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The Impact of Demographic Change on Social Security Financing 1/

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Abstract

This paper examines the relationship between prospective demographic changes and social security tax rates over the long term in four countries--the Federal Republic of Germany, Japan, the United Kingdom, and the United States. Using a simple projection model, it is shown that without significant reform, social security programs as constituted in 1980 would have implied substantial increases in social security tax rates by the year 2025 in all four countries. The model is then used to explore how a range of policy options would affect the evolution of tax rates. Recent policy measures taken in each of the countries can be summarized in terms of the model, and it is shown that these measures will lead to markedly lower tax rates than with unreformed programs, although the tax rate in the Federal Republic of Germany will still be high.

JEL Classification:
3221; 8410; 9150; 9180

1/ This is a revised and expanded version of a paper that the authors prepared for the Joint Japanese/OECD Conference on Health and Pensions Policies in the Context of Demographic Evolution and Economic Constraint, Tokyo, November 25-28, 1985.

2/ The work on this paper was undertaken while Mr. Halter was a summer intern in the Government Expenditure Analysis Division of the Fiscal Affairs Department.

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Summary

This paper explores the relationship between prospective demographic changes and social security tax rates over the long term in the Federal Republic of Germany, Japan, the United Kingdom, and the United States. The base year for the projections is 1980, and the starting point for the analysis is a series of projections, undertaken using a simple model, that assumes that the social security programs of 1980 will remain unchanged. The paper shows that, under such circumstances, social security tax rates would rise dramatically by 2025, when demographic pressures are reaching their peak; in some countries, the implied rates might be insupportable.

The paper then proceeds to explore how existing programs may be reformed, though retaining their essential characteristics, so as to moderate the increase in social security tax rates. The options include a change in the specification of the pension contract, changes in pension levels, and changes in pension age. It is shown that only the latter two, because they are direct, can effectively limit increases in tax rates. The possibility of funding social security, at least in part, is also discussed. Funding may offer some advantages but cannot be relied upon as a solution to a long-term financing problem.

In Japan, the United Kingdom, and the United States, social security programs have recently undergone reform with a view to tackling long-term financing problems. These reforms can be summarized in terms of the model used in this paper. The model confirms that these reforms will have a profound impact on future social security tax rates. The Federal Republic of Germany has also recently made a change to its pension system, although one that is less drastic than the changes that have occurred in the other three countries. Future tax rates will therefore remain high, and some further adjustment may be necessary.

I. Introduction

Demographic projections in many industrial countries suggest that population aging will continue into the foreseeable future, and that in some countries the elderly will become, during the lifetime of today's young, a large proportion of the total population. Given the existing structure of support in many of these countries, the elderly are likely to command an increasing share of available resources. Many countries have recognized that the tax rates required to finance social security pensions for the retired will increase substantially, and a number of them have begun to face up to the issues raised by this prospect. 1/

The purpose of this paper is to examine the relationship between population aging and social security financing in the context of prospective developments in four countries--the Federal Republic of Germany, Japan, the United Kingdom, and the United States. In each of these countries, the financing of social security has been widely discussed and, to varying degrees and in different ways, programs have been, or are in the process of being, restructured so as to cushion against future financial pressures.

Section II of the paper describes projected demographic developments through 2025. In Section III these developments are incorporated into a simple model of a social security program. Although the model requires that actual programs be described only in terms of their essential characteristics, it, nevertheless, embodies the principal trade-offs facing policymakers. Section IV looks at how the model can be used to assess the implications of reform strategies that do not imply a radical departure from existing financing mechanisms. It also discusses more radical reform, which breaks with existing financing mechanisms. Section V describes and analyzes recent policy developments in the four countries covered, and Section VI contains the summary and conclusions.

II. Demographic Trends Through 2025

1. Demographic assumptions

The analysis that follows is, for the most part, based upon a single demographic projection for each of the four countries. These projections share certain characteristics as regards future trends in

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1/ Throughout this paper, the term "social security" is used to refer only to a pension program, as is the practice in the United States. In many other countries, the term is used to describe a wider range of programs.

fertility, mortality, and immigration. 1/ In all four countries, the fertility rate (the average number of children per woman) has recently been below replacement level, which is around 2.1. The 1980 fertility rates were 1.42 for the Federal Republic of Germany, 1.75 for Japan, 1.78 for the United Kingdom, and 1.86 for the United States. In Japan and the United Kingdom, the fertility rate is projected to return to replacement level between 2010 and 2025. In the United States, the fertility rate is expected to increase but to not quite reach replacement level. The fertility rate in Germany is expected to increase by as much as in the other three countries; however, because the 1980 fertility rate was relatively low, the rate of 1.65 projected for 2025 remains well below replacement level.

Mortality rates are expected to fall so that, between 1980 and 2025, male life expectancy increases by about 5 percent on average, or 3 1/2 years, while female life expectancy increases by about 3 percent, or 3 years. Improvements in life expectancy are greatest in the United Kingdom and the United States and smallest in Japan, although the range is narrow.

The projections for immigration differ most widely, because quite different patterns are expected in each country. For Germany, net emigration of about one million people before 1990 is anticipated; for the United Kingdom, steadily declining net emigration through 2015 is expected; for Japan, no immigration or emigration is anticipated; and for the United States, the steady net immigration of about 400,000 people a year is expected.

2. Population structure

The fertility, mortality, and immigration assumptions described above, combined with the 1980 population structures, suggest markedly different demographic developments for each of the four countries through 2025. These developments are summarized in Table 1. Total population is projected to fall steadily in Germany and will be 13 percent smaller by 2025 than in 1980. In Japan, total population is projected to increase by 10 percent between 1980 and 2000, then to increase a little further by 2010, and to be at that same level in 2025. Total population is projected to increase steadily in the United Kingdom, although the overall increase will be less than 5 percent. In the United States, total population is projected to grow fairly rapidly, with an overall increase of 33 percent.

1/ These projections have been chosen because of their shared characteristics. They correspond to the baseline demographic projection described in Heller, Hemming, and Kohnert (1986), where a fuller description of the underlying assumptions can be found. These assumptions are broadly similar to those used to produce recent official mid-range population projections in the countries concerned.

Table 1. Demographic Structure, 1980-2025

	1980	2000	2010	2025
Index of total population				
Germany, Federal Republic of	100.0	94.6	94.1	87.0
Japan	100.0	109.8	112.9	112.9
United Kingdom	100.0	101.8	102.9	104.7
United States	100.0	117.4	124.3	132.9
Population aged 65 and over 1/				
Germany, Federal Republic of	15.5	17.0	20.7	23.6
Japan	9.0	14.9	18.2	21.2
United Kingdom	14.8	15.1	15.8	18.5
United States	11.2	13.0	13.8	19.4

Source: Heller, Hemming, and Kohnert (1986).

1/ As a percentage of total population.

Table 1 shows how population aging is projected to occur in each country. Between 1980 and 2000, the increase in the proportion of the population aged 65 and over is minimal in the United Kingdom, modest in Germany and the United States, and much larger in Japan. As a result, by 2000 a considerable part of the difference in age structure observed among the four countries in 1980 will have been eliminated. After 2000 aging in Japan slows down, while the populations of Germany and the United States age more rapidly than previously. Aging also accelerates in the United Kingdom, but still remains relatively slow. By 2025 close to 21 percent of the population in these countries, on average, is 65 and over, compared with 17 percent in 2010, 15 percent in 2000, and 12.6 percent in 1980.

Chart 1 places the aging pattern for 1980-2025 in some historical perspective. It is clear that the population of Japan will continue to age faster than at any time in the recent past, at least up until 2020. The population of the United States will begin to age more rapidly from about 2005, after aging slowly between 1980 and 2005. But in both Germany and the United Kingdom population aging is expected to occur, except for a brief period in Germany (between 2000 and 2005), at a slower rate than at any time between 1950 and 1980. 1/

In light of this historical perspective, why is concern about the implications of population aging emerging so widely and strongly in the 1980s? Everywhere except in Japan aging is taking place at a slower rate than at any time since World War II. Clearly, a rapidly aging population poses more difficult problems of adjustment than a slower aging one, although rapid aging may be quite manageable when there are relatively few elderly to begin with. However, once the elderly have become more numerous, even fairly slow aging can begin to look unmanageable. The current concern is not about rapid aging—although this is certainly of some immediate importance in Japan—so much as about the problems that may be created by half a century or more of continuous aging. One particular fear emerges from the way in which the financing of social security is affected by population aging.

