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Our Assumptions About Aging and What We Are Doing About It

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December 21, 2001

The opinions and conclusions drawn in this report are those of the author and should not be attributed to Watson Wyatt Worldwide or any of its other associates or to anyone who provided us input in developing the analysis. **Comments are welcome.**

We thank Mandeep Bains and Kieran McMorrow of the European Commission, and Howard Oxley and Ignazio Visco of the Organization for Economic Cooperation and Development for providing us much of the data supporting our analysis and for their help as we worked through the details of their work and projections.

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Abstract

A recent set of cost projections of pension and health care systems by the European Commission (EC) and the Organization for Economic and Cooperative Development (OECD) have been developed to assess the long-term sustainability of commitments to the elderly in the developed economies of the world. The analysis in this paper evaluates the underlying demographic, behavioral, structural, and economic assumptions used in developing those projections. The EC and OECD staffs use their projections to conclude that many countries have not yet done enough to reduce retirement commitments in the face of aging populations. Our analysis supports this conclusion but finds that the situation may be worse than estimated in the EC and OECD projections.

Introduction

In 1994, the World Bank published a study, *Averting the Old Age Crisis* (James) that raised the level of consciousness about the precarious state of national retirement systems around the globe. Various problems were identified in the study. These included the lack of coverage of significant segments of the workforce in some countries, benefit structures that caused various forms of inefficient economic behavior, too great a reliance on pay-as-you-go funding in many cases, and inefficient use of assets in many plans that were funded. These problems and others were considered within the context of aging of national populations. The aging of societies is occurring at varying rates, but generally the highly developed nations are experiencing more rapid population aging than less developed countries.[1]

The problems with the retirement systems that the World Bank identified for most of the developed countries were different than those they delineated for the developing countries. The developing countries' problems tended to be structural in nature. Large segments of their populations were not covered by their retirement systems. Many workers did not contribute to their plans on a regular basis. Benefit levels varied greatly from industry to industry. Assets in the plans were squandered on endeavors that provided little return or on excessively high administration fees. The less developed countries can anticipate significant increases in their elderly populations, even at higher rates than the developed countries have experienced in the past. But their demographic composition will not pose a particular problem for their retirement systems because their

high fertility rates will help to hold the relationship between the dependent elderly and working populations relatively low, often for several decades to come.

The developed countries' retirement problems stem from their demographic compositions and their general dependence on generous pay-as-you-go retirement programs. Virtually all of these countries experienced a "baby boom" after World War II, although the duration of the high fertility varied considerably from country to country. After their baby booms, the fertility rates declined significantly in all of these countries and have remained relatively low in most cases. The aging phenomenon in developed countries was in part related to their baby booms followed by fertility levels that fell below population replacement with the result that the younger generations in several of these countries are smaller than older ones. The aging phenomenon has been accentuated by the evolution of medical technology that has significantly extended the lives of older people in all of these countries. The combined implications of fertility patterns and increasing life expectancy on old-age dependency are already significant and will continue to unfold over the coming decades.

Prior to the release of the World Bank study in 1994, many of the developed countries had recognized that their own populations would be aging rapidly during the early part of the twenty-first century and would pose resulting demands on their economies and the fiscal operations of their governments. But until the World Bank study was published, there was not a general sense of the pervasiveness of the phenomenon and its implications. Simply put, the levels of health and retirement benefits provided to the elderly were going to increase exponentially in coming decades. Financing these would require significant increases in taxes, generally payroll taxes,

which distort labor markets and limit economic growth. The high levels of spending on these programs crowds out other important public goods and services.

Throughout the 1990s there was a growing sense of the need for national governments to modify their retirement programs to avoid fiscal collapse under the burden of aging societies. Several governments have undertaken reforms of their retirement systems, although the nature and extent of these reforms has been highly varied. Sweden and Italy are phasing in notional account defined contribution plans that promise to significantly curtail benefits for future generations of retirees. Germany and Japan have adopted legislation to reduce retirement benefits to varying degrees in their existing systems and have implemented voluntary tax-favored savings programs similar to the 401(k) system in the United States. Canada has adopted an increased schedule of payroll taxes so today's workers can pre-fund a portion of the benefits for future retirees. France has modestly reduced the generosity of private sector pensions, changing the indexing formula and number of years required to qualify for full benefits. The United States has debated reforming its government mandated retirement systems but have been unwilling to adopt any changes in them so far.

The World Bank report included an estimate developed during 1993 of how much the G-7 countries (Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States) would each have to increase taxes to finance their existing national pension programs over the long run (James, p. 159). The simple average of the required tax increases across the countries was 6.56 percent of GDP. A set of estimates developed during 2001 by the Organization for Economic Co-operation and Development (OECD) and the European Commission suggest that considerable progress has been made in

reining in pension costs in these countries. The simple average of the increase in pension spending in these same seven countries is expected to be only 2.30 percent of GDP higher in 2050 than in 2000 (OECD, p. 154).

There are a number of reasons that these two sets of estimates of future pension costs in the G-7 countries might be so different. One is that the national retirement systems in these countries have changed significantly reducing the anticipated cost of the programs in the future. Another reason these national pension systems appear to be more in balance now than earlier might be that our outlook on evolving demographics has changed. Yet another might be that we expect behavioral changes, such as delayed retirement, that will ameliorate the problem. It is possible that our outlook on future growth in worker productivity associated with the advent of the new economy has lightened pension burdens. Finally, it may simply be that the two sets of estimates were simply developed using different methodologies that account for the differences.

At a casual glance, however, the retirement systems in the G-7 countries do not appear to have been changed enough across the board to account for the change in estimates of long-term cost increases that they pose. France has not modified its retirement system significantly since the World Bank study was released. Canada has adopted higher tax rates to fund benefits but done little to actually reduce them over the long term. Germany has adopted some reforms but they may involve more shifting of the cost of benefits to general revenue financing from payroll tax financing rather than in actually cutting benefits. The United States has not modified its national retirement pension system at all between the development of the two sets of estimates. Italy has adopted significant changes to its retirement system but the phase-in of the reforms may

not affect retirement patterns for many years. Japan has continued to modify its retirement systems, but there is reason to believe it may not be realistically assessing the aging phenomenon it faces in its analysis of retirement costs in the future (Schieber and Hewitt, 2000). If we anticipate that more people will be working in the future than today, we ought to have a good rationale for such a belief. If we are counting on the new economy or other stimulants to productivity to reduce future pension burden rates, it is important that we understand the mechanisms by which such improvements will be achieved.

At best, estimating future pension costs is an inexact science. For example, Ignazio Visco of the OECD compares a set of projections of pension cost increase developed by the OECD in 1980 for 1995 with actual increases that were realized in a dozen highly developed countries (Visco, p. 81). The projected increases for these countries averaged 18.2 percent for the period. The actual increases realized during the period average 73.7 percent. The reasons for the sizeable disparities in the two series are attributed to several factors. These include the maturing of pay-as-you-go pension systems, declining labor force participation rates of older men, and an assumption that benefits are constant in real terms over time when they tend to grow with real income levels (p. 80).

It might be tempting to criticize OECD for having missed the actual pension cost increases so significantly in their 1980 projections, but that would be unfair. Back in the 1980s, when the OECD developed their projections, the cross national modeling of retirement systems was still in its infancy and understanding the dynamics of so many programs was extremely complicated. In addition, projections of these sorts that are

developed by the OECD, the EC, and others involve a considerable amount of give and take between the staffs doing the projections and the government officials responsible for the pension programs in the various countries for which projections are made. The assumptions and methods used in making the projections are often negotiated.

Today groups like the OECD have a much better grasp of how to model national retirement systems than just a decade ago. Their latest estimates of the increase in pension, health care and long-term health costs are presented in Table 1. While they are projecting substantial increases in the costs associated with aging, as noted above, the differences from the World Bank projections, past experience with projections and the potential magnitude of errors make it important that projections of these sorts be scrutinized very carefully.

The cost of pay-as-you-go national retirement systems is driven by the ratio of retirees to active workers supporting the systems, known as the dependency ratio, and the relationship between benefits and sources of income that are taxed to finance the system, sometimes referred to as the benefits ratio. To the extent that some systems might be partially funded, their cost is also dependent on the extent of funding in the system and the rates of return on the assets funding future benefits. The dependency ratio depends on a number of demographic and behavioral factors. The demographic factors include the fertility rate, life expectancy, and immigration rates. The behavioral factors include the labor force participation rates of various segments of society, typically categorized by gender and age. The relationship between the size of benefits and the sources of income taxed to finance those benefits are driven by the structural linkages between benefits and the sources of revenues and by the economic performance of the economy that affects

both of them over time. In many systems benefits are based on lifetime wages and grow with more or less correspondence between the two.

If one wishes to assess the projections of future pension costs in any particular society, it is important to understand whether or not the underlying assumptions about all of these factors are reasonable. In the following discussion, we assess the underlying assumptions that have been used to develop recent pension projections for the major developed countries around the world. In successive sections we look at demographic, behavioral, structural, and economic assumptions being used to generate contemporary estimates of national pension costs. In the final section, we discuss the implications of our findings.

Demographic Assumptions used in Projecting Aging Costs

The economies of the OECD are facing a significant change in the underlying age structure of their populations. Most countries in the OECD experienced a baby boom in the immediate aftermath of World War II followed by a sizable reduction in birth rates soon thereafter. The duration of the baby booms across the developed world varied considerably from country to country. In addition, all of these countries also have realized significant increases in life expectancy over much of the twentieth century. The result is that the economies of the OECD are now facing the prospect of increasing average age and slowing growth in their resident populations.

A major consequence of the demographic changes anticipated in developed countries over the coming decades will be increased fiscal pressures on programs that support the elderly in particular and require government financing in general. This includes the costs of public pension programs as well as health care and long-term care

expenditures. In anticipation of the potential burden that age-related spending will place on their fiscal budgets in the coming decades, most of the governments in the developed world have attempted to estimate future costs related to the aging in their societies. Since the aged dependency ratio, the ratio of retired people in a society to the number of people working there, is such a major determinant of pension costs, underlying assumptions about the future demographic composition of a population is extremely important in estimating national retirement obligations. In this section of our analysis, we analyze the demographic assumptions that have been used in the recent EC and OECD efforts to estimate the costs of aging in the developed economies of the world.

Life Expectancy

Table 2 shows life expectancy at birth for a number of OECD countries for various periods since the late 1950s with projections used in estimating the future costs of national retirement programs. Two general trends are evident from the data in the table. First, over the past half-century, the countries in the OECD have experienced significant increases in life expectancy. In general, the largest improvements are concentrated in countries, which exhibited the lowest levels of life expectancy in the late 1950's. As a result, the disparity in the length of life between countries has been greatly reduced. Japan is the most remarkable of the group with life expectancy as one of the lowest in the late 1950's and progressing to become the highest value by 2000. The second trend apparent in the table is the anticipated slowdown in life expectancy that is used to project future population levels. In almost every case, life expectancy improvements over the forty years from the late 1990s to the late 2030s are expected to be less than the improvements realized over the prior 40-year period. The only exceptions are Hungary

and Denmark both of which realized relatively modest improvements in recent decades compared to most other OECD countries.

One explanation for expecting declining rates of improvement in life expectancy measured from birth in the future is largely attributed to the fact that mortality improvements have varied quite substantially across age groups. Cutler and Meara (2001) investigated the causes for declining mortality rates in the U.S. over the last century. In general, increasing life expectancy is a function of two sources: (1) more infants and children reaching adulthood and (2) prolonging the life of old age individuals. They show that the declines in the early part of the century were the result of a number of factors that primarily improved the lives of younger individuals. Advancements in public health and sanitation and increased consciousness about nutrition improved people's ability to fight off infectious disease, a major cause of deaths among younger age groups. Improved working conditions reduced disease among the working age population and mortality due to accidental causes. With advancements such as penicillin and sulfa drugs by the middle part of the twentieth century, mortality rates also began to decline for other age groups – in particular for older age individuals. The continuing major advances in medical technology and its application has resulted in a continuing trend towards increasing life expectancy. However, as Cutler and Meara show, premature deaths caused by low birth weight and other traditional killers of the young such as pneumonia have declined so significantly that further improvements in these areas will add very little to overall longevity. As a result, most of the additional years added to life over the last few decades of the twentieth century were concentrated in the older age groups. And it is here that further improvements in life expectancy will largely be realized in the future.

Although it seems reasonable that further improvements in life expectancy will slow, there are several arguments that suggest otherwise. In particular, we are living in a period of stunning breakthroughs in biomedicine, where we are beginning to show substantial advancements in areas such as genetic research. As a result, many demographers and health scientists expect that these developments will add greatly to overall longevity in the future. As shown in Schieber and Hewitt (2001, p. 39), estimates of the U.S. population over 85 years old varies dramatically between those made by the Social Security Administration, U.S. Census Bureau, and three prominent demographers, who have analyzed the U.S. situation for the National Institute on Aging. In fact, the three demographers on average expect that by 2050 there will be over twice as many individuals 85 years and over in the United States than currently projected by either government agency. As a result, there is clearly reason to question whether the expected declines in life expectancy may lead to a gross underestimation of the extent of population aging throughout many of the OECD countries.[2]

Schieber and Hewitt's (2000) analysis of a set of stochastic projections of various demographic variables for the G-7 countries included projections of life expectancy out to 2050. Shripad Tuljapurkar developed the projections they used as an extension of a project he and his associates had done for the US National Institute on Aging evaluating aging in the G-7 countries. In Table 3, their median projections of life expectancy for 2030 and 2050 are compared to the underlying projections from the OECD and EC used in estimating future public retirement program costs in these same countries. The results suggest that among the G-7 countries, all but Japan seem to be using assumptions about improving life expectancy that are within fairly close tolerance of a median scenario

estimated by an independent demographer who has used these countries' historical life improvement patterns in developing his projections. But there is at least a 50 percent probability that life expectancy in these countries will improve by more than the median projection taken from Schieber and Hewitt (p. 49) that is included in this table.

Fertility Rates

The increase in fertility rates throughout many societies in the years immediately after World War II is often referred to as the baby boom phenomenon. The subsequent decline in fertility in subsequent years has contributed significantly to the aging of societies in the developed world. The extent of population aging in the future will largely depend on the number of births in a given country.

Table 4 shows how total fertility rates changed in various countries in the OECD from the late 1950's to the present compared with OECD projections into the middle of the current century. The total fertility rate (TFR) indicates the number of births that a woman would have if she experienced the age-specific birth rates observed in a given year throughout her own childbearing years. For most developed countries a population is able to replace itself if the TFR is at least 2.1 births per woman who reaches adulthood. The replacement rate must be greater than 2.0 since not all children survive to adulthood and also because male birth rates are typically slightly higher than females. Many less developed societies, subsequently, require higher replacement rates due to higher levels of infant and child mortality.

Between the late 1950's and the present, fertility rates have dropped precipitously across the OECD countries. Only the United States maintains a level close to replacement while the remaining countries are far below levels needed to support a stable

population over time. In fact, a number of major societies in the world now have birth rates below 1.5 births per woman. If the birth rates in these countries remain at current levels, they will experience declining populations in the future. However, expectations are that fertility rates will in fact rebound from their current lows over the coming decades. For the majority of countries in the OECD, fertility rates are projected to rise from their recent lows to between 1.5 and 1.8 by 2050, with most of the increase occurring over the next two decades. In the few cases where birth rates are relatively high, fertility is expected to decline from current levels.

But how reasonable is it to expect that fertility rates will reverse course across most of the OECD in the coming decades? Since the explosion in birth rates in the middle of the last century, there has been a steady and persistent decline in fertility rates. The United States is one of the rare exceptions reporting a slight increase throughout the 1980's and 1990's, mostly attributed to an increase in birth rates among white women. However, for most of the other societies in the OECD, national trends have shown no evidence of rebounding from recent low fertility levels or even of leveling off from their downward path. As a result, this certainly raises concerns whether these expectations of a rebound in fertility rates are overly optimistic.

Net Immigration

Along with rising life expectancy and declining birth rates, the extent of immigration and emigration significantly affects the size and age structure of a population. Table 5 shows the extent that net immigration has changed in these countries over the last several decades with projections into the future. In the late 1950's a number of countries including the United Kingdom, Spain and Italy faced significant outflows of

individuals with the greatest reduction occurring in Ireland, which was recording net emigration of over 1.5 percent of its population per annum. On the other side, Canada, Germany and the United States reported sizable inflows of immigrants over the same period. By the late 1990's all of the countries but a couple of the former Soviet bloc countries were reporting positive net immigration levels. Given the low birth rates in many of the countries and their relative prosperity, it is likely most of these countries will continue to log positive immigration rates in the future.

There is evidence that some countries believe that they can use immigration to help offset the effects of their relatively low fertility rates. For example, a government commission in Germany has recently recommended that it should restructure its immigration policies to encourage immigration of technical workers in response to shortages that are already apparent. At the same time Germany is attempting to attract more immigration, it still has relatively high unemployment levels that has exacerbated traditional cultural resistance to fully integrating outsiders into its society (Finn, 2001). While developed countries adjust migration policies and attempt to reduce their cultural barriers to attract needed workers from abroad, they may face a shortfall of working-age people who are willing to migrate to their countries. This could occur for a couple reasons. One relates to the demographic evolution of populations in less developed countries. The other relates to the relative evolution of developed and less developed economies as desirable places to work.

One problem with the assumption that immigration can be an effective antidote to low fertility rates in the developed world is that competition for desirable immigrants is likely to be much more intense than in the past. Today, many less-developed countries

contain an excess supply of labor, making it effective for working-age people there to migrate towards the better opportunities provided by the developed economies. However, fertility rates are now falling in many less developed countries. If these countries progress up the development ladder and experience the effects of their own declining fertility rates on their domestic labor supply, they will become more attractive places to work.[3] In addition, as the developed countries struggle with the macroeconomic effects of aging and the attendant rising tax rates and stagnation in standards of living, it is quite possible the advanced economies will become less attractive places to live and work in the future. Many less developed countries might not be bad places to work and live in the future and the attraction of today's developed economies may wane substantially.

