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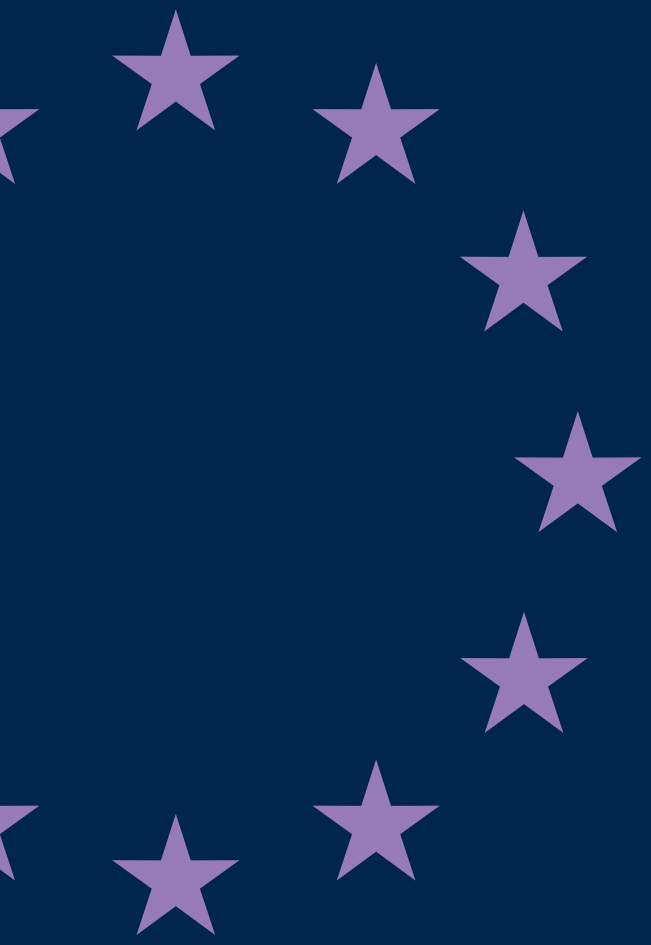

The 2005 projections of age-related expenditure (2004–50) for the EU-25 Member States: underlying assumptions and projection methodologies

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The 2005 projections of age-related expenditure (2004–50) for the EU-25 Member States: underlying assumptions and projection methodologies

by the Economic Policy Committee
and the European Commission
(Economic and Financial Affairs DG)

Abbreviations and symbols used

Member States

BE	Belgium
CZ	Czech Republic
DK	Denmark
DE	Germany
EE	Estonia
EL	Greece
ES	Spain
FR	France
IE	Ireland
IT	Italy
CY	Cyprus
LV	Latvia
LT	Lithuania
LU	Luxembourg
HU	Hungary
MT	Malta
NL	The Netherlands
AT	Austria
PL	Poland
PT	Portugal
SI	Slovenia
SK	Slovakia
FI	Finland
SE	Sweden
UK	United Kingdom

EUR-12	European Union Member States having adopted the single currency (BE, DE, EL, ES, FR, IE, IT, LU, NL, AT, PT, FI)
EU-25	European Union, 25 Member States
EU-15	European Union, 15 Member States before 1 May 2004 (EUR-12 plus DK, SE and UK)
EU-10	European Union, 10 Member States that joined the EU on 1 May 2004 (CZ, EE, CY, LV, LT, HU, MT, PL, SI, SK)

Currencies

EUR	euro
ECU	European currency unit
DKK	Danish krone
GBP	Pound sterling
SEK	Swedish krona
CAD	Canadian dollar
CHF	Swiss franc
JPY	Japanese yen
SUR	Russian rouble
USD	US dollar

Other abbreviations

SCPs	Stability and convergence programmes
PEPs	Pre-accession economic programmes
NMS	New Member States
SGP	Stability and Growth Pact

Acknowledgements

This report has been prepared as part of the mandate the Economic and Financial Affairs Council, in November 2003, gave to the Economic Policy Committee (EPC) to produce budgetary projections for the EU Member States for 2004–50.

The projection results will be calculated on the basis of the described methodology and will be presented to the Economic and Financial Affairs Council in February 2006.

In accordance with its normal practice, the EPC mandated a working group, the Ageing Working Group (AWG) under the chairmanship of Henri Bogaert, to take forward the work needed to discharge this remit. This report is presented by the EPC after full discussion on the basis of the AWG's comprehensive work.

The Directorate-General for Economic and Financial Affairs provided the necessary analysis and calculations used in the report. The demographic projections were carried out by Eurostat. Valuable contributions were also made by staff of the OECD, IMF and the ECB. The names of those who contributed are listed in Annex 1 of this document. The EPC and Economic and Financial Affairs DG would like to thank all those concerned.

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Overview of the 2005 projection of age-related expenditure

The mandate and broad principles

In 2003, the Economic and Financial Affairs Council gave the Economic Policy Committee (EPC) a mandate to produce a new set of long-run budgetary projections for all 25 Member States covering pensions, healthcare, long-term care, education, unemployment transfers and, if possible, contributions to pensions/social security systems ([1]). This follows the projection exercises of 2001 and 2003 ([2]). The age-related expenditure projections feed into a variety of policy debates at EU level. In particular, they are used in the annual assessment of the sustainability of public finances carried out as part of the Stability and Growth Pact; in the context of the open method of coordination on pensions; and the analysis on the impact of ageing populations on the labour market and potential growth which will be relevant for the Lisbon Strategy and broad economic policy guidelines.