III. Population Aging and Social Security Financing

1. ### Methodology

This paper takes what Aaron (1986) refers to as a "nation-as-a-whole" view of social security financing. Programs are assumed to operate on a pay-as-you-go basis—as for the most part they do in the four countries covered—with all pensions being paid out of current revenue. If a social security financing problem arises, it is likely to take the form of conflict as to how current resources are split between

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1/ These statements are based upon the rate of change of the proportion of the population aged 65 and over, represented by the slopes of the lines in Chart 1.

CHART 1. PERCENTAGE OF TOTAL POPULATION AGED 65 OR OVER,
1950-2025

GERMANY, FED. REP. OF
JAPAN
UK
US
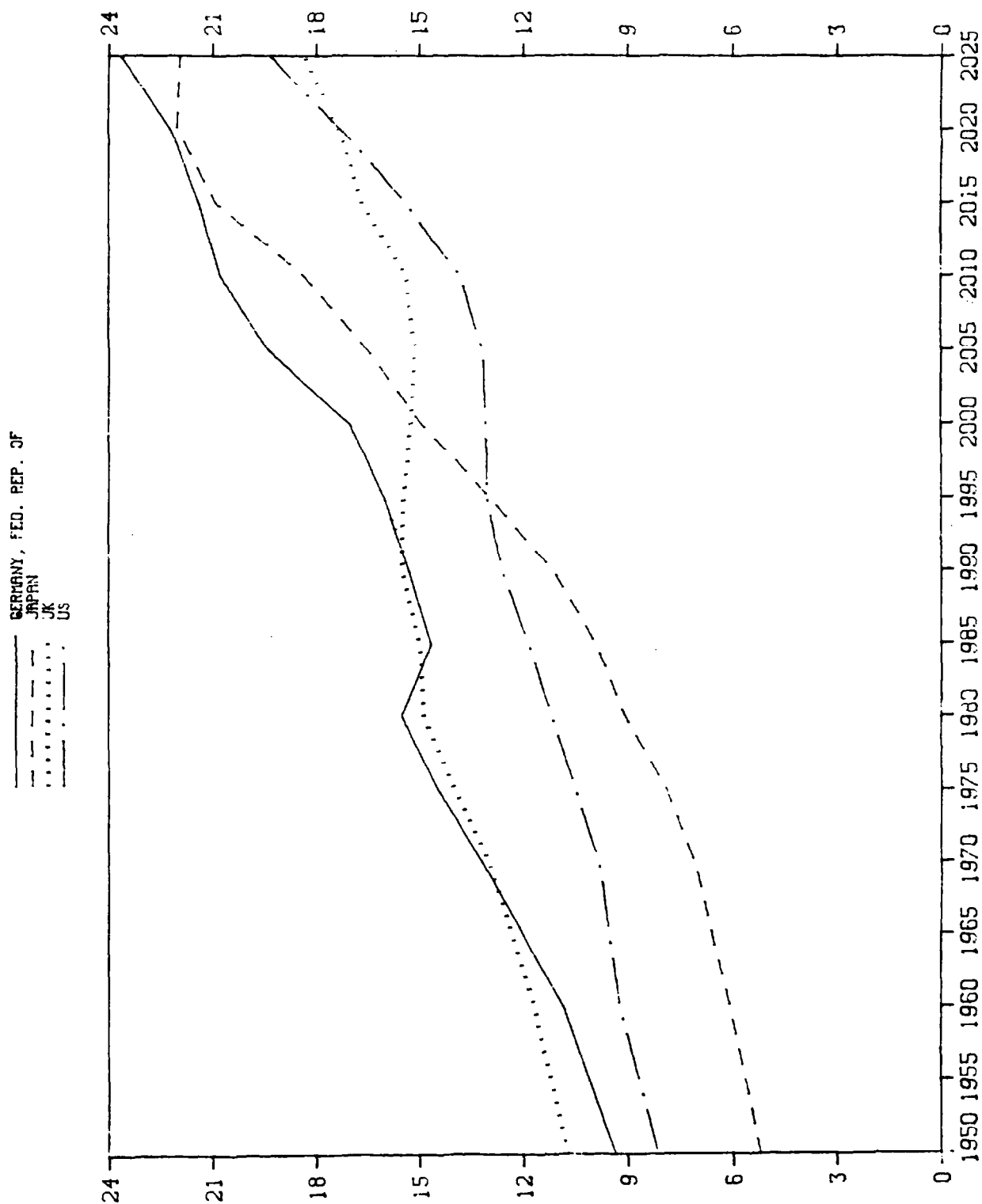
Source: OECD Demographic Trends, 1950-1990; Heller, Hemming, and Kohnert (1986);
and authors' estimates.

workers and pensioners. In particular, demographic developments imply that the financing of social security, as currently constituted, may require tax rates that are unacceptable to the working population. 1/

The relationship between population aging and social security financing will be examined in the context of a simple model of a pay-as-you-go social security program. It is assumed that the average social security pension and the average social security tax payment are a fixed proportion of the same average earnings base, y. If there are R retirement pensioners and the average pension is $p = \beta y$, then total pensions expenditure is $R\beta y$, where β is the average replacement rate. 2/ This pension program is financed on a pay-as-you-go basis, so that a social security tax is levied on the working population at a rate α to meet concurrent pensions expenditure. If there are W workers, then total social security tax revenue is $W\alpha y$, with pay-as-you-go requiring that the tax rate be given by

$$\alpha = \beta R/W = \beta/S \qquad (1)$$

where $S = W/R$ is the support ratio, that is, the number of workers per pensioner. With the replacement rate β fixed, the social security tax rate is inversely proportional to the support ratio. Thus, if projected demographic shifts can be transformed into changes in the support ratio, the implications of these shifts for social security tax rates follow directly.

Equation (1) forms the basis of the first set of social security tax rate projections--which may be thought of as "1980 status quo" projections--reported in this paper. These take as their starting point social security pension expenditure in 1980 and the pay-as-you-go tax rate needed to finance it, which in turn reflects the demographic structure, age-specific labor force participation rates, and unemployment rates. The social security programs included are the old age component of the social insurance program in Germany, the old age component of the full range of public programs in Japan, the flat rate and earnings-related state pensions in the United Kingdom, and the old age and survivors' component (OASI) of the social security program in

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1/ It should be noted, however, that the social security financing issue can be looked at in other ways. For example, it may be that a relatively large cohort retires having saved more and added more to productive capacity than smaller cohorts, and so has at least partially financed its apparently unacceptable claim to current resources (see Aaron, 1986).

2/ The average replacement rate, which is the ratio of the average pension to average earnings at the same point in time, should be distinguished from the more widely referred to marginal replacement rate, which is the ratio of the full pension to average earnings (or an average of previous earnings) on retirement. From now on, the term replacement rate will refer to the average rate.

the United States. 1/ From published information on these programs, it
is reasonably straightforward to calculate the 1980 values of α . 2/ R
and W reflect the age structure of the population pension age, and the
labor market factors noted above. Then from equation (1), β is derived as a
residual. The 1980 values of α,β, and S = W/R are shown in Table 2. 3/

With β fixed, a projection of α requires a projection of the
support ratio, S. This in turn is derived from the demographic
projections, assuming that pension age and age-specific labor force
participation rates remain at their 1980 values, and that unemployment
reverts to 1980 rates or below by 2000. 4/ The resulting support ratios
are shown in Table 3. The fall in support ratios in each country
mirrors the increase in the proportion of the total population aged 65
or over shown in Table 1, although it differs as pension age and labor
force participation rates (and hence retirement age) differ between
countries. 5/ The most dramatic decline occurs in Japan where the
number of workers per pensioner more than halves, and the most modest
decline occurs in the United Kingdom, where the support ratio remains

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1/ A brief description of these programs is contained in Appendix II
to Heller, Hemming, and Kohnert (1986).

2/ Social security tax rates are levied on both employees and
employers; α refers to the sum of the employees' and employers' rates.
For Germany and the United Kingdom where the social security programs
are run on a pure pay-as-you-go basis, these are the actual tax rates
associated with the programs concerned. The U.S. program is backed by a
trust fund, but in 1980 the actual tax rate was close to the pay-as-you-
go rate. In Japan, the multiplicity of programs, with widely ranging
characteristics, and the fact that social security is partially funded,
make estimation of the pay-as-you-go tax rate difficult. The assessed
rate is well below the actual rate, which in 1980 was 10.6 percent for
men in the largest program, the Employees' Pension Plan (KNH). In all
cases, the pay-as-you-go tax rates have been calculated net of any
government subsidy to the social security program, which is assumed to
remain unchanged in percentage terms over the projection period.

