

# AGEING AND FISCAL POLICIES IN THE EUROPEAN UNION

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Preliminary draft

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## Executive Summary

The study, which is part of a research project on the prospects for public finances in the EU Member States, aims at providing estimates of the budgetary effects of demographic changes in EU Member States over the coming decades and at developing a methodological framework for monitoring budgetary trends in Member States over the medium and long-term.

The study integrates the results of the most recent pension expenditure projections carried out by national authorities with estimates of the effects of demographic changes on the other main age-related expenditure items (such as health care, education and family allowances) to provide tentative estimates of the changes in the ratio of public primary expenditure to GDP under constant policies in six EU Member States over the period up to the year 2030.

An indicative measure of the primary balance trend, derived from the expenditure trends, is then used to evaluate the adjustments required on the primary balance over the period 1998-2030 to implement the "close-to-balance" rule indicated in the Stability and Growth Pact.

Several aspects of the project need substantial refinement and improvement. The estimates included in the note therefore indicate only the broad direction of the impact of demographic change and the broad dimension of required policy adjustment. Some general results are, however, rather clear.

Under constant policies, in most of the countries considered the ratio of public expenditure to GDP is likely to increase substantially. The effects of ageing on pension and health expenditure, in spite of recent reforms, would not be offset by the reduction in the demand for the public services and transfers directed to young citizens.

This implies that present primary surpluses would be gradually eroded by expenditure increases and that, if present expenditure policies are continued, in most countries population ageing will result in the long-run either in greater deficits and debts or in large increases in tax rates.

In most countries, the implementation of the "close-to-balance" rule indicated in the Stability and Growth Pact would require substantial changes to present budgetary policies. The achievement of a balanced budget over the next few years would nevertheless allow Member States to meet the worsening of the demographic situation after the year 2010 (when the baby-boom generation will retire) with smaller public debts. The ensuing reduction in interest payments would allow Member States to offset part of the likely increases in pension and health expenditure.

The "close-to-balance" rule would force governments to make use of the "breathing-space" available over the next decade to meet the ageing of the "baby-boom" generation on a sounder fiscal policy footing. This would reduce the total adjustment required on the primary balance.

## 1. Introduction\*

Changes in birth rates, life expectancy and migration flows are modifying the level and structure of the population of European Union Member States. The increase in the old-age dependency ratio, which is reaching historically unprecedented levels, is one of the most evident and important trends.<sup>1</sup> In the coming decades, demographic changes will produce pervasive effects on labour and capital markets, goods and services markets, macroeconomic aggregates and relative prices.<sup>2</sup> They will also affect public budgets, through their effects on the demand for public services and transfers and, indirectly, through their effects on the above-mentioned economic factors.

Significant pressures towards higher public expenditure are expected in the pension and health sectors. On the other hand, the decline in the share of young people in total population tends to reduce the demand for public services and transfers in other areas, namely education, maternity and child allowances. Overall, there is a widespread consensus that demographic changes tend to increase public expenditure and produce negative effects on public budgets.<sup>3</sup> These pressures, unless offset by policy changes, might endanger the fiscal framework designed in the Maastricht Treaty and the Stability and Growth Pact.

Both at national and EU level, studies are needed to evaluate, well in advance, the budgetary effects of these demographic changes. At national level, such evaluations should guide the adjustment of expenditure programs to the new demographic conditions. At Union level, systematic evaluations of the medium and long-term prospects of public budgets would contribute to signal trends potentially undermining the rules introduced for deficits and debts. This is particularly relevant since budgetary pressures arising from demographic changes will vary very much across the EU according to different national demographic trends and public expenditure structures. More specifically, indicators of medium- and long-term trends in public budgets could provide a framework for the assessment of the Stability and Convergence Programs.

**Objectives** - The study, which is part of a research project on the prospects for public finances in the EU Member States, has two objectives:

- a) to provide some preliminary estimates of the budgetary effects of demographic changes in some EU Member States over the coming decades;
- b) to develop a methodological framework for monitoring budgetary trends in Member States over the medium and long-term.

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\* The views expressed in this paper represent exclusively the positions of the authors and do not necessarily correspond to those of the European Commission. The authors would like to thank M. Jones, ..., for valuable comments and suggestions and C. John, R. Vanne and J. Walliser for having made available unpublished age-related expenditure profiles.

<sup>1</sup> See European Commission (1995, 1996) and OECD (1988a).

<sup>2</sup> See European Commission (1994), Börsch-Supan (1991), Hagemann and Nicoletti (1989).

<sup>3</sup> See Heller *et al.* (1986), OECD (1988a) and Leibfritz *et al.* (1995).

More specifically, as to the first objective, the study provides elements to assess the sustainability of current EU Member States' fiscal policies, i.e. the possibility of maintaining present expenditure and revenue policies without excessive debt accumulation, taking into account the impact of expected demographic changes. It also estimates the adjustments required to ensure the implementation of the "close-to-balance" rule outlined in the Stability and Growth Pact. The problem of developing indicators of long-term trends of public budgets is approached with a view that "a good indicator of sustainability is one which sends clear and easily interpretable signals when current policy appear to be leading to a rapidly growing debt to GDP ratio".<sup>4</sup>

**Methodology** - The first part of the study considers alternative indicators of long-term budgetary trends and examines the characteristics and results of the main international studies which have examined long-term public expenditure prospects in recent years. Some projections carried out by public institutions in EU Member States are also taken into consideration.

The following parts of the study provides some tentative estimates of the changes in the ratio of public primary expenditure to GDP in some EU Member States over the period up to the year 2030 by integrating:

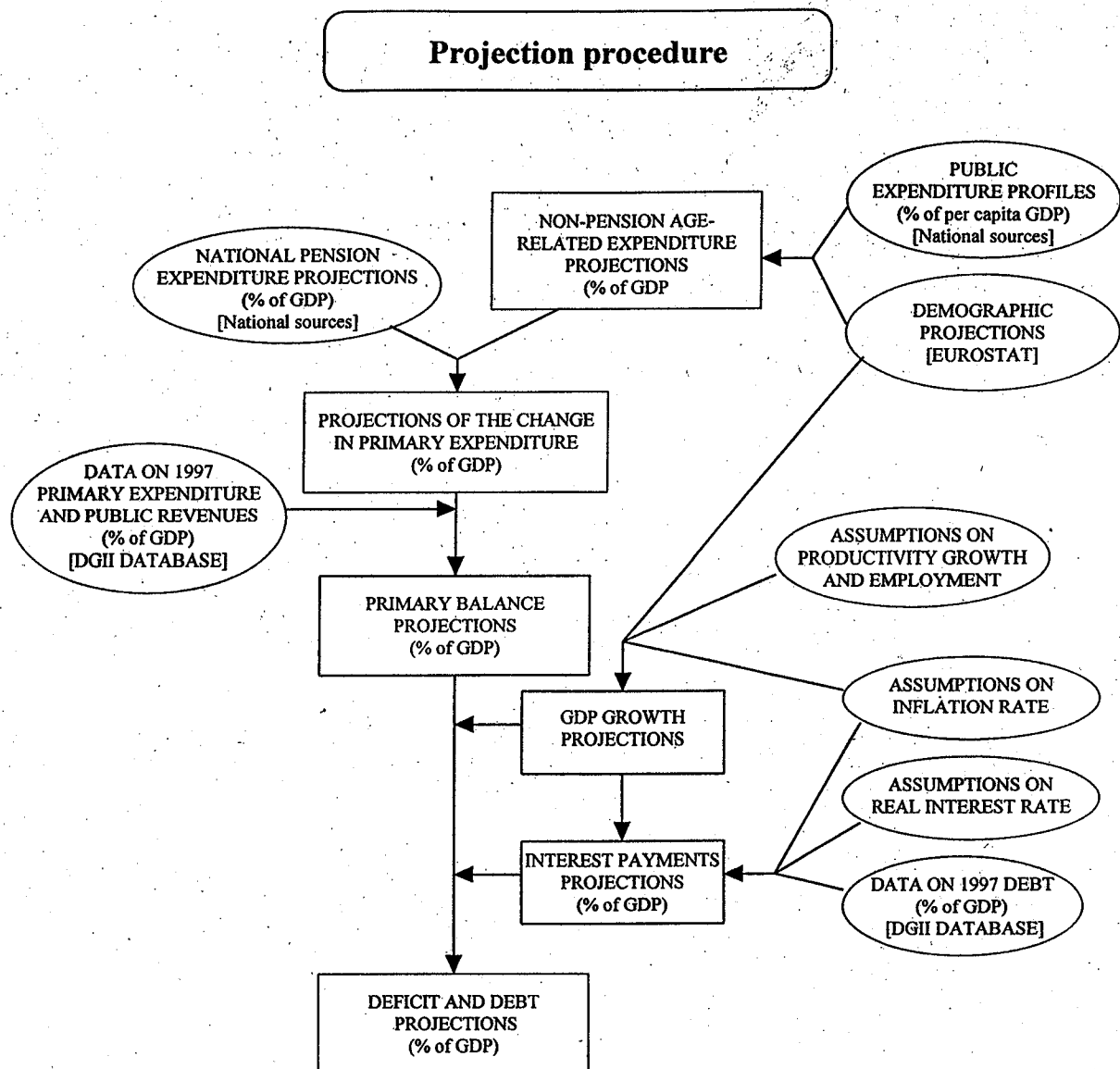
- (i) the results of the most recent pension expenditure projections carried out by national authorities (see the report on "Pension expenditure projections in Europe: A survey of national Projections" - European Economy, 1996, No. 3),
- (ii) mechanical estimates of the effects of demographic changes on the other main age-related expenditure items (such as health care, education and family allowances). At present, these estimates are provided for only six Member States for which data are available (Belgium, Finland, Germany, Italy, Spain and Sweden). The estimates are produced by combining data on per capita expenditures for different age-groups and for different budgetary items, expressed in terms of per capita GDP, with Eurostat's new demographic projections for the period 1995-2050. Age-related profiles of public expenditure have usually been obtained from generational accounting studies. Alternative demographic scenarios are considered, as well as alternative dynamics of age-related per capita expenditure.

An indicative measure of the primary balance trend is then obtained by adding the projected changes of age-related public expenditure to the primary balance level expected for 1997, assuming that revenues and age-unrelated expenditure are constant in GDP terms at their present levels. The estimates for the primary balance are finally used to project the ratio of public debt to GDP on the basis of assumptions on interest rates and productivity growth. For an outline of the projection procedure, see Chart below.

The estimates for the primary balance are also used to evaluate the adjustments required on the primary balance over the period 1997-2030 to achieve the "close-to-balance" rule indicated in the Stability and Growth Pact.

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<sup>4</sup> Blanchard *et al.* (1990, p. 8).



In order to have a concise and comparable measure of the adjustment required for each country, the study also estimates the “tax-gap” consistent with the implementation of the “close-to-balance” rule outlined in the Stability and Growth Pact. (i.e. the change in the tax to GDP ratio immediately required in order to reach, by the end of the projection period, the debt to GDP ratio that would be reached by implementing the “close-to-balance” rule). The tax-gap concept allows a comparison of the adjustments required by the “close-to-balance” rule with those that would be required to keep the debt to GDP ratio by the end of the projection period at the present level (i.e., the “sustainable tax-gap” *à la* Blanchard). It also allows comparisons of alternative macroeconomic scenarios.

**Notes of caution** - The limitations of this approach should be stressed.

- a) National pension projections are taken at face value; no attempt has been made to evaluate the reliability of the projections presented in the preceding sections. An indirect indicator of the reliability of projections is, however, provided by the

adjustments implemented in projections over time. The fact that estimates have been usually revised upwards<sup>5</sup> may suggest that there is tendency to underestimate expenditure trends. Moreover, the economic and demographic assumptions underlying the national projections are not homogeneous and may also differ from those used for projecting non-pension expenditure items.

- b) The approach used for projecting non-pension expenditure items is purely mechanical and takes only demographic factors into consideration. Demographic factors actually affect public budgets through several more complex channels. Moreover, public expenditure and revenue dynamics largely depend on non-demographic factors. Therefore, the estimates indicate only the *broad direction of the impact of demographic change* and the *broad dimension of required policy adjustment*.
- c) Some estimates of per capita expenditures for different age-groups and for different budgetary items are still rather unsatisfactory (for instance, the expenditure profiles for Spain consider only three large age-groups, those for Belgium refer to 1988 data, education expenditure is not considered for Germany and Sweden). Therefore the results presented in this draft are preliminary.
- d) Some assumptions (e.g., productivity growth, interest rates) are necessarily arbitrary. Sensitivity analysis is carried out to evaluate the implications of alternative assumptions.
- e) Present ratios of non age-related expenditure and revenue to GDP are assumed to remain constant over time. Some expenditure and revenue items are actually temporary (e.g., the expenditure related to German reunification and the one-off tax measures implemented by some governments). In order to evaluate the adjustment required by demographic changes under unchanged policies, expenditure and revenue ratios should be corrected for the most important of these temporary items.
- f) Labour force participation rates and unemployment rates are at present assumed constant over the projection period, as well as age-related per capita expenditure for unemployment benefits. As indicated in some national reports on long-term expenditure trends, unemployment rates and unemployment benefit expenditure are likely to decline.

**Structure of the paper** - The paper is structured as follows. Section 2 presents alternative indicators of long-term budgetary trends and examines the characteristics and results of the main international studies which have examined long-term public expenditure prospects in recent years. Some national projections are also taken into consideration. Section 3 presents the methodology for the estimates of age-related public expenditure trends; it also presents some estimates of the burden that these expenditures will represent for the working-age population. Section 4, drawing from a survey of national pension expenditure projections carried out within the European Commission, examines expected pension expenditure trends. Section 5 provides some tentative estimates of the ratio of age-related public expenditure to GDP by integrating national pension projections with the mechanical estimates of the effects of demographic changes on the age-related expenditure items. It also estimates primary balance trends under the assumption that revenues and age-unrelated expenditure remain constant as a share of

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<sup>5</sup> See Franco and Munzi (1996).

GDP. Finally, it provides estimates of the adjustments required on the primary balance over the period 1998-2030 to implement the "close-to-balance" rule indicated in the Stability and Growth Pact. The implications of the exclusion of some expenditure and revenue items of a temporary nature, as well as of different interest rates and productivity growth rates are also considered. Comparisons of different scenarios are presented in terms of tax-gaps. Section 6 outlines the main results of the study and point to directions for further work.

## **2. Indicators of medium- and long-term trends in public budgets**

Since the mid-80s, when it became apparent that Western countries were experiencing major changes in their demographic structure, an increasing number of studies have examined the long-term prospects of public budgets. The studies were prompted by the widespread perception that population ageing was going to increase the demand for public expenditure and produce negative effects on public budgets.

Two lines of research have been followed: one group of studies has evaluated the prospects of the main age-related expenditure programs and has produced projections of the ratio of age-related expenditure to GDP; projections of the primary balances have also been derived assuming age-unrelated expenditures and revenues to remain constant as a percentage of GDP.<sup>6</sup> Another group has taken all budgetary items into account in the Generational Accounting framework developed by Auerbach and Kotlikoff.<sup>7</sup> These two lines of research are examined in Sections 2.1 and 2.2 respectively.

### **2.1 Projections of age-related public expenditure**

The studies examining the prospects of age-related expenditure programs focus on the items of public expenditure which are particularly dependent on the age structure of the population (such as pension, health, education). They combine data on per capita expenditures for different age-groups and for different budgetary items with demographic projections. Some studies consider only the effects of demographic changes, while others also try to capture some non-demographic factors such as pension scheme maturation and long-term trends towards higher health expenditure. Some studies go further and develop projections for the primary balance and estimates of the adjustments required to ensure budgetary sustainability.

**2.1.1 Mechanical projections of the effects of demographic changes** - The most basic approach provides estimates of the effects of demographic changes on public expenditure under the assumption that age-related per capita expenditure levels remain constant in real terms or in per capita GDP terms on the initial level over the projection period. In other words, it is assumed that present standards of transfers and services are maintained for all population age-groups and that there is no behavioural response from governments and households to demographic changes and their budgetary effects.

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<sup>6</sup> Leibfritz *et al.* (1995), Roseveare *et al.* (1996) and OECD (1996) are among the most recent studies on the issue.

<sup>7</sup> See Auerbach *et al.* (1991, 1994) and Kotlikoff (1992).



Some mechanical projections aimed at evaluating the pure impact of demographic changes were carried out by OECD in 1988 for 12 countries (see OECD, 1988a). The burden for the financing of the main social programmes per working-age citizen was projected up to the year 2040 (see Box 1). Demographic pressure on pension and health expenditure was expected to be very large in all the countries considered. Education and family benefits, which are mostly related to younger age-classes, were expected to decrease in all countries, but not enough to offset the increase in pension and health expenditure. Over the period 1980-2040 the burden would grow by 54 per cent in Germany, 39 per cent in Italy and the Netherlands, 32 per cent in France, 20 to 26 per cent in Belgium, Sweden and Denmark and 11 per cent in the UK (Table 1). At the end of the period, the ratio of social expenditure to GDP would be in the 37-49 per cent range in all the above-mentioned countries (Table 2), with the only exception of the UK (24 per cent). The pressure of ageing on social expenditure was expected to increase substantially from 2010 onwards, when the "baby boom" generation reaches retirement age. A breathing space would therefore be available for taking corrective action.

However, it should be stressed that estimates combining data on per capita expenditures for different age-groups and for different budgetary items with demographic projections are only *indicative measures* of the likely effects of demographic change on public expenditure, since they do not take all relevant effects of demographic changes into account.<sup>8</sup>

- a) Mechanical estimates are based on the implicit assumption that the marginal cost of providing services to a smaller or a larger number of individuals in each age group in the future will be equal to the present average cost of these services.<sup>9</sup> In other words, it is assumed that there are no economies or diseconomies of scale in the production of public services. This assumption is surely implausible over relatively short periods, because of time-lags in the adjustment of inputs to changes in demand for public services.
- b) Mechanical estimates implicitly assume that demographic changes do not modify present age-related per capita expenditure levels, while they can actually affect them through many different channels. Demographic changes can influence the cost of inputs used in services (e.g., a relative shortage of young workers may increase the cost of public services employing them)<sup>10</sup> and the demand for some services (e.g., the reduction in the number of children may increase the demand for elderly care). They can also affect productivity trends, wage rates and saving ratios.

Economies/diseconomies of scale and the effects of demographic changes on the level of age-related per capita expenditure are not usually taken into account in expenditure projections. While the failure to consider economies and diseconomies of scale may compromise short period estimates, that concerning system-wide effects may affect long period estimates.

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<sup>8</sup> This point is made in OECD (1988a), pp. 27-28.

<sup>9</sup> See also the several criticisms expressed in Pearson *et al.* (1989).

<sup>10</sup> This point is stressed in Pearson *et al.* (1989).

Table 1

## PUBLIC EXPENDITURE PROJECTIONS: IMF (1986) AND OECD (1988)

Country	IMF (1986)					OECD (1988)				
	Pensions	Health	Education	Family Benefits	Total Social Expenditure	Pensions	Health	Education	Family Benefits	Total Social Expenditure
Belgium						158	116	84	87	120
Denmark						178	136	83	87	126
France	130	140	90	87	113	177	123	82	86	132
Germany <sup>(3)</sup>	154	159	82	67	125	200	143	84	95	154
Italy	171	130	75	-	138	174	140	81	83	139
The Netherlands						184	157	80	79	139
Sweden						138	131	93	94	122
United Kingdom	144	144	80	85	116	131	122	86	87	111
U.S.A.	110	172	74	-	110	171	141	81	91	131
Canada	123	152	75	42	102	236	169	80	85	145
Australia						181	151	80	79	130
Japan	319	168	86	-	176	252	161	87	85	154

1) Baseline Economic and Demographic Scenario. Calculated from Table 14.

2) Medium fertility variant. Calculated from Tables 19 and 22.

3) West Germany.

Sources: Heller *et al.* (1986) and OECD (1988a).

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Table 2

## PUBLIC EXPENDITURE PROJECTIONS: IMF (1986) AND OECD (1988)

Country	IMF (1986)					OECD (1988)				
	1980	2000	2010	2025	2040	1980	2000	2010	2020	2040
Belgium						38.2	36.3	37.1	39.3	45.8
Denmark						34.9	30.7	33.2	35.9	44.0
France	31.0	32.4	32.6	35.1		28.3	28.3	29.4	32.8	37.4
Germany <sup>(3)</sup>	31.1	33.2	35.3	38.8		30.8	32.6	34.8	38.2	47.4
Italy	25.1	27.7	30.2	34.7		26.9	26.6	28.5	31.2	37.4
The Netherlands						35.5	35.5	36.9	40.5	49.3
Sweden						32.5	30.9	32.5	35.8	39.7
United Kingdom	22.9	22.9	24.0	26.5		22.0	20.5	21.1	22.2	24.4
U.S.A.	17.7	16.4	16.6	19.4		20.7	19.9	20.5	24.2	27.1
Canada	20.3	17.4	17.4	20.7		21.0	21.6	22.9	26.3	30.5
Australia						18.6	18.6	19.2	20.8	24.2
Japan	15.4	21.1	25.9	27.2		16.9	19.4	23.2	24.0	26.0

1) Baseline Economic and Demographic Scenario. Reported from Table 14.

2) Medium fertility variant. Computed on the basis of the share of social expenditure in GDP in 1980 reported in Table 21 and the index of the financing burden per head of 15-64 age group as reported in Table 22.

3) West Germany.

Sources: Heller *et al.* (1986) and OECD (1988a).

Moreover, it should be stressed that demographic change is just one of the several factors affecting public expenditure dynamics. The contribution of mechanical estimates of the effects of demographic changes to the assessment of the prospects for public expenditure is therefore necessarily limited.

Box 1

### Main international projections of age-related public expenditure

At the international level, two major studies were carried out by IMF and OECD in the second part of the 1980s; a third was carried out by OECD in 1995 and updated in 1996. By combining data on per capita expenditure for each age-group within the various social programmes with demographic projections, OECD (1988a) evaluated the pure impact of demographic changes while the IMF study (Heller *et al.*, 1986) and the second OECD study (Leibfritz *et al.*, 1995 and Roseveare *et al.*, 1996) also considered some additional factors influencing pension and health expenditure. Both the earlier studies covered the five major social programs: education, health care, pensions (old-age, survivors and invalidity), unemployment compensation and family benefits. OECD (1996) also projected total public expenditure. OECD covered 12 countries in the first study and 20 in the second; IMF considered only the seven major Western countries.

OECD (1988a) baseline population projections were based on the assumption of (a) gradual convergence of fertility rates to replacement level, (b) an increase in life expectancy of 2 years for each sex between 1983 and 2030, (c) zero or low levels of net migration. IMF's baseline scenario was somewhat similar: (a) gradual increase in total fertility ratio that by 2010 reaches the replacement level in five out of the seven countries, (b) increase in life expectancy at birth of 3.4 years for males and 2.5 for females between 1980 and 2010, (c) limited net emigration from Germany and immigration to Canada and the United States. Two more scenarios were considered in the IMF paper. They both envisage a "Greater Ageing" situation with fertility broadly constant at 1980 levels and with a life expectancy increase of 6.7 years for males and 4.8 years for females. One scenario shares the baseline economic assumptions, while the other takes a more pessimistic view of growth and employment. In OECD (1988a), the share of the elderly (65 and over) in total population for the whole OECD was projected to rise from 12.2 per cent in 1980 to 15.4 per cent in 2010 and 22.1 in 2040. For the seven major countries it was projected to rise from 12.5 per cent in 1980 to 16.4 and 22.8 per cent respectively. The share of the elderly on the working age population was expected to grow at a faster rate. In the IMF projections the ageing process was slower; in the seven countries the share of population aged 65 and over was projected to rise from 12.5 per cent in 1980 to 15.9 in 2010 and 19.5 in 2025 (respectively 17.3 and 22.3 per cent in the Greater Ageing scenario).

OECD (1988a) follows a two-step approach: first it estimates the change in expenditure in real terms implied by projected demographic changes (i.e., what would be the expenditure level in the base year under different demographic conditions, all other factors being equal); then it takes into consideration the capacity to finance public expenditure by dividing the index of projected expenditure levels by the index of the number of working-age citizens (15-64 age group).

IMF (Heller *et al.*, 1986) projections of pension and health expenditure also considers some non-demographic factors. The growth in the number of pensioners and the dynamics of the average pension are projected taking the maturity of the different systems into consideration. More specifically, the average pension was expected to grow faster than implied by indexation arrangements for Italy, Japan and the United Kingdom. As to health expenditure, the study outlines a baseline scenario in which average medical costs increase in line with productivity and an alternative scenario, more closely corresponding with historical experience, in which they grow by 0.3 to 0.9 percentage points per year faster than productivity.

In the new projections produced within OECD in 1996 (see Roseveare *et al.*, 1996 and OECD, 1996, that extend the results of Leibfritz *et al.*, 1995), the impact of population ageing on public pensions, public health expenditure and the overall budget position were examined under the assumption of constant expenditure and revenue policies. As to pension expenditure, a simulation model was developed for each country taking legislated reforms into account. Despite the efforts

to capture the institutional arrangements, simplifying assumptions were necessary. Projections were carried out for a baseline and four alternative scenarios. Two alternative approaches were taken for health expenditure projections. In the first, expenditure trends were estimated by multiplying present per capita public health expenditure levels by the total number of elderly people; in the second, they were estimated by multiplying per capita health expenditure by the number of deaths among the elderly population. The latter approach is based on the consideration that consumption of health care is concentrated in the period preceding death, so that increases in life expectancy determine an increase in the healthy portion of life. Three alternative assumptions on the growth of per capita health expenditure were considered for each approach (with expenditure growing at the same rate of real GDP, 1 per cent slower and 1 per cent faster). In order to estimate the effects of ageing on the overall fiscal position, the other expenditure items and public revenues were assumed to remain constant as a percentage of GDP. In Leibfritz *et al.* (1995) specific projections were also carried out for education expenditure; spending per pupil was assumed to grow in line with productivity growth.

**2.1.2 Projections considering non-demographic factors** - In order to take non-demographic factors into consideration, it is necessary to remove the assumption that age-related per capita expenditure levels remain constant in real terms or in per capita GDP terms on the initial level over the projection period. This implies assuming that standards of transfers and services will change over time.

While several economic, political and social factors can obviously affect the dynamics of per capita transfers and services, the studies examining the prospects of age-related expenditure usually focus only on two rather specific factors: the effects of changes introduced in legislation, but not yet embodied in present expenditure profiles, and the continuation of structural expenditure trends. These two factors are considered because they are consistent with a constant policy approach, while there is usually no attempt to predict the effects of changes in behaviours and policies.

The effects of changes introduced in legislation, but not yet embodied in present expenditure profiles, are particularly relevant for pension expenditure projections. Since pension eligibility and transfer ratios<sup>11</sup> can change considerably over time because of the maturation of schemes, i.e. the process of adjustment of all pensions to present retirement rules.<sup>12</sup> On the one hand, pension coverage extensions and benefit improvements usually produce their full effects on the two ratios after many decades. On the other, quite often pension benefit curtailment reforms are implemented gradually and only display their full effects a long time later.<sup>13</sup> Therefore, the assumption that age-related per capita expenditure levels remain constant is not equivalent to a constant policy assumption. It implies that all the effects of changes introduced in legislation are reflected in present age-related per capita expenditure levels.

The continuation of structural expenditure trends (i.e., the assumption that some non-demographic factors relevant in the past would continue to affect expenditure dynamics in the future) is especially relevant for health care expenditure projections. In several countries the health sector has recorded for long periods a price deflator substantially

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11 For a definition of eligibility and transfer ratios, see Section 4.

12 The maturation of pension schemes is examined in Franco and Munzi (1996).

13 See OECD (1988b).

higher than the GDP deflator and a tendency towards a continuous increase in per capita consumption.<sup>14</sup>

Projections integrating the mechanical effects of demographic changes with estimates of some additional factors influencing pension and health expenditure were produced by the IMF in 1986 for the seven main Western economies (see Box 1).<sup>15</sup> The growth in the number of pensioners and the dynamics of the average pension were projected taking the maturity of the different systems into consideration. As to health expenditure, the study outlined a scenario in which average medical costs were rising more rapidly than productivity. For France and Germany IMF's estimates for total social expenditure were similar to those of OECD (1988a). The IMF projected larger increases than OECD for Italy, Japan and the United Kingdom and more limited increases for the United States (Table 2).<sup>16</sup>

New projections were produced by OECD in 1995 for the seven major Western economies; they were updated and extended to 20 countries in the following year (see Box 1).<sup>17</sup> Pension expenditure was projected up to the year 2070 taking present expenditure levels and the expected effects of major legislated changes in pension rules into account. Health-care projections were carried out up to the year 2030 under six alternative scenarios. Contrary to previous projections, the ratio of education expenditure to GDP was assumed to remain constant.

In OECD's recent projections, under the baseline scenario, over the period 2000-2030 in most countries the increase in pension expenditure would range between 4 and 6 percentage points of GDP; the only exceptions would be Ireland, the United Kingdom and the United States with lower increases, and Finland and Italy with an increase of about 8 points of GDP (see Table 3). Health expenditure would also increase substantially, with most of the countries in the 1 to 3 per cent bracket (Ireland and the United Kingdom would record lower increases). The burden for pension and health expenditure would increase mostly in the period 2015-2030.

Growing awareness for population ageing has also led to a substantial increase in the resources devoted to national long-term public expenditure projections.<sup>18</sup> Most projections consider only one expenditure sector, with pensions, health, education being the most frequently considered. The projections for pension expenditure are examined more extensively in Section 4. Projections for all the main public expenditure items are

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14 OECD (1993) decomposed nominal health care expenditure growth over the period 1980-1990 for the OECD area (11.8 per cent per year) into the effects of general inflation (8 per cent), medical specific inflation (0.7 per cent), the increase in volume of services (2.9 per cent, of which 2.4 per cent was attributed to the increase in per capita services and only 0.3 per cent was due to the ageing process.).

15 See Heller *et al.* (1986).

16 The difference in the estimates for the United States is due to the fact that, while the IMF considered the effects of the pension reform introduced in the early eighties, OECD (1988a) assumed that real per capita social benefits by age within each programme remained fixed at their 1980 levels.

17 See Leibfritz *et al.* (1995), Roseveare *et al.* (1996) and OECD (1996).

18 Some long-term projections were carried out also in the past. The Beveridge Report in 1942 included, for instance, a 30 year estimate of social expenditure in the UK.

available for only some countries. Four studies produced by Belgian, Danish, Finnish and Italian public institutions are examined in Box 2.<sup>19</sup> The Belgian and Italian projections appear less pessimistic than those carried out by IMF and OECD.

Box 2

### National projections of age-related public expenditure

The Belgian Bureau du Plan (Englert *et al.*, 1994) projected total public expenditure up to the year 2050 with the MALTESE model that allows non-demographic factors to be taken into consideration (i.e. the macroeconomic framework, socio-economic behaviour of agents and social policies). The projection considers the main age-related items (pensions, health care, unemployment benefits, family allowances, other social transfers) as well as the remainder of public expenditure. According to the most favourable scenario considered, the share of total public expenditure to GDP would increase from 41.6 per cent in 1990 to 45.4 per cent in 2030 and then decline to 43.8 per cent by the year 2050 (see table below). The increase in expenditure ratio would depend on pensions and health care, since expenditure for the other items is expected to decline.

#### Belgium - Englert *et al.* (1994)

Year	Social public expenditure					Other public expenditure			TOTAL
	Pensions	Health	Unemployment	Family allowances	Other social transfers	Public consumption	Transfers to firms	Other transfers	
1991	10.5	5.2	2.2	1.9	4.1	14.7	2.3	0.7	41.6
2000	11.6	5.7	2.2	1.6	3.9	14.5	2.1	0.9	42.5
2030	15.7	7.4	0.6	1.0	3.3	14.5	2.1	0.9	45.4
2050	14.7	7.6	0.5	0.8	3.0	14.3	2.1	0.9	43.8

Note: Favourable scenario assuming that private employment grows at 0.75 p.a. and GDP at 2.35% p.a.

The Danish Ministry of Finance (1995) projected public expenditure on transfers and services to elderly and young citizens. The share of public expenditure to GDP is expected to rise from 18 per cent in 1995 to about 19.5 per cent in 2005 and to more than 24 per cent in 2030. The increase in the expenditure for the elderly would not be compensated by a reduction of the expenditure for young citizens, which would also increase, particularly over the period up to 2010. The assumptions underlying these projections imply that changes in the burden for elderly and young citizens reflect changes in the size of these population groups. Sensitivity analysis was carried out to evaluate the effects of changes in unemployment rates, average retirement age, productivity growth in public services and life expectancy.

#### Denmark - Ministry of Finance (1995)

	Public expenditure for young citizens	Public expenditure for old citizens	TOTAL
1995	4.9	13.1	18
2005	5.8	13.7	19.5
2030	6.2	18.3	24.5

Note: It is assumed that the unemployment level is constant from 1995 onwards, that the ratio of the number of employees in services for the elderly to the number of elderly citizens is constant, and that public wages and transfers are adjusted in line with private sector wage dynamics.

<sup>19</sup> For the United States see Shoven *et al.* (1991), that consider expenditure programs representing about 40 per cent of public expenditure and carry out projections for the period up to the year 2040.

Table 3

## PUBLIC EXPENDITURE PROJECTIONS: OECD (1996)

Country	Expenditure/GDP		Effects of the demographic changes on net primary balance					Total
	Change in the period 2000-2030		Net primary balance/GDP					
	Health	Pensions	1995	2000	2015	2030	Change in the period 2000-2030	
Austria	-2.8	-5.8	-2.7	0.9	-2.3	-7.7	-8.6	
Belgium	-2.2	-4.2	4.3	5.9	5.7	-0.5	-6.4	
Denmark	-1.6	-4.5	2	3.8	1	-2.3	-6.1	
Finland	-2.8	-8.3	-4.3	2.3	-2.5	-8.8	-11.1	
France	-2	-3.7	-1.6	1.2	-0.1	-4.5	-5.7	
Germany	-1.5	-5	-0.6	-0.1	-0.2	-6.6	-6.5	
Ireland	-0.7	0.1	1.8	0.6	0.6	0.0	-0.6	
Italy	-2	-7.7	3.4	3.8	4.0	-5.9	-9.7	
Netherlands	-3.3	-5.5	1.4	2.8	0.0	-6.0	-8.8	
Portugal	-1	-6.1	0.6	1.5	-0.4	-5.6	-7.1	
Spain	-1.3	-4.6	-1.1	1.5	0.5	-4.4	-5.9	
Sweden	-1.7	-3.9	-5.1	2.9	0.2	-2.7	-5.6	
United Kingdom	-0.9	-1	-2.8	0.5	-0.1	-1.4	-1.9	
U.S.A.	-1.6	-2.4	0.4	0.2	-0.6	-3.8	-4	
Japan	-1.3	-5.9	-3.4	-1.5	-6.0	-8.7	-7.2	

Source: Roseveare *et al.* (1996)



Table 4

## INDICATORS OF SUSTAINABILITY OF FISCAL POLICY - OECD (1990)

Country	(percentage of GDP)					Short-term gap (1989)	Medium-term gap (1989-1994)
	Pensions only		Long-term gap (1989-2029)				
	Pensions and health, assuming a medical cost differential of:						
	0 per cent	1 per cent	2 per cent				
Austria	0.3	-	-	-	-	1.1	-0.7
Belgium	-2.2	-2.2	-1.5	-0.7	-	0.3	-1.5
Denmark	-3.1	-3.1	-2.4	-1.4	-	-2.3	-2.7
Finland	1.5	-	-	-	-	-2.5	-1.5
France	0.6	0.9	1.9	3.1	3.1	-0.1	-0.6
Germany	0.1	0.2	1.0	2.0	2.0	-2.0	-2.8
Greece	9.4	-	-	-	-	11.9	11.1
Ireland	-6.2	-	-	-	-	-0.9	-3.2
Italy	5.4	5.6	6.1	6.7	6.7	5.2	4.6
Netherlands	2.5	3.1	4.1	5.4	5.4	1.3	0.6
Portugal	-	-	-	-	-	-	-
Spain	1.4	-	-	-	-	0.3	0.6
Sweden	-0.4	-0.2	1.0	2.5	2.5	-3.4	-2.5
United Kingdom	-3.8	-3.6	-3.0	-2.2	-2.2	-3.5	-3.7
U.S.A.	0.1	0.6	1.4	2.3	2.3	-0.3	-0.6
Japan	0.7	1.4	2.2	3.3	3.3	-3.0	-3.1

Source: Blanchard *et al.* (1990).

The Finnish Ministry of Social Affairs and Health (1994) carried out social expenditure projections for the period 1990-2030 on the basis of three macroeconomic scenarios. In the baseline scenario, the share of social expenditure to GDP is expected to increase from 27.2 per cent in 1990 to 36.6 per cent by the year 2030 (see table below). Pension expenditure would increase from 11.1 per cent of GDP in 1990 to 18.8 per cent in 2030. Unemployment benefit expenditure would increase substantially over the first 10 years of the projection period (from 1.2 per cent in 1990 to 5.3 in 1995 and 4.4 per cent in 2000), and later decline to a level close to the initial one.

#### Finland - Ministry of Social Affairs and Health (1996)

Year	Social expenditure					TOTAL
	Pensions	Sickness insurance	Unemployment benefits	Social and health services	Other	
1990	11.1	3.5	1.2	10.2	1.2	27.2
1995	14.9	4.0	5.3	12.6	1.2	38.0
2000	15.0	3.8	4.4	11.8	1.1	36.1
2050	18.8	3.5	1.4	12.1	0.8	36.6

Note: Baseline scenario: GDP growth = 2.7% from 1996 to 2000, 2% from 2000 to 2010, 1.9% from 2010 to 2020 and 1.2% from 2020 to 2030.

In order to evaluate the dynamics of the three most important age-related expenditure items (pensions, health and education), the Italian State General Accounting Office (1996a, 1996b, 1996c) carried out projections based on different demographic and policy scenarios. In the baseline scenario, the share of pension and health expenditure to GDP would increase over the period 1995-2045 respectively from 13.6 to 14.7 per cent and from 4.4 to 6.6 per cent (see table below). Education expenditure would decline from 5.3 per cent to 4.2 per cent. Total expenditure for these three items would increase from 23.3 per cent of GDP in 1995 to 25.5 per cent in 2045.

#### Italy - State General Accounting Office (1996)

Year	Social expenditure			TOTAL
	Pensions	Health	Education	
1995	13.6	4.4	5.3	23.3
2000	13.6	4.5	4.7	22.8
2030	16.0	5.8	3.9	25.7
2045	14.7	6.6	4.2	25.5

Note: Baseline demographic scenario developed by the General Accounting Office. Pension expenditure estimates refer to the scenario including the effect of the 1995 reform and assuming the indexation of pensions to price dynamics and the adjustment of pension coefficients to changes in life expectancy. Health expenditure projections refer to the scenario assuming that expenditure per member of each age group increases as per worker productivity. Education expenditure estimates assume an increase in school attendance rates, an increase in the students/teachers ratio and wages in the education sector increasing in line with per worker productivity in the economy.

These estimates were updated in 1997 (see State General Accounting Office, 1997) on the basis of the new demographic projections carried out by the Italian National Statistical Office. The new estimates point to smaller increases in pension and health expenditure and to a smaller decline in education expenditure.

**2.1.3 Estimates of sustainable primary balances and tax-gaps** - Projections of age-related public expenditure can be used to produce estimates of the changes to be expected in the primary balance under the assumption that revenues and age-unrelated expenditures remain constant as a percentage of GDP. Estimates of primary balances can then be used to assess the sustainability of current budgetary policies taking expected

GDP growth and the burden for the public debt into consideration. Blanchard (1990) introduced the concept of *tax-gap*, i.e. the gap between the current tax to GDP level and the sustainable tax to GDP level, the latter being the level which, if constant, would achieve an unchanged debt to GDP ratio by the end of the projection period given expected expenditure trends (for a description of the methodology used to compute the "tax-gap", see Annex A, that refers to Blanchard, 1990, and Blanchard *et al.*, 1990).<sup>20</sup>

In a study carried out within OECD, Blanchard *et al.* (1990) estimated the long-term tax-gap for 18 countries over a 40 year horizon taking long-term projections of pension and health care expenditure into account. The ratio of pension expenditure to GDP was assumed to change in line with demographic trends,<sup>21</sup> while medical care expenditure was assumed to be affected by changes in population structure and increases in the relative price of medical care.<sup>22</sup> The study also estimated the short- and medium-term tax-gaps which are not affected by demographic changes: the former is computed on a one-year time horizon and does not require projections; the latter relies on five year projections of economic activity and public spending and considers expected cyclical effects.

Assuming that the difference between the interest rate and the growth rate is 2 per cent and relative medical inflation is 1 per cent, the long-term tax-gap resulted positive (i.e., an increase in revenues was required) in 5 out of the 8 EU Member States for which both pension and health expenditure trends were considered (see Table 4). The gap was particularly high for Italy (6 points) and the Netherlands (4 points). For France, Sweden and Germany it was in the 1 to 2 per cent bracket. Negative gaps were estimated for Belgium, Denmark and the United Kingdom (i.e., revenues could have been reduced). For most countries the medium-term gap was more favourable than either the short- or long-term gap. The worsening between the medium- and the long-term gap was usually very large.