This report provides a description of underlying assumptions, projection methodologies and background analysis of the age-related expenditure projections. Final results calculated on the basis of the described methodology will be presented to the Economic and Financial Affairs Council in February 2006.

In light of this mandate, the EPC developed a work programme establishing the broad arrangements for organising the budgetary projection exercise and for reaching agreement on the assumptions and methodologies ([3]). The work has been carried out by the EPC Working Group on Ageing Populations (AWG) and the Commission services with a view to improve the earlier projection exercise so as to enhance comparability across countries, consistency across expenditure items and the economic basis for the underlying assumptions. The work has been guided by the agreed principles of simplicity, comparability, consistency, prudence and transparency.

To this end, it was agreed to make the projections on the basis of a common demographic projection and common macroeconomic assumptions to be agreed in the EPC, which would be used for all age-related expenditure items. It was also agreed that the projections should be made on the basis of 'no policy change', in other words, only reflecting enacted legislation but not possible future policy changes (although account would be taken of provisions in enacted legislation that enter into force over time).

Participation in the budgetary projection exercise and working method

The work has been prepared by experts from 25 Member States, the Commission services (represented by the Directorate-General for Economic and Financial Affairs), the ECB and the OECD. The Economic and Financial Affairs DG has provided necessary analysis and calculations. The European Central Bank, the

([1]) Member States can also submit projections for additional expenditure and revenue items, for example family allowances, provided they are based on the agreed underlying assumptions.

([2]) The 2001 projections on pension, healthcare and long-term care were published in Economic and Financial Affairs DG (2001), 'Budgetary challenges posed by ageing populations', note for the attention of the EPC, EPC/ECFIN/655/01-EN of 24 October 2001. The projections on education and unemployment transfers were included in Economic and Financial Affairs DG (2003), 'The impact of ageing populations on public finances: overview of analysis carried out at EU level and proposals for a future work programme', note for the attention of the AWG, EPC/ECFIN/407/04-rev.3-EN of 22 October 2003 which summarises more recent projections made by several EU Member States, and outlines how the budgetary projections are used in the annual assessment of the sustainability of Member States' public finances.

([3]) 'Work programme for the 2004/05 long-run budgetary projection exercise', note from the Economic and Financial Affairs DG to the AWG (ECFIN/1/04-EN) of 8 January 2004.

OECD ([1]) and the IMF ([2]) have also contributed to the work. Eurostat have played a central role by preparing a population projection. Other Commission services have also been associated with this work, especially the Directorate-General for Employment, Social Affairs and Equal Opportunities and the Directorate-General for Health and Consumer Protection. The EPC and its AWG have coordinated the work with other Council formations, especially the Social Protection Committee ([3]).

The EPC expressed a strong preference for national statistical institutes to be closely involved in the preparation of the Eurostat population projection. This has been achieved by Eurostat, which actively consulted Member States via the 'Population projection' interest group on CIRCA, and through meetings of Eurostat's Working Group on Population Projection.

Coverage and general overview

Graph 1 below presents an overview of the entire age-related projection exercise. The starting point is a common 'AWG scenario' population projection for the period 2004 to 2050. Next, the EPC agreed a common set of exogenous macroeconomic assumptions covering the labour force (participation, employment and unemployment rates), labour productivity and the real interest rate. These combined assumptions enable the computation of GDP for all Member States up to 2050.

On the basis of these assumptions, separate projections are run for five age-related expenditure items. The projections for pensions are run by the Member States using their own national model(s). The projections for healthcare, long-term care, education and unemployment are run by the European Commission, on the basis of a common projection model. The results of the set of projections are aggregated to provide an overall projection of age-related public expenditures.

Approach to agreeing on the underlying assumptions and specific adjustments

The EPC adopted the following approach to reach agreement on the underlying exogenous assumptions and on the projection methodologies to use.

- A survey of the economic literature was carried out to identify best practices in international organisations and national authorities in making long-run budgetary projections. This was mostly done on the basis of contributions from the Economic and Financial Affairs DG and the OECD, and AWG members.

- On issues where specific expertise was required, a series of workshops was organised to which external academics and experts were invited ([4]).

- The EPC reached agreement on underlying assumptions, projection methodologies and coverage by consensus on the basis of proposals prepared by the Economic and Financial Affairs DG. The underlying assumptions have been made by applying a common methodology uniformly to all Member States. Specific adjustments have, however, been made for several Member States, either to take account of relevant country-specific circumstances or when the common methodology led to economically unsound outcomes. Table 1, below, provides an overview of the underlying assumptions, indicating the Member States for which adjustments were made to the commonly agreed methodology.

- Given the uncertainty surrounding the assumptions underpinning long-run budgetary projections, a number of sensitivity tests will be carried out in addition to the baseline or central variant, so as to quantify the responsiveness of projection results to changes in key underlying assumptions.