3/ When one takes into account differences in coverage, the different
bases used to compute taxes and pensions, and government subsidies, the
estimated average replacement rates reported in Table 2 are not
obviously inconsistent with the marginal replacement rates reported in
Aldrich (1982). We do not have sufficient information to make a more
careful comparison of the two sets of replacement rates.

4/ The assumed unemployment rates from 2000 onward are 3.0 percent in
Germany, 2.0 percent in Japan, 6.0 percent in the United Kingdom, and
5.5 percent in the United States.

5/ Pension ages are 63 for Germany, 60 for Japan, 65 for the United
States, and 65 for men and 60 for women in the United Kingdom. In Japan
different schemes have different pension ages. For example, the
Employees' Pension Plan has pension ages of 60 for men and 55 for women,
while the National Pension Plan has pension ages of 65 for men and
women.

Table 2. Social Security Tax Rates, Replacement
Rates, and Support Ratios, 1980

	Tax Rate (α)	Replacement Rate (β) 1/	Support Ratio (S)
Germany, Federal Republic of	14.6	40.2	2.75
Japan	6.4	35.9	5.61
United Kingdom	10.5	28.7	2.73
United States	9.4	42.2	4.49

Source: Authors' estimates.

1/ Derived using equation (1), i.e, $\beta = \alpha S$.

Table 3. Support Ratios, 1980-2025 1/

	1980	2000	2010	2025
Germany, Federal Republic of	2.75	2.35	1.95	1.56
Japan	5.61	3.59	2.77	2.38
United Kingdom	2.73	2.81	2.69	2.18
United States	4.49	3.99	3.78	2.53

Source: Authors' estimates.

1/ The number of workers per pensioner.

between two and three for the entire projection period. This is the range ultimately reached in Japan and the United States, while in Germany, the support ratio falls below two between 2000 and 2010 and then falls significantly thereafter.

In moving from projections of the support ratio to projections of social security tax rates, we must take into account an additional factor, not reflected in equation (1). In each of the four countries discussed in this paper, pensions are related to some measure of previous earnings and the number of working years in the program. Such programs have a maturation period, during which average replacement rates increase as people approach retirement having spent an increasing share of their working life in the program. Well established programs, like the one in Germany, are fully mature. The program in the United States is newer, but is nearly mature because of its relatively short qualifying period (ten years). Like the U.S. program, Japan's major programs are newer, but are still immature because of their much longer qualifying period (35 years in the case of the Employees' Pension Plan). And in the United Kingdom, the earnings-related program only came into effect in 1978, and will not fully mature until halfway through the twenty-first century. Because of the immaturity of the programs in these two countries, the average replacement rate β is allowed to grow steadily between 1980 and 2025. Thus if the subscript 0 indicates 1980 and the subscript t indicates any future year (so that $t = 45$ indicates 2025), then

$$\alpha_t = \beta_0 (1 + b)^t / s_t$$

where b is the rate at which the replacement rate is assumed to grow. Given that $\beta_0 = \alpha_0 s_0$, we then have

$$\alpha_t = \alpha_0 (1 + b)^t s_0 / s_t \qquad (2)$$

with b = 0 in the case of Germany and the United States and b > 0 in the case of Japan and the United Kingdom. The growth rates in the latter two countries have been derived from the maturity adjustment implicit in official projections. 1/ These growth rates are a little less than 0.6 percent a year in each case, and they imply that the average replacement rate will increase from 35.9 percent in 1980 to 46.4 percent by 2025 in Japan, and from 28.7 percent in 1980 to 37.5 percent by 2025 in the United Kingdom.

1/ For Japan, the official projection relates to only one program, the Employees' Pension Plan, as reported in Takayama (1982). For the United Kingdom, the official projection is taken from National Insurance Fund: Long-term Financial Estimates, Report by the Government Actuary on the First Quinquennial Review under Section 137 of the Social Security Act 1975 (London: HMSO, 1982).

2. Results

Projected social security tax rates implied by the changes in support ratios shown in Table 3 are reported in Table 4. In all four countries, the "1980 status quo" projections suggest that social security tax rates will be markedly higher in 2025 than they were in 1980, with much larger increases after 2000 than before. Overall, the tax rate less than doubles in Germany, the United Kingdom, and the United States, while it more than triples in Japan. From being the lowest in 1980, the tax rate in Japan increases to nearly 20 percent by 2025, a figure that is exceeded only in Germany, where the tax rate rises to over 25 percent by 2025. In the United Kingdom and the United States the social security tax rate increases to about 17 percent.

As with demographic developments, it is interesting to compare prospective changes with past ones. Although a time series of pay-as-you-go tax rates is not readily available, the Organization for Economic Cooperation and Development (OECD) (1985) reports the ratio of social security pensions expenditure to gross domestic product (GDP) for the period 1960-80. The projections in Table 4 can be converted to a similar base, which has been done in Chart 2. 1/ This chart provides little indication that the ratio of social security pensions expenditure to GDP will, in general, grow faster after 1980 than before; indeed, in each country future growth is markedly slower over much of the period between 1980 and 2025 than before 1980.

3. Pension increases

The above projections assume that the average pension is fixed relative to average gross earnings. Thus, the average pension starts as a specified proportion of average gross earnings, and is then increased after retirement in line with the growth in average gross earnings. Only in Germany was such a provision for pension increases after retirement built into legislation in 1980, although pension increases were capped in 1979, 1980, and 1981, with the result that pensions declined in value relative to average gross earnings. In Japan, legislation provides only for post-retirement increases in line with the cost of living, although pensions have been periodically increased to reflect real income growth in the economy as a whole. The United

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1/ It has been assumed that real GDP growth reflects changes in employment, as assumed in the support ratio projections and the following annual rates of growth of average productivity: 2 percent for Germany, 3 percent for Japan, 1.4 percent for the United States, and 1.6 percent for the United Kingdom (see Heller, Hemming, and Kohnert (1986), for further details and discussion). It should be noted that the OECD definition of pensions expenditure is wider than that used in this paper. The two series of expenditure to GDP ratios have been integrated using the 1980 ratio implied by the social security tax rates reported in Table 2 as a base.

CHART 2. RATIO OF SOCIAL SECURITY PENSIONS
EXPENDITURE TO GDP, 1960-2025 1/

GERMANY, FED. REP. OF
JAPAN
UK
US
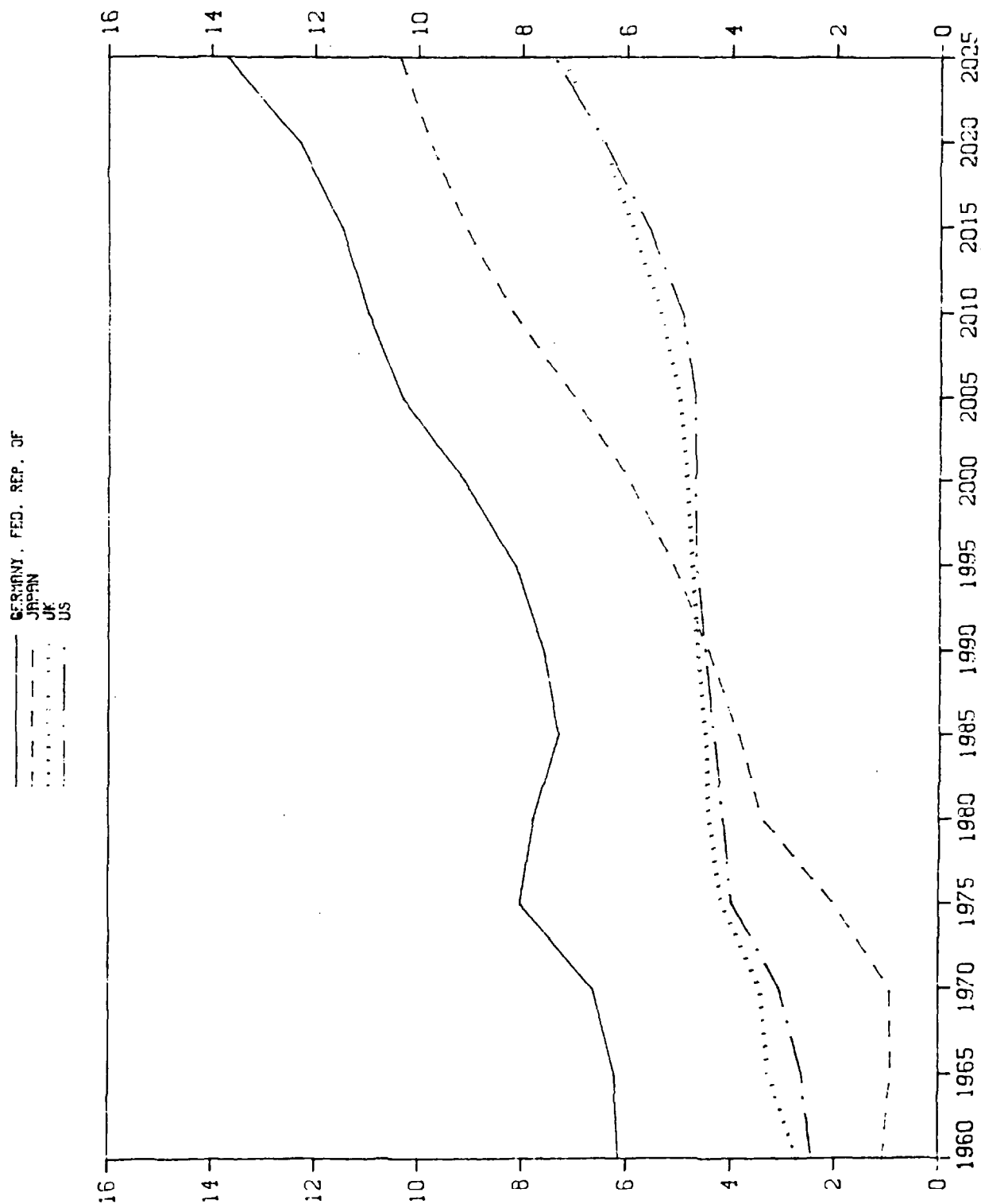
Sources: OECD Social Expenditure, 1960-1990; and authors' estimates.

