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Christian E. Weller

**Programs Without
Alternative: Public Pensions
in the OECD**

Working Paper

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PROGRAMS WITHOUT ALTERNATIVE:
PUBLIC PENSIONS IN THE OECD

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Introduction

Life expectancies in industrialized economies have grown, and birth rates have fallen. The number of those who pay for public pensions is shrinking, while the number of beneficiaries is growing, which supposedly puts public pensions in crisis. The question thus is whether we can still afford to pay for public pension programs in industrialized countries.

Most industrialized countries introduced public pensions to avert old age poverty. Because lifetime earnings and savings are unpredictable, public pensions offer an income guarantee to retirees of sufficient income for life out of poverty. Without Social Security in the U.S., an additional 39% of Americans over 65 would have lived in poverty in 1998.

Even though countries are still committed to provide public support for workers to reduce old age poverty, this promise seems to have hit a stumbling block. The argument is that because of demographic changes – more old people, and less young people – public pensions have to scale back their promises or raise taxes to unrealistic levels.

The impediments, however, to paying for public pensions are caused more by political decisions than by economic realities in seven OECD countries. By and large, public pensions may encounter a willingness-to-pay crisis, but not an ability-to-pay crisis.

Expenditures for old-age income programs are already the largest social expenditure. In most cases, expenditures can be expected to increase with the aging of each country's populations. However, whether growing expenditures can still be financed depends on the expected economic trends, on the structure of each country's public pension system and on the willingness of policy makers to increase revenues for public pensions if needed.

The growing financial needs of public pensions, mirrored in rising tax rates, are attributable to economic changes and to the structure of public pension systems. Slow or declining employment growth, low productivity and wage growth, and increasing income inequality have resulted in increasing public pension financing demands on workers.

As far as the future is concerned, most projections are overly pessimistic in their economic assumptions. Yet, even with pessimistic assumptions tax rates may decline and living standards may increase over the next decades. If better than expected economic trends materialize, each country's ability to pay for public pensions should also grow.

Because of a growing sense of crisis regarding the future of public pensions, though, more attention has focused on private market investments as a substitute for public pensions. But opponents of privatization point to its higher risks and costs, which makes private pensions a poor substitute for public pensions. However, because people's life expectancies are increasing, long-term financial needs are likely to increase, too. Some of these additional needs may not be met by public pensions. Hence, private pensions may serve as a supplement to public pensions.

Background

The Anti-Poverty Success of Public Pensions

Public pensions are designed to keep most if not all of the elderly out of poverty. The evidence suggests that public pensions are an important income source for pensioners (Hauser, 1998). Public pensions ranged from 58% of total gross household income in Italy in 1989 to 83% in West Germany in 1989. Also, pensions provided more than two thirds of gross household income in France (81%) in 1989, in the UK (68%) in 1991, and in the U.S. (67%) in 1991¹.

Consequently, old age poverty is significantly reduced through government transfers, mainly in the form of pensions (Smeeding, 1997). Germany and Sweden have high market income poverty rates, 65.8% in 1989 and 91.6% in 1992, respectively. Thanks largely to public pensions the German rates drop to 7.5%, and the Swedish to 6.4%. Similarly, in France and Italy,

old age poverty is reduced through a variety of programs, of which public pensions are the largest. In France, old-age poverty declines from 79.9% in 1984 to 4.8%, and in Italy from 55.7% to 4.4%. Finally, in the UK and the U.S. public pensions are also an important tool to lower old age poverty. Due to low benefit levels the reductions are from 68.5% to 23.9% in the UK in 1991 and from 58.7% to 19.6% in the U.S. in 1994 (Smeeding, 1997)².

Using different poverty thresholds for the U.S., the success of public pensions shows the same order of magnitude. According to the Social Security Administration (2000b), public pensions lowered old age poverty by 39% to 10.4% of pensioner households in 1998.

Crisis? What Crisis?

Public pension expenditures are the largest social expenditure in six of the seven OECD countries – with Japan as the exception, where medical expenses are slightly larger.

The fact that public pension expenditures relative to GDP have grown between 1980 and 1995 seems important for the growing sense that there is a public pension crisis in OECD countries (table 1). The smallest increases appear in Germany (+0.3%) and in the U.S. (+0.3%). In comparison, the increases are most pronounced in Japan (+2.2%), France (+2.6%), and Italy (+3.6%), leaving Sweden (+1.3%) and the UK (+1.4%) with more moderate changes.

*** Insert table 1 here***

Even where expenditures have increased, expenditures relative to GDP are still manageable. France and Italy surpassed Germany only in the 1990's with their spending on old-age cash assistance. By 1995, Italy's expenditures were 0.7% higher than Germany's, and France's were 0.07% larger than Germany's. Further, if Japan's expenditures relative to GDP continued to grow at the same rate as they had between 1980 and 1995, it would take more than 30 years before they exceeded 10% of GDP. Incidentally, this is the level that has been sustained by Germany between 1980 and 1995. The expenditure levels do not leave the impression that public pensions are in a state of crisis.

The tax burden for workers, though, seems to be more at the heart of the asserted public pension crisis, not expenditures. Most funding for public pensions stems from payroll taxes, with some additional support from general revenues.

Table 2 provides data on tax rates in the seven OECD countries since the 1961. Tax rates have only continuously increased in Germany and the U.S., which are also the two countries where expenditures relative to GDP have been relatively stable. In France and Italy, tax rates have increased since the 1970s. However, while the largest increases of French tax rates occurred in the 1970s, the largest jumps in Italian tax rates came in the 1990s. Further, Swedish tax rates increased sharply in the 1960s, declined in the 1970s and again in the 1990s after remaining stable in the 1980s. Also, Japanese tax rates dropped slightly in the 1980s before increasing again in the 1990s. Finally, British tax rates increased sharply in the 1970s, before declining in the 1980s and increasing in the 1990s.

*** Insert table 2 here ***

However, the tax rate increases in five countries in the 1990s hardly support the argument that public pensions are already in a crisis. First, in France combined tax rates in 1999 are still below their 1961 levels. Similarly, the combined British tax rates in 1999 were only 0.37 percentage points higher than the ones in 1975. Moreover, average tax increases in France in the

1990s were the smallest ever. Also, American rates have remained flat in the 1990s and Swedish rates have declined over the course of the 1990s. Finally, German tax rates have increased, despite the fact that expenditures have remained stable. Thus, only two out of seven countries, Italy and Japan, have both rapid tax increases and rising expenditure levels.

For the outlook on public pension finances forecasts of economic trends become crucial. The crisis scenario is often predicated on the notion that life expectancies increase, fertility rates decline, and that the demographic slowdown leads to less economic growth³.

Table 3 shows the relevant demographic forecasts. The share of people 65 years old and over relative to the total population is expected to increase dramatically. By 2000, the share of the elderly is expected to be somewhere between 13% (U.S.) and 18% (Italy), and is expected to increase to between 20% (U.S.) and 36% (Italy) by 2050.

*** Insert table 3 here ***

While the share of the elderly is projected to rise dramatically, these forecasts are rather meaningless. What matters to future generations is their standard of living, which depends only partially on the number of retirees they have to support. Gains in labor productivity make it easier for future workers to support more retirees. Also, unemployment may decline and employment may grow, making it even easier for all workers to support all the elderly.

The OECD's estimates highlight also some of the problems with long-range forecasts. Most forecasts are sensitive to the underlying assumptions, especially with respect to labor force participation and productivity growth. Labor force participation often receives only scant attention despite its importance in determining future projections (Turner et al., 1998; Herbertsson et al., 2000). Without any changes in labor force participation rates, GNP per capita will be 95% higher in the EU in 2050 than in 1995 (Turner et al., 1998). Allowing for higher labor force participation and lower unemployment, GDP per capita could be 138% higher than in 1995. In the OECD's calculation, changes in labor force participation have a greater impact on living standards in the EU than any other change. Further, productivity growth is one of the most important determinants of future living standards (Baker, 2001). But, the OECD study does not even consider the impact of faster rising productivity. Instead, historically low levels of productivity growth, 1.4%, are extrapolated over 50 years. Historically, productivity growth has never been this low for extended periods of time (table 6).

Other model calculations that focus on tax rates rely on pessimistic economic assumptions, too. Sinn (1999) argues that German tax rates will rise from 20% to over 30% by 2030. Also, Prognos AG (1998) estimated that German tax rates will increase merely to 24% by 2040, but it put a significantly higher burden on general revenues, thereby increasing the overall tax burden (Sinn and Thum, 1999). Both studies assume constant or low labor force participation rates of the working age population, and constantly high or even increasing unemployment rates (Sinn and Thum, 1999). Both model calculations also assume low productivity and wage growth.

Forecasts of rising tax rates and lower than otherwise expected living standards are based on overly pessimistic assumptions. Further, even where tax rates are expected to increase, living standards, as measured by after-tax wages are still projected to rise (Baker, 2001).

Economic and Demographic Factors Influencing Public Pensions in Theory

The following schematic discussion may be helpful to understand how economic factors could impact public pension finances. In general, public pension finances can be affected by employment and productivity growth and by changes in income distribution. Declining

employment and lower wages both result in a smaller tax base. Further, a redistribution of income from labor to capital shrinks the tax base as wages are not rising as fast as productivity, and a rise in income inequality raises benefit payments disproportionately because public pensions are income insurance programs designed to keep people out of poverty.

Public pensions receive income either from payroll taxes or from general revenues. Generally speaking, public pension income is the product of the tax rate times covered income. The tax rate is the combined tax rate levied on employers and employees, and the implicit tax rate charged to general revenue. Covered income is the sum of all covered incomes:

$$\text{Contribution}_T = t_T Y(N_T ; y_{wT}) \quad (1)$$

where t is the combined tax rate in period T , Y is total covered income, N is the number of covered employees in period T , and y is an individual worker's income in period T .

Increasing financial needs can arise as contributions decline relative to benefits payments. The share of the population that contributes to public pensions declines or grows slower than the number of beneficiaries because of lower employment growth or higher unemployment. Further, covered income either declines or grows slower than the benefits because real wages decline or grow at a slower pace. Slower wage growth may be the result of sluggish productivity growth or of a redistribution of income towards profits or both. Also, where countries have implemented a cap on income above which taxes are not applicable, greater income inequality means that an increasing amount of total income lies above the cap leaving a smaller taxable base. Finally, tax rates can be lowered by legislative act to reduce the revenue stream to public pensions.

Greater financing needs can also arise from faster growth of benefits (relative to contributions). Benefits are a function of eligibility criteria, individual earnings histories, indexation of past earnings and of benefits, a redistributive factor and a demographic factor:

$$\text{Benefits}_T (N_{BT}) = b_{iT} \quad (2)$$

$$b_{iT} = \rho I_{BT} ((\sum I_w W_{Bt}) / \text{Time}(\text{NRA}; \text{pensionable earnings years})) \quad (3)$$

Total benefits payable in period T are the sum of all individual benefits b_{iT} over all beneficiaries in period T , N_{BT} . Individual benefits are determined by individual earnings histories indexed by earnings indexation factor, I_B , and divided by the number of eligible years, which is again a function of the normal retirement age, NRA , and of the number of years of pensionable earnings an individual has had. The average wage is then multiplied by a replacement rate, ρ , by a redistributive factor, I_{BT} , by a demographic factor, I_B , and by a benefits indexation factor, I_{BT} .

Benefits increases result both from economic and demographic factors. Since public pensions are an insurance against old age poverty, they redistribute income towards lower lifetime earners. If the number of low lifetime earners rises, benefits grow disproportionately. Also, to maintain relative benefit levels, benefits are indexed to inflation, wages, productivity, or GDP growth. Faster growth of any of these factors lead to higher benefit payments. Finally, if benefit payments are not adjusted to demographic changes, the fact that people live longer should raise the total amount of benefits. Greater life expectancy is an automatic benefit increase.

Finally, changes in the benefits formula can result in growing financing needs. For instance, the number of beneficiaries may increase as more categories of people become eligible

or as the retirement age is lowered. Further, indexation and redistribution factors can be changed to make the system more generous.

Economic and Demographic Changes in Reality

In theory, a number of economic factors can affect the financing needs of public pensions. To see which factors could have had an impact on public pension finances in the OECD, I present evidence on employment, productivity and wage growth and on inequality.

Employment Table 3 shows the rising share of the over 65-year-olds. This graying of the population is due to low birth rates and improving life expectancies. From 1992 to 1997, population growth was below that of the early 1970's. In particular, fertility rates - births per woman - have been declining everywhere from the 1970's to the 1990's, with the largest drop in Japan (table 4). Also, life expectancies have increased by six years (France, Germany, Italy and Japan), by five years (Sweden), by four years (UK) and by three years (U.S.), respectively.

*** Insert table 4 here ***

Demographic changes, though, only set the limits for employment growth. If employment declines, those who bear the financial burden for public pensions may face greater demands. In France and Italy employment relative to the working age population has declined steadily since the 1960s (table 5), decreased somewhat in Italy, and dropped sharply in Sweden from the 1980s to the 1990s. In comparison, employment relative to the working age population has grown in the U.S. since the 1960s, in Japan since the 1970s, and in the UK and Germany since the 1980s.

*** Insert table 5 here ***

Also, employment levels vary across countries. Japan, Sweden and the U.S. all had average employment to working age population ratios above 70% in the 1990s. In comparison, the UK had slightly less than 70%, Germany 65%, France below 60%, and Italy 52%.

The divergence in employment rates suggests that the low levels observed in some countries towards the end of the 1990s could possibly improve again - contrary to what is often assumed in projections for public pension systems (Turner et al., 1998; Sinn, 1999; SSA, 2000). First, employment levels are low by historical standards in France, Germany, and Italy. In countries, where employment levels were high, they nevertheless continued to grow, such as in the US, the UK and Japan. Once high employment levels are reached, they may remain high as they did in Sweden (table 5). Thus, Italy's employment could increase by 30 percentage points relative to the working age population, and France's and Germany's by about 20 percentage points before it reached 80%, which was the highest level in any country over the past 40 years.