Delbecque and Bogaert (1994) carried out a similar analysis for Belgium for the period up to 2050. In a first stage, on the basis of current budgetary data from national sources and assuming a nominal GDP growth of 5 per cent, they computed the *required minimum primary surplus*, i.e. the level of the primary surplus that could be maintained forever without giving rise to an explosion of the public debt. As a result, under the assumption of a difference between the interest rate and the GDP growth rate of 2.5 per cent (which was considered the most realistic, given historical trends), the Belgian primary surplus should have been maintained constant from 1994 onwards at a level of 4.2 per cent percentage points of GDP (see Table 5). This would imply that Belgium, which then had a surplus of 5.2 per cent of GDP, was in a sustainable position.

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20 The tax-gap can be split in two components: the short-term primary gap (i.e., the adjustment - positive or negative - required to stabilise the debt in the short- term) and the effects of the changes in the primary balance (i.e., the adjustment required to offset the effects of the changes expected in expenditures and revenues).

21 More specifically, the expenditure to GDP ratio was assumed to change in line with changes in the old-age dependency ratio, which implies that the transfer and the eligibility ratio were assumed as constant.

22 Three assumptions were considered, with relative price inflation of medical care equal to 0, 1 and 2 per cent per year. Projections of health care were not produced for 6 countries.

Table 5

### Projections of the primary surplus in Belgium

Difference between the interest rate and the GDP growth rate	Required minimum primary surplus		Recommended primary surplus	
	Level of the surplus required in 1994	Gap with respect to the 1994 level (5.2%)	Level of the surplus required in 1997	Gap with respect to the 1996 level (6.5%)
1	2.2	-3	6.6	0.1
1.5	2.9	-2.3	6.9	0.4
2	3.5	-1.7	7.2	0.7
2.5	4.2	-1	7.6	1.1
3	4.9	-0.3	8	1.5
3.5	5.6	0.4	8.4	1.9
4	6.2	1	8.9	2.4

Source: Delbecque and Bogaert (1994).

Table 6

## PUBLIC EXPENDITURE PROJECTIONS: OECD (1996)

Country	Increase in tax/GDP ratios required to keep debt constant			
	Interest rate constant		Interest rate-growth rate differentials constant	
	2005	2015	2030	2030
Austria	3.8	7.3	15.4	15
Belgium	-2	-0.9	5.9	4.7
Denmark	-1.9	0.5	3.8	3.7
Finland	-1.4	2.7	8.8	8.9
France	0.8	2.9	7.1	6.6
Germany	2.8	2.6	9.7	8.8
Ireland	-0.3	1	1.8	1.1
Italy	1.8	-0.4	11.4	10.2
Netherlands	0.8	3.1	9	8.5
Portugal	0.5	2.2	8.2	7.4
Spain	0.9	2.3	7.4	6.6
Sweden	-0.6	1.4	4	3.9
United Kingdom	1.7	1.8	3.5	3.1
U.S.A.	-0.3	1.4	5.3	4.6
Japan	3.5	6.9	9.6	9.5

Source: Roseveare *et al.* (1996)

As a second stage of the analysis, Delbecque and Bogaert calculated the *recommended primary surplus*, i.e. the level of the primary surplus that would guarantee the long-term sustainability of fiscal policy, given the actual pension expenditure projections. This indicator was calculated on the basis of long-term public finance projections carried out within the MALTESE model.<sup>23</sup> The recommended primary surplus allows pension expenditure increases to be fully offset by a decline in interest payments caused by a fast reduction in the debt to GDP ratio. In this case, under the same economic assumptions, the sustainability would be assured only if the level of the primary surplus is increased to 7.6 per cent of GDP by the year 1997.

Underlying the minimum surplus and the recommended surplus there are different approaches to the expected increases in pension expenditure. The attainment of the minimum surplus would imply a year by year compensation of the expenditure growth with tax increases or expenditure cuts; the attainment of the recommended surplus would imply a bigger immediate effort with a view to preserve present pension arrangements. If reforms were introduced to curb pension expenditure growth, the recommended surplus would decline.

The overall impact of ageing populations on government budget positions up to the year 2030 was examined in the studies carried out by OECD in 1995-1996.<sup>24</sup> For the period 1995-2000, the net primary balance was projected on the basis of OECD's Medium Term Reference Scenario. For the period 2000-2030, long-term projections of the primary balance were carried out on the basis of the pension and health care projections examined in Section 2.1.2.<sup>25</sup> Revenues and other expenditure items were assumed constant to GDP. Under these assumptions, in most countries primary balances improve up to the year 2000 and deteriorate thereafter, particularly after 2015. Over the period 2000-2030, primary balances deteriorate by 11 percentage points of GDP in Finland, 10 points in Italy, 9 points in Austria and the Netherlands, 6 to 7 points in Belgium, Denmark, France, Germany, Japan, Portugal, Spain and Sweden, 4 points in the United States, 2 in the United Kingdom and less than 1 point in Ireland (see Table 3).

On the basis of these projections and different assumptions on interest rates on the public debt, the OECD's studies estimated the increase in tax revenues required to keep the debt to GDP ratio constant from the year 2000 onwards.<sup>26</sup> In other words, they estimated the increase in tax rates which, in each year, would offset the increase in public expenditure determined by ageing.<sup>27</sup> Assuming constant interest rates, in the period up to 2015, in most countries, the adjustment required was in the 1.5 to 3 per cent range, the exceptions being Austria and Japan, where larger tax increases would be needed, and Belgium and

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23 See Englert *et al.* (1994) and Lambrecht *et al.* (1994).

24 See Leibfritz *et al.* (1995), Roseveare *et al.* (1996) and OECD (1996).

25 As to pensions, the primary balance estimate considers the baseline scenario. As to the health care, it refers to the scenario assuming that the cost of health services grows in line with per capita GDP and that health care consumption depends on population structure and increases in line with the number of elderly citizens.

26 The debt level projected for the year 2000 is based on the assumption that fiscal consolidation takes place according to the path indicated by the OECD's Medium Term Reference Scenario.

27 This indicator corresponds to Blanchard's short-term gap.

Italy, where tax revenues could be reduced (see Table 6). By the year 2030 increases in tax revenues of 5 to 10 percentage points of GDP would be required in most countries. Greater increases would be needed in Austria and Italy, while smaller increases would be required in Denmark, Ireland, Sweden and the United Kingdom.

## 2.2 Generational Accounting studies

Generational Accounting is a new technique used to study the effects of fiscal policy on different generations. More specifically, it can assess the distributional implications across generations of changes in budgetary policies and highlight the effects of policy changes that do not affect the conventional deficit. Generational Accounting also provides estimates of long-term sustainability of budgetary policies on the basis of present expenditure and taxation policies, present net public debt and expected demographic and macroeconomic trends. The methodology of Generational Accounting is briefly presented in Box 3.

Box 3

### The methodology of Generational Accounting

Generational Accounting assesses the present value of transfers, services and taxes received and paid for by different generations (annual cohorts of the population) under the inter-temporal budget constraint requiring that the present value of future taxes is equal to the present value of future government consumption, less the initial stock of debt. Future taxes are split into the amount to be paid by all existing generations from the base-year to the end of their lives and those that are to be paid by all future generations. Cash transfers (e.g. pensions) are considered as negative taxes and deducted by future taxes.

The budget constraints can be expressed as:

Present value of all future government consumption	=	Stock of current government wealth	+	Present value of all future net payments of all living generations	+	Present value of all net tax payments of all future generations
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or, in algebraic form:

$$\sum_{s=b}^{\infty} G_s (1+r)^{b-s} = W_b^G + \sum_{s=0}^D N_{b,b-s} + \sum_{s=1}^{\infty} N_{b,b+s}$$

where  $G_s$  = government consumption in period  $s$ ;

$W_b^G$  = government net wealth in the base year  $b$  (minus in case of net debt);

$N_{b,k}$  = present value in the base year  $b$  of all future net tax payments of the generation born in the year  $k$ ;

$r$  = real interest rate;

$D$  = maximum age (constant value).

More specifically, the present value in the base year  $b$  of all future net tax payments of the generation born in the year  $k$ ,  $N_{b,k}$ , can be expressed as:

$$N_{b,k} = \sum_{s=\max(b,k)}^{k+D} T_{s,k} P_{s,k} (1+r)^{b-s}$$

where  $T_{s,k}$  = average per capita net tax payments in year  $s$  of the cohort born in year  $k$ ;

$P_{s,k}$  = number of surviving members in year  $s$  of the cohort born in year  $k$ .

Generational accounts are constructed so that no policy changes are envisaged for present generations (even if present policies are unbalanced), while future generations bear the burden for restoring the sustainability of public finances. It is also assumed that the adjustment of budgetary policies take place on the tax side. The difference between present and future generations' net taxes provides a measure of the imbalance in present fiscal policy.

More specifically, Generational Accounting compares the net discounted taxes paid by the new-born generation on the basis of present expenditure and revenue policies, with the net discounted taxes paid by future generations on the basis of present expenditure policies and the increase in tax rates required by the inter-temporal budget constraint.

The first step in the development of generational accounts for all living and future cohorts of the population consists in the attribution of present government revenues and outlays to the different age-groups. On the revenue side, Generational Accounting studies usually consider labour and capital income taxes, social security contributions and indirect taxes; on the expenditure side, they consider the main social transfers (pensions, family allowances, unemployment benefits) and age-related public consumption programmes (health, education). For each item, an age-related profile of the ratio of revenue or expenditure to per capita GDP is developed. For revenue and expenditure items that cannot be assigned to specific age-groups a uniform distribution on age-groups is assumed.

The Generational Accounting methodology was first applied in the United States by Auerbach, Gokhale and Kotlikoff (1991). In the United States (Office of Management and Budget, 1994) and Norway<sup>28</sup> (Ministry of Finance) it has also been introduced in official budget documents. Estimates have since been produced for Denmark, Finland, Germany, Italy and Sweden.<sup>29</sup>

In 1995 OECD produced estimates for the United States, Germany, Italy, Norway and Sweden. The main results are reported in Table 7. The imbalance in fiscal policy is extremely large for Italy, where future generations would be expected to pay net taxes more than five times higher than those paid by the new-born generation under present policies. In the United States taxes on future generations would be twice as high as those on the new-born generation. In Germany, Norway and Sweden the increase in net taxes would range between 27 and 53 per cent.

Generational Accounting, as already pointed out, evaluates the long-term sustainability of budgets taking the interaction of demographic and macroeconomic scenarios into account. However, it is liable to the same limitations listed above for public expenditure projections; it does not consider the future effects of past changes in legislation, the changes in economies/diseconomies of scale, the effects of demographic developments on relative prices and work, consumption and investment decisions.<sup>30</sup>

The usefulness of Generational Accounting, as against traditional expenditure and deficit projections, in estimating the effects of demographic changes and monitoring budgetary trends in Member States is limited by the fact that Generational Accounting does not

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28 For the application of Generational Accounting to Norway, see also Auerbach *et al.* (1993) and Steigum and Gjersem (1996).

29 See, respectively, Jensen and Raffelhüschen (1995), Prime Minister Office of Finland (1994), Gokhale *et al.* (1994), Franco *et al.* (1994), and Hagemann and John. (1995).

30 For a critical review of Generational Accounting see Haveman (1994) and Buiters (1995).



provide indications about the timing of the effects of demographic changes, nor does it outline budgetary trends over the short- and medium-term. Moreover, its results are not intuitive, which may hamper their use for policy objectives, and are very sensitive to assumptions about the determination of private consumption, productivity growth and discount rates.<sup>31</sup>

For all these reasons, this study follows the approach outlined in Section 2.1. However, it makes extensive use of the age-related expenditure profiles developed within Generational Accounting studies. Generational accounts, which provide considerable insight into the impact of fiscal policy on the lifetime budget constraints of households of different generations, would represent a useful complement to the indicators presented in this study.

### *3. Mechanical effects of demographic changes on public expenditure*

This section provides some estimates of the direct effects of demographic changes on public expenditure in the six EU Member States for which age-related expenditure profiles are available. As already mentioned, it is a mechanical exercise projecting future expenditure trends on the basis of initial age-related expenditure profiles and changing demographic population structures. These estimates update and improve the results of the studies mentioned in Section 2.1 and are obviously subject to the same limitations.

The methodology of the estimates is presented in Section 3.1. The results of the projections are presented in Section 3.2. More specifically, Section 3.2.1 outlines the baseline estimates for the burden of age-related public expenditure on the working-age population. Sections 3.2.3 and 3.2.4 consider alternative estimates, based respectively on different dynamics of per capita expenditure and demographic scenarios.

#### *3.1 The methodology*

The mechanical effects of demographic changes are assessed identifying the major items of public expenditure particularly dependent on population age structure. Data on per capita expenditure for different age-groups and for different budgetary items are combined with demographic projections. More specifically, the estimates, which cover the period 1995-2050, are based on the following two sets of data:

- a) demographic scenarios developed by EUROSTAT for the 15 EU Member States for the period 1995-2050 (see Annex B). Three scenarios are considered, the baseline and, in order to identify the range of possible effects of demographic changes, two extreme scenarios (the 'youngest population' and the 'most-aged population' scenarios).
- b) national estimates of the per capita amount of public expenditure concerning the citizens of each age-group. Six European countries are taken into consideration: Belgium, Finland, Germany, Italy, Spain and Sweden. Most estimates have been produced in research work on Generational Accounting. According to the availability of the data, the coverage of the profiles in terms of expenditure items is

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<sup>31</sup> On this issue see Hagemann and John (1995) and IMF (1996).

Table 7

**GENERATIONAL ACCOUNTING: OECD (1995)**

Present values of future net tax payments per capita (males)  
(thousands of dollars)<sup>(1)</sup>

Country	Generation's age in 1993						Future Generations	Percentage difference <sup>(2)</sup>
	0	20	40	60	80	80		
Germany	197	374	203	-150	-68	250	27%	
Italy	65	196	88	-148	-115	354	446%	
Sweden	156	259	253	-29	-29	204	31%	
Norway	110	177	134	-29	-43	171	53%	
U.S.A.	121	218	168	-58	-89	243	100%	

1) In constant prices, adjusted for income growth. Assuming real income growth of 1.5% and a discount rate of 5%.

2) Between future generations and the generation born in 1993.

Source: Leibfritz, *et al.* (1995)

Table 8

### MAIN FEATURES OF NATIONAL AGE-RELATED EXPENDITURE PROFILES

Country	Source	Year of reference	Main items included			Child Allowances attributed to	Share of age-related expenditure to GDP
			Pensions	Health	Education		
Belgium	Lambrecht <i>et al.</i> , 1994	1988	YES	YES	YES	Children	28.8
Finland	Mäki <i>et al.</i> , 1996	1993	YES	YES	YES	Children	43
Germany	Gokhale <i>et al.</i> , 1995	1992	YES	YES	NO	Children	19.5
Italy	Franco <i>et al.</i> , 1994	1994	YES	YES	YES	Parents	28.3
Spain	Barea and Fernández, 1994	1991	YES	YES	NO	Children	20.3
Sweden	Hagemann and John, 1995	1995	YES	NO	NO	Parents	23.6

different among countries. For some countries profiles are not available for all the major age-related expenditure sectors (e.g. for German, Spanish and Swedish education expenditure and for Swedish health expenditure).

**3.1.1 The expenditure profiles** - Citizens of different sex and age-groups consume different amounts of public services. They also receive different amounts of public transfers. Expenditures for educational and health services, pension benefits and child allowances are the budget items most dependent on the age-structure of the population. In order to compare different countries and periods, the amount spent for each age-group has been expressed as a percentage of per capita GDP (see Box 4).

<b>Age-related expenditure profiles</b>		<b>Box 4</b>
<p>In order to evaluate the effects of demographic changes on public expenditure, it is necessary to estimate the average amount spent for the members of each age-group and sex within each expenditure program. Total expenditure in the base year should be allocated among males (<i>M</i>) and females (<i>F</i>) such as:</p>		
$GG_k^b = \left[ \sum_i (gg_{ik}^b \times P_i^b) \right]^M + \left[ \sum_i (gg_{ik}^b \times P_i^b) \right]^F$		
with	$GG_k^b =$ $gg_{ik}^b =$ $P_i^b =$ $i =$ $b =$ $k =$	<p>total age-related public expenditure for budgetary item <i>k</i> in the base year <i>b</i>;</p> <p>expenditure for budgetary item <i>k</i> per member of each age-group <i>i</i> in national currency in the base year <i>b</i>;</p> <p>population in each age-group in the base year <i>b</i>;</p> <p>0, 90;</p> <p>base year;</p> <p>budgetary item (e.g., pension expenditure, health care expenditure).</p>
<p>In recent years age-related public expenditure profiles have been estimated for some countries either within studies projecting the effects of demographic changes on public budgets (Belgium, Spain) or within research work on Generational Accounting (Finland, Germany, Italy and Sweden). The profiles for Finland and Italy cover all public expenditure; those for the other countries cover only some important age-related items (Table 8). Different male and female profiles have been computed for Germany, Italy and Sweden. The profiles for Finland, Germany and Italy refer to 1-year age-groups, those for Belgium and Sweden, respectively, to 5-year and 10-year age-groups. Spanish profiles consider only three large age-groups.</p>		
<p>For the purpose of this paper, per capita expenditure for each age-group (<math>gg_{ik}^b</math>) has been divided by base-year per capita GDP obtaining the following identity:</p>		
$G_k^b = \left[ \sum_i (g_{ik}^b \times P_i^b) \right]^M + \left[ \sum_i (g_{ik}^b \times P_i^b) \right]^F$		
with	$G_k^b =$ $g_{ik}^b =$	<p>total age-related public expenditure for budgetary item <i>k</i> in the base year <i>b</i> in terms of the base-year per capita GDP;</p> <p>expenditure for budgetary item <i>k</i> per member of each age-group <i>i</i> in national currency in the base year <i>b</i> in terms of the base-year per capita GDP.</p>

The national profiles for the different age-related expenditure items are presented in Annex C. Charts 1a-1b outline the profiles for male and female *total age-related*

*expenditure*.<sup>32</sup> For instance, the estimate for total age-related expenditure for the 0-4 age-group in Belgium (.221) means that in the base-year (1988) the public sector spent 22.1 per cent of per capita GDP in order to provide services to each 0-4 year old citizen. The profiles are not fully comparable since national estimates differ in terms of coverage of expenditure items. For instance, education expenditure is not covered for Germany, Spain and Sweden and health care expenditure is not covered for Sweden. The expenditure programs taken into consideration represent about 40 per cent of total public expenditure (net of interest payments) in Sweden and Germany, about 50 per cent in Spain, 62-65 per cent in Belgium and nearly 80 per cent in Finland.

Profiles including all main items are typically two-peaked (see the profiles for Belgium and Italy). The first peak occurs in the 10-20 age group with education expenditure as the most important item. The second peak, reaching higher levels, occurs for the 60-80 age-groups and is largely determined by pension and health expenditure trends. The lowest expenditure levels are usually recorded for the 30-50 age groups. Female expenditure levels are lower than male levels. The Finnish profile presents two more peaks: high expenditure in the first year of life and in the over eighty age-group.

Charts 2a-2b compare the male and female profiles for *pension expenditure* in the six countries taken into consideration. Separate male and female profiles are available only for Germany, Italy and Sweden. Per capita expenditure increases earlier in Finland, Italy and Sweden, where, on average, 61 year old male<sup>33</sup> citizens receive pension payments amounting to about 55 per cent of per capita GDP. The Finnish male and female profile peaks for the 64-69 age group at about 65 per cent of per capita GDP. The Italian and Swedish male profiles peak at about 80 per cent of per capita GDP respectively for the 65-75 and the 70-79 age groups. This is about twice the percentage recorded by German males in the 70-75 age range. For Belgian males and females, expenditure peaks at about 55 per cent of per capita GDP for the 69-73 age groups. The Spanish profile is flat from 65 onwards at 58 per cent of per capita GDP. Female profiles are much lower than for male; they peak at 52 per cent of per capita GDP in Sweden, 40 per cent in Italy and 22 per cent in Germany.

In each country *health expenditure* increases gradually with age (see Chart 3). Belgium and Spain record the highest expenditure levels up to the 50 age group. Thereafter Finland, Italy and Spain record the highest levels. The Finnish profile records a peak for new-born children (7.5 per cent); expenditure is in the 2.5-4 per cent range for the age groups between 1 and 49; it increases gradually for the following age groups (it is over the 20 per cent level for the 83 and over groups). Italians aged 74 and over cost 13 per cent of per capita GDP, as against 2.5 per cent for children and 3 to 4.5 per cent for people in the 20 to 50 age group. Expenditure for 65 and over Spanish is about 13 per cent of GDP, as against 4.3 per cent for children and 5.3 per cent for the 15-64 age group. Elderly Belgian (60 and over) would cost about 8 per cent of per capita GDP, as against less than 3 per cent for children aged in the 5 to 19 range and 4 to 5.5 per cent for citizens aged in the 20 to 50. German expenditure ranges from less than 2 per cent of per capita GDP for children under 10 to 7 per cent for men over 60 and women over 70.

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32 For Germany, West-Germany profiles are considered in this paragraph.

33 Males and females in the case of Finland.

Chart 1a

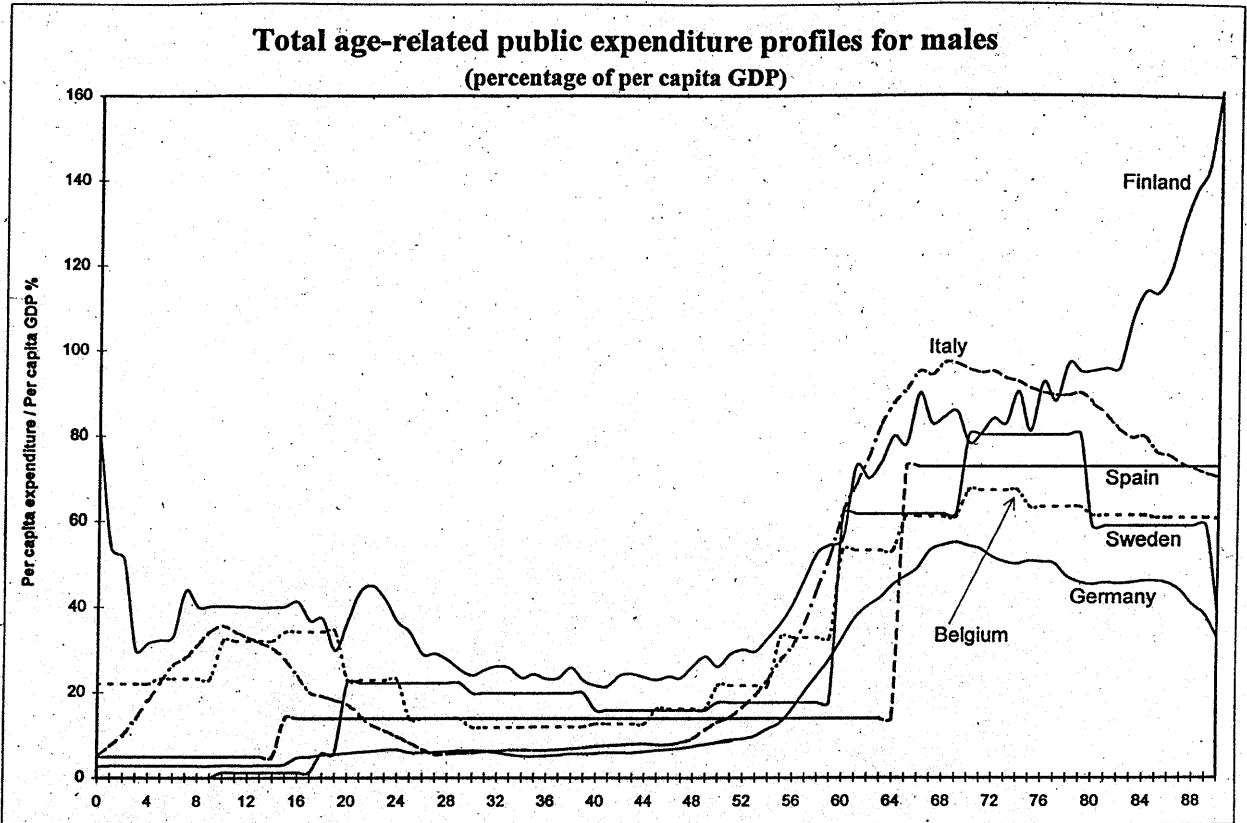


Chart 1b

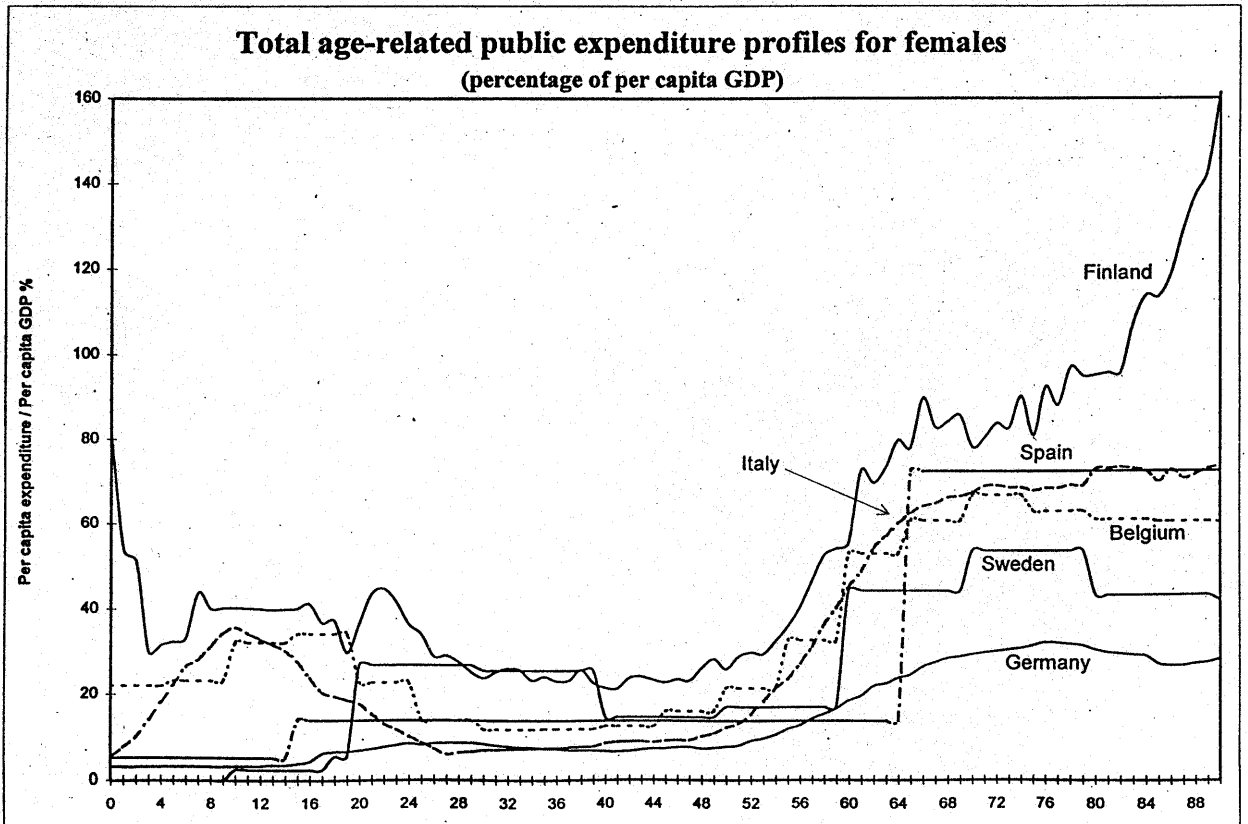


Chart 2a

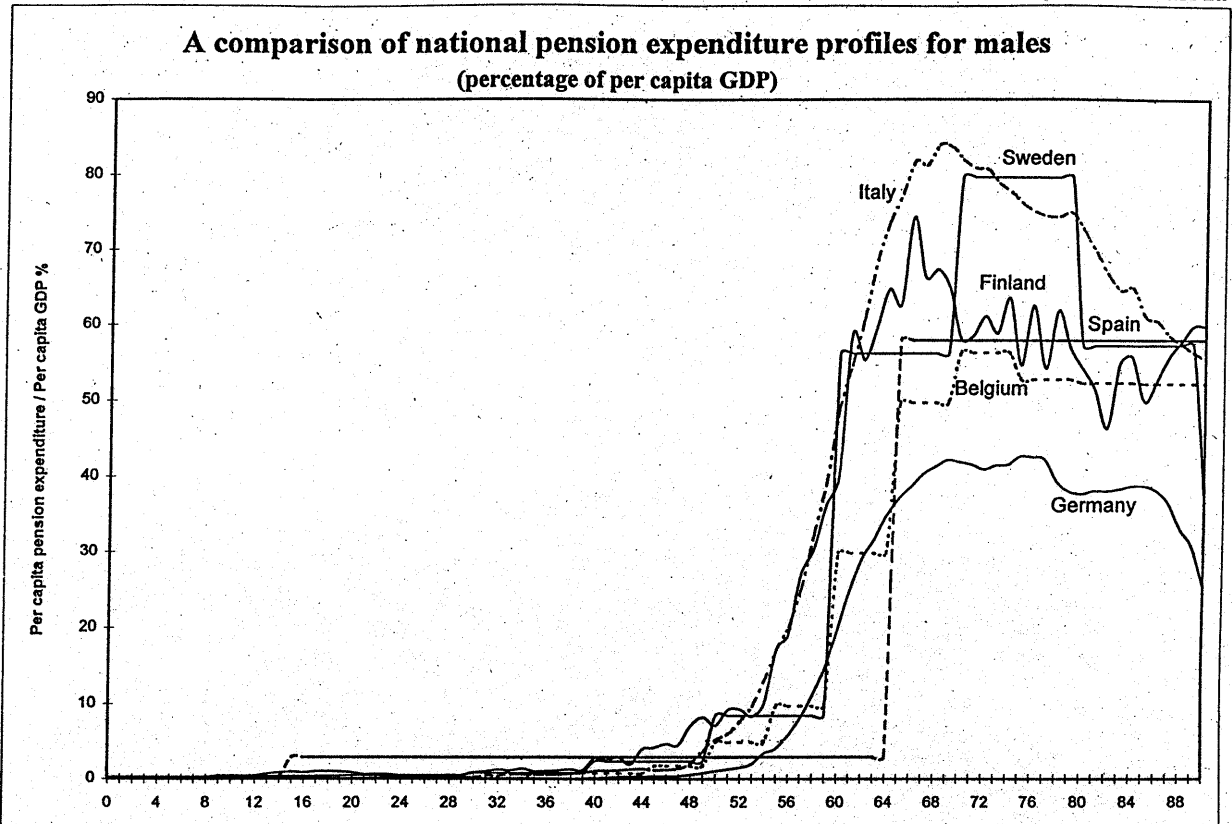


Chart 2b

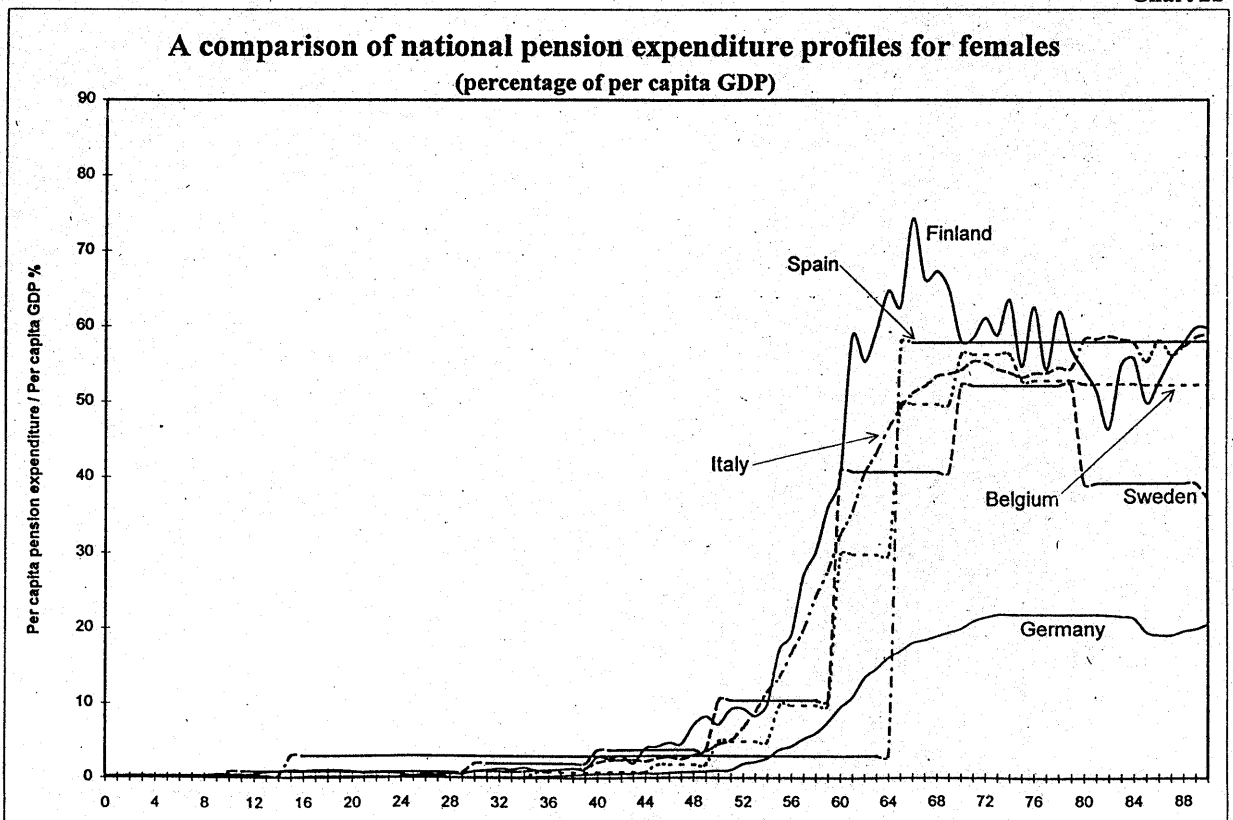


Chart 3

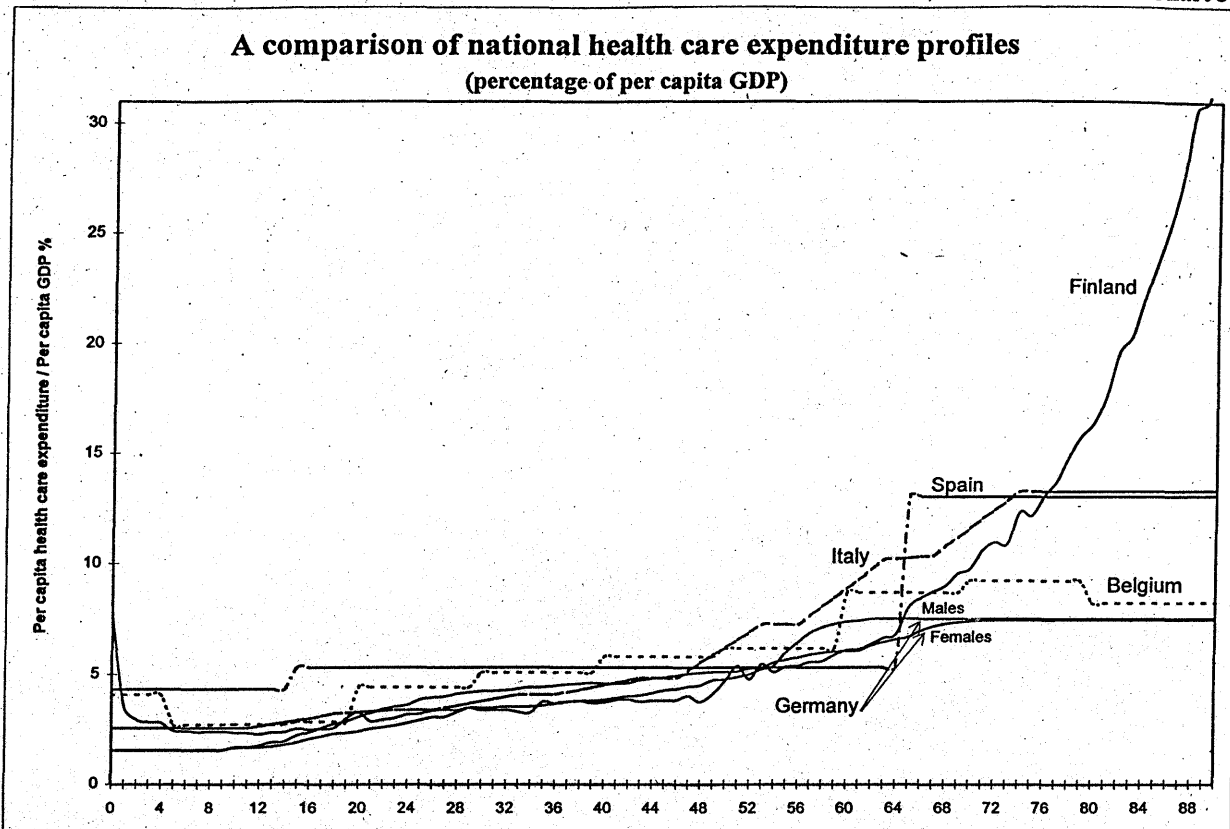


Chart 4

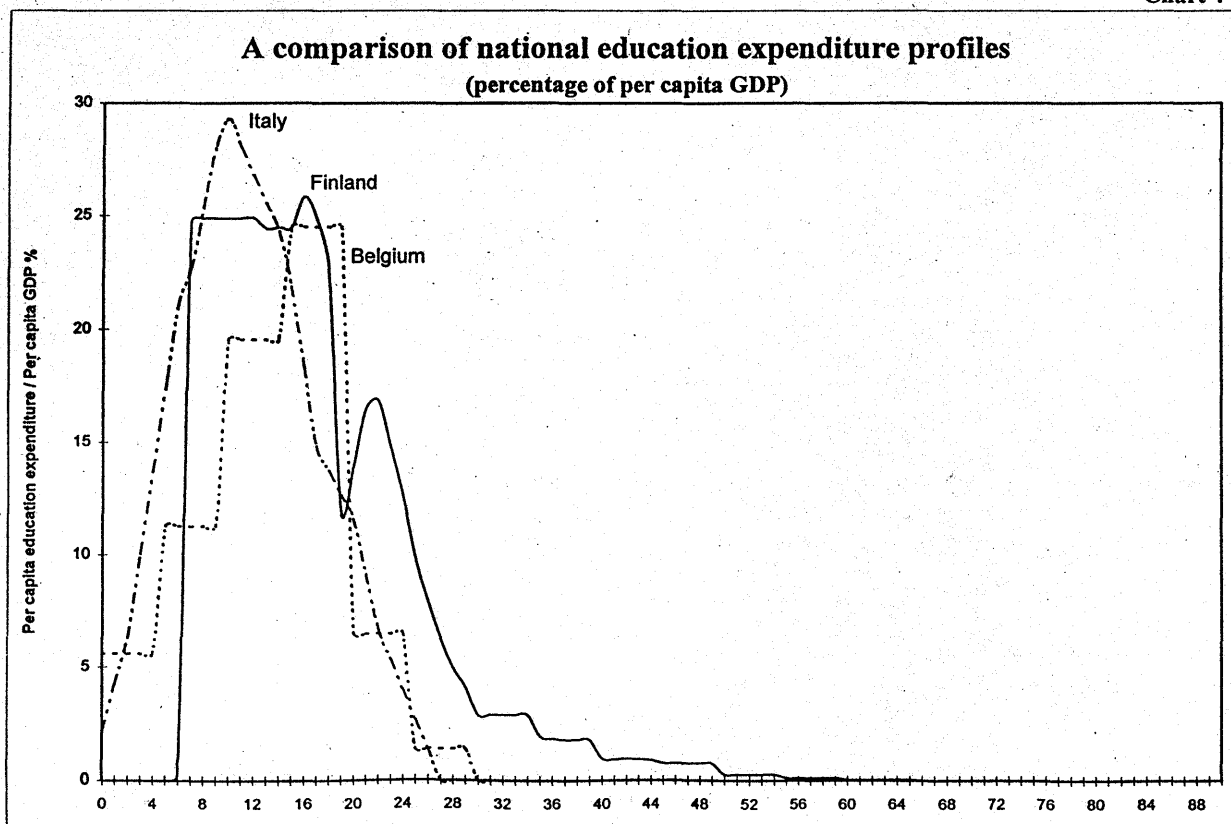




Chart 5

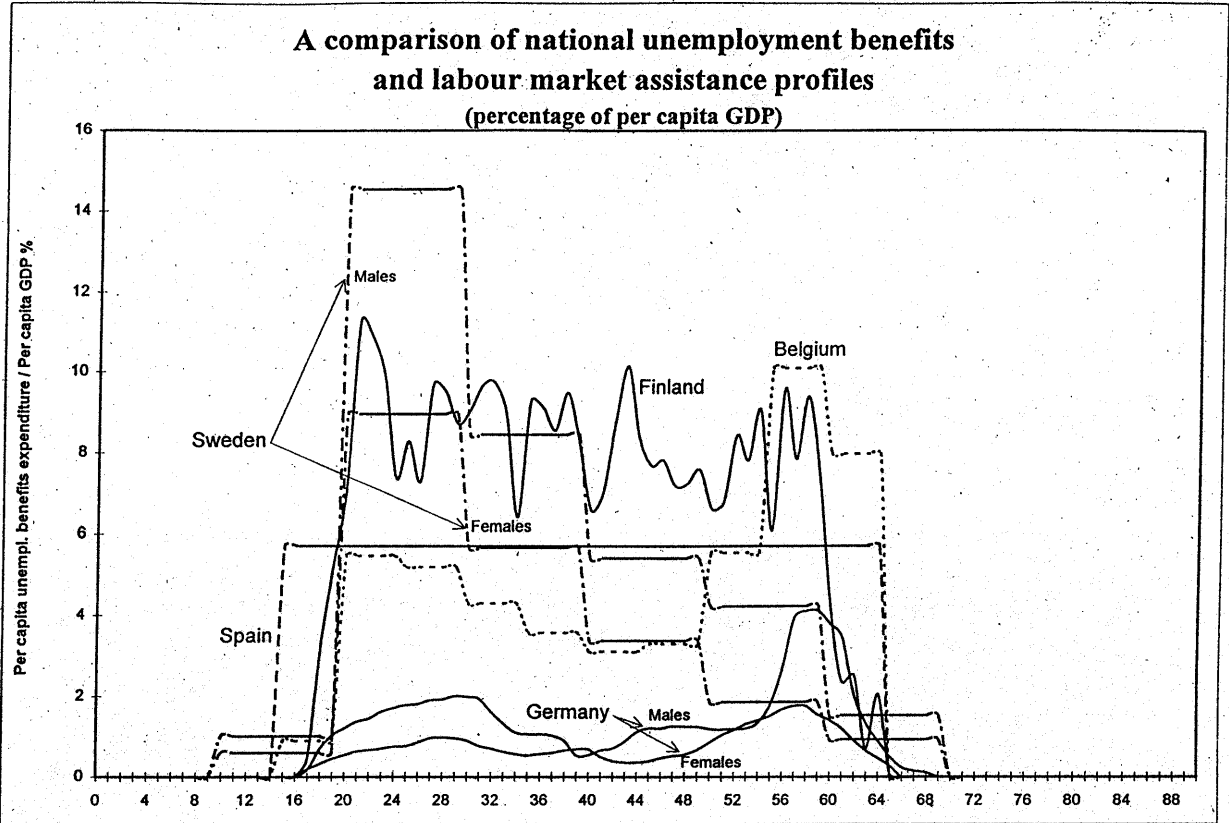
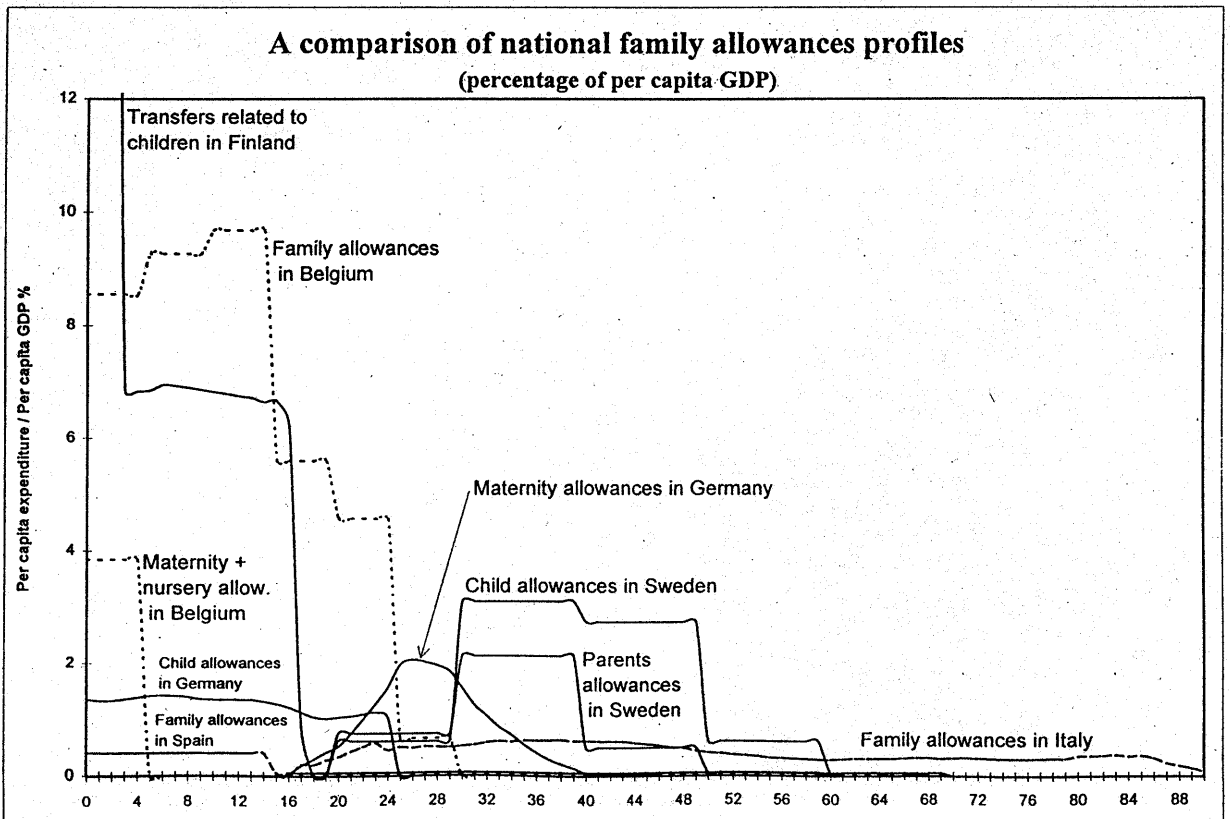


