OECD Countries*.

<sup>35</sup> Bauer, “How Japan and the Newly Industrialized Economies of Asia are Responding to Labor Scarcity,” p. 11.

<sup>36</sup> Takayama, “Gradual Retirement in Japan: Macro Issues and Policies,” p. 146.

<sup>37</sup> Joseph F. Quinn, Richard V. Burkhauser, and Daniel A. Myers, *Passing the Torch: The Influence of Economic Incentives on Work and Retirement* (Kalamazoo, MI, W.E. Upjohn Institute for Employment Research, 1990).

<sup>38</sup> David A. Wise, “Retirement Against the Demographic Trend: More Older People Living Longer, Working Less, and Saving Less,” *Demography*, February 1997, pp. 83–95 (quotations are from page 94).