1/ The 1960-80 data relate to the OECD definition of social expenditure on pensions, which is somewhat wider than the definition of social security pensions in this paper. It includes all benefits paid to the elderly, the disabled, and survivors, as well as government employee pensions.

Table 4. Social Security Tax Rates, 1980-2025: Pensions
Fixed Relative to Average Gross Earnings 1/

(In percent)

	1980	2000	2010	2025
Germany, Federal Republic of	14.6	17.1	20.6	25.7
Japan	6.4	11.2	15.4	19.5
United Kingdom	10.5	11.5	12.7	17.2
United States	9.4	10.6	11.2	16.7

Source: Authors' estimates.

1/ Derived using equation (2), i.e.,

$$\alpha_t = \alpha_0 (1 + b)^t \, s_0/s_t$$

with b = 0.00572 for Japan, b = 0.00595 for the United Kingdom, and b = 0 for Germany and the United States.

Kingdom and the United States appear to be more firmly committed to, at the most, increasing pensions to reflect price movements. However, in the United Kingdom pension increases have been more generous in the past, partly reflecting periods with more generous legislation and partly reflecting government discretion. In the United States, pension increases have also been more generous in the past, although this was due in part to a now-corrected error in the pension formula that provided for double indexation (relative to price changes) between 1972 and 1977 (see Munnell (1977) for more details).

In terms of a "1980 status quo," it would appear that fixing pensions relative to earnings is more reasonable in Germany and Japan than in the United Kingdom and the United States. Table 5 illustrates the potential impact that alternative mechanisms for increasing pensions can have on social security tax rates. If pensions are fixed at their real 1980 levels, other than for increases to reflect the maturing process, then in all countries the social security tax rate will be lower in 2025 than in 1980. However, because the programs in each country relate starting pension levels to previous earnings, pensions can only be held constant in real terms after retirement, in which case the future tax rate will reflect the demographic and labor market characteristics of the retired population. There is no straightforward way of capturing this type of provision in the model used in this paper. However, official U.K. projections suggest that, in the long term, maintaining the real value of pensions after retirement significantly reduces future social security tax rates as compared with linking pensions to earnings. In terms of the projections reported in Table 3, if pensions were increased after retirement by 1 percentage point less than the growth rate of earnings (with earnings growing at 8 percent a year in nominal terms), the 2025 social security tax rate would be about 13.5 percent rather than the reported 17.2 percent. 1/

The significant impact on social security tax rates of alternative provisions relating to pension increases after retirement gives rise to the question of whether long-run projections based upon pension increases linked to average earnings--especially where the legislated provision is different--provide a true guide to future tax rates. The answer depends upon whether a deviation from what has happened in the past can be sustained. This paper assumes that if changes in average real earnings are not reflected in pension levels, divergences and mismatches in living standards will result--between workers and pensioners and between older and younger pensioners--that are probably not sustainable in the long run.

1/ Based upon the figures in Table 14 of National Insurance Fund: Long-term Financial Estimates, Report by the Government Actuary on the First Quinquennial Review under Section 137 of the Social Security Act, 1975 (London: HMSO, 1982).

Table 5. Social Security Tax Rates, 1980-2025:
Pensions Fixed at 1980 Real Levels 1/

	1980	2000	2010	2025
Germany, Federal Republic of	14.6	11.5	11.4	10.5
Japan	6.4	6.2	6.3	5.2
United Kingdom	10.5	8.7	8.4	9.2
United States	9.4	7.7	6.9	8.2

Source: Authors' estimates.

1/ Derived from the equation $\alpha_t = \alpha_0 [(1+b)/(1+g)]^t \, S_0/S_t$

where g is the assumed rate of growth of real earnings. This
has been equated with the rate of growth of productivity.
Thus, g = 0.02 for Germany; g = 0.03 for Japan, g = 0.014 for
the United Kingdom; and g = 0.016 for the United States.

4.   Sensitivity to principal assumptions

     The preceding analysis is based upon a single, probably optimistic,
demographic projection, which corresponds to the baseline projection
reported in Heller, Hemming, and Kohnert (1986). That study also made
use of a less optimistic "greater aging" demographic projection, in
which fertility rates are assumed to remain at their 1980 levels except
in the United States, where a small decline is assumed. Life expectancy
is assumed to increase by a little less than twice as much as in the
baseline case; that is, average male life expectancy increases by
9 percent and average female life expectancy increases by 6 percent. It
is also assumed that the number of immigrants to the United States is
reduced by 25 percent in the greater aging case. These revised
assumptions yield lower projections of total population in each country,
and lower support ratios, whose impact on social security tax rates is
indicated in Table 6. By 2025, tax rates will be significantly higher
in Germany, Japan, and the United States; in the United Kingdom, the
difference between the baseline and greater aging population projections
will be relatively small.

     In addition to the demography, the economic environment may turn
out somewhat less favorably than allowed for in the projections.
However, lower-than-expected productivity growth would have no impact on
the projections, since pensions are assumed to increase in line with
average earnings. Only if the link between pensions and earnings is
severed will higher or lower average productivity growth affect the
projections. The assumed unemployment rate, on the other hand, has a
direct effect on the projections since a higher rate reduces the size of
the working population.

IV.   Social Security Reform

     The above analysis is fairly mechanical and makes no attempt to
assess whether the social security tax rates generated by the projection
exercises are sustainable, either from an economic or a political point
of view. The economic arguments--which revolve primarily around the
supply-side effects of high tax rates--cannot be resolved. In any
event, political considerations are likely to dominate economic
considerations, and the consensus emerging from today's politicians is
that future generations of workers will find the currently projected
social security tax rates unacceptable. Thus, social security reform is
again a topical subject, with the focus of attention on how to
accommodate the financial pressures associated with population aging.

     In the existing pay-as-you-go programs, the range of broad policy
options is limited. In terms of the model used above, the trade-off is
between social security tax rates and pension levels (as reflected in
the average replacement rate) and pension age. However, before
exploring this trade-off further, we will outline an alternative
approach to pension reform in the face of demographic pressure. A pay-
as-you-go pension program can be viewed as an implicit intergenerational

Table 6. Support Ratios and Social Security Tax Rates, 1980-2025:
Pessimistic Demographic Assumptions with Pensions
Fixed Relative to Average Gross Earnings

| | Social Security Tax Rates 1/ | | | |
	1980	2000	2010	2025
Support ratios				
Germany, Federal				
Republic of	2.75	2.35	1.93	1.47
Japan	5.61	3.10	2.38	2.06
United Kingdom	2.73	2.81	2.69	2.12
United States	4.49	3.80	3.46	2.14
Social security tax rates				
Germany	14.6	17.1	20.8	27.4
Japan	6.4	12.8	17.7	22.3
United Kingdom	10.5	11.5	12.7	17.6
United States	9.4	11.1	12.2	19.8

Source: Authors' estimates.

contract, under whose terms each working generation supports the retired, and expects to be supported in turn by future working generations. Musgrave (1981) examines how contracts with different terms divide demographic and economic risks between working and retired generations, and assesses the impact of amending the terms of the existing contract in various ways.

