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Ageing Populations, Pension Systems and Government Budgets: Simulations for 20 OECD Countries

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AGEING POPULATIONS, PENSION SYSTEMS AND GOVERNMENT BUDGETS : SIMULATIONS FOR 20 OECD COUNTRIES

by
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AGEING POPULATIONS, PENSION SYSTEMS AND GOVERNMENT BUDGETS: SIMULATIONS FOR 20 OECD COUNTRIES

This paper presents simulations of the impact of age-related public expenditures on overall government budget positions and on national savings for 20 countries. Using demographic projections prepared by the World Bank, models have been constructed for the evolution of public pension expenditures and contributions, on the assumption that present policies continue. Sensitivity analysis and some illustrative scenarios of possible reform options are also presented. Scenarios for the evolution of public health-care expenditures are also presented with sensitivity analysis of the assumptions linking age and health-care costs and the evolution of treatment costs. These scenarios for pensions and health care are set within the wider framework of general government balances to capture the effects of public debt accumulation and debt servicing costs.

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Ce document présente des simulations de l'impact des dépenses publiques affectées aux personnes en âge de retraite par rapport à l'ensemble des positions budgétaires et l'épargne nationale de 20 pays. A l'aide des projections démographiques établies par la Banque Mondiale, des modèles ont été construits, sur la base de la continuité des politiques actuelles, pour évaluer l'évolution des cotisations et des dépenses publiques relatives aux systèmes de retraite. Une analyse de sensibilité fondée sur d'éventuelles possibilités de réformes des systèmes de retraite est également présentée dans ce document. Des scénarios sur l'évolution des dépenses publiques de santé ont aussi été examinés ; différentes hypothèses sur les liens entre la structure d'âge et les coûts de santé ont été utilisées afin de tester la sensibilité des résultats. L'intégration de ces scénarios dans les comptes consolidés des administrations publiques permet de saisir les effets de l'accumulation de la dette publique et du service de la dette.

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AGEING POPULATIONS, PENSION SYSTEMS AND GOVERNMENT BUDGETS: SIMULATIONS FOR 20 OECD COUNTRIES

Deborah Roseveare, Willi Leibfritz, Douglas Fore and Eckhard Wurzel[1]

I. Introduction

1. Most OECD countries are facing major changes in the age structure of their population, with the elderly becoming a significantly larger proportion. At the same time, the working-age population is projected to shrink in many OECD countries and grow only very slowly in others. These demographic trends are likely to place considerable pressure on existing public pension and health-care systems and this could have a major impact on government fiscal positions.

2. To examine more closely the possible impact of demographics, scenarios have been constructed for 20 OECD countries[2]. These scenarios assume that current government expenditure and revenue policies continue. The impact of ageing on public pension systems is examined in Chapter II, while the impact on public health-care expenditures is addressed in Chapter III. The implications of ageing on the overall budget positions, taking into account debt servicing costs, are examined in Chapter IV and the impact of ageing on national saving is explored in Chapter V. Such scenarios are obviously highly speculative and rely on some fairly heroic assumptions; the main point of these calculations is to provide some idea of the scale and magnitude of future problems if no policy action is taken.

3. This quantitative analysis suggests that -- if no further measures were taken -- ageing would have a major impact on government budgets and on national savings in most of the countries considered. But the consequences differ depending on: the state of budget positions in the immediate future; the nature of demographic changes; and the exposure of government budgets to the effects of ageing, in particular through public pension systems and public health spending.

4. Amongst the major seven countries, only the United States and Canada seem to be well-placed to meet the pressures of ageing, both because pensions expenditure rise only modestly and because their underlying budget positions are relatively sound. However, public health expenditures are projected to rise particularly strongly in the United States. Japan, Germany, France and Italy all face strong pressures from pension expenditures and generally have underlying budget positions that would add to public debt, even if demographic pressures were absent. The United Kingdom faces no significant pressure from ageing, but public debt would nevertheless rise because of underlying budget weakness. Austria, Finland, the Netherlands, Portugal, Spain, and Sweden all experience a rapid increase in public debt, but Australia,

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2. The work updates and extends the analysis presented in Leibfritz *et al*. (1995).

Belgium, Denmark, Iceland, Ireland and Norway experience only a mild increase or, in some cases, a decrease in public debt, between now and 2030.

II. Public pensions

5. Virtually all OECD countries have multiple public pension schemes, either with different schemes covering different segments of the working population, or different schemes funding different components of the overall pension received (usually where benefits combine flat-rate and earnings-related components) (see the Annex for further description of public pension schemes in OECD countries). Countries typically also provide a flat-rate pension to those elderly who do not qualify for a pension on the basis of their earnings and contributions history and these benefits are usually financed from general taxation receipts. Public servants often have separate pensions schemes that are funded largely from general taxation, although some contributions may be levied on employees. Payroll taxes are generally levied as "contributions" and the pension benefit entitlements are usually based on a formula incorporating previous earnings and the number of years of contributions made.

6. Simulations illustrating the possible evolution of public pension schemes until 2070 have been run for 20 OECD countries. Despite efforts to capture as fully as possible the institutional arrangements in each country, simplifying assumptions have been necessary, and the scenarios should be viewed as only broadly indicative. All scenarios assume that:

- All economies have returned to their medium-term growth path and there is no cyclical unemployment.

- Medium-term economic growth is determined by the projected growth of the working-age population and an assumed labour productivity growth rate of 1½ per cent per year.

- Participation rates remain constant[3]. In scenarios where the age of entitlement to benefits rise, people who formerly would have been eligible for pensions are assumed to have the average participation rate across all workers of the same sex.

7. A baseline scenario was developed for each country. Data from national sources have been used to model contribution and benefit rates, and differences in retirement ages and eligibility criteria have been taken into account. As far as possible, all legislated reforms (e.g. increases in retirement ages) have also been incorporated. The population projections used for each country are shown in Figure 1 and were taken from the World Bank (Bos *et al.*, 1994). Further description of the methodology underpinning each simulation model is presented in the Annex.

8. In most countries, pension entitlements are generally more or less income-related, but once workers have retired, their pensions are adjusted according to a price index. However, in a few countries, pensions are adjusted according to the growth of nominal wages, either gross (Denmark, Iceland) or net of social charges or taxes (Japan, Germany, Austria) or according to a formula incorporating elements of price and wage indexation (Belgium, Finland, the Netherlands). The simulation models generally reflect the indexation system followed by a particular country, but some slight variation from official practice may remain.

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3. Participation rates depend on social as well as economic factors, making future trends difficult to predict. Sensitivity analysis indicates that the effects of increasing participation rates would be small.

9. The projected pension flows -- contributions and pension payments -- are shown in Figure 2. Three key features emerge. First, there is a marked difference in the magnitude of pension payments. In the United States, the United Kingdom, Canada, Australia, Iceland and Ireland, pension expenditure peaks at less than 10 per cent of GDP, whereas pension expenditure is much higher in most other countries, with Germany, Italy, Austria, Belgium, Finland, Portugal, Spain and Sweden all peaking at more than 15 per cent of GDP. These differences reflect both the relative generosity of pensions and differences in elderly dependency ratios. Second, in most countries, pension payments continue to rise until the baby-boom generation has passed (around 2030-2050) and then stay high in the second half of the period covered by the scenario. In contrast, in Japan, Germany, Italy, Canada, the Netherlands and Spain, expenditures peak and then fall after the baby-boom generation passes, as a result of falling elderly dependency ratios. Third, for those countries with contributory pension systems, the gap between contributions and pension payments is much larger in Japan, Germany, Austria, Belgium, Norway and Sweden than in the other countries.

10. The gap between the flows of contributions and pension payments can also be expressed in net present value terms. The main advantage of summarising net pension flows in net present value form is that it allows for easier comparison between different simulations. But the same pension flows can produce quite different net present values depending on the discount rate used. The pension flows, converted to net present values using discount rates of 3, 5 and 7 per cent, are shown in Table 1. The alternate productivity growth assumptions used to estimate pension flows (1, 1.5 and 2 per cent per year) have much less impact on the results than the discount rates used. Although a 1 percentage point difference in discount rates and in productivity growth rates would yield similar changes in net present values, the plausible range of productivity growth rates is much narrower than the plausible range of discount rates.

11. Four alternative scenarios have been constructed, purely for illustrative purposes, and are designed to indicate a way of adapting the baseline scenario to reflect some of the issues that are being discussed in some Member countries. The relative costs of different scenarios depend crucially on the parameters chosen in each alternative scenario (such as 70 years for retirement ages, or capping expenditure from 2015 onwards). The parameters used may, in some countries, appear as extreme if viewed in light of the actual reform proposals. They are chosen simply to illustrate the scale of pension reform that would be needed to get significant fiscal results.

12. The *later retirement scenario* gradually raises the age of entitlement to benefits to 70 years of age and assumes every year before that age is spent working and paying contributions. Under this scenario, upward pressure on pensions expenditures as a result of demographic pressures can be largely offset in most countries.

13. The *cost-containment scenario* limits total pension expenditure growth to the rate of growth of GDP from 2015 onwards, and budgetary pressures are reduced dramatically. It would correspond to practical reforms that made across-the-board cuts in benefit levels and indexation formulae. In many countries this would result in fiscal effects of about the same order as that in the later retirement scenario. However, under this scenario, the value of the public pension received by each person (relative to average earnings) also would drop significantly - from just over 40 per cent of average wages in 2015 to around 30 per cent by 2030, on average in the major seven countries.

14. A *targeting scenario* assumes that from 2010 onwards, replacement rates (benefits relative to wages) are held constant but the proportion of the elderly population that would get a pension gradually falls to 30 per cent. In other words, this scenario would correspond to proposals that would limit public pensions to those with lower incomes, and have middle and higher income groups relying on the private

sector. This would result in a large reduction in public expenditures. This option differs from the cost-containment scenario under which everyone would get a pension, but a very small one.

15. The *wage-indexation scenario* illustrates reforms that move in the opposite fiscal direction and that would improve pension benefits. It assumes that all pensions are wage-indexed. Under existing public pension rules in almost all OECD countries, benefits are adjusted only for price increases during retirement which implies that the relative living standards of pensioners decline as they grow older. Under the alternative of wage-indexing, the cost pressures would be exacerbated, by around 2 to 3 percentage points of GDP on average.

16. The baseline and alternative scenarios are summarised in net present value form in Table 2 and as annual contributions and expenditure flows in Table 3. The differences from the baseline scenario are shown in Figure 3.

III. Public expenditures on health

17. The pattern of health-care costs at different stages in the average life-cycle has been established in a number of studies: costs are relatively high in the first year of life, but they fall to low levels throughout childhood and adolescence. There is a small rise in early adulthood, especially for young men, reflecting injuries in particular, and an increase for women during their child-bearing years. Costs rise mildly but progressively after the mid-forties and then very steeply in the late seventies. This life-cycle implies that as the numbers of elderly increase, total health care costs are also likely to rise.

18. The effect of increased life expectancy on health costs is more difficult to establish because it depends, in part, on the physical dimensions of the ageing process. It has been argued that the major increase in health costs in later life is actually determined by the lifetime remaining before death occurs. On this basis, increased life expectancy would not increase health costs per person significantly. But the alternative case is also made that as life expectancy rises, people experience more episodes of major medical intervention. On this basis, an increase in life expectancy would lead to an increase in costs per person. The physical aspects of ageing (generally referred to in the scientific debate as the "compression of morbidity" thesis) and their impact on health-care costs remain a matter of on-going debate elsewhere and are not taken further in this paper.

19. However, to illustrate the range of uncertainty surrounding the projection of public health-care expenditures, six alternative scenarios are presented in Table 4. These scenarios are in two groups. The first group of scenarios are calculated by multiplying per capita public expenditure on health by the total number of elderly people. This assumes that as people grow older they consume more health care. These scenarios capture two demographic effects, the increase in the number of people becoming elderly and their increased life expectancy. The second group of scenarios are calculated by multiplying per capita expenditure on public health care by the number of deaths among the elderly population. This assumes that consumption of health care is concentrated in the period immediately before death and that as life expectancy rises, an increased portion of life is lived in good health. For most countries, the first group of scenarios generates higher total health-care costs, because of the rapid increase in numbers of elderly. Japan, however, shows a different pattern, because its demographic trends mean that it experiences a high number of deaths as the elderly population peaks around 2020. For both groups of scenarios, three alternative assumptions about the growth in expenditure on health relative to GDP were applied. In scenarios where growth in expenditure on health care treatment is assumed to be slower than GDP, overall public expenditure on health care would also be lower, while the reverse holds for the scenarios where growth in treatment costs is faster than GDP.

IV. Fiscal balances and public debt

20. Increasing pension and health expenditures resulting from ageing populations need to be assessed within a broader fiscal framework. Using the short and medium-term scenarios published in the *OECD Economic Outlook 59* as a base, it is possible to construct scenarios that separate out these demographically sensitive expenditures and explore the fiscal consequences beyond 2000, taking into account the initial fiscal positions and subsequent debt dynamics. The evolution of fiscal positions in response to ageing populations depends on the starting point for fiscal positions before the pressure from ageing populations begins to mount. Many OECD countries are currently some way from their potential output growth path. In order to eliminate any cyclical effects, it is assumed that output gaps have closed by the year 2000. After 2000, GDP growth is determined by the projections of the working-age population (with participation rates held constant) and an assumed productivity growth rate of 1.5 per cent per year.

21. The primary balances that result from these simulations are shown in Figure 4. Revenues and expenditures, other than pensions and health care are held constant as a per cent of GDP. Primary balances are projected to improve in all OECD countries between 1995 and 2000, but beyond 2000, pensions and health expenditure pressures lead to sometimes rapid deterioration in primary balances[4]. The relative contributions of pensions and health expenditures are illustrated in Figure 5.

22. Overall fiscal positions are determined not only by the primary balance but also by the cost of servicing debt. Where growth rates are lower than interest rates (expressed in nominal or real terms) a vicious circle of rising debt as a per cent of GDP will follow, unless the primary balance is sufficiently in surplus to offset increases in debt interest payments. These, in turn, depend on the initial stock of debt.

23. From 2000 onwards, the calculation of net interest payments is based on separating the stock of debt into two separate parts: debt accumulated up until 2000 ("old" debt) and additional debt accumulated from 2001 onwards ("new" debt). For the old debt, the net interest payments are derived using the implicit interest rate on the old debt (net interest payments divided by net debt)[5]. For new debt, long-term market interest rates are assumed to apply[6]. The development of interest payments and the accumulation of net debt as a per cent of GDP are governed by the differential between interest rates paid on government debt and the growth rate (see OECD, 1995). Two alternative debt dynamics scenarios have been prepared. In the first scenario, real interest rates are held constant so that any change in the growth rate is reflected in a change in the differential. In the second scenario, the interest rate/growth differential is held constant, so that interest rates move with changes in growth rates.

24. The combined effects on public finances of the factors listed above are presented in Table 5. The impact of ageing populations on budget positions and the related debt dynamics, taking into account existing debt in 2000, are quite different across countries. An alternative perspective -- the increase in tax/GDP ratios required to keep net debt constant -- is shown in Table 6. To see more clearly the effect of

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4. In constructing these overall fiscal scenarios, the baseline pensions scenario and the health costs scenario with people consuming more care as they age and with treatment costs moving in line with productivity growth have been used.

5. Because this stock of debt is fixed in national currency terms, it will gradually shrink relative to GDP from 2000 onwards.

6. Long-term nominal market interest rates were derived by calculating an average projected real interest rate for the countries analysed here and then using each country's projected individual inflation rate (in 1997) to calculate the nominal interest rate.

ageing on budgets, the costs of servicing the existing stock of debt in 2000 can be eliminated. The "pure ageing effect" on debt accumulation is shown in Table 7. Countries with relatively good fiscal positions are able to offset some of the effects of ageing populations, while for others, the pure ageing effect is exacerbated by a poor overall fiscal position which leads to an even larger accumulation of net debt.

25. A better starting point -- a lower net debt/GDP ratio and a higher primary surplus in 2000 -- would generate significantly more favourable debt dynamics. A sensitivity analysis of the effects of starting with primary surpluses 1 percentage point of GDP higher in 2000 is shown in Figure 6.

V. Impact of ageing on national saving

26. National saving consists of government saving and private saving. Both are influenced by ageing. The increased cost pressures on government that ageing creates were described above. Ageing, therefore, is a force toward government dissaving, one that will have to be offset by other means. It may also have adverse effects on private saving.

27. Economists often think about private saving using a life-cycle framework. People are assumed to save during their working lives when household income is high and run down their savings during retirement. Savings should be low when workers are young and have children to support, should rise once the children have left home and, still later in the life-cycle, become negative when people retire[7].

28. In reality, however, there is only mixed evidence in support of this traditional life-cycle model of private saving. The model predicts that people will accumulate sufficient assets to avoid a drop in standards of living on retirement, yet this may not be the case. The model also implies that people will spend more than they earn once they reach retirement. Again, this is not always clear. There is some evidence that retired people continue to save, but at lower rates, although measured saving rates of old people may overstate their "true savings" as they do not take into account directly or indirectly (via bequests) paid services delivered by family members.

29. As another illustration, the life-cycle model predicts savings will grow if the number of people of working age is growing relative to the number of children and retirees. Savings should also grow in anticipation of longer periods of time spent in retirement. Yet the opposite has happened. In recent decades, the baby-boom generation has entered the labour force and there has been a reduction in fertility.

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7. This apparently simple model assumes some sophisticated decision-making. First, people do not know how long they will live after retirement and therefore how much savings they will need. Second, the actual calculation of an optimal smoothing of life-cycle consumption is very difficult. Third, savings require a degree of self-control and capacity to "see far into the future" that may be unrealistic. Pensions help overcome these problems. They have the effect of reducing uncertainty about the length of retirement and removing the need to make difficult decisions about getting the best possible returns on savings. They provide a "savings" discipline. The precise role will depend on the type of pension. For example, decisions on the age at which people retire (or how much they save in preparation for retirement in addition to those pensions) are influenced, to some extent, by whether the pension is advanced funded or pay-as-you-go, or by the kind of actuarial adjustment made in cases of early retirement. There are different views about the effects of pay-as-you-go schemes on private saving. While some (notably by Feldstein) found a significant negative effect, others found both positive effects (as people retire earlier and therefore save more during their working life) and negative effects (as lifetime consumption increases as many people receive more in pension income than they have contributed) which are broadly offsetting. See among others Feldstein (1974 and 1994), Munnell (1987), Modigliani *et al.* (1983), Sturm (1983), Dean *et al.* (1990).

The result has been an increase in the number of people of working age when compared to children and retirees. As well, the average length of retirement has increased yet private saving has tended to fall in most countries. There is some evidence, however, that the entry of the baby-boom generation into the labour force did in fact have positive effects on private saving but that other factors which reduced savings were more important, notably the slowdown in income growth. Hence, the future ageing of populations is likely to have adverse effects on private saving, although there is much uncertainty about the size of such effects.

30. For an economy as a whole, it is overall national saving -- the sum of private and government saving -- that matters for future economic growth. On balance, it seems likely that with ageing populations and unchanged policies, both private and government saving will fall in the future. But it is not strictly correct to simply add together separate estimates of private and government saving because this ignores possible interactions between them. Views differ about the strength of these interactions. The strict Ricardian equivalence hypothesis[8] says that if government reduces its saving, households would know that they will have to pay higher taxes in the future and would immediately increase their savings. As a result, overall national saving would not be affected at all. Although most empirical studies reject full Ricardian equivalence, some interaction between government saving and private saving is likely,[9] especially in countries with adverse debt dynamics.

31. The illustrative saving scenarios under current policy settings are presented in Figure 7 and in Table 8 for the OECD area; they suggest that the overall effect of ageing on national savings could be significant with the largest impact stemming from the sharp fall in government saving. Applying the coefficient for the demographic effect on private saving as found by the IMF for industrial countries (see Masson *et al*., 1995) the increase in the dependency ratio of almost 20 percentage points as projected leads to a decline in the average private saving rate of the OECD area by around 6 percentage points between 2000 and 2030. Among the major seven OECD countries the decline is particularly marked in Japan, Germany and Italy where the private saving rate would decline by 7 to 9 percentage points. If instead of the coefficient of the demographic effect on savings of -0.28, the lower coefficient of -0.16 is applied, the private saving rate in the OECD area would fall by more than 3 percentage points and in Japan, Germany and Italy by 4 to 5 percentage points.