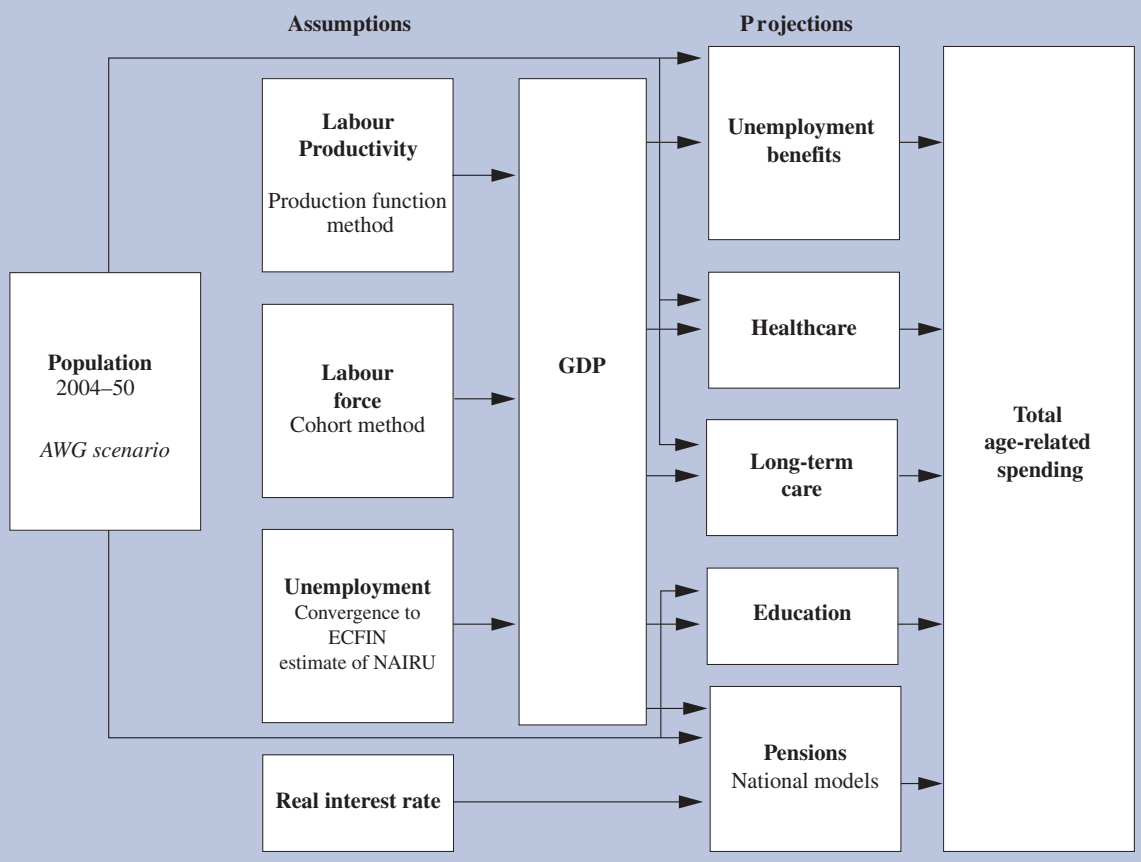
([1]) The 2001 projections were carried out in parallel with the OECD: see Dang et al. (2001), 'The fiscal implications of ageing: projections of age-related spending', *OECD Economics Department Working Papers*, ECO/WKP(2001)31, Paris. In 2004, the OECD envisaged running a parallel exercise alongside the EPC: see OECD (2004), 'Report on the joint EC/OECD ad hoc meeting of experts on revised projections of the fiscal cost of ageing', ECO/CPE/WP1(2004)5. This project did not proceed, although the OECD Secretariat has actively contributed to the EPC's work. The OECD continues work on issues related to ageing populations: see Oliveira et al. (2005), 'The impact of ageing on demand, factor markets and growth', *OECD Economic Working Papers*, No 249.

([2]) The work of the EPC does not reflect the positions of these international organisations.

([3]) The Economic and Financial Affairs DG and the EPC would like to thank David Stanton, Chairman of the Indicators Sub-Group of the SPC, for his valuable contributions to the budgetary projection exercise.

([4]) The Economic and Financial Affairs DG and the EPC would like to express their gratitude to Adelina Comas-Herrera and Ilija Batljan who provided advice on projection methodologies to project healthcare and long-term care spending during their periods as visiting research fellows in the Economic and Financial Affairs DG. The work of the EPC does not reflect the positions of these individuals, nor of any contributors to the workshops/conferences organised to prepare the budgetary projections.

Graph 1: **Overview of the 2005 projection of age-related expenditure**



Source: Commission services.

- 'Pure' sensitivity tests are planned, which introduce a uniform change or shock to a single underlying assumption/parameter in the projection framework for all Member States. An additional 'policy scenario' on migration may be carried out in 2006, after the budgetary projections are finalised. This would allow the impact of policy measures to be gauged (but moving away from a 'no policy change' scenario, introducing asymmetric shocks across Member States relative to the baseline scenario, and possibly involving several assumptions/parameters).

- Before being finalised, the budgetary projections will be subject to a process of peer review in the AWG. In addition, country fiches provided by Member States will, inter alia, describe the national pension model(s) used to make the pension projection and other relevant information on data sources and institutional factors which could be driving the budgetary projections.

This report is structured in two parts. The first one describes the underlying assumptions and sensitivity tests on the population projection, the labour force projection and the other macroeconomic assumptions. The second part presents the projection methodologies of pensions, healthcare, long-term care, education, unemployment transfers and contributions to pensions/social security systems.