1.   Changing the pension contract

With respect to demographic change, under pay-as-you-go arrangements the cost of adjustment falls on the working population. 1/ The rules determining pensions tend to be fixed, and the tax rate is adjusted to guarantee that income matches expenditure. With pensions fixed relative to average gross earnings, population aging results in continuously increasing tax rates, with a corresponding decrease in the relative net incomes of workers. According to Musgrave (1981), this type of contract ". . . contains a built-in potential for collapse" (p. 103). Continuously increasing tax rates without any compensating reduction in relative pension levels may induce a future generation of workers to renege on the contract. An alternative intergenerational contract, where the cost of aging is shared more evenly by working and retired generations, could reduce the likelihood of such an outcome. 2/

One way to achieve fairer cost sharing is to fix the average pension not as a proportion of average gross earnings, but as a proportion of average net earnings. If the social security tax is the only tax, then average net earnings are given by $n = (1 - \alpha^*)y$, where α^* is the social security tax rate. The average pension is then $p = \beta^* n = \beta^*(1 - \alpha^*)y$, where β^* is the average replacement rate defined relative to net earnings, and total pensions expenditure is $R\beta^*(1 - \alpha^*)y$. Social security tax revenue is again $W\alpha^*y$, with pay-as-you-go financing now requiring that

$$\alpha^*/(1 - \alpha^*) = \beta^*/S. \qquad (3)$$

The social security tax rate α^* is inversely related to the support ratio, and average net earnings and the average pension change in the same proportion, reflecting the change in the retention

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1/ While Musgrave's analysis is in terms of risk bearing (i.e., who pays if demographic developments are less favorable than expected?) this paper focuses on the burden of costs (i.e., who pays given specific demographic developments?). The difference between these two approaches relates only to whether a particular change is anticipated or unanticipated.

2/ A similar problem arises when pensions after retirement are increased in line with prices rather than earnings. Adverse demographic developments do not affect real pension levels; therefore, the full cost of adjustment is borne by workers.

rate $(1 - \alpha^*)$, as the support ratio worsens. This is the sense in which cost sharing is equitable. 1/

Taking into account increasing maturity, the future social security tax rate can be written (using the notation employed in Section III)

$$\alpha^*_t/(1 - \alpha^*_t) = \beta^*_0(1 + b)^t/S_t$$
$$= [\alpha_0/(1 - \alpha_0)](1 + b)^t S_0/S_t \text{ since } \beta^*_0 = \alpha_0 S_0/(1 - \alpha_0)$$
$$= \alpha_t/(1 - \alpha_0) \text{ from equation (2). } 2/$$

It then follows that

$$\alpha^*_t = \alpha_t/(1 - \alpha_0 + \alpha_t) \tag{4}$$

which is the equation used to derive the social security tax rates reported in Table 7. A comparison of these and the tax rates reported in Table 4 reveals that the reduction in social security tax rates implied by the switch in pension contracts taking effect in 1980 is between 2 and 3 percentage points by 2025 in Germany and Japan, and about 1 percentage point by 2025 in the United Kingdom and the United States. If the definition of net earnings were to take into account not only the social security tax but all direct taxes on income--a procedure that can be justified if it is believed that pensioners should share the costs of all government activities, and not just the costs of pension provision--the 2025 tax rate would be a little lower, that is, about 1 percentage point in Japan, about 3/4 of 1 percentage point in Germany, and about 1/2 of 1 percentage point elsewhere. 3/ But the impact of the fairer cost sharing formula remains modest, which suggests that while such a switch may be desirable in itself, it may not shift enough of the burden of population aging to the retired so as to guarantee the survival of the pension contract. More direct intervention is then required.

1/ As well as the costs (risks) associated with demographic developments, those associated with economic developments, for example, an anticipated/unanticipated slowdown in productivity growth, are also of interest. If pensions are fixed relative to either gross or net earnings, then workers and pensioners share economic costs and risks. However, if pensions are fixed in real terms, such costs and risks are borne by workers.

2/ For Japan and the United Kingdom, it is assumed that the replacement rate defined in terms of average net earnings, β^*, increases at the same rate as the replacement rate defined in terms of gross earnings, β, that is, b. Since b reflects the increase in the average length of the working life spent in a program, this seems appropriate.

3/ These estimates are based upon the assumption that the overall rate of income tax increases only as a result of increasing social security taxes. However, other public expenditure programs, and in particular health care, are affected by demographic developments, with the result that the financing of nonpension expenditure will also require higher tax rates (see Heller, Hemming, and Kohnert (1986)).

Table 7. Social Security Tax Rates, 1980-2025:
Pensions Fixed Relative to Average Net Earnings 1/

(In percent)

	1980	2000	2010	2015
Germany, Federal Republic of	14.6	16.7	19.4	23.1
Japan	6.4	10.7	14.1	17.2
United Kingdom	10.5	11.4	12.5	16.1
United States	9.4	10.5	11.0	15.6

Source: Authors' estimates.

1/ Derived using equation (4). i.e.,

$$\alpha_t^* = \alpha_t / (1 - \alpha_0 + \alpha_t)$$

2. Pension levels and pension age

In the context of a pay-as-you-go social security system, any attempt to contain the growth of pensions expenditure so as to limit the increase in tax rates must focus on pension levels or pension age.

a. Pension levels

Pension levels are a function of replacement rates, and the focus of attention will now shift from average to marginal rates (i.e., the proportion of earnings appropriately defined, replaced by a pension at the date of retirement), and the provision for pension increases after retirement. Among the ways in which marginal replacement rates could be changed, two would directly affect social security tax rates: the number of pensionable years of employment could be limited or accrual rates could be reduced. Alternatively, the pension base could be changed; for example, qualifying earnings could be reduced through the use of floors and ceilings, or, where past earnings were taken into account in determining a pension, intervening inflation and real earnings growth could be either partially compensated for or ignored. The above changes need not be applied uniformly. Rather, replacement rates could be made a decreasing function of earnings, with a view to targeting social security expenditure more directly at pensioners who need income support.

As noted above, altering pension levels by limiting pension increases after retirement has a potentially large financial impact. However, we have argued that pension levels are unlikely, in the long run, to move vastly out of line with earnings, nor is it desirable that they do. One argument against linking pensions to earnings is that the real incomes of pensioners will fall when real earnings fall. But it seems more reasonable to argue that pensioners should not be afforded more inflation protection than workers themselves can secure. However, if pensions are to be linked to earnings, there is a compelling case for linking them to some measure of net earnings. In response to the financial pressures created by demographic change, there is a strong case for having the fortunes of the retired population linked directly to those of the working population that is paying its pensions. Linking pensions to net earnings, on retirement and thereafter, achieves this objective.

b. Pension age

Pension age is different from retirement age in that there is early or late retirement, which is reflected in the participation rates of those in the labor force close to pension age. Pension age and other provisions of the pension program necessarily affect participation rates as do a range of other factors that could themselves be influenced by policy so as to increase the size of the workforce (e.g., the availability of child care facilities). However, we will focus on the impact of changes in pension age.

Increasing pension age has a direct effect on the support ratio--because it increases the number of workers and reduces the number of pensioners--and social security tax rates. In this paper, the effects of two alternative pension age scenarios are considered. In the first scenario, pension age is increased by one year in 2000 and by one year in 2010, with adjustments to labor force participation rates close to pension age to reflect the implied disincentive to retirement. 1/ The impact of this change is shown in Table 8. In the second scenario, pension age is assumed to increase by one year every five years, starting in 1995 and ending in 2025. The impact of this change is shown in Table 9.

To compare these alternative pension age scenarios with the 1980 status quo position shown in Table 4 and the effect of a revised pension contract as shown in Table 7, Chart 3 combines these four separate projections for each of the four countries. As outlined above, the revised pension contract has limited financial impact and, with the exception of Japan, a two-year increase in pension age is of greater benefit. By 2025, social security tax rates would be about 3 percentage points lower than in the 1980 status quo case for Germany; about 2 percentage points lower for the United Kingdom; between 1 and 2 percentage points lower for the United States; and about 1 percentage point lower for Japan. A five-year increase in pension age implies significantly lower social security tax rates in all countries, again with the exception of Japan, where the tax rate is reduced by less than 3 percentage points. The reduction is between 3 and 4 percentage points in the United Kingdom and the United States, and nearly 7 percentage points in Germany.