32. The long-term scenario for government budgets developed by the Secretariat implies a significant adverse effect on government saving over the coming decades. With the assumption of unchanged policies (as compared with current legislated policies), government saving would fall by about 10 percentage points of GDP in the OECD area and in Japan, by almost 20 percentage points of GDP (with base case assumptions about interest rate/growth differentials) and by 2030, there would be significant government dissaving in most OECD countries.

33. With the above illustrations for government saving and private saving, and assuming a 50 per cent Ricardian equivalence effect, national saving rates could decline between 2000 and 2030 by about 8 percentage points in the OECD as a whole. Most OECD countries could be left with extremely low net national saving and, in a number of countries national net saving would still become negative. However, macroeconomic models which are based on the theoretical framework of life-cycle saving and neo-

8. This is also sometimes referred to as the government debt neutrality hypothesis.

9. Some studies of industrial countries found that a unit government deficit increase (or drop in government saving) is offset by around a quarter or roughly half by an increase in private saving (Bosworth, 1993; Bernheim, 1987; Masson *et al.*, 1995), while others found evidence for full Ricardian equivalence (Seater, 1993).

classical growth theory show a much more significant fall in private saving[10] as well as national saving. These models provide a broader analytical framework, taking into account the inter-relationship between saving, investment and growth and, in some cases, also international repercussions. On the other hand, they assume that economies are initially in equilibrium (with actual saving equal to optimal saving) which is unlikely to be the case.

34. Given these inconclusive results about the size of the demographic effects of ageing, caution is needed in drawing direct conclusions about the future development of national saving. More work is needed to examine these issues further and to consider the effects of ageing on private and national saving in OECD countries in a global framework that includes the projected demographic and economic developments in non-OECD countries.

Effects of lower saving on living standards

35. There are two opposing views on the effect of a demographically-induced fall in national saving on national well-being. One is the conventional view: that lower domestic savings leads to less productive investment, and that long run growth will be lower as a result. The other view argues that less investment will be needed because there are fewer workers to equip. Furthermore, saving and investment are not the only factors that determine long-term living standards. For example, the rate of growth of technical progress is more important; maintaining present rates in the future is likely to outweigh the adverse effects of ageing populations on living standards[11]. This debate cannot be resolved without more research into the long-run determinants of economic growth.

36. Nevertheless, provided higher savings are translated into greater wealth holdings, domestic or foreign, and these maintain their value, greater savings will provide more scope for dealing with the adverse effects of ageing. Policies aimed at higher national saving rates over the next few years are therefore prudent, and reducing government dissaving may be the most direct way of achieving that aim.

10. See, for example, Auerbach et al. (1989), Auerbach *et al.* (1990); Hagemann and Nicoletti (1989); Cutler *et al.* (1990); Yoo (1994).

11. Some argue that ageing slows technical progress as innovation is less profitable in shrinking markets for capital goods and as an ageing society loses "dynamism" (Simon, 1981; Wattenberg, 1987), while others find empirical evidence that innovation increases when labour gets scarce (Habakkuk, 1962; Cutler *et al.*, 1990).

Table 1. **Net present value of public pension schemes**[1]
As a percentage of 1994 GDP

	Productivity growth assumption	Discount rate assumption		
		3 per cent	5 per cent	7 per cent
United States	1.0%	-62	-21	-6
	1.5%	-69	-23	-6
	2.0%	-78	-25	-6
Japan	1.0%	-151	-55	-14
	1.5%	-189	-70	-20
	2.0%	-237	-89	-29
Germany	1.0%	-111	-53	-28
	1.5%	-134	-62	-32
	2.0%	-163	-73	-37
France	1.0%	-185	-99	-62
	1.5%	-198	-102	-62
	2.0%	-212	-105	-62
Italy	1.0%	-135	-64	-35
	1.5%	-131	-60	-31
	2.0%	-124	-54	-27
United Kingdom	1.0%	-58	-33	-21
	1.5%	-36	-24	-16
	2.0%	-9	-13	-11
Canada	1.0%	-183	-97	-60
	1.5%	-192	-101	-61
	2.0%	-205	-105	-63
Australia	1.0%	-161	-89	-57
	1.5%	-181	-97	-61
	2.0%	-206	-106	-64
Austria	1.0%	-159	-81	-47
	1.5%	-188	-93	-52
	2.0%	-224	-107	-58
Belgium	1.0%	-257	-144	-94
	1.5%	-282	-153	-97
	2.0%	-312	-163	-101
Denmark	1.0%	-363	-212	-143
	1.5%	-416	-235	-153
	2.0%	-482	-261	-165

Table 1 (cont'd)

	Productivity growth assumption	Discount rate assumption		
		3 per cent	5 per cent	7 per cent
Finland	1.0%	-159	-57	-16
	1.5%	-181	-65	-18
	2.0%	-208	-73	-21
Iceland	1.0%	-116	-58	-34
	1.5%	-138	-66	-38
	2.0%	-165	-76	-42
Ireland	1.0%	-46	-25	-16
	1.5%	-28	-18	-13
	2.0%	-6	-9	-9
Netherlands [2]	1.0%	-113	-50	-24
	1.5%	-124	-53	-25
	2.0%	-137	-57	-26
New Zealand	1.0%	-345	-191	-123
	1.5%	-401	-213	-133
	2.0%	-471	-239	-144
Norway	1.0%	-227	-114	-66
	1.5%	-254	-124	-70
	2.0%	-287	-136	-74
Portugal	1.0%	-207	-100	-55
	1.5%	-234	-109	-59
	2.0%	-268	-121	-63
Spain	1.0%	-195	-100	-60
	1.5%	-220	-109	-63
	2.0%	-249	-119	-66
Sweden	1.0%	-252	-143	-93
	1.5%	-273	-150	-96
	2.0%	-298	-159	-99

1. Net present value of employee and employer contributions less pensions paid until 2070, plus existing assets.
2. These scenarios do not take account of recent changes to the widows' and orphans' schemes which the Netherlands authorities estimate will reduce expenditure by 4 per cent.

Table 2. **Net present value of pension contributions, expenditure and balances**[1]
As a percentage of 1994 GDP

		Baseline scenario	Cost containment scenario[2]	Wage indexation scenario[3]	Later retirement scenario[4]	Targeting scenario[5]
United States	Contributions	133.9	133.9	133.9	138.2	133.9
	Expenditure	162.5	142.1	177.4	141.7	108.0
	Balance[6]	-23.0	-2.6	-37.9	2.2	31.5
Japan	Contributions	192.2	192.2	192.2	200.7	192.2
	Expenditure	299.4	269.0	299.4	263.1	201.8
	Balance[6]	-70.0	-39.6	-70.0	-25.3	27.5
Germany	Contributions	286.3	286.3	286.3	301.1	286.3
	Expenditure	347.9	313.2	347.9	308.7	274.6
	Balance	-61.6	-26.9	-61.6	-7.6	11.7
France	Contributions	215.7	215.7	215.7	237.9	215.7
	Expenditure	317.8	289.3	351.8	253.0	228.2
	Balance	-102.1	-73.6	-136.1	-15.0	-12.5
Italy	Contributions	341.5	341.5	341.5	377.2	341.5
	Expenditure	401.3	347.7	451.9	347.4	315.4
	Balance	-59.7	-6.2	-110.3	29.8	26.1
United Kingdom	Contributions	118.2	118.2	118.2	124.1	118.2
	Expenditure	142.0	147.1	180.8	121.5	109.5
	Balance	-23.8	-28.9	-62.6	2.6	8.7
Canada	Contributions	97.4	97.4	97.4	103.4	97.4
	Expenditure	203.8	174.2	219.2	166.2	143.2
	Balance[6]	-100.7	-71.1	-116.1	-57.1	-40.1
Australia	Contributions	n.a.	n.a.	n.a.	n.a.	n.a.
	Expenditure	96.7	78.3	105.3	79.4	69.9
	Balance	-96.7	-78.3	-105.3	-79.4	-69.9
Austria	Contributions	205.4	205.4	205.4	218.5	205.4
	Expenditure	298.0	267.9	298.0	246.3	222.7
	Balance	-92.5	-62.4	-92.5	-27.8	-17.3
Belgium	Contributions	147.2	147.2	147.2	155.0	147.2
	Expenditure	299.8	259.9	323.6	251.5	212.6
	Balance	-152.6	-112.6	-176.4	-96.5	-65.3
Denmark	Contributions	n.a.	n.a.	n.a.	n.a.	n.a.
	Expenditure	234.5	210.6	234.5	179.4	149.8
	Balance	-234.5	-210.6	-234.5	-179.4	-149.8
Finland	Contributions	294.4	294.4	294.4	310.4	294.4
	Expenditure	384.2	340.9	408.4	303.9	266.9
	Balance[6]	-64.8	-21.6	-89.0	31.5	52.5

Table 2 (cont'd)

		Baseline scenario	Cost containment scenario[2]	Wage indexation scenario[3]	Later retirement scenario[4]	Targeting scenario[5]
Iceland	Contributions	40.1	40.1	40.1	41.3	40.1
	Expenditure	106.3	82.6	106.3	91.3	88.3
	Balance	-66.2	-42.5	-66.2	-50.0	-48.2
Ireland	Contributions	89.2	89.2	89.2	93.4	89.2
	Expenditure	107.0	105.7	145.0	89.5	85.5
	Balance	-17.8	-16.5	-55.8	4.0	3.7
Netherlands [7]	Contributions	160.1	160.1	160.1	168.8	160.1
	Expenditure	213.5	180.5	234.3	178.6	145.1
	Balance	-53.3	-20.4	-74.2	-9.8	15.1
New Zealand	Contributions	n.a.	n.a.	n.a.	n.a.	n.a.
	Expenditure	212.8	177.6	212.8	171.4	136.1
	Balance	-212.8	-177.6	-212.8	-171.4	-136.1
Norway	Contributions	105.4	105.4	105.4	108.7	105.4
	Expenditure	229.5	189.4	251.4	200.7	146.0
	Balance	-124.1	-84.1	-146.0	-92.0	-40.7
Portugal	Contributions	167.7	167.7	167.7	175.9	167.7
	Expenditure	277.0	228.0	297.9	236.3	169.4
	Balance	-109.2	-60.2	-130.2	-60.4	-1.7
Spain	Contributions	214.7	214.7	214.7	226.2	214.7
	Expenditure	323.3	283.1	340.2	298.4	264.8
	Balance	-108.6	-68.3	-125.4	-72.2	-50.1
Sweden	Contributions	219.4	219.4	219.4	231.0	219.4
	Expenditure	369.6	354.3	391.4	257.8	322.6
	Balance[6]	-132.3	-117.0	-154.1	-8.8	-85.2

1. The net present value refers to today's value of future receipts and payments. The calculation assumes a discount rate of 5 per cent per year over the period 1994-2070.
2. Pension expenditures are frozen as a percentage of GDP from 2015.
3. Pension expenditures grow with wages from 2005.
4. Starting after 2005, retirement age is raised by 0.5 each year to reach 70 years of age.
5. Eligibility rates (ratio of pensioners to the retirement age population) are gradually decreased to 30 per cent over the period 2015-2030, while the replacement rate (average pensions to average wages) is frozen at its 2010 level.
6. Including pre-existing assets which amount to 5.8 per cent of GDP for the United States, 37.1 per cent of GDP for Japan, 5.7 per cent of GDP for Canada, 25 per cent of GDP for Finland and 18 per cent of GDP for Sweden.
7. These scenarios do not take account of recent changes to the widows' and orphans' schemes which the Netherlands authorities estimate will reduce expenditure by 4 per cent.

Table 3. **Pension expenditures under various scenarios**
As a percentage of GDP in 1994 prices

		1995	2000	2010	2020	2030	2040	2050	2060	2070
United States	Baseline	4.1	4.2	4.5	5.2	6.6	7.1	7.0	7.2	7.4
	Cost containment	4.1	4.2	4.5	4.9	4.9	4.9	4.9	4.9	4.9
	Wage indexation	4.1	4.2	5.0	5.8	7.5	8.0	8.0	8.2	8.4
	Later retirement	4.1	4.2	3.6	3.9	5.1	5.7	5.7	5.9	6.1
	Targeting	4.1	4.2	4.5	3.4	2.0	2.1	2.1	2.2	2.3
Japan	Baseline	6.6	7.5	9.6	12.4	13.4	14.9	16.5	15.5	14.4
	Cost containment	6.6	7.5	9.6	11.2	11.2	11.2	11.2	11.2	11.2
	Wage indexation	6.6	7.5	9.6	12.4	13.4	14.9	16.5	15.5	14.4
	Later retirement	6.6	7.5	9.3	9.4	9.3	10.1	11.8	11.0	10.3
	Targeting	6.6	7.5	9.6	7.9	4.0	4.4	4.9	4.6	4.3
Germany	Baseline	11.1	11.5	11.8	12.3	16.5	18.4	17.5	16.5	15.5
	Cost containment	11.1	11.5	11.8	12.0	12.0	12.0	12.0	12.0	12.0
	Wage indexation	11.1	11.5	11.8	12.3	16.5	18.4	17.5	16.5	15.5
	Later retirement	11.1	11.5	10.7	9.0	10.6	12.6	12.8	12.3	11.7
	Targeting	11.1	11.5	11.8	8.8	7.8	8.8	8.3	7.8	7.3
France	Baseline	10.6	9.8	9.7	11.6	13.5	14.3	14.4	14.2	14.0
	Cost containment	10.6	9.8	9.7	10.7	10.7	10.7	10.7	10.7	10.7
	Wage indexation	10.6	9.8	10.8	13.5	15.8	16.8	17.0	16.8	16.5
	Later retirement	10.6	9.8	7.9	6.6	6.5	7.2	7.6	7.6	7.6
	Targeting	10.6	9.8	9.7	7.8	4.3	4.6	4.6	4.6	4.5
Italy	Baseline	13.3	12.6	13.2	15.3	20.3	21.4	20.3	18.7	17.0
	Cost containment	13.3	12.6	13.2	13.0	13.0	13.0	13.0	13.0	13.0
	Wage indexation	13.3	12.6	14.8	18.1	24.6	26.3	25.2	23.0	20.8
	Later retirement	13.3	12.6	12.8	11.7	10.5	8.8	10.2	9.3	8.3
	Targeting	13.3	12.6	13.2	11.5	8.9	9.5	9.2	8.3	7.5
United Kingdom	Baseline	4.5	4.5	5.2	5.1	5.5	5.0	4.1	3.6	3.1
	Cost containment	4.5	4.5	5.2	5.3	5.3	5.3	5.3	5.3	5.3
	Wage indexation	4.5	4.5	5.9	6.2	7.8	8.5	8.3	8.4	8.4
	Later retirement	4.5	4.5	4.3	3.7	3.4	3.3	2.9	2.5	2.2
	Targeting	4.5	4.5	5.2	3.2	1.9	2.0	2.0	2.0	2.0
Canada	Baseline	5.2	5.0	5.3	6.9	9.0	9.1	8.7	8.4	8.1
	Cost containment	5.2	5.0	5.3	6.0	6.0	6.0	6.0	6.0	6.0
	Wage indexation	5.2	5.0	5.2	7.2	10.0	10.8	10.9	11.0	11.1
	Later retirement	5.2	5.0	4.3	4.2	5.7	6.3	6.1	5.9	5.8
	Targeting	5.2	5.0	5.3	4.7	3.4	3.4	3.3	3.1	3.0
Australia	Baseline	2.6	2.3	2.3	2.9	3.8	4.3	4.5	4.6	4.6
	Cost containment	2.6	2.3	2.3	2.5	2.5	2.5	2.5	2.5	2.5
	Wage indexation	2.6	2.3	2.5	3.2	4.2	4.8	5.1	5.2	5.3
	Later retirement	2.6	2.3	1.9	1.8	2.4	2.9	3.2	3.2	3.3
	Targeting	2.6	2.3	2.3	2.1	1.7	1.9	2.0	2.1	2.1
Austria	Baseline	8.8	8.6	10.2	12.1	14.4	15.0	14.9	14.2	13.5
	Cost containment	8.8	8.6	10.2	10.9	10.9	10.9	10.9	10.9	10.9
	Wage indexation	8.8	8.6	10.2	12.1	14.4	15.0	14.9	14.2	13.5
	Later retirement	8.8	8.6	8.5	7.3	8.0	9.9	10.6	10.2	9.7
	Targeting	8.8	8.6	10.2	8.6	6.0	6.2	6.1	5.8	5.5
Belgium	Baseline	10.4	9.7	8.7	10.7	13.9	15.0	15.1	14.7	14.3
	Cost containment	10.4	9.7	8.7	9.5	9.5	9.5	9.5	9.5	9.5
	Wage indexation	10.4	9.7	9.5	11.9	15.6	17.0	17.1	16.7	16.3
	Later retirement	10.4	9.7	7.2	6.7	8.7	10.1	10.6	10.4	10.2
	Targeting	10.4	9.7	8.7	7.0	4.1	4.5	4.5	4.4	4.3

Table 3 (cont'd)

		1995	2000	2010	2020	2030	2040	2050	2060	2070
Denmark	Baseline	6.8	6.4	7.6	9.3	10.9	11.6	11.5	11.6	11.7
	Cost containment	6.8	6.4	7.6	8.5	8.5	8.5	8.5	8.5	8.5
	Wage indexation	6.8	6.4	7.6	9.3	10.9	11.6	11.5	11.6	11.7
	Later retirement	6.8	6.4	4.3	5.6	6.5	7.5	8.0	8.1	8.1
	Targeting	6.8	6.4	7.6	4.8	2.6	2.9	2.9	3.0	3.0
Finland	Baseline	10.1	9.5	10.7	15.2	17.8	18.0	17.7	17.7	17.8
	Cost containment	10.1	9.5	10.7	13.3	13.3	13.3	13.3	13.3	13.3
	Wage indexation	10.1	9.5	11.6	16.3	19.3	19.5	19.1	19.2	19.3
	Later retirement	10.1	9.5	8.1	8.8	11.2	11.8	11.6	11.8	12.0
	Targeting	10.1	9.5	10.7	10.1	6.1	6.2	6.1	6.1	6.1
Iceland	Baseline	2.5	2.4	2.4	3.1	4.2	4.8	5.2	5.4	5.5
	Cost containment	2.5	2.4	2.4	2.7	2.7	2.7	2.7	2.7	2.7
	Wage indexation	2.5	2.4	2.4	3.1	4.2	4.8	5.2	5.4	5.5
	Later retirement	2.5	2.4	1.9	2.3	3.2	3.8	4.1	4.3	4.4
	Targeting	2.5	2.4	2.4	2.6	2.9	3.3	3.6	3.7	3.8
Ireland	Baseline	3.6	2.9	2.6	2.7	2.8	2.9	3.0	2.6	2.2
	Cost containment	3.6	2.9	2.6	2.7	2.7	2.7	2.7	2.7	2.7
	Wage indexation	3.6	2.9	3.0	3.7	4.2	5.2	6.2	6.2	6.3
	Later retirement	3.6	2.9	2.1	1.8	1.8	1.9	2.0	1.8	1.6
	Targeting	3.6	2.9	2.6	2.0	1.1	1.4	1.7	1.7	1.7
Netherlands[1]	Baseline	6.0	5.7	6.1	8.4	11.2	12.1	11.4	11.2	11.0
	Cost containment	6.0	5.7	6.1	7.4	7.4	7.4	7.4	7.4	7.4
	Wage indexation	6.0	5.7	6.8	9.5	12.8	13.9	13.1	12.9	12.6
	Later retirement	6.0	5.7	5.1	5.5	7.2	8.3	8.6	8.4	8.2
	Targeting	6.0	5.7	6.1	5.5	3.4	3.7	3.5	3.4	3.4
New Zealand	Baseline	5.9	4.8	5.2	6.7	8.3	9.4	9.8	10.3	10.7
	Cost containment	5.9	4.8	5.2	6.0	6.0	6.0	6.0	6.0	6.0
	Wage indexation	5.9	4.8	5.2	6.7	8.3	9.4	9.8	10.3	10.7
	Later retirement	5.9	4.8	4.2	4.2	5.3	6.2	6.9	7.2	7.6
	Targeting	5.9	4.8	5.2	4.3	2.4	2.7	2.8	2.9	3.1
Norway	Baseline	5.2	4.9	6.0	8.6	10.9	11.8	11.5	11.1	11.1
	Cost containment	5.2	4.9	6.0	7.3	7.3	7.3	7.3	7.3	7.3
	Wage indexation	5.2	4.9	6.7	9.7	12.2	13.3	12.9	12.5	12.5
	Later retirement	5.2	4.9	4.9	6.6	8.5	9.4	9.5	9.2	9.1
	Targeting	5.2	4.9	6.0	5.4	3.1	3.5	3.5	3.5	3.6
Portugal	Baseline	7.1	6.9	8.1	9.6	13.0	15.2	16.5	15.6	14.8
	Cost containment	7.1	6.9	8.1	8.6	8.6	8.6	8.6	8.6	8.6
	Wage indexation	7.1	6.9	8.8	10.5	14.3	16.9	18.3	17.3	16.4
	Later retirement	7.1	6.9	6.8	6.4	8.5	11.2	12.8	11.8	11.1
	Targeting	7.1	6.9	8.1	5.6	2.3	2.9	3.3	3.2	3.0
Spain	Baseline	10.0	9.8	10.0	11.3	14.1	16.8	19.1	17.6	16.0
	Cost containment	10.0	9.8	10.0	10.6	10.6	10.6	10.6	10.6	10.6
	Wage indexation	10.0	9.8	10.6	12.1	15.2	18.3	21.0	19.2	17.5
	Later retirement	10.0	9.8	9.1	9.1	10.6	12.8	15.2	14.1	13.0
	Targeting	10.0	9.8	10.0	9.1	8.1	9.3	10.3	9.6	8.9
Sweden	Baseline	11.8	11.1	12.4	13.9	15.0	14.9	14.5	14.8	15.1
	Cost containment	11.8	11.1	12.4	13.3	13.3	13.3	13.3	13.3	13.3
	Wage indexation	11.8	11.1	13.2	15.1	16.4	16.3	15.9	16.3	16.6
	Later retirement	11.8	11.1	6.3	6.4	7.1	7.4	7.5	7.7	7.9
	Targeting	11.8	11.1	12.4	10.4	11.4	11.7	11.2	11.6	12.0

1. These scenarios do not take account of recent changes to the widows' and orphans' schemes which the Netherlands authorities estimate will reduce expenditure by 4 per cent.