Growing employment could also result from declining unemployment, from rising female labor force participation rates, or from fewer early retirees. In 1998, German women had an employment rate of 54%, whereas men had an employment rate of 69%. In France, the rate for women was 54%, and for men 68%, in Italy, 37% for women and 68% for men, in the UK, 64% for women, and 79% for men, and in Sweden, 67% for women, and 73% for men (EC, 1999).

Low labor force participation rates may be a result of a broadened application of early retirement options. Occasionally, public pensions have substituted for unemployment benefits (Herbertsson et al., 2000; Sinn, 1999; Blanchet and Pelé, 1997). For the EU as a whole, early retirement may have meant a loss in potential output of more than 10% (EC, 1999b). According to Social Security in the U.S. 19.8 million out of 27.5 million retirees received reduced

retirement benefits because they chose early retirement (SSA, 1999). Also, in Germany, about 2.3 million out of 5.9 million retirees received retirement pensions outside the regular schedule. German women, for example, are entitled to full retirement benefits at age 60, while the normal retirement age for men is 65. Further, long-term unemployed workers have the option to retire early (BfA, 2000). Under the Italian system, workers can retire before the normal retirement age with full benefits after 35 years of service. Thus, early retirement is widespread, despite low expenditures on separate programs (Brugiavini, 1997).

Productivity Faster increases in productivity should ease the burden of paying for the elderly. The same dependency ratio in the future as today may put less demand on current income if productivity and wages have grown faster than overall benefits.

There is little evidence to suggest that productivity growth will remain at low levels for extended periods. Between 1979 and 1999, productivity growth in Germany, Italy, Japan, and Sweden was lower than during the period from 1973 to 1979, but it accelerated in France, the UK and the U.S. at the same time. Thus, there are no clear long-term trends towards lower productivity growth emerging in the OECD, and there is no evidence that countries will suffer low productivity growth rates for extended periods – as has been assumed in some projections for future public pension finances (Turner et al., 1998; SSA, 2000).

In the long-run, wage growth should equal productivity growth. Wage growth has slowed in the past 20 years from its previously levels everywhere, except in the U.S., where wages have recovered some ground lost in the late 1970s. Also, in most countries wage growth has been below productivity growth. Thus, there has been a gradual shift in national income from labor to capital. Slower wage growth and a shift from labor income to capital income reduced the size of the tax base relative to GDP and relative to promised benefits.

Inequality Rising or falling earnings inequality matters for public pension finances. In particular, most systems redistribute funds to ensure that low lifetime earners receive an income that is close to or above the national poverty threshold.

Technically, rising inequality should lead to growing financing demands on public pensions if benefits are related to average earnings, or if taxable earnings are capped. Benefits are generally directly connected to a worker's earnings history. In addition, individual earnings histories are often set in relation to average earnings. If earnings inequality increases, either the number of people or their aggregate earnings below the average will fall. An indexation of benefits to average earnings would thus result in an increase in benefits that is disproportionate to contributions. On the contribution side, earnings above a certain level are often not subject to public pension taxes. Higher earnings inequality may also mean that a growing share of aggregate earnings come to lie above the earnings cap, thereby reducing contributions. In either case, the financing demands on those who are contributing to public pensions grow⁴.

Both earnings and income inequality appear to have grown in the 1980's and 1990's in most of the seven OECD countries. For instance, Gottschalk and Smeeding (1997) found that "[a]lmost all industrial economies experienced some increase in wage inequality among prime aged males" (Gottschalk and Smeeding, 1997: 636). They also found that inequality grew fastest in the UK and in the US, and the least in the Nordic countries. Other studies support some of these findings. The exceptions with respect to earnings inequality appear to be Germany, and possibly Italy. In comparison, the exception with respect to rising income inequality appears to be France in the 1990s⁵. Elsewhere, both earnings and income inequality appear to have grown.

In general, earnings inequality will be the more relevant aspect to consider since most contributions come in the form of payroll taxes, and most benefits are related to earnings

histories. Whether and how much inequality can adversely affected public pension finances depends on the exact benefit formula of each country's pension system.

Earnings inequality in France appears to have increased in the 1980s. For the years between 1976 and 1987, several studies suggest rising earnings inequality (Katz, Loveman, and Blanchflower, 1995).

There appears to be also little evidence of growing earnings inequality in Germany in the 1980s. Wage inequality has been found to remain stable throughout the 1980s (Freeman and Katz, 1995). Also, earnings inequality has stayed the same in Germany in the 1980s (Abraham and Houseman, 1995; Katz, Loveman and Blanchflower, 1995).

The evidence for Italy on earnings inequality appears to be mixed. Freeman and Katz (1995) report signs of expanding wage differentials by occupation and education in the late 1980's in Italy. In comparison, others have found that earnings inequality remains the same for Italy in the 1980's (Abraham and Houseman, 1995; Katz, Loveman and Blanchflower, 1995).

Japan's earnings inequality appears to have grown, too. According to one study, Japanese earnings inequality grew between 1974 and 1990 (Katz, Loveman and Blanchflower, 1995).

Sweden is yet another country with rising earnings inequality. Earnings inequality seems to have grown in Sweden in the 1980's with the stronger growth of inequality in the second half of the 1980's than before (Edin and Holmlund, 1995).

The UK appears to be the European country with the fastest growing earnings inequality. Wage inequality rose at double digit rates in the UK between 1979 and to 1990 (Freeman and Katz, 1995; Katz, Loveman and Blanchflower, 1995).

Finally, the U.S. appears to be another country where earnings inequality grew sharply. According to Freeman and Katz (1995), wage inequality rose at double digit rates – similar to the UK - in the US between 1979 and to 1990.

Predicting the Future

While demographic and economic changes can affect the finances of public pension systems, future trends may not warrant dire scenarios for public pension finances.

The idea that public pensions will incur a crisis depends largely on demographic projections that are often superimposed on recent adverse economic trends. For instance, Turner et al. (1998) assume no improvements in employment shares and continuously low productivity growth for the U.S., Japan, and the EU. Similarly, U.S. Social Security's trustees continue to forecast productivity growth rates at 1.5% annually and real wage growth at 1% each year. Given historical and international experiences, these figures appear unduly pessimistic (table 6).

*** Insert table 6 here ***

Assumptions that labor force participation rates will remain constant at their low levels for the next 50 years (Turner et al., 1998) appears unduly pessimistic. Considering the labor market situation in the OECD countries there seems to be room for employment to grow. First, employment levels are low by historical standards in France, Germany, and Italy. Second, employment levels continued to grow in the US, the UK and Japan even after relatively high levels at or above 65% of the working age population had been reached. Similarly, employment levels remained high in Sweden (table 5). If we assume that the rate of workers to the working age population reaches its maximum around 80% - the highest level for any country during the past 40 years - Italy's employment could increase by 30 percentage points relative to the working age population, and France's and Germany's by about 20 percentage points.

To illustrate the impact different assumptions on projections for public pensions, I calculate a ratio of the elderly to current workers that is adjusted for employment and productivity growth⁶ - the Care for the Aged and Retired by Employees Ratio (CARER). I calculate CARER to gain a tool for a cross-country comparison of each country's ability to pay for its public pension system. To facilitate cross-country comparisons, I have indexed CARER to 2000 and treat each public pension system as if it were a pay-as-you-go system⁷.

For ease of comparison of each country's ability to pay, I make a few simplifying assumptions. First, I assume that everybody over the age of 65 is a beneficiary. As all countries offer retirement, disability and survivorship benefits in addition to a minimum or poverty pension, few people over the normal retirement are not covered by public pensions. Second, differences in the normal retirement age are therefore ignored. Since rapid changes in the normal retirement age are rare, this assumption may understate the level of the dependency ratio, but not the changes of it. Third, I ignore the redistributive characteristics of public pension systems. Since income inequality has increased in almost every country, this assumption is likely to understate the burden of caring for future retirees. However, this is partially offset by calculating benefit increases on the basis of average wage growth. Increasing income inequality suggests below average earnings growth for low income earners, who benefit the most from public pension redistribution. Thus, including average wage growth - equal to productivity growth - as a measure of benefits increases means that I am likely overstating benefits increases⁸.

One characteristic of each country's public pension system that is included in the calculations, is the indexation method. Most countries index their benefits to price increases after retirement (France, Italy, Sweden, the UK and the U.S.). In comparison, Germany and Japan index their benefits to after tax wages⁹.

The changes in CARER are subsequently used to calculate after tax wage increases over the next fifty years as a measure of future living standards. Both the expected burden to care for the elderly, and the changes in future living standards help us to answer two questions. First, both measures can be used to discover how sensitive future projections are to the underlying assumptions, and second, they can be employed to analyze whether each country can afford a pay-as-you-go public pension system.

Table 7 calculates the burden of caring for the elderly and the resulting after-tax wages on the basis of each country's experience during the past twenty years. After adjusting for changes in employment and productivity gains, the burden of caring for the elderly increases in three countries and declines in the other four. The decline in the burden of caring for the elderly falls between 20% (France) and 52% (Sweden and the U.S.). In comparison, increases in the burden of caring for the elderly range from 25% in Japan to 40% in Germany.

*** Insert table 7 here ***

Even where the burden of caring for the elderly is expected to increase, living standards are likely to grow. After tax wages are more than twice as high in six out of seven countries in 2050, and two thirds higher than in 2000 in Italy.

The experience of the past 20 years, however, appears rather pessimistic and may hence underestimate the future economic performance of the seven OECD economies. With the exception of the U.S., the average productivity growth rate for the past 40 years has been higher than for the past 20 years. Further, the rate of change of the ratio of employment to the working

age population for the past 20 years has been rather similar to that of the past 40 years, with the exception of Japan (table 8).

*** Insert table 8 here ***

Given the different set of assumptions that is based on long-term historical experiences, the forecasts for the burden of caring for the elderly and for after tax wages become more optimistic. The burden of caring for the elderly is expected to still increase in two countries – Germany and Japan. However, CARER actually decreases in the last ten years in Japan. Only in Germany does CARER seem to be unaffected by the different set of assumptions. However, because of the largely more optimistic outlook on the economy, the forecasts in table 8 suggest more than a tripling of after tax wages in France, Italy, Japan, Sweden and the UK after 50 years. In Germany, after tax wages are expected to increase by 184%, and in the U.S. by 130%.

Table 9 summarizes the changes, which indicate that with the exception of Germany and the U.S. the long-range assumptions lead to lower forecasted burdens of caring for the elderly than the short-range assumptions. In Germany, a change in the underlying assumptions appears to have little effect on the burden of caring for the elderly, while the less optimistic assumptions lead to a higher burden in the U.S. case, as one would expect.

*** Insert table 9 here ***

The calculations have so far combined changes in two underlying assumptions at the same time, productivity growth and growth in the ratio of employment to the working age population. Table 10 records the impact of alternative assumptions about productivity growth and employment growth separately. As a baseline scenario, I assume – similar to the OECD studies - that each economy's productivity grows initially at 1.4% annually, and that employment to working age population remains unchanged. First, I increase annual productivity growth to 2%, then I raise employment growth relative to the working age population by 0.4% annually, and finally, I change both assumptions at the same time.

*** Insert table 10 here ***

Higher productivity growth translates into a lower burden of caring for the elderly in six countries. The only exception here is Germany, where higher productivity growth has no effect on caring for the elderly. In countries, where benefits are indexed to inflation, an increase in annual productivity growth from 1.4% to 2.0% results in a decline of the burden of caring for the elderly by 25% to 34% over 50 years.

The impact of faster employment growth is ambiguous. In three countries, France, Germany and the U.S., the burden of caring for the elderly declines, whereas it increases in the other four countries. The ambiguity in the effect of increasing employment can be explained with the fact that higher employment also leads to increases in future benefit payments.

The combined effects of higher productivity growth and faster employment growth result in a declining CARER for all countries. Put differently, the productivity gains are more than offset by the growing demands on Italy's public pension system from increases in the number of future retirees. Further, the combined gains in CARER from faster productivity and employment

growth are smallest in Japan (3.4%) and Germany (8.2%), where benefits are indexed to after tax wage increases.

The effects of different economic assumptions vary with the indexation of benefits. Thus, table 11 calculates the changes resulting from a switch in the indexation method given 1.4% productivity growth and no change in the ratio of employment to the working age population. Switching from a price indexation to an after-tax wage indexation means a benefit increase, and therefore increases CARER by about 80% to 90% in all five countries (France, Italy, Sweden, the UK and the U.S.) after 50 years. In comparison, switching from an after-tax wage or GDP indexation to a price indexation in Germany and Japan lowers CARER by 46% over 50 years.

*** Insert table 11 here ***

Another change in the level of benefits that has entered the debate in some OECD countries is a decrease in the retirement age¹⁰. Several countries, such as France or Germany, have already used de facto lower retirement ages to combat persistently high unemployment levels. What would happen to public pension finances if the hypothetical retirement age were lowered? To illustrate the impact of a lower retirement age, I reduce the retirement age in a linear fashion by 0.2 years each year for the next 25 years, and increase the number of retirees and lower the number of people in the working age population.

By definition, a lower retirement age increases the burden for current workers to care for the elderly. The increase is largest in Italy with its most rapidly changing demographics, and smallest in the U.S., which is also the country with the highest population growth rate and the youngest population among the seven OECD countries. The impact of a lower retirement age is a CARER that is between 11% and 38% higher than with a normal retirement age of 65.

By looking at two possible benefit increases, higher indexation and lower retirement age, and connecting these to the resulting after tax wages, we can gauge not only whether benefit increases are affordable, but also demonstrate that there is little to worry about. If a public pension system can afford benefit increases – when so desired by policymakers - , there is little grounds to assert that its future is in jeopardy. In the four countries, where the indexation is changed from prices to after tax wages, after tax wages of workers are still about twice as high in 2050 as they are in 2000. Further, with a lower retirement age, after tax wages are 73% to 110% higher in 2050 than in 2000. Benefit increases are possible, if policymakers are willing to increase tax rates, which should result in slower growth of after tax wages than otherwise, but growth of after tax wages nevertheless.