3.   The funding option

The preceding analysis has been set in the framework of a pay-as-you-go social security program, which is the norm throughout the developed world. The alternative, actuarial funding, is common in the private sector and also used in the public sector (enterprises, local government), but has been little used as a means of social security financing. There are three main reasons why pay-as-you-go programs have proved so popular. First, in a funded system, where pensions are paid out of accumulated savings, it takes many years to build up a claim to a reasonable pension. In contrast, under a pay-as-you-go system, a full pension can be paid immediately, with a transitional gain to retirees and some older workers. Second, since pensions are paid out of workers' earnings, they can be increased to reflect changes in prices or earnings without claiming an increasing share of these earnings. It is difficult--though not impossible--for funded programs to match this provision. Third, as Holzmann (1986) indicates, a pay-as-you-go system appeals to voters, in that a promise can be made to increase future

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1/ These adjustments are fairly arbitrary, involving no more than an extension of the age range over which participation rates immediately prior to the original pension age are applied.

CHART 3. THE IMPACT OF ALTERNATIVE POLICY MEASURES
ON SOCIAL SECURITY TAX RATES, 1980-2025

PENSIONS FIXED RELATIVE TO AVERAGE GROSS EARNINGS
PENSIONS FIXED RELATIVE TO AVERAGE NET EARNINGS
PHASED INCREASE IN PENSION AGE OF TWO YEARS
PHASED INCREASE IN PENSION AGE OF FIVE YEARS

JAPAN

GERMANY, FED. REP. OF

UNITED STATES

UNITED KINGDOM
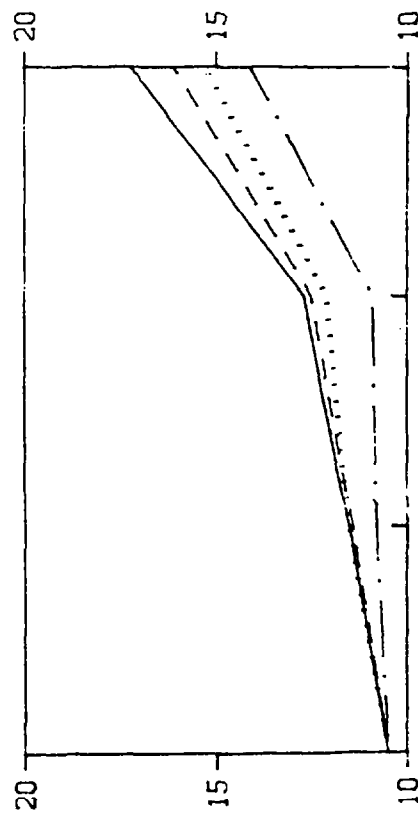
Table 8. Support Ratios and Social Security Tax Rates, 1980-2025:
Phased Increase in Pension Age of Two Years with Pensions
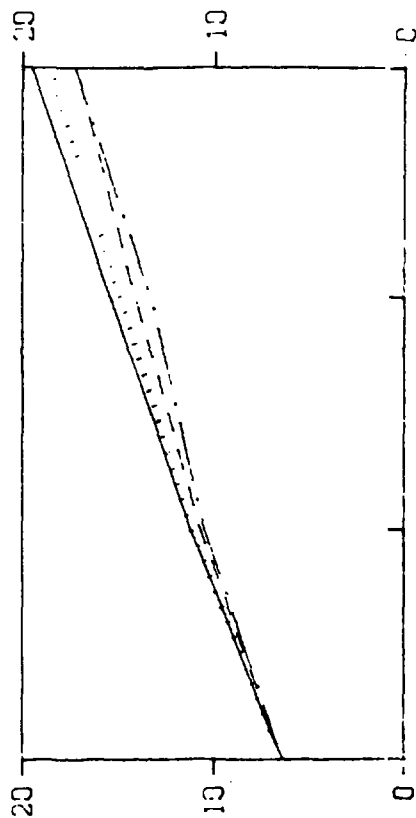Fixed Relative to Average Gross Earnings 1/

	1980	2000	2010	2025
Support ratios				
Germany, Fed. Rep. of	2.75	2.35	2.05	1.78
Japan	5.61	3.59	2.86	2.49
United Kingdom	2.73	2.81	2.84	2.44
United States	4.49	3.99	3.96	2.79
		(In percent)		
Social security tax rates				
Germany, Fed. Rep. of	14.6	17.1	19.6	22.6
Japan	6.4	11.2	14.9	18.6
United Kingdom	10.5	11.5	12.1	15.3
United States	9.4	10.6	10.7	15.1

Source: Authors' estimates.

1/ Pension age is assumed to increase by one year in 2000
and by one year in 2010.

Table 9. Social Security Tax Rates, 1980-2025: Phased
Increase in Pension Age of Five Years with Pensions
Fixed Relative to Average Gross Earnings 1/
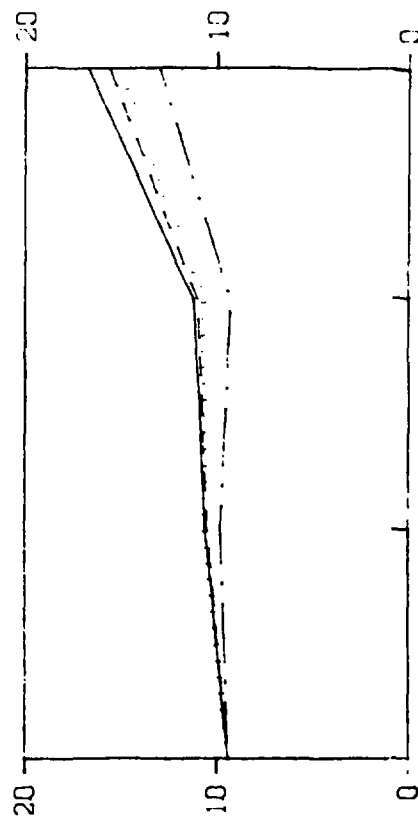
	1980	2000	2010	2025
Support ratios				
Germany, Fed. Rep. of	2.75	2.71	2.49	2.13
Japan	5.61	3.82	3.17	2.68
United Kingdom	2.73	3.00	3.14	2.65
United States	4.49	4.31	4.55	3.26
		(In percent)		
Social security tax rates				
Germany, Fed. Rep. of	14.6	14.8	16.1	18.9
Japan	6.4	10.5	13.3	17.3
United Kingdom	10.5	10.8	10.9	14.1
United States	9.4	9.8	9.3	13.0

Source: Authors' estimates.

1/ Pension age is assumed to increase by one year every
five years, starting in 1995 and ending in 2015.

pensions, that does not entail any immediate financial costs. Indeed, the cost of such provisions can be delayed many years.

However, we have shown above that adverse demographic developments can turn against pay-as-you-go programs; moreover, their impact is reinforced by the sort of voter-oriented promises mentioned above. One question that then arises is whether funding could be part of the solution to the problems to which these adverse developments give rise. By funding, we mean two things: (1) taxes (or, more appropriately, contributions) are determined according to the benefits being accrued; and (2) pension claims are backed by an accumulated reserve. According to these criteria, neither the Japanese nor the U.S. social security program can be regarded as funded, despite the existence of "funds." In both countries, the fund, which is invested in government securities, is used to smooth social security tax rates. These rates are not determined on an accrual basis, and the social security program will ultimately revert to a full pay-as-you-go basis.

Pay-as-you-go and funding are two different ways of establishing a claim to future resources. The former does this through an inter-generational contract whose terms dictate that each working generation will transfer part of its income to the retired, while the latter permits individuals to transfer resources from their working years to their retirement years. A switch from pay-as-you-go to funding does not affect the resources transferred to the retired unless, of course, funding is viewed as implying a benefit structure radically different from that associated with a pay-as-you-go program. 1/ However, the financing method used may affect the ease with which a specific pension claim can be met, because it affects capital accumulation and, as a result, the resources available to meet future pension payments.

If the government were to fund social security by building up a reserve of government securities, the result would be the effective equivalent of a pay-as-you-go program, and aggregate saving would be unaffected by the choice between the two financing mechanisms. Only if there were perceived to be a difference between pay-as-you-go and this form of funding would aggregate saving be affected. Alternatively, the government could accumulate private sector assets, although the extent to which this action contributes to an increase in the capital stock would depend upon the reactions of private investors and the corporate sector to the resulting change in the structure of asset demand and

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1/ For example, under funding, it may seem more natural to define the contribution level and to pay pensions on the basis of the fund's financial performance, rather than to define the benefits as at present. Moreover, in the absence of indexed securities, provision for pension increases after retirement may be removed or at least limited under funding.

supply. 1/ Clearly, the impact of alternative social security financing methods on aggregate saving and capital accumulation cannot be determined a priori. Moreover, where aspects of these relationships have been subjected to empirical investigation, few clear and uncontroversial conclusions have been produced. 2/ Thus, it cannot be concluded that there are strong grounds for substituting funding for pay-as-you-go because of the beneficial impact of the former on the capital stock; and, even if there were, other fiscal and monetary policy instruments probably provide the government with more direct means of influencing both public and private saving. It should also be noted that any shift from pay-as-you-go to funding will involve transitional losses, as at least one generation has to pay for the pensions of a previous generation (under pay-as-you-go) and provide its own pensions (under funding).