Another problem with the assumption that immigration will be a major relief for countries with low fertility rates is the sheer number of immigrants required to stabilize the populations in most developed countries. In Table 6, we estimate how much immigration would have to increase in various countries in order to offset the extent to which the total fertility rate is below the population replacement level, assumed to be 2.1 for this exercise. We use the average total fertility rate and average annual numbers of births for the period 1995 to 2000 as reported by the United Nations in their recent update of demographic measures around the world. From this we calculated additional births that would have been required to raise the total fertility rate from the measured level in the late 1990s to 2.1, the replacement rate. We calculated average net immigration for each of the countries as the product of the average immigration rates in the countries for the 1995 to 2000 period times the average population in each of the countries for the

period. We derived the increase in current immigration required to add the same number of people per year to the national populations as would have been added if the total fertility rate had been at replacement level rather than at the level actually recorded in each case.

The right hand column in Table 6 shows the multiple of actual immigration during the last half of the 1990s in each country that would have been required to offset the degree to which total fertility fell below long-term population replacement levels. For example, Australia would have had to realize immigration 2.5 times its actual immigration rate, Austria 44.2 times its rate, and so forth for them to offset their low fertility rates. The only country in the whole set where immigration more than offset the fertility shortfall was in the United States. For the majority of countries with low fertility rates it does not seem possible that the domestic populations would be willing to tolerate the massive infusions of foreigners into their societies required to offset low birth rates. There are already signs of resentment of "foreigners" in several European countries. Japan's immigration is significantly higher now than it has been in prior decades, but it is still miniscule by comparison to most other developed countries and the prospects for significant increases in immigration there is remote at this time.

The changes to immigration rates assumed in projecting the cost of aging across these countries as reflected in Table 5 are very modest in comparison to immigration needed to offset low fertility. The one country that seems out of line is Austria where the immigration rate from the late 1990s is projected to quadruple by the late 2010s. Given the recent political turmoil in Austria regarding immigration, this assumption seems to be overly aggressive. It is of little significance, however, in the larger picture.

Population Changes[4]

A combination of the trends in life expectancy, fertility rates, and immigration with assumptions about these values into the future portends significant changes in population levels over the coming decades as reflected in Table 7. The spike in fertility rates after World War II led the majority of countries throughout the OECD to experience significant increases in their population levels over the last half century. Among the more developed economies, the implications of the extended baby booms in Australia, Canada, New Zealand, and the United States are apparent from the data.

As we look to the future, the picture in the coming half-century is remarkably different than what we have experienced over the past fifty years. The EC and OECD project that nearly half the countries included in Table 7 will have population declines over the next half-century. Even then, our assessment is that the underlying demographic assumptions that have led to the results in Table 7 might be painting a somewhat rosier picture than most of the countries actually face. If historical rates of longevity improvement persist, there will be many more people at advanced ages than the assumptions that we have analyzed here would suggest. If fertility trends persist, there will be many fewer young people. In aggregate, the populations in 2050 will be remarkably different than those suggested by Table 7. The populations might not be all that much different in size, but they will be much older on average than we now seem to be assuming. From the perspective of realistically anticipating the costs associated with aging in our societies, the implications could be profound.

Behavioral Assumptions used in Projecting Aging Costs

We noted at the outset that the aged-dependency ratio in a society is one of the major determinants of age-related spending by its national government. Demographics certainly are one of the main forces behind the level of aged dependency in a society, but the behavior of able-bodied people may be of equal importance. By definition, the aged-dependency ratio is the ratio of retirees to workers. Raising the age at which a worker retires from 55 to 60 or 60 to 65 has a beneficial effect on both the numerator and denominator of the dependency ratio. Our assessment of how much our retirement programs are going to cost us in the future is dependent on what we assume about the labor market behavior of people in the future and how it might change from current patterns. Increasing the labor force participation of able-bodied people who would not work under current patterns of behavior could go a long way toward alleviating some of the fiscal pressures that aging societies will face.

Before looking at estimates of labor force participation in the future, it is important to understand the historical trends in such behavior. Male and female labor force participation rates for individuals ages 20 to 64 are reported in Table 8 for various countries in the OECD. Over the past thirty years, male labor force participation in this age group has generally fallen while female rates have increased. For the countries that have consistent data back as far as 1970, only Norway has recorded an increase in the labor force participation rates of males, and there the increase was less than one percent of the male population aged 20 to 64. In every case where there is data for 1970, the female labor force participation rates in 2000 were higher than recorded 30 years earlier. Something very different is driving the behavior of men and women.

In the case of the declining labor force participation rates of men reflected in Table 8, the maturing of the retirement systems in developed countries over the second half of the twentieth century is largely behind the trends. Figures 1 and 2 show the labor force participation rates of men aged 55 to 59 and 60 to 64 respectively for selected countries from 1960 through 1996. With the exception of Japan at the younger age, all of the countries posted declines in their male labor force participation rates over the period covered. In a few cases the declines seem to have flattened toward the end of the measurement period.

The declines in male labor force participation recorded across the broad age range in Table 8 and Figures 1 and 2 have been largely concentrated among men aged 55 to 64. In addition, the declines in the labor force participation rates of men aged 65 and over were also significant in the developed economies of the world. Comparing Figures 1 and 2, the declines for men 60 to 64 have been somewhat larger than the decline for men 55 to 59 in virtually every case. In a number of countries, there were indications toward the end of the 1990s that labor force participation among older men might be rising. In Finland, Germany, the Netherlands, Portugal, and Spain the participation levels for men ages 55 to 59 rose from 5 to 9 percent (not percentage points) between 1995 and 2000. In Finland and New Zealand the participation levels for men ages 60 to 64 jumped more than 20 percent. In a handful of other countries they increased from 3 to 5 percent. How much of this is a response to changing retirement incentives and how much to economic demand for workers is not clear. While there is some good news, there is still room for concern about the low rates of labor force participation by men of ages who could clearly still work.

In Spain and Canada men 65 and over in the mid-1990s were only one-third as likely to be in the labor force as their fathers' generation in the early 1960s. Spain's participation rate for men at this age dropped from 40 to 3 percent over the period, Netherlands from 20 to 4 percent, and France and Italy dropped from a quarter of men aged 65 and over being in the labor force to 2 and 6 percent respectively. In the United States, a third of the men 65 and above were still in the labor force in 1960 but only half that percentage was still there by 1996. Even in Japan, the rate dropped from 57 to 37 percent between 1965 and 1995 (Gruber and Wise).

At the same time male labor force participation was declining in recent decades, women aged 20 to 64 posted a remarkable increase in their attachment to the workforce in most of the developed countries. In the most dramatic case, the percentage of women in the labor force in the Netherlands increased by 82 percent between 1970 and 1990. In Canada it jumped by 68 percent and by 55 percent in Spain. In the United States, women between the ages 20 and 64 were nearly 40 percent more likely to be in the labor force in 1990 than in 1970. In the US case, we have more detailed historical information than on the other countries that allows us to more fully document the increasing pattern of female labor force participation. In the United States, the trend toward more women working is a long one, but it has not been a steady one.

In the United States, the biggest surge in labor force participation came as the baby boom cohorts of women reached working age. The post-World War II baby boom cohorts were born from 1946 to 1964 in the United States. Calculating backwards based on reproduction patterns, their mothers were mostly born between 1905 and 1945. Looking back in time, we can compare the labor force behavior of baby boom women to

that of their mothers. Figure 3 shows the labor force participation rates of various cohorts of women who would have been mothers of the baby boomers based on their age in 2000. Each line shows the labor force participation rate for a particular five-year birth grouping of women at various ages. For example, the top line shows the lifetime labor force participation of women born in 1941 to 1945. In 2000, these women would have been 55 to 59 years of age. The second line shows the labor force participation rates at various attained ages for the next five-year birth group of women, aged 60 to 64 in 2000, and the successively lower lines show the rates for successively older birth cohorts of women.

The Bureau of Labor Statistics data used to plot Figure 3 did not record the early-career labor force participation rates of the oldest women reflected there. But their early-life pattern of labor force participation likely followed a pattern similar to that of slightly younger women. It is clear that successive birth cohorts of women had higher labor force participation rates over most of their prime working ages than those who had gone before them. The biggest increase in labor force participation occurred for the youngest two cohorts of women, those aged 55 to 59 and those 60 to 64 in 2000. While some of these women were mothers of children born by 1964, the end of the baby boom, most of the children born to these two age cohorts were likely born after 1964, when fertility rates were much lower than during the baby boom period.

Figure 4 shows the labor force participation rates through 2000 at various attained ages of the youngest four birth cohorts of women from Figure 3, plus those of the baby boom women. Once again the picture is fairly clear. The baby boom women have had consistently higher labor force participation rates than earlier generations of women, even higher than the transition birth cohorts between them and their mothers. Figure 4 also

suggests that the increasing labor force participation rates of women dating back over half a century have peaked, and are not likely to increase appreciably in the future relative to immediately prior cohorts.

In the context of the current story, the baby boom generation of women entered the workforce at significantly higher rates and stayed in it much longer than prior generations of women. Overall, labor force participation rates of US working-working age women might continue to rise slightly as older cohorts of women with lower participation rates are replaced by younger ones with higher rates. However, if the daughters of the baby boomers do not work at appreciably higher rates than the baby boomers themselves, further increases will be limited. In most of the countries where there is labor force participation data that allows us to trace behavior back to 1970, the rate of increase in women joining the labor force in the 1990s was less than it had been in the prior two decades. This suggests the pattern we have documented in the United States is likely to be similar to what has been happening in other developed countries.

Table 9 shows the projected changes in the labor force participation rates for men and women aged 20 to 64 against the baseline of the participation rate in 2000. The changes shown in the table are derived from the OECD projected participation rates out to 2050 that are included in Appendix Table 1.[5] An individual's decision to enter the labor force is contingent on many factors. Therefore, trying to predict future trends in labor force participation is equivalent to estimating the future behavior of individuals, which often times is mere guesswork. However, it is still instructive to analyze how labor force participation rates are expected to change in the future because of the important role they play in estimating pension costs levels.[6]

Table 9 suggests that labor force participation for males age 20 to 64 are projected to continue to decline in most developed countries during this decade, in some cases substantially. In a handful of cases, the labor force participation rates of men are expected to increase. Three of the countries with projected increases, Australia, Italy, and Sweden, have adopted pension reforms that should change the incentives to continue working beyond early retirement age in the future. It is questionable, however, whether these reforms will have much of an effect within the coming decade. Another of the countries that has adopted recent pension reforms, Germany, is also expected to have an increase in labor force participation rates for this coming decade, although the pension reforms they have adopted would not appear to be sufficient to cause such an immediate change in behavior. Beyond 2010, it appears there is an anticipated slowing in the rate at which male participation in the labor force has been declining in most countries. Between 2030 and 2050, there is an expected increase in the labor force participation rates in several cases.

For women, the changes anticipated over the coming decades are much more dramatic than for men. Over the whole projection period, the labor force participation rates of women in all but two of the smaller countries are expected to increase significantly. Much of the prolonged growth in female labor force participation continues a period of transition where exiting cohorts of women who customarily did not enter the labor force are replaced by generations that were born into a dual worker society. The most pronounced changes are expected in countries that currently have relatively low female participation, especially Italy and Spain. However, for countries

that currently have high female participation such as Denmark, Finland and Sweden, rates are anticipated to remain relatively constant.

In combination, the projected increase in the labor force participation rates of women will more than offset the declines for men with the net result that overall participation of the populations from age 20 to 64 is expected to rise gradually. At first glance, the assumptions about the future labor force participation rates for men and women appear reasonable and achievable without any significant changes in public policy. However, what is not apparent is that in the midst of rapid population aging, the underlying trends in labor force participation are in fact declining.

In Table 10, we decompose the rise in female labor force participation rates between 2000 and 2050 into the sum of three terms. The first of these is the *demographic effect* of aging populations calculated by assuming that current female labor force participation rates at each age persist into the future. It is the sum across age-gender groups of the change in population shares, weighted by each group's participation rate. The second element is the *behavioral effect* on participation rates assumed in the projections. It is the sum across age-gender groups of the change in participation rates, weighted by each group's population share. The third element is a *cross product* term that reflects changes in weighting factors as both population shares and participation rates of each group change. Since female participation rates are expected to increase to a much greater extent in the projections between 2000 and 2050, we focus the following discussion on estimates of female labor force participation.

The separation of the growth in labor force participation into its underlying components provides a more realistic basis for assessing the reliability of the

participation projections. What at first might appear to require a relatively small change in labor force participation behavior could in fact turn out to require a very sizeable response. Given what we know about the age structure of the populations in the developed countries, we expected the demographic effect to be universally negative, which in fact turns out to be as reflected in Table 10. This means that to the extent policymakers expect increasing labor force participation from women, the demographic effect has to be offset by a positive behavioral response before any net increases in female labor force participation can be recorded. It is quite clear that the aging of the population will make it even more difficult for the developed countries to achieve the expectations set out by the OECD and EC in estimating the cost of aging societies. The total behavioral response by women between the ages of 20 and 64 required to meet the ultimate assumed labor force participation rates are large but are conceivable. In the United States, the labor force participation rates for women within these ages roughly doubled between 1950 and 2000.

It is important to keep in mind, however, that the effects reflected in Table 10 are significantly tied to the demographic assumptions discussed in the prior section. The female population considered in Table 10 is restricted to women at least 20 years of age and no more than 64. If the rebound in fertility in many of the developed countries discussed earlier does not come to pass, the required demographic response reported in Table 10 will ultimately be much larger than reflected there.

In the labor force projections under study here, the high fertility rates will start feeding a growing pool of potential workers into the working age populations by 2020 reducing the aged dependency ratio in several of the countries. By 2030 and 2040 this

assumed growth in the pool of potential workers becomes a significant share of the total projected working age population in some countries. If the assumed rates of higher fertility are not realized in fact, the real pool of workers will be much smaller than being estimated in the projections. If fertility has been overestimated, an even larger behavioral response than reflected in Table 10 will be required to offset the effects of growing aging dependency in the developed economies of the world.

Table 11 shows the assumed behavioral change in labor force participation rates for men aged 55 to 64 between 2000 and 2050. In many of the countries, the assumptions seem reasonable with the assumed participation rates of older men holding steady at current rates or continuing to decline slightly. In a small number of cases, however, the assumptions seem overly aggressive. This is most particularly so in Austria where the labor force participation rate of men aged 55 to 64 is expected to increase nearly 18 percent this decade and by a whopping 88 percent by 2050. Germany, Italy, and the Netherlands are also projecting significant increases in the work behavior of men in this age range during the current decade.

Structural Assumptions used in Projecting Aging Costs

Another difficult aspect of projecting the costs associated with aging in a society is developing models that actually capture the operations of the retirement benefit programs the projections cover. This is complicated at the national level and becomes significantly more complicated when projections are being developed across a range of countries because the retirement programs vary significantly from country to country. Recent efforts in developing cross national projections have tried to overcome this problem to the extent they can by working directly with the people who do the actual

program projections in the various countries where OECD and EC projections were developed. In the United States, for example, the actuaries who regularly develop the official projections for the Social Security retirement pension program developed the US pension projections for the OECD-EC effort. The OECD and EC worked with the national authorities in the various countries to achieve some consistency across nations in the underlying assumptions about the macroeconomic environment in which the retirement programs are expected to operate.

The approach taken in the recent modeling of national retirement systems probably comes much closer to capturing the actual character of those systems than prior cross-national efforts. It is still possible, however, that these models are not adequately reflecting the relationship between the growth in benefits and the financing sources over time. Consider a country with a system that runs largely on a pay-as-you-go basis that is financed by taxes on workers' pay and where benefits are based on the workers' earnings history under the program. Benefits in a system of this sort are typically based on lifetime earnings either being indexed to account for the growth in earnings or prices over a person's work history. The cost of these systems is the product of the dependency ratio in the system, the ratio of the number of beneficiaries to workers paying taxes, and the benefit ratio, the ratio of average benefits paid by the system to average wages covered by the supporting tax.

In valuing future benefits under such systems, there is generally an underlying assumption that benefits increase over time on some proportional basis in correspondence with the rate of growth in wages when controlling for changes to the dependency ratio. In the cases of systems that are fully wage indexed for initial benefits and increments in

benefits after retirement, like Germany's, the underlying assumption is that benefits will grow over time in direct correspondence with wage growth. In valuing systems of this sort, the revenues to support the system grow in direct correspondence with average wages, assuming a constant percentage of wages are taxed. In cases of systems that are price indexed for initial benefits and increments in benefits after retirement, like Belgium's, the underlying assumption is that the benefits will grow in correspondence with average prices. In valuing systems of this sort, growth in wages is usually assumed to exceed price growth, so revenues grow over time relative to benefits after controlling for changes to the dependency ratio. In cases of systems that are wage indexed for initial benefits and price indexed after retirement, like the US system, the underlying assumption is that initial benefits will grow at the rate of growth in average wages supporting the system. If wage growth exceeds price growth, however, overall benefits will grow at something between the rate of growth in wages and prices. Thus, controlling for the dependency ratio, revenues in these systems should gradually gain on benefits over time if wage growth steadily exceeds price growth.

There are two possible processes where average benefits under these systems might grow more rapidly than the rate of average wage growth would imply. The first is where the systems continue to mature in a way that the formula linkage between benefits and wages does not hold. The second is where the formulaic basis of benefits is not tied to the financing basis and the two do not grow on a corresponding basis. We believe that the projections of national retirement costs for many developed countries are affected by both of these conditions.

Extended Maturing Process of National Retirement Programs

Ignazio Visco suggested that one of the important reasons for the extent to which OECD estimates of pension costs developed in 1988 for 1995 fell short of actual pension costs in 1995 was the "failure to account for the maturation of pay-as-you-go pensions" (2001, p. 80). This is a common problem that pension plans have during their early years of operation if benefits are based on duration of service under the plan or a measure of aggregate earnings while participating in the plan. In these arrangements, individual benefit levels grow gradually as successive generations reach retirement age. The problem persists, to a certain degree, until a birth cohort of workers has as many years under the plan as it takes to earn a maximum benefit. The problem can be exacerbated if policymakers enhance benefit levels during the phase-in of the program.