Chart 6



*Education expenditure* profiles are available only for Belgium, Finland and Italy (see Chart 4). Expenditure peaks at about 25 per cent of per capita GDP in Belgium (for the 15-19 age group) and in Finland (for the 7-17 age group). The Italian profile is over 20 per cent for the 6-15 group with a peak of 29 per cent for the 10 year old group.<sup>34</sup>

The profiles for *unemployment benefits and labour market assistance* are available for Belgium, Finland, Germany, Spain and Sweden (see Chart 5).<sup>35</sup> Separate male and female profiles are available for Germany and Sweden. There is a peak for the 20-30 age group in Belgium (at 5.5 per cent of per capita GDP), Germany (2 per cent for males and 1 per cent for females) and Sweden (14.5 and 9 per cent respectively for males and females) and a second peak for the 55-60 group in Belgium (10 per cent) and Germany (4 and 1.5 per cent for males and females). Finnish expenditure ranges between 7 and 9 per cent for all 20-59 age groups.

Profiles for *family allowances* are available for Belgium, Finland, Germany, Italy, Spain and Sweden. It should be considered that in the Italian and Swedish estimates child allowances have been imputed to parents (Chart 6). Allowances are very high in Finland for children aged 0 to 2. In Belgium, they nearly reach 10 per cent of per capita GDP for the 10-14 age group. They are relatively low for Italy and Spain.

**3.1.2 The projections** - The expenditure profiles ( $g_{ik}^b$ ) reported in Charts 1-6 and in Annex C (expressed in percentage terms of the base-year per capita GDP) have been multiplied by the population in each age-group for the years 1995-2050 ( $P_i^j$ ).

$$G_k^j = \sum_i (g_{ik}^b \times P_i^j)$$

where  $j = 1995, 2050$   
 $b = 1995$ .

By dividing by the 1995 data, this provides an index of the change in age-related public expenditure in terms of base-year per capita GDP under the assumption of unchanged average public expenditure (in per capita GDP terms) for the members of each age-group. This index (henceforth defined as index  $A$ ) can be computed for each expenditure item  $k$  and for total age-related expenditure (by calculating the weighted average of the indices referring to the different expenditure items).

$$A_k = \frac{G_k^j}{G_k^b} = \frac{\sum_i (g_{ik}^b \times P_i^j)}{\sum_i (g_{ik}^b \times P_i^b)}$$

*Index A measures the pure effects of demographic changes* (i.e., changes in the size of population groups relevant to different expenditure programs and changes in the

<sup>34</sup> The difference between the Belgian and Finnish profiles and the Italian profile is probably related to lower attendance ratio in Italian secondary schools.

<sup>35</sup> In the case of Italy unemployment benefits are included in the item "Other social benefits".

proportion of population in the different groups) on the "demand" for public services and transfers, under the above-mentioned assumption.

Index *A* does not measure the burden that will be carried by workers and taxpayers, since the number of workers and taxpayers will also be affected by change in demographic structure. An assessment of this burden requires that trends in the size and productivity of the labour force (i.e., trends in GDP) are also taken into account.

Two indices (*B* and *C*) have been developed in order to consider these factors (for a brief overview of the formulae used for the computation of the two indices, see Box 5).

*Index B* measures the trend of the ratio of public expenditure to GDP, based on the assumption that per capita expenditure grows as per capita GDP. This index is suitable for evaluating the burden for transfer expenditure aimed at ensuring that benefit recipients have a living standard comparable to that of other citizens.

*Index C* measures the trend of the ratio of public expenditure to GDP, based on the assumption that per capita expenditure grows as GDP per worker. This index is suitable for expenditure programs mostly represented by wages, such as education and health care.

**Box 5**

**Indices of the burden of age-related expenditure on citizens of working-age**

The indices of the ratio of age-related public expenditure to GDP have been estimated for each age-related expenditure item considered in Section 3, on the basis of the following assumptions:

- a) the change in the number of workers and tax-payers has been assumed to be proportional to the change in the number of working-age citizens, which is equivalent to assuming that the aggregate labour force participation rate and unemployment rate remain constant over the projection period.
- b) The rate of growth of GDP has been determined on the basis of the change in the number of working-age citizens and the rate of increase in their productivity ( $r_w$ ), which has been assumed constant over time (even though demographic changes are actually likely to have repercussions on productivity growth). Because of the changes in population structure, per capita GDP growth (which depends on  $r_w$  and the population structure) is different from per worker GDP growth.
- c) Age-related public expenditure profiles have been projected to the future on the basis of two alternative assumptions:
  - i) public expenditure for the members of each age-group increases at a yearly rate equal to the rate of growth of per capita GDP (index *B*);
  - ii) public expenditure for the members of each age-group increases at a yearly rate equal to the rate of growth of GDP per worker (index *C*).

The indices can be expressed as:

$$B_k = \frac{\sum_{i=0}^{90} (g_{ik}^b \times gdp_C^b (1+r_C)^{j-b} \times P_i^j)}{\sum_{i=0}^{90} (g_{ik}^b \times gdp_C^b \times P_i^b)} \quad \text{and} \quad C_k = \frac{\sum_{i=0}^{90} (g_{ik}^b \times gdp_C^b (1+r_W)^{j-b} \times P_i^j)}{\sum_{i=20}^{64} (g_{ik}^b \times gdp_W^b \times P_i^b)}$$

$$\frac{\sum_{i=0}^{90} P_i^j \times gdp_C^b (1+r_C)^{j-b}}{\sum_{i=0}^{90} P_i^b \times gdp_C^b} \quad \text{and} \quad \frac{\sum_{i=20}^{64} P_i^j \times gdp_W^b (1+r_W)^{j-b}}{\sum_{i=20}^{64} P_i^b \times gdp_W^b}$$

where:  $gdp_C^b$  = per capita GDP in the base-year  $b$ ;  
 $gdp_W^b$  = GDP per worker in the base-year  $b$ ;  
 $P_i^b$  = population in each age-group in the base year  $b$ ;  
 $j$  = 1995, 2050;  
 $r_W$  = growth rate of GDP per worker;  
 $r_C$  = growth rate of per capita GDP.

The two indices can be expressed as follows:

$$B_k = \frac{\sum_{i=0}^{90} (g_{ik}^b \times P_i^j)}{\sum_{i=0}^{90} (g_{ik}^b \times P_i^b)} = \frac{A_k}{\frac{\sum_{i=0}^{90} P_i^j}{\sum_{i=0}^{90} P_i^b}} \quad \text{and} \quad C_k = \frac{\sum_{i=0}^{90} (g_{ik}^b \times P_i^j)}{\sum_{i=0}^{90} (g_{ik}^b \times P_i^b)} = \frac{A_k}{\frac{\sum_{i=20}^{64} P_i^j}{\sum_{i=20}^{64} P_i^b}}$$

The two indices can therefore be calculated as the ratio of index A to the index of the growth of total population (index B) or to the index of the growth of working-age population (index C). This implies that no assumptions are actually required for the level of  $r_W$ . The two indices B and C also represent the burden of age-related public expenditure on the working-age population.

*A fourth "mixed" index (D) has been computed by projecting expenditure profiles for transfers on the basis of per capita GDP growth (i.e., of index B) and expenditure profiles for public services on the basis of per worker GDP growth (i.e., of index C). While indices A, B and C are computed for each expenditure item as well as for total expenditure, index D is computed only for total expenditure. The baseline projections presented in the following sections refer to this mixed index.*

Before analysing the results of the projections, some notes of caution should be addressed.

- The coefficients  $g_{ik}^{1995}$  have been estimated on the basis of 1988 data for Belgium, 1991 data for Spain, 1992 data for Germany, 1993 data for Finland, 1994 data for Italy and 1995 preliminary data for Sweden.
- As already pointed out, the ratios are not directly comparable since not all the same items are taken into account for each country (Table 8). For instance, German, Spanish and Swedish estimates do not take education expenditure into account. This tends to overestimate the effects of ageing on public expenditure in these

countries. On the other hand, the fact that the share of public expenditure considered for these countries is much lower than the share considered for the other three countries tends to underestimate the effect of ageing.

### **3.2 The results: the burden on working-age population**

The first part of this section focuses on the results referring to index *D* in the baseline demographic scenario. The second on indices *B* and *C* in the same demographic scenario. The third on index *D* under alternative demographic scenarios. The results for index *A* (i.e., the change in the 'demand' of public expenditure determined by demographic changes) are presented in Annex D.

**3.2.1 Baseline economic and demographic projections** - As indicated in Section 3.1, in the baseline economic projection the burden of age-related public expenditure on working-age population is computed assuming that present per capita expenditure for education and health grows in line with GDP per worker, while expenditure for transfers grows in line with per capita GDP (i.e. index *D*).

Index *D* depends on the effects of demographic changes on the 'demand' of public expenditure (i.e., index *A*) and on the number of working-age citizens, i.e., the number of potential workers. Over the period 1995-2050, in the baseline demographic scenario the number of working-age citizens is expected to decline by 29 per cent in Italy, 21 per cent in Spain, 19 per cent in Germany, 11 per cent in Finland and 9 per cent in Belgium. It is expected to increase by 8 per cent in Sweden.

*The burden of total age-related expenditure* would increase substantially over the next decades in all the six countries considered (see Chart 7). By the year 2010 the burden would increase by 13 per cent in Germany, 10 per cent in Italy, 7 per cent in Finland and 4 to 6 per cent in Belgium, Spain and Sweden. The rate of increase would accelerate over the following 15 years. By the year 2025 the burden would be higher than in 1995, by 29 per cent in Germany, 25 per cent in Italy, 19 to 20 per cent in Finland and Spain, 16 per cent in Belgium and 10 per cent in Sweden. Over the period 2025-2040 national trends would be rather different; while the burden would increase substantially in Italy, Germany and Spain, its growth would slow down in Belgium, Finland and Sweden. By the year 2040 the burden would have peaked in Italy (with a 44 per cent increase over 1995), Germany (43 per cent), Finland (25 per cent), Belgium (22 per cent) and Sweden (12 per cent). It would still be growing in Spain (to 53 per cent in 2050).<sup>36</sup>

*Pension expenditure* trends, which contribute substantially to the expected increases in total expenditure, are rather homogeneous (see Chart 8a). By the year 2010 real pension expenditure would increase by 10 per cent in Sweden, by about 15 per cent in Belgium, Italy, and Spain and by nearly 22-24 per cent in Finland and Germany. By the year 2035 it would increase by 25 per cent in Sweden, 50 per cent in Belgium and Finland, and by 60-70 per cent in Germany, Italy and Spain.

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<sup>36</sup> In comparing the dynamics of age-related expenditure burden in the six countries, it should be taken into consideration that education expenditure is not considered for Germany, Spain and Sweden. This tends to overestimate the impact of demographic changes in these countries.

Chart 7

# Burden of age-related public expenditure on working-age population

Baseline economic and demographic scenario

Education and health expenditures grow as GDP per worker, other expenditure items grow as per capita GDP (1995=1)

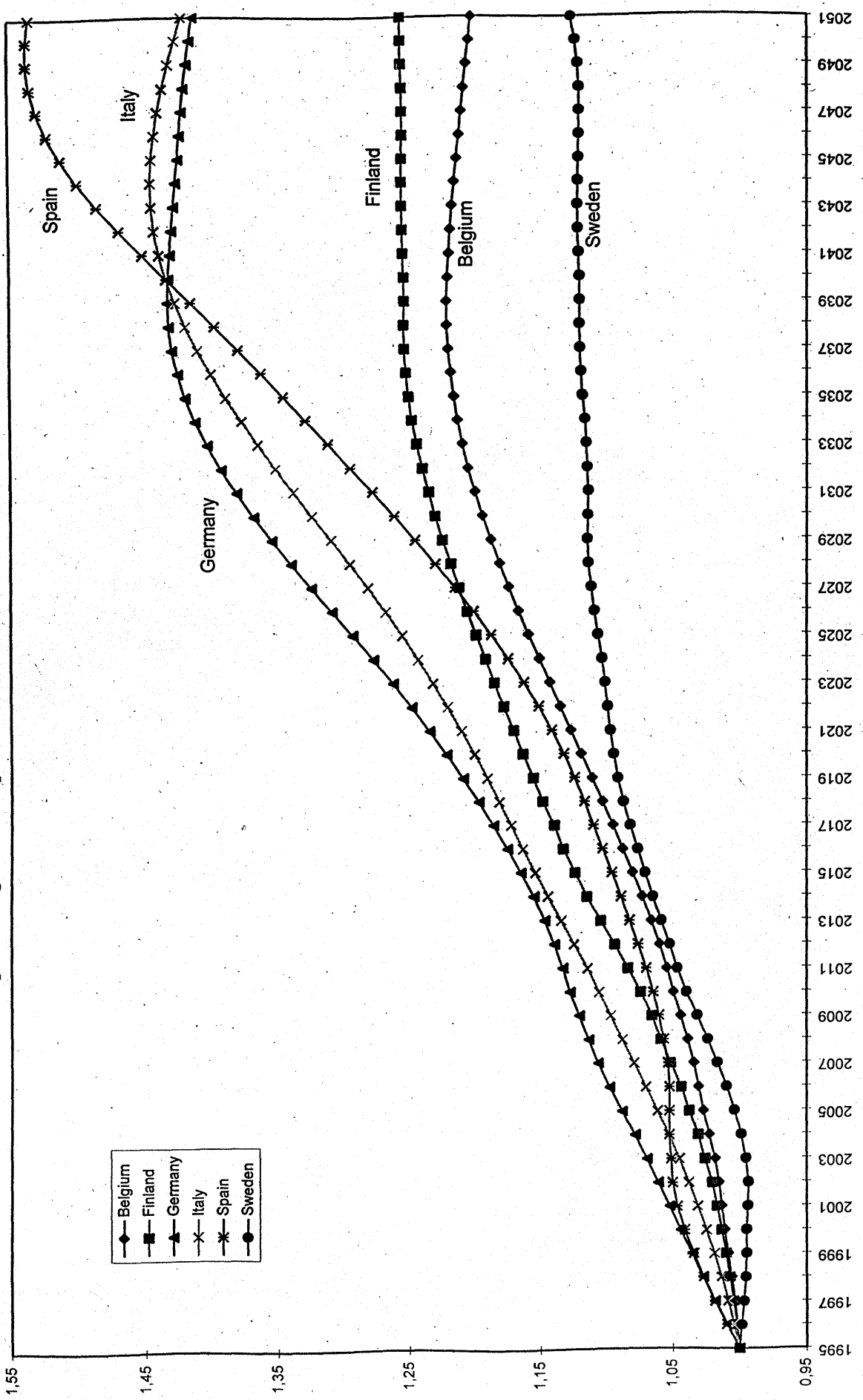


Chart 8a

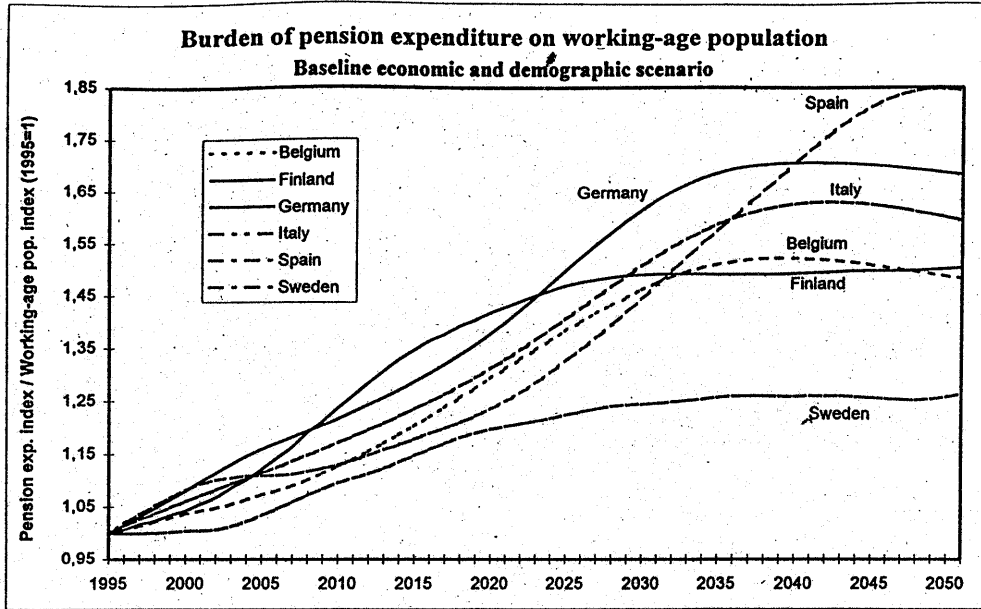


Chart 8b

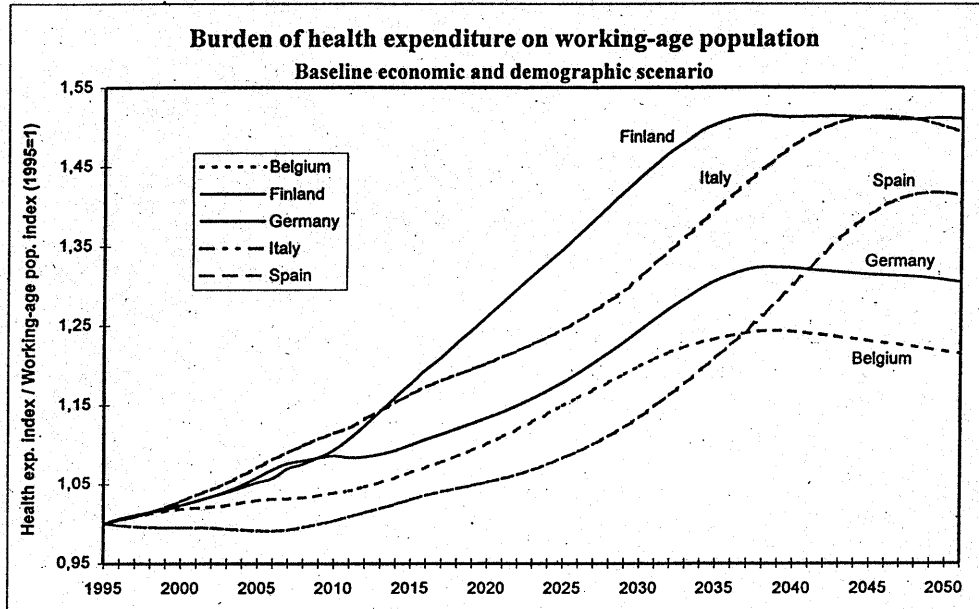
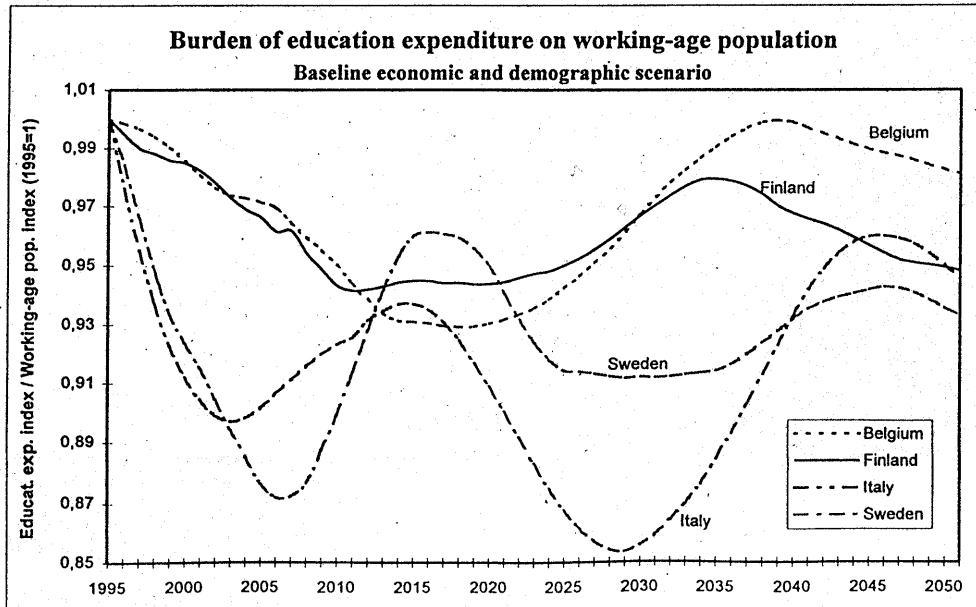


Chart 8c



In Finland, Germany and Belgium the burden for *health care* increases gradually up to 2035, by 51, 32 and 24 per cent respectively. In Italy and Spain it peaks later, with 51 and 41 per cent respectively (see Chart 8b).

*Education* provides some scope for expenditure cuts. The pattern of the burden for education is similar for Belgium and Finland: declining in the period up to 2010-2015, then stable for about a decade, then increasing again up to the period 2035-2040, and eventually declining again at the end of the projection period (see Chart 8c). Italy's pattern is less smooth, with two troughs, in 2003 (-10 per cent as against the 1995 level) and 2029 (-15 per cent), and two peaks, in 2015 (-6 per cent) and 2045 (-4 per cent).

Charts 9a-f report the effects of demographic changes on each age-related public expenditure item for the six countries in the baseline scenario. The dispersion among the expenditure trends for each different item is very high in Spain and Germany and relatively limited in Sweden.

**3.2.2 Alternative dynamics of per capita expenditure** - Charts 10a-f present the implications of alternative dynamics of per capita expenditure. If all expenditure items grow as per capita GDP (index *B*), the total burden is slightly lower than in the baseline scenario. If they grow as the GDP per worker (index *C*), the burden is substantially higher. This is due to the different weights of the two groups of items in the baseline scenario. In all countries, the expenditure for transfers is more important than that for services, like health and education. This is particularly relevant for Sweden, where, under the pessimistic scenario, only a very small share is assumed to grow as GDP per worker.

In the optimistic scenario, the burden is expected to grow only slightly less than in the baseline case. In Belgium and Finland the difference increases gradually up to a maximum of 5 percentage points from 2015 onwards; in Germany and Italy it starts increasing already at the beginning of next century, reaching a peak of 7-8 points in 2040-45; in Spain the difference is not significant until 2030, while thereafter it increases to 7 percentage points; finally, in Sweden there is almost no difference with the burden expected in the baseline scenario.

More important divergences from the burden expected in the baseline scenario are to be recorded within the pessimistic scenario, with the highest in Italy (more than 20 per cent in 2045), Germany (17 per cent in 2040), and Spain (17 per cent in 2045).

**3.2.3 Alternative demographic scenarios** - Charts 11a-f compare the expenditure trends under the baseline economic scenario and three different demographic scenarios. For all six countries, the prospects for the burden of total age-related expenditure on working-age population are much more pessimistic under the assumption of an older population ('most-aged population' scenario), while they are more optimistic in the youngest population scenario.

More specifically, in the countries for which education expenditure is considered (Belgium, Finland and Italy), real expenditure trends under the different scenarios are rather close up to the year 2035, since, under the most-aged scenario, the increase in pension expenditure is partly offset by the decrease in education expenditure and, in the same way, under the youngest population scenario the lower increase in pension expenditure is aggravated by a lower decrease (or even an increase) in education



expenditure. Over the longer term, the burden is expected to diverge more substantially according to the demographic scenario, due to the fact that after 2040 demographic trends start to converge and the opposite effects of young-related and old-related expenditure are less pronounced.

The difference in expenditure trends is greatest in Germany, Spain and, to a lesser degree, in Sweden, where, over the whole projection period, the highest increases in expenditure levels are recorded in the most-aged scenarios, since there is no offsetting education expenditure effect.

#### 4. National estimates of pension expenditure trends

Pension expenditure growth cannot be accurately forecast on the basis of demographic trends alone. Pension expenditure dynamics are also influenced by changes in legislation (that defines eligibility rules, the amount granted to new pensioners, indexation mechanisms, etc.), past and present employment (that influences the length of workers' membership in pension schemes and the distribution of workers among the different schemes), and social attitudes (as those towards early retirement and the demand for disability benefits).<sup>37</sup> While legislation basically determines the supply of pensions, the other factors define the demand for them stemming from citizens.

Any assessment of future pension expenditure must therefore consider the likely changes in the eligibility and transfer ratios, respectively the ratio of the number of pensions to the number of elderly citizens and the ratio of the average pension to per capita or per worker GDP (see Box 6). While from the 60s to the mid-80s these changes increased expenditure in most countries, in the future they are likely to work both ways. In some countries the effects of past extensions and improvements to pension schemes are still expanding expenditure; in others, the recently introduced reforms are reducing eligibility and transfer ratios. The latter might also be negatively influenced by the present widespread unemployment, which limits the contribution record of future pensioners.

Box 6

#### Factors influencing pension expenditure

In order to highlight the problems faced in projecting pension expenditure, one can refer to some simple accounting identities. Following the OECD (1988b) approach, the ratio of pension expenditure ( $EXP_p$ ) to GDP can be expressed on the basis of the four following ratios:

- a) The Old-age dependency ratio = Population at pensionable age ( $POP_p$ ) divided by the population at working age ( $POP_w$ ).
- b) The Eligibility ratio = Number of pension beneficiaries ( $NPEN$ ) divided by the population at pensionable age ( $POP_p$ ).
- c) The Transfer ratio = Average pension per beneficiary ( $p_a$ ) divided by GDP per worker ( $gdp_w$ ).

37 See OECD (1988b).

# Burden of age-related public expenditure on working-age population

Baseline economic and demographic scenario

Chart 9a

## Belgium

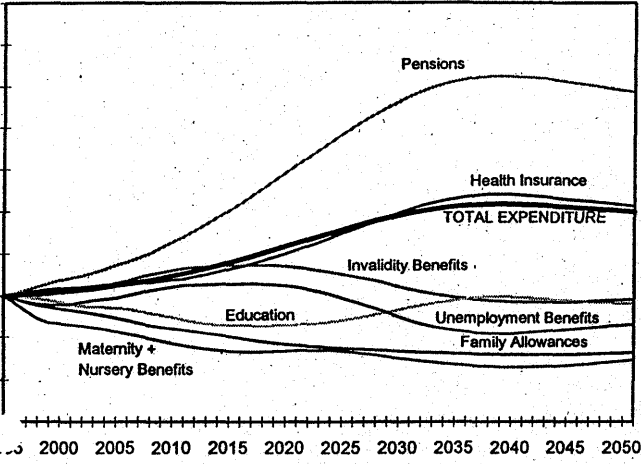


Chart 9b

## Finland

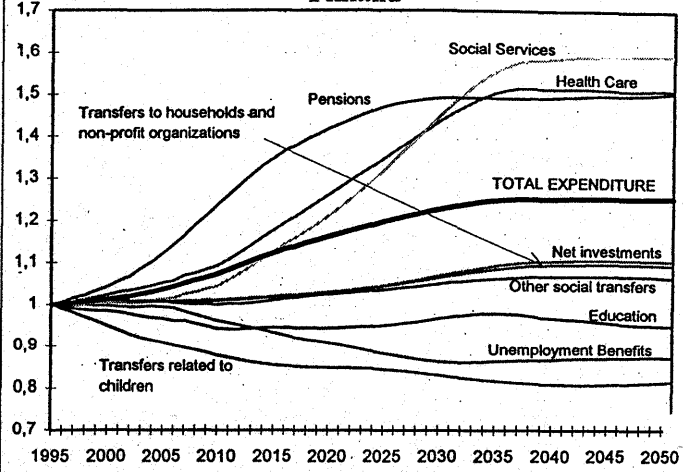


Chart 9c

## Germany

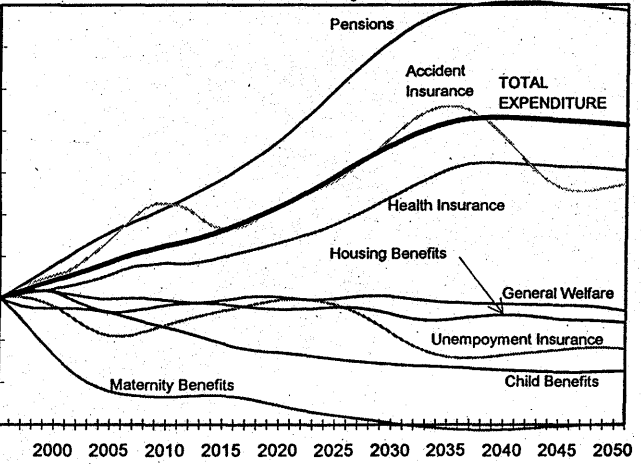


Chart 9d

## Italy

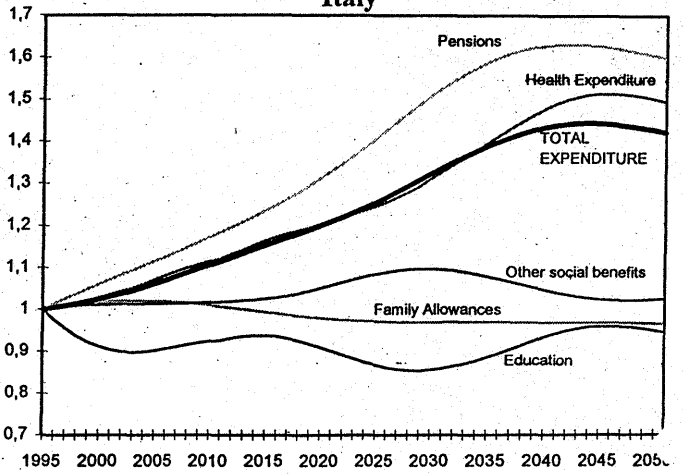


Chart 9e

## Spain

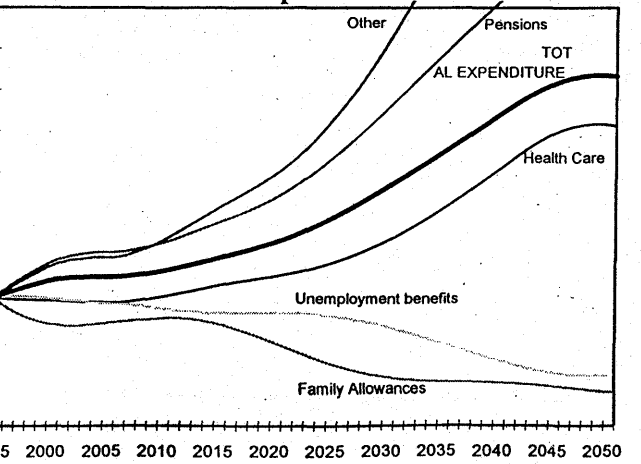
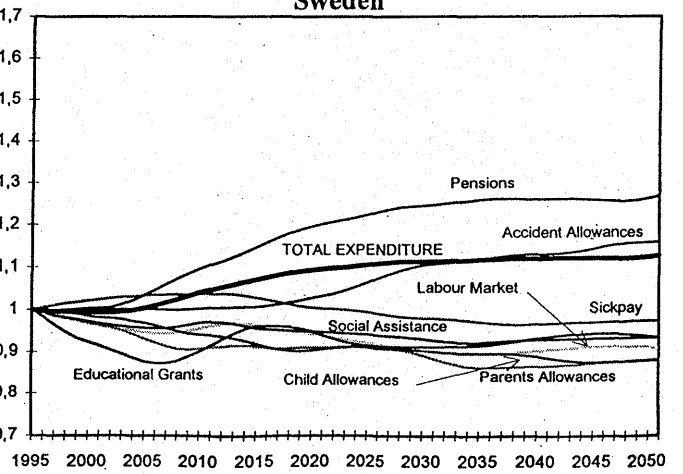


Chart 9f

## Sweden



**Burden of age-related public expenditure on working-age population  
with different assumptions on per capita expenditure growth rates  
Baseline demographic scenario (1995=1)**

Chart 10a

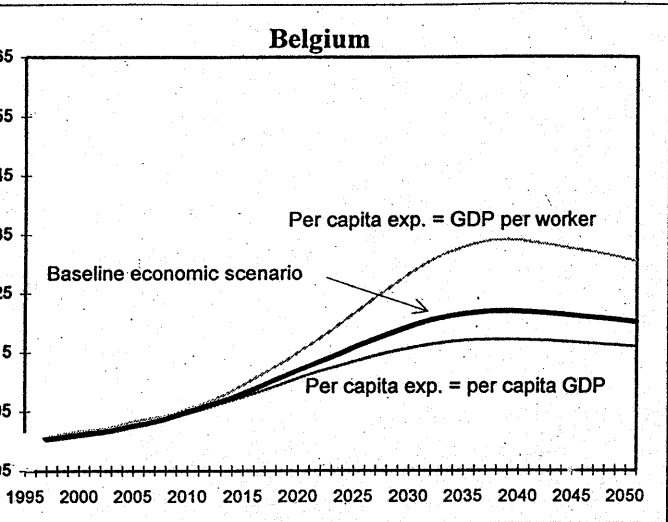


Chart 10b

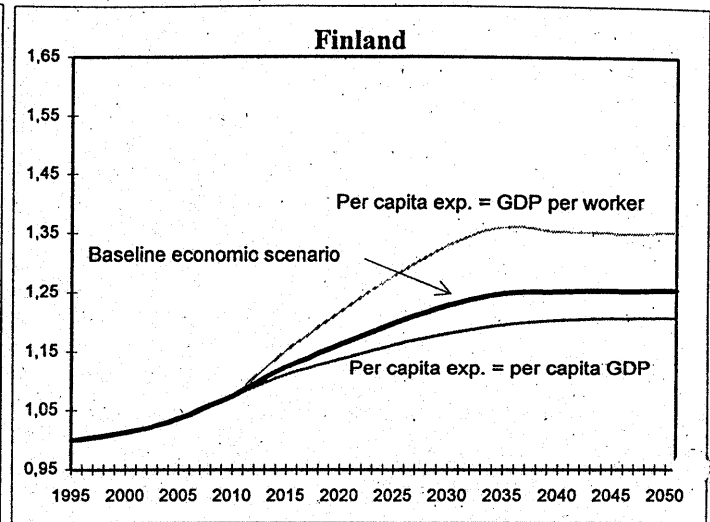


Chart 10c

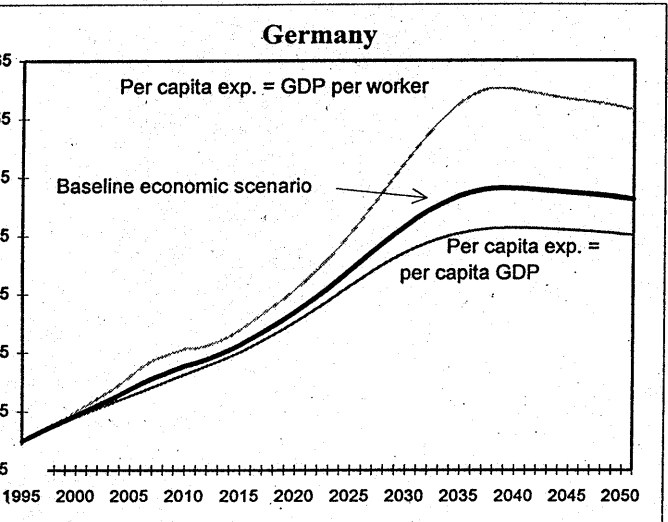


Chart 10d

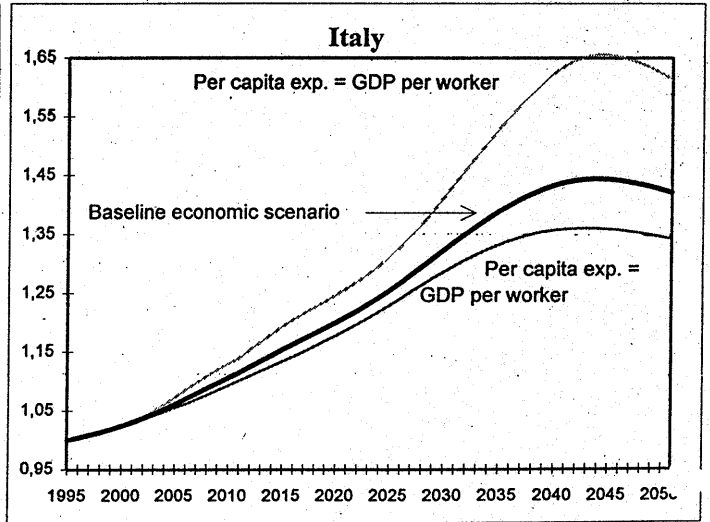


Chart 10e

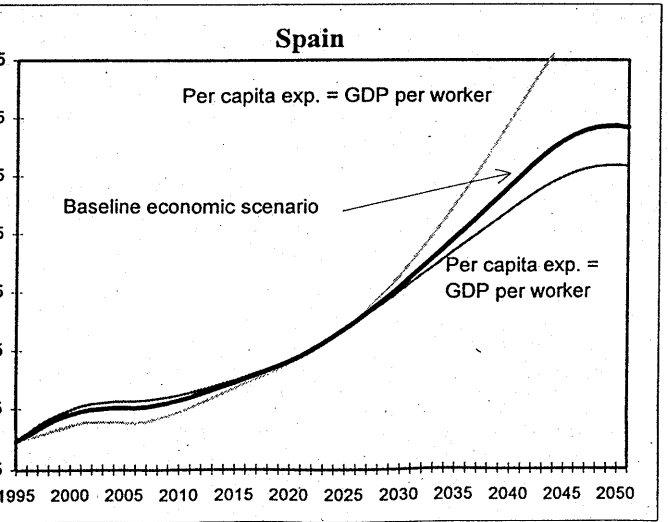
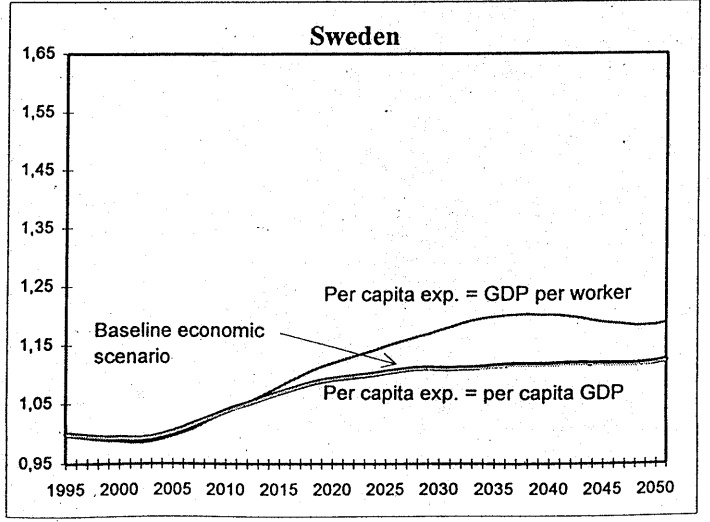