Table 4. **Projected public health care costs in 2030**[1]
As a per cent of GDP

	Health treatment cost growth rates[2]	Public health care costs in 1995	Projected public health care costs in 2030 assuming costs depend on:	
			Number of elderly	Number of deaths
United States	1% slower		6.1	5.2
	same rate	6.4	8.2	6.9
	1% faster		11.0	9.3
Japan	1% slower		4.7	5.4
	same rate	4.9	6.3	7.2
	1% faster		8.4	9.7
Germany	1% slower		5.6	5.5
	same rate	6.2	7.8	7.4
	1% faster		10.1	10.0
France	1% slower		6.6	6.1
	same rate	7.0	8.9	8.3
	1% faster		11.9	11.1
Italy	1% slower		6.0	5.7
	same rate	6.4	8.1	7.7
	1% faster		10.8	10.4
United Kingdom	1% slower		5.2	4.6
	same rate	6.0	7.0	6.2
	1% faster		9.4	8.3
Canada	1% slower		7.6	6.9
	same rate	7.4	10.3	9.3
	1% faster		13.8	12.5
Australia	1% slower		5.6	4.6
	same rate	5.8	7.6	6.2
	1% faster		10.2	8.3
Austria	1% slower		7.7	5.9
	same rate	7.4	10.3	8.0
	1% faster		13.8	10.7
Belgium	1% slower		7.0	5.8
	same rate	7.4	9.5	7.8
	1% faster		12.7	10.5
Denmark	1% slower		5.2	4.3
	same rate	5.6	7.0	5.8
	1% faster		9.4	7.8

Table 4 (cont'd)

	Health treatment cost growth rates2	Public health care costs in 1995	Projected public health care costs in 2030 assuming costs depend on:	
			Number of elderly	Number of deaths
Finland	1% slower		7.0	5.5
	same rate	6.9	9.4	7.4
	1% faster		12.6	9.9
Iceland d	1% slower		6.8	5.3
	same rate	7.4	9.1	7.1
	1% faster		12.3	9.5
Ireland	1% slower		4.2	3.5
	same rate	5.1	5.6	4.7
	1% faster		7.5	6.4
Netherlands	1% slower		7.3	5.5
	same rate	6.7	9.8	7.4
	1% faster		13.2	9.9
Norway	1% slower		6.9	5.5
	same rate	7.6	9.2	7.4
	1% faster		12.4	9.9
Portugal	1% slower		3.7	3.1
	same rate	4.1	5.0	4.2
	1% faster		6.8	5.6
Spain	1% slower		5.5	4.5
	same rate	5.7	7.4	6.1
	1% faster		10.0	8.1
Sweden	1% slower		5.9	5.0
	same rate	6.2	7.9	6.7
	1% faster		10.6	9.0

1. In projecting these public health cost scenarios, the following methods were used. First, the current population and the population projections were split into those under 65 years and those 65 years and over. For some countries, the over 65 years group was split further into those aged between 65 and 74 years and those 75 years and over. Current per capita public health care costs were calculated for each of these groups using recent data. These per capita health costs, adjusted for alternative growth rates in health treatment costs, were then applied to the population projections. For the scenarios with constant cost profiles, per capita costs were multiplied by the total number of people aged 65 and over. For the scenarios where costs depend on fatality rates, the per capita costs were multiplied by the number of deaths amongst people aged 65 and over.

2. Assuming that per capita health care treatment costs grow by the same rate, 1 per cent slower or 1 per cent faster than real GDP growth.

Table 5. **Fiscal indicators, 1995 to 2030**[1]
As a per cent of nominal GDP

			Interest-growth rate differential constant			Interest rate constant		
		Primary balance[2]	Net interest payments[3]	Financial balance[2]	Net financial liabilities	Net interest payments[3]	Financial balance[2]	Net financial liabilities
United States	1995	0.4	2.3	-2.0	51	2.3	-2.0	51
	2000	0.2	2.1	-2.0	49	2.1	-2.0	49
	2015	-0.6	2.5	-3.1	51	3.0	-3.6	54
	2030	-3.8	4.8	-8.6	95	7.3	-11.1	115
Japan	1995	-3.4	0.5	-3.9	11	0.5	-3.9	11
	2000	-1.5	1.0	-2.5	25	1.0	-2.5	25
	2015	-6.0	4.2	-10.2	102	4.7	-10.7	104
	2030	-8.7	13.4	-22.1	317	16.2	-24.9	339
Germany	1995	-0.6	2.9	-3.5	44	2.9	-3.5	44
	2000	-0.1	3.5	-3.6	53	3.5	-3.6	53
	2015	-0.2	6.0	-6.2	99	6.1	-6.3	99
	2030	-6.6	9.5	-16.1	216	14.5	-21.0	247
France	1995	-1.6	3.4	-5.0	35	3.4	-5.0	35
	2000	1.2	4.0	-2.8	45	4.0	-2.8	45
	2015	-0.1	4.4	-4.5	69	5.2	-5.3	73
	2030	-4.5	8.6	-13.1	165	11.6	-16.1	193
Italy	1995	3.4	10.5	-7.2	109	10.5	-7.2	109
	2000	3.8	8.1	-4.3	109	8.1	-4.3	109
	2015	4.0	10.2	-6.2	123	8.5	-4.5	112
	2030	-5.9	14.6	-20.4	234	17.3	-23.2	241
United Kingdom	1995	-2.8	3.0	-5.7	40	3.0	-5.7	40
	2000	0.5	3.6	-3.1	47	3.6	-3.1	47
	2015	-0.1	5.8	-6.0	79	5.6	-5.7	79
	2030	-1.4	8.4	-9.8	137	10.0	-11.3	144
Canada	1995	1.5	5.6	-4.2	70	5.6	-4.2	70
	2000	4.7	4.6	0.1	60	4.6	0.1	60
	2015	4.6	0.8	3.8	3	0.9	3.7	4
	2030	-1.0	-1.1	0.1	-27	-1.6	0.6	-29
Australia	1995	0.0	2.4	-2.4	28	2.4	-2.4	28
	2000	1.8	2.1	-0.3	27	2.1	-0.3	27
	2015	1.3	0.5	0.8	7	0.6	0.7	8
	2030	-1.4	0.5	-1.9	10	0.8	-2.2	12
Austria	1995	-2.7	3.5	-6.2	50	3.5	-6.2	50
	2000	0.9	4.5	-3.6	59	4.5	-3.6	59
	2015	-2.3	7.8	-10.2	125	7.9	-10.3	126
	2030	-7.7	17.4	-25.1	317	20.3	-28.0	340
Belgium	1995	4.3	8.8	-4.4	128	8.8	-4.4	128
	2000	5.9	8.6	-2.8	119	8.6	-2.8	119
	2015	5.7	5.2	0.5	78	5.8	0.0	81
	2030	-0.5	4.4	-4.9	77	6.2	-6.7	95

Table 5 (cont'd)

			Interest-growth rate differential constant			Interest rate constant		
		Primary balance[2]	Net interest payments[3]	Financial balance[2]	Net financial liabilities	Net interest payments[3]	Financial balance[2]	Net financial liabilities
Denmark	1995	2.0	3.7	-1.8	46	3.7	-1.8	46
	2000	3.8	3.1	0.7	37	3.1	0.7	37
	2015	1.0	1.0	0.0	12	1.1	-0.1	13
	2030	-2.3	2.1	-4.5	34	2.4	-4.7	36
Finland	1995	-4.3	1.3	-5.6	-7	1.3	-5.6	-7
	2000	2.3	0.7	1.5	-5	0.7	1.5	-5
	2015	-2.5	-0.5	-2.0	-12	-0.7	-1.8	-13
	2030	-8.8	5.6	-14.4	98	6.2	-15.0	99
Iceland	1995	-1.1	2.3	-3.4	35	2.3	-3.4	35
	2000	0.5	2.4	-1.8	34	2.4	-1.8	34
	2015	0.0	2.2	-2.2	32	2.3	-2.4	33
	2030	-3.3	4.4	-7.7	69	5.8	-9.1	78
Ireland	1995	1.8	4.2	-2.4	86	4.2	-2.4	86
	2000	0.6	3.4	-2.7	74	3.4	-2.7	74
	2015	0.6	2.8	-2.3	71	3.7	-3.1	76
	2030	0.0	3.7	-3.7	83	5.5	-5.4	102
Netherlands	1995	1.4	4.7	-3.3	43	4.7	-3.3	43
	2000	2.8	4.9	-2.1	45	4.9	-2.1	45
	2015	0.0	5.1	-5.1	67	5.4	-5.4	68
	2030	-6.0	10.2	-16.2	185	13.3	-19.3	206
Norway	1995	3.2	0.2	3.1	-26	0.2	3.1	-26
	2000	3.2	-0.5	3.7	-37	-0.5	3.7	-37
	2015	0.4	-3.8	4.2	-73	-4.2	4.6	-74
	2030	-4.7	-3.3	-1.4	-57	-4.6	-0.2	-69
Portugal[4]	1995	0.6	5.7	-5.1	71	5.7	-5.1	71
	2000	1.5	4.3	-2.8	70	4.3	-2.8	70
	2015	-0.4	4.9	-5.3	83	5.4	-5.8	85
	2030	-5.6	9.8	-15.4	170	12.9	-18.5	192
Spain	1995	-1.1	5.1	-6.2	50	5.1	-6.2	50
	2000	1.5	5.5	-4.0	58	5.5	-4.0	58
	2015	0.5	5.6	-5.2	78	6.5	-6.0	82
	2030	-4.4	9.7	-14.1	159	13.9	-18.3	191
Sweden	1995	-5.1	2.9	-8.1	28	2.9	-8.1	28
	2000	2.9	3.2	-0.3	32	3.2	-0.3	32
	2015	0.2	2.3	-2.2	29	2.4	-2.3	30
	2030	-2.7	5.3	-8.0	78	5.7	-8.4	81

1. 1995 and 2000 data correspond to OECD Secretariat's Medium Term Reference Scenario. For policy and other assumptions underlying these projections, see *OECD Economic Outlook*, June 1996, p. 5.
2. Surplus (+) or deficit (-).
3. The calculation of net interest payments after 2000 is based on separating the stock of debt into two separate parts: debt accumulated up until 2000 ("old" debt) and additional debt accumulated from 2001 onwards ("new" debt). For the old debt, the net interest payments are derived using the implicit interest rate on the old debt (net interest payments divided by net debt). For new debt, long-term market interest rates are assumed to apply. These were derived by calculating an average projected real interest rate analysed here and then using each country's projected individual inflation rate (in 2000) to calculate the nominal interest rate.
4. Gross financial liabilities for Ireland and Portugal.

Table 6. **Increase in tax/GDP ratios required to keep net debt constant**[1]
As a per cent of GDP[2]

		Interest rate constant	Interest rate-growth rate differentials constant
United States	2005	-0.3	-0.3
	2015	1.4	1.1
	2030	5.3	4.6
Japan	2005	3.5	3.5
	2015	6.9	6.7
	2030	9.6	9.5
Germany	2005	2.8	2.8
	2015	2.6	2.5
	2030	9.7	8.8
France	2005	0.8	0.8
	2015	2.9	2.5
	2030	7.1	6.6
Italy	2005	1.8	1.8
	2015	-0.4	0.4
	2030	11.4	10.2
United Kingdom	2005	1.7	1.7
	2015	1.8	2.0
	2030	3.5	3.1
Canada	2005	-3.2	-3.2
	2015	-2.4	-2.8
	2030	3.6	2.7
Australia	2005	-1.3	-1.3
	2015	-0.5	-0.7
	2030	2.4	2.0
Austria	2005	3.8	3.8
	2015	7.3	7.2
	2030	15.4	15.0
Belgium	2005	-2.0	-2.0
	2015	-0.9	-1.5
	2030	5.9	4.7

Table 6 (cont'd)

		Interest rates constant	Interest rate-growth rate differentials constant
Denmark	2005	-1.9	-1.9
	2015	0.5	0.4
	2030	3.8	3.7
Finland	2005	-1.4	-1.4
	2015	2.7	2.7
	2030	8.8	8.9
Iceland	2005	-0.3	-0.3
	2015	0.7	0.6
	2030	4.3	3.9
Ireland	2005	-0.3	-0.3
	2015	1.0	0.3
	2030	1.8	1.1
Netherlands	2005	0.8	0.8
	2015	3.1	2.9
	2030	9.0	8.5
Norway	2005	-2.7	-2.7
	2015	-0.7	-0.5
	2030	3.8	4.1
Portugal	2005	0.5	0.5
	2015	2.2	2.0
	2030	8.2	7.4
Spain	2005	0.9	0.9
	2015	2.3	1.9
	2030	7.4	6.6
Sweden	2005	-0.6	-0.6
	2015	1.4	1.3
	2030	4.0	3.9

1. To keep debt levels constant from 2000 onwards, assuming fiscal consolidation takes place between now and 2000, as indicated in *Economics Department Working Papers* No. 156, for the major seven countries.
2. Higher receipts (+), lower receipts (-).

Table 7. **Pure ageing effects on net financial liabilities, 2000-2030**[1]
As a per cent of GDP

	Interest rate constant	Interest-growth rate differentials constant
United States	44	41
Japan	190	180
Germany	45	42
France	62	60
Italy	109	103
United Kingdom	27	26
Canada	39	38
Australia	37	34
Austria	171	162
Belgium	42	41
Denmark	124	120
Finland	213	199
Iceland	41	38
Ireland	2	2
Netherlands	142	132
Norway	135	127
Portugal	110	102
Spain	66	61
Sweden	117	114

1. The pure ageing effect is estimated by measuring the debt accumulation resulting only from the change in primary balances from 2000 to 2030. Apart from demographic effects, primary balances are held constant at their levels in 2001.

Table 8. **Demographic impact on future national savings**

Illustrative scenarios

Net savings in per cent of GDP

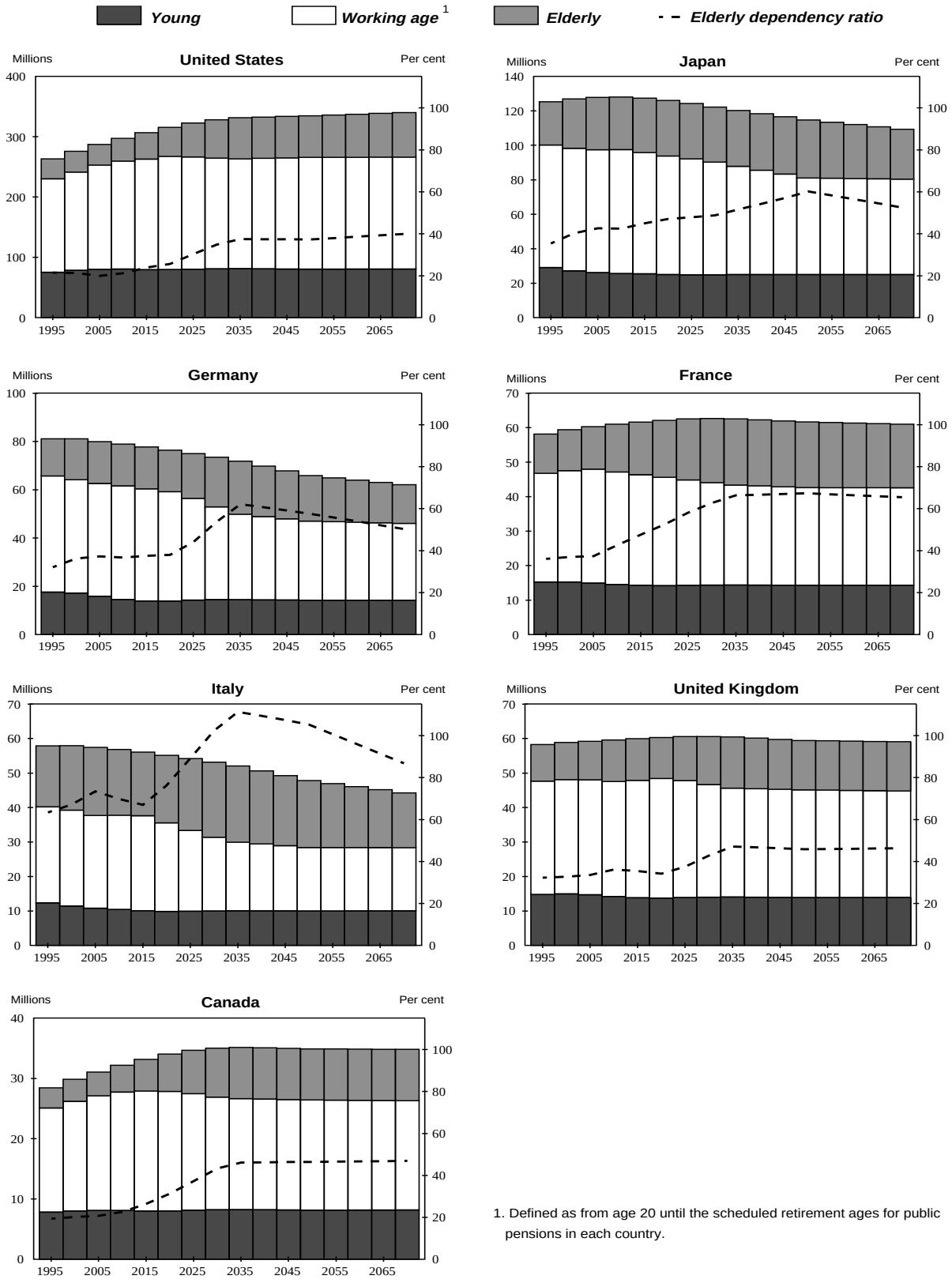
		1995	2000	2030	
				Scenario A	Scenario B
United States	Private saving	4.8	5.3	2.4	0.3
	National saving	3.9	4.4	-1.8	-7.2
Japan	Private saving	11.7	11.2	7.1	4.1
	National saving	15.0	15.2	4.3	-10.8
Germany	Private saving	10.8	11.5	6.5	2.7
	National saving	9.8	10.7	0.3	-10.8
France	Private saving	8.1	7.3	4.8	2.9
	National saving	6.4	7.6	-0.7	-7.1
Italy	Private saving	12.6	13.0	8.6	5.3
	National saving	8.1	12.0	0.2	-12.3
United Kingdom	Private saving	7.6	5.2	2.7	0.9
	National saving	4.3	4.2	-1.0	-7.1
Canada	Private saving	7.5	6.7	3.0	0.3
	National saving	4.4	7.7	2.1	1.5
Australia	Private saving	2.6	3.1	0.7	-1.0
	National saving	1.0	3.2	-0.8	-2.2
Austria	Private saving	14.2	14.1	10.3	7.4
	National saving	12.2	11.6	-0.5	-13.8
Belgium	Private saving	17.1	16.5	13.3	10.9
	National saving	14.4	15.8	9.5	7.9
Denmark	Private saving	3.3	2.9	-0.6	-3.3
	National saving	3.1	5.6	-0.5	-5.8
Finland	Private saving	7.8	3.7	-0.2	-3.2
	National saving	3.6	6.6	-5.7	-15.9
Ireland	Private saving	13.5	14.9	14.9	14.9
	National saving	12.6	14.3	13.5	12.5
Netherlands	Private saving	13.8	13.0	8.2	4.6
	National saving	12.5	13.1	1.6	-9.4
Norway	Private saving	8.8	10.1	7.5	5.6
	National saving	12.2	14.7	9.0	5.6
Portugal	Private saving	24.0	23.9	21.9	20.4
	National saving	22.3	24.9	16.6	8.9[4]
Spain	Private saving	13.1	12.2	9.2	6.9
	National saving	9.3	10.1	1.9	-4.8
Sweden	Private saving	11.4	6.8	4.2	2.2
	National saving	4.4	6.1	0.2	-4.6
Total OECD[1]	Private saving	8.3	8.2	4.8	2.3
	National saving	7.4	8.3	0.3	-7.6

1. Weighted average of above OECD countries.

Scenario A: The scenario for private saving has been derived by applying the lower coefficient (-0.16) to the change in the dependency ratio. The scenario for national saving has been derived by applying this lower coefficient for the effect on private saving and assuming a 50 per cent Ricardian equivalence effect with respect to government saving.