Most of the retirement systems in the developed countries have been in operation long enough that this problem should be largely overcome at this juncture. There are two facets of these programs' operations, however, that can result in benefits continuing to grow more rapidly than the wage base that supports them for some time well into the future. One is changes in the underlying laws defining the systems that expand benefit obligations on a gradual basis. The other is the changing labor force pattern of women in recent decades and the expectation that those patterns will continue to evolve for the next several decades. The simple existence of these phenomena does not result in underestimation of cost of retirement systems. It is failure to account for them that does. Examples of both of the phenomena identified can be found in the US Social Security program.

In 1972 the US Congress adopted legislation intended to automatically index various elements of the Social Security pension system. There were some problems with the legislation that combined with a period of high inflation during much of the 1970s led to a substantial increase in benefits for new retirees. By 1977, benefits were exploding so rapidly that Congress had to step back in and restructure the indexing of the system. At the time these changes were adopted, the maximum earnings level on which payroll taxes were levied to support the system was also increased significantly (See Schieber and Shoven, Chapters 10 and 11 for the details of these events). Under the US retirement program, benefits are determined on the basis of the highest thirty-five years of a worker's wage indexed earnings.

When the program was changed to significantly increase the maximum payroll that would be taxed under the programs, it had the side effect of increasing the level of earnings that would be used to determine benefits for anyone who had earnings above the old maximum. In the first few years, this had very little effect on benefits because the higher earnings were for very few years being averaged across a career of thirty-five years of earnings. As time passes, it is becoming increasingly important because more and more years at the higher earnings levels are being included. The full annual effects will not be realized until 2014 when up to thirty-five years at the higher earnings levels might be included in some benefit calculations.

The issue with the increasing labor force participation rates of women is very similar to that of the phasing in of higher taxable pay levels under the program. As the analysis earlier showed, the labor force participation rates of women in the United States have been increasing for several decades although the rate of increase has dropped

significantly since the baby boom generation of women has reached working age. The US Social Security pension system has paid dependent benefits to non-working spouses of covered workers since benefits were first paid by the program in 1940. The basic benefit for a dependent spouse is 50 percent of the retired worker's benefit. As women have increased their labor force participation rates and extended the duration of work outside the household, the benefits they have earned in their own right have grown to exceed their benefits as dependent spouses. As a result, the average benefits paid to women has been increasing. It will continue to do so until the high employment rates realized among younger women in recent years are reflected across full careers. In Germany the national retirement program does not pay dependent benefits. The effect of increasing labor force participation rates among women there could have an even more pronounced effect on aged dependency rates and average benefits across the whole elderly population than in a country like the United States where nonworking spouses have always received benefits.

The typical description of retirement plans where benefits are indexed at the rate of growth of wages is that benefits grow in lockstep with wages. In cases like the United States, where initial benefits are indexed to the rate of growth in wages this has not proven to be the case because of the phenomena just discussed. In the United States, initial benefits are based on a worker's average indexed monthly earnings (AIME). The index factors for calculating the AIME are equal to the ratio between average national wages when the person turned sixty and the average national wages in the year the earnings were generated. In calculating the AIME, only taxable earnings up to the maximum taxable amount in each year are considered.

After multiplying each entry in a worker's earnings history by the appropriate index factor, the Social Security Administration generates the individual's indexed earnings history. The next step is to determine the individual's highest 35 years of indexed earnings. These are the only years that count. If someone worked for 45 years, the taxes they paid in the ten years with the lowest indexed earnings will not affect their retirement benefits. After determining the 35 years with the highest indexed earnings, the Social Security Administration calculates the individual's AIME by simply adding up the indexed earnings in those 35 years and dividing by 420. The divisor is 420 because that is the number of months in 35 years. If the potential retiree didn't work for 35 years, then some of their highest 35 years of indexed earnings will be entered as zeros.

Once the average indexed monthly earnings (AIME) has been calculated, it is used to compute the primary insurance amount (PIA) the basic measure determining how much the retiree will get per month in initial benefits. The PIA is the amount that a single person would get at the normal retirement age, 65 years and six months in 2002, but the benefit amounts for people in other circumstances (e.g. married or retiring at a different age) can be determined directly from the PIA. The PIA formula for 2002 is (a) 90 percent of the first $592 of AIME, plus (b) 32 percent of AIME between $592 and $3,567, plus (c) 15 percent of the amount the AIME exceeds $3,567. The dollar figures in the PIA formula are indexed to the national average wage index and will likely increase accordingly for years 2003 and beyond. There is no legislation on the books to change the percentages. Figure 5 plots the PIA formula. Figure 5 only plots the PIA benefit level for AIMEs ranging up to $4,770 because the maximum possible AIME for someone retiring at age 62 in 2002 is $4,770. This is the AIME that someone would have

if they earned more than the maximum taxable amount for each of the 35 years 1966-2001. Their PIA would be $1,665.25 per month.

If all of the factors used in calculating the AIME and PIA had been in place for the full history of the program and labor force participation rates were stable over time, the system's average AIMEs and PIAs would increase over time at the rate of growth in average wages. But as the discussion above indicated, neither of these is the case. We have been able to estimate the implications of the combined effects of the increase in the earnings taxed under the payroll tax and increasing labor force participation rates on the AIMEs in the US retirement system. It appears that the effects are significant.

Figure 6 shows the AIMEs of three groups of people receiving Social Security retirement benefits in 1994. The groups include all of the beneficiaries at the ages of 62, 65, and 70 at that time. We picked age 62 because that is the earliest age at which workers qualify for benefits. We picked 65 because it was the normal retirement age in 1994. We picked 70 because it is the most advanced age among the groups for which we have data. Given the way the data is presented in the figure, the lower the line, the higher the distribution of benefits across the age groups. For example, among the folks at age 70, virtually 100 percent of them had AIMEs below $2,200. For the age 62 group, a third of them had AIMEs above that level. The difference in the lines suggests that AIMEs grew over the period from one group to the next. Indeed, the median AIME grew at an annual rate of 5.1 percent per year between the time 70-year-olds in 1994 had reached age 60 (in 1984) and the time the 62-year-old age group in 1994 had reached that age that age (in 1992). The annual rate of increase in the average AIME over the period was 5.2 percent. Average wages grew at 4.5 percent per year.

One possibility in looking at just two cohorts in analyzing the rate of growth in AIMEs relative to average wages is that we picked up something anomalous in the data because of unique behavioral characteristics of the two groups. So we looked at the average AIMEs across the full set of US Social Security retirement benefit recipients ranging in age from 62 to 70 in 1994 and calculated the growth rates for every possible base year. For example, using the 70-year-old cohort as a base, we could calculate the annual rate of growth in average AIMEs for each individual cohort ranging between the ages of 62 and 69. Using the 69-year-old cohort as a base, we could calculate growth rates for cohorts between the ages of 62 and 68. And so forth. In calculating the growth rates, we started by wage indexing all of the AIMEs to put them on the same basis as people retiring at age 62 in 1994. We did this by dividing the average wage that defined the 1994 age 62 cohort wage index (i.e., average wages in 1992) by the similar average wage that defined the index for earlier cohorts. The result of each of these calculations is the rate at which AIMEs from one cohort to another grow at different rates than average wages did across the period when each had their benefits set.

The results of our calculations are shown in Table 12. Of the 36 cells in the table, there are only two where the AIME did not grow more rapidly than average wages between the base year and the year a subsequent age cohort reached retirement age. The median growth rate among all the cells in the table is 0.47 percent. In summary, over the period in which this measurement was taken, initial benefits paid to retirees under the US Social Security system were growing at a rate of about 0.5 percent faster than wages on which payroll taxes were levied to finance the system.

As noted earlier, the mere fact that benefits may be growing more rapidly than wages that support these national retirement systems may not pose a problem for the assessment of their long-term cost. Today, the actuaries who regularly value the US Social Security system's costs and long-term obligations take the adjustments we have identified into account. However, several years ago, from one valuation year to the next they recognized a substantial deterioration in the long-term financing balance of the system because they changed their perspective on the rate of growth in women's benefits.

At this juncture we cannot certify one way or the other the extent to which the phenomena we have identified here are being taken into account in anticipating the cost of other national retirement systems in the developed world. The magnitude of the effect on the US system suggests that it could be a significant item if not anticipated properly. In the recent set of projections developed by the OECD and EU of the retirement systems in the major developed countries, they estimate that the benefit ratio will reduce the costs of pensions relative to GDP between now and 2050. On average the reduction due to this phenomenon is estimated to be 2.8 percent of GDP for the European Union countries (Costello and Bains, pp. 26-27).

In the analysis above, we have focused on the relationship between growth in initial benefits and the growth in average wages. In the OECD-EU analyses the benefit ratio is defined as the ratio of the average pension to GDP per worker. The two are definitely different. Costello and Bain note in their analysis that there are several reasons their benefits ratio can be expected to fall. One is that the pension systems they are analyzing have been reformed. This is true for some, but definitely not all of them. Another reason is that in many of the systems benefits in payment status are indexed to

prices and not wages or GDP growth rates. Again this is true in some cases but not all. Finally, they note future households may have two pensions but the average of them will be lower than the historical average. While this may be true of the benefits ratio that they identify, it would have an offsetting effect on the percentage of the elderly receiving benefits and thus result in a cost increase for the overall systems.

A Case of Inherent Benefit Growth Exceeding Growth in the Financing Base

Our analysis of the growth in pension benefits exceeding the rate of growth in the financing base supporting them suggests that this is a temporary phenomenon, albeit one that might extend over several decades. In the case of health care, there is reason to believe that a similar phenomenon exists and may well persist over time. This is likely to be the case for two reasons. The first is that there is no direct linkage in the actual benefit provided through national health insurance programs and the base on which these benefits are financed. The second relates to the nature of the benefit that is provided and how it is evolving across time.

In the case of a pension, a direct linkage between the benefit and the financing base can be established by plan design. In most countries with pay-as-you-go financed retirement systems a substantial portion of the benefit is based on earnings or income before retirement that also serves to define the base against which much of the tax supporting the systems is levied. In the case of health care, the benefit is based on the health status of the retiree population at a point in time, the standards of service delivery for treating various health needs of that population, and the price of services in providing such treatment. There is no direct tie between the benefits provided in this case and the financing base to pay for them. Putting aside demographic issues that imply increased

dependency in the future, this is not a particular problem as long as the average benefits provided to the eligible population grow at rates that are consistent with the growth in the financing basis.

One reason there is considerable concern about the implications of aging societies on health care expenditures in developed countries is that older people in these societies consume considerably more health care on average than younger ones. Figure 7 shows the pattern of age-related public per capita expenditures on health care in a number of European countries and Figure 8 shows a similar pattern of per capita total expenditures on health care in the United States. When you consider this pattern of health spending in combination with the anticipated growth in the relative size of the aged populations in these countries, the initial reaction is that health costs could explode over the coming decades.

There is an alternative perspective on the implications of aging populations on health care costs. This perspective follows from the observation that a disproportionate share of health care costs over a person's life are spent over a relatively brief period before death. Lubitz and Riley (1998) analyzed Medicare expenditures in the United States for the period 1976 to 1988 and found that medical costs for beneficiaries in their last year of life were about seven times those of beneficiaries who did not die. They found that about 27 to 28 percent of all Medicare payments were made to people in their last year of life. Medicare in the United States covers both the elderly population ages 65 and above and people who have qualified for disability pensions under the system. In a subsequent analysis, Garber, MaCurdy and McClellan (1998) analyzed U.S. Medicare

expenditures on the elderly Medicare population for the period from 1988 through 1995. Their findings were similar to the earlier analysis of the total Medicare population.

Even within the last year of life, expenditures tend to be very concentrated at the end of the period. Lubitz and Riley found that about 52 percent of all Medicare payments in the last year were concentrated in the two months of the year and about 60 percent in the last quarter. Garber and his colleagues found somewhat less concentration with between 40 and 45 percent of the last year's payments being concentrated in the last quarter of the year. A similar study looking at health costs of members aged 65 and above of a large Swiss sickness fund (Zweifel, Felder and Meiers, 1999) found results consistent with Garber, *et al*. In a rural sample of cases spanning the period from 1983 to 1992, they found that 49 percent of terminal year costs were concentrated in the last quarter. In a more urban sample covering the period 1983 to 1994, they found that 42 percent of terminal year costs were incurred in the last quarter.

Zweifel and his colleagues developed an econometric analysis to test whether health care expenditures were driven by advancing age or by remaining time until death. In the last two years of life they found that age had no effect on health costs once they controlled for remaining lifetime. They found the same result when they extended their analysis to cover the last five years of life. They concluded, "per capita [health care expenditure] is not necessarily affected by the aging of the population due to an increase in life expectancy. Rather an increase in the elderly's share of population seems to shift the bulk of [health care expenditure] to higher age, leaving per capita [health care expenditure] unchanged" (p. 493).

In developing their projections of the implications of population aging on the health care costs facing various developed nations, the EC and OECD developed projections on somewhat different bases. While they undertook this modeling as a joint project and their input assumptions are generally consistent, the results they have reported in various places are not consistent. For example, in the OECD Economic Outlook from June 2001, the OECD presents results that show Belgium's spending on health care and long-term care would grow from a baseline of 6.2 percent of GDP in 2000 to 9.2 percent of GDP in 2050 (OECD 2001, p. 154). By comparison, the EC has more recently estimated Belgium's spending on total health care and long term-care would grow from a baseline of 6.1 percent of GDP in 2000, a difference that might be explained by rounding error. But the EC projects that Belgium's spending in this area would grow to 8.2 percent of GDP where they assumed that average expenditures per head would grow at the same rate as GDP per capita in 2050. Alternatively, they projected costs would grow to 8.5 percent of GDP where they assumed that average expenditures per head would grow at the same rate as GDP per worker. Neither of these rates correspond with the OECD projection results (Costello and Bains, 2001, p. 44). The results for several other overlapping countries have comparable differences.

Part of the explanation for these differences is that the results are continuously being refined and the results released in the two reports are simply of different vintages. When the OECD put together their Economic Outlook report in June 2001, the EC had not yet developed their health care projections. The OECD may have relied more on the assumptions set at the local country level than the EC did when they ran their estimates

later. And it appears that the OECD has not yet gone back and developed health care estimates on the same common assumptions and methodology platform that the EC used.

Focusing purely on the EC results for the European Union countries' expenditures on health care only, the results of their projections for 2050 are presented in Table 13. We have included both their projections on public expenditures for health care and pensions for comparative purposes. In most cases the projected increases in public expenditures on health are expected to be relatively moderate and considerably less than projected increases in pension expenditures over the same period. But these health projections should be used with caution.

Costello and Bains (2001, p. 40) warn that the health care cost projections carried out in the OECD and EC exercise "cannot be considered to be likely 'real' levels of future public expenditure on health and long-term expenditures." They identify the problem with their projections is that they only measure the impact of anticipated demographic changes under two limited sets of assumptions about health costs growth rates. They acknowledge that they ignore other factors, most notably technology, which might drive up future health expenditures. Simply assuming per capita health costs grow with a country's demographic profile indexed by increases in per capita GDP or productivity has the potential to either overestimate or underestimate future costs. It might overestimate them because of the phenomenon that costs tend to be concentrated at the end of life. One of the main reasons there will be more old people in the future is because death rates at every age are declining. If future populations of the elderly do not die at the same rate as contemporary elderly populations and health costs are largely tied to dying, simply projecting health costs on the basis of aging will tend to lead to

overestimates of cost increases. On the other hand, the failure to model the evolution of medical technology, differences in medical prices inflation compared to that of other goods and services, and the relative intensity of services provided to older people not immediately approaching death will tend to lead to underestimates of cost increases.

George Schieber and Jean-Pierre Poullier (1989), and later Schieber, Poullier, and Greenwald (1992) identified the arithmetic for sorting out the components of growth in health costs across countries. Huber (1999) has used their structure more recently to evaluate health trends in OECD countries from 1970 to 1997. We have adopted the approach they have specified to evaluate historical patterns of utilization, sometimes referred to as volume intensity, and of relative price inflation for medical services across the OECD countries. There are always problems with such cross-country comparisons because of the different accounting for medical services from one nation to the next. But the OECD has been working with its member countries in recent years to use consistent definitions and procedures to allow these sorts of analyses to be done on a more consistent basis. While there may not be perfect consistency across all countries, the patterns of results across countries are certainly illustrative of the implications of ignoring these factors in projecting long-term health costs.

Table 14 shows the rate of excess health inflation over the last three decades in the OECD countries where there was sufficient data to calculate the measures. The rates are calculated by subtracting the economy wide inflation rate, as measured by the GDP price deflator in 1995 local currency units, from the health care price index for the selected countries. A positive number in the table means that health prices were growing

more rapidly than general prices in the economy and a negative number means the opposite.

In nine of the 15 countries for which we could calculate values in the 1970s, the rate of health inflation outpaced general price inflation. In the 1980s, health price inflation outstripped general inflation in 16 of 19 countries for which we could do calculations. In the 1990s, 17 out of 21 countries reported health price inflation that exceeded general price inflation. The only country where health cost inflation was held below general price inflation across the whole period was France. George Schieber (1990) has questioned whether Frances's results in this regard might be the result of faulty health care price deflators rather than really holding health price inflation below general rates. Denmark, for which we could only calculate the index for the 1980s and 1990s, also has medical price inflation below general inflation for a sustained period according to the calculations. Otherwise, to the extent some countries had decades in which they registered a negative rate in Table 14 their results overall were mixed. Overall, the trend in most countries in this measure is positive, and in quite a number of cases, it is strongly so.

One of the important reasons that health costs have risen in most countries in recent decades has been change in utilization rates of health goods and services. Partly this derives from the evolution of health technologies; there are simply more things that medical providers can do to keep people alive and functional than in the past. Partly it derives from the overall growth in incomes and the observed positive relationship across countries between income level and health consumption. Partly it is the result of the way we finance health care in most developed countries where the large majority of services

are paid for through insurance mechanisms. When consumers are shielded from the market prices of the goods or services they purchase, the demand levels are typically higher than when they have to pay directly for what they buy.