Table 1

Overview of underlying assumptions and adjustments for certain Member States

	Population AWG scenario (differences compared with Europop 2004)		Labour force projections				Productivity	
	Convergence in life expectancy across EU-15	Data adjustment for migration	Data adjustment for pension reforms	Data adjustment for conversion into national account equivalent	Special convergence rule on NAIRU	Data adjustment for conversion into national account equivalent	Total factor productivity adjustment to speed up the catch-up of EU-15 countries	Real convergence of EU-10
BE	■		■	■	■	■		
CZ			■		■			■
DK	■			■				
DE	■	■	■	■		■		
EE			■					■
EL	■						■	
ES	■	■	■				■	
FR	■		■	■				
IE	■							
IT	■	■	■		■		■	
CY								■
LV			■					■
LT			■					■
LU	■			■		■		
HU			■					■
MT								■
NL	■							
AT	■		■	■				
PT	■						■	
PL			■		■			■
SI			■					■
SK			■		■			■
FI	■		■		■			
SE	■		■	■		■		
UK	■		■					

NB: The blue areas indicate the adjustments that have been made.

Source: Economic and Financial Affairs DG.

Part I

Underlying assumptions and sensitivity tests

1. Population

1.1. Background and general approach

The population projection used by the EPC is based on Europop 2004 but with adjustments for some Member States on life expectancy and net migration.

For the 2005 age-related expenditure projection, the EPC agreed to use a new population projection for the 25 EU countries prepared by Eurostat. It is based on, but not identical to, the Europop 2004 population projection released by Eurostat in May 2005 (see Eurostat, 2005c) ([1]). A full description of the methodologies used to project fertility rates, life expectancy and net migration in Europop 2004 can be found in Eurostat (2004b, c and d). In preparing the Europop 2004 population projection, Eurostat actively involved national statistical institutes via the 'Population projection' interest group on CIRCA and through meetings of its Working Group on Population Projection.

For its baseline budgetary projections, the EPC agreed to use the fertility rate assumptions in the baseline of Europop 2004 for all 25 Member States. However, some changes were made regarding the assumptions on life expectancy and migration flows as follows.

- Regarding life expectancy at birth, for the EU-10 Member States, the assumptions are the same as those in the baseline of Europop 2004. For the EU-15 Member States, the assumptions on life expectancy at birth are based on an 'AWG scenario' produced by Eurostat.

- Regarding net migration, the same assumptions as in the baseline of Europop 2004 are used for all Member States except Germany, Italy and Spain where specific adjustments were made to the level and/or age structure of migrants.

([1]) For simplicity, the baseline variant of the trend scenario of Europop 2004 is referred to as the Europop 2004 baseline.

AWG workshop on demography of 5 February 2004

In a workshop held on 5 February 2004, the AWG reviewed various topics relevant for the demographic projection (see Annex 2 for the workshop programme), inter alia considering the main driving forces and principal uncertainties shaping fertility rates, life expectancy and migratory flows. Four types of considerations emerge from this discussion.

- Population projections are subject to a high degree of uncertainty over the very long run. The uncertainty underlines the need to envisage sensitivity tests for various population scenarios. It should be noted that while the total population size varies considerably in different population scenarios, its age structure (for example, the old age dependency ratio) tends to be more stable.

- Past experience with population projections indicates wide margins of error. However, as regards the age structure of the population, the errors have tended to compensate each other, in other words, the number of young people was overestimated and the number of elderly was underestimated.

- Some demographers argue that it would be better to also make use of stochastic population projections, which are, however, much more difficult to carry out than standard deterministic projections. High-low intervals of standard projections do not give a realistic indication of what can happen because they underestimate demographic uncertainty. While the standard forecasting methods provide no indication of the probability of whether future outcomes will be inside or outside the range of estimates, stochastic modelling methods such as those used in the project called UPE ('Changing population of Europe:

uncertain future') is able to do so by estimating a probability distribution of future outcomes ([1]). Caution should also be exercised when estimating the benefits of stochastic projections in quantifying uncertainty, as they could give a misleading sense of precision and most stochastic projections disregard substantive knowledge about the components of demographic change ([2]).

- Demographic projections are, in part, based on assumptions on future economic developments. In making population projections, demographers have to choose the 'most likely' scenario. Each component of population change — fertility, mortality and migration — has 'scenario-resistant' and 'scenario-dependent' trends. Scenario-resistant trends are autonomous developments on which there is a good deal of knowledge and certainty. Scenario-dependent trends depend on the underlying scenario selected by the demographer: for example, migration is dependent on unemployment. These interlinkages between future population trends and assumptions on economic developments need to be borne in mind, and again point to the need to run several population scenarios.

1.2. Projection of fertility rates

1.2.1. Past trends and driving forces

Fertility rates have been declining to well below the natural replacement level.

From a post-war 'baby boom' peak above 2.5 in the second half of the 1960s, fertility rates have declined sharply in all EU-15 Member States (see Table 1.1). This decline to below the natural replacement rate of some 2.1 was relatively fast and unexpected (just as the surge in fertility rates in post-war years was unexpected).

The trend of falling fertility rates differed across countries in scale and timing. Fertility rates fell below replacement levels in the late 1960s in Sweden, Denmark, Finland, Luxembourg and Germany. The fall took place somewhat later in Belgium, the Netherlands, Austria, the United Kingdom, France (1972–73) and Italy (1975). Declines in fertility rates occurred much later in Greece, Spain, Portugal (1981–82) and Ireland (1990). Currently, several Member States have very low fertility rates below 1.4, namely Germany, Austria, Spain, Greece and Italy. Recent trends since 2000 also differ across EU-15 Member States, with fertility rates continuing to fall in Belgium, Germany, Greece and Luxembourg; this contrasts with increases (albeit small) in Spain, Ireland, Italy, the Netherlands, Sweden, the United Kingdom and Finland. Overall, there is a substantial gap in fertility rates between neighbouring countries with similar levels of economic development (e.g. 1.9 in France compared with some 1.2 to 1.3 in Germany and Italy), which if sustained over the long run will lead to very different outcomes for the size and age structure of future populations.