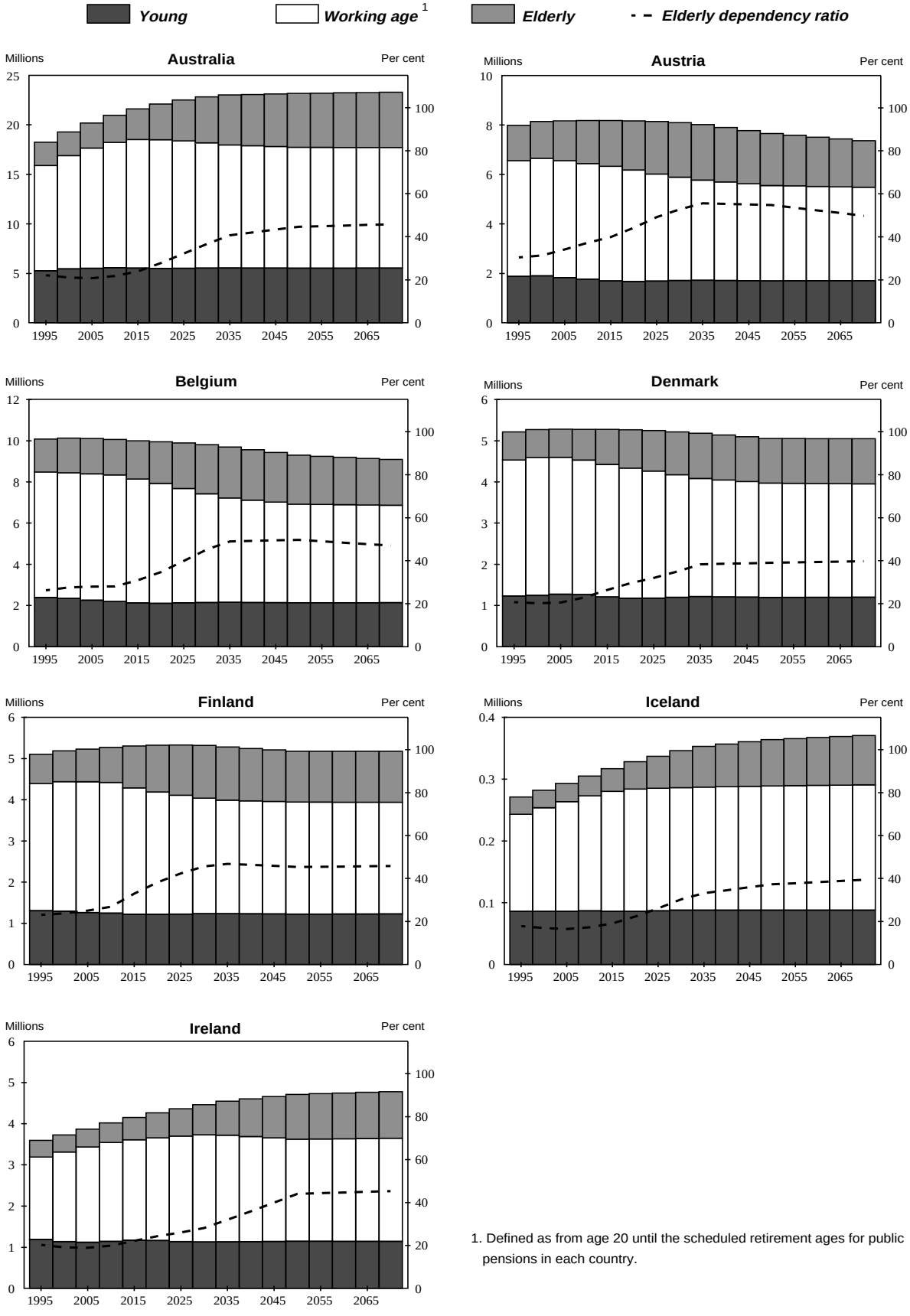
Scenario B: The scenario for private saving has been derived by applying the higher coefficient (-0.28) to the change in the dependency ratio. The scenario for national saving has been derived by applying this higher coefficient for the effect on private saving and assuming no Ricardian equivalence effect with respect to government saving.

Figure 1. **Population projections and elderly dependency ratios 1995 to 2070**



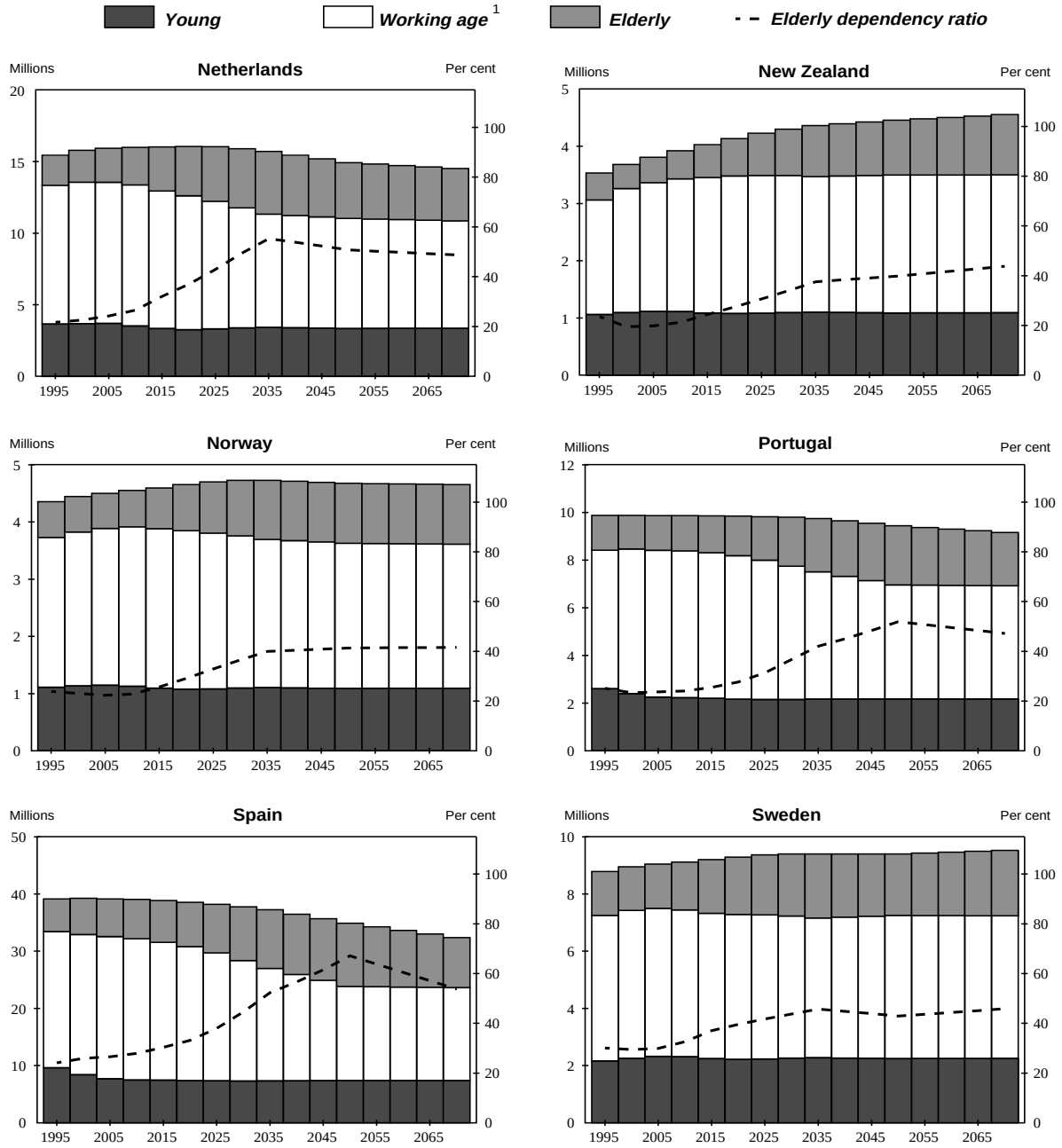
1. Defined as from age 20 until the scheduled retirement ages for public pensions in each country.

Figure 1. (cont'd). **Population projections and elderly dependency ratios 1995 to 2070**



1. Defined as from age 20 until the scheduled retirement ages for public pensions in each country.

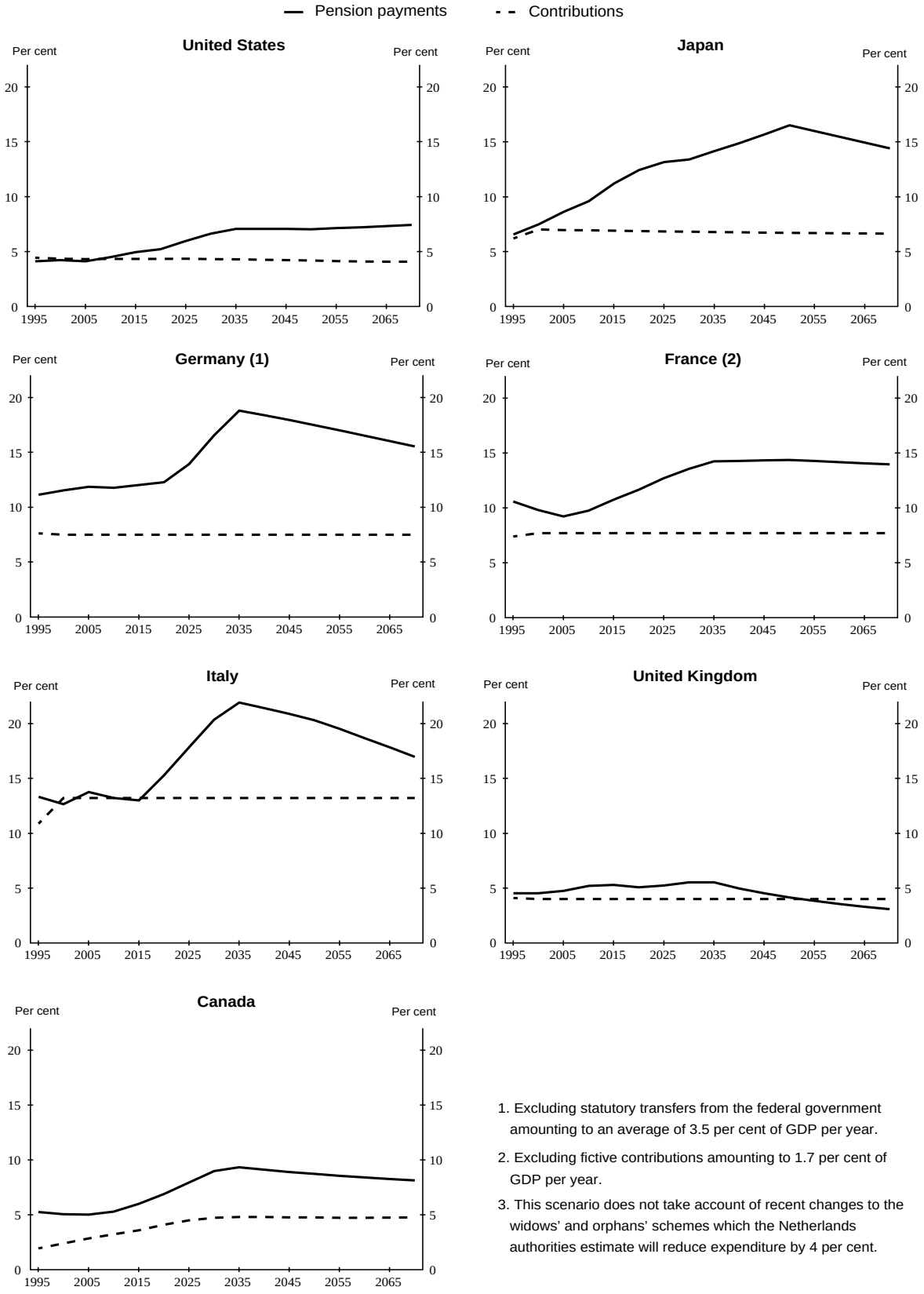
Figure 1. (cont'd). **Population projections and elderly dependency ratios 1995 to 2070**



1. Defined as from age 20 until the scheduled retirement ages for public pensions in each country.

Figure 2. **Pension payments and contributions**

As a percentage of GDP



1. Excluding statutory transfers from the federal government amounting to an average of 3.5 per cent of GDP per year.
2. Excluding fictive contributions amounting to 1.7 per cent of GDP per year.
3. This scenario does not take account of recent changes to the widows' and orphans' schemes which the Netherlands authorities estimate will reduce expenditure by 4 per cent.