The growth in the intensity of health consumption is not directly measurable. It can be derived, however, by factoring out the increases in health care expenditures that are associated with price inflation and population growth. The results of doing this are shown in Table 15. The growing intensity in the utilization of health goods and services is shown there in two different measures. In the first set of columns, we focus on the compound growth in real spending per capita. In the second set of columns, we look at the rate of increase in health care consumption per capita relative to the rate of growth in GDP per capita. The first set of growth rates focus on the absolute growth in the consumption of health care whereas the second look at growth relative to overall economic capacity.

Focusing first on the growth in real spending on health care per capita, once again, the vast majority of the entries in the table are positive. France, where health price inflation seemed to be under control from the data, has consistently had substantial growth in real per capita expenditures on health. In many of the countries, the rates of growth in real health expenditures per capita have slowed in recent years compared to earlier times reflecting aggressive programs in several counties to bring their health care systems under control.

Possibly a better indicator of the increasing utilization of health services is to compare the growth in health consumption on a per capita basis to the growing economic capacity of a country as measured by GDP per capita. Among the larger economies in

the list of countries, Germany and Japan stick out as recording fairly significant increases in increasing utilization of health services over the past decade. In the majority of countries, the trends in recent years have been toward slower growth in utilization than in earlier years, once again reflecting the aggressive efforts many countries have undertaken to bring health care under control. Graig (1999) has used a variety of colorful terms to describe the systems and efforts to reform them in various countries. She characterizes the U.S. system as being in "constant flux;" " health care reform as a permanent state" in Germany; and the implementation of competition and free market principles to the United Kingdom's National Health Service as "mission impossible."

The combination of Tables 14 and 15 bring to mind a characterization sometimes applied to the U.S. health system as being a bulging balloon which policymakers squeeze to control it's overall expansion. The problem is that as they squeeze on one side of the balloon, another part of it bulges outward. The cost of health care services in any country is the product of prices and the volume of services that are delivered. Pressures to bring prices under control often result in health providers simply increasing the volume of services they provide. Pressures to control the volume of services delivered throws pressure right back on prices.

In the 21 countries in which we have all the elements for computing excessive health inflation during the 1990s and increasing per capita utilization, ten of them recorded positive growth in one of the two and negative growth in the other. In another eight of these countries, both excessive inflation and higher volume intensity were positive during the 1990s. In only three did both decline. The net result of these pressures in combination with population growth is that health consumption in most

developed countries has been growing relative to the rest of the economy as shown in Table 16. We believe that it is impractical to assume that the excessive price inflation will not persist in the future or that we will not continue to experience further increases in per capita utilization of services across the set of countries under consideration. It is clear that the folks at the European Commission who developed the projections, reflected in Table 13, share our conclusion.

The important question in evaluating whether the EC or OECD projections are reasonable is the extent that assuming health costs increase with age and ignoring time until death results in the overestimation and if it covers the underestimation from not considering excessive price inflation and increasing utilization. Cutler and Sheiner (1998) have developed an analysis for the United States that will help sort out this question in at least one country. Their analytical framework takes into account the number of people in each age group, the average health status of people in the group, and the average medical spending conditional on health status. Their analysis is limited to the Medicare program in the United States so it is a more limited population than that covered by the national health insurance program in many countries.

Cutler and Sheiner assess the implications of accounting for changes in age of death on per capita medical costs under the U.S. Medicare program through a series of simulations. They also control for the rate of reduction in disability among the surviving elderly. They used historical evidence on reported limitations to daily activities and on days confined to bed for people at advanced ages to show that disabling limitations were declining across the surviving elderly population at any given age. They present evidence that shows the gains in this regard being realized in the United States are also

being realized in other countries. They used their analysis of the U.S. population to develop a regression analysis of the relationship between disability and medical expenditures from which they concluded "that a large part of the relationship between health costs and age is better attributable to the relationship between disability and age. Once disability is accounted for, the relationship between health expenditures and age is much weaker" (p.22). They estimated that two-thirds of the difference in spending on medical care for those over 85 is attributable to disability rather than age. They used these results to simulate future health costs assuming disability continued to decline somewhat in line with the empirical evidence developed.

The results of Cutler's and Sheiner's simulations of future health costs for the elderly, taking into consideration improving life expectancy and the improving health status of survivors, are reflected in Table 17. In their baseline projection, that essentially parallels what the EC has done in its projections, average health costs in 2050 would be 9 percent higher in constant dollars than in 1992. By accounting for changes in the age of death, the 9 percent increase disappears. By accounting further improvements in the health of survivors, average health costs in 2050 are projected to decline by 9 percent from the 1992 baseline.

Cutler and Sheiner also analyze the implications of changes in death and disability patterns in estimating future U.S. Medicare expenditures on the elderly in combination with assumptions that costs continue to rise more rapidly than GDP as they have historically. The results of this analysis are presented in Table 18. In this case, they presented the estimated Medicare spending on the elderly as a percentage of GDP. As in Table 17, the effects of accounting for improvements in life expectancy and the disability

experience of survivors reduces the projected costs of Medicare relative to assumptions that age-specific costs will be constant over time. In the simulation, where they assume that the cost of medical services will increase at the rate of growth in GDP per capita, the increased costs associated with the aging population are projected to rise from 1.7 percent of GDP in 1992 to 3.1 percent in 2050. In this case, the increase in Medicare costs from 1992 to 2050 for the elderly is projected to be about 40 percent less when considering improving health status than when ignoring it. It appears that ignoring the improving health status of the elderly does lead to significant overestimates in future costs of health care attributable to the aging phenomenon going on in developed countries.

While ignoring improvements in health status of the elderly might lead to overestimates of health costs, Cutler's and Sheiner's analysis suggests that ignoring the relative increase in cost of medical services might be far more important. In the last two lines of Table 18 we show their results for a set of simulations they ran where they allowed Medicare costs to grow at the historic rate they have grown relative to GDP growth. While taking account of improving health status of the aged is still important for the results, the effects of costs accelerating more rapidly than the growth in GDP swamps the health effects. Including the historical escalation in health costs relative to economic growth results in an estimate of Medicare costs for the elderly in 2050 that are more than four times the estimate when they are not included. In other words, it seems that ignoring health improvement patterns is important but ignoring the unique cost characteristics of health care is more important.

For years, the U.S. Medicare program's future costs have been estimated under the assumption that average per-beneficiary costs would increase at about the same rate

as the underlying sources of funding for the program. The system is financed under two separate mechanisms. The Supplementary Medical Insurance (SMI) program largely covers doctors' fees and is financed through premiums from the beneficiaries that cover about 25 percent of the operating costs and the remainder from general tax revenues. In projecting SMI costs, the assumption about their future growth rate was that it would ultimately be at the same rate of growth as per capita GDP. The Hospital Insurance (HI) program, which largely covers hospital charges, is financed by a payroll tax. Here the assumption was that HI costs will grow over the long term at the rate of growth in wages.

Periodically in the United States, both the Social Security pension and medical systems and the projections of their future costs are evaluated by technical panels of outside experts who are gathered to assess the underlying assumptions and method used to evaluate these programs. In December 2000, such a panel concluded a review of the Medicare system. They came to the conclusion that the assumptions about future health care costs facing the system were not reasonable given the historical pattern of cost increases and the aging of the population that the program will cover. They concluded that the "long-term, age and gender-adjusted growth rate of medical spending per beneficiary should be revised upward to a rate that is 1 percentage point above the expected growth rate of GDP per capita" (Technical Panel, p. 28). In the 2001 valuation of the SMI and HI programs, this modified assumption was adopted. The results of the 2000 and the 2001 projections of these programs are presented in Table 19.

The results in Table 18 show that the implications of the special cost considerations related to health care are important in the projections of these sorts of systems. The differences in these projection results are not as large as those in the Cutler

and Sheiner analysis because the latter used a higher rate of growth in health costs compared to GDP growth than was used in the 2001 official valuation of the program. Cutler and Sheiner used the experience in health costs in the United States for the whole period since the end of World War II, whereas the basis for the difference recommended by the Medicare Technical panel last year is based on more recent experience. There is some reason to believe that the long-term health cost escalation rate chosen by the Technical Panel might be somewhat conservative. It really depends on whether the recent, somewhat favorable history of health cost growth in the United States will persist.

There were two factors that helped to make the 1990s health cost experience in the United States somewhat more favorable than in prior decades. One was the widespread adoption and implementation of managed care programs. But there has been considerable backlash on the part of the public to these programs and it is not clear that their ameliorative effects can help to control costs over the long term. The other thing that tempered the cost increases relative to growth in the remainder of the economy was the significant expansion of the economy during the 1990s and the high rates of increase in worker productivity and wages when compared to recent history. There is a question of whether those rates of productivity and wage growth will persist through the first decade of this millennium and further into the future as the population ages.

One natural reaction to the results from the perspective of other countries is that the United States is in a league by itself when it comes to health care costs. It is true that the US expenditures on health care per capita exceed those of all other developed countries. But looking back at the earlier analysis, one-third of the countries we looked at had higher rates of excess health price inflation in their economies during the 1990s

than the United States. And one half of the countries recorded higher rates of growth in the real per capita utilization of services than the United States. Finally, almost every developed country in the world is facing more severe aging of its population over the coming decades than the United States. Even though controlling for increases in longevity and declines in disability among the aging will reduce the projected health costs associated with an aging population, an older population will still consume more health care than a younger one. Any set of long-term health care projections that does not take into account the peculiar nature of the health care market is not adequately considering the costs they face. We believe the current method of valuing these long-term costs in most developed countries is leading to substantial underestimates of the costs that are likely to occur.

Economic Assumptions Used in Projecting Aging Costs

In their attempts to control the potential fiscal burden of aging societies, policymakers have primarily utilized means to directly control the dependency ratio or benefits ratios in their retirement systems. Raising retirement ages or introducing incentives that encourage workers to extend their careers has the potential to increase the number of workers in the future while reducing the number of beneficiaries, thus reducing the dependency ratio. Reducing benefit levels explicitly or moving from wage indexation to price indexation of benefits will reduce the benefits ratio. Either or both have the beneficial effect of reducing retirement program costs over time.

In the interest of controlling retirement plan costs, policymakers can also implement a set of complementary policies that promote a faster pace of economic growth. Increasing the rate of economic expansion and improving standards of living are

generally policy goals in their own right, but they have the potential beneficial side effects of reducing the burden levels retirement programs place on an economy. Two important economic variables that policymakers often watch closely are unemployment and labor productivity. High rates of unemployment are signs of general economic inefficiency, but they also have the potential to reduce the aged-dependency ratio in a society. High rates of growth in worker productivity translate into improving standards of living, but they also offer the potential to suppress the benefits ratio in national retirement systems. In modeling retirement programs, analysts have to make certain assumptions about how public policies will ultimately play out in the evolution of an economy, including assumptions about unemployment and labor productivity. These assumptions have enormous implications in the future cost estimates of retirement programs relative to a country's GDP.

Economists generally explain economic production in terms of a fundamental model where three major factors contribute to production: human capital, physical capital and technology. Workers and their inherent work-related capabilities make up human capital. Physical capital is the physical plant and tools available for the production of goods and services. Technology comprises the knowledge and skills embedded in production processes.

A basic premise of this model is that human capital can be expanded in two dimensions: increasing the number of workers or increasing productivity. Another premise is that more physical capital will make workers more productive—up to a point. This model assumes that there is a certain amount of substitutability between workers and capital, but that beyond some level, workers simply cannot use more tools. For example,

one worker with an air gun might drive as many nails in a day as three workers with regular hammers, but giving the worker two air guns will not double his productivity in most cases. So there are limits to the extent to which physical capital can be effectively substituted for human capital. Technology evolves over time and may enhance the productivity of physical capital, human capital or both. Technology can also alter the extent to which capital and labor can be substituted for each other.

In this context, the ability of an economy to utilize it's human capital to a greater extent than it has in the past will serve to boost the level of output. One way this can be accomplished is through increasing the number of workers employed. The alternative is to utilize the pool of workers available more effectively by increasing their productivity.

Unemployment Outlook

Raising labor force participation rates of women and the elderly could go a long way toward increasing the numbers of workers in aging economies. However, our analysis suggests that some countries may have considerable difficulty meeting the assumed increases in the labor force participation rates of women or older people in their societies. Alternatively, the number of employed individuals in the workforce could also be raised through a reduction in unemployment rates, especially in countries where unemployment has been chronically high.

Table 20 reports the unemployment rate for a number of OECD countries at selected points during the last thirty years and the unemployment rates assumed in the estimation of future public pension and health expenditures by the OECD. The most noticeable trend since the 1970's is that many of the OECD countries have experienced marked increases in unemployment rates. For example, Germany encountered over a ten-

fold rise in its unemployment rate between 1970 and 2000. In Germany's case some of the increase might have been related to the reunification between East and West Germany, but France, Italy and Spain have each experienced increases in their unemployment rates that aren't that much different than Germany's. Japan, which has historically maintained low rates of unemployment, has also begun to report increases in its unemployment rates. This is not to suggest that the trend in unemployment rates is consistent across the set of countries as a number of them have posted declining rates during the 1990s.

In projecting the programmatic costs associates with aging in these countries, the assumptions used suggest that unemployment rates in the countries that have experienced high rates recently will fall and that the countries with low rates recently will generally rise, albeit moderately. In fact, a number of economies such as Spain, Finland and Germany are assumed to have significant declines in unemployment over the coming decade, with further reductions projected by 2050. Whether or not these expectations are met will depend on the underlying causes of past trends and, in the cases of countries with high unemployment rates, what policies are being adopted to reduce the levels going forward.

A common explanation for the varied experiences in performance between the European and U.S. economies over the most recent decade is that the United States labor markets are much more flexible than those in Europe and Japan. Whereas the laws on hiring and firing in the United States are relatively weak and uncomplicated, those throughout much of Europe and Japan are complicated and often highly restrictive. The argument is that economies that rely on strict rules regarding employment protection,

fixed-term contracts, minimum wages, working time and employees' representation rights on work councils, company boards and the like, end up creating less efficient labor markets resulting in higher rates of unemployment. Higher levels of unionization also cause greater rigidities in the labor markets in many developed countries. Formal rules or historical traditions that restrict labor market flexibility impose fixed costs on employers in providing jobs to workers. Labor market restrictions also may have important implications on wage determination for people with jobs (Nickell 1997) whereby gains in productivity flow more rapidly to wages for individuals already employed than to profits, investment and increased employment for the unemployed.

In a recent report the Secretariat of the European Commission of the United Nations has argued that the "story" about relative rigidities in the labor markets in the United States and Europe as explanations for differing levels of unemployment are "badly flawed" (Secretariat 2001, pp. 7-8). They suggest the first problem with the argument is that labor markets in Europe itself are highly varied and that some of them outperformed the United States during the 1990s. Secondly, they note that labor market institutions in Europe are highly heterogeneous. Thirdly, they note that there is no strong empirical support for the notion that European workers have captured productivity gains in the form of higher wages to any greater extent than US workers.

As an alternative explanation for the performance of labor markets in Europe and the United States, the UN report turns to differences in macroeconomic policy during the 1990s as the plausible explanation. They suggest that such policies in the United States were more supportive of the growth in domestic demand, especially fixed investment, than in Europe. In the US case, favorable macroeconomic policy led to confident

expectations about economic growth that stimulated investment and thus rising productivity, which in turn led to higher profits, wages, and employment levels. The 1990s for much of Western Europe were characterized by restrictive macroeconomic policies significantly driven by governmental budgetary requirements in the Maastricht Treaty that had to be met for membership in the European Union. These policies resulted in relatively high interest rates and relatively low rates of fixed investment, especially investment targeted at economic expansion.

Which of these two perceptions about the differences in the economic behavior in Europe and the United States during the 1990s is correct may not make that much difference as the implications of aging populations are brought to bear. If the theory about labor market rigidities is correct, increasing pension costs are likely to exacerbate the price on job creation that such rigidities impose. If the theory about differences in macroeconomic policies and their effects on investment is correct, the increasing claims that programs for the aged impose on governmental budgets might severely limit policymakers ability to support expansionary macroeconomic policies for their local economies.

In any economy where there are minimum wage requirements, the imposition of payroll taxes on employers adds a fixed cost to the wage that is paid to a worker. Any additional restrictions imposed on the contract between the employer and worker impose additional fixed costs on providing a worker a job. In an aging society where the costs of supporting retirement plans are rising, the fixed costs associated with hiring and keeping a worker will increase. As this phenomenon occurs, more and more workers with marginal human capital will be rendered economically unemployable because their

potential marginal product will not match the cost of giving them a job. In this perspective of the world, the potential costs associated with an aging society would seem to suggest unemployment rates might rise rather than fall.

In any economy where the needs of the elderly are largely financed through government financing, a growing elderly population will increase the costs of the relevant public programs. In cases like the European Union where the Stability and Growth Pact limit member government's ability to run deficits, increasing costs for retirement plans are likely to limit other functions that governments perform. Governments may simply not be able to pursue policies that encourage aggressive economic investment as they meet their aging obligations. In cases where there are no limits on government borrowing, heavy deficit financing of the needs of the elderly are likely to result in reductions in available capital for investment and high interest rates, which will suppress the demand for investment capital.

In summary, unless several of the developed economies are willing to take steps to reduce labor market rigidities and adopt a new set of policies that promote investment, they are not likely to achieve significant reductions in their current unemployment rates. But even if these rates are achievable in the time horizon specified, there are obvious limits to the extent that increased employment rates will translate into enhanced output growth.

Enhancing Labor Force Productivity

An alternative to expanding the labor force in an effort to reduce the aged-dependency ratio is to utilize existing workers more effectively. In countries where post-retirement benefits are indexed as something less than wage rates, growth in wages has

the potential to reduce the benefits ratio, the relationship between benefits and average wages or growth in incomes. In countries where initial benefits grow at something less than the rate of growth in wages or income, the benefits ratio can be reduced even more by increasing wages. The mechanism by which wages or incomes can grow in real terms over time is through the growth of labor productivity, the growth in output workers produce during a basic unit of time. In the basic economic model, growth in labor productivity – measured as the ratio of GDP to hours worked – occurs through the accumulation of various kinds of capital, both physical and human, as well as through technological advancement.