Recent developments in the EU-10 Member States are different. The drop of fertility rates below replacement levels started in the late 1960s in Hungary, Latvia and the Czech Republic, but occurred much later in Malta (1980), Poland and Slovakia (in 1989). Following the collapse of communist regimes, there was a very sharp reduction of fertility rates to below 1.4 in many countries and they have remained at very low levels up to 2000.

Factors driving fertility rates

The literature distinguishes proximate causes of fertility decline from more fundamental socioeconomic determinants. The main proximate cause is the use of contraception. Induced abortion has also played a significant role, accounting for 10–30 % of fertility decline (UN, 2004). The postponement of marriage and first birth has been another important factor, especially in the decline of 'period' (that is, calendar year specific) measures of fertility. In more developed countries, first and second births have been reduced much less than higher-order births, which have been virtually eliminated and are the main determinant of the low fertility. So far, childlessness has not played a large role in explaining low fertility (UN, 2004).

The socioeconomic factors behind fertility decline are an increase in female educational attainment and labour force participation, higher female economic autonomy, social developments towards more equal roles in society, a less important role of women as mothers and children

([1]) The UPE project was completed in September 2004. It was funded within the key action, 'Improving the human potential and the socioeconomic knowledge base', under the area, 'Individual and collective strategies in a changing society', of the fifth research framework programme. Another project called Demwel (Demographic uncertainty and the sustainability of social welfare systems) focuses on the quantification of demographic uncertainty into economic models and economic analysis of the effects of population ageing. It started on 1 January 2003, under the 'Quality of life and management of living resources'programme of the fifth research framework programme, key action 6, 'The ageing population and disabilities', action line 6.3, 'Demographic and social policy aspects of population ageing — Socioeconomic impact'. It will be finalised in 2006.

([2]) This point was raised by several experts during the external review of the assumptions (see Annex 11).

Table 1.1

Past trends in fertility rates, 1950–2000

	1950	1960	1970	1980	1990	2000	Change 1960–2000
BE	2.34	2.56	2.25	1.68	1.62	1.66	*– 0.9*
DK	2.57	2.57	1.95	1.55	1.67	1.77	*– 0.8*
DE		2.37	2.03	1.56	1.45	1.38	*– 1.0*
EL		2.28	2.39	2.21	1.39	1.29	*– 1.0*
ES		2.86	2.90	2.20	1.36	1.24	*– 1.6*
FR	2.93	2.73	2.47	1.95	1.78	1.88	*– 0.9*
IE		3.76	3.93	3.25	2.11	1.90	*– 1.9*
IT	2.50	2.41	2.42	1.64	1.33	1.24	*– 1.2*
LU		2.28	1.98	1.49	1.61	1.76	*– 0.5*
NL	3.10	3.12	2.57	1.60	1.62	1.72	*– 1.4*
AT		2.69	2.29	1.65	1.46	1.36	*– 1.3*
PT		3.10	2.83	2.18	1.57	1.55	*– 1.6*
FI		2.72	1.82	1.63	1.78	1.73	*– 1.0*
SE		2.20	1.92	1.68	2.13	1.54	*– 0.7*
UK		2.72	2.43	1.90	1.83	1.64	*– 1.1*
CY		3.51	2.54		2.42	1.64	*– 1.9*
CZ		2.11	1.91	2.10	1.89	1.14	*– 1.0*
EE			2.16		2.04	1.34	
HU		2.02	1.98	1.92	1.87	1.32	*– 0.7*
LT		2.60	2.40	2.00	2.03	1.39	*– 1.2*
LV			2.01	1.90	2.01	1.24	
MT		3.62	2.02	1.99	2.05	1.72	*– 1.9*
PL		2.98	2.20	2.28	2.04	1.34	*– 1.6*
SK		3.07	2.40	2.32	2.09	1.30	*– 1.8*
SI		2.18	2.10	2.11	1.46	1.26	*– 0.9*
EU-25			*2.32*		*1.78*	*1.49*	
EU-15		*2.69*	*2.41*	*1.88*	*1.65*	*1.58*	
EU-10			*2.17*		*1.99*	*1.37*	

NB: EU averages are not weighted by population size.

Source: Eurostat.

as a result of free choice. Economic growth has also an impact on the timing and level of fertility, as well as the cultural environment and, to some extent, public policies such as schemes to reduce the burden of work and care (van Wissem, 2004).

The concept of the 'second demographic transition' developed by Van de Kaa and Lestaeghe (Eurostat, 2004b) analyses the growth of cohabitation, lone parenthood, childbearing outside marriage, rising probabilities of separation and divorce and low fertility observed in many countries after the 1960s. The reduction in fertility rates starting in the late 1960s is partly due to a postponement of fertility, followed by only a partial catching up at later ages (Eurostat, 2004b). These trends have been consolidated during the last two decades.

Clearly, their prevalence differs from one country to another. Regional differences are strong, with higher fertility in northern and western countries and lower fertility in southern countries — excluding France — since the end of the 1980s, whilst it used to be the opposite earlier on. In EU-10 countries, the recent drop in fertility rates to levels of 1.15 to 1.40 can be partly explained by a post-

ponement of childbearing starting with the transition to market economies; the mean age of the mother has increased considerably in all EU-10 countries, although it remains well below the EU-15 average (Eurostat, 2004b).