My simulations are merely indications of broad trends. They illustrate the sensitivity of future projections to what often appears like marginal differences in the underlying assumptions. Further, the scenarios speak directly to the claim that public pension systems in the OECD are going to be in a crisis. Even if we use the most pessimistic assumptions, the simulations do not spiral out of control. Quite the contrary, even with pessimistic assumptions, benefit increases appear affordable, if policymakers are willing to introduce them.

My projections take each country's system's characteristics only to a limited degree into account. Nevertheless, my simulations provide a sense of each country's ability to pay for the elderly. This ability to pay should not be confused with the willingness of policy makers to implement the necessary changes. Despite an improving ability to pay for the elderly, tax increases may be necessary. Some factors that require higher tax rates may not be connected to

economic trends, but to policy decisions. The following section provides therefore a description of the designs of public pension systems.

Country Experiences with Public and Private Pensions

The discussion over the future of public pension systems has helped to generate a sense of crisis among policy makers and increasingly among the public. It seems that the greater the sense of crisis becomes, the less willing policymakers may be to consider changing the structures of public pension systems, so that they may take advantage of the possibly greater ability to pay for public pensions in the future. Thus, considering privatization appears as a viable solution to perceived problems of public pensions. Hence, we consider existing private pension systems in each country in the following discussion.

The French Experience with Public and Private Pensions

The French public retirement system offers a variety of co-existing schemes, all of which are on a pay-as you-go (PAYG) basis. For private sector employees, there are two public pensions, the general regime and complementary schemes.

Changes to the French retirement system have been implemented on occasion since the early 1970's (table 12). Most notable are increased replacement ratios and the affiliation of homemakers. On the other hand, benefit cuts have come as extensions of the years required for maximum benefits and as expansions of the years over which average earnings are calculated.

*** Insert table 12 here ***

Approximately 65% of all workers are eligible for the defined benefits of the general scheme, which was created in 1945. In addition, roughly 180 complementary schemes exist, based on occupation, that belong to one of two federations. AGIRC manages pensions for workers in executive and managerial positions for the portion of their income that is above the income cap of the general scheme. ARRCO handles pensions for all other workers, and for the part of managerial and executive wages that are below the cap. Even though complementary schemes were created between 1946 and the mid-1960's, participation did not become mandatory until 1972 (Blanchet and Pelé, 1997). There are also approximately 120 specialized systems (Blanchet and Pelé, 1997). These are pensions for the self-employed and for public sector employees, and they remain outside the public pension system. Finally, 1 million retirees in 1997 received means tested minimum pensions, down from 2.55 million in 1959 (CGP, 1995).

Public pension contributions are collected mainly as payroll taxes. Taxes for the general system amount to an employee contribution of 6.55% of pensionable earnings, and to 0.1% of total earnings for surviving spouse's benefits. The employer pays an additional 8.2% of covered wages plus 1.6% of total wages (Blanchet and Pelé, 1997; SSA, 1999). For the complementary schemes, payroll taxes are 2% on income up to three times the income ceiling for non-managerial workers. Managerial workers pay 2% for the income that is below the income ceiling, and 4.68% above the income ceiling as long as it is below four times the ceiling. In 1994, the actual contribution rates for complementary schemes were calculated by multiplying the tax rates by a factor of 1.25 (Blanchet and Pelé, 1997).

All benefits are defined benefits based on an individual's earnings history. General benefits are based on the eleven to 25 highest income years - depending on the year of birth -, on years of contribution up to a maximum of 37.5, and on age at retirement. The replacement ratio amounts to 50% of average wages of 25 best years as of January 01, 2008 (SSA, 1999). For each quarter that a retiree is shy of the maximum of 37.5 years, the replacement rate of a worker's

highest ten year average is reduced by 1.25% in addition to a penalty for contributing less than the maximum years. Similarly, for each quarter that a worker is shy of age 65 the replacement rate is reduced by 1.25%. In cases, where workers are younger than 65 and have contributed less than 37.5 years, the higher retirement income is chosen. Benefits are indexed to prices or average wages on a discretionary basis (Blanchet and Pelé, 1997). In the complementary system, workers earn “points” towards their pension benefit, which are accumulated relative to contributions. The pension is ultimately equal to the total number of points collected multiplied by a variable coefficient. There is no preset replacement rate for the complementary system.

Since 1963, French workers have the option to retire early. Between 1963 and 1972, early retirement was used as an income support for older workers who had been affected by mass layoffs (Blanchet and Pelé, 1997). Since 1972, this system was replaced with a more general program that was intended to provide 60-70% of one’s income to workers who had lost their job at age 60 or older. When the normal retirement age was lowered to 60 in 1983, its impact was small as most workers had already taken early retirement (Blanchet and Pelé, 1997).

Workers have other early retirement options. First, there are negotiated benefits under the National Fund for Employment that can result from negotiations between the employer and the government. Second, there are unemployment benefits for workers 58 years old or over to help them make the transition to retirement (Blanchet and Pelé, 1997).

The French public pension system also offers means tested spousal benefits, disability pensions for workers under the age of 60, and survivorship benefits if the surviving spouse is over 55, or for children of the deceased.

Since public pensions offer relatively generous benefits as indicated by comparatively high replacement ratios, private pensions are rare in France¹¹ (Davis, 1994). Only a small number of firms offer group-insured plans for executives, or what is referred to as top-hat plans. These could be either defined benefit or defined contribution plans.

The German Experience with Public and Private Pensions

The public pension system is separate from the government, but subsidized by the government. Originally designed as fully funded disability insurance in 1889, it eventually turned into a PAYG system when the Great Depression and WWII affected its finances.

Over the decades, there have been several reforms. In 1972, the government expanded benefits by introducing early retirement benefits and average before tax wage indexation instead of inflation. The 1992 pension reform introduced benefit cuts by changing indexation to after tax wages, by raising the normal retirement age for women from 60 to 65 in 2004 (table 13), and by lowering the replacement rate from 70% to 64% over time (Sinn, 1999). Finally, in 1999, it was proposed to index benefits to inflation for two years, and to after tax wages thereafter.

*** Insert table 13 here ***

Payroll taxes cover 80% of benefits, while the government covers the rest out of general revenues (Börsch-Supan and Schnabel, 1997; BfA, 2000). Combined tax rates – split evenly between employer and employee - have been between 18% and 20% since 1973 on earnings below an income cap. Since the income ceiling is indexed to average wage growth the tax base has become wider over time.

Pension benefits are generous. They offer an average replacement rate of 71% of average after tax wages, based on a worker’s earnings. After retirement benefits are indexed to average after tax wages. To calculate benefits, a worker’s contributions are indexed to annual average

contributions, which are then averaged over the full working life. In 1972, a floor of 75% of average contributions for benefit calculations was introduced, thereby lifting the averages for low lifetime earners. The 1993 reform eliminated the floor. For workers whose contributions are below 50% of average contributions, contributions below 75% of average contributions are multiplied by a factor of 1.5 up to a ceiling of 75%. Further, benefits are based on years of services, which include years of no contributions, such as unemployment, military service, or years spent in school. To combat high unemployment, the eligibility for benefits has been widened, especially by expanding early retirement (Börsch-Supan and Schnabel, 1997).

Early retirement has become a popular option. Following the 1973 reform, which made it possible to retire early with full benefits, the average retirement age declined from age 63 to 58.5 (Börsch-Supan and Schnabel, 1997). Early retirement incentives also led to a sharp drop in labor force participation rates in East Germany immediately following unification. In particular, labor force participation rates in East Germany declined from 56.9% in 1990 to 37.4% in 1992, which is attributed largely to generous early retirement benefits (Börsch-Supan and Schmidt, 1996).

German workers have different options for retiring early. Out of 5.9 million retirees in 1999, 1.1 million were women, who were entitled to full retirement benefits earlier than men. A little over half a million retirees received retirement benefits because of unemployment (BfA, 2000). Further, Börsch-Supan and Schnabel (1997) report that at age 59, about 45% of men consider themselves retired, half of whom have taken advantage of early retirement options, and the other half because they qualify for disability benefits. Other than regular retirement options, workers can also use unemployment benefits after age 56 as early retirement income or as subsidized support from their employers after age 58 (Börsch-Supan and Schnabel, 1997).

In addition to retirement pensions, Germany's system offers also disability benefits of at least two-thirds of the applicable old-age pension. Further, survivorship benefits are paid at 60% of the spouse's applicable old age pension if children are present and 25% if not.

Even though a large share of employees receives private pensions, these are relatively small. Only 5% of a typical household's retirement income come from employment based private sources (Börsch-Supan et al., 2000). The fact that German workers receive few pension benefits from their employers results from the generosity of public pensions on the one hand, and from provisions of private pensions that keep the risks associated with them largely with the employer. Most private pensions are defined benefits, and companies are legally mandated to index benefits. Pension coverage has declined from 70% to 66% in the 1980's (Davis, 1994).

There are four types of private pensions (Deutsche Bundesbank, 1984; Ahrend, 1996, Davis, 1994). Direct commitments are the largest one, which appear on the balance sheets of companies. In 1991, direct commitments – valued at DM 240 billion – were 60% of pension liabilities. They are insured in case a firm goes bankrupt, and since 1987, provisions for otherwise unfunded liabilities have been mandatory. Contributions are tax free, they earn 6% nominally, and can only be invested within the firm. Second, external pensions exist, and about 10% of pensions are in the form of direct insurance, where a firm contracts with a life insurer on behalf of its employees (Davis, 1994). Investment risks are borne by the insurer and investments are governed by insurance regulations. Third, a company may set up a separate pension fund or a support fund. In 1991, pension funds held 20% of all pension liabilities, and support funds held an additional 10% (Davis, 1994). While pension funds are similar to those elsewhere, support funds are set up as mutual insurances to handle a company's pension scheme. The portfolio choices of pension funds are limited (see table 12), while those of support funds are not. Finally, special security funds have become increasingly relevant. These are investment companies that

allow highly liquid companies that have direct commitments on their balance sheets to invest part of their pension provisions in the capital markets (Davis, 1994).

The Italian Experience with Public and Private Pensions

Italy's public pensions date back to 1889 when pensions for members of the army were introduced. By the 1960's, a variety of public pension schemes existed. For instance, the "National Institute for Social Security – INPS" collected mandatory contributions from a large part of private sector employees and from some self-employed. Subsequently, the INPS and the Public Sector Employees Fund became the main branches of Italy's public pension system. Also, several occupations set up their own funds, guided by their own rules.

Italy's system has been changed several times in the past (Brugiavini, 1997). In 1969, funding was switched to a PAYG, benefits were based on "final salary", a means-tested minimum pension for uncovered workers was introduced, benefits became inflation indexed, and early retirement for private sector employees with at least 35 years of service was offered. In 1976, pensions became indexed to real wage growth. In 1984, requirements for disability benefits were tightened. In 1989, the redistributive aspects of the benefits formula were weakened. In 1992, the amount that a worker could earn without loss of retirement benefits was lowered, the reference period for average wages was lengthened, the minimum requirement was raised, increase in the retirement age for men and women. Also, a reform in 1995 eliminated the earnings cap on benefits, benefits were indexed to inflation. Finally, in 1997 the harmonization of public sector pensions to private sector pensions was accelerated, and the harmonization of special schemes to private sector pensions was introduced (OECD, 2000).

Revenues are mainly payroll taxes. In 1998, the employee contribution amounted to 8.89% of earnings up to an income threshold, and of 9.9% of earnings beyond that threshold, while the employer contribution was at 23.81% of payroll. The government covered any shortfall of contributions in the form of lump-sum subsidies for the past decades.

Benefits are computed on the basis of age, years of service, and earnings. Workers who entered the workforce after 1996 become eligible at 57 with at least 5 years of contributions. With less than 19 years of coverage, men are eligible at 65 and women at 60 (SSA, 1999). Private sector employees can collect full benefits at 55 and 35 years of service. Under current law, there are three benefits calculations. For new entrants after 1996, pensions are based on accumulated contributions multiplied by an age varying coefficient ranging from 4.72 at age 57 to 6.136 at age 65. Second, if a worker has less than 19 years of contributions, benefits are based on progressive percentage between 0.9 and 2 percent of salary times years of contributions, while years after 1995 are calculated in the same way as they are for new entrants. Third, for workers with more than 19 years of contributions in 2000, benefit calculations are based on progressive percentage ranging from 0.9 to 2 percent of salary times years of contributions (SSA, 1999).

There are other benefits. Since 1977, survivorship benefits include widow/widower benefits, children and other dependents. Workers who have contributed for at least five years are also eligible for disability benefits.

Italy is another country, where private pensions have played a relatively small role. They are mostly supplements to public pensions, and can take different forms as there is no law on private pensions. There are book entries similar to Germany's direct commitments, separate pension funds, or pension funds within a firm. Additionally, companies can set up tax-free severance funds that are book reserves (Davis, 1994). However, if the firm goes bankrupt, the worker bears the risk of loss of retirement income.

The Swedish Experience with Public and Private Pensions

Sweden implemented its first compulsory, fully funded old-age pension system in 1913. It consisted of a means-tested basic pension and a supplementary pension relative to a worker's earnings, and covered everybody, not just workers. In 1935, the system switched to a PAYG system, funding switched to employers' contributions, and benefit levels increased (Palme and Svensson, 1997). The minimum pension increased from about 11.3% of earnings of an industrial worker in 1913 to 29.4% in 1941. The minimum pension was replaced with the basic pension in 1946. Based on a referendum in 1959, compulsory supplementary pensions were introduced. In 1976, the mandatory retirement age was lowered from 67 to 65. A survivor's benefit was introduced in 1990 to replace the widow's pension.