Table 21 provides compound annual growth rates in labor productivity for the last three decades along with projections for the coming half-century that were used in developing the OECD and EC aging cost projections. The historical pattern of productivity improvement is somewhat mixed from country-to-country. Among the very largest countries, France, Germany, Italy, and Japan have shown a consistent pattern of declining rates of productivity improvement over each of the last three decades. The United Kingdom and the United States have shown a mixed pattern with some declines from one decade to the next and increases in others. Canada shows a steady pattern of improvement. The majority of the countries for which we could do the calculations have shown the pattern of consistently declining rates of improvement.

The assumptions about future rates of improvement in productivity, reflected in Table 21, suggest a reversal of the patterns that have prevailed recently in most countries. In all of the G-7 countries and most of the others as well, the assumed rate of increase in productivity for the current decade exceeds the measured rates for the 1990s. In only

four cases is the rate of improvement for this decade expected to be less than during the 1990s, although the rates are expected to be about equal over the two decades in Spain.

Increasing productivity improvement rates in the coming decades could occur for a relatively limited set of reasons. Some of the labor market rigidities we discussed earlier might be eliminated allowing employers to more effectively use existing labor pools. In the United States, during the latter part of the 1990s and during 2000, there was considerable discussion that information technology would be the foundation for the "new economy" in which worker productivity levels would surge at rates not seen since immediately after World War II. Outside of information technology, it is possible that other forms of technology might enhance workers' productivity rates. Finally, it is possible that managerial techniques and methods of motivating and compensating workers will enhance their productivity rates (Council of Economic Advisors, 2001).

There are reasons to believe that labor market rigidities that exist today in many countries are going to be difficult to eliminate. In many cases, the rigidities are there because of strong political support from organized labor or other groups. In many cases the benefits of labor market rules accrue to workers with substantial tenure and these will become collectively more valuable in any society with an aging workforce. The ability to change these rules will become increasingly limited as older voters make up a larger and larger share of the total body politic from country to country.

Much of the discussion about the new economy has focused on the explosion of technological improvements adopted by employers in recent years, especially those in information technology. While there has been a perceptible quickening in productivity growth in the U.S. over the latter half of the 1990's, there is evidence that indicates the

increase may not be as significant as conventional wisdom would have it. Gordon (1999, Table 1) disaggregated the rapid productivity growth in the U.S. during the latter part of the 1990s between manufacturing and the remainder of the nonfarm private business sector. Outside of manufacturing, the annual increase in worker productivity over the period was only 1.50 percent. Within the manufacturing sector, it was 2.05 percent for nondurable manufacturing, and 4.58 percent for durable manufacturing. But within durable manufacturing, the annual productivity increases were only 1.82 percent for firms producing goods other than computers—and 41.70 percent for those producing computers. Gordon concludes that the explosion of output and productivity growth in the latter half of the 1990s was almost entirely due to the production of computers.

Other technological breakthroughs outside of the information technology realm that will result in a significant leap forward on worker productivity also seem unlikely. The major economies will undoubtedly continue to invest in research and development that will gradually enhance workers' efficiency, but the advances will probably come in relatively small increments. The societies in the developed world may have greater potential to ameliorate their own aging burdens by accelerating their savings rates and investing in less developed economies where known technologies can be applied to significantly improve labor productivity rates there. The returns on capital invested in such a manner can later be repatriated to the savers in the developed economy to help cover the costs of aged dependency.

The ability to adopt new managerial techniques and incentives aimed at increasing workers' productivity levels will often face the same resistance and other changes to the rules and agreements that control the work environment in many

developed economies today. What may look like an incentive plan that encourages employees to work harder or faster from a manager's perspective will often look like a device to exploit workers from the perspective of defenders of status quo.

We simply do not see the basis for assuming that the trends in labor productivity, dating back more than a quarter century in many cases and almost a half-century in some, will be substantially reversed during the coming decade. However, even if these higher rates of productivity growth can be achieved, Visco (2001, p. 96) argues that the extent productivity improvement will ease the future fiscal pressures of aging populations is uncertain. This is especially true for countries like Austria, Denmark, Greece, Germany, the Netherlands, Portugal and Sweden, which index pensions in some manner to earnings. As a result, the faster growth in productivity would feed through wages and into higher per capita pension payments resulting in only a minor impact on government pension spending as a share of GDP. However, Finland, France, Italy, Spain and the United Kingdom, which do not tie pensions directly to earnings, could in fact receive moderate improvements in their fiscal budgets in the future due to higher rates of productivity growth.

Preparations for Older Age

One of the results of modeling the retirement systems in the major developed countries around the world has been a growing awareness of the potential problems an aging population can pose. This awareness has motivated a number of countries to adopt new policies that will ameliorate the burden that retirement obligations will impose on their economies. The fact that there is greater awareness on the part of policymakers about the problems associated with aging societies or that they have adopted policies to

deal with the phenomenon raises the question of whether the developed countries are doing enough to respond to the challenge aging populations pose. The answer to the question in particular cases, in part, depends to whom it is addressed. And a problem in answering the question is that there is no universally accepted objective measure of the level of cost for supporting the elderly that is appropriate.

Some countries have clearly done a great deal more than others in modifying the structure or the generosity of their retirement systems with the goal of reducing the prospective burden of aged dependency to tolerable levels. But then, some countries face a much larger aged dependency problem than others. For example, the aged dependency ratio in Italy, Japan and Spain in 2050 is projected to be about twice that of the United States in the analysis presented earlier. It may not be as crucial that the United States adopt policies to deal with its aging or that it do it as soon as those with a more serious aging problem. But then again, the United States has such a relatively expensive health system with attendant costs for its aged dependents that might more than offset any benefits it accrues from having less aging dependency.

In the European Union, the members are subject to the Stability and Growth Pact that requires that they run their government budgets "close to balance or in surplus." The expectation that each member of the EU will abide by this agreement gives this set of developed economies, all with aging population, a unique cross national interest in addressing the problem of rising aging obligations. It is not a coincidence that the major contribution the EC and OECD have made in helping detail the costs of aging across the developed economies evolved where it did. Both the EC and OECD are based in the

heart of the EU. One is exclusively made up of its members and the other is significantly comprised of them.

The views that the EC and OECD develop about the appropriate responses to aging are undoubtedly affected by a set of countervailing pressures from their members from the EU. On the one hand, each country has a vested interest in making sure that the others do not pursue policies that would adversely affect them while at the same time wishing to pursue policies in their own home countries that meet the needs and desires of their own local populations. In this regard, it is unacceptable that a member of the EU simply ignore the claims future aged dependency will impose on its economy under the assumption that they will simply use deficit financing to cover the cost as it arises. Such an approach would impose a drain on savings, diverting them from productive investment that would contribute to economic growth and would drive up interest rates. Both would have adverse effects on other member countries. The alternative of simply driving up contribution rates is also unacceptable because of its implications on labor costs and the adverse incentives on labor supply.

At the same time there are pressures across the membership of the EU to control programs supporting the elderly, the long history of social democratic institutions and sense of social solidarity within the societies there cannot be ignored. The historical goals of adequacy of benefits, social redistribution, and rights to access to health care services are fundamental principles in these societies.

The cross national concerns about the potential increasing costs from aging dependency have led the EU to be proactive in addressing the issue. A recent report by the Director General for Economic and Financial Affairs (2001) noted:

> There is a growing recognition that there are benefits to addressing issues related to ageing populations at EU level, with the result that the issue has featured prominently on the agendas of several recent European Council's (Stockholm of March 2001, Nice of December 2000 and Lisbon of March 2000). A comprehensive approach has been taken drawing upon the report *Maintaining prosperity in an ageing society* (OECD, 1998), which policies through which societies can transfer resources to a rapidly growing number of retired persons without creating major economic and social strains. Such an approach recognizes that budgetary sustainability in light of ageing populations must be accompanied with sustainability.

The European Council has established a Committee on Social Protection to develop policies to address both the budgetary and social concerns that bear on the matter of costs associated with aging in the member countries. The treaty establishing the EU relegates the development of pension and health policy within member countries to those countries themselves under its "subsidiarity" principle. This policy notwithstanding, the European Council has agreed that the "open method of co-ordination" be extended to pensions. It has also put a report, released in December 2001 on the quality and sustainability of the pension systems, on the agenda for discussion at the next European Council meeting to be held in Barcelona in March 2002.

In the December 2001 report the authors conclude (p. 213):

> Member States have already launched a wide range of reforms with the aim of tackling the ageing problem which they collectively face. Notwithstanding the reforms undertaken up until the end of the 1990s, the latest estimates of the effect on growth and on public expenditure on pensions confirm that the impact of ageing will be so significant and widespread that additional reforms will still be needed in order to address the associated growth loss and to put the public finances on a sounder footing. In this regard, the design and structure of public pension systems play a crucial role in determining the scale of the budgetary growth impact of ageing and consequently a discussion on the relative merits of individual pension systems is of the utmost importance.

The European Commission's earlier report (2001) reviewed the budget plans of the EU members against the standards in the Stability and Growth Pact from both a short-

term and intermediate-term perspective. In virtually all of the cases, they included comments in their country reviews on the sustainability of the national pension system under current law. In a number of cases, they also included comments about the costs that would be associated with aging under the health care system. In 10 of the 15 country reviews, there was a recommendation that further adjustments would likely have to be made to the pension system for the country to stay in compliance with the Stability and Growth Pact over the longer term. This conclusion was based on the modeling of the pension systems done by the EC and included assumptions that other non-age related functions of the various governments would continue to operate in the future at roughly the same size as currently relative to size of the national economy.

Outside of the original European Union members that have been the focus of the EC analysis, the countries that we have evaluated in various parts of this analysis include the Czech Republic, Hungary and Poland, Australia and New Zealand, Japan and Korea, and Canada and the United States. The Eastern European countries in the list are undertaking so many reforms as they transition to market based economies that it is difficult to assess the long-term viability of their governmental sponsored retirement systems. Many of these countries have adopted far more significant retirement system reforms than most of the developed countries around the world have thus far. Australia has undertaken fundamental reform of its retirement income system that would seemingly reduce its costs significantly in the face of an aging population. New Zealand has not been able to craft politically sustainable reform of its pension system thus far and faces essentially the same challenges as a number of Western European countries, albeit with a slightly less severe aging problem. Korea has a much younger population than most so

its pension financing problems are delayed accordingly. Japan is already in the throes of rapid aging and has shown a remarkable willingness to adjust its retirement system to make it more affordable. But there are a host of other structural social and economic issues that raise concerns over the long-term viability of its system. In North America, Canada has accelerated the increase in payroll tax rates to fund its system and reduced some benefits that put its pension commitments on much sounder footing than just a few years ago. But there are still concerns over whether Canada has gone far enough in providing for benefits in its current system. In the United States, an increase in the normal retirement age is now being phased in but there is nearly universal agreement the pension system is not sufficiently funded to sustain benefits for the retirement of the baby boom generation. There are no signs of consensus on how the US system will be adjusted in response to the current underfunding.

This set of conclusions about the viability of the pension systems across the developed economies suggests that the majority of countries have not yet addressed the challenges of aging populations. The picture drawn by the EC relative to the EU countries is clear. Ignazio Visco (2001) at the OECD looking at the broader spectrum of developed economies reaches the same conclusion. He observes that "the need to continue responding as early as possible to the economic and fiscal pressures associated with ageing populations is, therefore, not reduced when the most recent reforms introduced in OECD countries are taken into account" (p. 99).

In assessing aging in the various developed countries both the EC and OECD have identified four multiplicative factors that contribute to rising pension costs associated with aging.[7] They measure the factors expected to change over the coming

decades to show what lies behind projected cost increases. These are the old-age dependency ratio, the employment ratio, the benefit ratio, and the eligibility ratio. The dependency ratio, in this case, is the ratio of people aged 55 and over in a society relative to those aged 20 to 64. The employment ratio is the ratio of people aged 20 to 64 in the population to the number of people employed in the economy. The benefit ratio is the ratio of average benefits to average worker productivity. And the eligibility ratio, which might more aptly be referred to as the recipiency ratio, is the number of people receiving a pension to the total number of people ages 55 and above.

In Table 22 we present the breakdown in each of these components as derived by the OECD to explain what is projected to be driving the increase in pension costs between 2000 and 2050. It is pretty clear that the main culprit is the growing dependency ratio. In all but one of the countries, increased employment of working-age people is expected to drive down the employment ratio. In most of the countries the benefit ratio is expected to drive down costs because benefits are not expected to grow as fast as worker productivity. The eligibility ratio is expected to rise in the majority of countries, largely because of the increased labor force participation of women.

The OECD estimates included in Table 22, however, are based on the sets of assumptions that we have reviewed above. If we are correct that the assumptions about fertility rates might be a little high and if life expectancy continues to increase more rapidly than is being assumed, the estimates of cost increases attributed to the old-age dependency ratio in Table 22 would prove low. If employment levels at advanced ages and among women do not rise as much as suggested, the negative effect of the employment rate would be smaller, leading to an underestimate of the increase in pension

costs. If benefits do not decline as much relative to productivity as assumed for the reasons we analyzed, the negative effect of the benefit ratio will be smaller, also leading to an underestimate in pension costs. Finally, the eligibility ratio is driven by number of recipients that will be affected largely by increases in the labor supply of women and deferrals in taking benefits as people work longer. If workers are not as responsive to the changes in policy that reduce benefits for early retirement, the eligibility or recipiency ratio would further add to overall pension costs.

Another problem with Table 22 is that it only includes pension costs associated with aging populations. In Table 23, we have combined the estimates of spending increases for both pension and health care from the OECD projections in the limited number of countries where data has been published. We assumed that the dependency ratio, the employment ratio, and eligibility ratios would be the same for the two categories of aging costs and solved for the combined benefit ratio. In this case the combined benefit ratio is positive across most countries and the effects are quite significant in a number of cases. In interpreting Table 23, however, it is important to keep in mind that the health cost projections assume that that the average cost of services per capita will increase over time at the rate of growth in GDP per capita. We believe this set of projections substantially underestimates the real rate of increase in health costs.

We think the EC and the OECD have come to the reasonable conclusion from their work that the systems of support for the aged in the developed economies need to be significantly reformed and the sooner the better. However, we believe the EC and OECD may have underestimated the magnitude of cost increases many of the developed economies face from population aging under the programs now in effect.

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Table 1: Estimated Age Related Spending for Old-Age Pensions, Health Care and Long-Term Care as a Percent of GDP in 2000 and 2050 for Selected Countries

	Old-age pension		Health care and long-term care	
	2000	2050	2000	2050
Australia	3.0 %	4.6 %	6.8 %	13.0 %
Austria	9.5	11.7	na	na
Belgium	8.8	12.1	6.2	9.2
Canada	5.1	10.9	6.3	10.5
Czech Republic	7.8	14.6	7.5	9.5
Denmark	6.1	8.8	6.6	9.3
Finland	8.1	12.9	8.1	11.9
France	12.1	15.9	na	na
Germany	11.8	16.8	na	na
Hungary	6.0	7.2	na	na
Italy	14.2	13.9	na	na
Japan	7.9	8.5	5.8	8.2
Korea	2.1	10.1	0.7	1.2
Netherlands	5.2	10.0	7.2	12.0
New Zealand	4.8	10.5	6.7	10.7
Norway	4.9	12.9	5.2	8.4
Poland	10.8	8.3	na	na
Spain	9.4	17.4	na	na
Sweden	9.2	10.8	8.1	11.3
United Kingdom	4.3	3.6	5.6	7.3
United States	4.4	6.2	2.6	7.0

Source: Thai Than Dang, Pablo Antolin, and Howard Oxley, *Fiscal Projections of Aging: Projections of Age Related Spending* (Paris: OECD, September 2001), Economics Department Working Papers No. 305, p. 25

Table 2: Life Expectancy at Birth and Years of Improvement for Selected Periods

	Life expectancy (both sexes combined)					Years in life improvement	
	1955 to 1960	1975 to 1980	1995 to 2000	2015 to 2020	2035 2040	Late 1950s to late 1990s	Late 1990s to late 2030s
Australia	70.4	73.5	78.7	82.3	84.2	8.3	5.5
Austria	68.0	72.0	77.7	80.4	82.6	9.7	4.9
Belgium	69.7	72.3	77.9	81.5	82.8	8.3	4.9
Canada	70.6	74.2	78.5	79.9	82.0	8.0	3.4
Czech Republic	70.1	70.6	74.3	77.6	78.4	4.2	4.0
Denmark	72.0	74.2	75.9	79.2	80.8	3.9	4.9
Finland	68.0	72.2	77.2	80.1	82.0	9.1	4.9
France	69.6	73.7	78.1	81.8	83.2	8.5	5.1
Germany	69.1	72.5	77.3	80.4	82.1	8.2	4.8
Greece	67.9	73.7	78.0	81.2	82.7	10.1	4.7
Hungary	66.9	69.4	70.7	73.8	76.7	3 .8	6.0
Ireland	68.9	72.0	76.1	79.7	81.2	7.2	5.1
Italy	68.5	73.6	78.2	81.4	83.0	9.8	4.8
Japan	66.8	75.5	80.5	81.9	82.6	13.7	2.1
Korea	52.6	64.8	74.4	76.6	78.8	21.8	4.5
Netherlands	73.0	75.3	77.9	80.9	82.3	4.9	4.4
Norway	73.3	75.3	78.2	80.3	81.6	4.8	3.5
Poland	65.8	70.9	72.8	77.0	79.8	7.0	7.0
Portugal	62.3	70.2	75.2	78.3	80.5	12.9	5.3
Spain	67.7	74.3	78.1	80.3	81.7	10.4	3.6
Sweden	72.7	75.2	79.3	81.0	82.8	6.7	3.4
United Kingdom	70.4	72.8	77.2	80.3	82.1	6.8	4.9
United States	69.7	73.3	76.5	78.5	80.3	6.9	3.8

Source: From 1955-2000 based *United Nations Population Division* - February 2000 Revision – Medium Variant; from 2015-2040 based on an unpublished series provided by the OECD.