Chart 10f



**Burden of age-related public expenditure on working-age population  
with different demographic scenarios  
Baseline economic scenario (1995=1)**

Chart 11a

Chart 11b

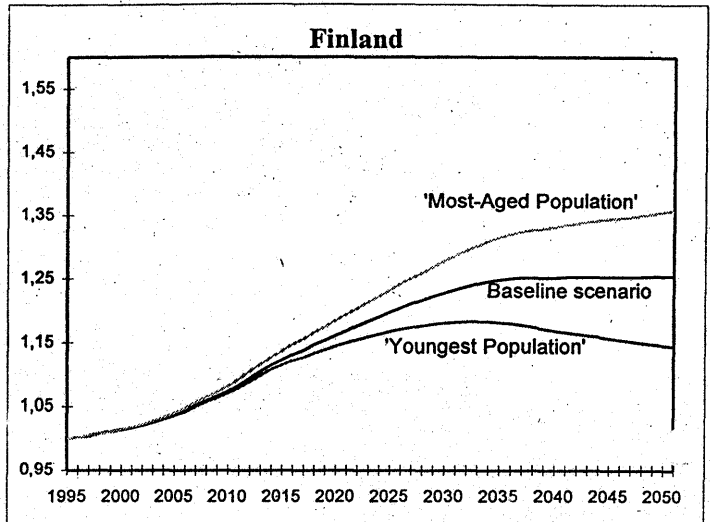
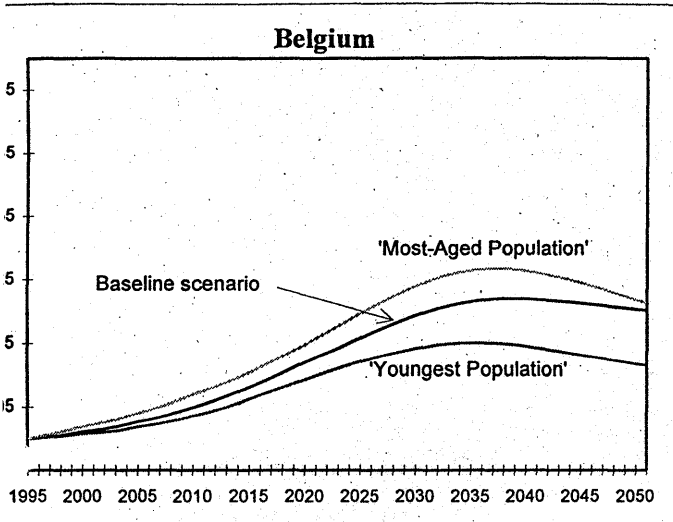


Chart 11c

Chart 11d

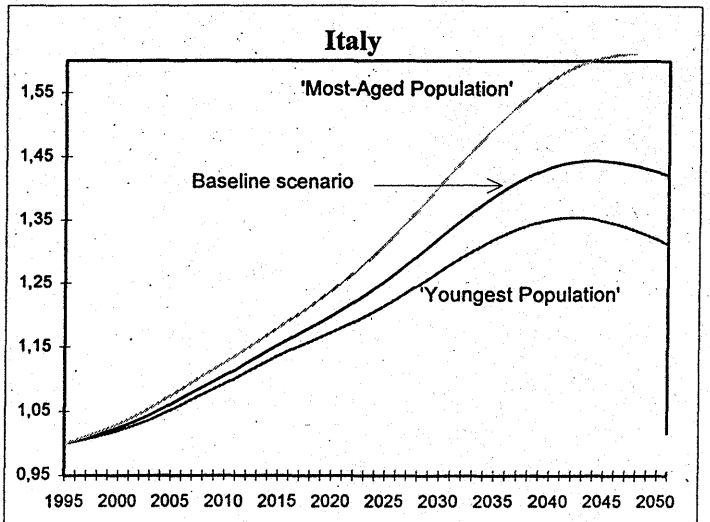
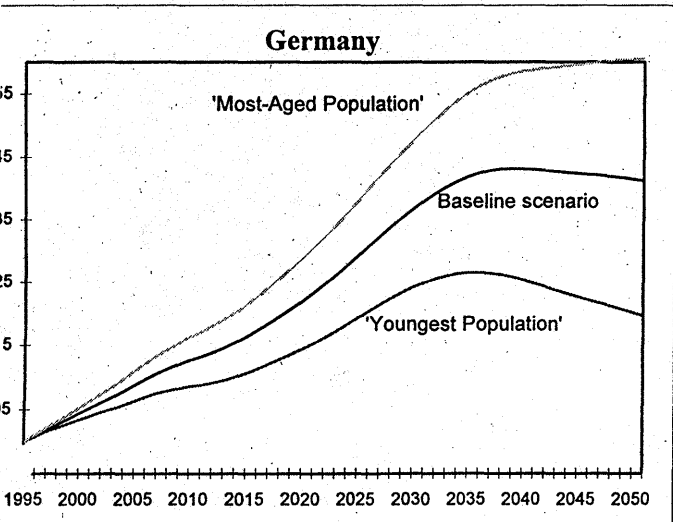
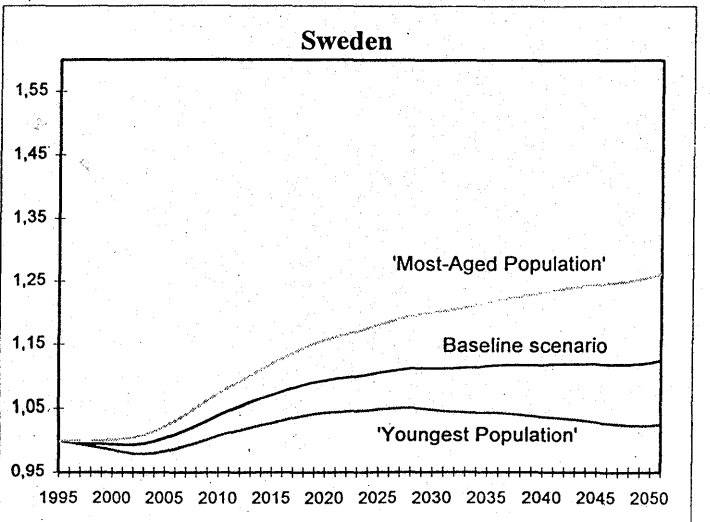
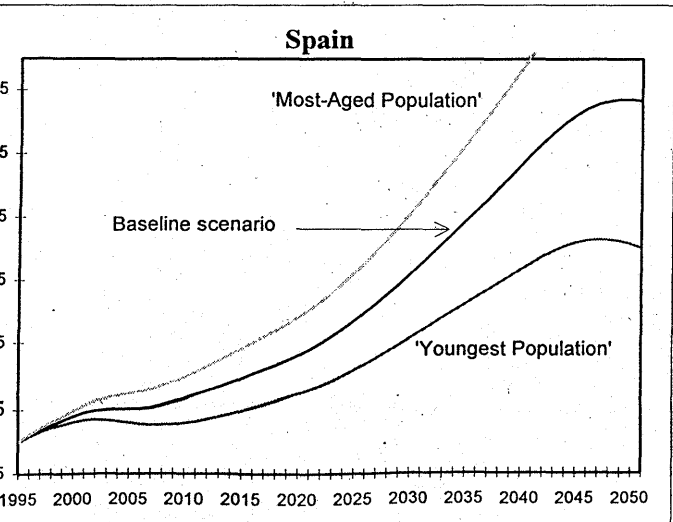


Chart 11e

Chart 11f



- d) The Employment ratio = Population at working age ( $POP_w$ ) divided by employment ( $NWOR$ ).

The ratio of public expenditure on old-age pensions to GDP can therefore be written as:

$$\frac{EXP_p}{GDP} = \left( \frac{POP_p}{POP_w} \right) \times \left( \frac{NPEN}{POP_p} \right) \times \left( \frac{p_a}{gdp_w} \right) \times \left( \frac{POP_w}{NWOR} \right)$$

Ratio a) represent the pure demographic component of expenditure dynamics. Ratios b) and c) depend on legislation and economic factors. Ratio d) is affected by economic factors. Ratios b) and c) can change considerably over time because of the 'maturing' of pension schemes, i.e. the process of adjustment of all pensions to present retirement rules. On the one hand, pension coverage extensions and benefit improvements usually produce their full effects on the two ratios after many decades. On the other, quite often pension reforms curtailing benefits are implemented gradually and only display their full effects a long time later.

Changes in the relative number of workers enrolled in the different schemes are also likely to influence ratios b) and c). In many countries, for instance, in the last decades public employment has grown faster than total employment and, since public employees frequently have better retirement rules, the shift in employment increases pension expenditure.

According to OECD (1988b), between 1960 and 1985 in the OECD countries the old-age dependency, eligibility, transfer and employment ratios respectively contributed to 25.6, 38.0, 33.2, and 3.2 per cent of total change in the pension expenditure to GDP ratio. Among the 15 EU countries, only in Denmark and the United Kingdom was the old-age dependency ratio the most relevant factor in contributing to expenditure growth. These data reflect the widespread process of expansion of pension coverage and improvement of benefits that took place in many European countries from the fifties to the seventies.

In order to take the non-demographic factors affecting pension expenditure dynamics into consideration, this section draws on the results of the most recent public pension expenditure projections carried out in each country by a public institution.<sup>38</sup> This also allows consideration of the maturation of pension systems, i.e., the fact that pension expenditure dynamics over the next decades will be influenced by changes already introduced in legislation. The projections taken into consideration are based on the assumption of unchanged policies. This approach may lead to some unrealistic outcomes, since policies will obviously adapt over time to new demographic and economic circumstances, but it is helpful in identifying the dimension of required policy adjustment.

National projections are not homogeneous in their coverage of pension expenditure. Therefore, although they provide some useful indications about trends in future pension expenditure in the EU Member States, they do not provide an estimate of the impact of the future evolution of public pension schemes on general governments' accounts. Franco and Munzi (1996) tried to fill this gap by applying each country's projected expenditure trend to an estimate of its 1995 ratio of total public pension expenditure to GDP.<sup>39</sup>

<sup>38</sup> These projections have been examined in Franco and Munzi (1996). For Italy the more recent projections reported in State General Accounting Office (1996c) have been taken into consideration.

<sup>39</sup> More specifically, the expected values of the ratio of pension expenditure to GDP and of the ECR have been turned into an index based on a 1995 value of 1. Then the index has been multiplied by the ratio of public pension expenditure to GDP estimated for 1995. The latter data has been computed in different ways, according to the data available for each country.

The results of these estimates for the six countries considered in this paper are presented in Charts 12a and 12b. Wherever additional scenarios were considered in the national projections, the most favourable and the least favourable are used to provide a range for future pension expenditure growth.

The data can be examined over three periods: the next five years, the period 2000-2010 and the period after the year 2010. Between 1995 and the year 2000, the ratio of public pension expenditure to GDP would grow by 0.7 percentage points in Germany and by 0.5 to 0.7 points in Belgium; it would remain almost stable in Spain, while in Italy it would remain stable in the best scenario and increase by 1.4 points in the worst. In Finland and Sweden the best and the worst economic scenarios point to a decline in the expenditure ratio of 0.5 points and to an increase of 0.6 - 0.8 points respectively.

Expenditure growth would accelerate in the period 2000-2010. Over the decade, the expenditure to GDP ratio would grow by 1.2 percentage points in Germany; 1 to 2.4 points in Finland; 0.7 to 2.2 points in Italy, 0.6 to 1.3 points in Belgium, 0.4 to 1 points in Sweden. In Spain the ratio would be nearly stable in the best scenario and increase by 0.5 points in the worst.

After the year 2010 expenditure pressure would rise substantially in most countries. The increase expected for the period 2010-2030 is 3.5 points for Germany, 3 to 3.2 points for Belgium, 2.2 to 4.6 points for Italy, 0.6 to 2.4 points for Finland. Expenditure pressures would be more moderate in Spain (0.3 to 1.4 percentage points of GDP) and Sweden (0 to 0.5 points).

By comparing the expected trend of the old-age dependency ratio with those of the expenditure to GDP ratio, it is possible to evaluate the expected future effects of the non-demographic factors (more specifically the effects of changes in the eligibility and transfer ratios). Charts 13a-f plot the two ratios for the six countries. An old-age dependency ratio line above the expenditure line points to a reduction in the eligibility and transfer ratios. This implies that restrictive reforms, counterbalancing the ageing trend, have already been implemented in the pension system. An old-age dependency ratio line close to the expenditure line points to stable eligibility and transfer ratios, and therefore to a mature pension system in which expenditure growth depends mostly on demographic change. An old-age dependency ratio line under the expenditure line points to an increase in the eligibility and transfer ratios. This implies that the effects of demographic changes will be increased by the improvements introduced in pension rules in the past or by the gradual increase in workers' contributory records.

In the six countries studied, the old-age dependency line is expected to lie above the expenditure line, particularly in the long-term. This is due to a radical change in pension policies with respect to previous decades: the phase of extension of coverage and improvement of benefits is over, while several reforms have been implemented to curb expenditure. According to national projections, only demographic trends are presently exerting an upward pressure on the expenditure to GDP; non-demographic factors are actually going to partly offset the effects of demographic trends.

The effects of non-demographic factors can also be evaluated by comparing the national pension expenditure projections with the mechanical projections estimated in Section 3

Chart 12a

**Estimates of total public pension expenditure - Part I**  
(percentage of GDP)

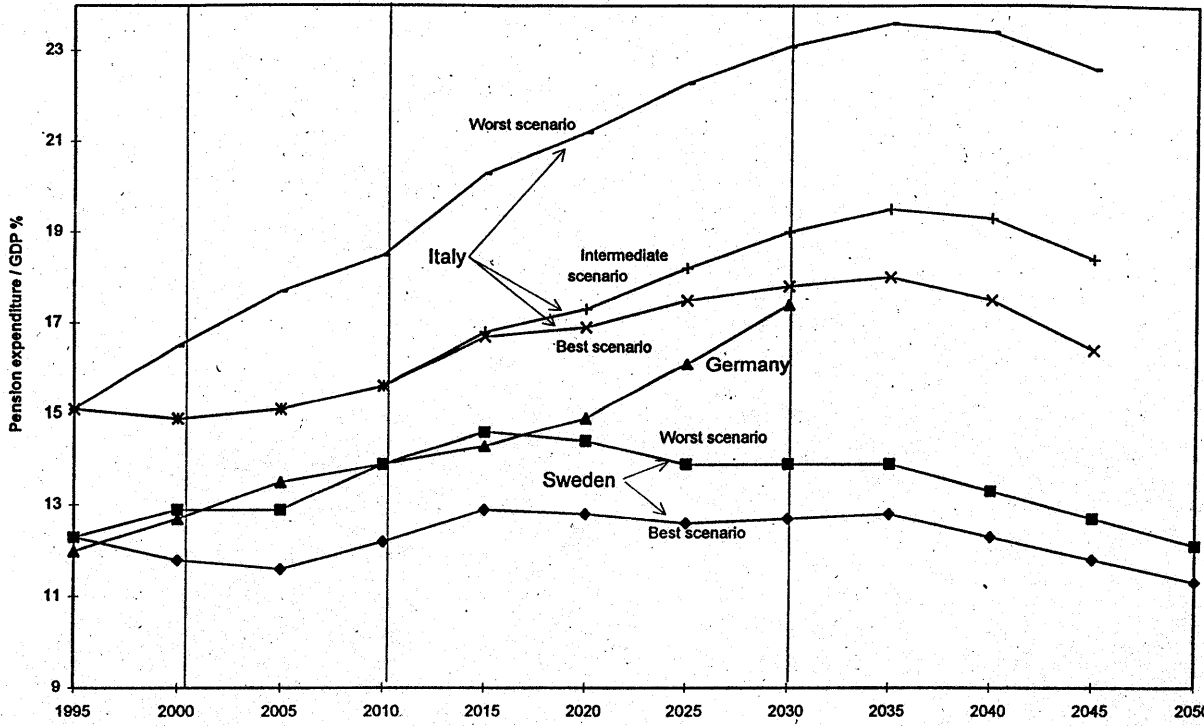
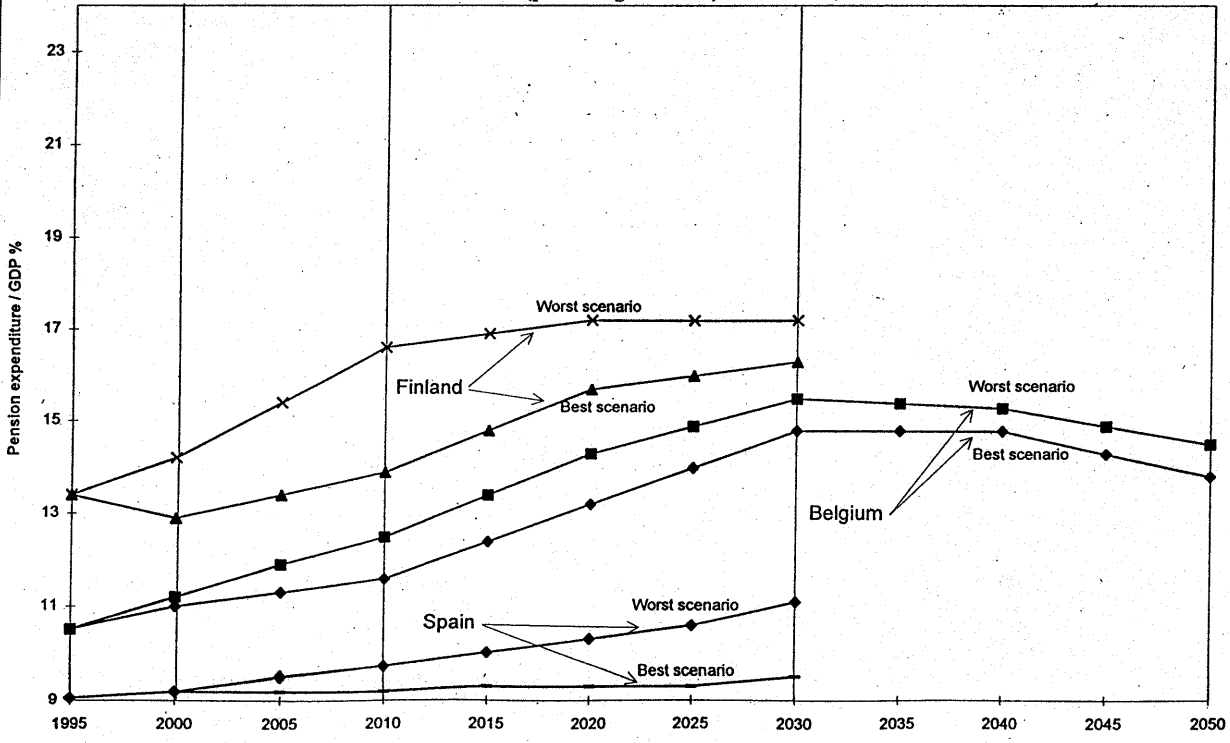


Chart 12b

**Estimates of total public pension expenditure - Part II**  
(percentage of GDP)



# Pension expenditure dynamics: demographic and non-demographic factors (1990 or 1995 = 100)

Chart 13a

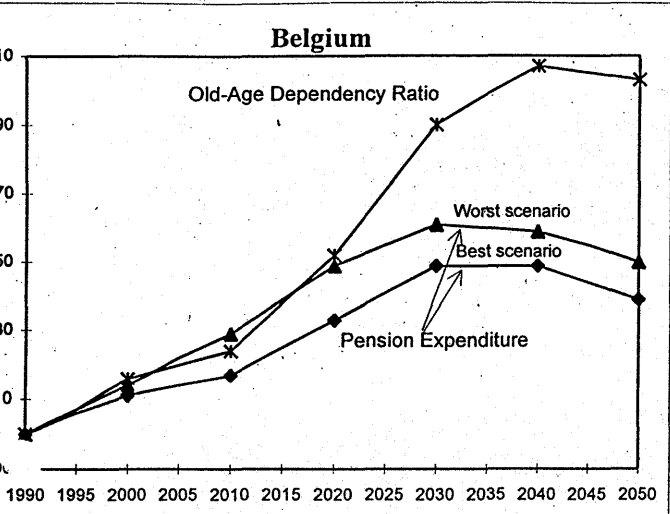


Chart 13b

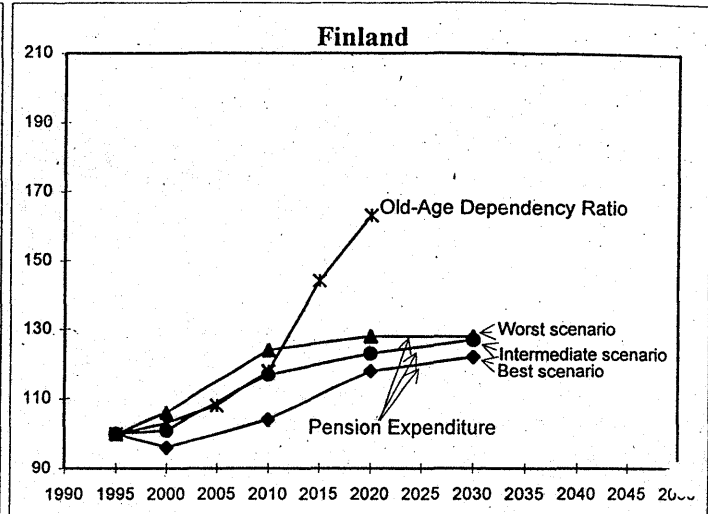


Chart 13c

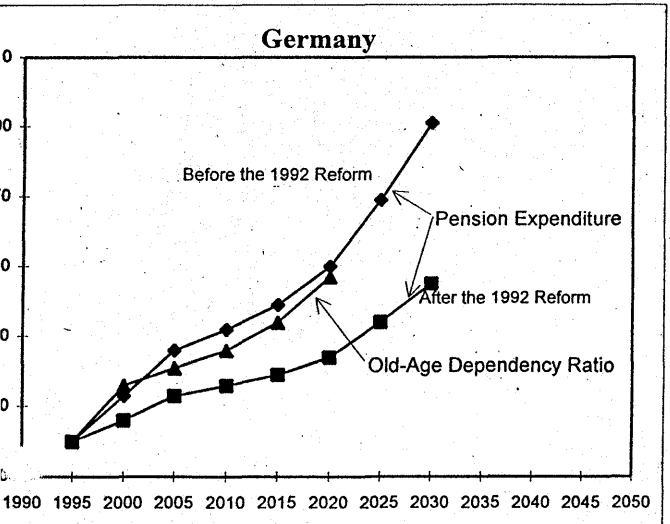


Chart 13d

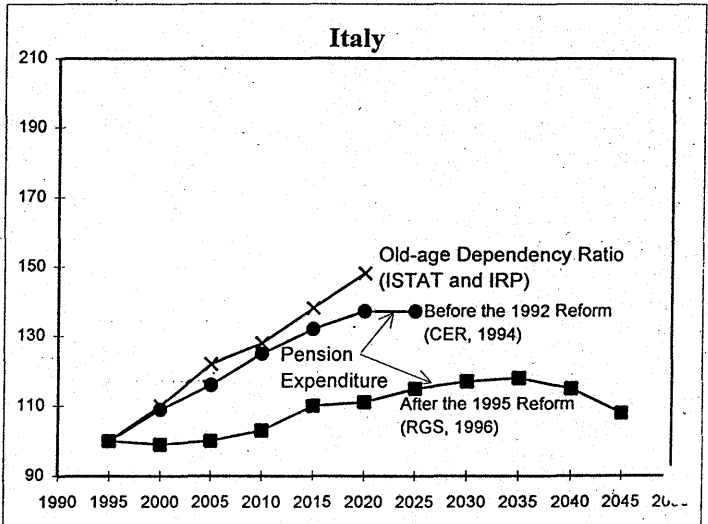


Chart 13e

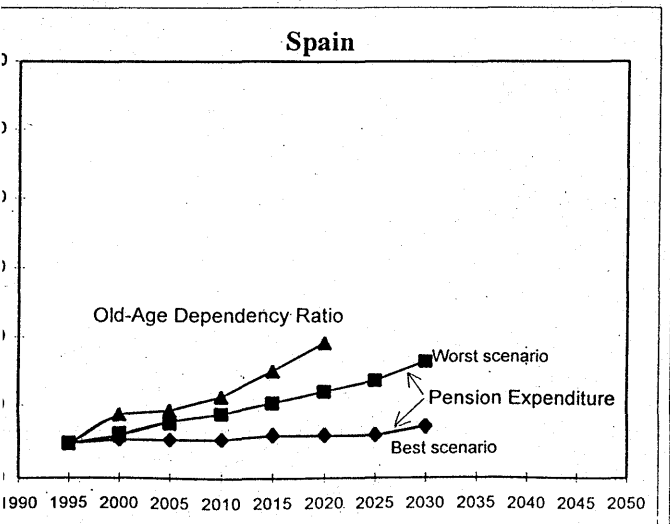
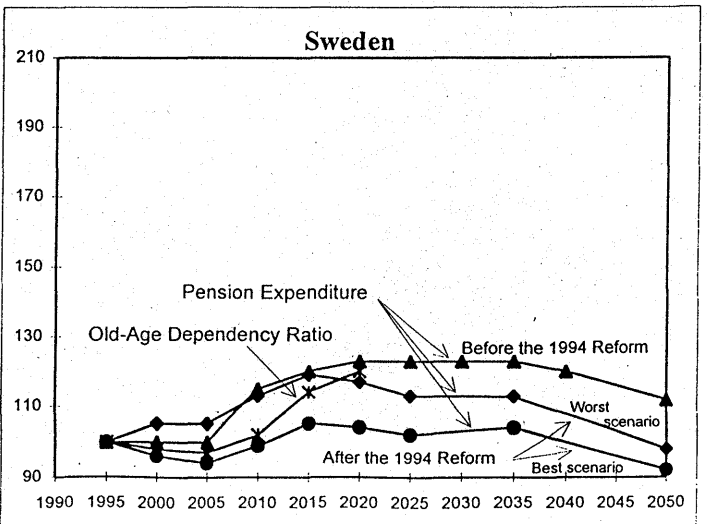


Chart 13f





(see Charts 14a-f). The differences in share of pension expenditure to GDP are very large and tend to increase over the projection period. By the year 2030, the shares would diverge by 0.2 per cent in Belgium, 1.7 in Germany, 3.1 in Sweden, 3.7 in Finland, 4.1 in Spain and 5.3 in Italy; by the end of the projection period, Belgium would record a difference of 1.8 per cent, Italy of 7.6 per cent and Sweden 4.8 per cent.

## ***5. Primary balance trends and budgetary adjustments: tentative estimates***

The first part of this section integrates the mechanical estimates of the effects of demographic changes on non-pension items presented in Section 3 with the pension expenditure projections considered in Section 4 in order to provide some tentative estimates of the share of total age-related public expenditure to GDP and to derive primary balance and public debt trends under unchanged policy scenarios. The base year is 1997. The first part also provides estimates of the adjustment required on the primary balance over the period 1998-2030 to implement the "close-to-balance" rule indicated in the Stability and Growth Pact. The dimension of the adjustment is also assessed on the basis of the tax-gap concept, that allows comparisons with alternative fiscal policies, such as, for instance, keeping the debt to GDP ratio by the end of the projection period at the present level.

The second part of the section examines some alternative scenarios. More specifically it considers the implications of the exclusion from the unchanged policy scenario of some expenditure and revenue items of a temporary nature. It also examines the implications of different interest rates on the public debt and different productivity growth rates. Finally, it evaluates the effects of taking 1996 rather than 1997 as the base year.

The third part of the section briefly considers the implications of alternative budgetary strategies for the problems raised by population ageing. It shows how the fast contraction in the debt to GDP ratio determined by the implementation of the "close-to-balance" rule would allow EU Member States to meet the worsening of the demographic situation after the year 2010 on a sounder fiscal footing.

### ***5.1 Public expenditure, primary balances and budgetary adjustments: baseline scenario***

**5.1.1 Age-related public expenditure<sup>40</sup>** - In order to project the share of total age-related public expenditure to GDP, the share of pension expenditure to GDP is derived from the national pension expenditure projections, while that of each non-pension item is estimated by multiplying the base year expenditure to GDP ratio by the baseline index presented in Section 3.2.1.<sup>41</sup> It should be noted that the total age-related expenditure to

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<sup>40</sup> Since national pension expenditure projections for Finland, Germany, Sweden and Italy are not available up to the year 2050, the estimates presented in this Section cover only the period up to the year 2030 for the former three countries and up the year 2045 for the latter.

<sup>41</sup> More specifically, the estimates for the expenditure to GDP share of the transfer items (excluding pensions) refer to Index *B*, while those for the share of expenditure programs mostly represented by wages (education and health care) refer to Index *C*.

GDP ratios for the different countries are not comparable in their levels since, as already mentioned, different items were considered for the six countries.<sup>42</sup>

Under the baseline demographic and economic scenarios defined in Section 3, the share of total age-related expenditure to GDP is expected to grow substantially in five of the six countries taken into consideration.<sup>43</sup> In Belgium, it would increase by 4.9 to 5.6 percentage points over the period 1995-2030 (respectively according to the most favourable and the most unfavourable pension expenditure scenario defined in Section 4) and by 3.9 to 4.6 percentage points over the period 1995-2050 (see Table 9). Over the period 1995-2030, in Finland and Germany it would increase respectively by 5.9 to 6.8 and by 5.4 percentage points. In Italy the share of total age-related expenditure to GDP would increase by 3.8 to 5.0 percentage points over the period 1995-2030 and by 3.9 to 6.0 percentage points over the period 1995-2045. Expenditure growth would be more limited in Spain: 1.1 to 2.8 points over the period 1995-2030.

Sweden is the only country where the share of age-related expenditure to GDP would remain nearly stable over the period 1995-2030 (-0.3 to 1.1 percentage points) and decline thereafter (-1.8 to -0.9 points over the period 1995-2050). These favourable prospects are related to the Swedish demographic trends<sup>44</sup> and to the expected effects of the pension reform outlined in 1994. It should also be considered that education and health expenditure have not been included in the estimates.

**5.1.2 Primary balances** - The projections for age-related expenditure items can be used to estimate the changes to be expected in primary balances, under the assumption that age-unrelated expenditure items and revenues are constant as a share to GDP. This assumption implies that the revenues and expenditures of a temporary nature are substituted with permanent revenues and expenditures (Section 5.4 considers the implication of removing this assumption for two countries). More specifically, the share of total primary public expenditure to GDP over the next decades, has been estimated by adding to its current share the increase in age-related public expenditure projected above.<sup>45</sup> An indicative measure of the primary balance is obtained by subtracting from the expected share of total primary expenditure to GDP, a constant share of revenues to GDP.<sup>46</sup>

In Belgium, Finland, Germany, Italy and Spain present primary surpluses would be gradually eroded by expenditure increases. In Belgium the primary balance would move from a surplus of 5.2 per cent in 1997 to close to balance in 2030 and to a deficit of 0.8 to

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42 The comparisons are more significant for the specific expenditure items (pensions, health, education). Nevertheless, also these comparisons should be carried out with some caution, since the same item can include slightly different programs in each country.

43 It should be stressed that these estimates are based on different base years. See Annex C.

44 As pointed out in Section 3.2.1, Sweden is the only country for which an increase in working age population is expected over the period 1995-2050. See Annex B.

45 Data on current total public expenditure net of interest payments refer to the latest European Commission estimates for the year 1997.

46 The share of revenues to GDP is assumed constant on its 1997 level as in the latest European Commission estimates.

**Pension expenditure dynamics:  
burden on working-age population compared to national projections  
(1995 = 1)**

Chart 14a

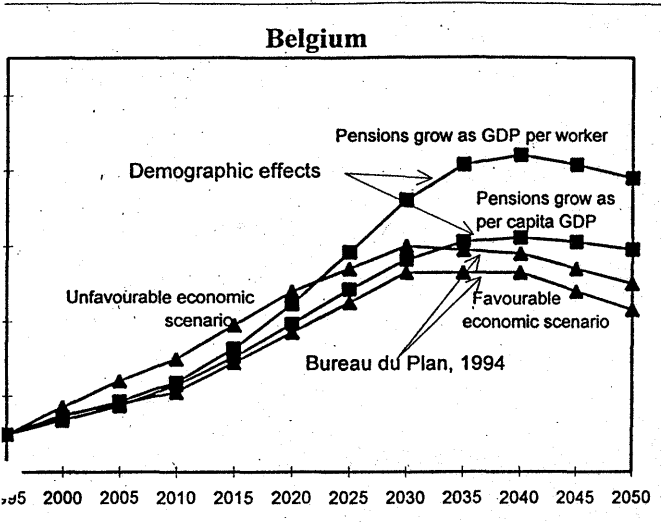


Chart 14b

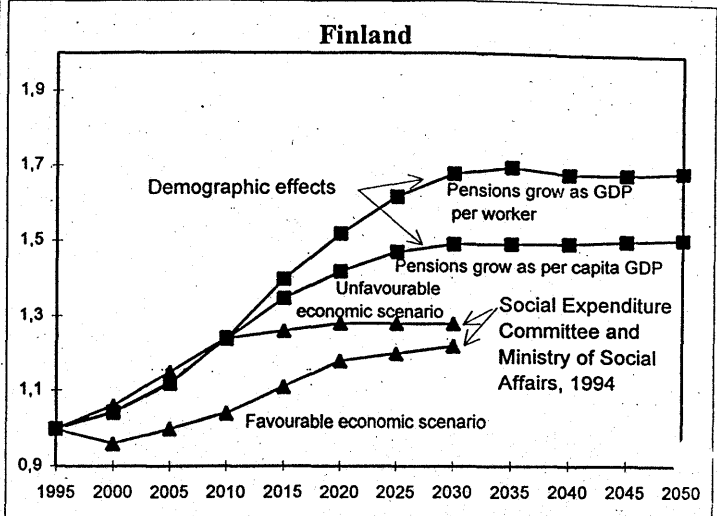


Chart 14c

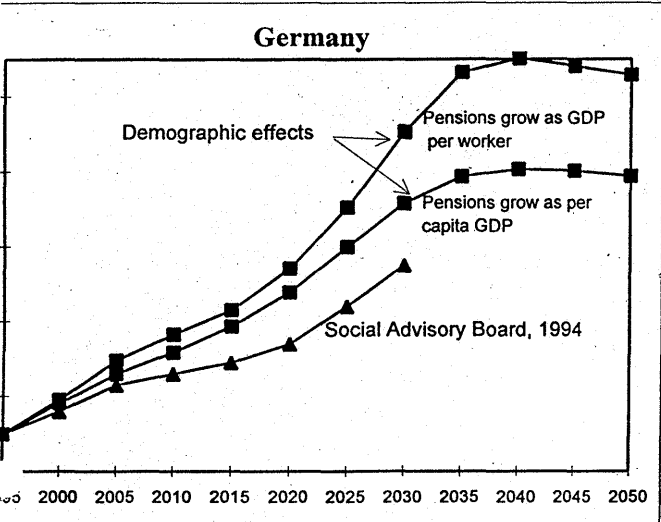


Chart 14d

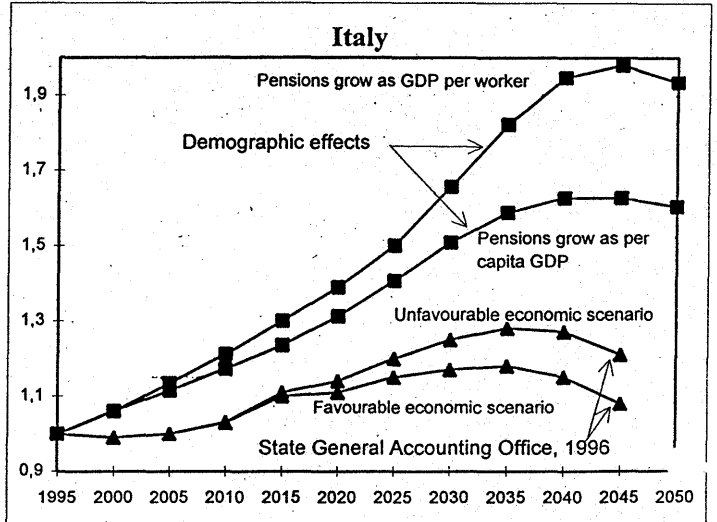


Chart 14e

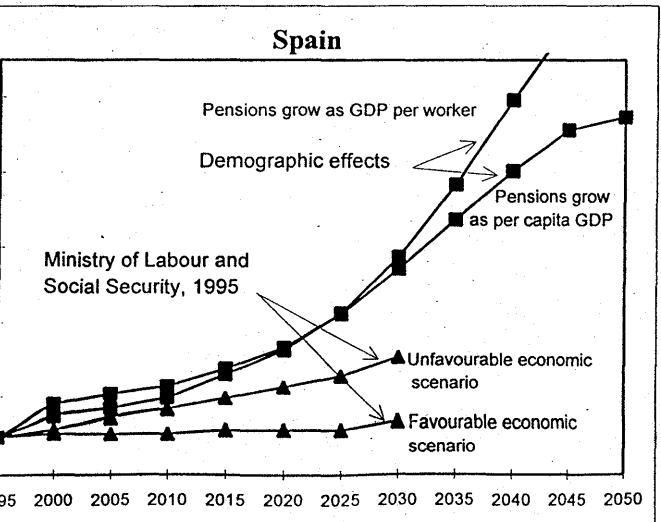
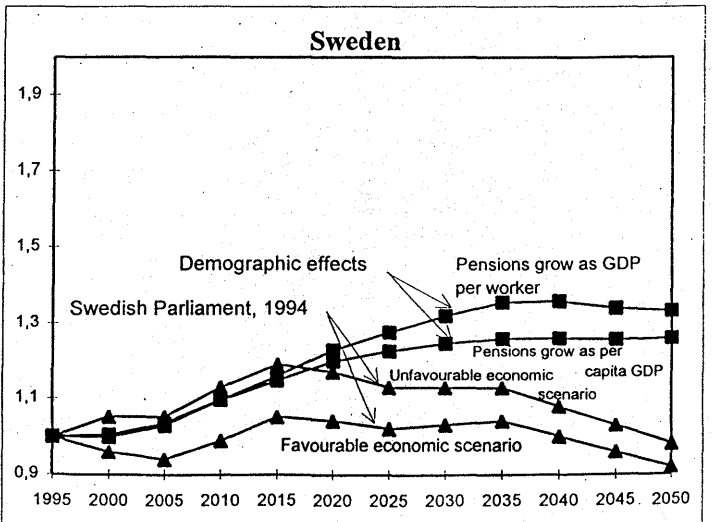