Sweden changed its system in 1998 (Ministry of Health and Social Affairs, 1998). Now, pensions are based on lifetime income, the combined tax rate is 18.5% of a worker's lifetime average income, split between employer and employee, of which 16% pay for benefits and 2.5% go into an individual retirement account. Benefits from the PAYG system are indexed to real income growth, and adjusted for life expectancy. In addition to the new pension system, there is also a guaranteed pension as a supplement for low lifetime earners.

In the old system, employer contributions and government subsidies finance most of the system. In 1999, the contribution rate for the national basic pension amounted to 5.86% of payroll for employers, and to 1% of assessable income for employees. 25% of the costs were covered by the government. There is no income ceiling for contributions.

For workers covered under the old system, benefits are based on the basic amount (BA). Everybody is entitled to a full basic pension if they have lived in Sweden for 40 years, or worked there for 30 years. The basic pension for a single pensioner is 96% of the BA and 78.5% for a married worker. Pensioners who are not covered by the supplementary scheme are also entitled to a special supplement, equal to 55.5% of the BA. The share of income that exceeds the BA determines supplementary pension benefits. Three years of income greater than the BA are required to qualify for supplementary benefits. Income that exceeds 7.5 times the BA is not counted for benefits calculations. For income that is above the BA and equal to one time the BA, a worker earns one pension point up to a maximum of 6.5 points per year. The average points of the best 15 years are taken and multiplied by a factor of 0.6, by the BA, and by the number of service years relative to a maximum of 30 years. If a worker has earned 30 years of service, she receives a replacement ratio of 60% of her best 15 years (below the income cap). Benefits are nowadays indexed to inflation (Palme and Svensson, 1997). Everybody receives the basic pension, and there are no benefits for dependents under the supplementary scheme.

Early retirement is an option for workers between the ages of 61 and 65. Under the new system early retirement benefits are actuarially fair reductions of full benefits at the normal retirement age (Herbertsson et al., 2000). Labor force participation rates for men between the ages of 60 and 64 have continuously declined from a high of about 85% in 1964 to close to 60% in 1996 (Palme and Svensson, 1997). In contrast, labor force participation rates for women between the ages of 60 and 64 have increase from about 35% to 45% in the early 1990s, before dropping to about 40% in the wake of the Swedish recession.

The old system offers also survivorship, disability, and early retirement benefits. The basic pension offers survivorship benefits of 90% of the BA for women born before 1945. For everybody born after 1945, survivorship benefits replace the old widow's pensions. Under the supplementary scheme, widow benefits for women born before 1945 offer 35% or 40% of a deceased worker's pension until the normal retirement age of 65. Since 1997, all survivors receive 20% of the deceased spouse's pension if there are children entitled to a children's

pension, and 40% otherwise. Further, disability benefits consist of the basic and the supplementary pension. Calculation of disability benefits is the same as for pension benefits at full retirement age. Finally, both basic and supplementary pensions can be claimed as early as age 60. The monthly benefit is reduced by 0.5% for each month of early withdrawal.

In addition to its complementary fully funded pensions, Sweden also has numerous private pensions, which are arranged through the collective bargaining process. Every worker is covered by one of the plans. White-collar workers are covered by the ITP and blue collar workers are covered by the STP. Funding for the ITP comes from book reserves, insurance contracts or contracts with a special pension company, whereas the STP plan is offered only through a mutual insurance organization (Davis, 1994).

The private pensions offer only a small addition in retirement income with a replacement ratio of roughly 10-15% of the final wage. Up to 1998, investments were limited to insurance companies, mainly in the life insurer SPP for the ITP and the AMF System for blue-collar workers. Both SPP and ITP are now allowed to invest in domestic shares. Since 1998, workers can decide where to allocate their pension assets and who will manage the funds.

The UK Experience with Public and Private Pensions

Retirees in the UK only receive a small fraction of their retirement income from public pensions. The basic state pension amounted to 16% of male average earnings in 1996 (Blundell and Johnson, 1997). Introduced in 1906, the basic pension offers a flat rate benefit, that is an earned benefit and paid for by payroll taxes. In 1978, a supplementary scheme, the State Earnings Related Pension Scheme (SERPS), was introduced. It had originally a target benefit level equal to 25% of average wage-indexed lifetime earnings. Changes introduced to SERPS in 1986 and 1995 reduced the benefits payable under the supplementary program from 25% to 20% of wages, which was supposed to result in lower tax rates (CBO, 1999).

Contributions for the basic pension and the SERPS amount to a maximum marginal rate of 21.6% in 1999 (SSA, 1999) with employees contributing 10% up to the upper earnings limit and employers contributing 12.2% depending on a worker's earnings. Employers can opt out of the SERPS by providing similar private market alternatives, thereby lowering their contribution rates to 9.6% to 11.6%.

“Perhaps the most important feature of the basic pension system is its low level” (Blundell and Johnson, 1997: 19). In 1996, it represented 16% of average male earnings, down from about 20% in the 1970's. Since it is indexed to the Retail Price Index, it is expected to continue to fall to 7% or 8% of average male earnings by 2030. To receive the full basic pension only past contributions and age matter. 44 years of contributions are required for men and 39 years of contributions for women (rising to 44 when the normal retirement age becomes the same in 2020) at the normal retirement age, which is 65 for men and 60 for women. The basic pension offers also spousal benefits and survivorship benefits, but there is no early retirement provision. There is, however, the option of deferral for up to five years with each year of deferral earning a 7.5% increase. Further, there is also a means-tested supplementary Income Support that offers a higher pension benefit than the basic pension for low income pensioners. In 1997, 1.5 million out of 10 million pensioners relied on this minimum pension (Blundell and Johnson, 1997).

Early retirement is not an option in the UK. However, about 43 percent of males between the ages of 60 and 64 receive some form of benefits. The highest incidence rate of benefits before the normal retirement age comes from invalidity benefits, which 25% of males received in 1994/95, followed by income support – or poverty pensions, which went to 17% of males, and 10% of males received other health related benefits (Blundell and Johnson, 1997).

The SERPS was introduced in 1978. Its benefits are relative to a worker's earnings. Earnings are counted above a lower earnings limit and below an upper earnings limit, with all other earnings not counted. Both upper and lower limits are indexed to inflation. Relevant earnings are indexed by average earnings in each year up to the year where the beneficiary reaches pensionable age. From the average of the indexed earnings the lower earnings limit is subtracted. The resulting difference is then multiplied by an accrual factor, and by the contribution years. Similar to the basic pension, SERPS offers survivorship benefits equal to 50% of the worker's pension, and a disability pension, but no early retirement option.

If a worker is covered under an employment related scheme with certain benefits, the worker can give up rights to SERPS. Since 1988 traditional occupational schemes and Personal Pension schemes could contract out of SERPS. 75% of eligible workers are not covered by SERPS, 2/3 of which are in occupational schemes, and 1/3 in Personal Pension schemes.

There is a heavy reliance on private pensions. Only 44% of retirement income come from the basic pension, which is expected to decline to 28% in 2025 (OFT, 1997). An additional 4% of benefits came from SERPS in 1994, which is expected to grow to 16% in 2025 (OFT, 1997). More than half of an average worker's retirement benefit comes from occupational schemes – with employer contributions - and personal pension savings – without employer contributions¹². 50% of all workers are covered by an occupational scheme, and 20% by personal pension plans. While 60% of male workers are covered by an occupational scheme, only 35% of female workers are covered. Further, all public sector employees are covered by occupational schemes, but only 59% of private sector (Davis, 1994). While the pension coverage is unequally distributed, the coverage level has been constant since 1967 (Davis, 1994).

All public sector employees and most private sector workers receive a defined benefit, sometimes even with indexation provisions. Defined benefit plans became less attractive for employers due to high inflation and low returns in the mid-1970s. From 1971 to 1981, employers' contributions to private pensions grew from 1.75% to 3.23% of GDP to cover shortfalls in defined benefit plans. Their finances improved, so that employers' contributions dropped to 2% of GDP in 1987, and to 1.22% in 1992 (Davis, 1994).

In the early 1990's, defined contribution plans and individual retirement savings schemes have become more popular. A survey of employers found a clear preference for them when establishing a new plan (CBI, 1994). Reasons for this preference are that the risks are borne by the employee, that at least for smaller employers there is a cost advantage in setting up defined contribution plans over defined benefit plans, and that more employment contracts are contingent, and short-term (OFT, 1997). In 1993, 3% of all workers were covered by an occupational defined contribution plan, but 19% of workers working for small firms were covered by such plans (Davis, 1994). Also, OFT (1997) reports that survey evidence suggests that there is a steady increase in defined contribution plans, especially in smaller firms.

The Japanese Experience with Public and Private Pensions

The Japanese public pension system dates back to 1942, when a pension insurance was established. The current system with two pillars for pensions was created in 1961. One pillar covers self-employed workers and unpaid workers, the other covers both public and private sector employees. The employee pension consists of a basic pension that is also offered to the self-employed and to unpaid workers and an earnings related pension (Oshio and Yashiro, 1997).

Basic pensions offer the main public retirement benefit to the self-employed. Benefits paid are a flat amount and are unrelated to a worker's earnings. It is paid for from a flat Yen

amount each worker contributes per month. The basic pension does not offer spousal or survivorship benefits, but it does offer a disability pension.

The earnings related system is managed by eight plans covering different occupations, with the largest one, the Kosei Nenkin Hoken (KNH), covering roughly 85% of all employees. Contributions to KNH are split evenly between employers and employees for a combined tax rate of 16.5% in 1995. The Japanese public pension schemes are partially funded systems as they hold government securities. Hence, additional funds come from interest on government debt on top of government transfers equal to third of benefits and expenses.

Benefits are based on earnings and on the age of the worker. At retirement age, normally 65, the worker's wages are converted into standard average monthly earnings using a scale of currently thirty brackets. After conversion, a worker's earnings are averaged over the entire career since there is no minimum or maximum of years. The target replacement ratio was revised in 1994 to slightly lower than 30% of monthly wages by 2025, down from 60%. Also, indexation was changed from price indexation to net wage indexation in 1994.

Additionally, the KNH offers benefits for dependents at flat rates for spouses and children under the age of 18. Also, dependent spouses are entitled to their own basic benefits in addition to spousal benefits under the supplementary earnings related plan.

The supplementary system also offers early retirement, survivorship, and disability benefits. Workers between the ages of 60 and 65 can retire early, and their pensions are subject to an earnings test. Further, surviving spouses and other dependents receive 75% of the deceased worker's full benefit beginning at age 60. Finally, workers can receive disability benefits after the age of 20, which are calculated similar to pension benefits with an additional 25% available for severe disabilities. Alternatively, a disabled worker can choose to collect a flat amount.

Early retirement is an option at age 60. Early retirement benefits are dependent on the worker meeting certain earnings criteria. Even a minimal amount of earnings reduces early retirement benefits by 20%. A fair number of people, though, opt to leave the labor force at age 60. In 1990, labor force participation rates for women declined with age from a high of 70% for 45-year-old women to a little over 40% for 60-year-olds. Similarly, labor force participation rates for men dropped from close to 100% for 45-year-olds to about 85% for 60-year-olds and to about 65% for 65-year-olds (Oshio and Yashiro, 1997).

Public pensions offer a small basic benefit. Yet, private pension schemes are still rare. There are three private pension systems, which are all defined benefit plans. Since 1962, tax qualified pension plans (TQPP) have been allowed for firms with fifteen or more employees. By 1989, TQPPs covered 28% of private sector employees, and held \$76bn in assets (Davis, 1994). Second, since 1966 employees' pension funds (EPFs) have been introduced for firms with 500 or more employees. The advantage of EPFs to employers results from the option to contract out of the earnings-related public pension portion, though benefits from EPFs have to be in excess of 30% of public pensions. By 1989, EPFs covered 26% of the workforce and held assets to the tune of \$143bn. Trust banks or life insurance companies handle fund management of private pensions in Japan. Trust banks control 60% of all pension assets, and life insurers the remaining 40%. Third, Japanese firms carry unfunded retirement bonuses as liabilities on their books.

The American Experience with Public and Private Pensions

The U.S. Social Security was established in 1935. Originally, all workers in commerce and industry, with the exception of railroads were covered. Its coverage has gradually grown. Only some state and local employees may not be included (Diamond and Gruber, 1997).

Social Security's structure has changed over the years. Early retirement benefits for women between the ages of 62 and 65 were offered in 1956 and for men in 1961. Benefits for dependents and widows were introduced in 1939, and for widowers and dependent husbands in 1950. In 1973, Social Security's benefits were indexed to inflation, and average lifetime wages were indexed by average wages. Finally, in 1983, a gradual increase in the normal retirement age from 65 to 67 in effect for workers reaching age 62 in 2022 or later was implemented.

Contributions to Social Security come from combined payroll taxes amounting to 12.4%, which are evenly split between employers and employees, up to an income ceiling. Also, Social Security earns interest on a portfolio of government securities.

Benefits are based on age and earnings. To calculate benefits, a worker's earnings are indexed by average wages. The 35 highest earnings years are subsequently averaged, and build the basis for a redistributive replacement formula, whereby a three-piece linear progressive schedule is applied. Thus, there is a declining replacement ratio as average lifetime earnings go up. After retirement benefits are adjusted each year for price increases. Dependent benefits amount to 50% of the worker's benefits for spouses, as well as for children up to a family maximum of roughly 175% of the worker's benefit.

U.S. workers are eligible for early retirement benefits at the age of 62. If a worker chooses to retire early, her benefits are reduced in an actuarially fair manner by 6 and 2/3 % for each year that a worker retires early. Thus, a 62 year old receives 20% less than she would have if she had continued to work to the normal retirement age at 65. Most U.S. workers retire early. In 1998, 19.2 million out of 27.5 million retirees received reduced retirement benefits because they retired before the normal retirement age (SSA, 1999).

The system also offers a low income pension. The Supplemental Security Income program offers income support for low income elderly and disabled individuals based on their relative income compared to the rest of the population.