Table 3: Forecasts of Life Expectancy at Birth in Selected Future Years

	Source of estimate for 2030			Source of estimate for 2050		
	Schieber and Hewitt	EC and OECD	Percentage difference	Schieber and Hewitt	EC and OECD	Percentage difference
Canada	83.7	82.0	2.1 %	86.6	82.0	5.7 %
France	83.9	82.7	1.4	87.0	83.4	4.3
Germany	80.6	81.7	-1.3	82.9	82.4	0.6
Italy	83.7	82.6	1.3	86.5	83.4	3.7
Japan	88.5	82.4	7.4	91.9	82.9	10.9
United Kingdom	81.5	81.2	0.4	84.2	82.4	2.1
United States	80.6	79.7	1.1	83.2	81.3	2.3

Sources: Schieber, Sylvester J. and Paul S. Hewitt, "Demographic Risk in Industrial Societies," *World Economics* (October-December 2000), vol. 1, no. 4, p. 49, and unpublished data from the OECD.

Table 4: Total Fertility Rates and Change in the Rates for Selected Periods

	Total fertility rate					Percentage change	
	1950 to 1960	1975 to 1980	1995 to 2000	2015 to 2020	2035 to 2040	Late 1950s to late 1990s	Late 1990s to late 2030s
Australia	3.41	2.09	1.77	1.61	1.57	-48.03	-11.31
Austria	2.52	1.64	1.36	1.46	1.5	-46.08	10.21
Belgium	2.5	1.70	1.55	1.73	1.8	-38.06	16.2
Canada	3.9	1.74	1.6	1.5	1.5	-58.95	-6.25
Czech Republic	2.35	2.32	1.18	1.41	1.5	-49.94	27.33
Denmark	2.54	1.68	1.74	1.78	1.8	-31.76	3.7
Finland	2.78	1.64	1.71	1.69	1.7	-38.45	-0.76
France	2.71	1.86	1.73	1.79	1.8	-36.06	3.81
Germany	2.3	1.52	1.33	1.5	1.5	-42.44	13.21
Greece	2.27	2.32	1.3	1.52	1.6	-42.73	23.08
Hungary	2.21	2.12	1.37	1.54	1.6	-37.95	16.62
Ireland	3.68	3.48	1.92	1.82	1.8	-47.83	-6.25
Italy	2.35	1.89	1.2	1.41	1.5	-48.77	24.58
Korea	6.33	2.92	1.51	1.78	1.64	-76.15	8.61
Japan	2.08	1.81	1.41	1.58	1.61	-32.07	14.1
Netherlands	3.1	1.60	1.54	1.79	1.8	-50.15	16.66
Norway	2.84	1.81	1.83	1.8	1.8	-35.5	-1.64
Poland	3.29	2.26	1.46	1.72	1.83	-55.64	25.27
Portugal	3.03	2.41	1.46	1.68	1.7	-51.72	16.2
Spain	2.75	2.57	1.16	1.4	1.5	-57.96	29.65
Sweden	2.23	1.66	1.51	1.68	1.8	-32.59	19.52
United Kingdom	2.49	1.72	1.7	1.78	1.8	-31.8	5.82
United States	3.71	1.79	2.04	1.98	1.95	-44.87	-4.55

Source: Derived by the authors from 1955-2000 based United Nations Population Division, *World Population Prospects: The 2000 Revision*; from 2015-2040 based on an unpublished series provided by the OECD.

Table 5: Net Immigration Rates for Selected Countries and Periods

	Annual net immigration per 1,000 residents				
	1955-1960	1975-1980	1995-2000	2015-2020	2035-2040
Australia	8.31	1.13	5.10	4.80	4.26
Austria	-1.47	0.05	0.62	2.48	2.52
Belgium	1.19	0.46	1.27	1.43	1.44
Canada	6.23	3.36	4.79	4.69	4.31
Czech Republic	0.10	1.40	1.00	1.25	1.63
Denmark	-1.44	0.60	2.66	1.80	1.78
Finland	-1.84	-1.51	0.82	0.94	0.96
France	3.55	0.69	0.66	0.80	0.79
Germany	2.02	0.84	2.26	2.40	2.50
Greece	-3.04	5.95	3.29	2.31	2.36
Hungary	-4.33	-0.14	-0.73	-0.26	-0.35
Ireland	-15.07	2.57	4.86	1.22	1.06
Italy	-2.08	0.31	2.05	1.42	1.53
Japan	-0.14	-0.04	0.44	-	-
Korea	-0.04	-0.98	-0.40	-	-
Netherlands	-0.55	2.42	2.06	2.04	1.96
New Zealand	3.75	-7.04	2.10	-	-
Norway	-0.58	0.99	1.99	2.06	1.93
Poland	-1.77	-1.20	-0.52	-	-
Portugal	-7.12	6.19	1.30	2.39	2.32
Spain	-3.50	1.23	0.93	1.51	1.59
Sweden	1.06	2.02	1.00	2.20	2.17
United Kingdom	-0.21	-0.12	1.61	1.13	1.11
United States	2.04	2.69	4.53	2.87	2.59

Source: Derived by the authors from 1955-2000 based United Nations Population Division, *World Population Prospects: The 2000 Revision*; from 2015-2040 based on an unpublished series provided by the OECD.

Table 6: Increase in Immigration Required to Offset the Extent Fertility Falls below Population Replacement Levels

	Average total fertility rate 1995-2000	Average births 1995-2000 (000s)	Additional Births at TFR=2.1 (000s)	Average net immigration 1995-2000 (000s)	Multiple of current immigration to offset low fertility
Australia	1.8	1,250	233	95	2.5
Austria	1.4	408	221	5	44.2
Belgium	1.5	553	197	13	15.2
Canada	1.6	1,782	557	144	3.9
Czech Republic	1.2	452	354	10	34.4
Denmark	1.7	328	69	14	4.9
Finland	1.7	290	66	4	15.5
France	1.7	3,649	770	39	19.9
Germany	1.3	3,815	2,231	185	12.0
Greece	1.3	500	310	35	8.9
Hungary	1.4	496	263	(7)	-35.7
Ireland	1.9	263	24	18	1.4
Italy	1.2	2,623	1,952	118	16.6
Japan	1.4	6,160	3,008	56	54.1
Korea	2.1	2,034	47	(9)	-5.3
Netherlands	1.5	935	338	32	10.5
New Zealand	2.0	276	18	8	2.3
Norway	1.8	289	43	9	4.9
Poland	1.5	2,018	889	(20)	-44.2
Portugal	1.5	563	245	13	18.9
Spain	1.2	1,823	1,486	37	40.1
Sweden	1.5	441	174	9	19.6
United Kingdom	1.7	3,530	828	95	8.7
United States	2.0	19,983	558	1,250	0.4

Source: Derived by the authors from 1955-2000 based United Nations Population Division, *World Population Prospects: The 2000 Revision*.

Table 7: Total and Change in Population for Selected Countries and Years

	Total Population in Millions						Percentage Change	
	1950	1975	2000	2010	2030	2050	1950 to 2000	2000 to 2050
Australia	8.2	13.9	15.4	17.5	20.5	21.8	87.73	41.17
Austria	6.9	7.6	8.1	8.1	8.1	7.6	16.57	-6.14
Belgium	8.6	9.8	10.2	10.4	10.5	10.1	18.39	-1.36
Canada	13.7	23.1	30.8	33.1	36.4	37.1	123.88	20.53
Czech Republic	8.9	10.0	10.3	10.2	9.7	8.4	15.04	-18.51
Denmark	4.3	5.1	5.4	5.5	5.7	5.5	26.13	2.63
Finland	4.0	4.7	5.2	5.3	5.3	5.0	29.02	-4.28
France	41.8	52.7	59.2	61.4	63.7	62.2	41.53	4.99
Germany	68.4	78.7	82.3	83.5	81.8	75.6	20.42	-8.20
Greece	7.6	9.1	10.6	10.8	10.7	10.2	39.47	-3.77
Hungary	9.3	10.5	10.0	9.7	9.0	8.1	7.56	-19.70
Ireland	3.0	3.2	3.8	4.1	4.6	4.8	27.95	26.32
Italy	47.1	55.4	57.6	57.3	54.0	48.1	22.26	-16.52
Japan	83.6	111.5	126.9	127.6	117.2	100.5	51.74	-20.76
Korea	20.4	35.3	47.3	50.7	52.6	47.7	132.26	0.90
Netherlands	10.1	13.7	15.9	16.7	17.7	17.7	56.80	11.48
New Zealand	1.9	3.1	3.8	4.1	4.5	4.6	101.58	19.57
Norway	3.3	4.0	4.5	4.7	5.1	5.2	37.83	16.08
Poland	24.8	34.0	38.7	39.0	38.5	35.0	55.93	-9.54
Portugal	8.4	9.1	10.0	10.3	10.7	10.7	19.01	6.67
Spain	28.0	35.6	39.4	39.9	38.6	35.1	40.79	-10.87
Sweden	7.0	8.2	8.9	9.0	9.3	9.2	26.43	3.72
United Kingdom	50.6	56.2	59.5	60.9	63.2	61.8	17.59	3.82
United States	157.8	220.2	275.3	297.7	337.5	361.1	74.47	31.16

Source: The 1950 and 1975 observations are from United Nations Population Division, *World Population Prospects: The 2000 Revision*; from 2000 to 2040 observations are based on the Eurostat middle variant projections from an unpublished series provided by the OECD.

Table 8: Labor Force Participation Rates by Gender in Selected Countries

	Men			Women		
	1970	1990	2000	1970	1990	2000
Australia	94.5	88.2	84.6	43.1	62.1	66.5
Belgium	-	79.3	78.0	-	56.9	63.8
Canada	92.1	87.9	83.7	41.5	69.7	71.9
Denmark	-	89.5	86.9	-	79.5	78.4
Finland	86.0	83.6	81.8	64.8	76.6	77.3
France	90.6	82.9	83.0	50.3	63.1	68.4
Germany	92.7	84.9	84.8	44.7	58.6	68.1
Italy	-	-	77.5	-	-	47.8
Japan	93.1	91.9	91.7	56.2	62.1	65.9
Korea	-	86.9	85.3	-	55.1	57.1
Netherlands	91.2	81.4	83.6	27.0	49.1	59.0
New Zealand	-	87.0	85.5	-	64.0	71.1
Norway	86.5	87.4	87.4	50.3	73.3	79.2
Portugal	92.2	87.5	86.9	47.0	61.8	65.7
Spain	92.4	85.9	83.4	28.3	44.0	54.3
Sweden	90.3	90.2	85.4	60.1	84.8	79.6
United Kingdom	-	89.6	88.1	-	64.6	69.7
United States	91.7	88.7	86.1	49.9	69.3	73.8

Source: The authors' calculations from *The OECD CDROM on Labour Market Statistics Database* (forthcoming in January 2002).

Table 9: Projected Changes in the Labor Force Participation Rates of Men and Women Ages 20 to 64 as a Percentage of the Participation Rate in 2000

	Males			Females		
	2000-2010	2000-2030	2000-2050	2000-2010	2000-2030	2000-2050
Australia	-0.9 %	1.7 %	1.2 %	2.5 %	4.3 %	4.7 %
Belgium	-3.9	-4.9	-3.4	5.9	10.3	12.0
Canada	-2.6	-3.5	-4.3	0.6	2.3	2.8
Denmark	-2.5	-3.1	-3.2	-0.5	1.8	5.6
Finland	-4.6	-3.2	-4.4	-2.5	0.4	0.7
France	-4.1	-5.3	-5.0	-0.1	2.2	7.3
Germany	0.8	-2.0	-1.4	8.9	8.7	10.0
Italy	4.1	2.6	2.9	9.6	24.4	44.9
Japan	-1.5	-2.0	-1.4	6.5	12.5	21.8
Korea	0.2	-2.2	-1.5	13.1	27.2	28.6
Netherlands	-2.1	-5.1	-4.0	11.7	22.7	25.4
New Zealand	-1.1	-1.5	-1.8	1.0	-0.8	-0.5
Norway	-2.0	-3.2	-3.0	-2.3	-2.6	-1.6
Portugal	-0.9	-2.8	-1.8	3.5	6.5	15.5
Spain	-0.3	-2.7	-0.7	10.0	22.1	33.6
Sweden	1.3	1.0	0.5	3.1	5.0	6.6
United Kingdom	-1.7	-2.1	-2.3	3.7	3.4	6.9
United States	-0.6	-1.6	-1.8	2.9	7.6	5.4

Sources: Derived from Appendix Table 1 which is based on the authors' calculations from *The OECD CDROM on Labour Market Statistics Database* (forthcoming in January 2002) and an unpublished series of projections provided by the OECD (December, 2001).

Table 10: Decomposition of Projected Changes in the Labor Force Participation Rates between 2000 and 2050 for Selected Countries

	Percentage change in labor force participation rates for females ages 20 to 64			
	Total effect	Demographic effect	Behavioral effect	Cross product
Australia	4.71	-4.74	9.08	0.37
Austria	20.53	-5.89	22.64	3.78
Belgium	12.06	-5.67	16.54	1.18
Canada	2.80	-5.06	6.70	1.16
Denmark	5.61	-1.11	6.63	0.09
Finland	0.73	-3.19	3.98	-0.07
France	7.28	-4.85	12.52	-0.40
Germany	9.96	-2.04	11.57	0.43
Italy	44.92	-4.16	48.56	0.53
Japan	21.82	-0.91	22.33	0.39
Korea	28.61	-1.32	31.30	-1.36
Netherlands	25.40	-5.07	30.15	0.32
New Zealand	-0.46	-3.04	2.23	0.35
Norway	-1.57	-1.9	0.13	0.21
Poland	6.89	-8.52	13.33	2.08
Portugal	15.55	-2.05	16.98	0.62
Spain	33.60	-5.2	37.84	0.95
Sweden	6.63	-1.26	7.99	-0.09
United Kingdom	6.89	-1.92	8.42	0.39
United States	5.45	-2.22	7.62	0.05

Source: The authors' calculations from an unpublished series of projections provided by the OECD, which uses the baseline population projections by Eurostat (December, 2001).

Table 11: Estimated Labor Force Participation Rates by Gender for Ages 55 to 64 for Selected Countries

	Men				Women			
	2000	2010	2030	2050	2000	2010	2030	2050
	Percentage of age group in the labor force							
Australia	60.6	62.2	65.9	66.7	34.8	39.7	42.7	43.3
Austria	38.0	44.7	56.4	71.3	13.9	20.4	36.4	57.8
Belgium	34.0	36.2	35.6	38.6	17.0	29.9	36.3	37.3
Canada	58.1	56.0	56.0	56.0	38.8	40.6	48.3	51.2
Czech Republic	56.6	61.2	61.2	61.2	27.0	38.9	45.1	51.2
Denmark	65.5	59.1	59.1	59.1	46.3	43.6	48.6	54.1
Finland	45.7	46.0	46.0	46.0	43.6	46.0	46.0	46.0
France	42.4	39.9	39.9	39.9	29.5	28.5	31.5	34.9
Germany	55.7	62.4	60.8	62.4	37.0	46.0	48.9	51.4
Hungary	38.2	44.0	46.4	44.4	16.2	49.6	52.5	50.6
Ireland	67.9	66.9	64.4	64.4	19.0	20.5	27.0	44.4
Italy	44.9	51.9	57.9	53.3	17.4	26.6	33.4	44.5
Japan	83.7	80.0	80.0	80.0	47.1	47.1	57.4	70.0
Korea	74.2	74.1	73.3	73.8	49.9	56.1	60.1	60.3
Netherlands	45.6	52.9	48.2	49.5	17.8	24.0	36.4	38.1
New Zealand	71.0	72.6	71.8	72.6	50.3	54.7	53.5	54.3
Norway	68.8	64.9	63.1	62.7	56.5	55.7	56.9	59.1
Poland	44.5	55.0	55.0	55.0	26.1	36.1	40.3	44.5
Portugal	62.6	61.1	61.1	61.1	33.7	35.1	43.8	54.5
Spain	58.3	58.3	58.3	58.3	21.8	30.6	42.9	48.3
Sweden	72.0	70.1	70.1	70.1	64.8	70.1	70.1	70.1
United Kingdom	66.4	62.9	62.9	62.9	40.0	40.5	43.0	51.9
United States	67.7	69.2	66.1	65.6	52.0	57.4	58.6	58.1

Source: The authors' calculations from an unpublished series of projections provided by the OECD, which uses the baseline population projections by Eurostat (December, 2001).

Table 12: AIME Growth Exceeding Average Wage Growth across Various Birth Cohorts of US Social Security Retirement Beneficiaries by Age in 1994

Year the cohort reached 62	Base year from which subsequent growth in AIMEs was calculated							
	1984	1985	1986	1987	1988	1989	1990	1991
	Compound annual growth rate of average AIME from base year to year cohort retired							
1985	1.25 %							
1986	0.41	-0.43 %						
1987	0.32	-0.14	0.15 %					
1988	0.60	0.38	0.79	1.43 %				
1989	0.52	0.34	0.59	0.81	0.20 %			
1990	0.45	0.29	0.47	0.58	0.16	0.12 %		
1991	0.43	0.29	0.43	0.50	0.20	0.20	0.28 %	
1992	0.69	0.61	0.79	0.91	0.78	0.98	1.42	2.85 %

Source: Derived by the authors from data from the Office of the Actuary, US Social Security Administration.

Table 13: Total Public Expenditure on Health Care and Pensions

	Health Expenditure as share of GDP in 2000	Increase in health expenditure in percent of GDP from 2000 and 2050		Pension expenditure as share of GDP in 2000	Increase in pension expenditure in percent of GDP from 2000 to 2050
		per capita	per worker		
Austria	5.7 %	1.7 %	2.0 %	14.5	2.5
Belgium	5.3	1.3	1.5	10.0	3.3
Denmark	5.1	0.7	1.1	10.5	2.8
Finland	4.6	1.2	1.8	11.3	4.6
France	6.2	1.2	1.9	12.1	
Germany	5.7	1.4	2.1	11.8	5.0
Greece	4.8	1.7	1.6	12.6	12.2
Ireland	5.9		2.3	4.6	4.4
Italy	4.9	1.5	1.7	13.8	0.3
Luxembourg				7.4	1.9
Netherlands	4.7	1.0	1.3	7.9	5.7
Portugal	5.4	0.8	1.3	9.8	3.4
Spain	5.0	1.7	1.5	9.4	5.9
Sweden	6.0	1.0	1.2	9.0	1.7
United Kingdom	4.6	1.0	1.4	10.4	2.9

Source: Costello, Declan and Mandeep Bains, *Budgetary Challenges Posed by Aging Populations*, (Brussels: Economic Policy Committee, European Economic Commission, October 2001), pp. 22 and 44.