Chart 14f



## SHARE OF PUBLIC EXPENDITURE TO GDP

Table 9

Baseline economic and demographic scenario

	Share to GDP						Change over the period		
	1995	2000	2010	2020	2030	2040	2050	1995-2030	1995-2050
<b>Belgium</b>									
Health Insurance	5.4	5.5	5.6	5.9	6.5	6.7	6.6	1.1	1.2
Invalidity Benefits	2.6	2.6	2.8	2.8	2.7	2.6	2.6	0.1	0.0
Education	4.5	4.4	4.3	4.2	4.4	4.5	4.4	-0.1	-0.1
<i>Pensions best</i>	10.3	10.8	11.4	13.1	14.7	14.7	13.7	4.4	3.4
<i>Pensions worst</i>	10.3	11.0	12.4	14.2	15.5	15.2	14.4	5.2	4.1
Unemployment Benefits	3.3	3.2	3.4	3.4	3.1	3.0	3.1	-0.2	-0.2
Family Allowances	2.5	2.4	2.3	2.2	2.2	2.1	2.2	-0.3	-0.3
Maternity + Nursery Benefits	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0
<b>TOTAL EXPENDITURE best</b>	<b>28.8</b>	<b>29.2</b>	<b>29.9</b>	<b>31.8</b>	<b>33.7</b>	<b>33.8</b>	<b>32.7</b>	<b>4.9</b>	<b>3.9</b>
<b>TOTAL EXPENDITURE worst</b>	<b>28.8</b>	<b>29.4</b>	<b>30.9</b>	<b>32.9</b>	<b>34.4</b>	<b>34.3</b>	<b>33.4</b>	<b>5.6</b>	<b>4.6</b>
<b>Finland</b>									
Education	5.9	5.8	5.5	5.5	5.7	5.7	5.6	-0.2	-0.3
Health Care	5.1	5.2	5.6	6.4	7.3	7.7	7.7	2.2	2.6
Social Services	3.6	3.6	3.7	4.3	5.2	5.7	5.7	1.6	2.1
Net investments	1.4	1.4	1.4	1.5	1.5	1.6	1.6	0.1	0.2
Transfers related to children	2.9	2.7	2.5	2.4	2.4	2.3	2.3	-0.5	-0.5
<i>Pensions best</i>	14.0	13.4	14.6	16.5	17.1			3.1	
<i>Pensions worst</i>	14.0	14.8	17.4	17.9	17.9			3.9	
Unemployment Benefits	4.9	4.9	4.7	4.5	4.2	4.3	4.3	-0.7	-0.6
Other social Transfers	3.6	3.6	3.6	3.7	3.8	3.8	3.8	0.2	0.2
Transfers to households	1.7	1.7	1.7	1.7	1.8	1.9	1.9	0.1	0.2
<b>TOTAL EXPENDITURE best</b>	<b>43.0</b>	<b>42.4</b>	<b>43.4</b>	<b>46.6</b>	<b>48.9</b>			<b>5.9</b>	
<b>TOTAL EXPENDITURE worst</b>	<b>43.0</b>	<b>43.8</b>	<b>46.2</b>	<b>48.0</b>	<b>49.8</b>			<b>6.8</b>	
<b>Germany</b>									
<i>Pensions</i>	8.7	9.2	10.1	10.8	12.6			3.9	
Health Insurance	6.5	6.6	7.0	7.3	8.1	8.6	8.5	1.6	2.0
Accident Insurance	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.2	0.1
Unemployment Insurance	1.9	1.8	1.7	1.8	1.7	1.6	1.6	-0.1	-0.2
General Welfare	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0	0.0
Housing Benefits	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0
Maternity Benefits	0.3	0.2	0.2	0.2	0.2	0.2	0.2	-0.1	-0.1
Child Benefits	0.5	0.5	0.5	0.5	0.5	0.5	0.4	-0.1	-0.1
<b>TOTAL EXPENDITURE</b>	<b>19.5</b>	<b>20.1</b>	<b>21.3</b>	<b>22.4</b>	<b>24.9</b>			<b>5.4</b>	
<b>Italy</b>									
Education	5.3	4.8	4.9	4.8	4.5	4.9	5.0	-0.8	-0.3
Health Expenditure	5.6	5.8	6.2	6.7	7.3	8.3	8.4	1.7	2.8
<i>Pensions best</i>	15.5	15.3	16.0	17.2	18.1	17.8	16.7	2.6	1.2
<i>Pensions worst</i>	15.5	15.3	16.0	17.7	19.4	19.7	18.8	3.9	3.3
Family allowances	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.0	0.0
Other social benefits	1.6	1.6	1.6	1.7	1.8	1.7	1.6	0.2	0.0
<b>TOTAL EXPENDITURE best</b>	<b>28.3</b>	<b>27.9</b>	<b>29.0</b>	<b>30.7</b>	<b>32.1</b>	<b>33.0</b>	<b>32.2</b>	<b>3.8</b>	<b>3.9</b>
<b>TOTAL EXPENDITURE worst</b>	<b>28.3</b>	<b>27.9</b>	<b>29.0</b>	<b>31.2</b>	<b>33.3</b>	<b>34.9</b>	<b>34.3</b>	<b>5.0</b>	<b>6.0</b>
<b>Spain</b>									
Health Care	6.2	6.1	6.2	6.5	7.0	8.0	8.7	0.8	2.6
<i>Pensions best</i>	9.9	10.0	10.0	10.1	10.3			0.4	
<i>Pensions worst</i>	9.9	10.1	10.6	11.2	12.0			2.1	
Unemployment	3.8	3.8	3.7	3.7	3.6	3.3	3.1	-0.2	-0.7
Family allowances	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0
Other	0.3	0.3	0.3	0.3	0.4	0.6	0.7	0.2	0.4
<b>TOTAL EXPENDITURE best</b>	<b>20.3</b>	<b>20.4</b>	<b>20.3</b>	<b>20.7</b>	<b>21.4</b>			<b>1.1</b>	
<b>TOTAL EXPENDITURE worst</b>	<b>20.3</b>	<b>20.5</b>	<b>20.9</b>	<b>21.8</b>	<b>23.1</b>			<b>2.8</b>	
<b>Sweden</b>									
<i>Pensions best</i>	13.7	13.2	13.6	14.3	14.1	13.7	12.6	0.4	-1.1
<i>Pensions worst</i>	13.7	14.4	15.5	16.0	15.5	14.8	13.4	1.8	-0.3
Sickpay	1.7	1.8	1.8	1.7	1.7	1.7	1.7	0.0	0.0
Labour Market	3.8	3.7	3.6	3.6	3.4	3.4	3.5	-0.4	-0.3
Parents Allowances	1.3	1.3	1.2	1.2	1.2	1.1	1.1	-0.1	-0.2
Educational Grants	0.6	0.6	0.5	0.6	0.5	0.6	0.6	-0.1	0.0
Accident Allowances	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.1	0.1
Child Allowances	1.1	1.1	1.1	1.0	1.0	1.0	1.0	-0.1	-0.1
Social Assistance	0.7	0.7	0.7	0.7	0.7	0.7	0.7	-0.1	-0.1
<b>TOTAL EXPENDITURE best</b>	<b>23.6</b>	<b>22.9</b>	<b>23.1</b>	<b>23.7</b>	<b>23.3</b>	<b>22.9</b>	<b>21.8</b>	<b>-0.3</b>	<b>-1.8</b>
<b>TOTAL EXPENDITURE worst</b>	<b>23.6</b>	<b>24.1</b>	<b>25.0</b>	<b>25.5</b>	<b>24.7</b>	<b>24.0</b>	<b>22.7</b>	<b>1.1</b>	<b>-0.9</b>

Note: Where two data are presented, the left assumes the most favourable pension expenditure scenario and the right the most unfavourable one

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1.5 percentage points in 2050 (See Chart 15a-f). In Finland the 3.9 per cent surplus of 1997 would turn into a deficit of 2.3 to 2.6 points in 2030. The German primary surplus would turn into a deficit in the first decade of the next century; the deficit would then gradually increase up to 4.4 per cent in 2030. In Italy the present surplus of 6.6 points of GDP would gradually decline; in the year 2040 a small primary deficit would be recorded in the worst scenario. The Spanish 2.2 per cent surplus would also turn into a small deficit only in the worst scenario. Only Sweden would retain a primary surplus in both scenarios; the surplus would decline to 3.1 to 4 points in 2030 and then increase to around 5 points by the year 2050.

**5.1.3 Debt to GDP ratio** - On the basis of the primary balance trends presented above and some assumptions on real GDP growth, interest rates and inflation, it is possible to estimate the dynamics of the debt to GDP ratio under unchanged policies.

More specifically, it has been assumed that in all countries:

- a) productivity per worker increases by 1.5 per cent per year (the standard assumption in OECD's recent studies on long-term economic prospects),<sup>47</sup>
- b) GDP growth depends on productivity growth and the rate of change in the number of working age citizens (i.e., aggregate labour force participation rates and unemployment rates remain constant over the projection period),
- c) inflation and the real interest rate on public debt are respectively 2 and 4 per cent over the whole projection period,<sup>48</sup>
- d) the stock-flow adjustment is systematically zero.

The debt to GDP ratio (under unchanged policies) would follow a U-shaped curve in Belgium, Finland and Spain with the debt decreasing until the second or third decade of the next century and increasing thereafter. More specifically, over the period 1997-2030, the ratio would either decline from 127 to 110 per cent in the best scenario or increase to 145 per cent in the worst scenario in Belgium, it would decline from 59 to 35 per cent or increase to 100 per cent in Finland, it would decline from 68 to 56 per cent in the best scenario or increase to 91 per cent in the worst scenario in Spain.

In Italy, where the primary surplus expected for 1997 is relatively high (6.6 per cent of GDP), the ratio would decline in both scenarios from 122 per cent to respectively 37 and 50 per cent. The ratio would continuously increase in Germany (from 62 per cent in 1996 to about 213 per cent in 2030), while in Sweden it would decrease substantially and turn into a net credit position in the period 2020-2040, according to different pension projections.

In conclusion, under unchanged policies, in spite of the decline of primary surplus due to the increase in age-related expenditure, the debt to GDP ratio would decline substantially in most countries over the next 2 or 3 decades. Thereafter, it would increase in most countries.

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<sup>47</sup> See Leibfritz *et al.* (1995) and Roseveare *et al.* (1996).

<sup>48</sup> It is assumed that the adjustment of interest payments to the interest rate assumed in the projections takes place gradually over four years.

**5.1.4 The adjustment required by “close-to-balance” policies** - According to the Stability and Growth Pact approved at the Dublin summit of December 1996, EMU Members should set medium-term budgetary targets of close-to-balance or in surplus.<sup>49</sup> These targets would allow them to respect the 3 per cent ceiling even during economic downturns. Taking the close-to-balance indication and the likely effects of downturns into consideration, the average deficit of these countries may be of the order of 1 per cent of GDP.

Assuming that the deficit is fixed at 1 per cent from the year 1998 onwards and taking interest payments into account, it is possible to derive the primary balance level required by the “close-to-balance” rule. In the four non-heavily indebted countries the required primary surplus would decline from an initial value of 3 to 5 points of GDP to about 1 to 2 points by the year 2030 (See Charts 16a-f). In the two heavily indebted countries it would decline from 6.4 per cent of GDP in Belgium and 8.1 per cent in Italy, to about 3 per cent of GDP. In some countries the reduction is particularly fast over the period 1998-2001, due to the assumption that the real interest rate on the public debt converges to 4 per cent. In all countries the primary balance level required by the “close-to-balance” rule is reduced by the decline in interest payments related to the fast contraction in the level of the debt to GDP ratio.

The difference between this required primary balance and the trend primary deficit provides an indicative measure of the adjustment required by the implementation of the “close-to-balance rule”. The adjustment, which reflects the changes in age-related expenditure and the decrease in interest payments determined by the reduction in the debt to GDP level, is positive in five of the six countries considered. In other words, in five countries measures should be taken to improve the primary balance over most of the period 1997-2030 (see Charts 16a-f).<sup>50</sup>

In Belgium the adjustment is always positive with a peak of 2.3 to 3.0 percentage points in the year 2030. In Italy it is positive up to the year 1999 and after the year 2015 (in the worst scenario) or the year 2026 (in the best scenario) with a peak in the 1.1 to 2.9 per cent range in the year 2040. In Germany the adjustment is also always positive, increasing up to 6 percentage points by the year 2030. In Finland the adjustment is positive respectively from 2007 and 2016 in the worst and the best scenarios and reaches a peak of around 3.5 points by the year 2030. In Spain it is always positive in the worst scenario and it is positive before 2009 and after 2021 in the best scenario, with a peak in the 0.4 to 2.1 range by the year 2030.

Only Sweden would be able to relax its fiscal policy, since the adjustment is almost always negative. The negative gap between the required primary balance and the trend primary deficit would increase over most of the projection period, reaching 1.5/2.5 points in 2030 and 4.1/4.4 points in 2050.

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<sup>49</sup> See Buti *et al.* (1997).

<sup>50</sup> The adjustment estimated for the period 1998-2001 is obviously affected by the assumption that over the period the real interest rates on the public debt gradually converge to 4 per cent.

# Primary balance and public debt trends under constant policies

## - Belgium - (percentage of GDP)

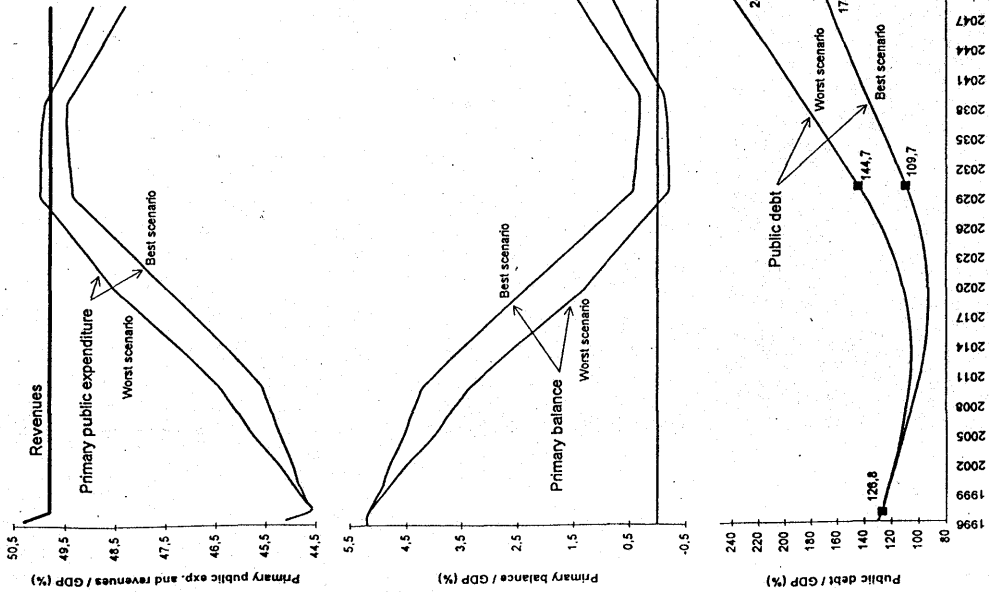


Chart 15a

## - Finland - (percentage of GDP)

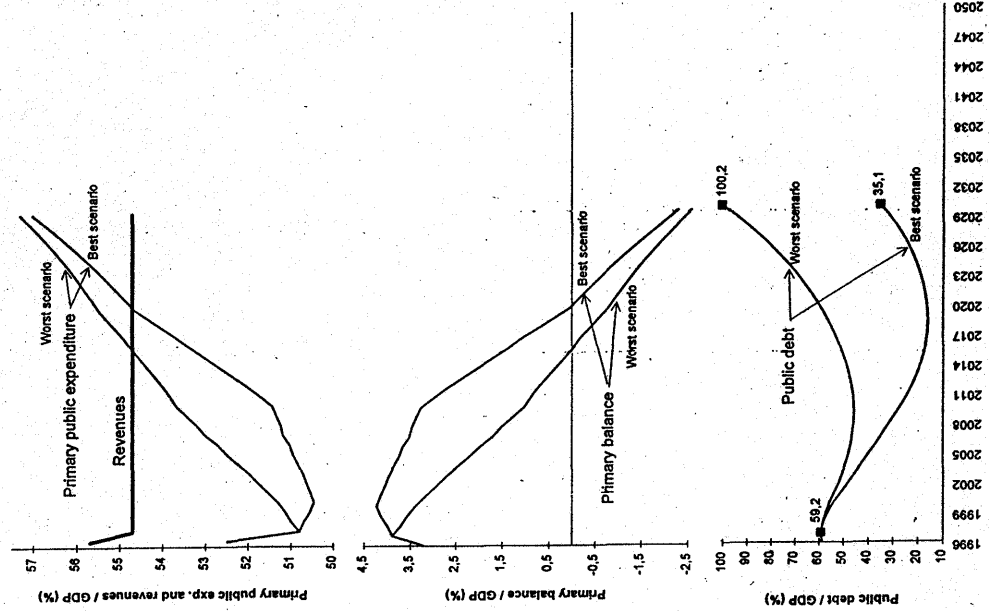


Chart 15b

## - Germany - (percentage of GDP)

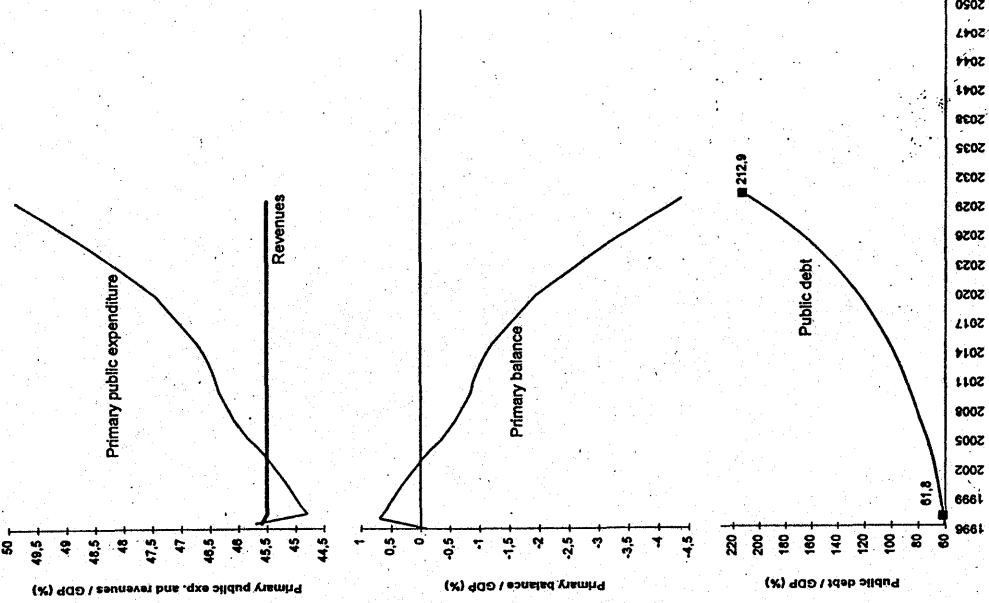


Chart 15c

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# Primary balance and public debt trends under constant policies

## - Italy - (percentage of GDP)

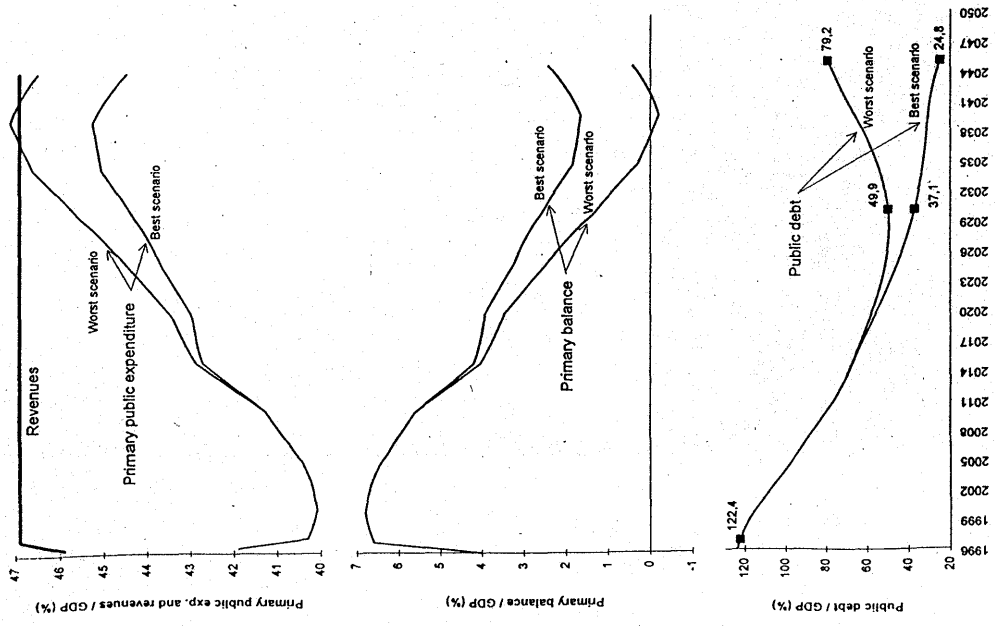


Chart 15d

## - Spain - (percentage of GDP)

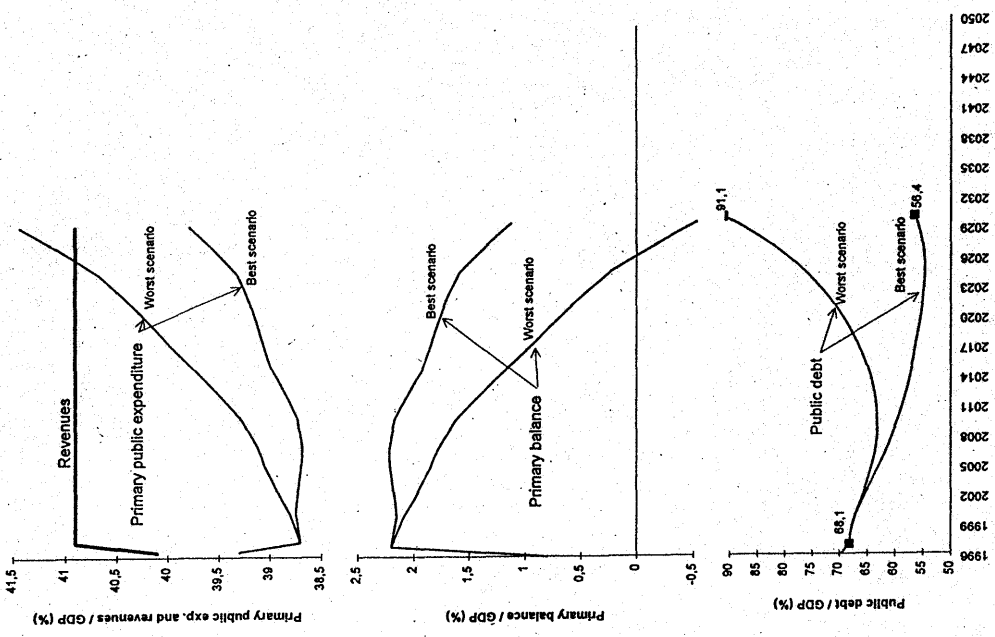


Chart 15e

## - Sweden - (percentage of GDP)

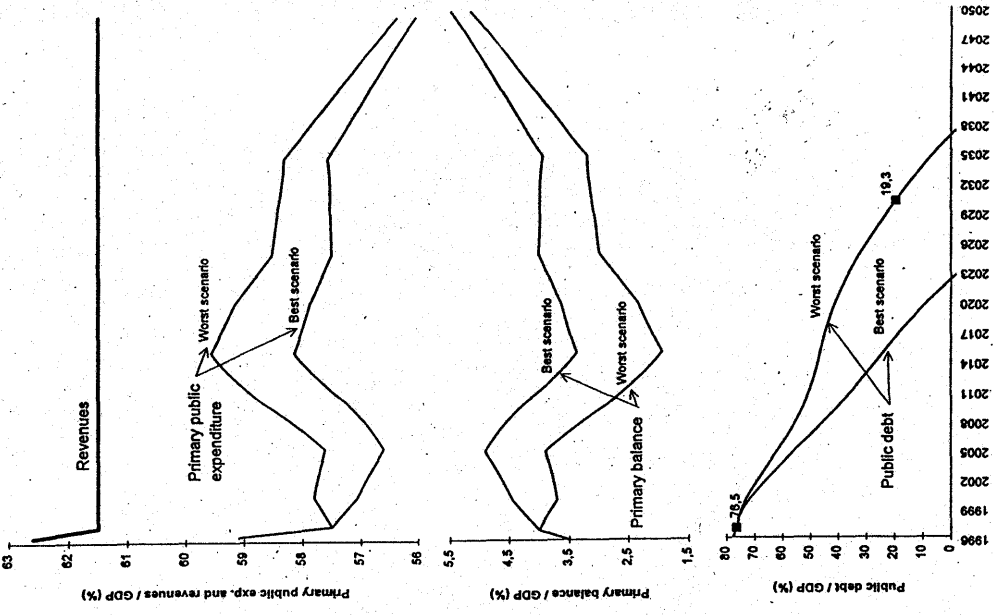


Chart 15f



# Adjustment in primary balances required for the implementation of the "close to balance" rule

## - Belgium - (percentage of GDP)

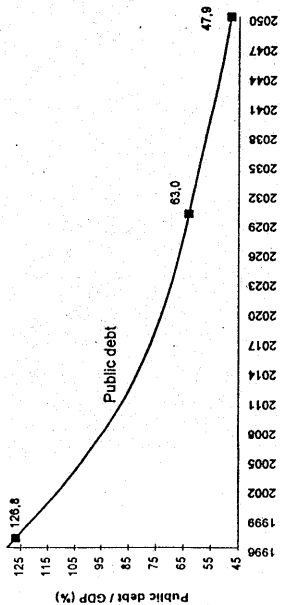
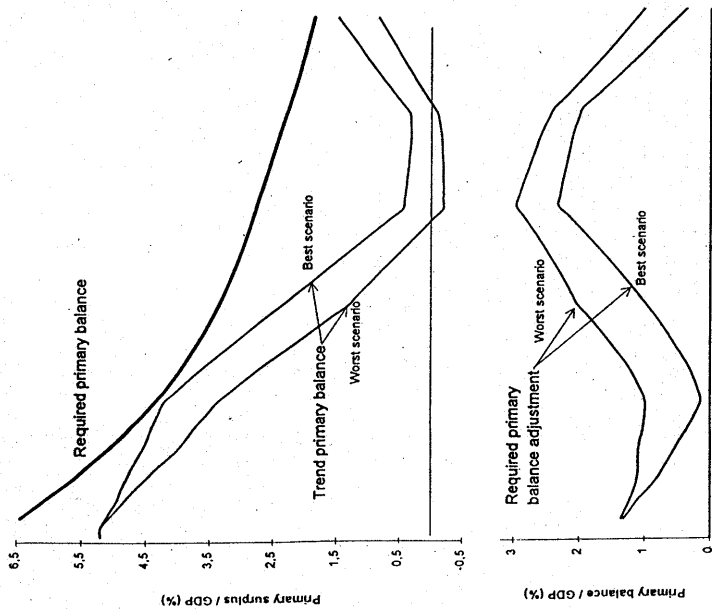


Chart 16a

## - Finland - (percentage of GDP)

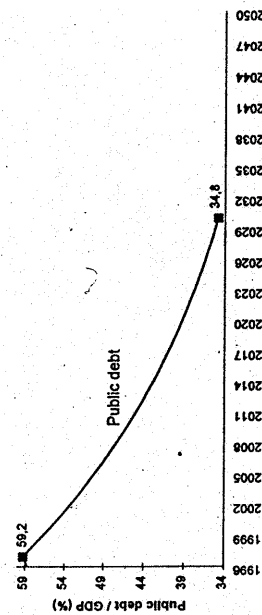
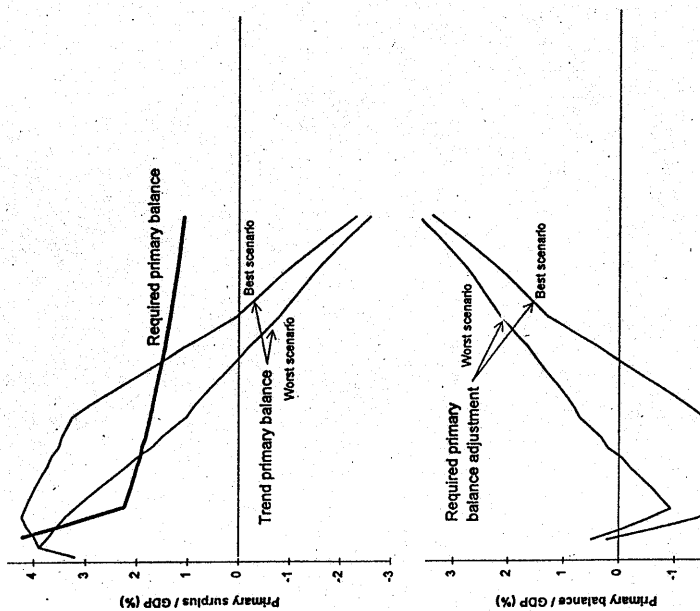


Chart 16b

## - Germany - (percentage of GDP)

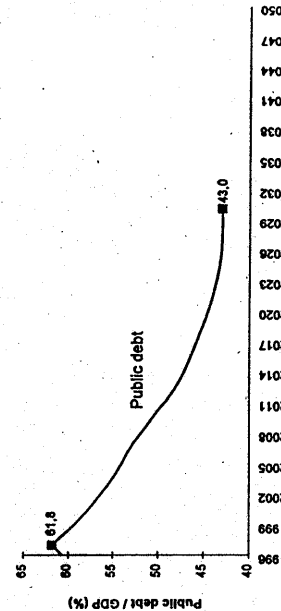
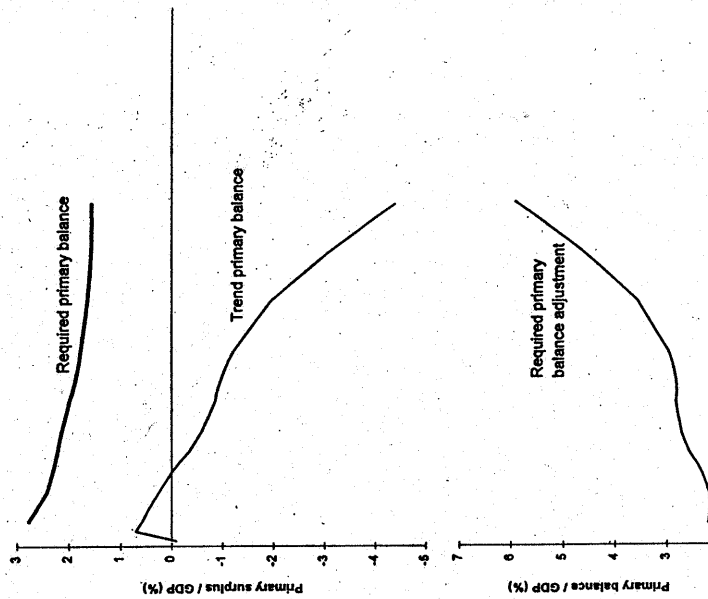


Chart 16c

34c

# Adjustment in primary balances required for the implementation of the "close to balance" rule

## - Italy - (percentage of GDP)

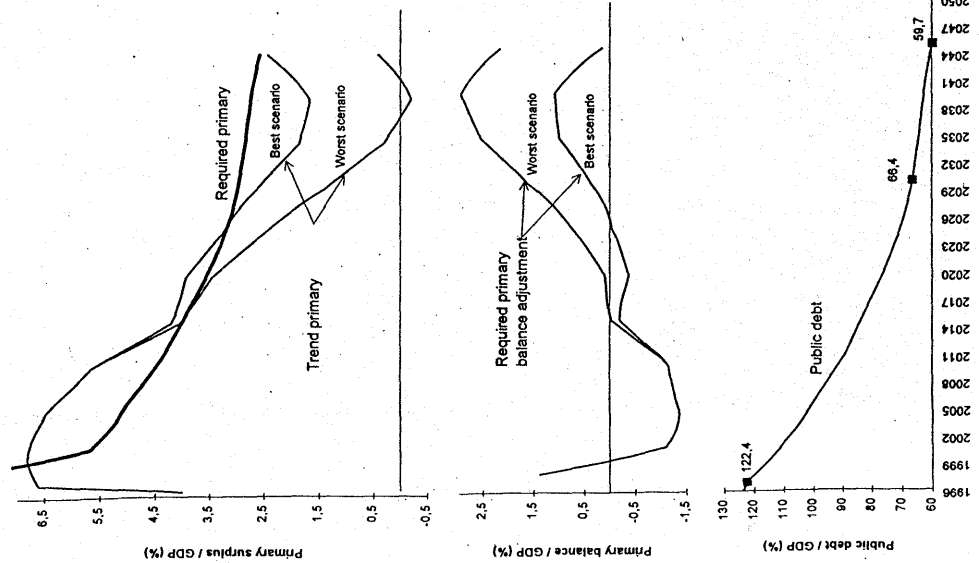


Chart 16d

## - Spain - (percentage of GDP)

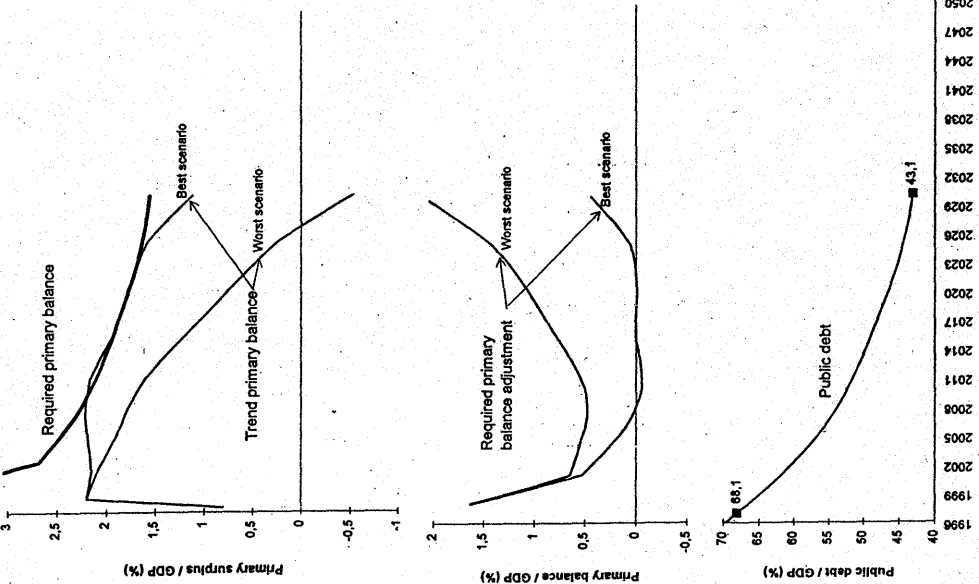


Chart 16e

## - Sweden - (percentage of GDP)

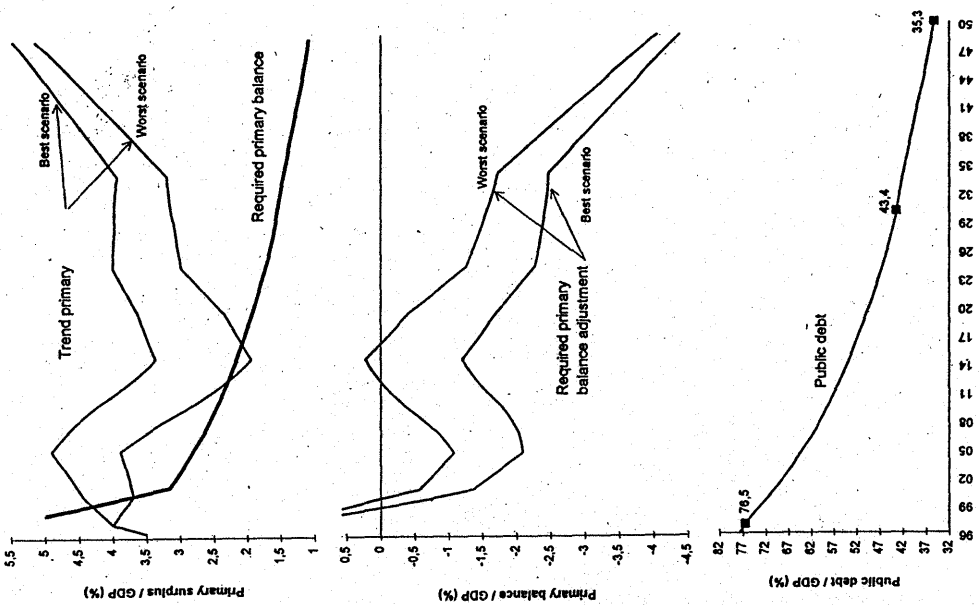


Chart 16f

**5.1.5 Tax-gaps and comparisons of alternative fiscal policies** - The adjustments required to implement the “close-to-balance” rule change over time, according to primary deficit trends and interest expenditure dynamics. A concise measure of the adjustment required for each country over the whole period considered is provided by the tax-gap, i.e. the change in the tax to GDP ratio immediately required to reach by the end of the projection period the debt to GDP ratio that would be reached by implementing the “close-to-balance” rule outlined in the Stability and Growth Pact.<sup>51</sup>

The tax-gap concept also allows comparison of the adjustment required by the “close-to-balance” rule with those required by alternative policies, such as for instance, keeping the debt to GDP ratio by the end of the projection period at the present level (i.e., the “sustainable tax-gap” *à la* Blanchard)<sup>52</sup> or bringing it to the 60 per cent level, as required by the Maastricht debt criterium.

Under the above-mentioned assumptions on productivity growth, GDP growth, inflation and interest rates, the tax-gap allowing for the respect of the “close-to-balance” rule over the period 1996-2030, is the highest in Germany (3.1 points). According to the different pension scenarios, it is in the 0.9 to 1.5 range in Belgium, in the 0 to 1.2 range in Finland and in the 0.3 to 0.9 range in Spain (see Table 10). In Italy and Sweden the tax-gap is negative for both pension scenarios, implying that, given spending trends and current revenues, no adjustment is needed over the whole of the period considered for the implementation of the “close-to-balance” rule.

For all six countries, the “close-to-balance” rule obviously implies bigger adjustments than those required for keeping the debt to GDP ratio at the end of the projection period at the present level. For the four less indebted countries it also requires bigger adjustments than those required for maintaining a level of the debt below 60 per cent. For Belgium and Italy the adjustments required by the implementation of the “close-to-balance” rule are slightly lower than those required to keep the debt below 60 per cent, implying that, even if the rule is respected, the level of the debt to GDP ratio would still not have declined below 60 per cent by the year 2030. In Italy and Sweden all tax-gaps are negative, irrespective of pension scenarios and fiscal policy objectives, implying that current fiscal policies allow for the respect of the debt sustainability, the 60 per cent debt criterium and the “close-to-balance” rule.

## 5.2 Alternative scenarios

**5.2.1 Temporary expenditure and revenue items** - The estimates presented in Section 5.1 are based on the assumption that, under constant policies, revenues and age-unrelated expenditure items are constant as a share to GDP at their 1997 level. Therefore, the

<sup>51</sup> The calculation of the tax-gap has been carried out on the basis of the discrete formula used by Blanchard (1990) adjusted in order to be used for a different level of required debt to GDP by the end of the projection period. The formula used is (symbols refer to Annex A):

$$\tau^* = \left( \frac{r-\theta}{1+r-\theta} \right) \frac{b_0 - b_n(1+r-\theta)^{-n} + \sum_{s=1}^n (g+h_s)(1+r-\theta)^{-(s-1)}}{1-(1+r-\theta)^{-n}}$$

<sup>52</sup> See Section 2.1.3.

temporary nature of some revenue and expenditure items is not taken into consideration. This section provides some tentative estimates of the effects of the removal of this assumption. Two cases are considered: the expenditure related to German reunification and the one-off revenues included in the 1997 Italian budget.

Public expenditure related to German reunification has been estimated by the German Ministry of Finance (1996) as 4 to 5 per cent of West German GDP. If the reduction of the burden for reunification would allow German public expenditure to decline by, say, 0.2 per cent of GDP per year over a 15 year period, the expected primary balance trend would change radically: rather than worsening continuously, it would improve for 15 years and worsen thereafter (see Chart 17). Accordingly, the debt to GDP ratio would increase substantially only after the year 2020.

The adjustment to be implemented in the primary balance would also be substantially smaller than in the scenario assuming a constant expenditure to GDP ratio. While in the latter scenario the tax-gap allowing for the implementation of the "close-to-balance" rule is 3.1 per cent, in the scenario including reduction of the burden for reunification the tax-gap is only 1 per cent.