Additional benefits of Social Security include early retirement, dependent, survivor benefits, and disability benefits. Early retirement is available at age 62 with a reduction by 5/9 of one percent per month in the primary insurance amount to which the progressive replacement schedule is applied. Also, surviving spouses receive 100% of a worker's benefits beginning at age 60. Finally, disability benefits offer workers full benefits based on their earnings record.

The U.S. is another country where private pensions have traditionally played an important role in the provision of retirement income. At the end of 1998, financial assets of pension funds amounted to roughly \$8 trillion (BoG, 1999). While 39% of all workers had a defined benefit plan as their primary plan in 1975, only 23% did so in 1995. In contrast, the percentage of full and part-time private sector workers who were covered by a defined contribution plan rose from 6% in 1975 to 23% in 1995 (DoL, 1999). Further, while 91% of private sector full time workers at medium and large firms were covered by some form of a retirement plan in 1985, only 79% were in 1997 (BLS, 1999). The percent of workers enrolled in defined benefit plans declined from 80% in 1985 to 50% in 1997, and coverage by defined contribution plans grew from 53% to 57% over the same period. Finally, less than half of all full time workers in small firms are covered by any form of retirement benefit. The share enrolled in defined benefit plans declined from 20% in 1990 to 15% in 1996, whereas the share enrolled in defined contribution plans grew from 31% to 41%.

Comparison of OECD Experiences with Public and Private Pensions

Public pension systems that have helped to provide income support for the elderly have faced growing financing needs. Both economic and policy changes have resulted in rising

expenditures relative to GDP and higher tax rates. In recent years, employment growth has been low or even negative, productivity and wage growth have been sluggish and inequality has risen.

Assuming that all of these trends will continue or possibly even get worse in the medium to long-term seems unrealistic. However, proponents of the theory that public pensions will inevitably end up in crisis base their scenarios on the assumption that all adverse trends we have observed in the recent past, will continue over the next 50 years (Turner et al., 1998). If we assume even marginally better economic scenarios, the forecasts of looming crises often become much less pronounced or even disappear (Turner et al., 1998; Baker and Weisbrot, 1999).

Due to the design of public pension systems in all seven countries, the adverse economic trends could have given rise to greater financing needs everywhere. Demographic changes could have contributed to more severe financial constraints of public pension systems if they had direct impacts on employment growth. In particular, none of the seven countries has had a demographic factor in their benefits formulas that would link benefit payments to either demographic or employment changes. Only Sweden has introduced a demographic factor into its benefits formula when it reformed its public pension system in 1998.

It is important to keep in mind that demographic changes only set the parameters for employment growth. With respect to the changes in the share of employment relative to the population, the demographic trends are not necessarily reflected. In some countries, France and Italy, employment's share of the working age population has declined steadily since the 1960s. In comparison, employment as share of the working age population has continuously increased in the U.S. since the 1960s, in Japan since the 1970s, and in the UK and Germany since the 1980s. Further, levels of employment relative to the working age population are at or above 70% in Japan, Sweden, the UK and the U.S., but substantially lower in France and Italy.

Early retirement options have helped to lower employment relative to the working age population. Early retirement exists in all countries – except the UK. In addition to formal early retirement options, some countries use unemployment insurance provisions to offer what are de facto early retirement benefits for elderly unemployed workers (France, Germany). In some cases, disability benefits also serve partially as early retirement benefits (France, Germany, UK). All in all, the share of retirees who have retired under some form of early retirement option often exceeds 50% of all retirees, thereby lowering the median retirement age and the labor force participation rates of workers close to the normal retirement age.

Lower productivity and wage growth may have also played a role everywhere. In all countries, benefits are related to past earnings, which means that funding constraints arise as income is growing slower than benefits. In contrast, in France, Sweden, the UK and the US future benefits are indexed to inflation. Thus, faster real wage growth can help to ease funding constraints as benefits growth is slower than wage growth. Finally, Germany's and Japan's benefits are indexed to after-tax wage growth, which means that slower wage growth has little impact on public pension finances.

Further, increasing income inequality may have impacted all systems. In France, Germany, and the U.S., there are income ceilings for covered wages. Greater income inequality can result in a declining share of national income being covered, thereby lowering the income to public pension systems. Further, all systems have some redistributive aspects, such as minimum pensions, non-earnings related, flat benefits, or explicit redistributive factors in the benefit formula, which means that benefits relative to covered income rising for the relevant income groups. The impact of greater income inequality is larger, though, where the income ceiling is

lower, or where redistribution is greater: more aggregate income will reach the non-taxable threshold sooner, or more low life-time earners require larger benefits relative to their earnings.

Funding constraints for public pension systems may not only result from demographic and economic changes, but also from policy choices that make the systems more generous. Aside from frequent tax rate changes (table 2), the seven OECD countries have made infrequent changes to benefits. Out of a total of 40 changes in all seven countries over the course of 28 years, 22 have meant benefit increases, 14 have meant benefit cuts, and 4 have had ambiguous benefit effects. The vast majority of benefit increases, 20, have been before the 1990's, whereas the majority of benefit cuts, 10, have been in the 1990's (table 12). Thus, while public pensions became more generous before the 1990's, the likelihood of benefit cuts increased in the 1990's.

Private Pensions as a Solution?

Privatization has been proposed as a means to reduce the financing needs of public pensions. Privatization refers to the investment of public pension assets in private market securities, which can be invested by individuals or the government (or the respective public pension agencies). Since the focus is on investments in private securities, privatization is slightly different from partial or full pre-funding. Pre-funded public pension systems hold assets, including public securities, such as government debt, to cover part or all of their future liabilities.

Rates of Return and Cost Comparisons

Privatization proponents argue that individual accounts will generate higher rates of return, thus reducing financing needs without reducing benefits.

Public pensions promise relatively high rates of return for some workers, especially for low life-time earners. Most public pensions offer benefits that are also available in the private market, but often at higher costs. In particular, public pensions offer indexed lifetime annuities, disability and life insurance. In an analysis of the U.S. system's implicit rates of return, Baker (1998) estimates that the real rate of return for a couple with one low wage earner is 5.0%, and for a couple with two low wage earners is 3.5% if the insurance value of Social Security is accounted for. In comparison, realistic rates of return for private equity accounts should be around 4% given the long-term projections made by the U.S. public pension trustees (Baker, 1997), or around 4-4.5% given the current market overvaluation (Diamond, 1999).

The two factors that underlie the projections of lower real rates of return in the U.S. in the future are slower economic growth, and thus also slower profit growth, and the serious overvaluation of the stock market. Both of these trends also hold for the other six countries. Real GDP growth was slower during the 1990s than during the 1970s, and – with the exception of Germany – slower than during the 1980s (table 14).

*** Insert table 14 here ***

In contrast to the real economy, where real and productivity growth have been sluggish, equity markets have increased rapidly, particularly during the 1990s. Price earnings ratios almost doubled in the UK and in the U.S., increased two-and-a-half-fold in Sweden, and almost tripled in Germany between 1990 and 1998. Italy's and Japan's price earnings ratios have fallen precipitously from their heights in the early 1990s, but they still remain significantly higher in the late 1990s than during the early 1990s. Also, dividend yields have fallen everywhere over the course of the 1990s, with the exception of Sweden, despite the fact that in all countries but Japan capital share of business sector income has increased between 1990 and 1998 (OECD, 1998a).

The combination of slower economic growth and slower productivity growth with recent rapid growth in stock market valuations increases the chance that future equity rates of return will fall below their past averages. Both lower expected profit growth and overvalued stock markets should result in lower rates of return in the medium to long-term¹³.

In comparison, internal rates of return for public pension systems can be largely expected to remain stable. For the U.S., the internal rate of return for Social Security has been estimated to be 3.5% for a couple with two low wage earners (Baker, 1998). Rates of return for other public pension systems may be slightly lower than for the U.S. because of fewer economies of scale (Mitchell, 1996). In particular, higher administrative costs elsewhere suggest fewer economies of scale. By and large, administrative costs increase with the size of the funds to be administered or with the number of people to be serviced (Mitchell, 1996)¹⁴.

Even though administrative costs for public pension systems appear to differ strongly across countries, they are small compared to the costs that privatized accounts cost. Fund management alone costs between 1% and 2% of assets annually in the U.S.. Over a 30-year investment horizon, as administrative costs accumulate, total final savings are more than 20% less than they would have been absent of administrative costs. Orszag (1999) and Murthi et al. (1999) estimate that total administrative costs lower the accumulated savings by 25% over a worker's working life in the UK. In addition, costs that arise from switching between funds are estimated to amount to 15% of total accumulated savings at the end of a worker's working life.

Privatization of public pensions also requires additional costs that are often ignored. Private pensions require that workers use financial management companies to manage their funds while they work. Once a worker retires, an insurance company needs to provide retirement benefits in the form of lifetime annuities¹⁵. Mitchell et al. (1997) estimate that annuities cost on average 15-20% of annual premiums in the U.S.. Given current life expectancies at age 65, this translates into 4-6% of the total accumulated savings at the end of one's working life. For the UK, Orszag (1999) and Murthi et al. (1999) estimate annuity costs to be 10% of the account value at retirement. Considering that both the U.S. and the UK have well developed financial markets that are more likely to benefit from economies of scale than financial institutions in other countries, costs in less developed financial markets can be expected to be at least as high.

Finally, privatization requires transition costs. Workers have already incurred benefit claims against the existing public pension system. To honor these claims, public pension systems require funds even after privatization has ended their revenue stream. In a model calculation for the U.S., the Employee Benefit Research Institute (Olsen et al., 1998) estimated that transition costs under a fully privatized system would amount to 5% over 40 years.

The Risks of Private Accounts

The combination of lower expected rates of returns than in the past, and of higher costs than public pensions reduces the presumed competitive advantage that private accounts would have. However, even though the higher rates of return that are supposedly associated with private accounts are unlikely to materialize, the higher risks that workers would incur by investing in private accounts remain undiminished. Aside from the obvious financial market risk, workers have to face additional economic, regulatory and political risks.

Private pensions subject workers to more risks than public pensions, such as the risks of bad investment decisions, fraud, or bankruptcy of plan sponsors. While private pensions may be able to match the expected retirement income on average, the variations of retirement income become larger, exposing workers automatically to greater retirement income insecurity. A reliance on private pensions as replacement of public pensions weakens their insurance value.

Private pensions can be defined benefit or defined contribution plans. In defined benefit plans, workers face the risk that the plan sponsor goes bankrupt. Employer bankruptcy poses less of a problem in defined contribution plans, but workers bear financial market risks alone. Most private pensions in the seven countries are defined benefits plans (table 15). This is changing in the UK and the U.S., where private pension coverage is most widespread.

*** Insert table 15 here ***

Second, workers cannot rely on private pensions in the same way as they can on public pensions. If permitted by law, employers can change benefit promises e.g, under US law, employers cannot reduce already accrued benefits, but they can change future benefit accruals.

Third, long vesting periods or restricted portability of pensions reduce the value of private pensions if workers change jobs. How long it takes for workers to become vested depends on the law, on the plan type and on the employer. Should the worker, leave before she is vested in a plan, no retirement benefits are accrued. Maximum vesting periods range from an immediate vesting in Sweden to 30 years in Japan (table 15). If portability of pensions is restricted, workers may keep the benefits, but costs and risks cannot be consolidated. Portability is restricted to some degree in all countries, except Sweden (table 15).

Fourth, accumulated pension wealth may be used for purposes other than retirement income. The permission to “cash out” account balances requires that workers correctly assess their financial needs over an indeterminate time horizon. Similarly, if pension benefits are not indexed price increases can erode the value of private pensions over time. Indexation is only mandatory in Germany, but it is possible in Sweden, the UK and the US (table 15).

Fifth, regulations may protect workers from investment risks. The permission for individual investors or pension plans to invest in riskier, but potentially higher yielding securities raises the risk of losses. In defined benefit plans some risks can be mitigated through diversification, but market risks remain. Most countries impose limits on the asset allocation of pension plans (table 16). The restrictions are loosest in the US, and strictest in Sweden.

*** Insert table 16 here ***

Also, large-scale privatizations would overwhelm domestic financial markets and local regulators in most countries since private pensions are only a small part of financial market activities. Table 17 shows that in three countries, France, Germany and Italy, private pension accounts amount to less than 6% of GDP. Further, in all three countries, market capitalizations are significantly lower than in three countries, Sweden, the UK and the U.S., where private pensions are more widespread (table 18). Privatizations would mean the rapid creation of private pension funds. For instance, the German government has proposed to create individual accounts to which workers would contribute 2.5% of payroll in order to replace part of the benefits cut in the 1999 reform of the German public pension system. Given the size of the German public pension system and assuming that the vast majority, say 80%, of private pension funds are invested in equities, German pension funds would increase demand for equities by 2.0% of GDP annually. This additional demand reflects currently more than 4% of Germany’s market capitalization, and this demand would continue each year indefinitely. Considering that equity markets are already overvalued, additional demand of this magnitude would help to extend a

stock market bubble, and workers could face an increasing risk of a market downturn with their retirement assets.

*** Insert table 17 here ***

*** Insert table 18 here ***

The risks and costs associated with private pensions only apply to those, who actually have private pensions. However, as the example of the two countries with the largest private pension systems, the UK and the U.S., indicates the distribution of those benefits is quite unequal. In the UK, 65% of full-time workers who earned between 64 pounds and 100 pounds per week had neither an occupational nor a personal pension plan, leaving them with their supplementary SERPS benefits that are cut from 25% of wages to 20% of wages (CBO, 1999). Similarly, while 79% of full-time workers at medium and large U.S. firm were covered by some form of a private pension plan in 1997, less than half of all full-time workers at small firms were covered by any plan in 1996. Finally, Disney et al. (1998) report that families reporting financial wealth, where the household head is 67 years old, range from 80% for bottom quintile to 98% for the top quintile in Germany. Further, the dispersion ranges from 84% to 97% in Sweden, from 50% to 80% in the UK, and from 54 to 97% in the US (Disney et al., 1998).