Table 14: Rate of Growth in Health Care Price Inflation over Economy-Wide Price Inflation for Selected Countries and Selected Periods

	1970-1980	1980-1990	1990s	Last year in data series
	Annual compound rate of growth in percents			
Australia	-0.27 %	0.78 %	-0.07 %	1998
Austria	3.14	1.46	-2.41	1999
Belgium	0.28	0.58	2.41	1996
Canada	0.26	1.15	0.27	1999
Denmark	na	-0.20	-0.53	1999
Finland	-0.59	1.48	0.99	1999
France	-1.06	-0.79	-0.29	1999
Germany	0.55	0.76	0.62	1996
Iceland	3.70	0.06	0.62	1999
Ireland	-3.78	2.50	1.23	1998
Italy	-1.41	1.71	-0.73	1999
Japan	na	0.40	1.13	1997
Korea	na	na	0.04	1997
Luxembourg	na	0.80	5.21	1996
Netherlands	na	0.33	0.21	1996
Norway	1.14	0.83	1.18	1997
Portugal	na	na	8.78	1996
Spain	1.13	-0.58	0.18	1996
Switzerland	2.35	0.36	0.61	1999
United Kingdom	-0.60	1.15	1.20	1996
United States	0.82	3.08	0.82	1999

Source: OECD: *OECD Health Data 2001*.

Table 15: Growth in Real Health Expenditures Per Capita and the Excess of Over Real Growth in GDP Per Capita for Selected Countries and Periods

	Compound annual growth in real health expenditures per capita			Growth in real health expenditures per capita minus real GDP growth per capita			Last year in data series
	1970-1980	1980-1990	1990s	1970-1980	1980-1990	1990s	
Australia	3.1 %	2.0 %	1.9 %	3.4	1.9	0.7	1998
Austria	4.1	-0.1	-0.5	0.7	-1.9	-1.5	1999
Belgium	7.8	2.8	2.1	4.9	1.0	0.9	1996
Canada	2.6	2.9	-0.1	1.4	2.6	-0.3	1999
Denmark	3.0	1.0	0.9	1.9	-0.5	-0.5	1999
Finland	5.1	3.3	-1.8	2.4	1.1	-2.6	1999
France	6.5	4.4	1.5	4.5	3.0	0.8	1999
Germany	5.5	1.3	3.7	3.1	-0.6	6.7	1996
Iceland	5.2	4.2	-0.5	1.1	3.7	-0.8	1999
Ireland	12.8	-1.4	2.1	11.2	-4.4	-2.4	1998
Italy	7.8	1.9	1.0	5.3	-0.3	0.0	1999
Japan	na	2.3	3.1	na	-0.6	2.5	1997
Korea	na	na	6.8	na	na	3.6	1997
Luxembourg	6.8	3.5	-1.1	5.7	0.1	-3.5	1996
Mexico	na	na	1.2	na	na	2.3	1996
Netherlands	na	1.8	2.0	na	0.8	0.8	1996
New Zealand	na	1.6	-1.4	na	1.1	-1.1	1999
Norway	7.9	2.3	1.7	4.3	0.6	-0.3	1997
Portugal	na	na	-2.7	na	na	-4.8	1996
Spain	5.7	5.3	2.6	4.3	3.1	0.8	1996
Switzerland	1.8	2.4	1.0	0.9	1.4	1.8	1998
United Kingdom	4.7	2.0	2.6	0.7	-2.5	0.0	1996
United States	3.5	2.3	0.6	2.6	1.1	-0.3	1999

Source: Derived by authors from *OECD Health Data 2001*.

Table 16: Health Care Expenditures as a Percent of GDP and the Rates of Growth in Health Care as Percent of GDP for Selected Countries and Periods

	Health care as percent of GDP in 1970	Annual compound growth rate in health expenditures as percent of GDP			Health care as percent of GDP in	Last year in data series
		1970-1980	1980-1990	1990-1999	1998 or 1999	
Australia	5.7 %	1.1 %	1.2 %	1.1 %	8.6 %	1998
Austria	5.3	3.7	-0.7	1.6	8.2	1999
Belgium	4.0	4.8	1.5	1.9	8.8	1999
Canada	7.0	0.1	2.4	0.4	9.3	1999
Denmark	8.0	0.7	-0.7	-0.1	8.4	1999
Finland	5.6	1.3	2.1	-1.7	6.8	1999
France	5.7	2.6	1.5	1.0	9.4	1999
Germany	6.3	3.4	-0.1	2.1	10.3	1998
Greece	5.6	1.5	1.4	1.4	8.4	1998
Iceland	4.9	2.2	2.6	1.1	8.7	1999
Ireland	5.1	5.1	-2.2	0.2	6.8	1998
Italy	5.1	3.2	1.5	0.1	8.2	1999
Japan	4.6	3.5	-0.6	2.4	7.4	1998
Korea				1.3	5.4	1999
Luxembourg	3.5	5.4	0.3	0.0	6.1	1999
Mexico				2.4	5.3	1998
Netherlands			0.6	0.3	8.7	1999
New Zealand	5.2	1.4	1.6	1.6	8.1	1999
Norway	4.4	4.8	1.1	2.0	9.3	1999
Poland				1.8	6.2	1999
Portugal	2.7	7.6	1.0	2.7	7.7	1998
Spain	3.6	4.1	2.0	0.7	7.0	1998
Sweden	6.9	2.8	-0.7	-0.9	7.9	1998
Switzerland	5.4	3.1	1.3	2.9	10.4	1998
United Kingdom	4.5	2.2	0.7	1.6	6.9	1999
United States	6.9	2.3	3.2	0.9	12.9	1999

Source: Derived by authors from *OECD Health Data 2001*.

Table 17: Forecasts of Medicare Acute Care Expenditures Accounting for Changes in Age at Death, and Disability among Survivors

	1992	2010	2030	2050
Forecast holding constant age-specific spending	$3,232	$3,342	$3,272	$3,510
Estimate as ratio of 1992 baseline	1.00	1.03	1.01	1.09
Forecast accounting for change in age of death	3,232	3,261	3,121	3,287
Estimate as ratio of 1992 baseline	1.00	1.01	0.97	1.02
Forecast accounting for change in age of death and 1 percent annual reduction in disability	3,234	3,138	2,903	2,947
Estimate as ratio of 1992 baseline	1.00	0.97	0.90	0.91

Source: David Cutler and Louise Sheiner, "Demographics and Medical Care Spending: Standard and Non-Standard Effects," (Cambridge, MA: National Bureau of Economic Research, 1998), NBER Working Paper, no. 6866, Table 11.

Table 18: Forecasts of U.S. Medicare Spending on the Aged as a Share of GDP

	1992	2010	2030	2050
Medicare costs grow with GDP per capita				
Holding constant age- specific spending	1.7	1.8	2.7	3.1
Accounting for change in age of death and 1 percent annual reduction in disability	1.7	1.7	2.4	2.5
Medicare costs grow at historic rate of increase relative to GDP				
Holding constant age-specific spending	1.7	2.9	7.1	12.8
Accounting for change in age of death and 1 percent annual reduction in disability	1.7	2.7	6.1	10.4

Source: David Cutler and Louise Sheiner, "Demographics and Medical Care Spending: Standard and Non-Standard Effects," (Cambridge, MA: National Bureau of Economic Research, 1998), NBER Working Paper, no. 6866, Table 11.

Table 19: Projected Cost of the US Medicare Programs as a Percent of GDP for Selected Years from the 2000 and 2001 Valuations of the Programs

	2000 valuation projection			2001 valuation projection		
Calendar Year	HI	SMI	Total	HI	SMI	Total
		(percent of GDP)			(percent of GDP)	
2000	1.39 %	0.94 %	2.33 %	1.32 %	0.92 %	2.24 %
2005	1.43	1.09	2.52	1.32	1.09	2.41
2010	1.53	1.22	2.75	1.39	1.19	2.57
2015	1.63	1.47	3.09	1.53	1.36	2.89
2020	1.78	1.72	3.50	1.73	1.61	3.34
2025	2.00	1.95	3.95	2.00	1.90	3.90
2030	2.23	2.13	4.36	2.32	2.18	4.51
2035	2.42	2.22	4.64	2.63	2.39	5.03
2040	2.54	2.22	4.76	2.89	2.52	5.41
2045	2.60	2.19	4.80	3.11	2.61	5.72
2050	2.63	2.17	4.79	3.30	2.71	6.01
2055	2.65	2.18	4.83	3.49	2.87	6.36
2060	2.69	2.24	4.93	3.73	3.10	6.83
2065	2.76	2.31	5.07	4.03	3.35	7.38
2070	2.84	2.35	5.19	4.35	3.59	7.94
2075	2.92	2.36	5.28	4.69	3.80	8.49

Sources: *The 2001 Annual Report of the Board of Trustees of the Federal Hospital Insurance Fund*, p. 82; and *The 2000 Annual Report of the Board of Trustees of the Federal Hospital Insurance Fund*, p. 88.

Table 20: Past and Projected Unemployment Rates in Selected Countries

	Percent of total labor force unemployed					
	1970	1990	2000	2010	2030	2050
Austria	1.4 %	3.3 %	5.9 %	4.7 %	4.0 %	4.0 %
Belgium	1.9	6.9	10.2	7.9	6.6	6.6
Canada	5.7	8.4	6.7	6.5	6.5	6.5
Denmark	0.7	8.6	6.3	5.8	5.7	5.9
Finland	2.0	3.1	9.8	7.0	7.0	7.0
France	1.7	9.3	9.8	8.8	7.4	6.1
Germany	0.6	4.8	7.9	6.3	5.6	5.6
Ireland	5.8	13.1	5.0	5.0	5.0	5.0
Italy	2.9	10.5	10.7	9.7	8.5	7.0
Japan	1.1	2.0	4.7	4.0	4.0	4.0
Korea	-	2.4	4.1	3.5	3.3	3.2
Netherlands	1.0	7.4	3.2	4.0	4.0	4.0
New Zealand	0.2	7.7	6.1	6.0	6.0	6.0
Norway	0.7	5.1	3.6	3.8	3.8	3.8
Portugal	-	4.7	4.5	4.5	4.5	4.5
Spain	2.6	15.7	14.2	6.9	4.5	4.0
Sweden	1.5	1.8	6.0	5.2	5.1	5.1
United Kingdom	2.2	6.8	5.3	5.6	5.6	5.6
United States	4.9	5.6	4.1	5.1	5.1	5.1

Source: For the period 1970-2000, *OECD Health Data 2001: A Comparative Analysis of 30 Countries*; and for the period 2000-2050, data based on an unpublished series provided by the OECD.

Table 21: Compound Annual Growth in Labor Productivity for Selected Periods

	1970-1980	1980-1990	1990-2000	2000-2010	2010-2030	2030-2050
	Annual percentage increase in GDP per hour of work in the economy					
Austria	3.01	2.08	1.59	2.14	1.41	1.77
Belgium	3.20	1.93	1.66	1.92	1.83	1.75
Canada	0.85	1.11	1.37	1.48	1.45	1.75
Denmark	1.81	1.04	2.02	1.70	1.71	1.60
Finland	2.53	2.36	2.88	3.01	1.88	1.77
France	2.72	2.07	1.28	1.61	1.74	1.75
Germany	2.56	1.70	-0.40	1.75	1.75	1.75
Ireland	3.76	3.57	3.13	2.90	1.90	1.80
Italy	2.55	1.60	1.57	2.07	1.75	1.75
Japan	3.56	2.84	1.04	1.40	1.71	1.75
Netherlands	2.69	1.60	1.16	1.45	1.71	1.73
New Zealand	-	1.42	0.85	1.60	1.75	1.75
Norway	3.16	1.77	2.20	0.84	1.21	1.10
Portugal	2.97	1.74	1.61	3.13	3.18	3.26
Spain	3.78	2.28	1.64	1.65	2.30	1.75
Sweden	0.98	1.59	2.50	1.76	1.75	1.75
United Kingdom	1.75	1.97	1.88	1.99	1.79	1.75
United States	1.57	1.42	1.59	1.95	1.80	1.80

Source: Authors' calculations from Source OECD Economic Outlook for 1970-2000; for the period 2000-2050, data based on an unpublished series provided by the OECD.

Table 22: Decomposition of Changes in Old-Age Pension Spending, 2000 to 2050

	Total old-age pension spending, change from 2000 to 2050	Contribution of:			
		Old -age Dependency ratio	Employment ratio	Benefit ratio	Eligibility ratio
Australia	1.6	2.5	-0.1	-0.5	-0.2
Austria	2.2	7.6	-1.9	-1.1	-2.4
Belgium	3.3	4.7	-0.7	-1.6	1.0
Canada	5.8	5.1	0.0	-0.6	1.3
Czech Republic	6.8	8.2	-0.8	-0.1	-0.1
Denmark	2.7	2.7	-0.3	-1.5	1.7
Finland	4.8	5.2	-0.1	-0.2	0.0
France	3.8	7.6	-0.5	-3.4	0.4
Germany	5.0	6.4	-0.7	-2.7	2.1
Hungary	1.2	2.9	-1.0	-0.3	-0.4
Italy	-0.3	10.1	-3.2	-5.5	-1.5
Japan	0.6	5.1	-1.2	-3.9	0.9
Korea	8.0	4.8	-1.0	0.2	5.0
Netherlands	4.8	3.8	-0.5	0.2	1.4
New Zealand	5.7	4.7	-0.1	1.0	0.0
Norway	8.0	3.0	0.1	3.9	1.2
Poland	-2.5	7.3	-1.3	-5.9	-2.1
Spain	8.0	8.6	-2.6	0.0	2.0
Sweden	1.6	3.9	-0.5	-2.1	0.4
United Kingdom	-0.7	1.7	0.1	-2.5	0.1
United States	1.8	2.4	-0.1	-0.2	-0.3

Source: Organization for Economic Co-Operation and Development, *OECD Economic Outlook* (Paris: OECD, June 2001), no. 69, p. 155.

Table 23: Decomposition of Changes in Old-Age Pension and Health Care Spending, 2000 to 2050

	Total old-age Pension and health spending, change from 2000 to 2050	Contribution of:			
		Old -age Dependency ratio	Employment ratio	Benefit ratio	Eligibility ratio
Australia	6.6	2.5	-0.1	4.4	-0.2
Belgium	6.3	4.7	-0.7	1.3	1.0
Canada	10.0	5.1	0.0	3.6	1.3
Czech Republic	8.5	8.2	-0.8	1.2	-0.1
Denmark	3.7	2.7	-0.3	-0.4	1.7
Finland	6.8	5.2	-0.1	1.7	0.0
Japan	3.0	5.1	-1.2	-1.8	0.9
Korea	8.4	4.8	-1.0	-0.4	5.0
Netherlands	9.6	3.8	-0.5	4.9	1.4
New Zealand	9.7	4.7	-0.1	5.1	0.0
Norway	11.2	3.0	0.1	6.9	1.2
Sweden	2.8	3.9	-0.5	-1.0	0.4
United Kingdom	1.0	1.7	0.1	-0.9	0.1
United States	3.8	2.4	-0.1	1.8	-0.3

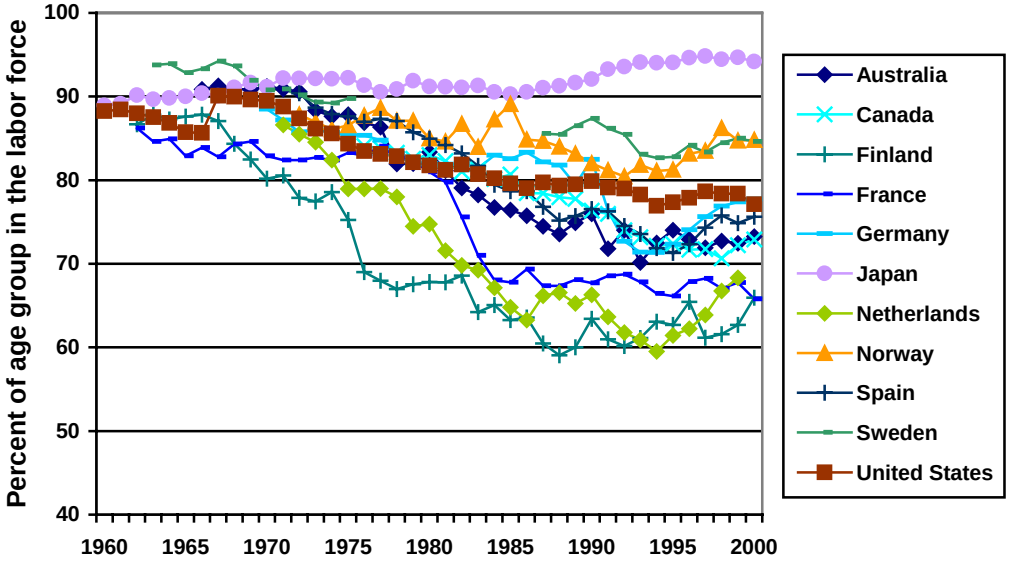
Source: Derived by the authors from Organization for Economic Co-Operation and Development, *OECD Economic Outlook* (Paris: OECD, June 2001), no. 69, p. 155 and Thai Than Dang, Pablo Antolin, and Howard Oxley, *Fiscal Implications of Ageing: Projections of Age-Related Spending* (Paris: OECD, September 2001), Economics Department Working Papers No. 305, p. 52.