Uncertainties over future trends

There has been a debate in recent years on whether a convergence in future fertility patterns of EU Member States can be expected. Fertility rates could converge in the long term, just as a common pattern of steady decline has taken place, although with different timing and scale across countries.

The fertility assumptions underlying the 2004 revision of world population prospects by the United Nations are based on the assumption of long-term convergence of fertility rates in all countries (United Nations, 2005). The UN assumes total fertility in all countries to converge toward a level of 1.85 children per woman. Not all countries, however, reach this level by 2050. The same principle for projecting fertility rates is applied to all countries, with slightly different assumptions depending on whether total fertility was above or below replacement levels over the period 2000 to 2005.

Many questions are still open. Will the EU Member States tend towards uniformity in fertility trends or, on the contrary, towards more diversity? Could fertility levels increase again to values above replacement levels? Is the low fertility in southern and eastern European Member States due to postponement of childbearing, to be recuperated in coming years and thus fertility rates are low temporarily? Or is there a reduction in desired family size which would mean that the observed reduction in fertility rates will be structural? Are we witnessing the development of a one-child family model in the south and a two-child family model in northern and western EU Member States? Surveys indicate that people in northern Europe would like to have two children, which is not too far from what they achieve, but that people in southern Europe would like to have more children than they do, which suggests that something may be preventing them from doing so (van Wissem, 2004). Recent trends of low fertility levels in eastern European Member States may be partly due to the large economic and political transitions that have taken place: a key issue is whether trends in these countries will eventually converge towards the patterns observed in (higher fertility) northern/western EU Member States or towards (lower fertility) southern EU Member States.

1.2.2. The projection used in Europop 2004: methodology and results

The projection methodology used for EU-15 Member States

Eurostat (2004b) provides an overview of the methodology used to derive fertility assumptions for the EU-15 Member States in Europop 2004. Eurostat does not assume convergence in fertility rates between EU-15 Member States, arguing that recent trends appear to contradict such a hypothesis, at least in the medium-term future. Cross-country differences in fertility rates could persist due, among other factors, to the extent to which different socioeconomic and institutional contexts influence the variation in fertility levels.

The baseline Europop 2004 for fertility is derived from the analysis of postponement and recuperation of childbearing in EU-15 Member States. Postponement of fertility, in particular for first births, is a common feature in most countries. Changes in the timing of childbearing may distort 'period' measures of fertility, such as total fertility rates. In order to take into account these timing effects, Eurostat uses 'cohort' measures of fertility with a focus on family size by generation at different ages of the mother. In essence, the methodology consists in extrapolating observed cumulated fertility at ages 20, 25, 30, 35, 40 and 49, up to the reference cohort of women born in 1990, after which fertility is kept constant.

Based on a method developed by de Jong (Eurostat, 2004a) which was also used for previous Eurostat population projections in 1995 and 1999, the extrapolation is carried out as follows:

- cumulated cohort fertility ([1]) at age 20 is extrapolated using simple time-series methods;
- a recursive extrapolation is done until age 40. For each cohort, a multiplicative correction coefficient is applied to the estimated cumulated fertility. The assumptions on future patterns of fertility recuperation, which may differ from recent observations, are introduced through these correction coefficients. In particular, recuperation is assumed to be higher than observed in southern EU-15 countries, where observed fertility in young adulthood has dropped the most. Coefficients are close to 1 in the baseline scenario. Fertility between

([1]) Cumulated cohort fertility is calculated for a cohort born in a specific year; it is a real cohort and not a synthetic one; it is not complete.

ages 40 and 49, which is almost negligible, is extrapolated using simple time-series methods;

- the series of single-year fertility rates by age is estimated;
- minor adjustments are introduced to smooth the pattern of projected total period fertility rate and mean age at childbearing. The outcome of this approach is that the total fertility rate reaches a constant level from approximately 2020 onwards. The choice of the long-term value strongly influences the size and age structure of the population at the end of the projection period ([1]).

The projection methodology used for EU-10 Member States

The fertility assumptions for the EU-10 Member States have been prepared on the basis of a study made for Eurostat by the Netherlands Interdisciplinary Demographic Institute (NIDI) (Eurostat, 2004b). It is assumed that fertility postponement proceeds as a consequence of modernisation and westernisation. At the end of the projection period, most EU-10 Member States are assumed to converge to an EU average level of median age at childbearing of 30 years.

The projected fertility rates in Europop 2004

The main results worth highlighting are the following.

- For the EU-25, fertility rates are projected to rise from 1.48 in 2004 to 1.60 by 2030 and to stay constant at that level until 2050. The total fertility rate (TFR) is projected to increase over the projection period in all Member States, except France, Ireland and Malta, but in all countries fertility rates will remain well below the natural replacement rate of 2.1.
- The largest increases in fertility rates are projected to take place in the new Member States (except Malta and Cyprus) which currently have the lowest fertility rates in the EU. The increase is projected to occur slowly, with fertility rates approaching 1.60 in most of these countries by 2030–40. While Poland and Slovenia are projected to attain fertility levels slightly above the EU-10 average in 2050, the fertility levels in the Czech Republic and Slovenia would remain below the EU-10 average, according to the projection. Cyprus will see a marginal increase of its fertility level, leading to its level falling from above to below the EU-10 average as of 2024.
- EU-15 Member States with very low fertility rates in 2003 (Greece, Spain, Germany and Italy) will see an increase, but not by a significantly larger amount than in other EU-15 countries. Hence, these countries, together with Austria, will have fertility rates significantly below the EU-15 average of 1.60 by the end of the projection period, in other words, 1.4–1.5.
- There is a process of convergence in the fertility rates across Member States, as indicated by the fall in standard deviation.