The fact that private pensions carry a larger risk with them than public pensions has put workers into a bind. Also, public pension benefits are reduced in a number of countries (table 13), and there seems to be a shift from defined benefits to defined contribution plans, especially in countries, where private pensions are an important source of retirement income. Workers are therefore faced with the option of lower risks and subsequently less retirement income or the possibility of higher retirement income at a significantly higher risk. Consequently, workers tend to invest their retirement savings increasingly in risky equity funds. About 75% of all 401(k) plan balances in the U.S. were estimated to be invested directly or indirectly in equities (VanDerhei et al., 2000). More specifically, plan holders in their 60s still have 39.2% invested in equities, whereas people in their 20s have 62.2% directly invested in equities. Similarly, in the UK case 80% of pension fund assets were invested in equity in 1994 (EC, 1997).

The promised rates of return for private accounts, particularly private equity accounts are unlikely to materialize in the medium to long-term because of slower expected GDP and productivity growth, and because of the current market valuations. In addition, the costs associated with private pensions are substantially higher than the costs associated with public pensions for the same services. Further, private pensions shift risks from the public to the individual. The risks for the individual seem to have especially increased in countries where the reliance on private pensions is most pronounced, the U.S. and the UK.

Concluding Remarks

Public pensions have been a successful tool in combating poverty among the elderly. The commitment to the elderly to provide them with adequate retirement income seems to be intact in the industrialized countries. However, the question is whether governments should continue to provide public pensions as social insurances, or whether private markets should take over. The evidence presented in this paper suggests that public pension can be provided as public goods in the foreseeable future if policy changes are made, and that private pensions would put the social insurance aspect of public pensions in jeopardy.

Financial needs of public pensions appear to have grown. Higher tax rates and benefit cuts have been the result. The evidence suggests that both economic factors as well as the particular design of each country's public pension system have led to greater financing needs. Especially slow employment and wage growth and possibly rising income inequality have adversely impacted the finances of all public pension systems.

Projections of future problems rest to a large degree on rather pessimistic assumptions about economic trends, and the unchanged structure of public pensions. Under more moderate assumptions the burden of caring for the elderly for workers grows slower or declines. Finally, regardless of the underlying assumptions, the living standards of future generations are likely to be substantially higher than those of current workers.

The changing demographics that exist in each country and that are likely to continue can be compensated by more rapid employment growth and more rapid productivity and wage growth than is currently expected. Thus, policymakers have the opportunity to influence forces that can compensate for the continued increase in longevity and the decline in population growth.

The goal of policies that will ensure the future of public pensions should be to raise employment and productivity. In particular, labor force participation could be boosted through family friendly policies that allow parents to combine child rearing responsibilities and full-time jobs. Even though raising the normal retirement age could increase labor force participation, such a benefit is very regressive and puts the largest burden on low lifetime earners, and thus should not be further pursued. Macro economic policies could be used, particularly in Europe, as a stimulus to lower unemployment and raise employment growth. In particular, a less stringent monetary policy appears to be a means to achieve lower unemployment. Finally, more equal earnings distributions can be achieved through government policies, such the setting of a minimum wage, or through the strengthening of collective bargaining.

Aside from economic policies, changes in the structure of public pensions may be necessary to ensure their long-term viability. In particular, public pensions should be universal systems that require everybody to participate. Second, public pensions should not serve as a substitute for unemployment insurance. Third, the financing base of public pensions should be stable. Thus, shifts in labor income as share of national income should not affect public pension finances. In particular, instead of financing public pensions solely out of payroll taxes, other forms of income, such as capital income, could also be taxed. Similarly, public pensions could be financed out of general revenue.

Privatization of pensions, albeit increasingly popular, appears too risky and too costly to be viable. Also, in many cases, they constitute only a small addition to public pensions, with the exceptions of the UK and the US. While coverage of workers under private pension schemes seems to increase in countries where such plans are rather small, it is declining in the two countries where pension coverage is relatively large. Further, a rapid privatization of a significant share of public pensions, that would be necessary to make it a viable option in theory, would most likely overwhelm private financial institutions and markets, possibly leading to financial instability and greater risks for workers.

It is time to put the debate over the future of public pensions in a serious framework. Thus, the pessimistic "gloom and doom" forecasts of those who want to see an end to government administered and publicly supported social insurance have to be put in perspective. Where the underlying public pension structures are adversely affected, possibly even to a degree that magnifies existing trends the solutions lie both in redesigning public pensions and in affecting inequality, productivity and employment growth in a positive manner. There is no law

of nature that says that industrialized economies will be mired in slow growth, and rising inequality in the long-term future. Policy makers have the option to affect the economic outcomes in a positive manner that would aid their public pension systems directly.

Appendix:

Calculating Combined Tax Rates for OECD Countries

This section describes how the calculation for the combined tax rates in table 2.

France

Government contributions are reported as share of benefit payments in 1969, and as share of income between 1989 and 1997. The reported figures for 1999 (“various subsidies”) are assumed to be close to zero, and are hence ignored. It is assumed that income and outgo are identical. Thus, the combined employer and employee contributions out of average earnings are scaled by the share made up by government contributions.

Germany

Government contributions are reported as share of benefit payments (1961-1969), and as share of total system (1971-1999). It is assumed that both benefits and contributions are identical and that there are no other costs. Hence, the combined employer and employee contribution rates are scaled by the government contribution to arrive at the combined tax rate.

Italy

For 1997, employer contributions amount to 8.89% for earnings up to lire 63,054,000 per year and to 9.9% for earnings above that, but below 250,000,000. For 1997 and 1999, employee contributions are two-tiered. Since the first tier is very close to the annual average wage rate of the business sector, only the first tier tax rate is used for either employer or employee.

Government contributions are reported as share of total covered earnings (1961-1964), as share of costs (1967), or as lump-sum subsidies (1969-1999). For the years 1961 and 1964, the government’s percentage contribution is added to employer and employee contribution rates, and for 1967, the combined employer and employee contribution rates are scaled by the government’s contribution to arrive at the combined tax rates. In all other year, the government’s contribution is set equal to zero.

Japan

Employee contributions are reported as fixed yen amount. I divide them by average annual wage rate of the business sector to arrive at the average tax rate. Complete data are only available from 1980 forward. Between 1980 and 1993, three tax rates (women, men, miners) are averaged (simple average), and between 1995 and 1999, two tax rates (women, men) are averaged for the welfare pensions. Finally, the tax rates for welfare pensions and for national pensions are added.

Both welfare and national pensions receive government contributions as share of benefits. It is assumed that benefits are equal to contributions and that there are no other substantial costs. Hence, the combined employer and employee contributions are scaled – separately for each program - by the government contributions.

Sweden

Employer contributions are reported as share of payroll since 1975 for universal pensions and since 1983 for supplementary pensions. Before 1975, there are no employer contributions to universal pensions, and before 1983, employer contributions to supplementary pensions are reported as share of earnings between a lower and an upper bound. Tax rates that fall below between an upper and a lower bound are scaled by the difference between upper and lower bound relative to the upper bound, which lies well beyond the average wage rate.

Government contributions to universal pensions are reported as share of benefits and other costs. It is assumed that benefit payments are equal to contributions. Combined employer and employee contributions to universal pensions are scaled by government contributions.

United Kingdom

Where ranges of tax rates are reported, the simple average is taken. If tax is only payable above a weekly earnings threshold (as is the case in 1999), the tax rates are scaled by average wage rates above the earnings threshold relative to average earnings.

Government contributions are reported as share of benefits and other costs between 1975 and as “various subsidies” after that. Hence, combined employer and employee contributions are scaled by government contributions between 1975 and 1991. Government contributions are assumed to be marginal thereafter, and hence set equal to zero.

United States

The average wage is below the income tax above which income is not subject to the payroll tax. Thus, the combined tax rate is simply the sum of employer and employee contribution rates.

The Ability to Pay and Changes in Living Standards

A country's ability to pay for its retirees depends on the number of workers relative to all retirees and on average wages and benefits. I first construct a measure that adjusts each year's ratio of beneficiaries to workers by increases in before tax real wages, and by changes in benefit indexation, where necessary. I call this adjusted ratio the Care for the Aged and Retired by Employees Ratio (CARER).

CARER is defined as follows:

$$CARER_t = \frac{POP65+}{EMPLOYEES}_t * \frac{(newret)_t * \overline{(wage)_{t-n,t}}}{wage_t} * BenIndex \quad (1)$$

with $POP65+$ as the sum of all people above the age of 64, $EMPLOYEES$ as total employment, $w_{t-n,t}$ as the average wage growth for the past n years (equal to the maximum of years needed for full benefits), which is scaled by the proportion of 65-year-olds relative to all elderly, $newret$. . The number of employees is scaled by the real before tax wages relative to their level in 2000, the base year. All economic variables are real, thus in countries where benefits are indexed to inflation, the benefits indexation, $BenIndex$, is equal to one. In countries, where benefits are indexed to either net wages (Germany, Japan), $BenIndex$ is equal to the after tax wage or real GDP in period $t-1$ (indexed to after tax wages or GDP in 2000).

A few assumptions are necessary for this calculation. The number of public pension beneficiaries is equal to the number of over 65-year-olds. Since all public pension systems offer not only retirement, but also disability and survivorship benefits, and in some cases welfare or poverty pensions (see section II for a detailed description of each country's benefits), the vast majority of over 64-year-olds will receive benefits in one form or another.

To calculate changes in the net wage relative to its level in 2000, I proceed as follows. The change in the after tax wage is equal to the change in the before tax wage minus changes in tax rates. I assume that taxes other than public pension taxes remain constant over time. As a country's population ages, this assumption is likely to overstate the tax burden on workers because an aging population will most likely incur fewer costs for child care, education and other expenses related to the younger share of the population. Further, changes in public pension taxes are arrived at by multiplying the cumulative percentage changes of the CARERatio with each country's combined tax rate in 1999 (see table 2 for details).

Different sources are used for the calculations. Demographic variables are provided by the U.S. Bureau of the Census' International Data Base. All economic variables, with the exception of the CPI, are taken from the OECD's Economic Outlook Database, and the CPI is taken from the IMF's International Financial Statistics CD-ROM.

TABLE 1
 OLD AGE CASH BENEFITS AS SHARE OF GDP

	France	Germany	Italy	Japan	Sweden	UK	US
1980	7.79	9.99	7.36	3.50	6.83	5.07	5.05
1985	8.81	10.11	9.04	4.29	7.35	5.57	5.21
1990	9.32	9.52	9.63	4.42	7.50	6.37	5.05
1995	10.36	10.29	10.99	5.49	8.17	6.46	5.36

Notes: All figures are in percent. Old age cash benefits include old-age pensions, old-age civil servant pensions, veteran's old-age pensions, early retirement pensions and other old-age cash benefits. Source is OECD Social Expenditure Database (SOCX).

TABLE 2
COMBINED TAX RATES AS SHARE OF AVERAGE WAGE, 1961 TO 1999

	France	Germany	Italy	Japan	Sweden	UK	U.S.
1961	19.50	19.05	21.10	N/A	17.67	N/A	6.00
1971	8.75	20.00	19.00	N/A	25.55	N/A	9.20
1981	13.00	21.51	24.31	13.74	22.62	26.16	10.70
1991	15.02	20.73	26.28	15.32	22.85	13.92	12.40
1999	16.45	24.38	32.70	18.72	19.56	17.41	12.40
Average annual rate of change							
1961-1999	-0.08	0.14	0.31	N/A	0.05	N/A	0.17
1961-1969	-1.28	0.34	-0.75	N/A	0.74	N/A	0.14
1969-1979	0.43	0.14	0.46	N/A	-0.08	2.45	0.10
1979-1989	0.29	0.05	0.09	-0.08	0.00	-1.07	0.14
1989-1999	0.14	0.36	0.64	0.34	-0.33	0.35	0.00

Notes: All figures are in percent. All combined tax rates are based on author's own calculations based on SSA, Social Security Programs throughout the World. See the appendix for assumptions made in calculations.

TABLE 3
65 YEAR OLDS AS SHARE OF TOTAL POPULATION, 1990 TO 2050

	France	Germany	Italy	Japan	Sweden	UK	US
1990	14.02	-	-	11.96	17.79	-	12.50
2000	16.00	16.25	18.09	17.01	17.29	15.67	12.64
2010	16.79	19.70	20.55	21.76	19.18	16.69	13.23
2020	20.61	21.41	23.55	26.83	22.69	19.59	16.52
2030	23.98	25.75	28.15	28.31	25.08	23.50	20.02
2040	26.45	28.43	34.24	31.85	27.11	26.35	20.44
2050	27.25	28.55	36.10	33.86	27.23	26.83	20.30

Notes: All figures are in percent. Source is the U.S. Bureau of the Census, International Database.

TABLE 4
POPULATION GROWTH, FERTILITY RATES AND LIFE EXPECTANCY FOR FIVE EU COUNTRIES

	Population Growth			Fertility Rate			Life Expectancy		
	1970-75	1980-85	1992-97	1970-75	1980-85	1992-97	1970-75	1980-85	1992-97
France	0.4	0.5	0.4	1.9	1.8	1.7	72	75	78
Germany	0.2	-0.2	0.2	1.5	1.4	1.4	71	73	77
Italy	0.6	0.1	0.2	2.2	1.4	1.2	72	75	78
Sweden	0.4	0.1	0.3	1.8	1.7	1.7	75	76	79
UK	0.2	0.1	0.3	1.8	1.8	1.7	72	74	77
Japan	1.4	0.7	0.2	1.9	1.8	1.4	74	78	80
US	1.0	0.9	0.8	1.8	1.8	2.0	73	75	76

Notes: Population growth and fertility rates are in percent, life expectancy is in years. Source is the World Bank, Poverty Monitoring Database.