The 1997 Italian budget includes revenues of a temporary nature amounting to about 1.5 per cent of GDP. The exclusion of these revenues from 1998 onwards would reduce the primary surplus and modify the debt dynamics in the unchanged policy scenario. The debt to GDP ratio would decline up to the year 2010 and then gradually increase; by the year 2030 it would be in the 120 to 133 range (see Chart 18).

The adjustment required by the implementation of the "close-to-balance" rule would be substantially increased. Over the whole projection period, the unchanged policy primary surplus would be smaller than that required by the rule. The tax-gap would be in the 1 to 1.2 range, as against the negative values indicated in the estimates including temporary tax revenues.

**5.2.2 Different macroeconomic scenarios: sensitivity analysis** - As already mentioned, the results presented in the previous sections are based on primary expenditure projections and macroeconomic assumptions. As to the latter, it has been assumed that, for all the countries considered, productivity per worker increases by 1.5 per cent per year, GDP growth depends on productivity growth and the rate of change in the number of working age citizens. It is also assumed that inflation and the real interest rate on public debt are respectively 2 and 4 per cent over the whole projection period.

The long-term economic outlook is obviously very uncertain. In order to assess the implications of alternative economic scenarios on the adjustments required by "close-to-balance" rule, sensitivity analyses have been carried out by taking different values for the interest and productivity growth rates. More specifically, as to the interest rate, two alternative scenarios have been considered: a more favourable one where the real interest rate on the public debt would be 0.5 percentage point smaller than in the baseline scenario and a more unfavourable one, where it would be 0.5 percentage point higher. As to the productivity rate, an alternative scenario has been examined assuming a yearly growth rate of 2 per cent as against the 1.5 per cent yearly growth assumed in the baseline scenario.

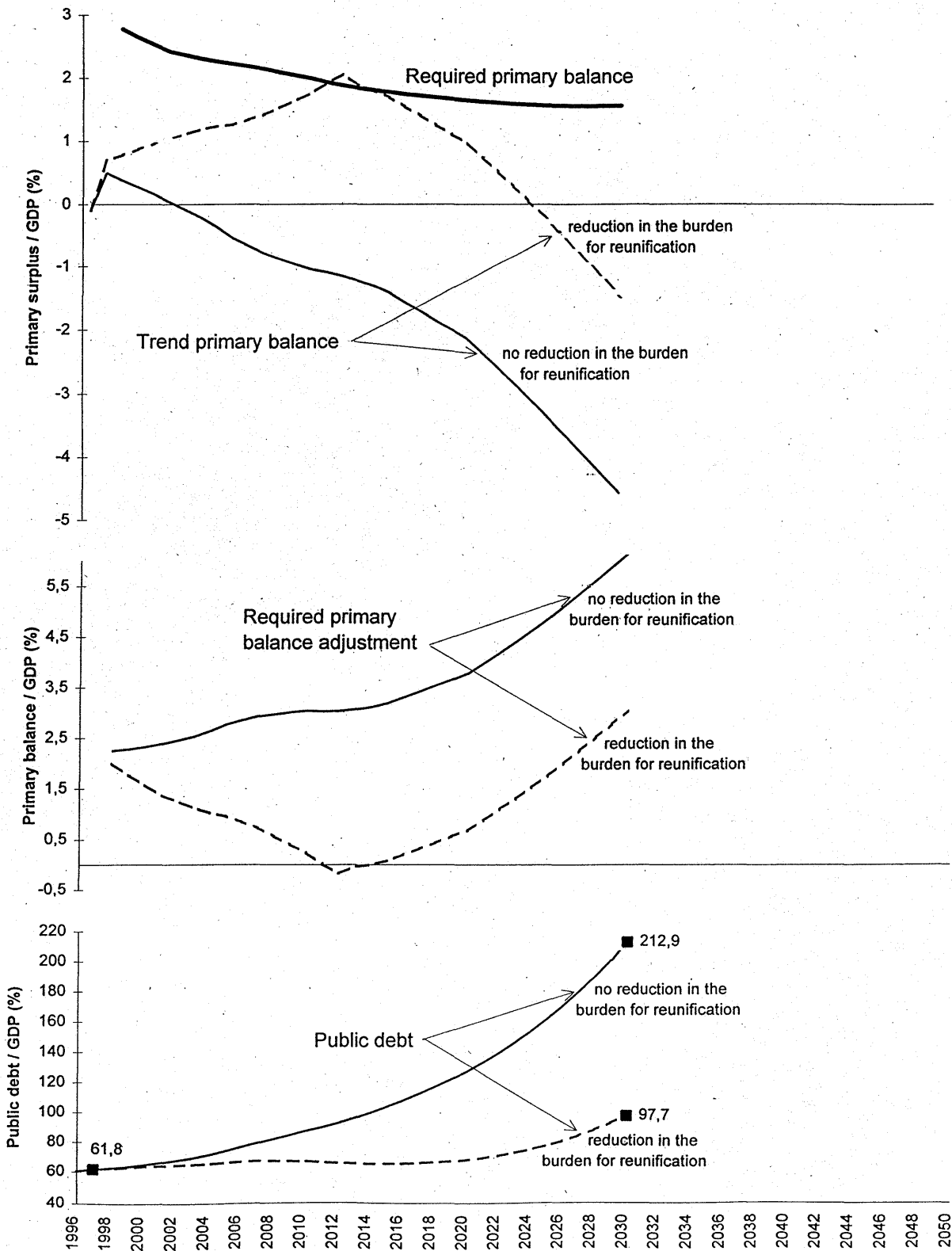
Table 10

**Tax-gap computed over the period 1997-2030 allowing for the respect of:**

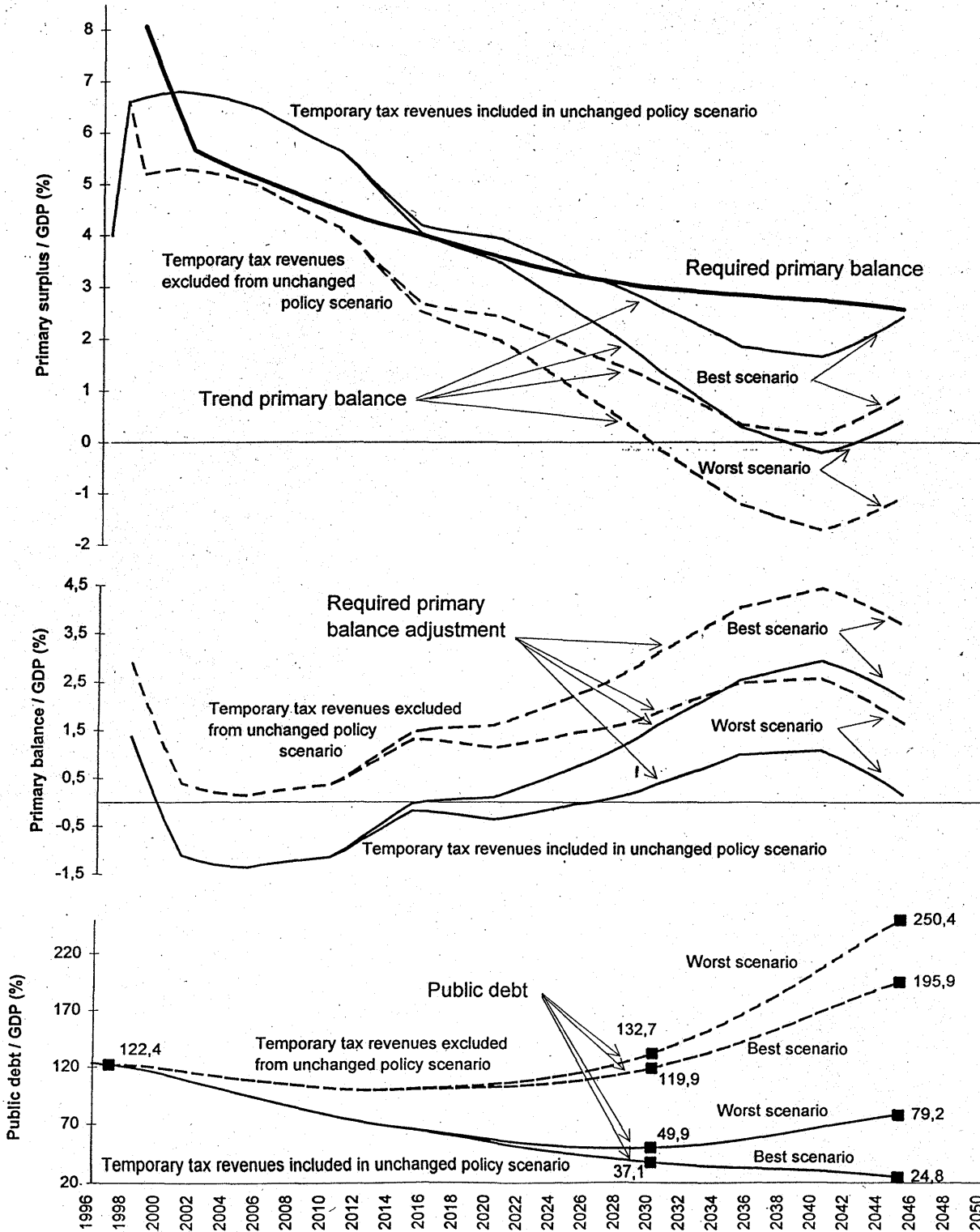
	<b>"Close to balance" rule</b>		<b>60 per cent debt criterium</b>		<b>Sustainable public debt</b>	
	<b>Favourable pension scenario</b>	<b>Unfavourable pension scenario</b>	<b>Favourable pension scenario</b>	<b>Unfavourable pension scenario</b>	<b>Favourable pension scenario</b>	<b>Unfavourable pension scenario</b>
<b>Belgium</b>	0.9	1.5	0.9	1.6	-0.3	0.3
<b>Finland</b>	0.0	1.2	-0.5	0.7	-0.4	0.8
<b>Germany</b>	3.1	-	2.8	-	2.8	-
<b>Italy</b>	-0.5	-0.3	-0.4	-0.2	-1.5	-1.3
<b>Spain</b>	0.3	0.9	-0.1	0.6	-0.2	0.4
<b>Sweden</b>	-1.6	-0.5	-1.9	-0.8	-2.2	-1.2

	<b>"Close to balance" rule</b>		<b>60 per cent debt criterium</b>		<b>Sustainable public debt</b>	
	<b>Favourable pension scenario</b>	<b>Unfavourable pension scenario</b>	<b>Favourable pension scenario</b>	<b>Unfavourable pension scenario</b>	<b>Favourable pension scenario</b>	<b>Unfavourable pension scenario</b>
<b>Belgium</b>	0.9	1.5	0.9	1.6	-0.3	0.3
<b>Finland</b>	0.0	1.2	-0.5	0.7	-0.4	0.8
<b>Germany</b>	3.1	-	2.8	-	2.8	-
<b>Italy</b>	-0.5	-0.3	-0.4	-0.2	-1.5	-1.3
<b>Spain</b>	0.3	0.9	-0.1	0.6	-0.2	0.4
<b>Sweden</b>	-1.6	-0.5	-1.9	-0.8	-2.2	-1.2

**Adjustment in primary balances required for the implementation of the "close to balance" rule in Germany: tentative evaluation of the reduction in the burden for reunification (percentage of GDP)**



**Adjustment in primary balances required for the implementation of the "close-to-balance" rule in Italy: exclusion of 1997 one-off tax revenues from unchanged policy scenario (percentage of GDP)**



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**Table 11 Tax-gap computed over the period 1997-2030 allowing for the respect of the "close to balance" rule:**

	real interest rate = 0,035		real interest rate = 0,04		real interest rate = 0,045	
	Favourable pension scenario	Unfavourable pension scenario	Favourable pension scenario	Unfavourable pension scenario	Favourable pension scenario	Unfavourable pension scenario
Belgium	0,4	1,1	0,9	1,5	1,3	2,0
Finland	-0,1	1,1	0,0	1,2	0,2	1,4
Germany	2,9		3,1		3,3	
Italy	-0,9	-0,6	-0,5	-0,3	-0,1	0,1
Spain	0,0	0,7	0,3	0,9	0,5	1,1
Sweden	-1,9	-0,8	-1,6	-0,5	-1,3	-0,2

**Table 12 Tax-gap computed over the period 1997-2030 allowing for the respect of the "close to balance" rule:**

	(real interest rate = 4%)		productivity growth = 0,02	
	Favourable pension scenario	Unfavourable pension scenario	Favourable pension scenario	Unfavourable pension scenario
Belgium	0,9	1,5	0,6	1,2
Finland	0,0	1,2	-0,2	1,0
Germany	3,1		3,0	
Italy	-0,5	-0,3	-0,8	-0,6
Spain	0,3	0,9	0,1	0,8
Sweden	-1,6	-0,5	-1,8	-0,7

**Table 13 Tax-gap computed over the period up to 2030 allowing for the respect of the "Close to balance" rule**

	Base-year: 1996		Base-year: 1997	
	Favourable pension scenario	Unfavourable pension scenario	Favourable pension scenario	Unfavourable pension scenario
Belgium	1,0	1,7	0,9	1,5
Finland	0,4	1,9	0,0	1,2
Germany	3,9	-	3,1	-
Italy	2,0	2,2	-0,5	-0,3
Spain	1,7	2,4	0,3	0,9
Sweden	-1,2	0,1	-1,6	-0,5



The results of both analyses are expressed in terms of tax-gaps. As to the analysis of the effect of different interest rates, obviously, for all the countries considered, the lower interest rate would allow smaller tax-gaps, while the higher rate would imply larger ones (see Table 11). Belgium and Italy would have the biggest differences, with a tax-gap 0.4-0.5 percentage points smaller in the more favourable scenario and 0.4-0.5 points bigger in the more unfavourable one. In Spain and Sweden, the difference between tax-gaps in the baseline scenario and in the alternative scenarios would amount to 0.2-0.3 percentage points for both scenarios. In Finland and Germany the difference would be the smallest, with the tax-gaps being 0.1-0.2 percentage points respectively smaller or bigger.

A higher productivity growth rate would allow all countries to have smaller tax-gaps (see Table 12). Belgium and Italy would again show the biggest differences (0.3 percentage points). In the other countries, the difference between the tax-gaps in the baseline scenario and those in the alternative scenario would amount to 0.1-0.2 percentage points.

**5.2.3 Different initial budgetary conditions: 1996 versus 1997** - The results presented in the previous sections refer to the latest European Commission public finance estimates for the year 1997. In order to highlight the sensitivity of the results to changes in the base year primary balance and debt to GDP ratio, the adjustments required to implement the "close-to-balance" rule have also been estimated on the basis of 1996 primary balances and debts.

On the whole, 1996 deficits and debts are worse than those expected for 1997. The 1996 primary balance is equal to the that expected for 1997 for Belgium and worse for the other countries. The 1996 debt ratio is higher for four countries (Belgium, Italy, Spain and Sweden) and slightly lower for the other two.

As a consequence, for the six countries the adjustment required by the implementation of the "close-to-balance" rule on the basis of 1996 data is substantially higher than that required on the basis of 1997 data (see Table 13). The change is particularly significant for Italy and Spain.

### ***5.3 Debt reduction and the ageing process***

The "close-to-balance" rule has been primarily introduced for avoiding budgetary imbalances in monetary union. Solid budgetary discipline is an essential condition for the success of Economic and Monetary Union (EMU). A sound budgetary position before joining the single currency and budgetary prudence once in (EMU) are at the core of the budgetary policy provisions of the Maastricht Treaty.

The implementation of the "close-to-balance" rule will also have implications on the way governments will meet the worsening of the demographic situation after the year 2010 (when the baby-boom generation will retire). By inducing a fast contraction in the level of the debt to GDP ratio, it would move budgets to a sounder position.

An indication of this effect is provided by Charts 19a-f, that compare the primary balances required for ensuring the stability of the debt to GDP ratio at the present level with those required for the implementation of the "close-to-balance" rule. For all countries considered, debt stabilisation would require lower surpluses in the period up to

2010-2020 and higher surpluses in the following period. The difference between the two scenarios are particularly relevant for the highly indebted countries.

This implies that the "close-to-balance" rule would smooth the changes to be implemented in present budgetary policy as compared with the scenario in which adjustments are delayed to the period in which ageing will be more accentuated. More specifically, the rule would allow Member States to offset part of the likely increases in pension and health expenditure with reductions in interest payments. About half of the increase in public expenditure determined by population ageing in the two heavily indebted countries taken into consideration would be offset by reductions in interest payments.

In conclusion, the implementation of the "close-to-balance" rule would force governments to make use of the "breathing-space" available over the next decade to meet the ageing of the "baby-boom" generation on a sounder fiscal policy footing.

## **6. Conclusions**

Before presenting the main results of the study, its major limitations should be enumerated. National pension expenditure projections have been taken at face value and are not homogeneous. The expenditure trends of the other age-related items have been projected mechanically. Some expenditure profiles used for the projections are rather unsatisfactory. It also should be stressed that demographic factors affect public budgets through several complex channels and that public expenditure and revenue dynamics largely depend on non-demographic factors. For these reasons, the estimates presented in this study indicate only the broad direction of the impact of demographic change on public budgets and represent only a starting point for the analysis of the prospects of public finances in the EU Member States.

### **6.1 Main results**

The main results are the following.

- a) Citizens of different sex and age-groups consume different amounts of public services. They also receive different amounts of public transfers. Expenditures for educational and health services, pension benefits and child allowances are the budget items most dependent on the age-structure of the population. The profiles of per capita expenditure for different age-groups of the six countries considered are typically two-peaked. The first peak occurs in the 10-20 age group with education expenditure as the most important item. The second peak, reaching higher levels, occurs for the 60-80 age-groups and is largely determined by pension and health expenditure trends. The lowest expenditure levels are usually recorded for the 30-50 age groups. Female expenditure levels are lower than male levels.
- b) According to studies produced by national institutions, over the period 1995-2030, the ratio of public pension expenditure to GDP would increase by about 4.5 to 5 percentage points of GDP in Belgium, 2.5 to 4 points in Finland, Germany and Italy, 0.5 to 2 points in Spain and Sweden. Expenditure pressures are expected to be rather limited up to the year 2000. The outlook worsens in the first decade of the next century and deteriorates even further after the year 2010, when the baby-boom

# Primary balance adjustments required for debt/GDP stability & the implementation of the "close-to-balance" rule

## - Belgium - (percentage of GDP)

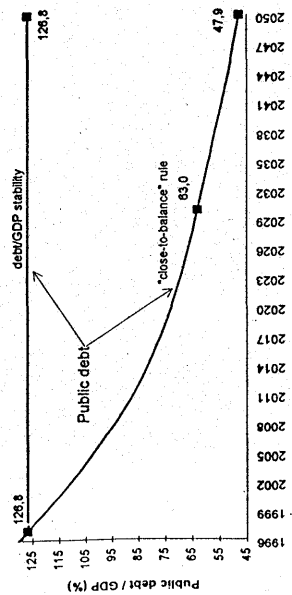
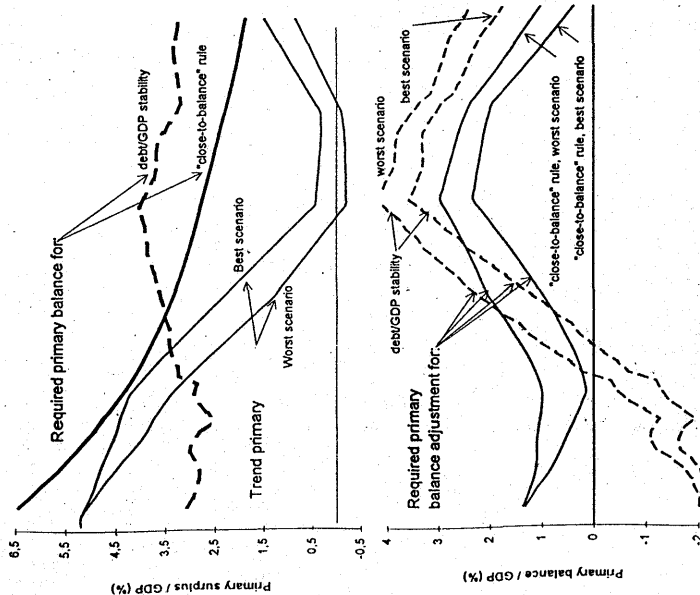


Chart 19a

## - Finland - (percentage of GDP)

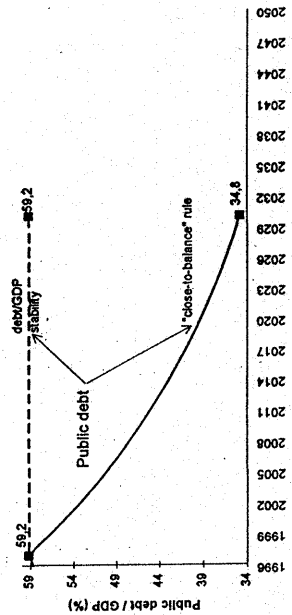
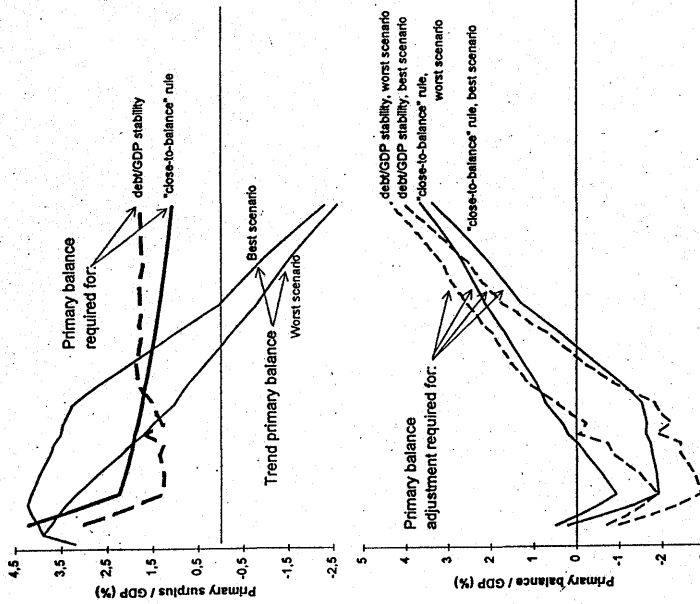


Chart 19b

## - Germany - (percentage of GDP)

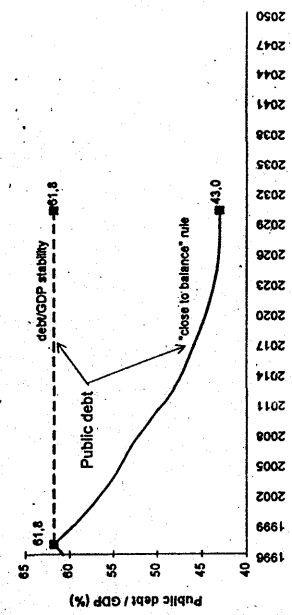
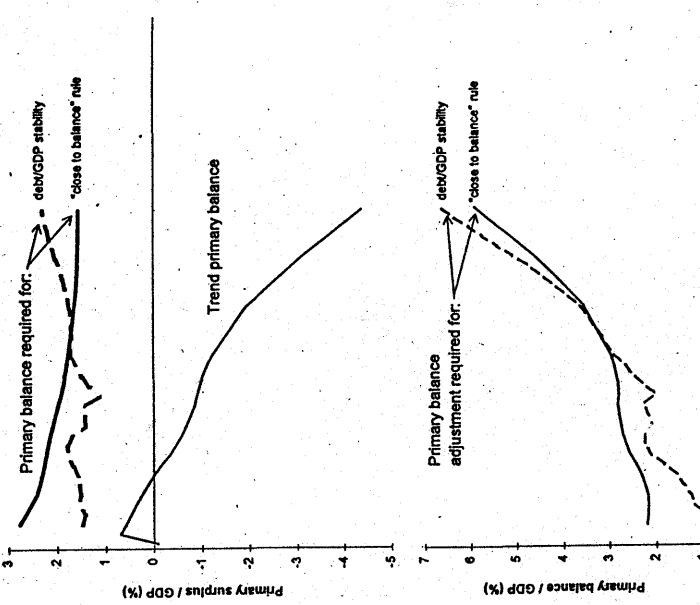


Chart 19c

# Primary balance adjustments required for debt/GDP stability & the implementation of the "close-to-balance" rule

**- Italy -**  
(percentage of GDP)

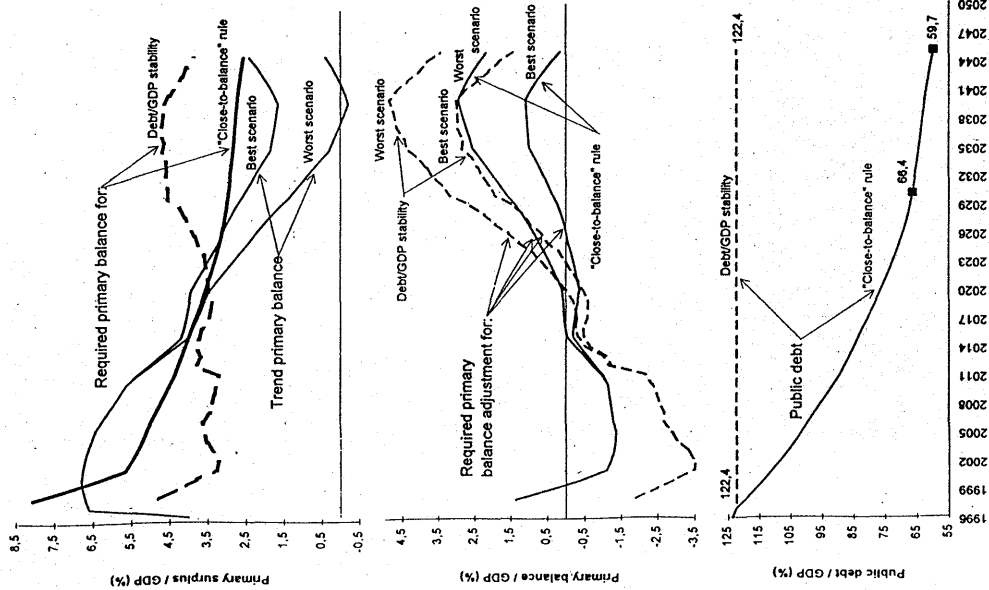


Chart 19d

**- Spain -**  
(percentage of GDP)

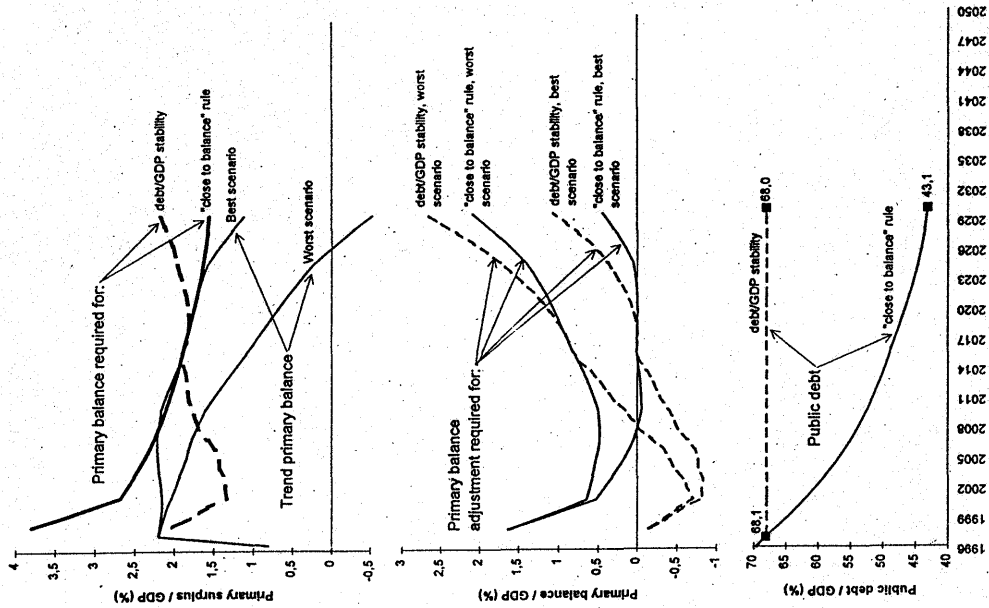


Chart 19e

**- Sweden -**  
(percentage of GDP)

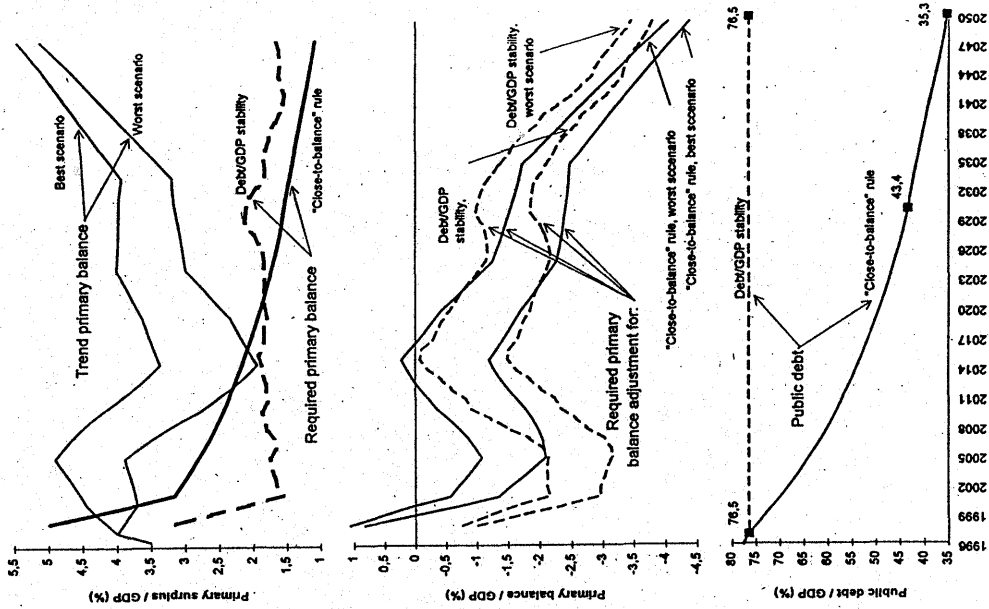


Chart 19f

generation retires. In several countries the effects of demographic trends will be partly offset by reforms already introduced aimed at restraining expenditure growth.

- c) The integration of the estimates of pension expenditure trends with mechanical projections of the effects of demographic changes on the other main age-related expenditure items points to the following increases in the share to GDP of total primary expenditure over the period 1997-2030: 5.9 to 6.8 percentage points in Finland (according to different pension expenditure scenarios), 4.9 to 5.6 points in Belgium, 3.8 to 5.0 points in Italy, 5.4 points in Germany. In Sweden the share would remain nearly constant (-0.3 to 1.1 points). This implies that in most countries the effects of ageing on pension and health expenditure would not be offset by the reduction in the demand for the public services and transfers directed to young citizens (education, maternity and child allowances).
- d) Under the assumption that age-unrelated expenditure items and revenues are constant as a share to GDP at the levels currently estimated for the year 1997, in Belgium, Finland, Germany, Italy and Spain present primary surpluses would be gradually eroded by expenditure increases. Only Sweden would retain a primary surplus.

Assuming for all countries that productivity per worker increases by 1.5 per cent per year, that GDP growth depends on productivity growth and the rate of change in the number of working age citizens, that inflation and the real interest rate on public debt are respectively 2 and 4 per cent over the whole projection period and that the stock-flow adjustment is systematically zero, the debt to GDP ratio (under unchanged policies) would follow a U-shaped curve in Belgium, Finland, Italy and Spain. It would continuously increase in Germany, while in Sweden the debt would decrease substantially and turn into a net credit position.

- e) According to the Stability and Growth Pact approved at the Dublin summit of December 1996, EMU Members should set medium-term budgetary targets of close-to-balance or in surplus. These targets would allow them to respect the 3 per cent ceiling even during economic downturns. Taking the likely effects of downturns into consideration, the average deficit over the cycle may be of the order of 1 per cent of GDP.

Assuming that the deficit is fixed at 1 per cent from the year 1998 onwards and taking interest payments into account, it is possible to derive the primary balance level required by the "close-to-balance" rule. In the four non-heavily indebted countries the required primary surplus would decline from an initial value of 3 to 5 per cent of GDP to 1 to 2 per cent by the year 2030. In the two heavily indebted countries it would decline from 6.5 to 8 per cent to 2.5 to 3 per cent of GDP. The reduction is determined by the decline in interest payments related to the fast contraction in the level of the debt to GDP ratio.

The difference between the required primary balance and the trend primary balance provides an indicative measure of the adjustment required by the implementation of the "close-to-balance" rule. The adjustment, which reflects the changes in age-related expenditure, is positive in five of the six countries considered. In other words, in five countries measures should be taken to improve the primary balance over most of the period 1997-2030. Only Sweden would appear to be able to relax its fiscal policy, since the adjustment is negative in most of the period taken into consideration.

- f) Some expenditure and revenue items are of a temporary nature and should not be kept constant over the whole projection period. The public expenditure related to German reunification and the one-off tax measures included in the 1997 Italian budget are two of the most relevant cases. Tentative estimates assuming a gradual reduction of the burden for reunification (3 per cent of GDP over a 15 year period) point to a substantial reduction of the fiscal adjustment required in Germany for the implementation of the "close-to-balance" rule. Estimates excluding from the Italian unchanged policy scenario temporary tax revenues amounting to 1.5 per cent of GDP point to the need of implementing fiscal adjustment over the whole period taken into consideration.
- g) The achievement of a "close-to-balance" budget over the next few years would allow Member States to meet the worsening of the demographic situation after the year 2010 (when the baby-boom generation will retire) with smaller public debts. This would allow them to offset part of the likely increases in pension and health expenditure with reductions in interest payments. About half of the increase in public expenditure determined by population ageing in the two heavily indebted countries taken into consideration would be offset by reductions in interest payments
- The "close-to-balance" rule would force governments to make use of the "breathing-space" available over the next decade to meet the ageing of the "baby-boom" generation on a sounder fiscal policy footing. This would allow them to smooth the changes to be implemented in present budgetary policy as compared with the scenario in which adjustments are delayed to the period in which ageing will be more accentuated.
- h) Lower (higher) interest rates on public debt would obviously reduce (increase) the dimension of the adjustment required for the primary balance. For instance, a reduction of about 0.5 percentage points would reduce the adjustment required for the year 2030 by 0.3 to 0.4 percentage points of GDP for the heavily indebted countries and by 0.2 points for the other countries.

## 6.2 Further work

As already pointed out, several aspects of the study need substantial refinement and improvement. The following points are among the most relevant.

- a) Data concerning public expenditure for different age-groups should be updated. The same expenditure programmes should be considered for the different Member States. If possible, other Member States should be included.
- b) The results of long-term projections for non-pension public expenditure items carried out by national institutions should be compared with the mechanical projections and, if possible, integrated in the projections. This may allow the impact of some relevant non-demographic factors to be taken into consideration (e.g., long-term trends in health expenditure).
- c) The baseline scenario should include the likely decline over time of the main expenditure and revenue items of a temporary nature.
- d) As already mentioned, labour force participation rates and unemployment rates are at present assumed constant over the projection period, as well as age-related per capita expenditure for unemployment benefits. Alternative assumptions envisaging

a reduction in unemployment rates and unemployment benefit expenditure should be taken into consideration.

- e) The assumptions for interest rates and productivity and employment growth in the Member States could be differentiated.
- f) The average deficit over the economic cycle consistent with the "close-to-balance" rule and assumed as a reference for evaluating the adjustment to be carried out on the primary balance, which at present is fixed at 1 per cent for all countries, could be differentiated according to the dimension of the output swings and that of the automatic stabilisers. These factors would affect the deficit level to be acquired in non-recession years in order to avoid sanctions.

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## Annex A: The “tax-gap”

In order to construct an indicator of budget sustainability, the first step is to define the primary deficit  $d$  such as:

$$d = g + h - t$$

where  $g$  is government spending on good and services,  $h$  government transfers and  $t$  taxes all expressed in terms of ratios to GDP.

The change in the ratio of public debt ( $b$ ) to GDP, is then expressed by

$$\frac{db}{ds} = g + h - t + (r - \theta)b = d + (r - \theta)b$$

where  $r$  is the real interest rate and  $\theta$  the real GDP growth rate.

The public debt to GDP ratio in the year  $n$  can be expressed as the debt to GDP ratio in the initial year  $b_0$  accumulated at a rate equal to the difference between the interest rate  $r$  and the growth rate  $\theta$ , plus the accumulated value, at the same rate, of the primary deficits along the way:

$$b_n = b_0 e^{(r-\theta)n} + \int_0^n d_s e^{(r-\theta)(n-s)} ds$$

By discounting to time zero, the equation becomes:

$$b_n e^{-(r-\theta)n} = b_0 + \int_0^n d_s e^{-(r-\theta)s} ds$$

By substitution of  $d_s$  with  $(g + h - t)_s$ , the equation becomes:

$$b_n e^{-(r-\theta)n} = b_0 + \int_0^n (g + h - t)_s e^{-(r-\theta)s} ds$$

which is equivalent to:

$$\int_0^n t_s e^{-(r-\theta)s} ds = b_0 - b_n e^{-(r-\theta)n} + \int_0^n (g + h)_s e^{-(r-\theta)s} ds$$

Assuming that the tax rate  $\bar{t} = t_s$  is constant over time; the equation becomes:

$$\bar{t} \int_0^n e^{-(r-\theta)s} ds = b_0 - b_n e^{-(r-\theta)n} + \int_0^n (g + h)_s e^{-(r-\theta)s} ds$$

It is now possible to solve the integral in the left side of the equation

$$\int_0^n e^{-(r-\theta)s} ds = \left[ \frac{1}{-(r-\theta)} e^{-(r-\theta)s} \right]_0^n = -(r-\theta)^{-1} (e^{-(r-\theta)n} - 1)$$

The equation becomes thus:

$$\bar{t} [-(r-\theta)^{-1} (e^{-(r-\theta)n} - 1)] = b_0 - b_n e^{-(r-\theta)n} + \int_0^n (g+h)_s e^{-(r-\theta)s} ds$$

By isolating the tax  $\bar{t}$ , we obtain:

$$\bar{t} = \frac{b_0 - b_n e^{-(r-\theta)n} + \int_0^n (g+h)_s e^{-(r-\theta)s} ds}{-(r-\theta)^{-1} (e^{-(r-\theta)n} - 1)}$$

which is equivalent to:

$$\bar{t} = (r-\theta) \frac{b_0 - b_n e^{-(r-\theta)n} + \int_0^n (g+h)_s e^{-(r-\theta)s} ds}{1 - e^{-(r-\theta)n}}$$

Let define  $\bar{t}$  as the sustainable tax rate  $t^*$  that allows for the debt to GDP ratio at the end of the projection period  $n$  to be equal at the initial level of the debt ( $b_0 = b_n$ ); then the equation becomes:

$$t^* = (r-\theta) \frac{b_0 (1 - e^{-(r-\theta)n}) + \int_0^n (g+h)_s e^{-(r-\theta)s} ds}{1 - e^{-(r-\theta)n}}$$

which is equivalent to:

$$t^* = (r-\theta) \left[ b_0 + \frac{\int_0^n (g+h)_s e^{-(r-\theta)s} ds}{1 - e^{-(r-\theta)n}} \right]$$

The sustainable tax rate is thus expressed as follows:

$$t^* = (r-\theta) \left[ b_0 + (1 - e^{-(r-\theta)n})^{-1} \int_0^n (g+h)_s e^{-(r-\theta)s} ds \right]$$

The sustainable tax rate  $t^*$  is thus equal to the annuity value of future expected spending and transfers, plus the difference between the ex ante interest rate and the growth rate times the ratio of debt to GDP. If the sustainable tax rate is greater than the current tax rate,  $t$ , then sooner or later taxes will have to be increased, and/or spending decreased. This latter indicator may be defined as the *tax-gap* and it is given by  $t^* - t$ .

## Annex B: EU demographic prospects

Changes in birth rates, life expectancy and migration flows are modifying the level and structure of the population of the European Union. In recent years national and international institutions have carried out several long-term projections of population. Forecasts for all countries were released in 1994 by the World Bank (see Bos. *et al.*). Forecasts for the European Union Member States were produced in 1991 and 1996 by EUROSTAT. This paper is based on the latter projections.<sup>53</sup>

Long-term demographic projections are however quite uncertain.<sup>54</sup> Fertility rates can fluctuate considerably and rather unpredictably even in the short-term.<sup>55</sup> Mortality rates, although the margins of error are relatively smaller, are also difficult to predict.<sup>56</sup> Even greater uncertainties stem from the projection of net migration flows, which depend on several economic and social factors, on political decisions and on the enforcement of policies.<sup>57</sup> The uncertainty of long-term projections is stressed in Danish Ministry of Finance (1995) that provides the following example: by assuming a higher birth-rate and higher net immigration, Denmark's Statistical Department, in its 1994 projection, estimated a population of five million people for the year 2025, as against the four million estimate projected a decade earlier.

In order to take the uncertainty of the demographic outlook into account, this paper refers to three of the five different scenarios developed by EUROSTAT in 1996: the 'baseline' scenario, the 'youngest population' scenario and the 'most-aged population' scenario.