Figure 2. (cont'd). **Pension payments and contributions**

As a percentage of GDP

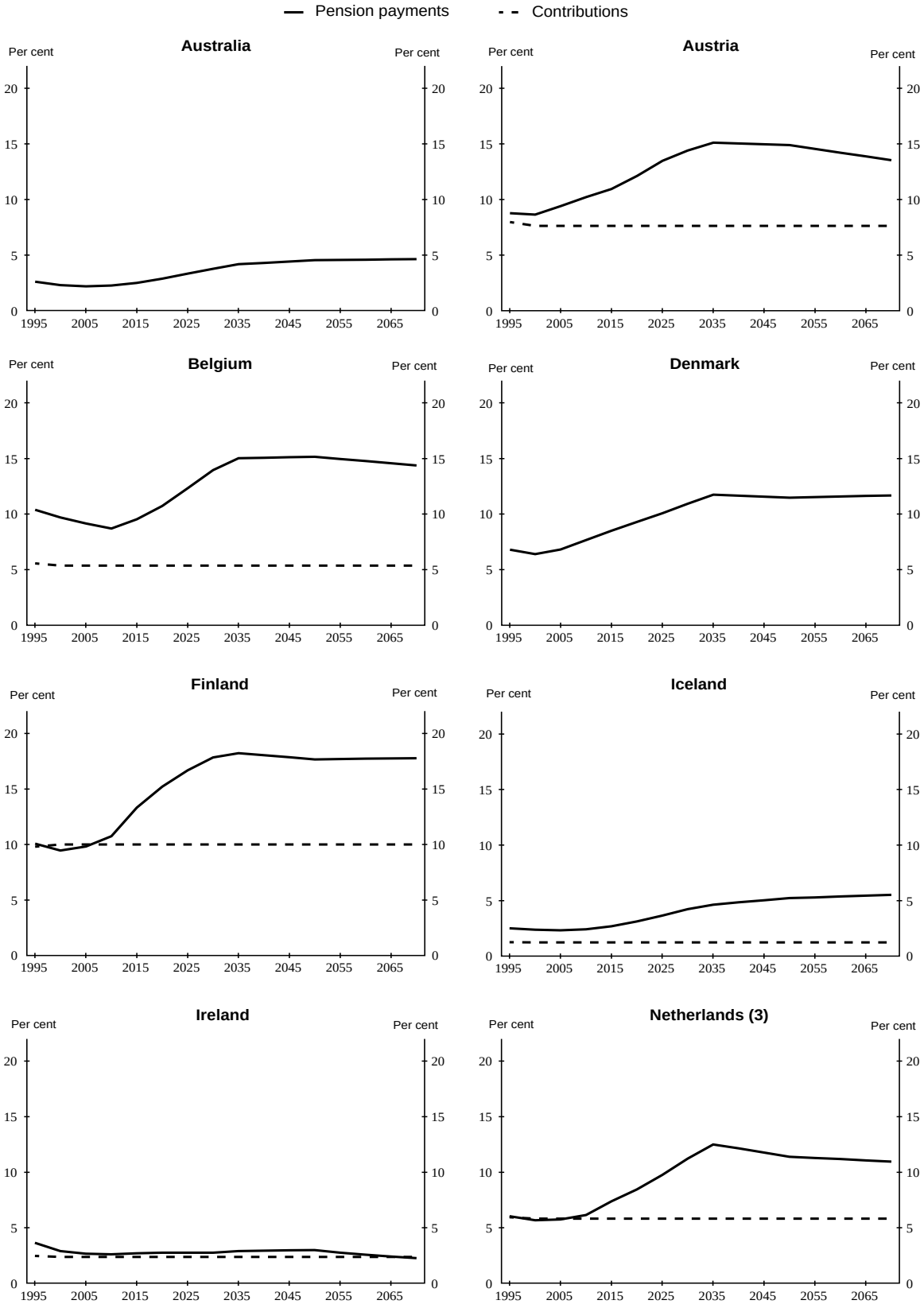


Figure 2. (cont'd). **Pension payments and contributions**

As a percentage of GDP

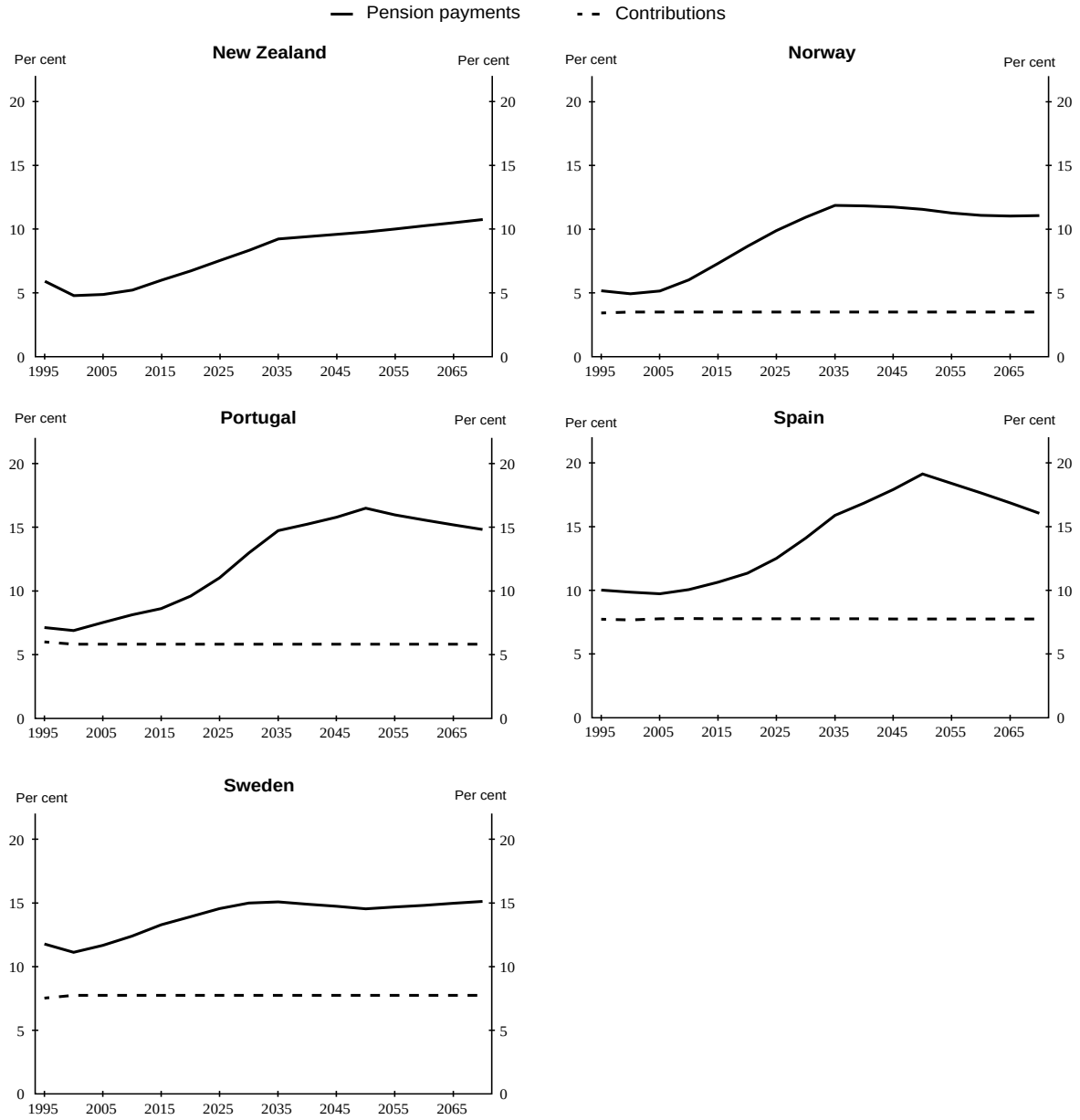
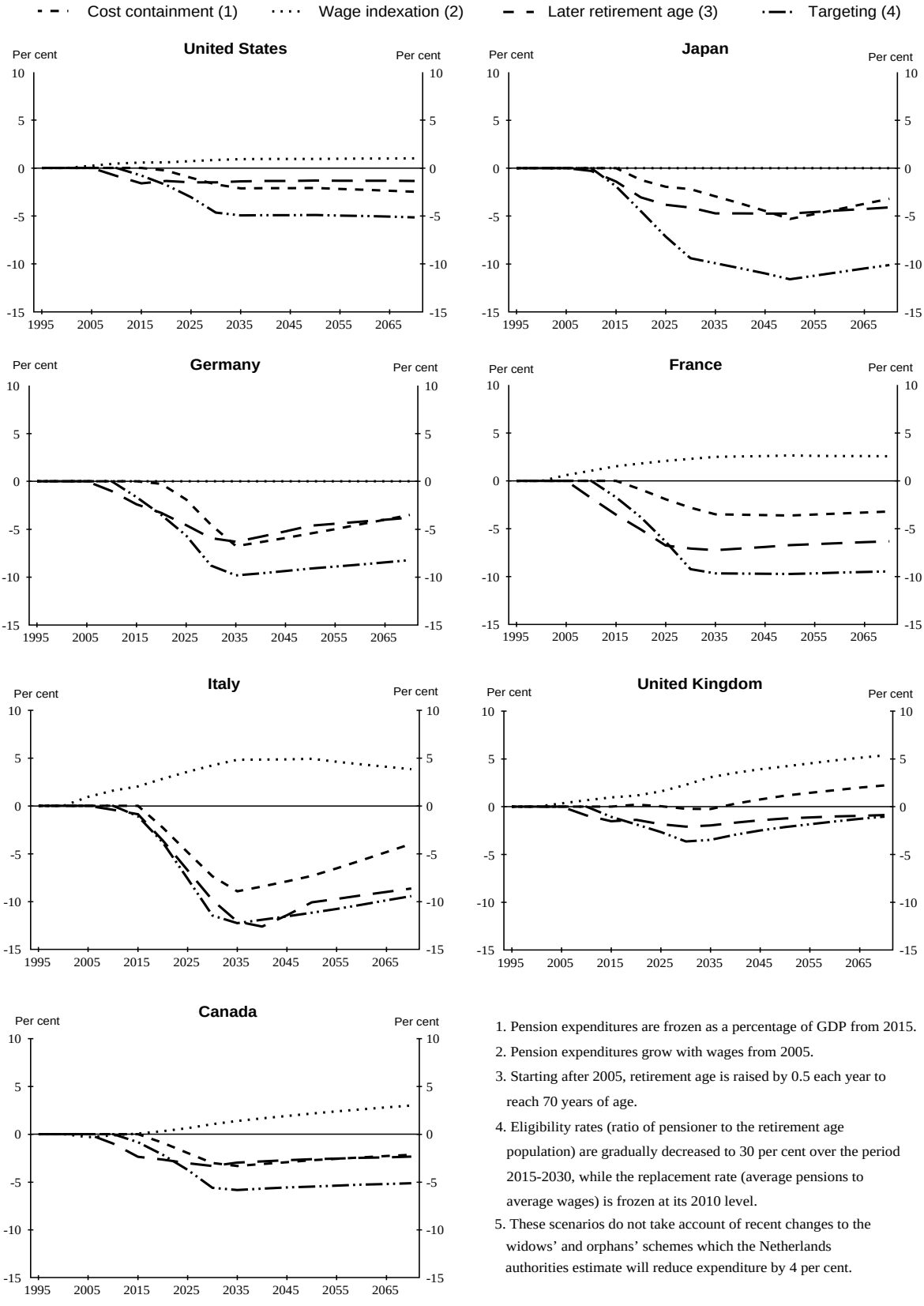


Figure 3. **Pension scenarios: variations from baseline**

Pension balances as a percentage of GDP



1. Pension expenditures are frozen as a percentage of GDP from 2015.
2. Pension expenditures grow with wages from 2005.
3. Starting after 2005, retirement age is raised by 0.5 each year to reach 70 years of age.
4. Eligibility rates (ratio of pensioner to the retirement age population) are gradually decreased to 30 per cent over the period 2015-2030, while the replacement rate (average pensions to average wages) is frozen at its 2010 level.
5. These scenarios do not take account of recent changes to the widows' and orphans' schemes which the Netherlands authorities estimate will reduce expenditure by 4 per cent.