TABLE 5
EMPLOYMENT AS SHARE OF TOTAL POPULATION AND AS SHARE OF POPULATION BETWEEN 15 AND 64,
1960 TO 2000

	France	Germany	Italy	Japan	Sweden	UK	US	France	Germany	Italy	Japan	Sweden	UK	US
	Average employment as share of total population							Average employment as share of working age population (15 to 64 years)						
1960-1999	40.07	44.22	36.50	48.83	48.61	45.05	42.43	62.52	66.21	55.33	71.62	75.12	70.00	66.10
1960-1973	41.02	44.74	37.30	48.34	47.74	45.68	37.43	65.85	68.99	57.86	71.26	72.52	71.59	61.38
1973-1979	40.96	42.56	35.91	46.96	49.61	44.66	41.65	65.14	65.85	55.98	69.53	77.44	70.83	64.00
1979-1999	39.38	44.26	35.95	49.79	48.90	44.63	46.21	60.24	64.36	53.12	72.40	76.22	68.57	70.06

Notes: All figures are in percent. Sources are the OECD, Economic Outlook, various years, and the U.S. Bureau of the Census, International Data Base.

TABLE 6
PRODUCTIVITY AND WAGE GROWTH RATES, 1960-1999

	France	Germany	Italy	Japan	Sweden	United Kingdom	United States
Productivity growth rates							
1960 – 1999	2.36	2.31	2.99	3.92	2.16	2.13	1.54
1960 – 1973	2.24	7.67	3.97	4.25	5.37	3.08	3.48
1973 – 1979	0.29	2.73	2.65	2.35	2.34	1.24	0.53
1979 – 1999	1.36	1.88	1.01	1.64	1.62	1.74	1.81
Wage rate growth (in business sector)							
1960 – 1999	1.42	2.20	2.82	2.32	1.70	1.86	0.53
1960 – 1973	N/A	5.11	6.11	8.08	N/A	3.58	1.48
1973 – 1979	2.73	2.25	4.26	1.65	N/A	0.99	-1.13
1979 – 1999	0.61	0.40	0.38	0.50	1.79	1.87	0.43

Notes: All figures are in percent. Source is the OECD, Economic Outlook Database. Hourly earnings for Germany are from 1963, for UK from 1964, for Italy and France from 1969, and for Sweden from 1971. Wage rates are available for Japan only from 1966, for France from 1970, for the UK from 1969 and for Sweden from 1980.

TABLE 7
BURDEN OF CARING FOR THE ELDERLY FOR CURRENT WORKERS
(CARER), SHORT RANGE ASSUMPTIONS, 2000 TO 2050

	France	Germany	Italy	Japan	Sweden	UK	US
Productivity Growth	1.36	1.88	1.01	1.64	1.62	1.74	1.81
Δ (Employment/Population)	-0.22	-0.10	-0.19	0.22	-0.35	-0.01	0.38
CARER							
2000	100.00	100.00	100.00	100.00	100.00	100.00	100.00
2010	90.05	108.89	102.07	118.75	91.30	91.13	83.61
2020	90.05	114.34	100.84	132.64	86.15	87.19	74.94
2030	89.42	128.05	102.21	134.67	74.29	84.61	68.28
2040	86.68	137.11	106.94	135.23	62.46	75.35	57.71
2050	79.90	139.71	92.09	125.25	47.94	60.51	48.17
After-tax wage							
2000	100.00	100.00	100.00	100.00	100.00	100.00	100.00
2010	116.18	117.95	109.72	113.89	119.41	120.54	121.86
2020	133.14	140.52	121.76	130.48	141.33	144.19	147.49
2030	152.54	164.17	134.56	152.86	169.80	172.12	177.84
2040	175.23	192.73	146.12	179.59	203.87	207.43	215.47
2050	202.78	230.93	168.42	214.71	246.24	252.87	260.90

Notes: See Appendix for methodology, assumptions and sources. An increase in CARER indicates a growing burden for workers, a decline in the index indicates a shrinking burden for workers. Both CARER and net wages are indexed to 2000 as the base year.

TABLE 8
BURDEN OF CARING FOR THE ELDERLY FOR CURRENT WORKERS
(CARER), LONG-RANGE ASSUMPTIONS, 2000 TO 2050

	France	Germany	Italy	Japan	Sweden	UK	US
Productivity Growth (%)	2.36	2.31	2.99	3.92	2.16	2.13	1.54
Δ (Employment/Population) (%)	-0.15	-0.13	-0.26	0.03	-0.03	-0.05	0.34
CARER							
2000	100.00	100.00	100.00	100.00	100.00	100.00	100.00
2010	81.39	108.94	84.35	119.89	86.10	87.93	85.96
2020	73.61	114.72	67.37	136.69	77.69	81.25	79.06
2030	66.06	128.98	51.44	133.39	64.33	75.99	73.88
2040	57.78	138.66	35.94	116.83	52.47	64.50	64.10
2050	48.01	141.83	18.43	89.13	39.14	48.76	54.94
After-tax wage							
2000	100.00	100.00	100.00	100.00	100.00	100.00	100.00
2010	129.78	123.02	140.22	142.09	127.05	125.85	118.36
2020	166.13	152.77	198.66	202.13	159.61	157.16	139.17
2030	212.35	185.95	281.04	297.89	202.76	195.79	163.14
2040	271.60	227.37	395.81	449.87	256.81	246.14	192.29
2050	348.44	283.78	562.23	693.59	326.30	312.26	226.62

Notes: See Appendix for methodology, assumptions and sources. An increase in CARER indicates a growing burden for workers, a decline in the index indicates a shrinking burden for workers. Both CARER and net wages are indexed to 2000 as the base year.

TABLE 9
COMPARISON OF “CARER” AND AFTER TAX WAGES BASED ON SHORT-RANGE OR
LONG-RANGE ASSUMPTIONS, 2000 TO 2050

	France	Germany	Italy	Japan	Sweden	UK	US
CARER							
2010	-9.6	0.1	-17.4	1.0	-5.7	-3.5	2.8
2020	-18.3	0.3	-33.2	3.1	-9.8	-6.8	5.5
2030	-26.1	0.7	-49.7	-0.9	-13.4	-10.2	8.2
2040	-33.3	1.1	-66.4	-13.6	-16.0	-14.4	11.1
2050	-39.9	1.5	-80.0	-28.8	-18.4	-19.4	14.1
After-tax wage							
2010	11.7	4.3	15.5	24.8	6.4	4.4	-2.9
2020	24.8	8.7	30.3	54.9	12.9	9.0	-5.6
2030	39.2	13.3	49.6	94.9	19.4	13.8	-8.3
2040	55.0	18.0	79.8	150.5	26.0	18.7	-10.8
2050	71.8	22.9	135.0	223.0	32.5	23.5	-13.1

Notes: All figures are in percent. The difference measures the results based on the long-range assumptions minus the results based on the short-range results. See Appendix for methodology, assumptions and sources. An increase in CARERatio indicates a growing burden for workers, a decline in the index indicates a shrinking burden for workers. Both CARERatio and net wages are indexed to 2000 as the base year.

TABLE 10
PCHANGES OF “CARER” UNDER DIFFERENT ECONOMIC ASSUMPTIONS, 2000 TO
2050

	France	Germany	Italy	Japan	Sweden	UK	US
Faster productivity growth							
2010	-5.6	-0.1	-5.6	0.1	-5.3	-5.4	-5.7
2020	-10.8	0.0	-11.0	0.6	-10.5	-10.1	-11.1
2030	-15.6	0.2	-17.2	-0.2	-16.4	-14.6	-16.1
2040	-20.2	0.4	-24.8	-3.5	-21.8	-19.8	-20.8
2050	-24.6	0.6	-33.5	-8.1	-27.9	-25.8	-25.3
Higher employment growth							
2010	-2.3	-1.7	-0.3	-1.0	-1.1	-0.5	-1.2
2020	-5.2	-3.7	1.4	-0.5	0.2	0.5	-2.7
2030	-8.2	-6.1	3.4	0.7	3.3	3.9	-3.2
2040	-11.1	-8.3	6.2	2.1	6.1	8.0	-3.2
2050	-12.9	-9.0	11.2	3.0	8.3	11.4	-3.2
Faster productivity growth and higher employment growth							
2010	-7.8	-1.8	-5.8	-0.8	-6.3	-5.8	-6.9
2020	-15.4	-3.7	-9.0	0.5	-9.7	-9.2	-13.4
2030	-22.6	-5.9	-12.1	1.4	-12.0	-9.7	-18.7
2040	-29.1	-7.9	-15.2	0.1	-14.5	-10.5	-23.4
2050	-34.3	-8.2	-18.4	-3.4	-18.8	-13.4	-27.7

Notes: All figures are in percent. Baseline assumptions are 1.4% productivity growth and 0% employment growth relative to working age population. Alternative assumptions are 2% productivity growth and 0.4% annual change in employment relative to working age population up to a maximum of 80%. See Appendix for methodology, assumptions and sources. An increase in CARER indicates a growing burden for workers, a decline in the index indicates a shrinking burden for workers. Both CARER and net wages are indexed to 2000 as the base year.

TABLE 11
CHANGES OF “CARER” UNDER DIFFERENT POLICY ASSUMPTIONS, 2000 TO 2050

	France	Germany	Italy	Japan	Sweden	UK	US
Changed indexation and CARER (% change from baseline)							
2010	14.7	-11.2	11.8	-9.0	14.1	13.7	13.4
2020	29.7	-22.0	24.7	-18.5	28.4	28.1	27.3
2030	46.6	-30.2	38.7	-28.8	46.5	43.7	44.0
2040	66.1	-37.9	52.2	-38.1	67.4	62.9	65.1
2050	90.0	-45.8	76.3	-46.8	93.9	88.4	89.8
Lower retirement age and CARER (% change from baseline)							
2010	9.3	5.9	11.3	7.6	8.2	7.5	4.1
2020	20.3	16.1	26.3	11.7	15.9	16.1	10.5
2030	27.4	23.6	47.9	18.1	23.4	25.0	11.3
2040	25.1	17.4	44.0	19.6	20.0	19.7	10.0
2050	26.9	20.7	37.7	16.4	24.2	23.3	11.0
Changed indexation and after tax wages (index levels)							
2010	114.7	115.6	111.77	113.1	114.1	113.7	115.0
2020	129.7	135.7	124.73	129.7	128.4	128.1	131.2
2030	146.6	156.4	138.66	152.7	146.5	143.7	149.2
2040	166.1	181.3	152.22	179.5	167.4	162.9	171.1
2050	190.0	213.5	176.35	212.4	193.9	188.4	196.7
Lower retirement age and after tax wages (index levels)							
2010	115.6	111.1	111.89	109.6	115.2	114.8	116.0
2020	131.4	123.2	125.01	120.9	131.1	130.5	133.4
2030	150.1	133.2	136.36	136.4	151.4	147.6	153.7
2040	174.7	152.4	158.13	155.6	178.4	173.2	179.2
2050	203.7	172.8	200.29	183.4	210.2	203.9	208.3

Notes: Productivity growth is assumed to be 1.4% per year, and employment growth is assumed to be 0.4% annually relative to working age population. Baseline indexation is actual indexation (see table 12). Indexation is subsequently changed from net wages and GDP to prices for Germany, Italy and Japan, and from prices to after tax wage growth for all other countries. The assumed retirement age is lowered from 65 to 60 in a linear progression at a rate of 0.2 years per year. See Appendix for methodology, assumptions and sources. An increase in CARER indicates a growing burden for workers, a decline in the index indicates a shrinking burden for workers. Both CARER and net wages are indexed to 2000 as the base year.

TABLE 12
CHANGES TO RETIREMENT BENEFITS IN PUBLIC PENSION SYSTEMS, 1960-1998

Year	Variables Affected	Nature of Change	Change
France			
1971	w_{Bt}	Benefit cut	Years of required coverage extended to 34 from 30.
	N_B	Benefit increase	Pre-retirement benefit for unemployment.
	ρ	Benefit increase	Increase in replacement ratio beginning in 1975
1975	N_B	Benefit increase	Voluntary affiliation for nonworking homemakers
	w_{Bt}	Benefit cut	Years of required coverage extended to 37.5 from 34.
1980	N_B	Benefit increase	Compulsory old-age pension affiliation for women receiving family supplement.
	N_B	Benefit increase	Surviving spouse's allowance
1993	w_{Bt}	Benefit cut	Years of required coverage extended to 40 starting in 2003.
	w_{Bt}	Benefit cut	Benefit calculation based on best 25 years in 2008, up from best 10, with gradual increases in between.
Germany			
1972	N_B	Benefit increase	Introduction of early retirement benefits.
	I_B	~	Shifting of benefits indexation from inflation to average gross wage growth.
1992	I_B	~	Indexation shifted from gross wage to net wage growth
	N_B	Benefit cut	Gradual increase in the retirement age of women from 60 to 65 in 2004
1999	I_B	Benefit cut	Benefits indexed to inflation for two years (2000 and 2001) and to net wages thereafter.
	w_{Bt}	Benefit cut	Contributions for the unemployed based on unemployment benefits and not on last income.
Italy			
1965	NRA	Benefit increase	Pension payable after 35 years of service at any age
1969	$t_T Y$; Benefits _T	~	Funding switched to PAYG
	w_{Bt}	Benefit increase	Benefit computation based on "final salary"
	ρ	Benefit increase	Introduction of means-tested minimum pension
	I_B	Benefit increase	Inflation indexation of benefits
	w_{Bt}	Benefit increase	Introduction of early retirement benefits.
1976	I_B	Benefit increase	Real wage growth indexation
1982	NRA	Benefit increase	Lowering age for preretirement benefits to 55 (men) and 50 (women), respectively.
1989		Benefit cut	Redistributive formula benefits computation weakened.
1992	NRA	Benefit cut	As of 1993, NRA raised to 60 (men) and 55 (women), respectively.
	NRA	Benefit cut	Beginning in 1994, the NRA will rise by 1 year every 2 years to age 65 (men) and 60 (women).
1995	w_{Bt}	Benefit increase	Cap on earnings for purposes of benefit calculation eliminated

Year	Variables Affected	Nature of Change	Change
Sweden			
1976	NRA	Benefit increase	Mandatory retirement age lowered from 67 to 65.
1998	w_{Bt}	Benefit cut	Pensions based on lifetime income.
	I_B	~ Benefit cut	Benefits from PAYG system indexed to real income growth. Benefits from PAYG system adjusted for life expectancy.
	w_{Bt}	Benefit increase	Guaranteed minimum pension.
Japan			
1973	I_B	Benefit increase	Inflation indexation of benefits for both programs
1994		Benefit cut	Target replacement ratio reduced to 30% of monthly wages – down from 60% - , to be reached by 2025.
		~	Benefit indexation changed to net wage growth from inflation
UK			
1966	w_{Bt}	Benefit increase	Means-tested allowance introduced
1971	w_{Bt}	Benefit increase	Old person's pension for retirees age 80 and above introduced
1978	w_{Bt}	Benefit increase	Introduction of earnings related pension (SERPS)
US			
1973	I_B	Benefit increase	Inflation indexation of benefits introduced
1983	N_B	Benefit increase	Federal employees hired after December 31, 1983 are included
		Benefit cut	NRA gradually increased for workers who attain age 62 in 2000 and thereafter such that NRA is equal to 67 in 2022 and after.