### Baseline

Fertility rates are assumed to increase in low fertility countries and remain nearly stable in other countries (in the year 2035 total fertility rates in the 15 countries are in the 1.5-1.9 range), life expectancy at birth is projected to increase by 5.5-7.7 years in the different countries for males and 4.3-6.2 years for females in the period up to 2050, an inflow of 600,000 persons per year for the Union is projected up to 2010 (see Table B1).

### Youngest population

Fertility rates are assumed to increase in all countries (with total fertility rates in the 1.8-2.1 range in the year 2035), life expectancy at birth is projected to increase by 2.0-3.2 years for males and 1.6-2.8 years for females in the period up to 2050, net migration is relatively high (an inflow of 800,000 persons per year up to 2010).

<sup>53</sup> See Eding (1995) and the papers presented at the seminar *New Long-Term Population Scenarios for the European Economic Area* - EUROSTAT - European Commission - Luxembourg, 1995.

<sup>54</sup> Long (1995) and Rogers (1995) evaluate the methodological problems underlying long-term population projections. Long also analyses the accuracy of official population projections used for government planning.

<sup>55</sup> In the early nineties, for instance, the number of births in the European Union was lower than that predicted by Eurostat in 1991 in the low-fertility scenario. See De Jong (1995) and Crujsen and Eding (1995). According to the latter paper (p. 4), "fertility showed once again its capricious and unpredictable nature".

<sup>56</sup> See Van Hoorn and De Beer (1995) and Crujsen and Eding (1995).

<sup>57</sup> The topic is examined in Visser (1995).

### **Most-aged population**

Fertility rates decline in most countries (with total fertility rates in the 1.3-1.6 range in the year 2035), life expectancy increases by 8.5-11.4 years for males and 6.7-8.2 years for females in the period up to 2050, net migration is relatively low (400,000 persons per year up to the year 2010).

In the baseline scenario, total EU population increases from 371.6 million in 1995 to 388.0 million in 2025, declining thereafter to 367.0 million in 2050. In the least-aged scenario, total EU population increases up to the year 2044 (to 414.3 million) and remain nearly constant afterwards (413.6 million in 2050). In the most-aged scenario, total population reaches a peak in 2010 (378.6 million) and thereafter declines to 331.6 million in 2050.

A significant ageing of EU population occurs under all scenarios. The change in the population structure is clearly shown in the population pyramids that refer to the baseline scenario (Charts B1a-c). In this scenario the ratio of the citizens aged 65 and over to total population increases from 15.4 per cent in 1995 to 27.3 per cent in 2040 and remains stable thereafter.

The ratio of the elderly to working age population, which provides a first measure of the burden represented by the former group, increases even more substantially: in the baseline scenario it rises from 25.3 per cent in 1995 to 38.1 per cent in 2025 and 51.4 in 2040. In the 'youngest population' scenario it reaches a peak at 41.4 per cent in 2040; in the 'most aged population' scenario it grows continuously to 65.1 per cent in 2050 (see Chart B2a). This process affects all the countries taken into consideration in this study, with Italy and Spain reaching the highest ratios in all scenarios and Sweden recording the lowest ratios (see Chart B3a-f).

The composition of the elderly and working-age population will also change substantially; both groups will gradually age (see Charts B1a-c). In the baseline scenario, in the EU the ratio of people aged 80 and over to people aged 65 and over increases from 25.1 per cent in 1995, to 27.2 per cent in 2025 and 36.3 in 2050. The ratio of people aged 50-64 to people aged 15-64 increases from 27.6 per cent in 1995 to 37.6 in 2025; thereafter it declines to 34.9 in 2040.

In the baseline scenario the ratio of the EU citizens aged 0 to 19 to working age population declines from 39.4 per cent in 1995 to 34.7 per cent in 2025. Thereafter it rises up to 36.6 per cent by the year 2040. In the youngest population scenario the ratio increases up to a 44.0 per cent peak in 2040. In the most-aged population scenario it declines to 30.0 per cent in 2025 and remains stable thereafter (see Chart B2b). Similar trends are expected for all the six countries taken into consideration, with Italy and Spain recording the lowest levels and Finland and Sweden recording the highest ones (see Chart B4a-f).



Table B1

## Key assumptions on fertility, mortality and migration rates

	Total fertility rate						Life expectancy at birth						Net migration (x 1000)									
	1994	2035		2050		High	1990-1994		2050		High	1990-1994		2050		High	2010					
		Low	Baseline	Low	Baseline		Low	Baseline	Low	Baseline		Low	Baseline	Low	Baseline		Low	Baseline	High	Low	Baseline	High
Austria	1.5	1.4	1.6	1.9	72.7	75.5	80.0	83.0	79.2	81.5	85.0	87.0	79.2	81.5	85.0	87.0	15	23	30			
Belgium	1.6	1.5	1.8	2.0	73.0	76.0	80.0	83.0	79.7	82.0	85.0	87.0	79.7	82.0	85.0	87.0	10	15	20			
Denmark	1.8	1.5	1.8	2.0	72.5	75.0	79.0	82.0	77.9	79.5	83.0	85.0	77.9	79.5	83.0	85.0	5	10	15			
Finland	1.9	1.6	1.8	2.1	71.7	74.5	79.0	82.0	79.5	81.5	85.0	87.0	79.5	81.5	85.0	87.0	0	5	10			
France	1.7	1.6	1.8	2.1	73.1	76.0	80.0	83.0	81.2	84.0	87.0	88.0	81.2	84.0	87.0	88.0	30	50	70			
Germany	1.3	1.3	1.5	1.8	72.5	75.0	79.0	82.0	78.9	81.5	84.0	86.0	78.9	81.5	84.0	86.0	150	200	250			
Greece	1.4	1.4	1.7	1.9	74.8	77.5	81.0	84.0	79.7	82.0	85.0	87.0	79.7	82.0	85.0	87.0	20	25	30			
Ireland	1.9	1.6	1.8	2.1	72.5	75.0	79.0	82.0	78.0	80.5	84.0	86.0	78.0	80.5	84.0	86.0	-5	-3	0			
Italy	1.2	1.3	1.5	1.8	73.7	76.0	80.0	83.0	80.3	82.5	85.0	87.0	80.3	82.5	85.0	87.0	60	80	100			
Luxembourg	1.7	1.5	1.8	2.0	72.3	75.5	80.0	83.0	78.9	81.5	85.0	87.0	78.9	81.5	85.0	87.0	1	2	3			
Netherlands	1.6	1.5	1.8	2.0	74.1	76.5	80.0	83.0	80.2	82.0	85.0	87.0	80.2	82.0	85.0	87.0	20	35	50			
Portugal	1.4	1.4	1.7	1.9	70.6	73.0	78.0	82.0	77.8	80.0	84.0	86.0	77.8	80.0	84.0	86.0	20	25	30			
Spain	1.2	1.3	1.5	1.8	73.5	75.5	79.0	82.0	80.7	82.5	85.0	87.0	80.7	82.5	85.0	87.0	40	60	80			
Sweden	1.9	1.6	1.9	2.1	75.4	78.0	82.0	85.0	80.7	83.0	86.0	88.0	80.7	83.0	86.0	88.0	10	20	30			
United Kingdom	1.7	1.6	1.8	2.1	73.4	76.5	80.0	83.0	78.8	81.5	85.0	87.0	78.8	81.5	85.0	87.0	20	45	70			

Chart B1a

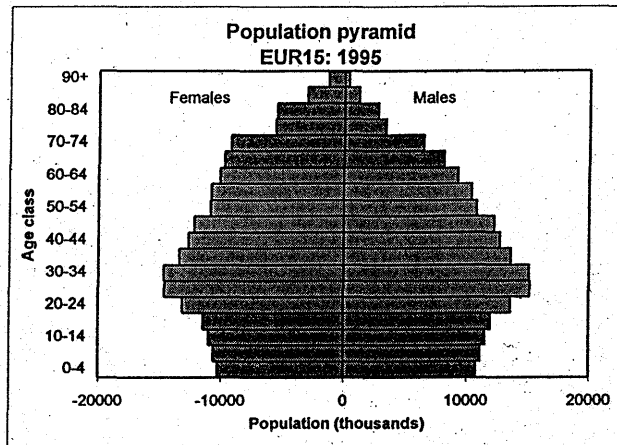


Chart B1b

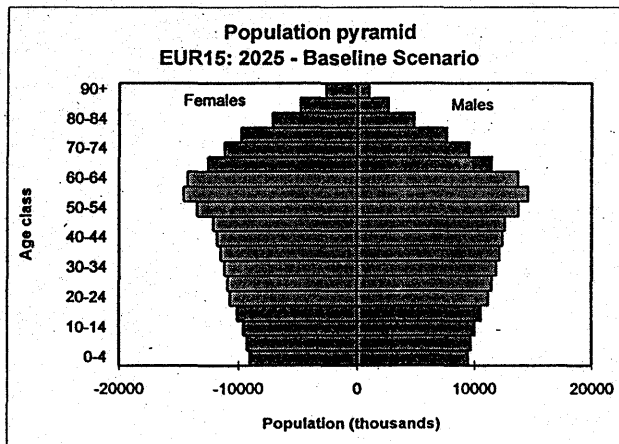
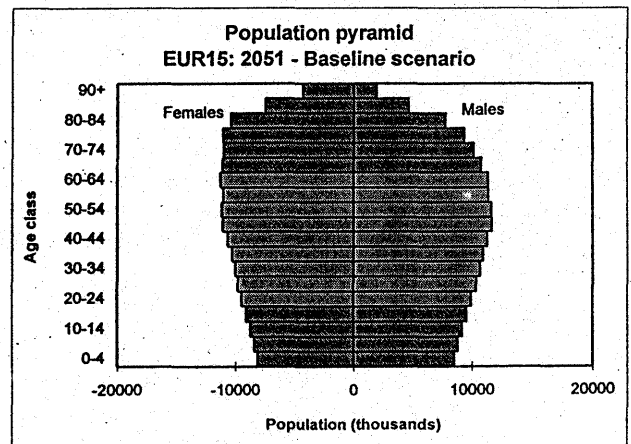


Chart B1c



# Old-age and young dependency ratios in EUR15: the three EUROSTAT scenarios

Chart B2a

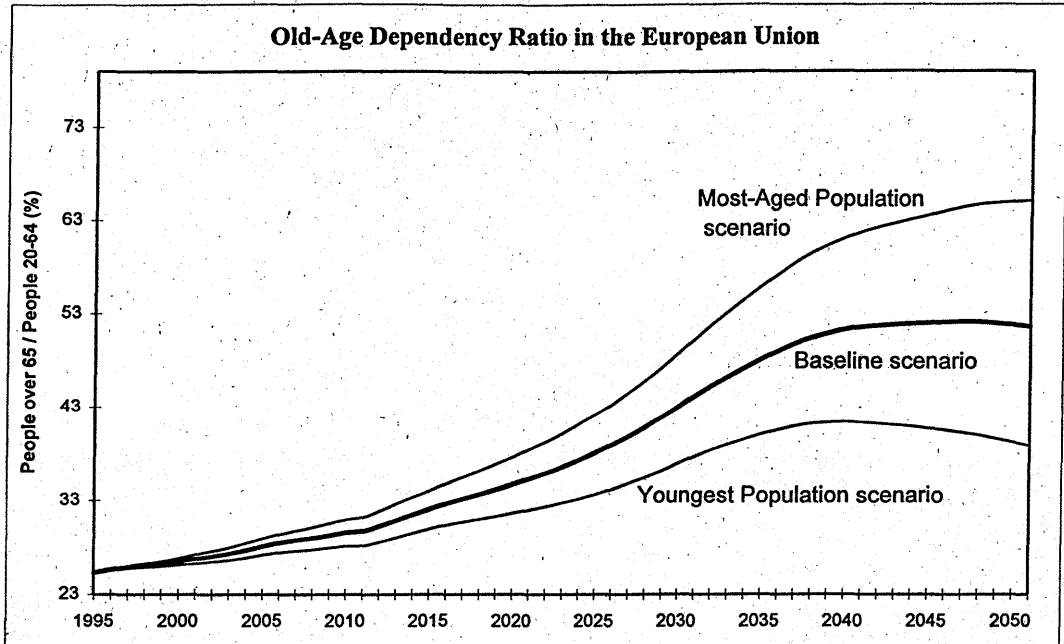
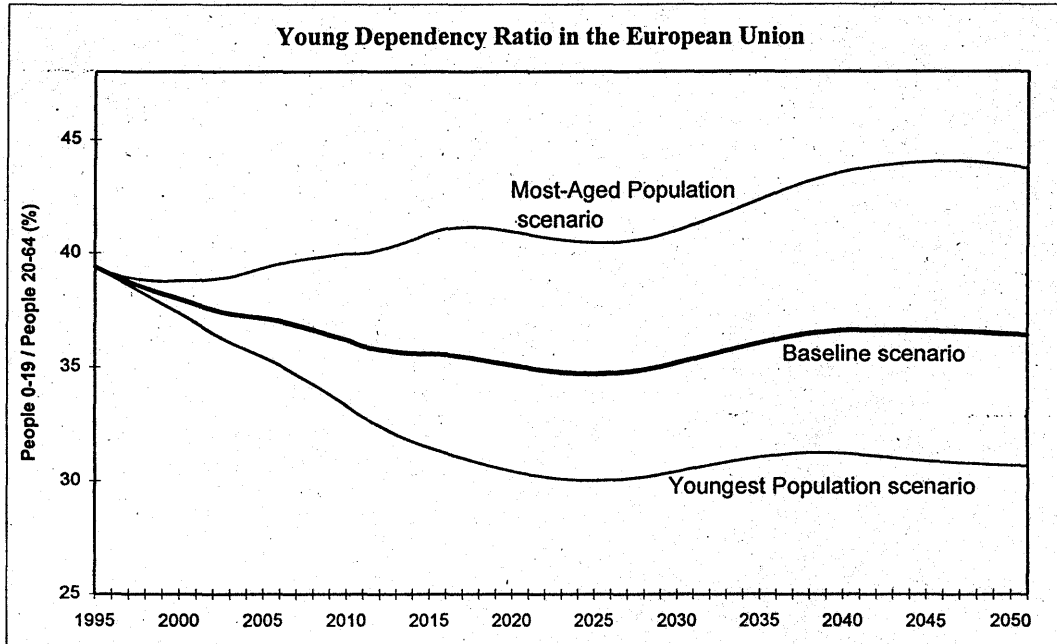


Chart B2b



Old-age dependency ratio: the three EUROSTAT scenarios

Chart B3a

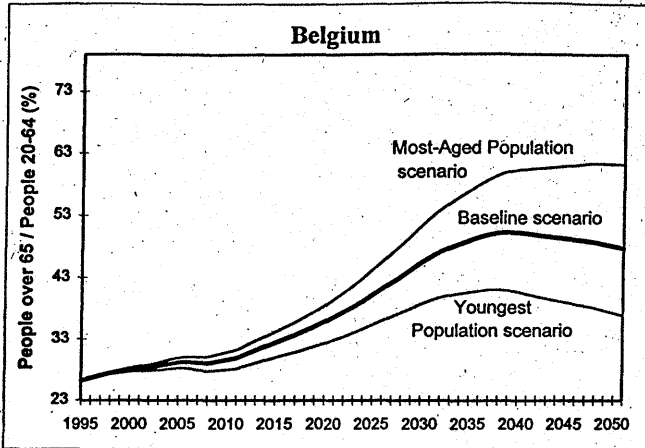


Chart B3b

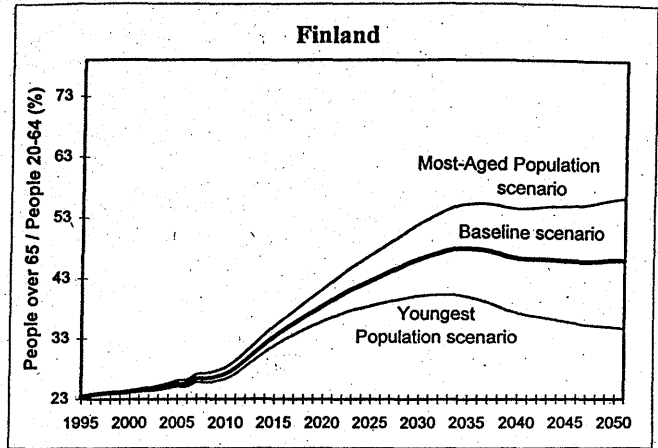


Chart B3c

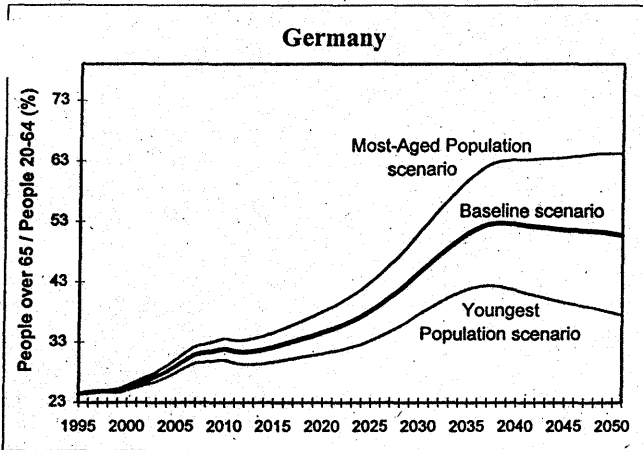


Chart B3d

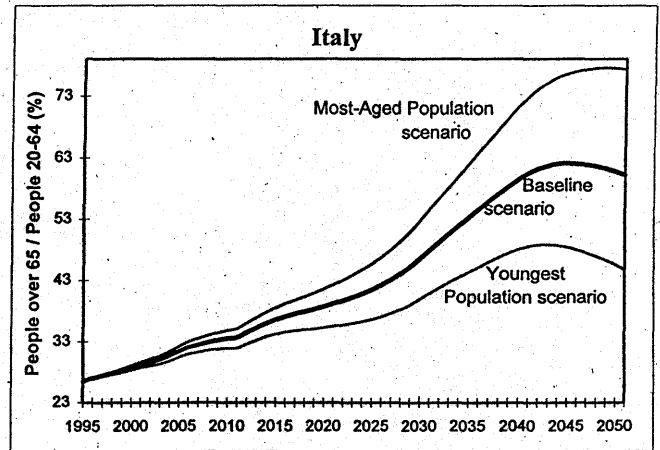


Chart B3e

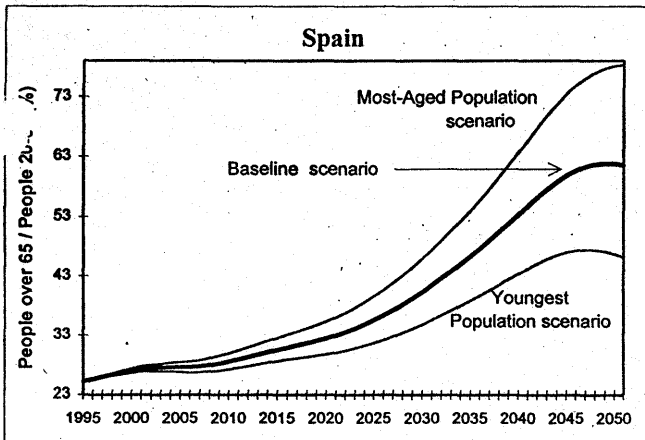
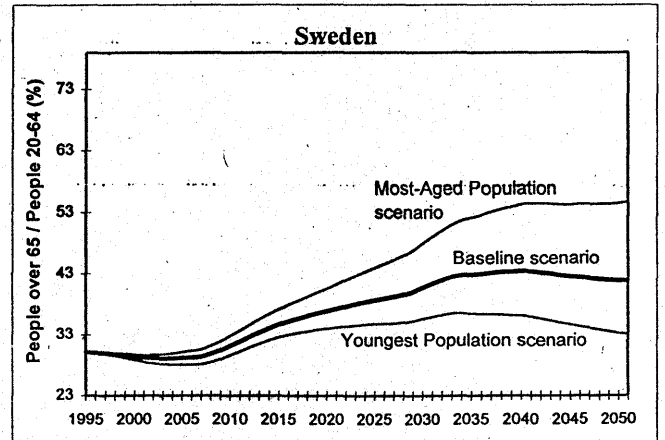


Chart B3f



Young dependency ratio: the three EUROSTAT scenarios

Chart B4a

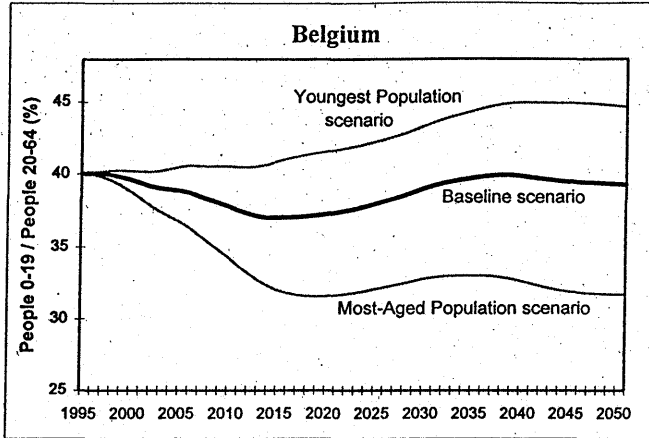


Chart B4b

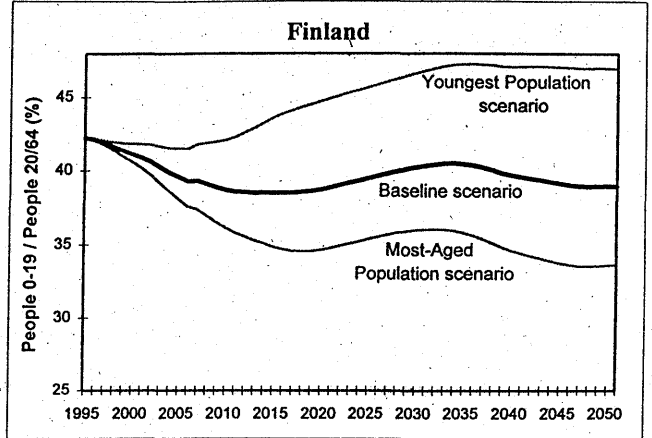


Chart B4c

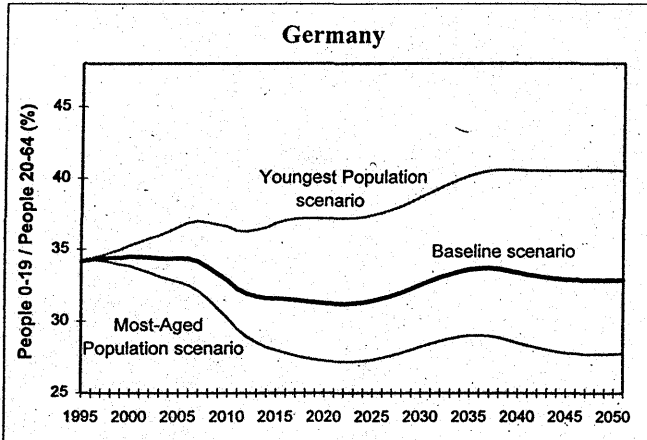


Chart B4d

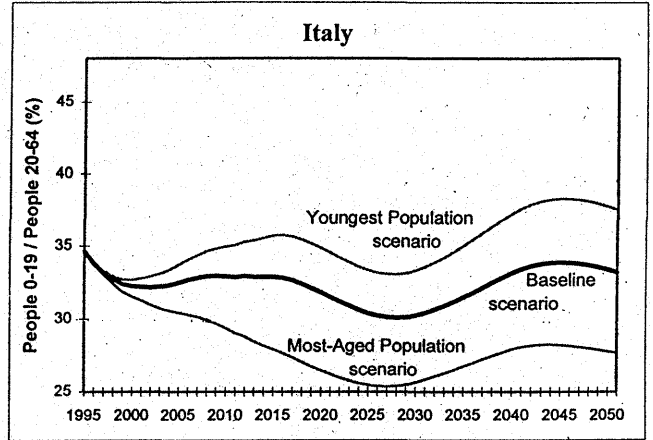


Chart B4e

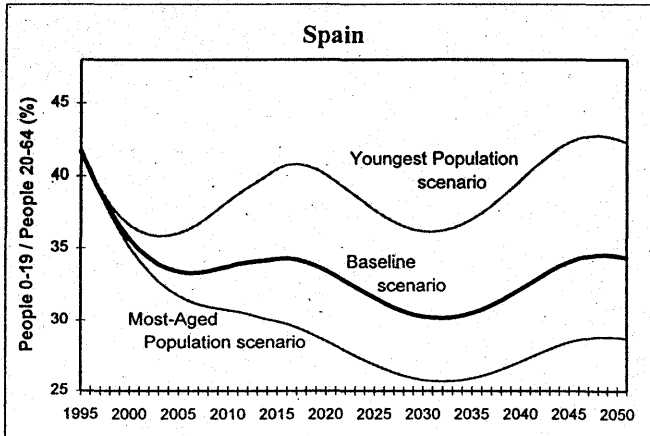
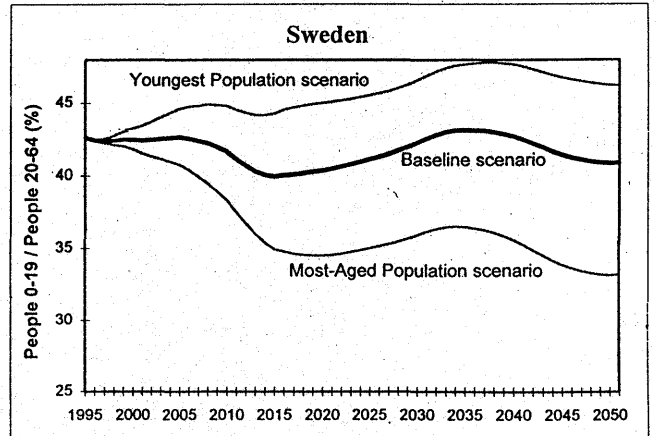


Chart B4f



## Annex C: National age-related expenditure profiles

**C.1 Belgium** - The expenditure profiles for Belgium are based on the estimates provided by Lambrecht *et al.* (1994).<sup>58</sup> The aggregate 1988 values for the main social expenditure items have been allocated by 5-year age classes (0-4 to 95-99 years). These data have been used to compute the average per capita expenditure in Belgian francs for each age-group in the year 1988. The following items were considered: health care, invalidity benefits,<sup>59</sup> education, pensions (for both the public and the private sector), unemployment benefits,<sup>60</sup> family allowances, maternity benefits and expenditure for nursery schools.

In 1988, the programs considered by Lambrecht *et al.* accounted for about 62 per cent of general government expenditure net of interest payments and represented 28.8 per cent of GDP.<sup>61</sup>

The per capita expenditures reported in Lambrecht *et al.* have been expressed in terms of per capita 1988 GDP. Chart C1 outlines the resulting age-related profiles. The total age-related expenditure profile has two peaks for the 15-19 and the 70-74 age-groups. Educational expenditure largely contributes in determining the increase in total expenditure from the 0-4 to the 15-19 age-group. Expenditure then gradually declines, reaching a minimum level with the 30-34 age-group. It remains relatively low up to the 45-49 age-group. Thereafter it increases fast, because of the substantial increase in disability and unemployment benefits (in the 50-64 age range) and in pensions (which become the most relevant expenditure item from the 60-64 age-group). Expenditure peaks in the 70-74 group and declines afterwards.

**C.2 Finland** - The age expenditure profiles for Finland have been estimated in Mäki *et al.* (1996). The aggregate 1993 values for the main social expenditure items have been allocated by age classes (0 to 108 years). These data have been used to compute the average per capita expenditure in Finnish markka for each age-group in the year 1993. General Government payments, net of interest payments, have been broken down into spending on 11 age-related items (health, education, pensions, social services, transfers related to children, unemployment benefits, other social transfers, transfers to households, transfers to non-profit organisations, transfers to farmers and firms, net investments) and on the remaining age-unrelated public consumption. The net investment profile is based on the profile for public consumption.

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<sup>58</sup> The study updated and improved some estimates of the effects of demographic changes on public expenditure carried out in 1981 (see Lambrecht, 1981).

<sup>59</sup> These include benefits for temporary work disability, invalidity, work accidents, professional diseases and handicaps.

<sup>60</sup> Expenditure for unemployment also includes expenditure for early retirement pensions and active employment policies.

<sup>61</sup> The total amount of public expenditure for the items considered by Lambrecht *et al.* have been computed multiplying the age-related per capita amounts indicated by Lambrecht *et al.* by the number of people in each age-group resulting in EUROSTAT statistics.

In 1993, the programs considered by Mäki *et al.* (1996) accounted for about 78 per cent of general government expenditure net of interest payments and represented 43.0 per cent of GDP.<sup>62</sup>

The per capita expenditures reported in Mäki *et al.* have been expressed in terms of per capita 1993 GDP. Chart C2 outlines the resulting age-related profiles. The total age-related expenditure profile is U-shaped. Transfers related to children and social services determine a high level of expenditure for the 0-2 age group (over 50 per cent of per capita GDP). For the 7-18 age-group education is the main expenditure item, with total expenditure amounting to about 40 per cent of per capita GDP. Total expenditure remains high for the 20-25 group, for which unemployment benefits and other social transfers add up to the gradually declining education expenditure. The lowest expenditure levels (20-25 per cent of per capita GDP) are recorded for the 30-50 age-group. For the following generations expenditure gradually increases, reaching 55 per cent of per capita GDP for 60 year old, 78 per cent for 65 year old, 95 per cent for 80 year old. This profile is determined by the high level of pension benefits (over 50 per cent of per capita GDP for all classes over 60) and by the rising level of health and social services expenditure.

**C.3 Germany** - The age and sex expenditure profiles for both Western and Eastern Germany were utilised by Gokhale J., Raffelhüschen B. and Walliser J. (1995). Most of the data were obtained from the German Socio-Economic Panel. The health expenditure profile is a smoothed version of data collected by Henke and Berhens (1989).

Public expenditure profiles have been computed for the main age-related items: social security, health, accident insurance, unemployment insurance, general welfare, housing benefits, maternity benefits and child benefits. The profiles are presented in terms of indexes ( $c_{ik}^j$ ) based on the expenditure recorded for a 40 year old male in the base-year 1992.

$$G_k^j = \sum_i (c_{ik}^j \times P_i^j) \times V_{40}^j$$

with  $c_{ik}^j$  = (expenditure for budgetary item  $k$  per member of each age-group  $i$  in the base year  $j$ ) / (expenditure for budgetary item  $k$  per male of the age-group 40 in the base year  $j$ );

$V_{40}^j$  = expenditure for budgetary item  $k$  in national currency per male of the age-group 40 in the base year  $j$ .

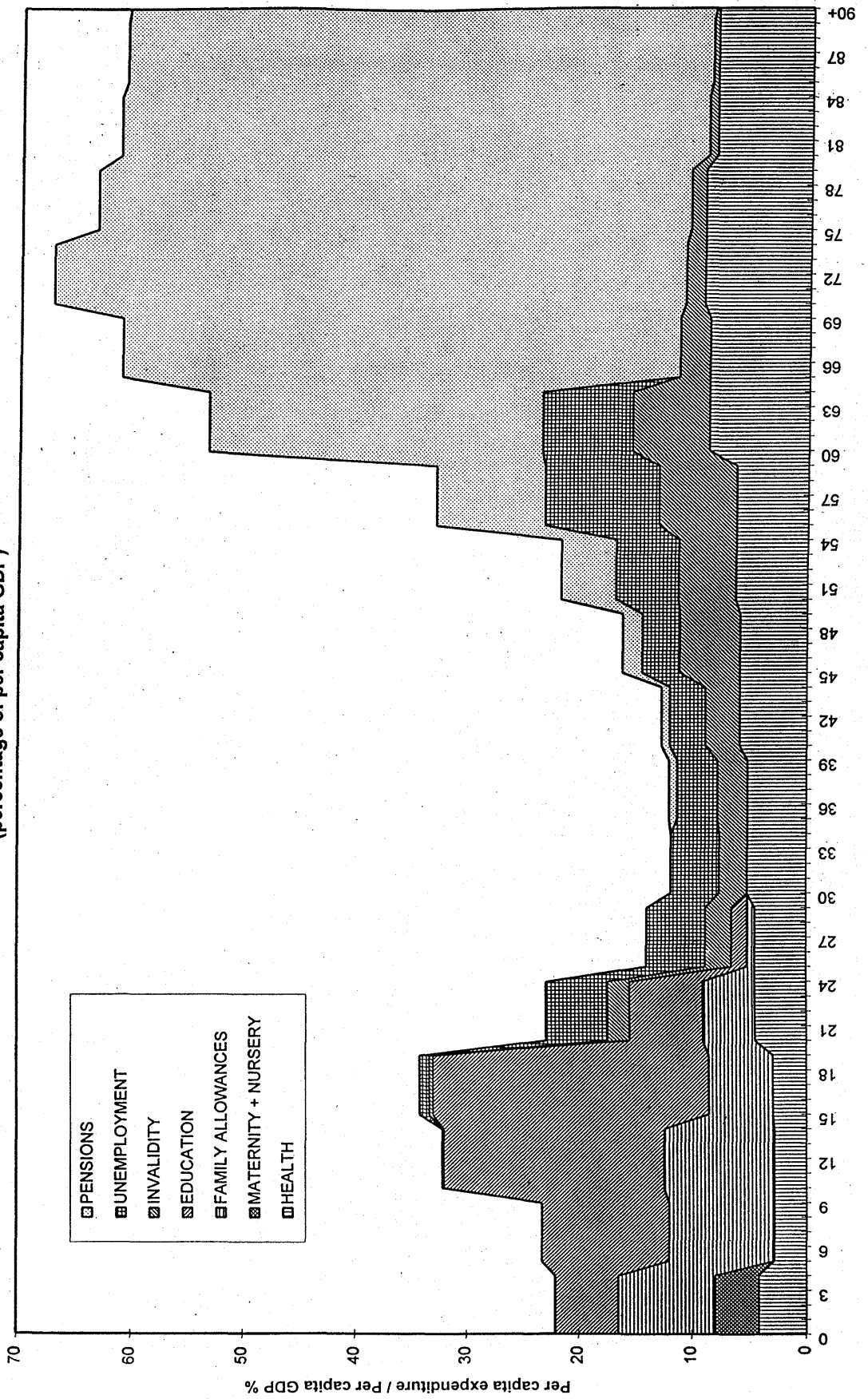
In 1992, the programs considered by Gokhale J. *et al.* accounted for about 43 per cent of general government expenditure net of interest payments and represented 19.5 per cent of GDP.<sup>63</sup>

<sup>62</sup> The total amount of public expenditure for the items considered by Mäki *et al.* (1996) have been computed multiplying the age-related per capita amounts indicated by Mäki *et al.* (1996) by the number of people in each age-group indicated in the same study.

<sup>63</sup> According to Gokhale *et al.*, the programs accounted for DM 725 billion.

Chart C1

### Age-related public expenditure profiles in Belgium (percentage of per capita GDP)

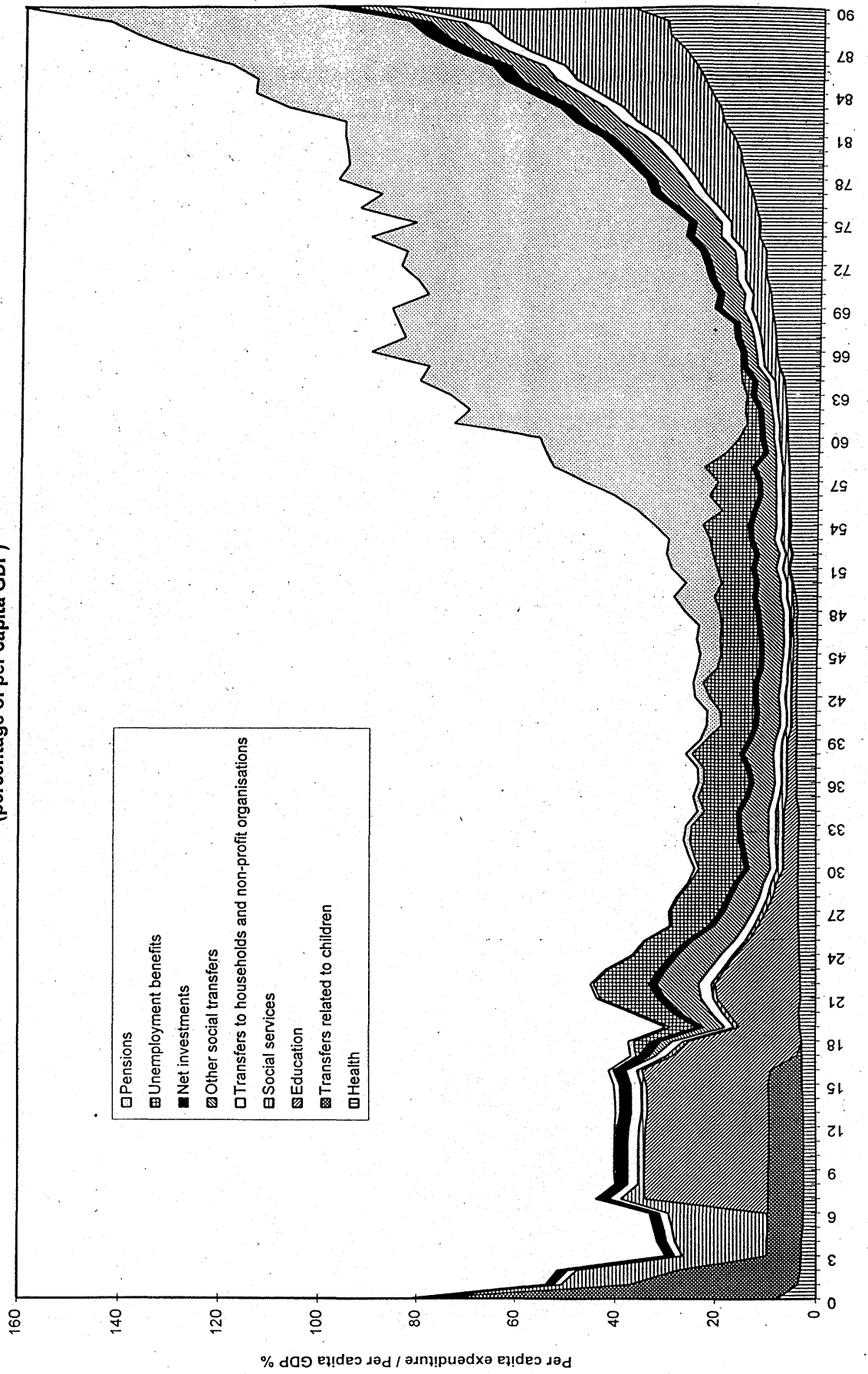


045



Chart C2

### Age-related public expenditure profiles in Finland (percentage of per capita GDP)



945

Chart C3a

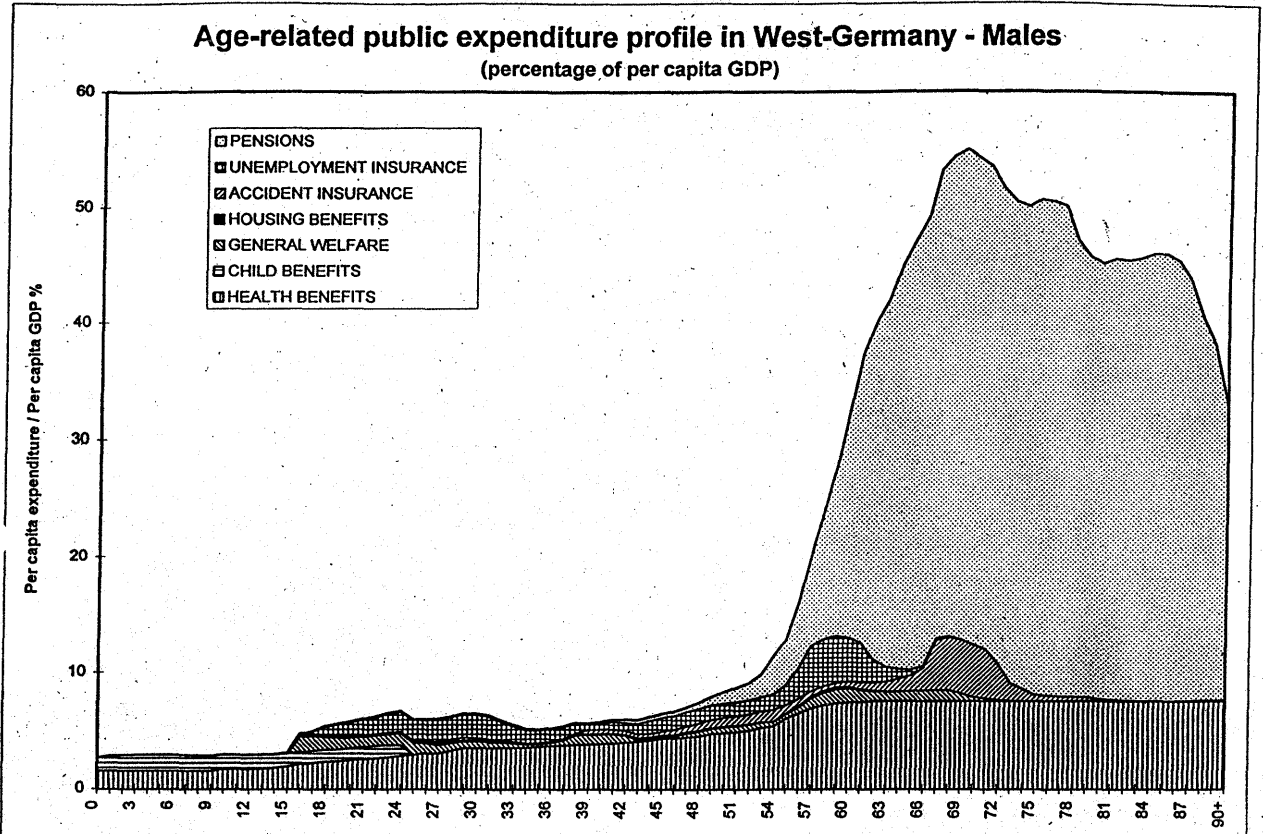
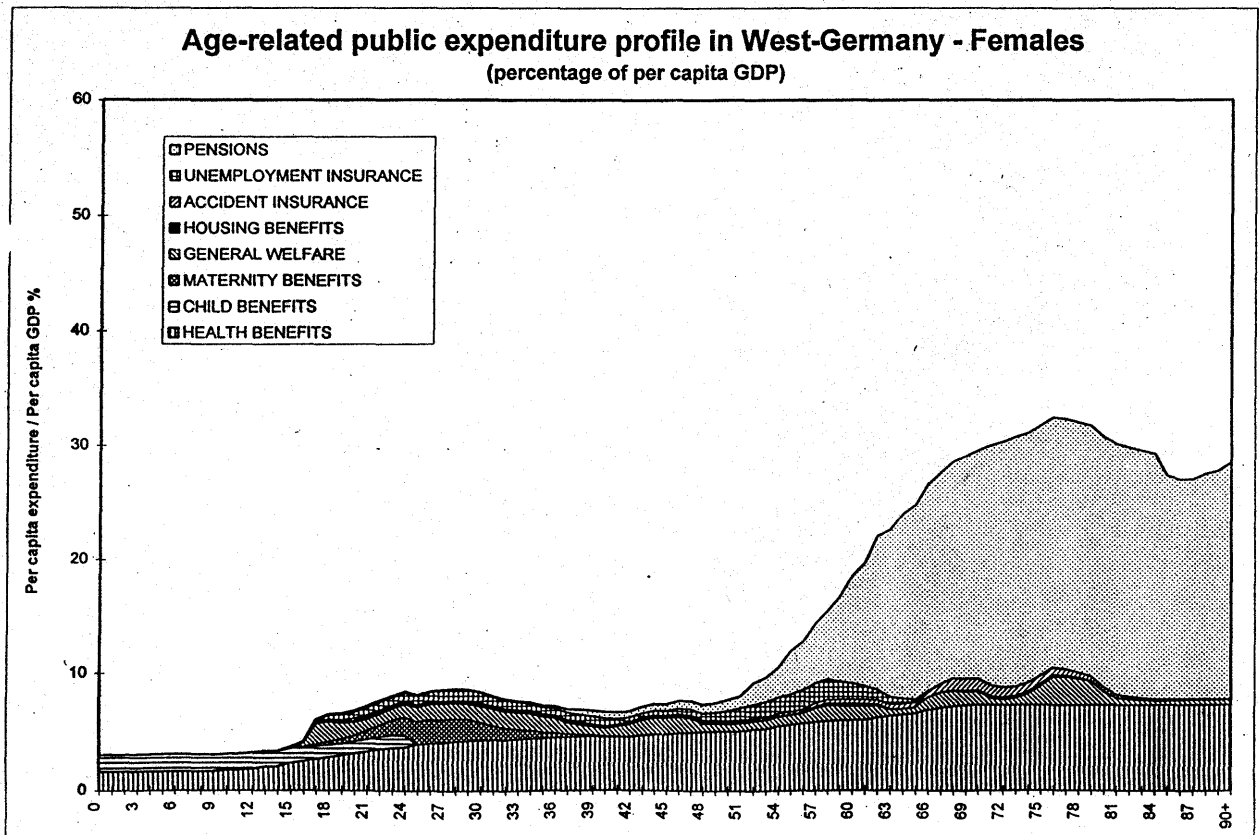