Figure 3. (cont'd). **Pension scenarios: variations from baseline**

Pension balances as a percentage of GDP

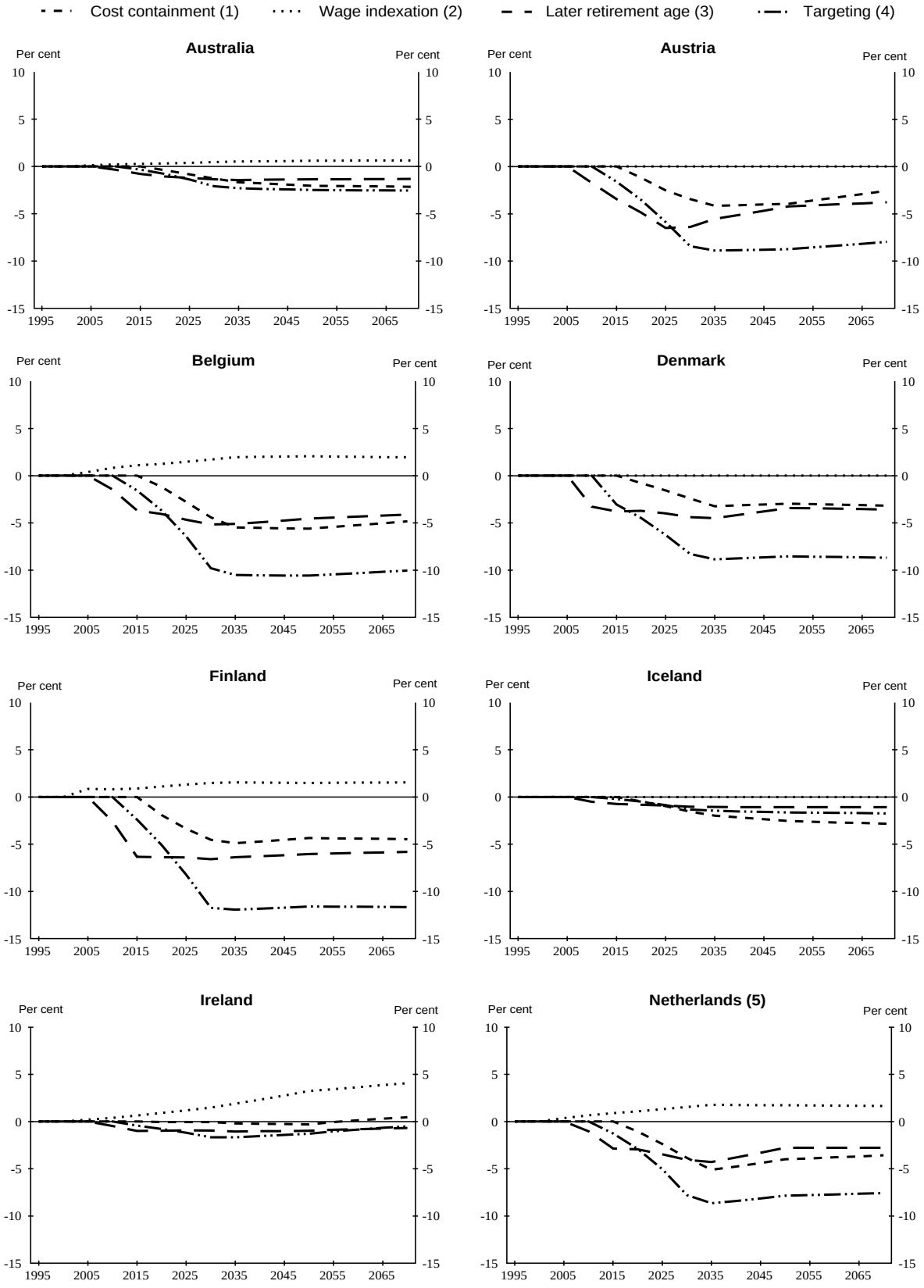


Figure 3. (cont'd). **Pension scenarios: variations from baseline**

Pension balances as a percentage of GDP

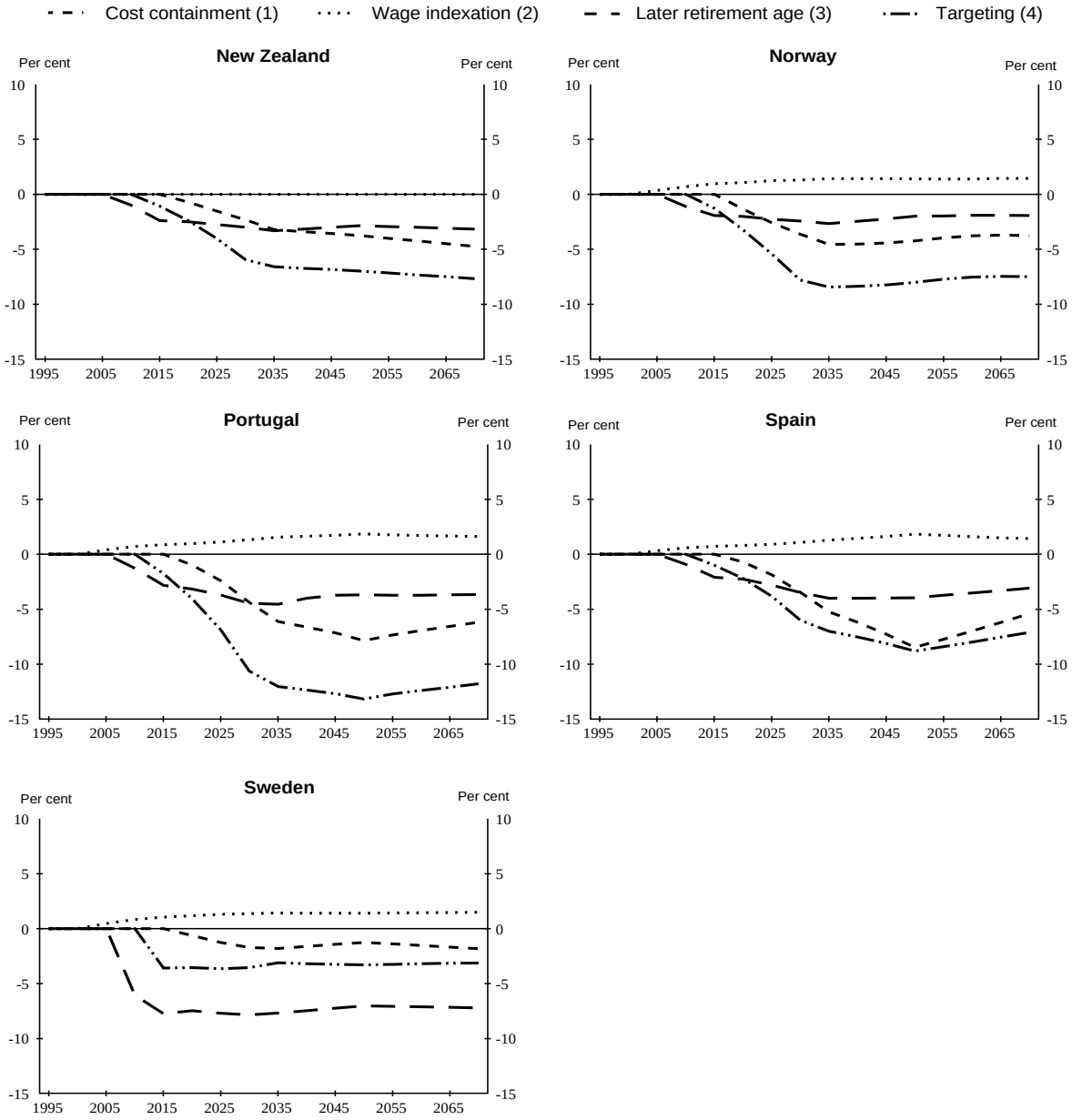


Figure 4. **General government primary balances**

Surplus (+) or deficit (−) as a percentage of GDP

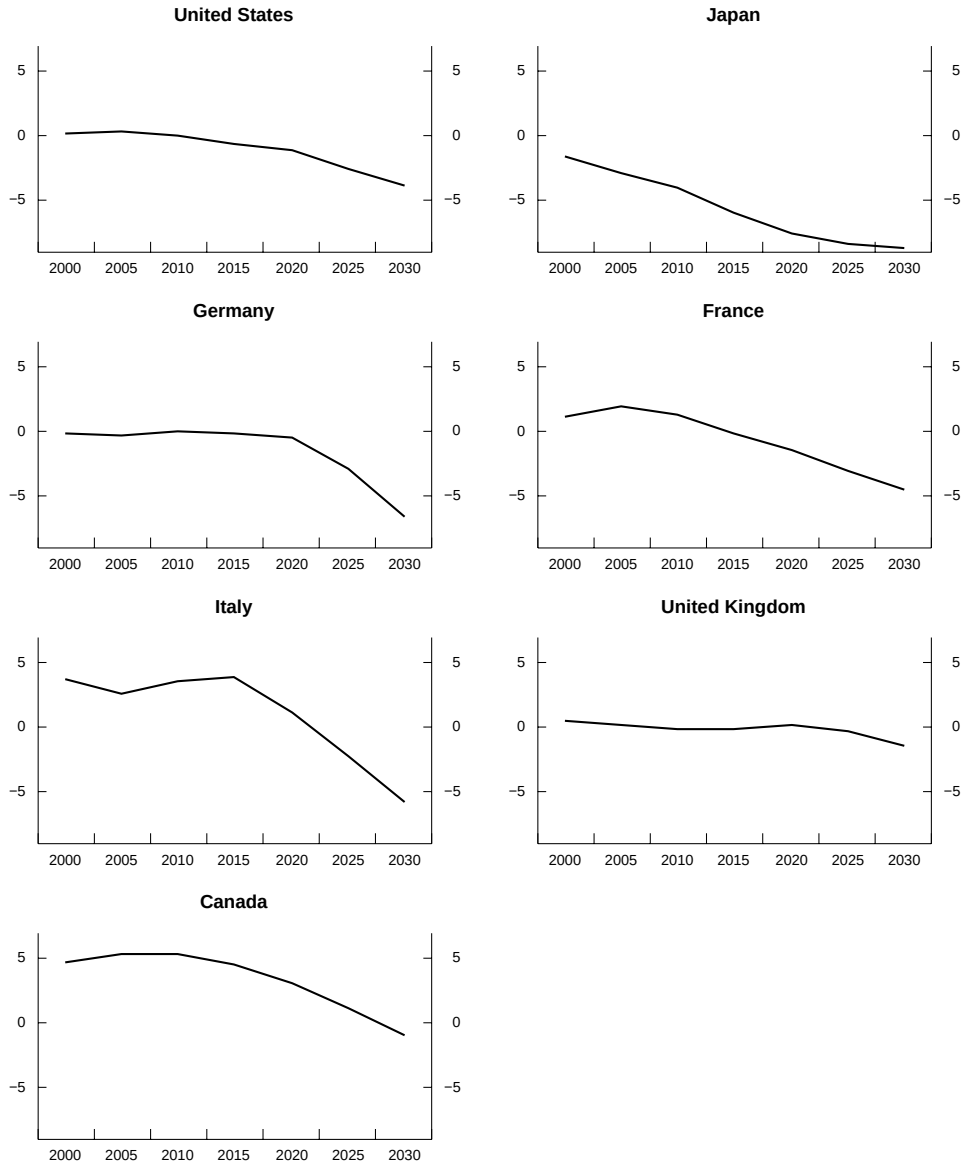


Figure 4 (cont'd). **General government primary balances**

Surplus (+) or deficit (−) as a percentage of GDP

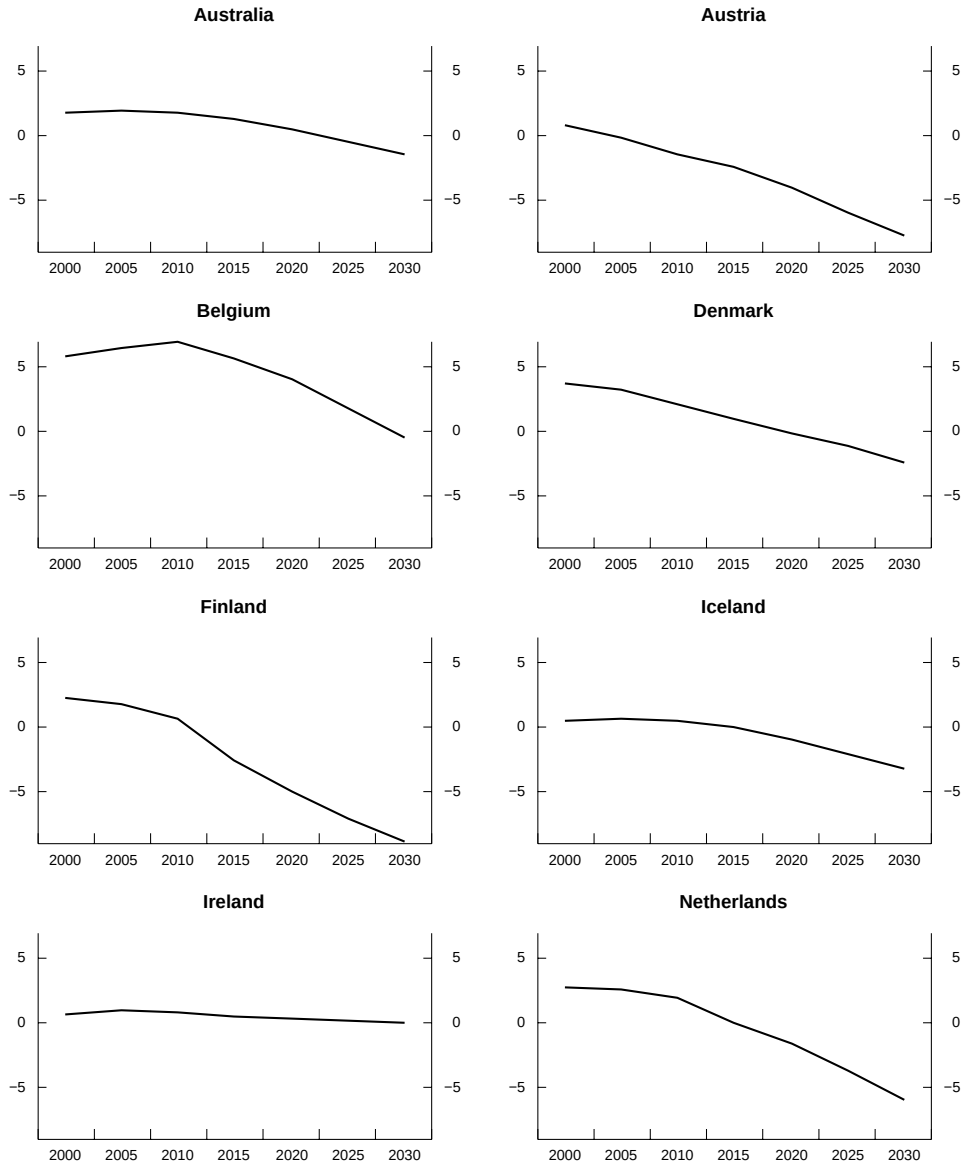


Figure 4 (cont'd). **General government primary balances**

Surplus (+) or deficit (−) as a percentage of GDP

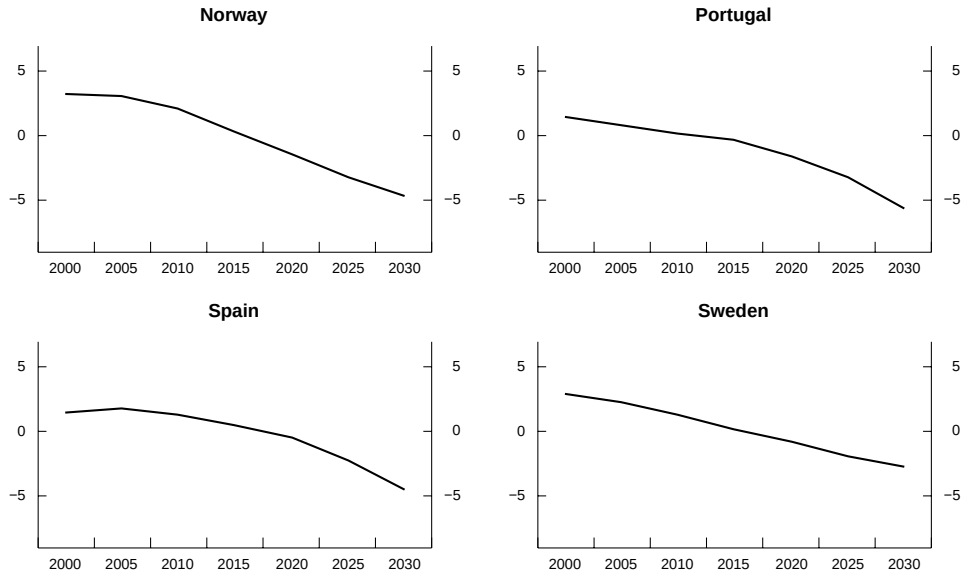


Figure 5. **Primary expenditure components and primary receipts**

As a percentage of GDP

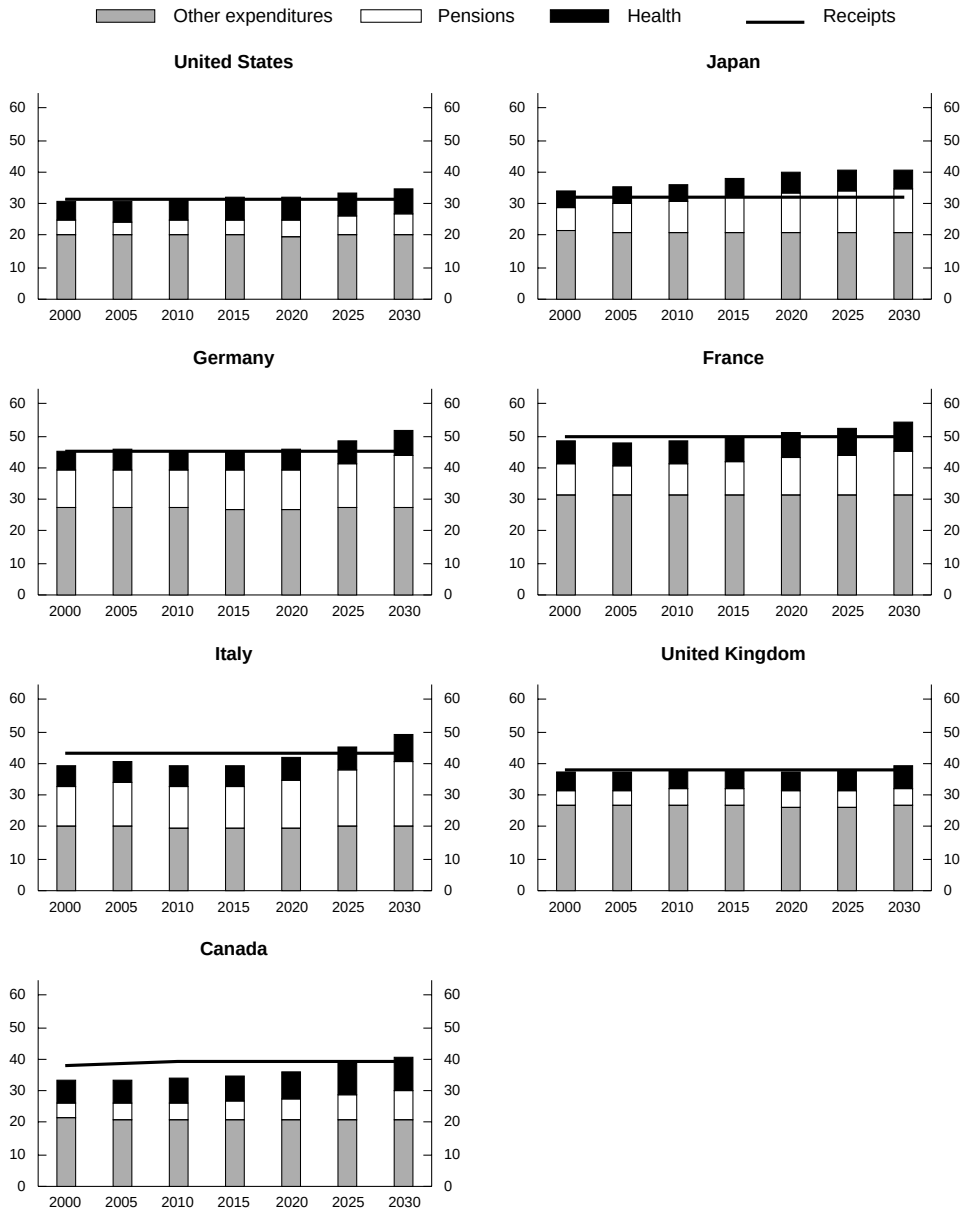


Figure 5 (cont'd). **Primary expenditure components and primary receipts**

As a percentage of GDP

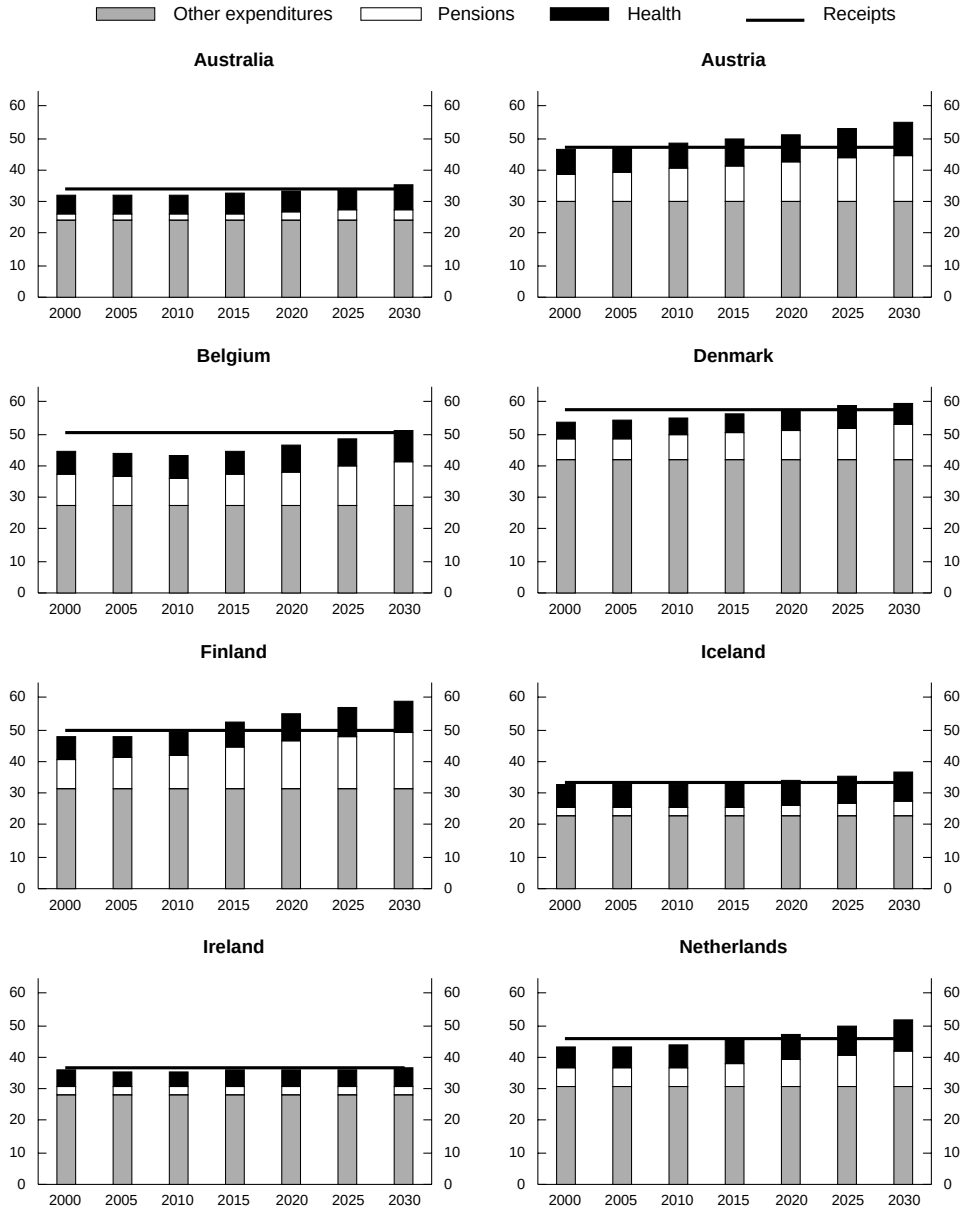


Figure 5 (cont'd). **Primary expenditure components and primary receipts**

As a percentage of GDP

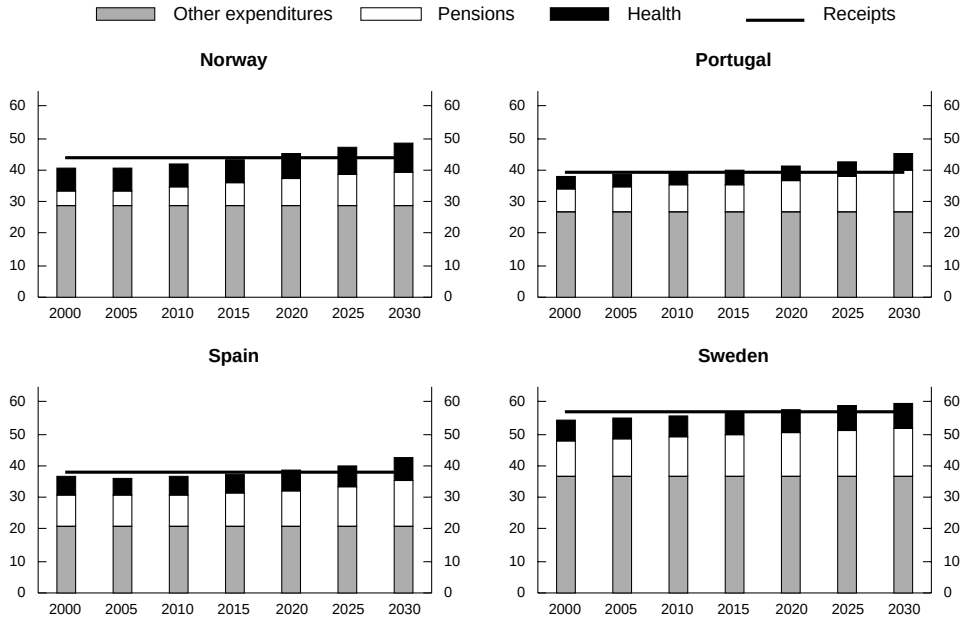
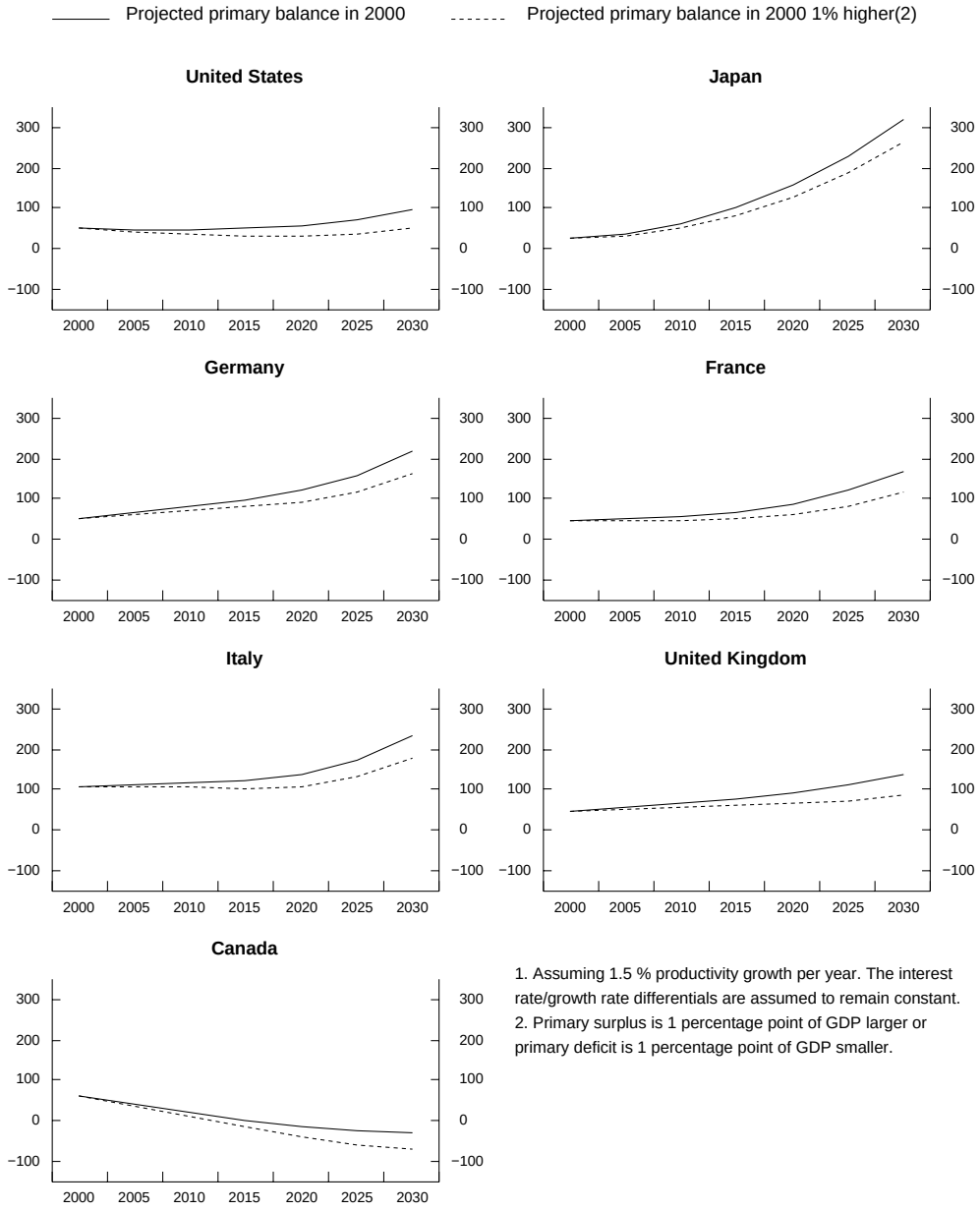


Figure 6.**Impact of different initial primary balances on net debt**

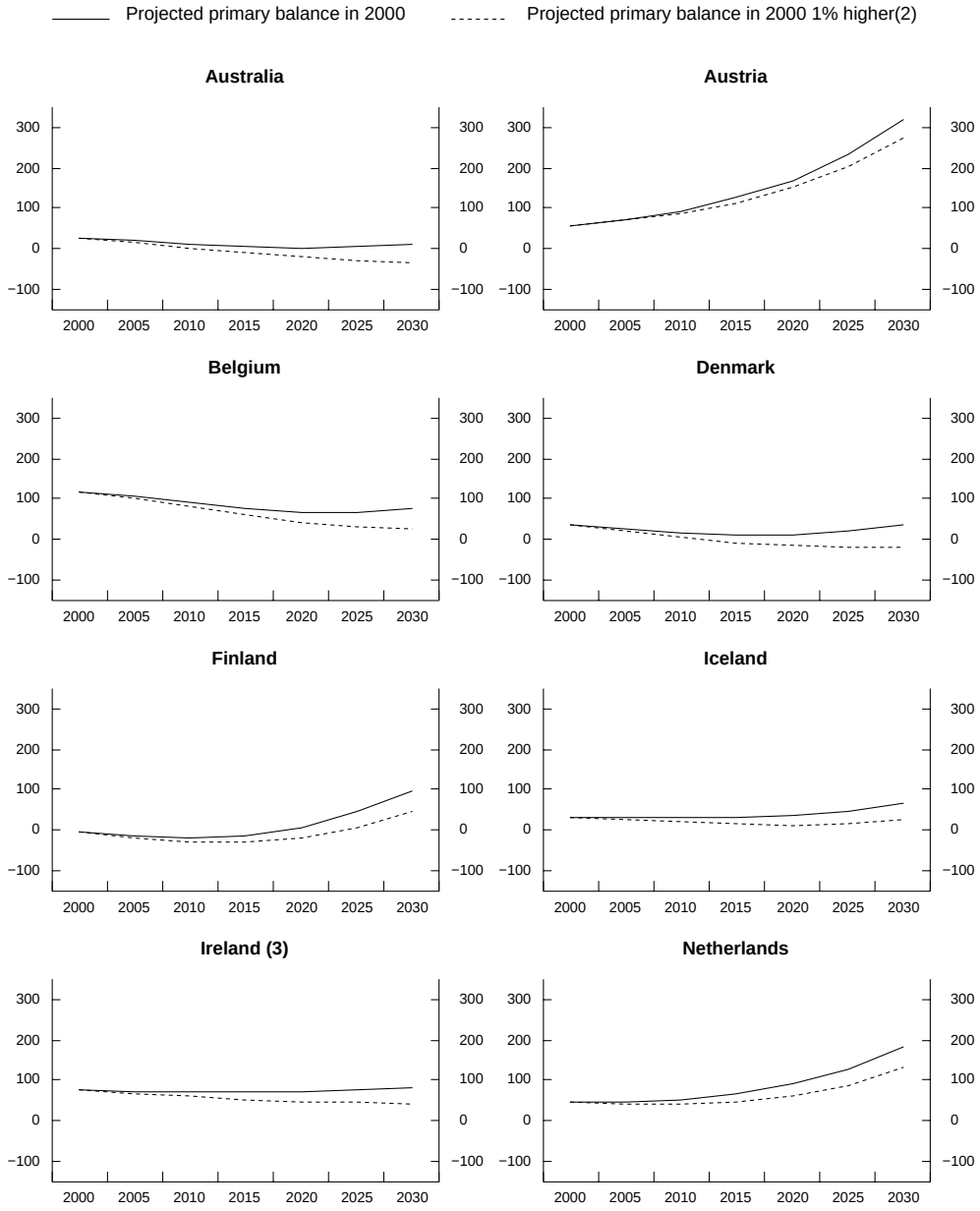
As a percentage of GDP (1)



1. Assuming 1.5 % productivity growth per year. The interest rate/growth rate differentials are assumed to remain constant.
2. Primary surplus is 1 percentage point of GDP larger or primary deficit is 1 percentage point of GDP smaller.