Appendix Table 1: Labor Force Participation Rates by Gender for Selected Countries and Selected Years

	Males				Females			
	2000	2010	2030	2050	2000	2010	2030	2050
Australia	84.6 %	83.8 %	86.0 %	85.6 %	66.5 %	68.1 %	69.4 %	69.6 %
Belgium	78.0	74.9	74.2	75.4	63.8	67.6	70.4	71.5
Canada	83.7	81.4	80.7	80.1	71.9	72.3	73.5	73.9
Denmark	86.9	84.7	84.1	84.1	78.4	78.0	79.8	82.8
Finland	81.8	78.0	79.2	78.2	77.3	75.4	77.6	77.9
France	83.0	79.6	78.6	78.8	68.4	68.3	69.9	73.4
Germany	84.8	85.4	83.1	83.6	68.1	74.2	74.0	74.9
Italy	77.5	80.6	79.5	79.7	47.8	52.4	59.4	69.2
Japan	91.7	90.3	89.9	90.4	65.9	70.1	74.1	80.3
Korea	85.3	85.5	83.5	84.1	57.1	64.6	72.6	73.4
Netherlands	83.6	81.8	79.3	80.3	59.0	66.0	72.4	74.0
New Zealand	85.5	84.6	84.2	84.0	71.1	71.9	70.6	70.8
Norway	87.4	85.7	84.6	84.8	79.2	77.4	77.2	78.0
Portugal	86.9	86.1	84.5	85.4	65.7	68.0	70.0	75.9
Spain	83.4	83.1	81.1	82.9	54.3	59.8	66.4	72.6
Sweden	85.4	86.5	86.3	85.8	79.6	82.0	83.6	84.9
United Kingdom	88.1	86.5	86.2	86.0	69.7	72.3	72.0	74.5
United States	86.1	85.5	84.7	84.5	73.8	75.9	79.4	77.8

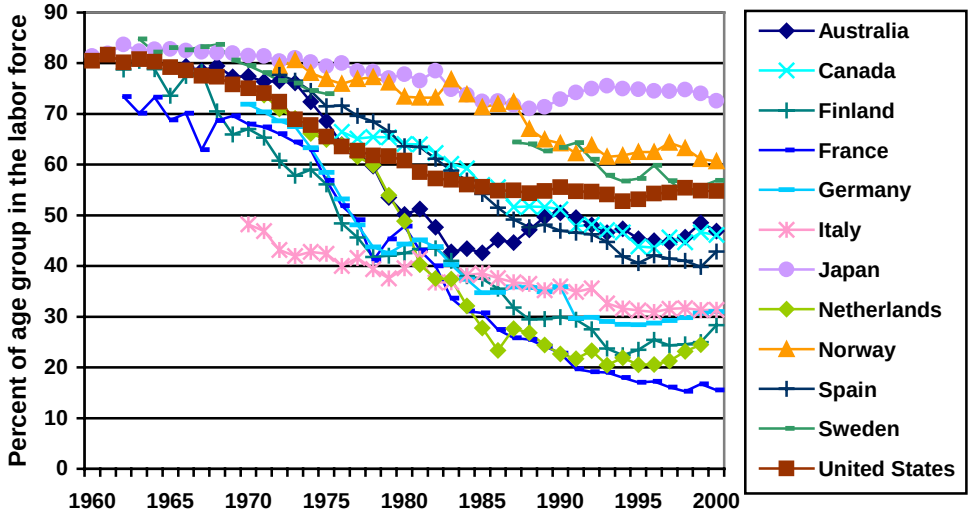
Sources: The authors' calculations from *The OECD CDROM on Labour Market Statistics Database* (forthcoming in January 2002 and an unpublished series of projections provided by the OECD (December, 2001).

Figure 1: Labor Force Participation for Males Age 55-59 for Various Countries in the OECD



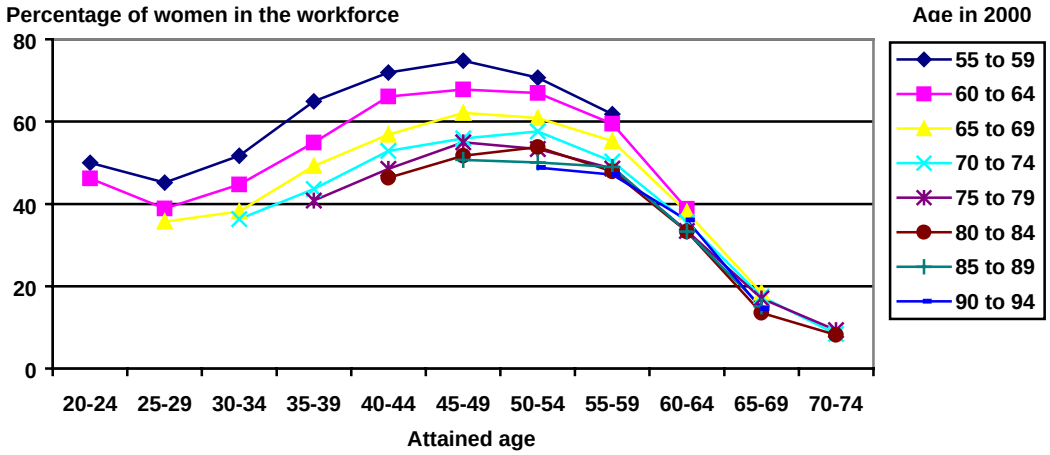
Source: *The OECD CDROM on Labour Market Statistics Database* (forthcoming in January 2002).

Figure 2: Labor Force Participation for Males Age 60-64 for Various Countries in the OECD



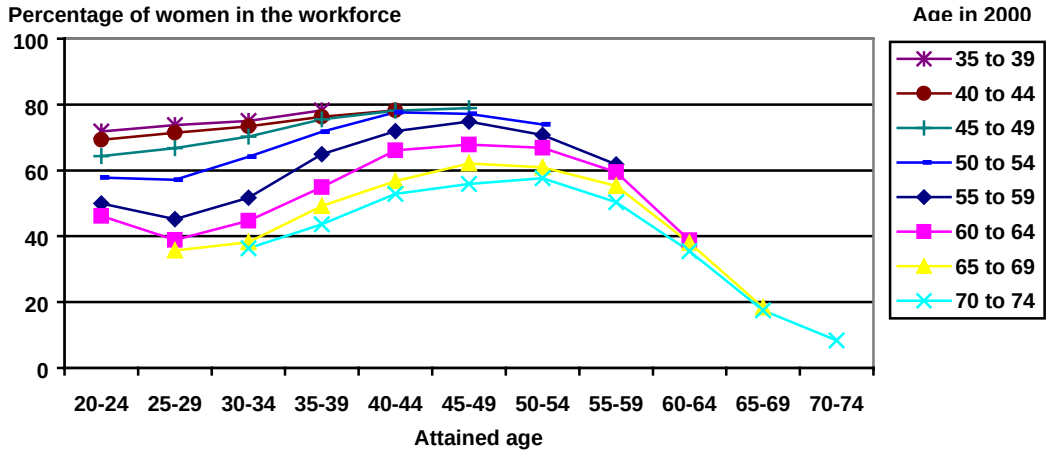
Source: *The OECD CDROM on Labour Market Statistics Database* (forthcoming in January 2002).

Figure 3: Labor Force Participation Rates of Mothers of the Baby Boom Generation by Age in 2000 at Various Attained Ages throughout Their Lives



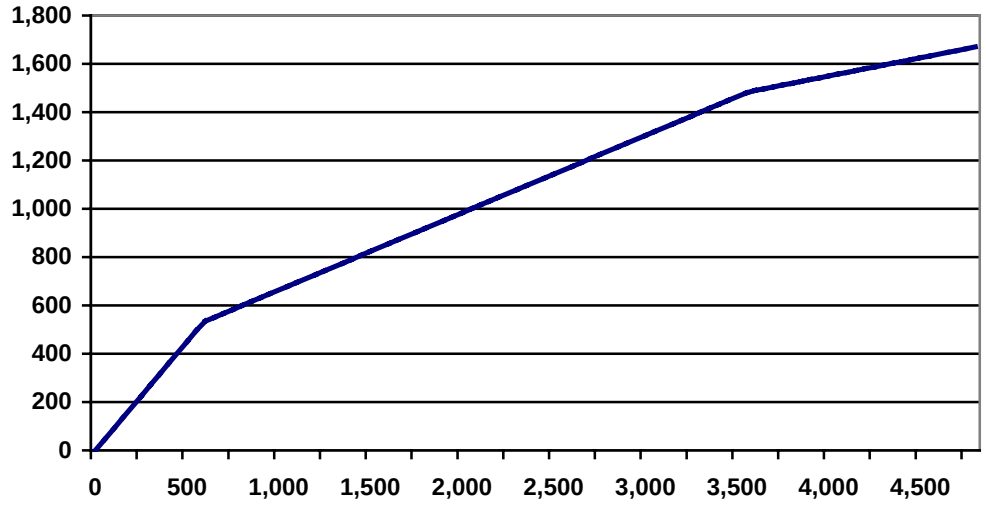
Sources: U.S. Department of Labor (2000).

Figure 4: Labor Force Participation Rates of Selected Female Birth Cohorts by Age in 2000 at Various Ages throughout Their Lives



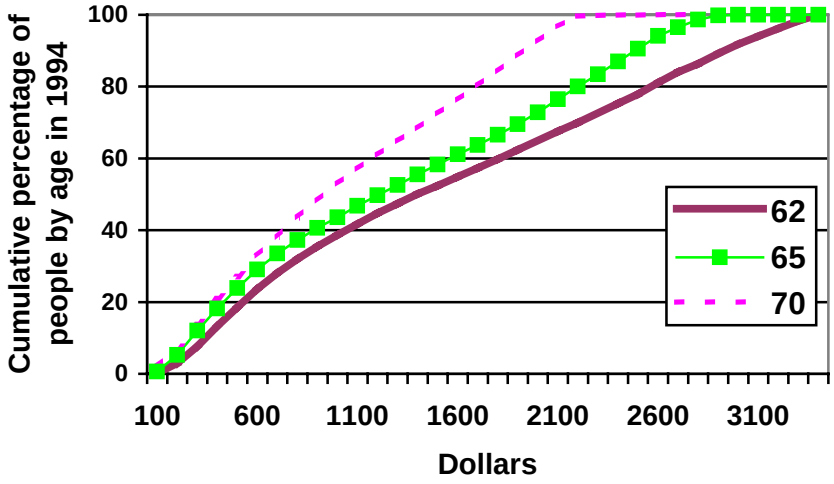
Sources: U.S. Department of Labor (2000).

Figure 5: Primary Insurance Amount for Different Levels of AIME



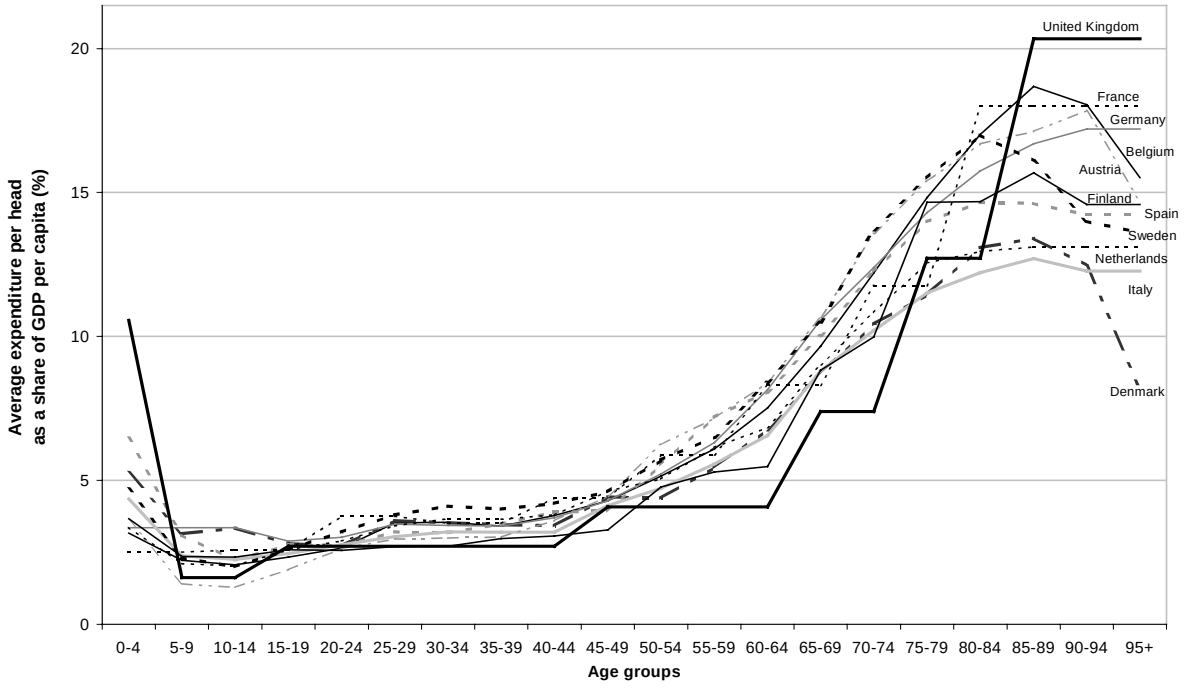
Source: Calculated by the authors.

Figure 6: Cumulative Distributions of Average Indexed Monthly Earnings Levels for US Retirees Receiving Social Security benefits in 1994 by Age



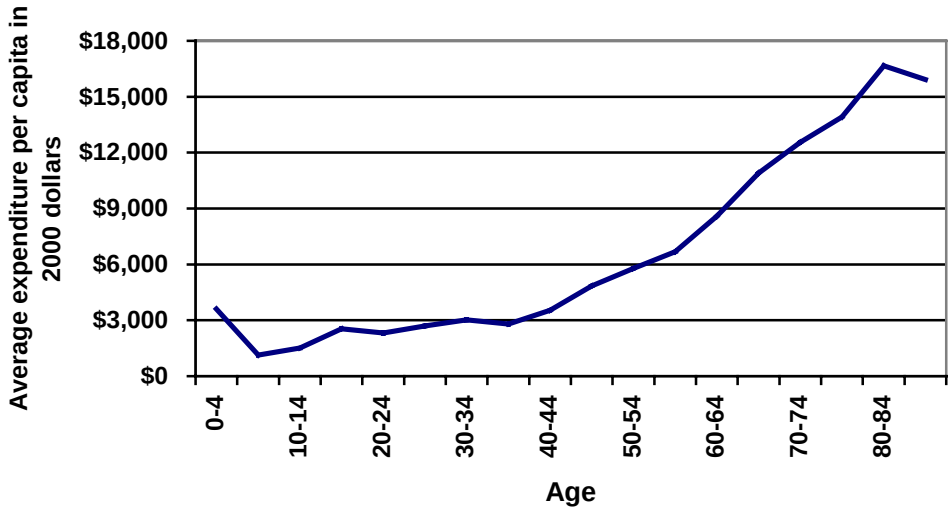
Source: Unpublished data from the Office of the Actuary, US Social Security Administration.

Figure 7: Age Profiles for Public Expenditure on Health Care for Selected Countries



Source: Declan Costello and Mandeep Bains, *Budgetary Challenges Posed by Aging Populations*, (Brussels: Economic Policy Committee, European Economic Commission, October 2001), p. 24.

Figure 8: Age Profile for Expenditures on Health Care in the United States for 2000



Source: Watson Wyatt Worldwide.

Endnotes

[1] The notable exception to this general rule is China, which has imposed birth limits on its citizens, which is resulting in unusually rapid population aging there compared to other less developed countries.

[2] Aside from advances in biomedicine serving as the source to additional gains in longevity, Lee and Carter (1992) used more advanced statistical methods to extrapolate life expectancy with no effort to incorporate knowledge about medical, behavioral, or social influences into their model. While the Actuary of the Social Security Administration forecasts life expectancy using combined age specific trends with the views of medical experts on ultimate cause-specific rates of mortality decline, Lee and Carter allow each age-specific death rate to decline at its own historical rate. The advantage is that this is more consistent with historical trends than imposing that all age-specific rates ultimately decline at the same pace. The implications of this approach are that Lee and Carter forecast life expectancy to be 5.6 years greater by 2065 than the Actuary.

[3] Macunovich (2001, chapter 12) shows that as less developed countries begin to experience a rising share of their young adult population (15-24) relative to their adult population (25-59), largely caused by declines in infant mortality, total fertility rates precipitously decline. Interestingly, once fertility rates begin to decline in most developing nations, Macunovich provides evidence that through asymmetric effects; subsequent increases in young adult cohort size have little reversal effect on fertility rates – what she refers to as a "cascade" effect on social norms.

[4] Population projections are based on the middle variant of national, or in the case of the European Union countries, Eurostat population projections. The Eurostat projections were specially prepared for the EC and OECD aging cost projections.

[5] The historical LFPR's were derived from an unpublished data file supplied by the OECD, which are used in the construction of the OECD Employment Outlook. The projections of labor force participation are based on the combined efforts of the OECD, Eurostat and ILO under the agreement of the countries and the OECD Secretariat. Furthermore, these numbers are based on the middle variant of Eurostat population projections for the countries in the European Union (EU) and the national projections for the remaining countries.

[6] For the predictions of labor force participation discussed in this analysis and presented in Tables 9 for the 20 to 64 age cohort, the OECD builds from the ILO (1997) predictions for the period from 2000 to 2010. For the period after 2010, they follow the basic assumption that participation rates for men will remain relatively constant. However, they assume participation rates for women aged 20 to 54 and 55 to 64 rise progressively towards a ceiling at the end of the period equal to 5 percentage points below those of men in countries with widely subsidized child-care and 10 percentage points below elsewhere. There are some moderate deviations from the above assumptions largely due to recent reforms in policies that are expected to result in higher retirement ages.

[7] This is based on the following formula:

$$\frac{PENS}{GDP} = \frac{POP(55+)}{POP(20\text{ to }64)} \times \frac{POP(20\text{ to }64)}{EMPL} \times \frac{AVBEN}{AVPDTY} \times \frac{REC}{(POP55+)}$$

where PENS/GDP is the ratio of old-age pension spending to GDP; POP (55+) is the population 55 and over; POP (20 to 64) is the population ages 20 to 64; EMPL is employment; AVBEN is total old-age pension spending divided by the number of recipients; AVPDTY is labor productivity; and REC is the number of pension recipients.