Chart C3b



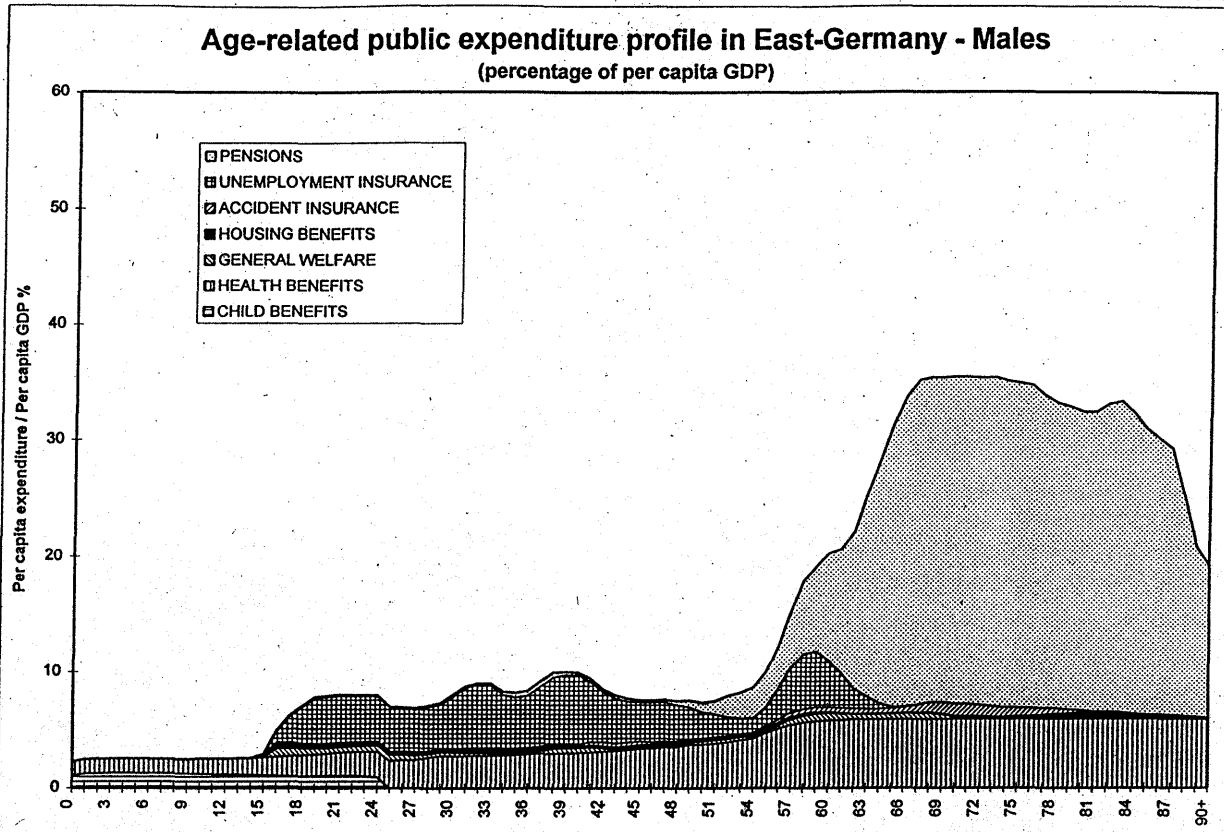
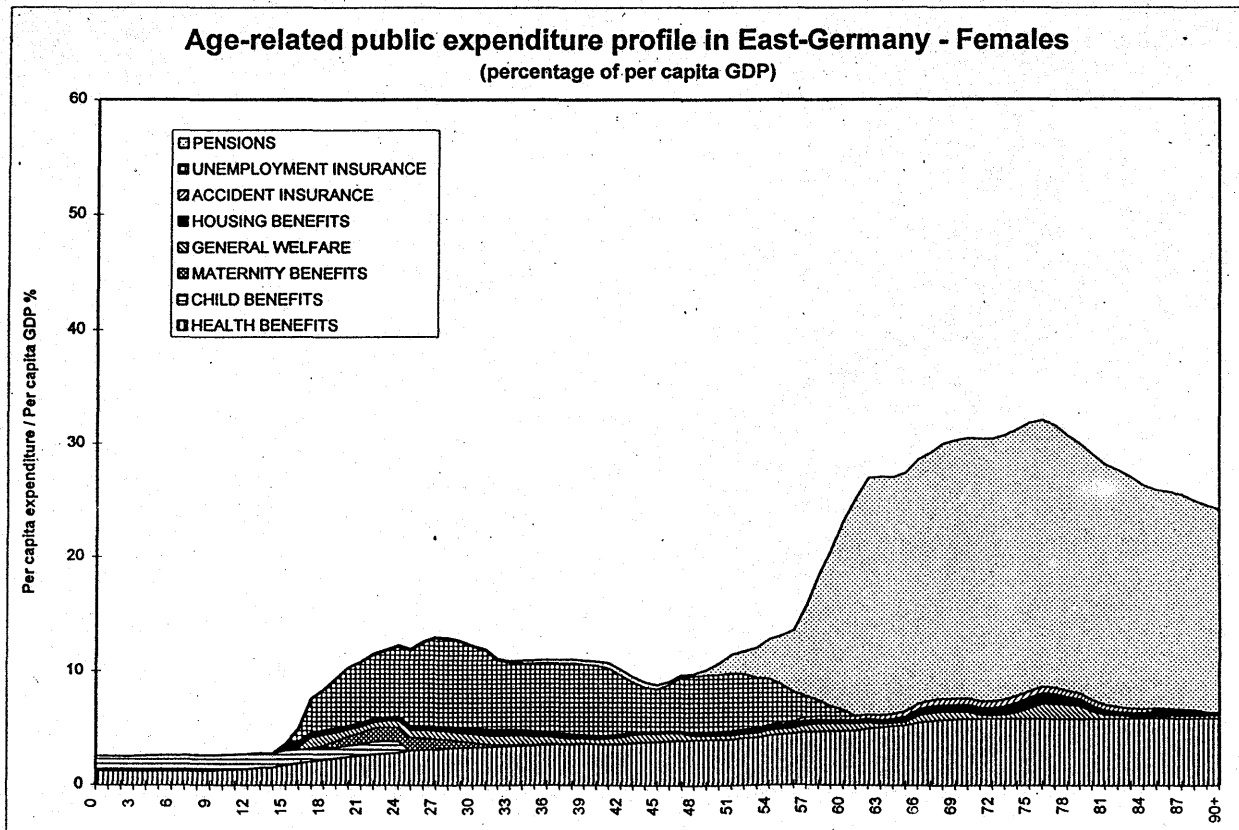


Chart C3d



The profiles have been expressed in terms of per capita 1992 GDP. Charts C3a and C3b outline the West-Germany age-related profiles of the expenditure items taken into consideration. Since educational expenditure is not included, the profiles present only one peak. Expenditure is rather limited up to the 15 year class. Thereafter it increases because of a rise in health services, unemployment and welfare benefits. Pension benefits affect males and females' expenditure profiles from the 50 year class; they peak in the 68-75 group for males and in the 70-85 group for females. Accident insurance benefits substantially affect the males' profile in the 65-70 age-group. Because of differences in pension benefits, the males' profile is substantially higher than the female's one for the age-groups over 55.

Charts C3c and C3d outline the profiles computed for former East-Germany. Because of higher unemployment benefits, males' and females' expenditure levels are higher than those presented for West-Germany up to the 50 year class. Thereafter, because of lower pension expenditure, East-Germany males' profile is substantially below Western levels. The females' profiles of the two areas are rather similar. Over the whole lifetime, East-Germany presents lower health expenditure and higher housing benefits.

**C.4 Italy** -The age and sex expenditure profile for Italy has been estimated in Franco *et al.* (1994). General Government payments, net of interest payments, have been broken down into spending on five age-related items (health, education, pensions, household responsibility payments and other social security transfers) and on the remaining age-unrelated items. The aggregate 1990 values of each of these different payments have been allocated by age (0 to 90 years and over) and sex according to cross section age-sex profiles. As for German public expenditure, the profiles are presented in terms of indexes with the index 1 representing the expenditure for a 40 year old male in the base-year 1990.

In 1990, the age-related programs considered by Franco *et al.* accounted for about 66 per cent of general government expenditure net of interest payments and represented 27.4 per cent of GDP.

Within the present study, the data have been updated on the basis of 1994 General Government aggregate outlays ( $G_k^{1994}$ ) and 1994 population ( $P_i^{1994}$ ). This means that the projection is based on the 1990 indexes of relative expenditure for each age-group within each expenditure item ( $c_{ik}^{1990}$ ), but on the 1994 level of the expenditure.<sup>64</sup> In 1994 the age-related programs considered by Franco *et al.* accounted for about 65 per cent of general government expenditure net of interest payments and represented 28.3 per cent of GDP.

Charts C4a and C4b outline the age-related profile of the expenditure items taken into consideration expressed in terms of per capita 1994 GDP. Both the males' and females' profiles have a peak for the 10 year old age class. Educational expenditure largely contributes in determining the changes in total expenditure up to the 20-24 age classes. Expenditure then declines, reaching a minimum level for the 27-48 age classes. Thereafter it increases fast, because of the substantial increase in pension expenditure.

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<sup>64</sup> The value of  $V_{40}^{1994}$  has been computed as  $V_{40}^{1994} = \frac{G_k^{1994}}{\sum_i (c_{ik}^{1990} \times P_i^{1994})}$

Health expenditure also contributes to this trend. The males' profile peaks for the 65-70 age classes, while the females' profile is nearly flat after the 65 age class.

**C.5 Spain** - The expenditure profiles for Spain are based on the estimates provided by Tejero and Moreno (1994). The average per capita expenditure in Spanish Pesetas for three age classes (0 to 14, 15 to 64 and 65 and over) results from the allocation of the aggregate 1991 values for the main social expenditure items over each age-group. The following five items were considered: health care, pensions, unemployment benefits, family allowances, other social benefits. Different profiles were not computed for males and females.

In 1991, the age-related programs considered by Tejero and Moreno accounted for about 49 per cent of general government expenditure net of interest payments and represented about 20.3 per cent of GDP.

The per capita expenditures reported in Tejero and Moreno have been expressed in terms of per capita 1991 GDP. Chart C5 outlines the resulting age-related profiles. Expenditure increases from 5 per cent of per capita GDP for the 0-14 age-group to 14 per cent for the 15-64 group and to 73 per cent for the older age group. Pensions and health care account for most of the changes in expenditure levels.

**C.6 Sweden** - The age and sex expenditure profiles have been estimated by Hagemann and John (1995) according to the results of an income and expenditure survey undertaken by the Swedish Statistical Office. The survey refers to 1992. Per capita expenditure in Swedish kronor have been computed for 20 age-groups (10 for males and 10 for females). Only cash transfer have been considered. Profiles have been produced for the following items: pensions, labour market assistance, sickness benefits, social assistance, child allowances, parents allowances, educational grants, accident allowances. Child allowances are attributed to parents.

The 1992 indexes of relative expenditure for each age-group within each expenditure item ( $c_k^{1992}$ ) have been updated by the above mentioned economists on the basis of an estimate of 1995 level of the expenditure. In 1995 the age-related programs considered by Hagemann and John represented 23.5 per cent of GDP.

Charts C6a and C6b outline the age-related profile of the expenditure items taken into consideration expressed in terms of per capita 1995 GDP. As already pointed out, education and health expenditures are not included and child allowances are attributed to parents. This underestimates public expenditure devoted to younger age groups. The males' and females' profiles have a peak for the 20-30 year age-groups, with labour market assistance representing the major expenditure item. Expenditure then declines, reaching a minimum level for the 40-50 age classes. It increases substantially for the over-60 age-groups. Pensions represent the only relevant expenditure item for these groups. Both profiles peak for the 70-80 age classes, respectively at 80 per cent of per capita GDP for males and at 55 per cent for females.

Chart C4a

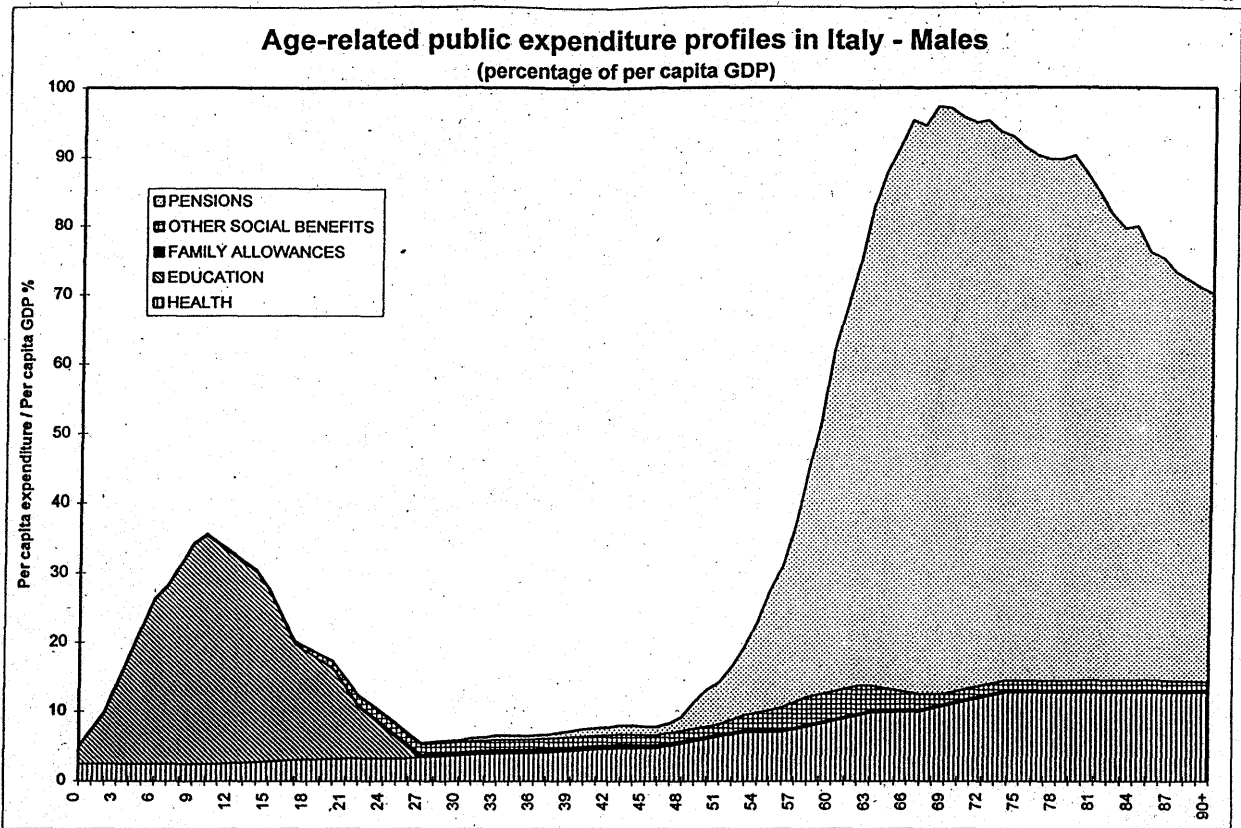


Chart C4b

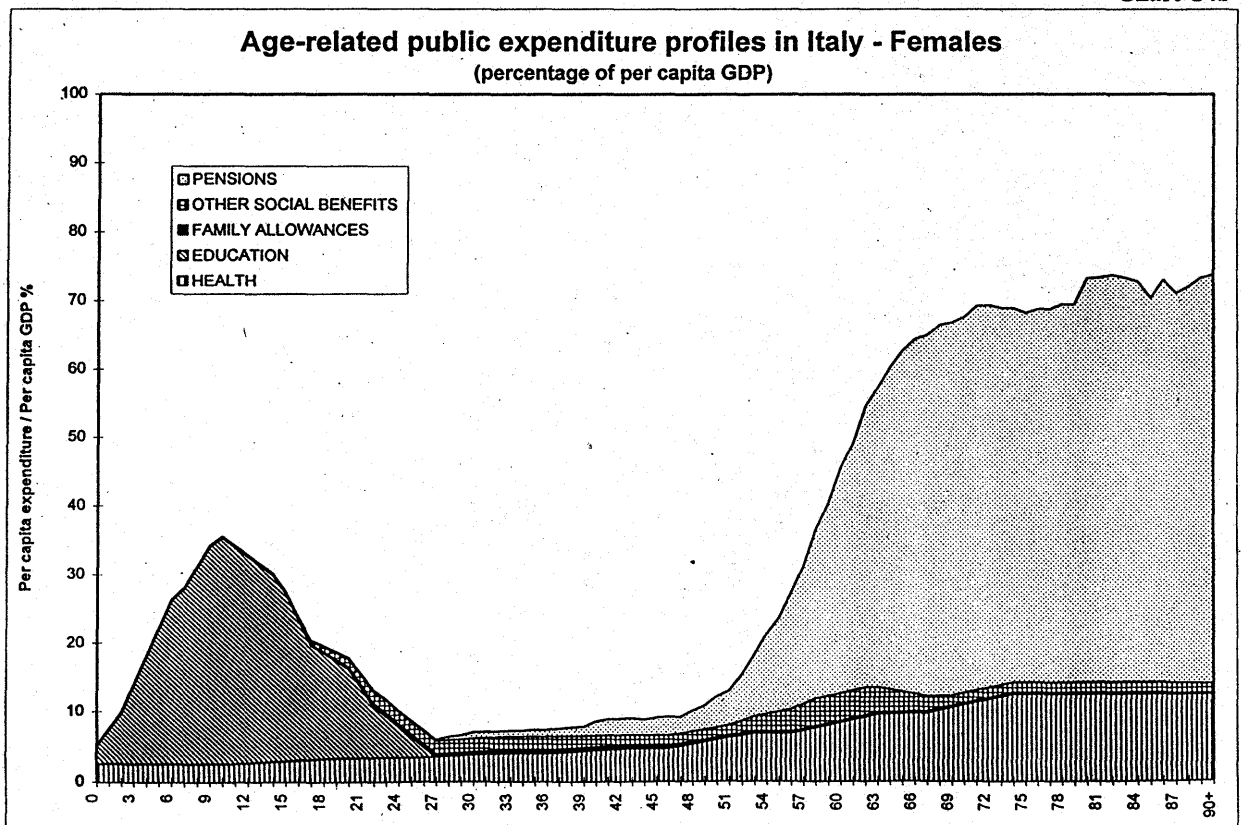


Chart C5

### Age-related public expenditure profile in Spain - Males & Females (percentage of per capita GDP)

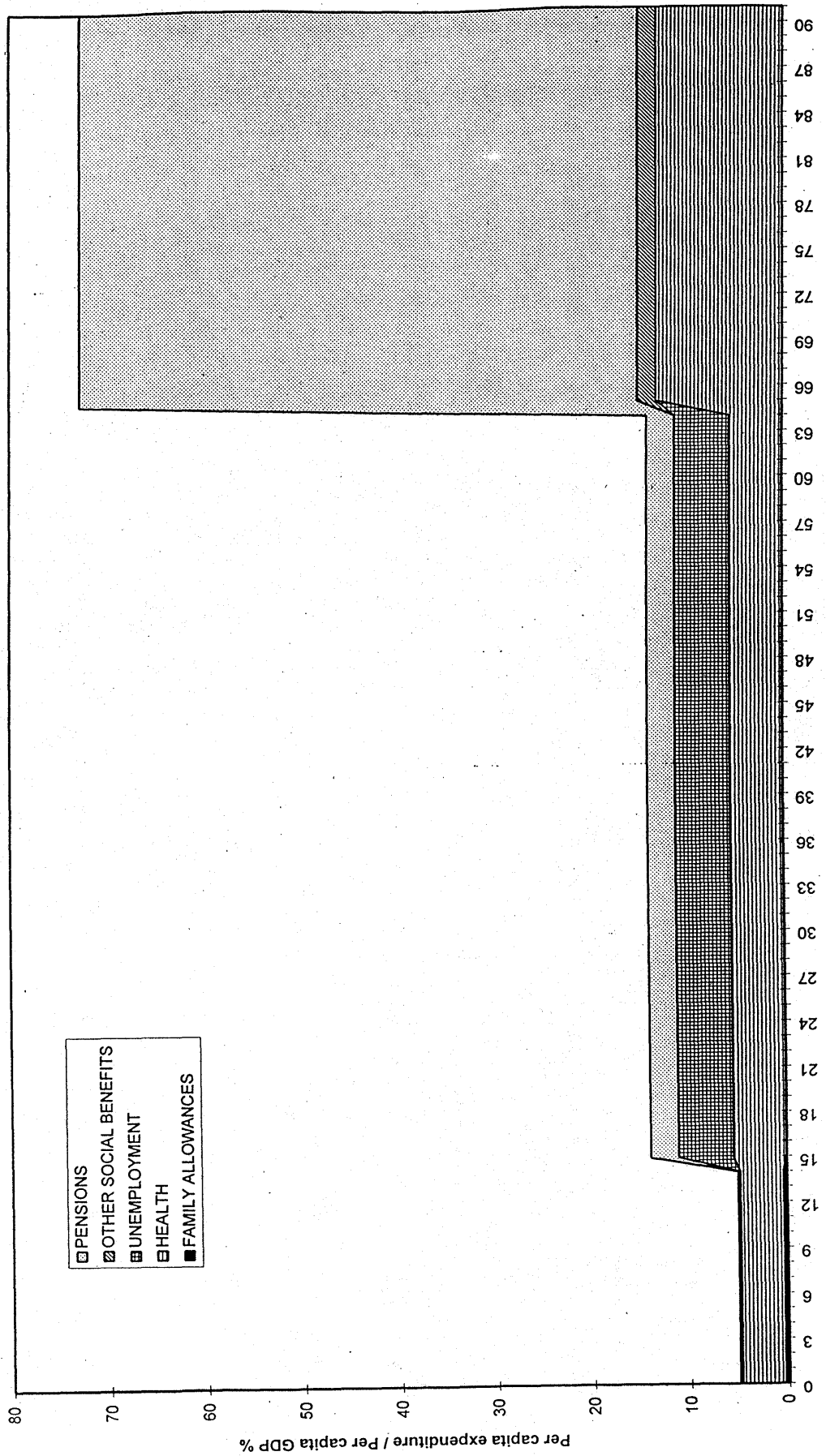


Chart C6a

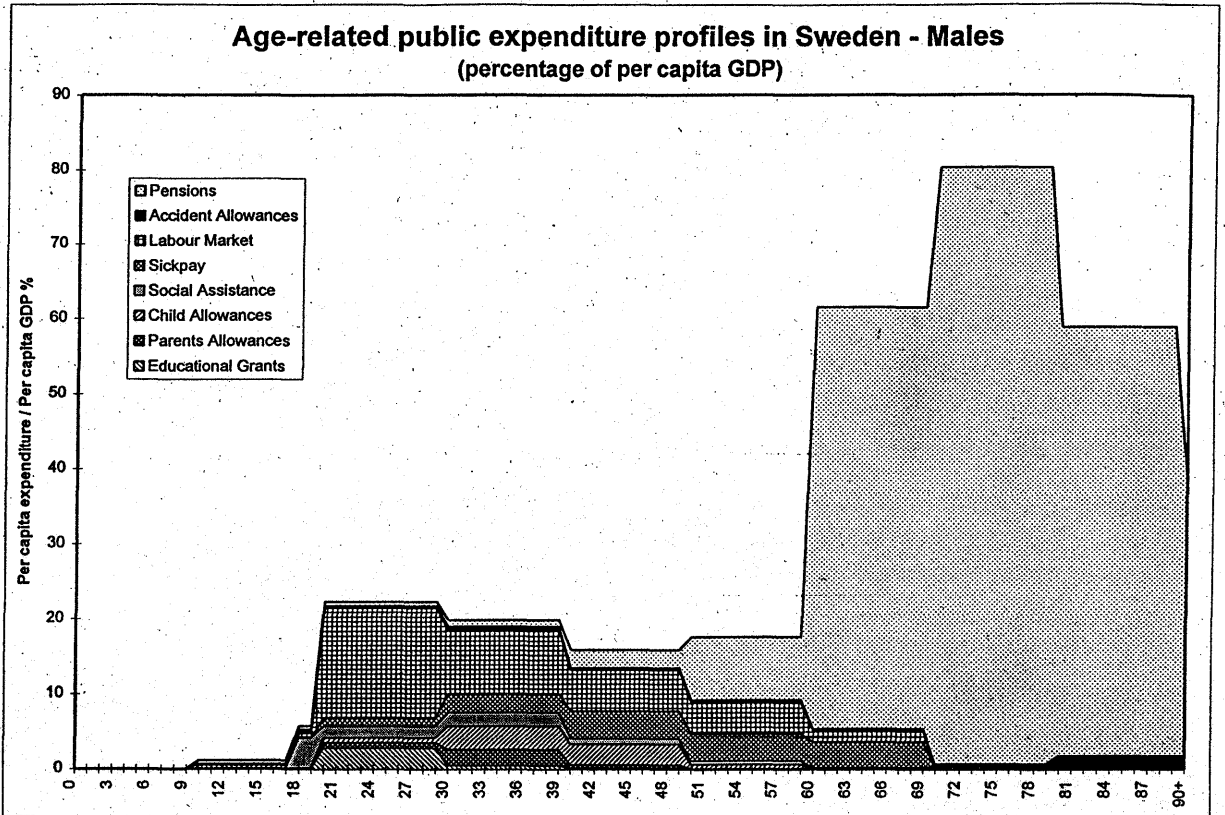
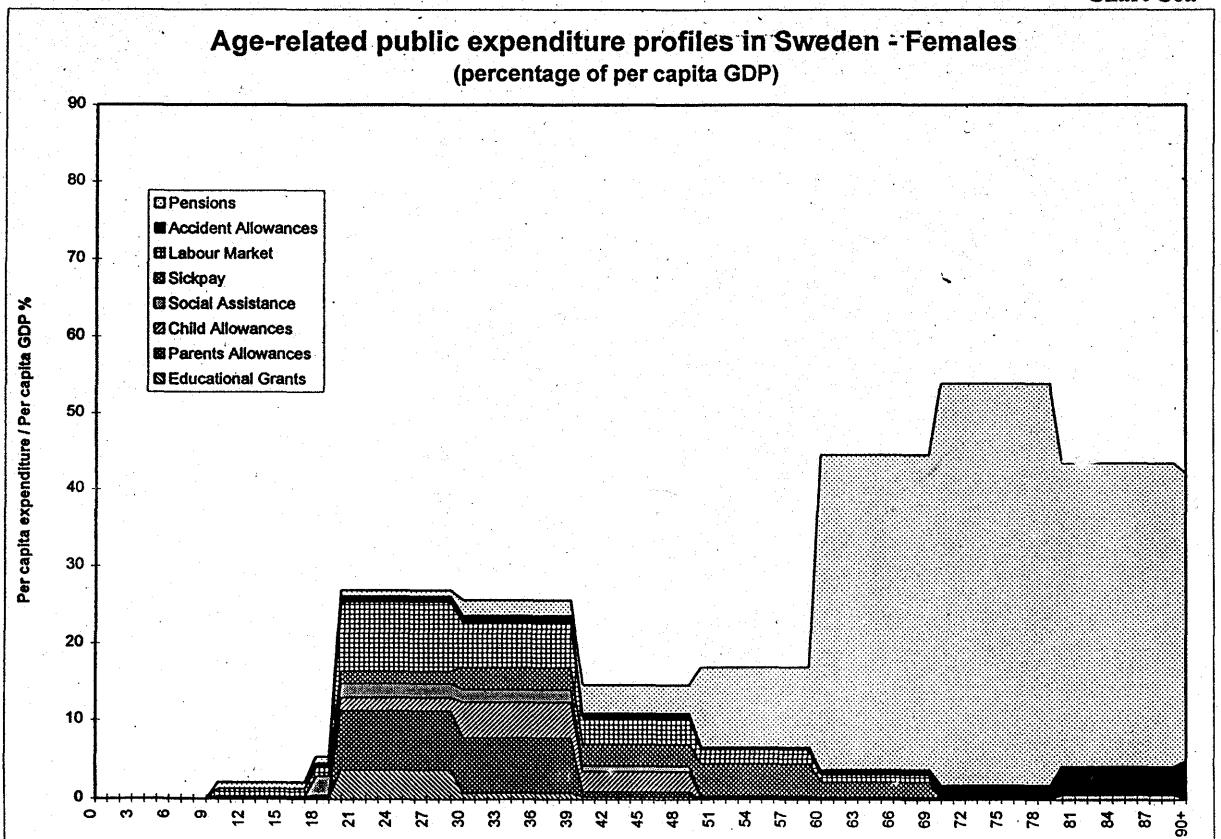


Chart C6a





## Annex D: The 'demand' for public expenditure

This Annex examines the changes in the 'demand' for public expenditure determined by demographic changes under the assumption of constant expenditure profiles for the members of each age-group (i.e. index *A*).

In the period 1995-2010 total age-related expenditure would increase by 16 per cent in Germany and by 8 to 11 per cent in the other five countries taken into consideration. Substantial increments would be recorded over the following 15 years in all the six countries (see Chart D1). Thereafter it would gradually flatten and decline in most countries after the year 2035. Projected increases are lower for the countries for which education expenditure is taken into consideration: the increase in total age-related expenditure would reach 25 per cent in Belgium, Finland and Italy, 29 per cent in Sweden, 37 per cent in German and 40 per cent.<sup>65</sup>

Pension expenditure trends, which contribute substantially to expected increases in total expenditure, are rather homogeneous (see Chart D2a). By the year 2010 real pension expenditure would increase by 15 to 18 per cent in Belgium, Italy, Spain and Sweden and by nearly 30 per cent in Finland and Germany. By the year 2035 it would increase by 50-55 per cent in Finland, Italy and Sweden and by 60-70 per cent in Belgium, Germany and Spain.

Health expenditure trends are rather similar for Belgium, Italy, Germany and Spain, with expenditure increasing by about 15 per cent and peaking in the period 2030-2035 for the first three countries and ten years later in Spain. Finnish expenditure trends are quite different: real health expenditure increases by nearly 40 per cent (see Chart D2b).

Over the period 1995-2010 real education expenditure would decline by about 10 per cent in Italy and 3-4 per cent in Belgium and Finland. By the year 2035 the reduction would reach 27 per cent in Italy and 10 per cent in Belgium and Finland (see Chart D2c). The substantial reduction projected for Italy is related to its low projected fertility rate (1.5, as against 1.8 for Belgium and Finland) and to its higher present expenditure profile.

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<sup>65</sup> It should be stressed that real expenditure trends also depend on the evolution of total population. The relatively small increases projected for Italy largely depend on the expected decline of Italian population.

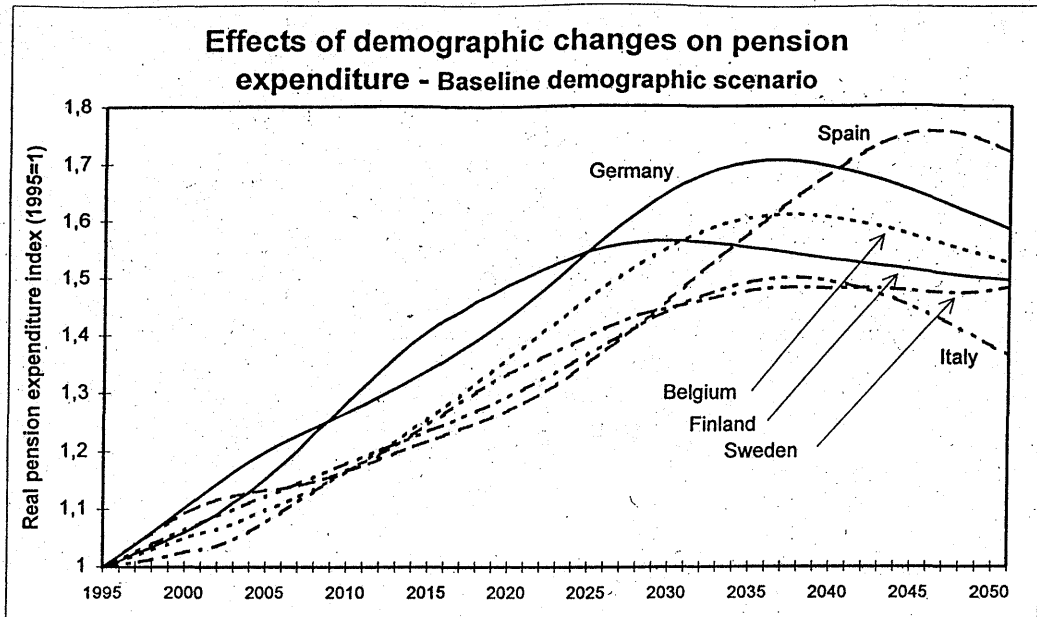


Chart D2b

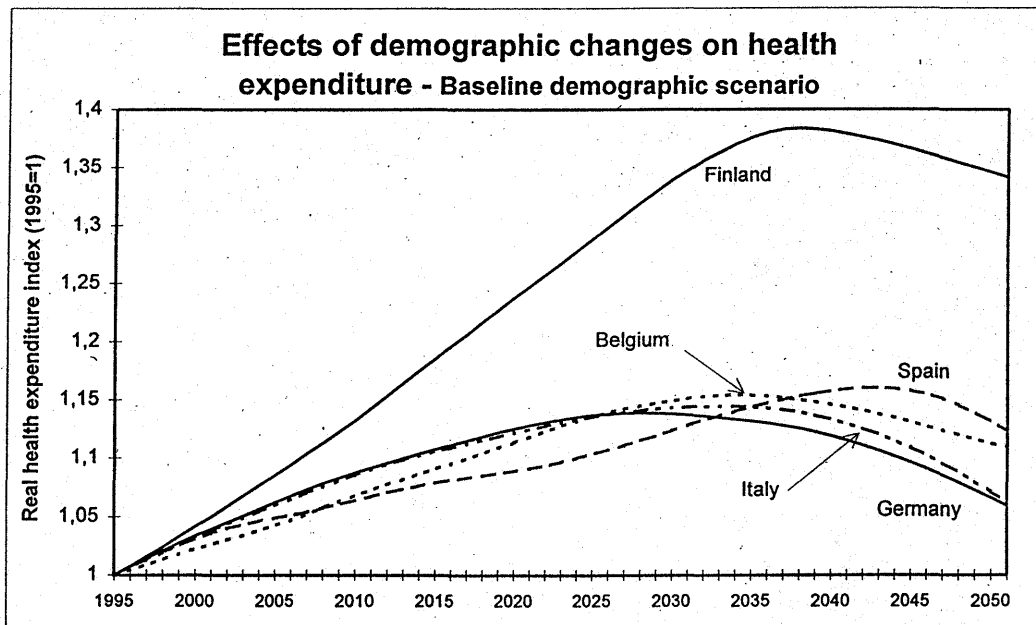


Chart D2c

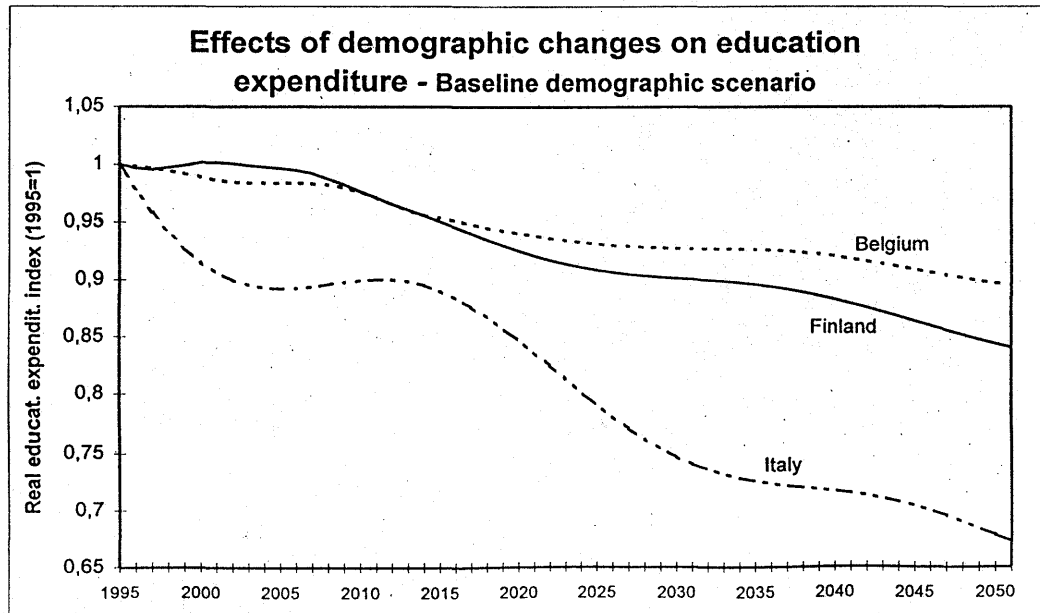


Chart D1

# Effects of demographic changes on real total age-related public expenditure

Baseline demographic scenario