Notes: Only changes to old age retirement benefits are included.

Source: Social Security Administration, Social Security Programs Throughout the World, various years.

TABLE 13
SUMMARY CHARACTERISTICS OF PUBLIC PENSION SYSTEMS

	Funded	Earned Benefit	Replacement ratio	Indexation of benefits	Income cap on contributions	Impact of lower ratio of workers to retirees	Effects of growing inequality	Effects of lower productivity and real wage gains
France	Partial	Yes	50% of best 11 to 25 years (depending on year of birth)	Prices	Yes	-	-	-
Germany	PAYG	Yes	70% of net average wages in economy	Net wages	Yes	-	-	-
Italy	PAYG	Yes	80% of average lifetime earnings	Prices	No	-	-	-
Sweden	PAYG (basic) Full (complementary)	No	96% of basic amount (BA) (basic) plus 60% of covered earnings (complementary)	Government discretion	No	-	-	-
UK	Partial	Yes	16% of average male earnings (basic) plus 25% of average lifetime earnings (supplement)	Prices	No	-	-	-
Japan	Partial	Yes	Target of 30% of monthly wages in 2025	Net wages	No	-	-	-
US	Partial	Yes	39.6% of average earnings in economy	Prices	Yes	-	-	-

Source: Social Security Administration, Social Security Programs Throughout the World, various years.

TABLE 14
REAL GDP GROWTH

	France	Germany	Italy	Japan	Sweden	UK	U.S.
1990	2.52	5.74	1.97	5.08	1.36	0.64	1.23
1991	0.78	5.01	1.39	3.8	-1.12	-1.49	-0.93
1992	1.16	2.24	0.76	1.02	-1.42	0.05	2.71
1993	-1.33	-1.09	-0.88	0.31	-2.22	2.32	2.32
1994	2.83	2.35	2.21	0.64	3.94	4.39	3.46
1995	2.08	1.75	2.92	1.47	3.71	2.79	2.28
1996	1.55	0.75	0.87	5.05	1.28	2.56	3.45
1997	2.32	1.75	1.48	1.43	1.79	3.51	3.93
1998	3.2	2.25	1.34	-2.83	2.63	2.24	3.88
1999	2.47	1.42	1.23	1.04	3.19	1.14	3.71
	Averages						
1970 to 1979	3.73	3.15	3.91	5.21	1.79	2.40	3.19
1989 to 1989	2.27	1.79	2.40	3.78	2.72	2.43	2.76
1990 to 1999	1.76	2.22	1.33	1.70	1.31	1.82	2.60

Notes: Source is the IMF's, World Economic Outlook, September 2000.

TABLE 15
SUMMARY OF PENSION PLAN CHARACTERISTICS

	Participation	Plan Types	Vesting	Portability	Coverage	Min. Funding Reqmts	Conversion at Retirement	Indexation of Benefits
France	C (partly)	DB, DC		-	Top-hat plans for executives	N/A	Lump sum payouts disallowed	-
Germany	V	DB mainly	10 years	-	42% (W. Germany '92)	Yes up to PBO	Payouts not in interest of firms	Mandatory indexation
Italy	V	DB	-	-	5% (mainly for executives)	Yes, uninsured plans must be fully funded based on 15-year projections	Capital sum pay-out under complementary system mandatory	-
Sweden	C (collective agreement)	DB	Immediate	Full	90% (compulsory)	For ATO; IBO is funded	Annuity mandatory	Indexation
UK	V	DB mainly	2 years	Transfer to other plans	50% occupational schemes	Only for opted plans	Capital sum payout possible of ¼ of the total with max. of 1.5 times annual salary	Indexation
Japan	V	DB mainly	From 5 to 30 years	Little transfer value	37% (funded schemes only)	Optional	No mandate	Rare, except for pensions substituting for public schemes
US	V	DB, DC	5 years	No transfer of DB; lump sum pay-out of DC		-	No mandate	Discretionary indexation

Note: "C" indicates compulsory participation, "V" denotes voluntary participation in private pension plans; DB indicates defined benefit plans, whereas DC denotes defined contribution plans.

Sources: OECD, Financial Market Trends, 70, June 1998; OECD, Financial Market Trends, 71, November 1998; DoL, 1999; Davis, 1994

TABLE 16
REGULATION GOVERNING PENSION FUND INVESTMENT

Country	Portfolio Regulations
France	
Germany	Guidelines: 30 percent max. in EU shares, 25 percent in EU real estate, 6 percent in non-EU bonds, 20 percent in foreign assets; 10 percent self-investment.
Italy	The Decree of Ministry of Finance No. 703 of 21 November 1996 on investments in pension funds grants in general autonomy to the funds to implement their own investment strategies. There are ceilings for investment in some categories as investment in liquid assets, admitted up to 20 percent, shares in closed funds up to 20 percent, shares and bonds, non-quoted on regulated stock markets in EU countries, in the U.S., in Canada or in Japan up to a ceiling of 50 percent if they are issued by OECD member countries
Sweden	The majority of investments should be made in bonds, loans, and retroverse loans to contributors
UK	5 percent max. self-investment, "prudent man rule" concentration limit for defined contribution plans
Japan	50 percent minimum in bonds, 30 percent max. in shares, 20 percent max. in real estate 30 max. in foreign assets, and 10 percent max in the assets of a single company.
US	"prudent man rule"

Source: OECD, Financial Market Trends, 71, November 1998

TABLE 17
PENSION FUND ASSETS AS SHARE OF GDP, 1987-96

	1987	1990	1992	1994	1995	1996
France	-	3.4	3.2	3.8	4.3	5.6
Germany	3.4	3.3	5.1	5.4	5.2	5.8
Italy	-	-	1.1	2.2	2.6	3.0
Sweden	33.4	31.0	29.6	25.7	30.5	32.6
United Kingdom	62.3	59.7	58.2	69.2	73.2	74.7
Japan	38.0	37.4	37.3	49.4	40.6	41.8
United States	35.7	38.1	48.2	50.6	58.9	58.2

Notes: All figures are in percent. German pension fund assets include company pension fund assets from 1992 onwards; figures for Sweden include first pillar assets up to 1992. Source are the OECD, Financial Market Trends, 71, November 1998

TABLE 18
 MARKET CAPITALIZATIONS (AS SHARE OF GDP), PRICE EARNINGS RATIOS AND
 TOTAL RATES OF RETURN FOR OECD STOCK MARKETS, 1990 TO 1998

	France	Germany	Italy	Japan	Sweden	UK	U.S.
Market capitalization (as share of GDP)							
1990	24.15	21.78	12.74	91.53	38.57	79.71	53.51
1991	28.07	20.31	12.69	85.16	37.08	89.65	68.48
1992	27.05	17.71	11.97	61.41	38.13	101.02	71.31
1993	37.18	24.64	15.87	68.38	61.39	122.67	76.93
1994	32.30	22.80	18.37	74.76	61.03	108.42	71.27
1995	31.58	23.45	18.55	75.44	67.07	122.84	93.48
1996	38.67	28.75	20.67	69.82	94.03	128.43	108.17
1997	49.37	40.28	30.78	55.09	115.05	148.99	129.27
1998	64.85	47.96	45.42	56.57	118.84	168.05	144.39
Price earnings ratios							
1990	10.2	11.6	16.5	11.0	39.8	10.6	14.8
1991	13.8	14.1	16.9	22.0	37.8	14.2	25.8
1992	15.4	22	25.8	60.0	36.7	17.5	22.7
1993	19.0	24.5	58.6	31.0	64.9	24.8	23.4
1994	14.0	25.2	136.9	14.0	79.5	17.4	18.2
1995	16.0	22.3	30.2	11.0	86.5	15.6	19.2
1996	NA	20.7	18.9	17.0	79.3	15.9	20.6
1997	NA	27.8	24.7	22.0	37.6	19.2	23.9
1998	NA	30.6	25.0	21.0	103.1	23.3	27.2
Dividend yield (in percent)							
1990	4.0	3.78	3.3	3.6	0.6	5.7	3.7
1991	3.8	3.8	3.8	3.2	0.7	5.0	2.4
1992	3.8	4	4.1	2.7	0.9	4.3	3.0
1993	2.7	2.9	2.5	1.4	0.8	3.9	2.5
1994	3.2	3.32	1.6	2.0	0.8	4.3	2.9
1995	3.3	2.8	1.7	2.8	0.9	3.9	2.4
1996	2.7	1.8	2.4	2.4	0.8	3.9	2.1
1997	2.2	1.7	1.7	2.1	1.0	3.2	1.7
1998	2.1	1.3	1.4	2.2	1.2	2.8	NA

Notes: Sources are the FIBV, Statistics, and the IMF, International Financial Statistics. Market capitalization for the U.S. is the sum of year-end market capitalizations of AMEX, NYSE, NASDAQ and Chicago. U.S. price-earnings-ratio and dividend yield are for NYSE only.

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¹ No data are available for Japan or Sweden. Also, the UK data include the supplementary pensions.

² Poverty rates vary from national measures as the LIS uses 50% of the median adjusted disposable personal income as the poverty threshold.

³ See Turner et al. (1998) for a formalization of the connection between demographic changes and growth. Their predictions, however, are sensitive to assumptions about unemployment rates and labor force participation.

⁴ If income is not capped, inequality has an ambiguous effect. Because of the redistributive functions of public pension benefits, a growing share of high income earners may in fact help public pension finances. The exact effect depends on each system's benefits formulas.

⁵ According to the OECD (1997), income inequality grew in France between 1986 and 1997; the Luxembourg Income Study (1999b) indicates that income inequality grew in France in the early 1980's, remained stable in the late 1980's, and fell in the 1990's; and Atkinson (1998) finds that income inequality has continuously declined in France from 1977 to 1990. According to the Luxembourg Income Study (1999b), inequality rose in Germany from 1981 to 1995; the OECD (1997) indicates continuously income inequality in Germany between 1986 and 1991; Atkinson (1998) found rising income inequality in Germany from 1977 to 1995; and the DIW (2000) reports increasing income inequality throughout the 1990s. The OECD (1997) found continuously growing income inequality in Italy between 1986 and 1991; Atkinson (1998) found that income inequality has grown in Italy from 1991 to 1993; and the LIS (1999) showed that income inequality has risen in Italy from 1991 to 1995. Also, income inequality appears to have grown in Japan in recent decades as Atkinson (1998) found growing income inequality between 1977 and 1991. The LIS (1999) showed that income inequality grew in Sweden from 1981 to 1992, and declined slightly by 1995. The OECD (1997) found also continuously growing income inequality in the UK between 1986 and 1991; the LIS (1999) showed rising income inequality in the UK between 1974 and 1995; and Atkinson (1998) found that income inequality grew in the UK from 1977 to 1995. Finally, income inequality has grown in the U.S. between 1986 and 1991 (OECD, 1997), and between 1979 and 1997 (LIS, 1999).

⁶ See the appendix for a detailed description of the methodology and the assumptions used in the simulations.

⁷ Because prefunded or partially funded systems impose a larger tax burden on capital than PAYG, our cost estimates are likely overstating the future burden.

⁸ It is common to assume that real wage growth is equal to productivity growth in the long run.

⁹ It is assumed that GDP growth is one percentage point higher than productivity growth.

¹⁰ A lower normal retirement age is different from early retirement. Under early retirement rules, benefits are reduced, generally in an actuarially fair way, but with a lower normal retirement age full benefits are paid earlier.

¹¹ Sometimes the complementary mandatory pensions are considered employment related pensions (OECD, 1998a; Davis, 1994). From a risk perspective, these schemes resemble more public pensions than private pension systems.

¹² Also, compulsory membership in a company scheme as a condition of employment was abolished in 1998. Thus personal pensions to which employers are not required to contribute have increased in numbers (Davis, 1994).

¹³ Productivity and profits may rise faster than expected, resulting in higher rates of return. However, at this point forecasts for the future of public pensions would have to be revised, too. Significantly higher productivity growth rates would result in sharply declining burdens of caring for the elderly as the simulations in section II have shown.

¹⁴ Administrative costs amount to 0.7% of benefit payments in Sweden (information provided by the National Social Insurance Board), to 0.9% in the U.S. (SSA, 2000a), to 1.8% in Japan (Mitchell, 1996), to 1.9% in Italy (ILO, 2000), to 2.1% in Germany (ILO, 2000), to 3.1% in the UK (Mitchell, 1996), and to 4.2% in France (ILO, 2000).

¹⁵ While not all privatization proposals would require the purchase of annuities, it is necessary to include them in a fair comparison between the costs of private and public pensions.

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