1.3. Projection of life expectancy

1.3.1. Past trends and driving forces

Large and continuous increases in life expectancy have been observed.

According to Vaupel (2002), life expectancy is on the rise worldwide with very few exceptions and it is a very long-run trend in most developed countries ([2]). As shown in Table 1.3, there have been significant increases in life expectancy at birth since 1960 in all Member States. Between 1960 and 2002, life expectancy at birth in EU-15 countries increased by 8.7 years for females and by 8.2 for males. In recent decades, the decrease in mortality at older ages has exceeded that at younger ages. In EU-15 Member States, the decrease in mortality rates between ages 70 and 79 accounts for about 20 % of the improvement in life expectancy over the period 1982 to 2002. In Sweden, reduction in mortality for the age cohort 60–79 accounted for almost 50 % of gains in male

([1]) Total period fertility rate (TPFR), or total fertility rate, is the sum of the observed fertility rates by age, for a given year. It can be interpreted as the average number of children of a synthetic cohort, that is, a hypothetical generation of women whose lifelong fertility would be equal to the fertility rates observed in a particular year. In a given year, fertility rates by age are computed over more than 30 generations of women. The reproductive age-span considered ranges between ages 14 and 49. Its level is often comparable with the completed fertility of generations, but this indicator may differ for long periods when fertility timing changes: a delay if women are postponing child-bearing leads to a drop in the TPFR even if the completed fertility of the generations is not modified, but because some women are having their children later.

([2]) Since the 19th century, improvements in living conditions and medical advances have led to increases in life expectancy at birth. Several stages have been identified in the decline in mortality, starting in north-west Europe around 1700 to 1800 with a reduction of variations in mortality rates as famine-related mortality was reduced (United Nations, 2004). Mortality levels began to decline in a second stage that started in the early 19th century in England and northern European countries, due to vaccination and public health measures as well as improved personal hygiene. The decline in mortality rates accelerated during the third stage in the early years of the 20th century, with significant improvements made in reduction of infant and child mortality and in survival rates of young adults.

Table 1.2

Projection of fertility rates in Europop 2004

	2004	2010	2020	2030	2040	2050	Change
BE	1.62	1.66	1.69	1.70	1.70	1.70	*0.08*
DK	1.76	1.78	1.79	1.79	1.80	1.80	*0.04*
DE	1.35	1.41	1.44	1.45	1.45	1.45	*0.10*
EL	1.29	1.41	1.49	1.50	1.50	1.50	*0.21*
ES	1.30	1.36	1.40	1.40	1.40	1.40	*0.10*
FR	1.89	1.87	1.86	1.85	1.85	1.85	*– 0.04*
IE	1.97	1.89	1.81	1.80	1.80	1.80	*– 0.17*
IT	1.31	1.38	1.40	1.40	1.40	1.40	*0.09*
LU	1.65	1.73	1.78	1.79	1.80	1.80	*0.15*
NL	1.75	1.76	1.75	1.75	1.75	1.75	*0.00*
AT	1.40	1.42	1.44	1.45	1.45	1.45	*0.05*
PT	1.45	1.52	1.59	1.60	1.60	1.60	*0.15*
FI	1.76	1.78	1.79	1.80	1.80	1.80	*0.04*
SE	1.74	1.84	1.85	1.85	1.85	1.85	*0.11*
UK	1.72	1.74	1.75	1.75	1.75	1.75	*0.03*
CY	1.47	1.43	1.49	1.50	1.50	1.50	*0.03*
CZ	1.15	1.24	1.44	1.50	1.50	1.50	*0.35*
EE	1.39	1.45	1.54	1.60	1.60	1.60	*0.21*
HU	1.30	1.33	1.51	1.59	1.60	1.60	*0.30*
LT	1.29	1.30	1.41	1.55	1.60	1.60	*0.31*
LV	1.30	1.42	1.53	1.59	1.60	1.60	*0.30*
MT	1.66	1.49	1.54	1.60	1.60	1.60	*– 0.06*
PL	1.21	1.19	1.42	1.58	1.60	1.60	*0.39*
SK	1.19	1.18	1.33	1.52	1.59	1.60	*0.41*
SI	1.18	1.27	1.46	1.50	1.50	1.50	*0.32*
EU-25	*1.48*	*1.52*	*1.57*	*1.59*	*1.60*	*1.60*	*0.12*
EU-15	*1.53*	*1.57*	*1.60*	*1.60*	*1.60*	*1.61*	*0.07*
EU-10	*1.23*	*1.24*	*1.44*	*1.56*	*1.58*	*1.58*	*0.36*

NB: EU averages are weighted by population size, unless indicated otherwise.

Source: Eurostat Europop 2004 baseline.

life expectancy and similar results were observed for all EU-15 Member States.

Since 1980, the differential between women and men has narrowed, due to faster improvements in life expectancy for males relative to females. Over the period 1980 to 2002, males have gained on average 2.9 months per year in life expectancy, while females around 2.3 months, in the EU-15. The difference in life expectancy between women and men is largest at birth, due to higher male infant mortality and higher risks of fatal accidents in childhood, youth and early adulthood (Eurostat, 2004c). By the age of 65, the difference is smaller. The literature suggests that societal and lifestyle factors (such as smoking, diet and medical care) have the greatest influence on the gap, rather than biology.