While funding offers the private sector a number of advantages—the most important are tax concessions and a measure of financial security for program members—its signalling function is of clear value to both the private and public sectors. The accrual basis requires that taxes (or contribution rates) reflect the liabilities that are being incurred. This is not a feature of pay-as-you-go, although such a link could be established without resorting to funding. Rather than building up a fund, government would levy higher taxes than under pay-as-you-go and reduce current borrowing, with the result that, if compensating deficits do not build up on other programs, increases in future tax rates can be correspondingly contained. This principle underlies the notional funding practice common in the public sector in the United Kingdom (see Kay, 1983). It is also partially reflected in the current trust fund arrangement in the United States, in that between now and about 2025 workers will be paying more than is necessary under pay-as-you-go while, for a number of years, future generations will be paying less. However, in the interest of equity between generations, the taxes paid and pensions received by successive generations should ideally bear a fixed relationship to that generation's earnings (Aaron 1985). 3/ In effect, and in contrast to current arrangements in the United States and elsewhere, the rate of return successive generations receive under the social security program would be brought into line.

1/ A question may also arise as to the justification for heavy public investment in the private sector, which would certainly rest uneasily with widely held misgivings about public ownership, and the current popularity of privatization.

2/ For a review of this evidence, see Thompson (1983) and the references cited therein.

3/ Such an outcome would only emerge under pay-as-you-go if the aggregate earnings of each successive generation were to increase at a constant rate.

V. Social Security Policy

The preceding analysis makes it clear that pay-as-you-go social security programs, as currently constituted, will come under severe pressure from the forces of demographic change. Many countries have recognized this, including the four which have been examined in this paper. However, they have also recognized that pay-as-you-go has limited potential for flexibility to respond to demographic change. As reflected in the model used in this paper--the issue of the appropriate basis for pension increases aside--the social security tax rate, the replacement rate, and pension age are the only direct policy instruments. Expenditure control then requires either lower replacement rates, a higher pension age, or some combination of the two. If social security expenditure does not fully adjust, then tax rates must inevitably increase. This trade-off is exemplified in the policy responses that have occurred in Germany, Japan, the United Kingdom, and the United States.

1. Recent policy responses

a. The Federal Republic of Germany

The early 1970s were a period of rapid expansion of the social security system in Germany, with extensions in coverage to groups outside the workforce and the introduction of generous early retirement provisions that brought pension age and effective retirement age down to 63 (and later to 60 for unemployed men). During the early 1970s, social security expenditure as a percentage of GDP increased rapidly, partly reflecting this expansion, but also reflecting demographic developments and real wage growth, the latter affecting both starting pension levels and pension increases that were linked to increases in average earnings (see Chart 2).

As we pointed out earlier, by the beginning of the 1980s, Germany was relying on ad hoc post retirement pension increases in place of the specific indexation mechanism previously used--increasing pensions in line with average gross earnings (averaged over the previous three years)--to control the growth of social security pension expenditure in response to the pressures of an aging population, increasing unemployment, and a falling retirement age (itself largely a response to increasing unemployment). The capping of pension increases during 1979-81 led to a drop in pensions not only relative to average earnings but also in real terms (see Cumming (1983)), and a decline in social security expenditure as a percentage of GDP (see Chart 2). After 1981 pensions were again increased in line with average gross earnings, but this practice was soon abandoned with the onset of recession, and ad hoc procedures (in particular delayed increases) were reinstated. However, at the end of 1984 these procedures were replaced by a formal

arrangement when the authorities decided, in a supplementary law to the 1985 budget, that, in principle, pensions would be adjusted in line with average net earnings. 1/

b. Japan

The social security system in Japan underwent rapid expansion throughout the 1970s as coverage grew, pension levels improved as the programs matured, and the population aged. Social security expenditure as a percentage of GDP increased correspondingly (see Chart 2). The prospect of still larger expenditure increases after 1980 made social security reform a central issue in Japan.

The 1985 Pensions Reform Act represents a comprehensive plan to restructure the Japanese social security program. There are two principal elements to the reform. The first is the integration of the two largest public programs, the National Pension Plan and the Employees' Pension Plan. Since the first of these pays flat rate pensions and the second pays earnings-related pensions, the integrated program will pay a combination of the two. There will also be some extensions of coverage, an aspect of the plan that brings about a significant rationalization of the existing system. The second element of the reform attempts to tackle the financial difficulties created by rapid population aging.

As pointed out earlier, the Japanese social security program is still immature. However, the integrated system will cap earnings-related benefits at their current levels in real terms for single-earner couples and reduce them for single people or two-earner couples, effectively eliminating any further maturation of the program. The average new pensioner has now been in the program about 32 years, compared with the maximum of 40 years. The long-run average replacement rate has therefore been reduced by about 20 percent. Significant increases in contributions are also proposed, some to take effect immediately and some in the future. Although the growth in benefits will be moderated, by 2025 social security tax rates will still be more than twice as high as they are now. Thus, the Government has also indicated that the pension age may have to be increased at some time in the future and that the basis for pension increases may have to be changed.

c. The United Kingdom

Social security expenditure as a percentage of GDP grew slowly but steadily between 1960 and 1980 in the United Kingdom, and is expected to continue, though at a slightly slower rate, through 2000 (see Chart 2). Thereafter, as demographic pressures mount and the costs of

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1/ Based upon information reported in Haushaltsbegleitgesetz, December 22, 1984 (Sections 79 AVG and 1271 RVD). No further details relating to this change are available.

the earnings-related component of the social security program--
introduced in 1978--build up, the ratio of social security expenditure
to GDP increases more rapidly, although not as fast as in Japan and
Germany. After only a few years of operation the new earnings-related
program was being criticized, particularly the detailed workings of the
scheme, its long-run costs, and the structure of pension provision as a
whole it implied (see, for example, Hemming and Kay (1982)). The
Government, sharing misgivings about the scheme, developed a reform
strategy.

The U.K. Government's initial proposal to counter cost increases
was to phase out earnings-related pensions and to make occupational
pension coverage mandatory. However, in response to criticism of this
proposal, the Government decided to retain the earnings-related pension
scheme but to eliminate some of the more costly and less essential
provisions. 1/ These include switching from the best 20 years to a
lifetime basis for pension determination, changing the replacement rate
from 25 percent to 20 percent, shifting a larger part of the
responsibility for pension increases for employees who are not full
members of the scheme (by virtue of the quality of their private
pension) to the private sector, and reducing widows' pensions. The
pension changes are to be phased in from 1988. In the long run (by
about 2033 in official projections), and without reform, earnings-
related pensions would have accounted for about half the total costs of
social security pension provision; the reforms described above will
reduce these costs by about half. Rather than making occupational
pension schemes mandatory, the Government is now going to provide
incentives to encourage the growth of this sector.

d. The United States

The future growth of social security expenditure relative to GDP in
the United States, with an unreformed social security program, would
also be modest (see Chart 2). However, social security reform in the
United States has proceeded faster than in any of the other countries
analyzed in this paper, the program having been substantially reformed
in 1983, with the result that future expenditure growth will be slower
than under the 1980 status quo. The major changes can be divided into
those of a short-term nature and those of a long-term nature. For the
short term, it was decided to increase the social security tax rate, to
delay annual benefit increases by six months, to bring new Federal
employees and all nonprofit organization employees into the program, and
to tax one half of the benefits received by high-income individuals.
For the long term, an increase in pension age--from 65 to 67--is to be

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1/ These reforms are described in Reform of Social Security:
Programme for Action (London: HMSO Cmnd. 9691, 1985).

phased in between 2000 and 2027, while early retirement benefits are to
be lowered and delayed retirement credits increased so as to promote
later retirement. 1/

2. Assessment

Section IV describes the alternative approaches that might be taken
to social security reform, within a pay-as-you-go framework; it is clear
that the four countries examined in this paper have followed different
courses. In Germany, the basis for pension increases has been switched
from gross to net earnings; in Japan, replacement rates are to be held
constant or reduced, and it looks as though social security tax rates
will be deliberately allowed to increase markedly, at least at present;
in the United Kingdom, replacement rates will rise less than initially
envisaged; and in the United States future increases in social security
tax rates are to be limited by an increase in the retirement age.