Figure 6 (cont'd)**Impact of different initial primary balances on net debt**

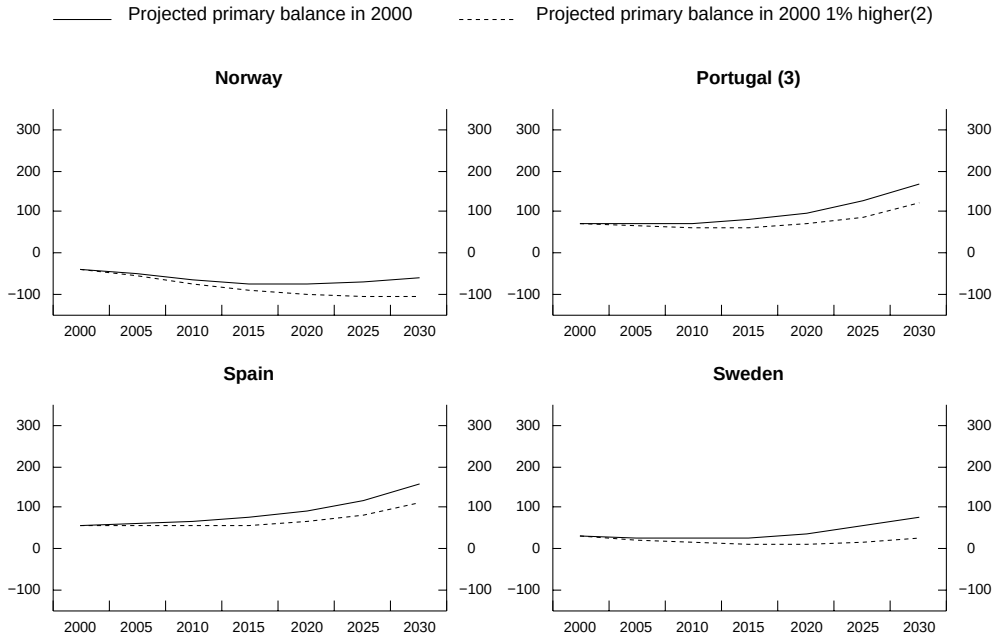
As a percentage of nominal GDP (1)



1. Assuming 1.5 % productivity growth per year. The interest rate/growth rate differentials are assumed to remain constant.
2. Primary surplus is 1 percentage point of GDP larger or primary deficit is 1 percentage point of GDP smaller.
3. Gross financial liabilities.

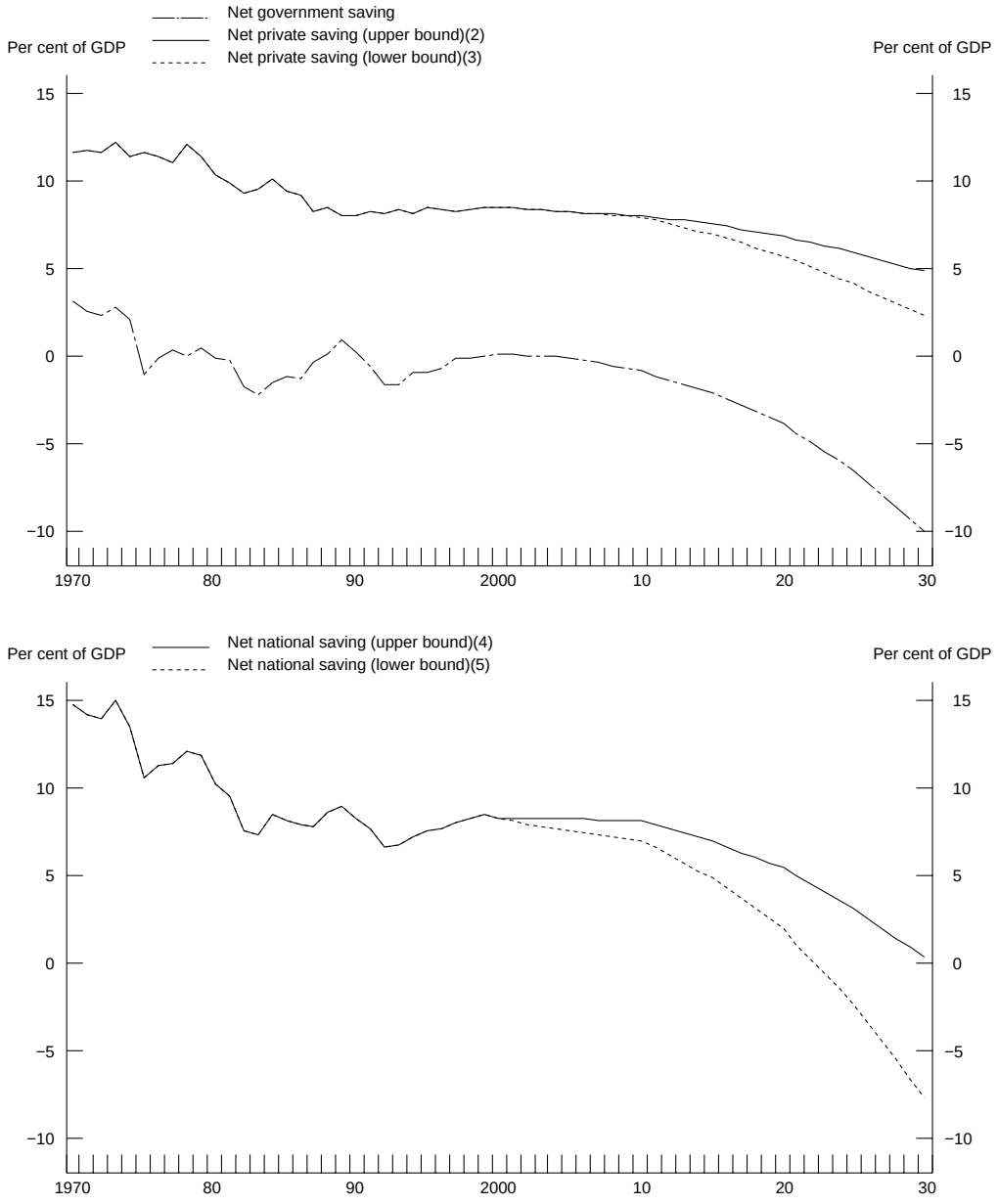
Figure 6 (cont'd)**Impact of different initial primary balances on net debt**

As a percentage of nominal GDP (1)



1. Assuming 1.5 % productivity growth per year. The interest rate/growth rate differentials are assumed to remain constant.
2. Primary surplus is 1 percentage point of GDP larger or primary deficit is 1 percentage point of GDP smaller.
3. Gross financial liabilities.

Figure 7. **Demographic impact on future net national savings in OECD countries (1)**



1. Weighted average of OECD countries excluding Czech Republic, Greece, Mexico, New Zealand, Switzerland and Turkey.
2. Applying the lower coefficient (−0.16) to the change in the dependency ratio.
3. Applying the higher coefficient (−0.28) to the change in the dependency ratio.
4. Applying the lower coefficient for the effect on private saving and assuming a 50 percent Ricardian equivalence effect.
5. Applying the higher coefficient for the effect on private saving and assuming no Ricardian equivalence effect.

Annex:
Description of pension systems and methodology used in simulations

United States

Description

- The main old-age public pension scheme is the Old Age and Survivors Insurance (OASI) programme, commonly referred to as "Social Security," which covers all private sector and almost all public sector employees, including federal civilian employees since 1984, military personnel and state and local government employees. Federal civilian employees who began employment with the Government before 1984 are covered by an unfunded pension scheme that was closed to new entrants in 1984.

- The combined OASI employee and employer contributions rate is currently 10.52 per cent, which is also the rate for the self-employed. In 2000, the OASI tax rate is scheduled to decline to 10.38 per cent. Contributions are made on earnings up to a ceiling ($60 600 per year in 1994) and indexed to the growth in nominal wages.

- Pension beneficiaries with income above a threshold are subject to personal income tax on up to 85 per cent of their pensions. The threshold is not indexed for inflation, and the tax on benefits is forecast to produce significant revenues in later decades. The tax revenues are assigned automatically to the OASI and hospital insurance (HI) trust funds.

- The social security system is partially funded and held assets equivalent to 6 per cent of GDP in 1993. Additional revenue is generated by interest income on assets held by the pension system[12].

- On average, newly retired workers in 1994 received pensions equal to 42.5 per cent of their last salary, and this replacement rate is projected by the SSA to stay virtually constant over the forecast time horizon. After retirement, pensions received are indexed to consumer price inflation.

- The retirement age is scheduled to rise from 65 to 67, for both men and women between 2000 and 2022. Early retirement is possible from the age of 62, but is penalised with an offsetting actuarial reduction in pension payments. Later retirement is also possible with a corresponding actuarial increase.

- The overall eligibility ratio for pension benefits is projected by the Social Security Administration (SSA) to increase from 77 per cent to 90.5 per cent over the forecast period, reflecting a steady increase in the female eligibility ratio.

Simulation model

- The model covers the Old Age and Survivors Insurance (OASI) and the railroad retirement system, which was treated as if it were a part of social security for purposes of the simulations.

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1. However, interest on income earned on holdings of federal, state and local government bonds is consolidated out for the general government sector as a whole.

– Total contributions into the system were calculated by using the "intermediate" scenario of the SSA forecasts of the future evolution of the contributions base, contribution rates and taxes on pensions (Board of Trustees, 1994).

– Average benefits were calculated by dividing total benefits by total beneficiaries, using 1993 as the base year. Pensions for new retirees were then calculated using SSA forecasts of benefit replacement rates as a percentage of final salary. Final salaries were assumed to grow in line with productivity growth. The ratio of beneficiaries to the total retired population used in the SSA forecasts was then applied to the World Bank population projections used in this analysis.

– The model accounts for future changes in the OASI tax rate and the retirement age.

– Pensions for each cohort of new retirees were indexed to inflation.

Japan

Description

– Japan has six public pension schemes, divided into flat-rate and earnings-related components (Takayama, 1992). The flat-rate scheme, the *Kokumin-Nenkin* (KN), provides pensions to all retirees. The principal earnings-related scheme is the *Kosei-Nenkin-Hoken* (KNH), which provides benefits to non-agricultural workers in the private sector. Dependent wives of men in the KNH scheme are entitled to pensions without making contributions. The other schemes cover central government employees, local government employees, private school teachers, and agricultural workers respectively (Social Development Research Institute, 1991).

– The contribution rate applied to wage income is currently 16.5 per cent, will be raised to 17.35 per cent in October 1996, and then will be reviewed every five years. There is provision for rates to be raised by 2.5 percentage points at each review.

– As an additional revenue raising measure, bonuses will be subject to a 1 per cent contribution rate from April 1995 onwards.

– The Japanese public pension system is partially funded, and pension assets were equivalent to 37 per cent of GDP in 1992. The system is currently operating in approximate balance.

– In the KNH scheme, benefits are accrued at a rate of 0.75 per cent of indexed monthly wages, multiplied by the number of months of insurance coverage.

– The main earnings-related scheme is still maturing and consequently the replacement ratio will rise in the future.

– After retirement, benefits are indexed to inflation.

– The retirement age is currently 60 for men and women, but will gradually be raised to 65 by 2014 for men and 2019 for women.

– Overall eligibility is 100 per cent for both men and women.

Simulation model

- As there is some uncertainty about contribution rate increases scheduled beyond 2000, contribution rates are not increased beyond 1999.

- As an initial starting point, data on total contributions for 1994 were taken from the *Guidebook of Social Insurance in Japan*, 1995 and additional information supplied by the Japanese authorities. Data on pensions paid was taken from *The Cost of Social Security in Japan,* 1993, *The Japanese Budget in Brief*, 1995 and additional information provided by the Japanese authorities.

- The simulation model takes into account the maturation of the main earnings-related scheme and future increases in the retirement age.

- Pensions for each new cohort of retirees were indexed for inflation.

Germany

Description

- Public pensions in Germany are related to earnings, with the main schemes covering wage earning (*Rentenversicherung der Arbeiter*) and salaried (*Rentenversicherung der Angestellten*) employees. Dependent spouses are covered only if they contribute voluntarily. Widows and widowers are eligible for survivors' benefits, which currently provide close to half of the pension payments received by women. Other schemes exist for various occupations, with the most important being for civil servants with the status of *Beamte,* who do not pay pension contributions.

- Contribution rates are set each year at the levels required to balance the system. In 1994, the contribution rate was 19.2 per cent, applied to annual wage income up to a ceiling, (DM 94 000 in 1994) that is adjusted every year.

- The average pension for a retiring worker who earned the average manufacturing wage is equal to 53 per cent of the gross wage (Eurostat, 1993).

- After retirement, benefits are indexed to the growth in net wages. Among the seven major countries, Germany is now the only country which continues to index pension benefits to wage growth.

- The retirement age is currently 63 for men (under certain conditions it is 65) and 60 for women and will be raised gradually to 65 by 2009 for men and by 2018 for women (*Bundesminister für Arbeit und Sozialordnung*, 1991). Early retirement is possible, and widely taken for a variety of reasons ranging from having reached 35 years of contributions needed for full pension to unemployment or disability. Early retirement as a substitute for unemployment has been used extensively.

- The eligibility ratio for men is virtually 100 per cent. Dependent wives are only eligible for old-age pensions if they make voluntary contributions to the schemes, but are eligible for survivors' benefits.

Simulation model

- Statutory transfers from general revenues are included. Inclusion of the transfers changes the net pension liability, but not the overall fiscal impact.

- The net pension liability for the schemes covering wage earning employees (*Arbeiter*), salaried employees (*Angestellte*), miners (*Knappschaft*) and civil servants with the status of *Beamte* was estimated.

- Legislated changes in the contribution rate up until 1998 were taken into account. The ceiling on contributions was also taken into account. After 1998, the contribution rate was kept at the 1998 level.

- Early retirement is widespread in Germany. To account for this, data on the total number of pensions paid in 1993 were obtained from the German national accounts.

- Data for the number of civil servants with the status of *Beamte* and total pensions paid to *Beamte* pensioners in 1994 were obtained from the Ministry of Finance.

- Pensions were indexed to wages.

- Legislated increases in the retirement age were taken into account.

France

Description

- There are over 500 separate public pension schemes in France (*Livre blanc sur les retraites*, 1991), but they can be functionally divided into four groups; the *régime général*, which pays earnings-related benefits to private sector workers, the *régimes complémentaires* which provide earnings-related supplements, the plan for civil servants, which pays benefits broadly comparable to those of the *régime général* and *régimes complémentaires* combined, and occupational schemes for groups such as miners, farmers, railway employees and other specific occupational groups. The average retiree receives 2.8 pensions from different sources. There is also a means-tested minimum benefit, which is paid to a small and shrinking minority of pensioners.

- Contribution rates vary widely by scheme and there is also a wide variation in the base on which they are calculated. For the civil servants' scheme, the explicit contribution rate is quite low and the Government allots "fictive" contributions from general revenues to balance the system (although these are essentially a bookkeeping measure).

- In the scheme for civil servants the initial benefit is based on 75 per cent of the final salary. In the *régime général* benefits have been based on the best ten years of lifetime earnings. In the future, they will be based on the best 25 years of earnings, with this reform to be phased in over the next 13 years.

- Indexation formulas for pension benefits vary according to the scheme, but as a result of the 1993 reforms, benefits are in practice indexed to inflation.

– The standard retirement age is 60 for both men and women, although some of the occupational schemes have even lower retirement ages. There are no plans at present to raise the statutory retirement age and early retirement has been encouraged as a way of dealing with unemployment among older workers. However, the number of years of contributions required to qualify for a full pension was extended to 37.75 years in 1994 and will be raised to 40 years over the next nine years at a rate of 3 months each year.

– Eligibility is 100 per cent for both men and women.

Simulation model

– The "fictive" contributions into the civil servants scheme (and some of the smaller schemes) were not counted as a part of total contributions, in order to better reflect the underlying balance of that scheme.

– The schemes were separated into the four broad groups, with benefit and contribution rates calculated on the basis of total benefits paid and total contributions collected for the year 1993.

– Expenditures on the means-tested minimum pension were included.

– Revenues from the *contribution sociale généralisée* were included.

– Pensions for each new cohort of retirees were assumed to be indexed to inflation.

– Future increases in contribution rates for the *régimes complémentaires* were incorporated.

– Future reductions in benefit replacement rates as a result of the 1993 reforms were incorporated.

Italy

Description

– There are many public pension schemes, with a wide variety of rules regarding eligibility and benefit payments. The main scheme, *Instituto Nazionale de Previdenza Sociale,* (INPS) which pays earnings-related benefits to private sector workers, administers 70 per cent of pension expenditure (Franco and Frasca, 1992).

– The Dini Reform of 1995 links pensions to contributions instead of wages. The reform effectively disallows “seniority” retirement by requiring 40 years of contributions in order to retire before the age of 57. The reform also lowers the number of years of contributions needed to be eligible for a pension at retirement age from 15 years to 5 years.

– For those workers without sufficient years of contributions to qualify for the earnings-related scheme, there is also a means-tested flat-rate pension.

– The full INPS pension for a new retiree is equal to 78 per cent of the average gross wage (Eurostat, 1993). Pensions for women, who typically have fewer years of contributions, are lower on average.

Eurostat estimates indicate that the pension for a new retiree with 20 years of contributions is equal to 45 per cent of the average gross wage.

- Also as part of the 1993 reform, pension benefits will eventually be based on lifetime earnings. Previously, benefits in the INPS scheme were based on the last five years of earnings, while benefits for state employees were based on the final salary.

- As a result of the 1993 pension reform, benefits are now indexed to inflation.

- The retirement age of 60 for men and 55 for women is being raised to 65 for men and 60 for women. In 1995, the statutory retirement ages were raised to 62 for men and 57 for women and the increases will be fully phased in by 2001.

- Overall eligibility is 100 per cent for men and women.

Simulation model

- The model takes into account the 1995 Dini Reform.

- The contribution rates for employees is 32 per cent. The implied contribution rate for the self-employed is 20 per cent.

- The overall replacement rate was frozen at the 1994 level of 49 per cent, given the total number of pensions and total pension expenditure.

- Pensions for each cohort of new retirees were indexed to inflation.

- The legislated increase in the retirement age was taken into account.

United Kingdom

Description

- The United Kingdom has both flat-rate and earnings-related public pension schemes (National Insurance Fund, 1990), although it is possible to opt out of the earnings-related scheme.

- To receive full flat-rate and earnings-related pension rights, contributions must normally have been paid for at least 90 per cent of a working life. No pension is paid at all if contributions were paid for less than a quarter of a working life. Years spent at home due to child-raising responsibilities or to care for disabled persons are excluded from the definition of a working life, enabling easier satisfaction of the contribution conditions.

- At present, 99 per cent of men and approximately 75 per cent of women qualify for a flat-rate pension. Since women have averaged fewer working years before retirement than men, their flat-rate pensions average only 75 per cent of men's pensions. The eligibility ratio for women is expected to rise to 100 per cent by the year 2010, and women's flat-rate pensions are also expected to rise to 91 per cent of the value for men. This increase in relative pension values is expected to occur by 2020.

- The flat-rate pensions are indexed to inflation and as there is no built-in mechanism for adjusting for real wage growth, the relative value of flat-rate pensions is expected to decline over time.

- The earnings-related scheme is still maturing, and it will be 1998 before retirees are able to claim full earnings-related benefits. From 1999, earnings-related benefits will be based on lifetime earnings. Retirement ages are the same as in the flat-rate scheme.

- As the relative value of flat-rate pensions declines, and the earnings-related scheme matures, the National Insurance Fund forecasts earnings-related pensions to eventually account for approximately a third of pension expenditure. Currently, almost no earnings-related benefits are paid out.

- Earnings-related benefits are also indexed for inflation.

- Eligibility ratios for men and women are comparable to those for the flat-rate scheme.

- Retirement ages in both the flat-rate and earnings-related pension schemes are 65 for men and 60 for women, although the retirement age for women is being raised to 65 between 2010 and 2020 as a result of a reform passed in 1994.

Simulation model

- It was assumed that all workers remained in the earnings-related scheme, rather than opting out.

- Total retirement-related national insurance contributions in 1993 were divided by total wages in that year to calculate an implied pension contribution rate. This rate was then kept constant.

- Earnings-related pensions were modelled by using National Insurance Fund forecasts of total pensions paid in future decades, divided by their forecasts of future retirees, to calculate earnings-related pensions payable in a given year. These estimates of future expenditure were then applied to the World Bank population data to get total earnings-related expenditure. As the pension formula becomes less favourable with the move to lifetime earnings from 1999 onwards, the average earnings-related benefit, as a proportion of average wages, peaks in the first two decades of the next century and then declines.

- Flat-rate and earnings-related pensions for each cohort of new retirees were indexed to inflation.

Canada

Description

- Canada has both flat-rate and earnings-related public pension schemes (Old Age Security Program, 1991; Canada Pension Plan, 1991). The flat-rate programmes are financed out of general revenues, while the earnings-related schemes are financed from payroll contributions.

- There are three flat-rate schemes; Old Age Security (OAS), the Guaranteed Income Supplement (GIS), and the Spouse's Allowance Program (SPA). The GIS and SPA are means-tested to target poorer retirees, whereas the OAS is payable to all eligible retirees.

- Eligibility for a full pension is dependent on 40 years of residence in Canada between the ages of 18 and 65. Eligibility for the earnings-related schemes are also dependent on years of contributions. Benefits are reduced proportionately for fewer years of residence in Canada.

- The flat-rate schemes are indexed to inflation only, and will decline relative to average earnings over time unless the government of the day acts to raise them. They have been raised in real terms in the past.

- The earnings-related schemes are the Canada Pension Plan (CPP) and the Quebec Pension Plan (QPP). The QPP provides benefits to retired workers in Quebec, the CPP to retired workers in the rest of Canada. The two plans have virtually identical contribution and benefit characteristics.

- In 1994 the aggregate contribution rate was 5.2 per cent, paid equally by employees and employers. The self-employed pay the combined rate. Contributions were payable on annual wage income between C$ 3 400 and C$ 34 400. The wage floor and ceiling are adjusted every year in line with the growth in nominal earnings.

- In 1995 the contribution rate will rise to 5.4 per cent and it will continue to increase in subsequent years until 2016 when it will reach 10.1 per cent.

- The earnings-related scheme is designed to pay benefits equal to 25 per cent of average wages.

- All benefits are financed from employee and employer contributions, and earnings on assets held by the reserve fund. The fund currently has assets approximately equivalent to two years' expenditures, invested in debt securities issued by the Provinces.

- Benefits are indexed to inflation.

- Currently, 98 per cent of male retirees qualify for an earnings-related pension, and 85 per cent of female retirees. By 2050 the Government forecasts that 90 per cent of female retirees will be eligible for an earnings-related pension.

- The retirement age is 65 for both men and women.

Simulation model

- The flat-rate and earnings-related schemes were modelled separately.

- It was assumed that the parameters of the CPP applied to the whole of Canada.

- The contribution rate increases were incorporated until 2016.

- Pensions benefits were indexed to inflation.

Australia

Description

- Australia has a means-tested flat-rate scheme financed entirely from general revenues. A new scheme, the superannuation guarantee charge, was introduced in 1992 which obliges employers to contribute to fully-funded private pension plans.

- As of the 1994-95 fiscal year, approximately 68 per cent of the elderly population received pensions roughly equal to 30 per cent of the average wage.

- Benefits are indexed to consumer price inflation.

- The retirement age is currently 65 for men and 60½ for women. The retirement age for women will be gradually raised to 65 by 2014.

Simulation model

- Data on the total number of pensions paid and total pension payments in the 1994-95 fiscal year were used to calculate an eligibility ratio and average benefit (source: government budget).

- Future retirees were assumed to receive the same initial benefit as a percentage of future average wages.

- Pensions for each new cohort of retirees were indexed to inflation.

- The model incorporates the increase in the retirement age for women.

Austria

Description

- Austria has a variety of earnings-related schemes organised along occupational lines, with the two main schemes covering wage earners and salaried employees, respectively.

- Employee and employer contributions are paid up to a ceiling, the overall contribution rate is 18.8 per cent of average wages.

- Benefits are based on earnings over a maximum of 45 years, with the best 15 years disproportionately weighted. The average benefit received by all retirees is equal to approximately 49 per cent of average wages. Adjustment of pensions is discretionary, but in practice pensions are more or less indexed to the growth in net wages.

- The retirement age is 65 for men and 60 for women. The retirement age for women will be gradually raised to 65 between 2024 and 2033.

Simulation model

- The earnings-related schemes were modelled in the aggregate. Survivors' benefits were included.

- Data on total contributions in 1994 were used to calculate an implied contribution rate. This contribution rate was held constant throughout (source: government submission).

- Data on total old-age beneficiaries and total old-age benefits paid in 1994 were used to calculate eligibility ratios and average benefits. National projections of pensions received by newly retired wage earners with 35 years of contributions were used to calculate benefits for new male retirees. Pensions received by new female retirees were calculated as the residual, based on total pensions paid in 1994 (source: government submission).

- Data on total survivors' pensions paid to men and women and total survivors' benefits paid to men and women were used to calculate eligibility ratios and benefit replacement rates for survivors' pensions. These were held constant over time (source: government submission).

- Old-age and survivors' pensions were indexed to wages.

- The model incorporates the increase in the retirement age for women.

- The measures of the spring 1996 savings package are not included.

Belgium

Description

- Belgium has a number of earnings-related schemes, the principal ones being for salaried workers, wage earners, public servants, and a minimum pension scheme. The schemes operate on a pay-as-you-go (PAYG) basis and employee and employer contributions finance about half of yearly expenditures.

- The contribution rate varies according to the scheme, with public-sector employees paying little in the way of contributions and employee and employer contributions in the salaried workers' scheme amounting to approximately 16 per cent of wages.

- Pensions for public-sector employees are considerably higher than pensions for workers in other schemes; with benefits averaging approximately 85 per cent of average wages in 1994. Average benefits in the other schemes range from 33 per cent to 60 per cent of average wages.

- Pensions for public-sector employees are indexed to wages, while pensions in the other schemes are indexed to prices.

- The retirement age is 65 for men and women, but early retirement from 60 on is possible.

Simulation model

- The schemes for salaried workers, wage earners, public servants, and the minimum pension scheme were modelled. The scheme for salaried workers was disaggregated into three separate sub-schemes for men and four separate sub-schemes for women.

- Data on total contributions paid into all of the schemes in 1994 were used to calculate an implied contribution rate. This was then held constant (source: government submission).

- Data on total numbers of beneficiaries in the separate schemes and sub-schemes in 1994 were used to calculate eligibility ratios. These were then held constant for the wage earners' scheme, the public servants' scheme, and the minimum pension scheme. National projections on future numbers of beneficiaries in the sub-schemes of the salaried workers' scheme were used to calculate eligibility ratios for 1995 on in this scheme (source: government submission).

- Data on total benefits paid and benefits paid to new retirees in 1994 in each of the schemes and sub-schemes were used to calculate benefit replacement rates for current and new retirees (source: government submission).

- Pensions for new retirees were indexed to inflation.

- Early retirees were included in the model.

Denmark

Description

- Denmark has a universal pension scheme (the Social Pension) providing retired persons with a flat-rate basic benefit as well as means-tested supplementary benefits. The schemes are financed out of general revenues and benefits are indexed to the growth in nominal wages. Both of these schemes operate on a PAYG basis.

- There is also a fully-funded supplementary scheme (the ATP) which pays benefits based on the number of hours worked.

- In 1994 the Social Pension scheme paid benefits of approximately 38 per cent of average wages.

- The standard retirement age is 67 for men and women, but early retirement is possible at any time if justified by health or social reasons.

Simulation model

- Data on total old-age benefits paid by the PAYG schemes were used to calculate average old-age benefits (source: government budget).

- Data on total numbers of early retirement pensions paid and total early retirement pension benefits were used to calculate average early retirement benefits (source: government budget).

- The eligibility ratio for recipients of early retirement pensions was assumed constant over time.

– Pensions for each new cohort of retirees were indexed to wages.

Finland

Description

– Finland has both a flat-rate scheme, the national pension, and earnings-related schemes, collectively known as the employment pension. The employment pension makes up by far the largest share of the overall pension. There is also a scheme for war veterans.

– The contribution rate for the employment pension is 20.6 per cent. The average contribution rate for the national pension is approximately 3.9 per cent.

– Employment pensions are calculated based on the earnings of the last ten years, with the national pension serving to complement the employment pension. Thus, for new retirees who tend to have accrued full employment pension rights the national pension is usually small, while for older retirees the national pension may comprise half of pension income. The national pension is also relatively more important for women, but is declining in importance for new female retirees.

– On average, new retirees receive total pensions of approximately 58 per cent of average earnings. Pensions for each new cohort of retirees are adjusted with an index-based 20 per cent on the growth in nominal wages, and 80 per cent on the growth in prices.

– The retirement age is 65 for men and women, although early retirement is possible.

Simulation model

– The national and employment schemes were modelled, and the declining relative importance of the national pension scheme was incorporated. Early retirees in the national and employment pension schemes were incorporated as well.

– Total contributions were calculated using contribution rates of 20.6 per cent for the employment pension and 3.9 per cent for the national pension. (Source: Ministry of Finance; *Social Security Programs Throughout the World*, US Social Security Administration, 1995.)

– Average benefits for each scheme were calculated using data on the numbers of recipients and total payments in 1994. Pensions for new retirees were calculated by using data on payments to retirees in the 65-69 age group. The replacement rate generated using these data was then held constant. (Source: government submission; *Statistical Yearbook of Pensioners in Finland, 1994*, *The Finnish Employment Pension Scheme*, Central Pension Security Institute, 1994.)

– Pensions for each new cohort of retirees were adjusted using the mixed wage/price index referred to above.

Iceland

Description

- Iceland has a variety of flat-rate and earnings-related PAYG schemes, and a comprehensive system of fully-funded employment related schemes that provide the bulk of pension benefits. The PAYG schemes are means-tested.

- The contribution rate for the PAYG schemes is approximately 3.8 per cent, and funds roughly half of PAYG expenditures.

- Benefits under the various schemes range from approximately 4 per cent to 34 per cent of average wages.

- The retirement age in the PAYG schemes is in general 67 for men and women. Mariners can retire at 60. As the retirement age in the funded schemes is typically 70, most of the non-seafaring population retire at that date.

- PAYG pensions are indexed to wages.

Simulation model

- The model covers the following schemes: Basic; Income Supplement; Reduced Income Supplement; Additional Supplement; Household Supplement; Additional Household Supplement; Money Support; Petrol Allowance; Residential Home Support; and Survivors.

- Data on total contributions were used to calculate an implied contribution rate of 3.8 per cent (source: *Statistical Abstract of Iceland*).

- Average benefits in each scheme were calculated using data on total benefits and total beneficiaries in 1993 (source: *Statistical Abstract of Iceland*).

- The retirement age was assumed to be 67 for men and women.

- Pensions for each new cohort of retirees were indexed to wages.

Ireland

Description

- Ireland has contributory and non-contributory flat-rate schemes; and a separate scheme for civil servants which is financed out of general revenues.

- Contributions range from zero for those with low earnings to a maximum of 17.7 per cent. Maximum employer contributions of 12.2 per cent have a ceiling of Ir£ 25 800 in annual earnings. Maximum employee contributions of 5.5 per cent have an earnings ceiling of Ir£ 21 500. Earnings above the ceiling are subject to an employee contribution rate of 2.25 per cent.

– Contributions also fund other social security benefits.

– Benefits are means-tested, and there is no formal rule for indexation of pensions.

– The retirement age is 65 for men and women.

Simulation model

– The model covers all of the schemes, including the scheme for civil servants.

– Total contributions were calculated by allocating the share of social security contributions corresponding to the share of pension expenditure in the contributory schemes in total social security expenditure. This was then used to calculate an implied contribution rate (source: government submission).

– Average benefits for civil servants were calculated by dividing total benefits by total beneficiaries, using 1994 as the base year. New retirees were paid a one time bonus of one and a half years average salary (source: government submission).

– Average benefits for non-civil servant retirees were calculated for each scheme by dividing total benefits by the total retired population, less civil servant retirees (source: government submission).

– The model incorporates the future reform to the civil servants scheme.

– Pensions for each new cohort of retirees were indexed to inflation.

The Netherlands

Description

– The Netherlands has a universal flat-rate public pension scheme (the AOW) and a public widows and orphans scheme (the AWW). Although benefits vary by category (e.g. single or married), everyone in a particular category receives the same benefit.

– The contribution rate is 14.55 per cent for the AOW scheme and 1.80 per cent for the AWW scheme. Low-income persons are exempted from contributions and there is a maximum earnings ceiling on contributions as well.

– In 1994 the average pension in the AOW scheme was approximately 30 per cent of average wages.

– The retirement age is 65 for men and women.

– Pensions are adjusted with changes in contractual wages, as long as the inactivity/activity ratio (the ratio of all benefit recipients to those employed) does not exceed 82.3 per cent.

Simulation model

- Data on total benefits paid in the AOW and AWW schemes in 1994 were used to calculate average replacement rates (source: National Accounts).

- Data on total contributions paid in 1994 were used to calculate an implied contribution rate. This was then held constant (Source: National Accounts).

- Pensions were indexed to movements in wages until the inactivity/activity ratio of 82.3 per cent was reached. They were held constant in real terms thereafter.

New Zealand

Description

- The New Zealand superannuation scheme is a flat-rate scheme payable to all persons who have reached the retirement age and meet the residency requirement. Benefits vary by category (e.g. single or married) but everyone within the same category receives the same benefit. There is also a scheme for war veterans.

- The scheme is funded out of general revenues, and superannuation payments are taxable. Where pensioners have other income above a certain level, an additional tax surcharge is applied. Approximately one-fifth of total pension payments are taxed back each year.

- Benefits average approximately 50 per cent of average (before-tax) wages. Pensions are indexed for inflation, and are also adjusted to stay within a band defined as between 65 per cent and 72.5 per cent of average after-tax ordinary time wages.

- As of 1 April 1996 the retirement age will be 62½ for men and women. It will be increased to 65 by 2001.

Simulation model

- National projections of tax revenue from pension payments (including surcharge revenue) were used to calculate tax rates on pension benefits (source: government submission).

- Data on numbers of beneficiaries in 1994 and expected numbers of beneficiaries until 1999 were used to calculate eligibility ratios. (Source: *New Zealand Yearbook*; government submission).

- Data on total benefits paid in 1994 and national projections of total benefits through 1999 were used to calculate benefit replacement rates.(Source: *New Zealand Yearbook*; government submission).

- Pensions for each new cohort of retirees were indexed to wages.

- The model incorporates the increase in the retirement age.

- The model generates projections of future gross and net pensio0n expenditures almost identical to those of national authorities.

Norway

Description

- Norway has both a universal flat-rate and an earnings-related scheme. The earnings-related scheme was introduced in 1967 and requires 40 years of earnings to qualify for a full pension. Consequently, it will not reach maturity until 2007. Special transition rules apply for those persons who retire before 2007, enabling them to obtain a larger pension than would otherwise have been possible.

- A reform introduced in 1992 and designed to ensure the future sustainability of the system will eventually reduce future replacement rates. The first cohort of retirees to have pensions based entirely on these new rules will begin to retire in 2032.

- The social insurance contribution rate, which funds social security benefits in addition to pensions, varies by geographic area. In 1994 the share of social insurance contributions dedicated to financing pension expenditures was approximately equal to 9 per cent of wages.

- The benefit replacement rate for new retirees is currently approximately 55 per cent of average wages. Pensions are adjusted once a year for changes in prices and the overall income level.

- The retirement age is 67 for men and women.

Simulation model

- The model covers both the flat-rate and earnings-related schemes.

- The model takes account of the maturation of the system and the 1992 reform.

- Data on total old-age benefits were used to calculate average old-age benefits. National projections of the replacement rate that will be received by future retirees were used to calculate future replacement rates (source: government submission).

- An implied contribution rate was derived by calculating the share of old-age pension expenditure in total social security expenditure and then applying that share to total social insurance contributions (source: government budget).

- Pensions for each new cohort of retirees were indexed to inflation.

Portugal

Description

- The principal old-age public pension scheme is the *regime geral*, which covers almost all private-sector workers. Separate schemes organised along occupational lines (e.g. for fishermen) are being integrated into the *regime geral*. Civil servants have a separate scheme. There is also a non-contributory minimum pension scheme.

– Contribution rates for the *regime geral* are currently 34.75 per cent for employees and 21 to 24 per cent for the self-employed. Contributions also fund other social security programmes.

– Pension benefits in the *regime geral* are earnings-related and based on income during the last 15 years preceding retirement.

– On average, newly-retired workers in 1994 received benefits equal to 50.8 per cent of average wages. There is no formal indexation rule for adjustment of pensions after retirement.

– The retirement age is 65 for men and is being raised to 65 for women by 2000. In 1995 the retirement age for women was 63.

– Eligibility is universal as all of the elderly are covered at least by the minimum pension scheme.

Simulation model

– The model covers all of the schemes, and includes survivors' benefits.

– Total contributions were calculated by allocating the share of social security contributions corresponding to the share of pension expenditure in total social security expenditure. This was then used to calculate an implied contribution rate (source: government budget).

– Average benefits were calculated by dividing total benefits by total beneficiaries, using 1994 as the base year. Pensions for new retirees in the *regime geral* were calculated using data on pensions paid to new retirees in 1994. Pensions for new retirees in the civil servants' scheme were assumed to equal average benefits for current retirees. The replacement rate generated for new retirees in 1994 in all of the schemes was then held constant for future retirees. Survivors' benefits were calculated similarly (source: government submission).

– The model incorporates the increase in the retirement age for women.

– Pensions for each new cohort of retirees were indexed to inflation.

Spain

Description

– Spain has a variety of earnings-related schemes organised along occupational lines. The primary scheme is the *regime general*, which pays benefits as high as 100 per cent of final salary for workers with a full contribution history of 35 years. In practice, average benefits are much lower.

– Contribution rates and the base on which contributions are paid vary according to the scheme. The contribution rate in the *regime general* is 28.8 per cent.

– The government makes contributions to the schemes on behalf of the unemployed.

– Benefits accrue at a rate of 4 per cent per year for the first 15 years of employment, and then 2 per cent per year for the next 20 years, up to a maximum of 100 per cent of the final salary.

– The retirement age is 65 for men and women, but early retirement is possible from 60 on subject to an actuarial reduction. The temporary and permanent disability schemes are widely used as a form of early retirement.

– Pensions are effectively indexed to inflation.

Simulation model

– The simulation model covers the *regime general,* and the schemes for farmers and the self-employed. The temporary and permanent disability schemes are included as well.

– Contributions were calculated by taking the contribution rates for each scheme and applying them to the share of the workforce who are employees, farmers and the self-employed, respectively (source: government budget).

– Government contributions on behalf of the unemployed were excluded (source: government budget).

– Average benefits were calculated by using government data on total old-age benefits paid and total beneficiaries in 1994. Beneficiaries of disability pensions were assumed to be a constant share of the work force (source: government budget).

– Pensions for each new cohort of retirees were indexed to inflation.

– For further information see *OECD Survey of Spain*, 1996.

Sweden

Description

– Sweden has a universal flat-rate scheme and an earnings-related scheme for employees. Under a reform which will be phased in between 2000 and 2019 the two schemes will be merged into a single earnings-related PAYG scheme with benefits based on lifetime contributions.

– Employee and employer contributions are approximately 5.4 per cent for the universal scheme and 13.6 per cent for the earnings-related scheme. Under a reform which went into effect in 1995, employees now pay contributions into the earnings-related scheme.

– Recipients of both the universal and earnings-related pensions now receive average benefits of approximately 50 per cent of average wages. Under the reform persons who work for 40 years and receive real wage increases of 2.0 per cent per year should receive about 55 per cent of their final wage upon retirement at 65.

– The retirement age is 65 for men and women, but early retirement is possible from 60 on, subject to an actuarial reduction.

– Pension benefits are effectively indexed to inflation.

Simulation model

- Both the universal and flat-rate schemes were modelled.

- Data on contributions were taken from the national accounts to calculate an implied contribution rate. Employee contributions to the earnings-related scheme were included beginning in 1995.

- Average old-age benefits in each scheme were calculated using data on numbers of beneficiaries and total benefits paid in 1994 (source: government submission).

- Average early retirement benefits in each scheme were calculated using data on numbers of beneficiaries and total benefits paid in 1994 (source: government submission).

- Pensions for each new cohort of retirees were indexed to inflation.

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