Table 10 attempts to capture the financial impact of the reforms
described above. The estimates shown relate, for the most part, to the
principal features of reform packages as they are best reflected in the
projection model described earlier. Thus, in the case of Germany, the
2025 social security tax rate--with recent reforms--of 23.1 percent
allows for pension increases related to changes in earnings net of
social security taxes. If all direct taxes on income are taken into
account, the corresponding estimate will be 22.4 percent. 2/ In Japan
the replacement rate has been frozen at its 1985 level. For the United
Kingdom, the full impact of the 1985 reforms on social security
expenditure is reflected in the reported estimate, and that this
estimate, not surprisingly, coincides with the official estimate
adjusted to the same basis. It should be recalled that the reported
estimate assumes pension increases are linked to average earnings; if
pensions are increased in line with prices, the 2025 social security tax
rate is close to that prevailing in 1980. In the United States, the
reported tax rate takes into account a two-year increase in pension age
(up to 2025 rather than 2027). Official projections indicate that the
pay-as-you-go rate for OASI in 2025 will be about 12.5 percent rather
than the 15.1 percent reported in Table 10. 3/ This difference will
reflect a number of factors, including the following: the assumed link
between pension increases and average earnings as opposed to cost-of-
living increases; the impact of the 1983 amendments other than the
phased increase in pension age; and differences in modeling (and in
particular the fuller analysis of behavioral responses to the social
security amendments in the official projections).

1/ These reforms are described in Social Security Amendments of 1983
(P.L. 98-21, April 1983).
2/ If account is taken of the impact of demographic change on other
social programs, the reduction in future tax rates is larger (see
Heller, Hemming and Kohnert (1986), p. 35).
3/ As reported in 1985 Annual Report of the Board of Trustees of the
Federal Old-Age and Survivors Insurance and Disability Trust Funds,
Social Security Administration (March 1985).

Table 10. Social Security Tax Rates, 1980 and 2025
Assuming 1980 Status Quo and With Recent Reforms

(In percent)

	1980	2025	
		1980 Status Quo	With Recent Reforms
Germany, Federal Republic of	14.6	25.7	23.1
Japan	6.4	19.5	13.6
United Kingdom	10.5	17.2	14.4
United States	9.4	16.7	15.1

Source: Authors' estimates.

For the present, the current arrangements in the United States look stable, as do those in the United Kingdom that reflect the 1985 reforms. The arrangements in Japan are also probably sustainable, although with its relatively low pension age, there is scope to limit future increases in tax rates by increasing pension age, which is under consideration. The German situation is the most intriguing. Even with pensions linked to net rather than gross earnings, the social security tax rate (or at least that part which pays for pensions) is set to increase to well over 20 percent by 2025. This may well combine with other social security taxes and the income tax to produce a personal tax burden that is judged unsustainable. 1/ If this is soon recognized, then recent developments in the other three countries are certainly instructive, since they acknowledge what is widely regarded as a crucial requirement of pensions reform: the need to announce future changes well in advance.

Major pension reforms cannot be introduced in haste. Many older workers and pensioners make irreversible labor market and savings decisions on the basis of expectations set up by prevailing social security arrangements. To violate these expectations may undermine the contractual basis of social security pension programs and diminish the widespread support they have attracted in the past. But these schemes have weaknesses, one clear example of which is the way they are affected by demographic change. Reform in this area, and others, is manifestly desirable. However, change must be gradual to give people time to adjust. Because demographic pressures will not really begin to be felt until after the turn of the century, there is time for the necessary reforms to be phased in.

XI. Summary and Conclusions

Expenditure on social security pensions is expected to grow rapidly between now and the end of the first quarter of the twenty-first century, principally on account of population aging. Demographic trends imply a substantial increase in the number of retired people as the baby boom generation--born between 1945 and 1960--reaches retirement age. This generation is currently in the workforce, sharing the cost of a relatively modest pension burden. For the next 30 years or so, the net effect of having this enlarged birth cohort moving through the

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1/ Heller, Hemming, and Kohnert (1986) report that payroll tax rates in Germany will have to rise by about 15 percentage points between 1980 and 2025 to pay for projected increases in government social expenditure, and will reach about 43 percent. This is nearly double the corresponding social security tax rate. It should also be noted that in Japan payroll tax rates are projected to increase by over 20 percentage points (with social security tax rates projected to increase by about 7 percentage points). In the United Kingdom payroll tax rates are projected to increase by about 6 percentage points, while in the United States the projected increase is only 3 percentage points.

population age structure will be to contain the growth of social
security tax rates. But thereafter, social security taxes will begin to
escalate, and in a number of countries could reach a level that, it is
widely felt, may be unsupportable.

In this paper, we have not attempted to explore the full range of
equity and efficiency issues associated with demographic change and
social security financing. Although they are important issues, they
would take us into the areas of the distributional characteristics of
alternative programs, the interaction of the social security system with
tax/transfer systems, and the appropriate role of the public and private
sectors in pension provision. Our purpose has been to examine the
effect that some modifications to existing social security programs
would have on future social security tax rates.

We have focused on four countries whose policy developments are of
particular interest. Our analysis of each is for the most part based
upon a single, probably optimistic, demographic projection. Although,
by historical standards, populations will not age particularly quickly
between 1980 and 2025, the share of the elderly in the population will
rise, on average from 12.5 to 20.5 percent. It is assumed that social
security is financed on a pay-as-you-go basis, with pensions initially
fixed relative to average gross earnings. Demographic developments then
govern the projections. Under such an assumption, social security tax
rates will increase significantly in each country, but more so in
Germany and Japan than in the United Kingdom and the United States.

A feature of pay-as-you-go financing, as reflected in these
projections, is that the burden of adjustment to adverse demographic
developments falls on the working population, whose tax rates adjust to
pay for the benefits the pension programs define. It is this feature
which has led some observers to conclude that the implicit pension
contract that exists between successive generations contains the seeds
of its own destruction. One generation of workers will ultimately walk
away from its obligation to provide the preceding generation with
pensions. How can such an eventuality be avoided? This paper explores
some possible solutions. One involves letting pensions automatically
adjust as the population structure changes, in a way that shares the
adjustment costs equally between the working and retired populations.
Fixing pensions relative to net earnings achieves this; however, the
impact of such a switch on future tax rates is limited. Another
possibility is to adjust retirement age, and in each of the four
countries a two-year or, more significantly, a five-year increase in
pension age has a marked impact on tax rates. Within the framework
developed in this paper, if expenditure growth is not controlled in one
of these ways, then the replacement rate has to be reduced directly.
The alternative is to let tax rates rise.

Having presented the basic model and results, we should emphasize
that the exercise we have described is wholly mechanical. It does not
point to the need for expenditure control, nor does it provide a guide

to appropriate policy responses, although it can indicate how effective
certain policies might prove. Presenting policy choices very starkly--
as the model does--and then trying to summarize actual policy responses
so that they can be analyzed in terms of the model plainly does not do
full justice to the reforms undertaken in the countries concerned.
However, even though the model is not all embracing, it still embodies
the trade-offs facing the policymakers charged with controlling the
growth of social security expenditure, and therefore provides a guide to
the implications of choosing between broad alternative strategies. In
this context, two concluding comments should be made.

By linking pensions to earnings and equating earnings and
productivity increases, the possibility that economic growth will
provide the means to support the retired has been ruled out. To the
extent that pensions are not indexed to earnings but are instead
designed to preserve pensioners real income levels, economic growth can
provide the means to support current pension arrangements. However,
even this possibility does not make reform any less urgent; indeed, it
compounds the problems. Our concern in this paper has been the costs
(or risks) associated with demographic change, and because existing
programs do not have any built-in capability to adjust in response to
these costs (and risks), reform is needed. As we emphasized earlier,
whatever adjustment is planned, preparations have to be made well in
advance so that if major structural changes are involved, people are
given the time to make appropriate behavioral adjustments. Taking
account of the costs (and risks) associated with future economic
developments reinforces the need for advance preparation.

A final comment should be offered on the pay-as-you-go financing
mechanism itself. We again emphasize that the choice between pay-as-
you-go financing and funding depends on their repective impact on the
real economy, as well as on aspects of monetary and fiscal management.
A switch to funding may affect the ability of the economy to support a
particular level of pension expenditure. However, given the benefit
structure, it cannot affect the required level of expenditure and, as a
result, the resources transferred to the elderly. But, this does not
preclude the possibility that introducing an element of funding--either
because it will contribute to capital accumulation or, more
realistically, because it will endow a pay-as-you-go scheme with greater
intergenerational fairness--will help accommodate demographic and
economic developments in a way that secures the future of existing
social security programs.

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