The gains in life expectancy at birth have differed across countries since 1980. Women have gained more than 2.7 months per year in Italy, Austria and Portugal; at the lower end, life expectancy has increased by only 0.7 months per year in the Netherlands and around 1.5 in Denmark and Greece. Gains in the life expectancy of men have been highest in Germany, France, Italy, Luxembourg, Austria, Finland and the United Kingdom, between 2.8 and 3 months per year, while increases of less than 1.9 have occurred in Greece, Spain and the Netherlands. In the same period in the EU-10,

Table 1.3

Past trends in life expectancy at birth, 1950–2000

	Males							Females						
	1950	1960	1970	1980	1990	2000	Change 1960–2000	1950	1960	1970	1980	1990	2000	Change 1960–2000
BE	62	67.7	67.8	70	72.7	74.6	*6.9*	67.3	73.5	74.2	76.8	79.4	80.8	*7.3*
DK		70.4	70.7	71.2	72	74.5	*4.1*		74.4	75.9	77.3	77.7	79.3	*4.9*
DE	64.6			69.6	72	75		68.5			76.1	78.4	81	*81*
EL	63.4	67.3	70.1	72.2	74.6	75.5	*8.2*	68.5	72.4	73.8	76.8	79.5	80.6	*8.2*
ES	59.8	67.4	69.2	72.5	73.3	75.7	*8.3*	64.3	72.2	74.8	78.6	80.3	82.5	*10.3*
FR	62.9	66.9	68.4	70.2	72.8	75.3	*8.4*	68.5	73.6	75.9	78.4	80.9	82.7	*9.1*
IE	64.5	68.1	68.8	70.1	72.1	73.9	*5.8*	67.1	71.9	73.5	75.6	77.6	79.1	*7.2*
IT	63.7	67.2	69	70.6	73.6	76.6	*9.4*	67.2	72.3	74.9	77.4	80.1	82.5	*10.2*
LU		66.5	67.1	69.1	72.3	74.8	*8.3*		72.2	73.4	75.9	78.5	81.1	*8.9*
NL		71.5	70.7	72.7	73.8	75.5	*4*		75.3	76.5	79.3	80.9	80.5	*5.2*
AT		66.2	66.5	69	72.2	75.1	*8.9*		72.7	73.4	76	78.8	81.1	*8.4*
PT	56.4	61.2	64.2	67.7	70.4	73.2	*12*	61.6	66.8	70.8	75.2	77.4	80	*13.2*
FI		65.5	66.5	69.2	70.9	74.2	*8.7*		72.5	75	77.6	78.9	81	*8.5*
SE		71.2	72.2	72.8	74.8	77.4	*6.2*		74.9	77.1	78.8	80.4	82	*7.1*
UK	66.2	67.9	68.7	70.2	72.9	75.5	*7.6*	71.2	73.7	75	76.2	78.5	80.2	*6.5*
CY				72.3	74.1						77	78.6		
CZ		67.9	66.1	66.8	67.6	71.7	*3.8*		73.4	73	73.9	75.4	78.4	*5*
EE		64.3	65.5	64.1	64.7	65.6	*1.3*		71.6	74.1	74.1	74.9	76.4	*4.8*
HU		65.9	66.3	65.5	65.1	67.4	*1.5*		70.1	72.1	72.7	73.7	75.9	*5.8*
LT		64.9	66.9	65.5	66.4	66.8	*1.9*		71.4	74.8	75.4	76.2	77.4	*6*
LV		65.2	66	63.6	64.3	65	*-0.2*		72.4	74.4	74.2	74.6	76.1	*3.7*
MT		66.5	68.4	68.5	73.7	76.3	*9.8*		70.5	72.6	72.7	78.1	80.4	*9.9*
PL		64.9	66.6	66.9	66.7	69.7	*4.8*		70.6	73.3	75.4	76.3	77.9	*7.3*
SK		68.4	66.7	66.8	66.6	69.2	*0.8*		72.7	72.9	74.3	75.4	77.4	*4.7*
SI		66.1	65	67.4	69.5	72.3	*6.2*		72	72.4	75.2	77.4	79.7	*7.7*
EU-25				*69.0*	*70.8*						*76.0*	*77.9*		
EU-15				*70.7*	*72.9*	*75.1*					*77.1*	*79.2*	*81.0*	
EU-10				*66.7*	*67.9*						*74.5*	*76.1*		

NB: EU averages are not weighted.

Source: Eurostat.

women have gained over 3.2 months per year in Malta and Slovenia and, on the lower end, less than 1.5 in Estonia, Latvia and Lithuania. For males, gains over 3 months per year have been recorded in the Czech Republic, Malta and Slovenia, while life expectancy has stagnated or even slightly decreased in the Baltic States (– 0.1 in Estonia, – 0.5 in Latvia, 0.5 in Lithuania).

…uncertainties over future developments

There is no consensus among demographers on trends over the very long term, for example, whether there is a natural biological limit to longevity, the impact of future medical breakthroughs, long-term impact of public health programmes and societal behaviour such as reduction of smoking rates or increased prevalence of obesity. Past population projections from official sources have, however, underestimated the gains in life expectancy at birth, and some commentators have argued that governments may be underestimating the potential budgetary impact of ageing populations ([1]).

([1]) See Oliveira Martins (2005), CSIS (2002).

Official projections assume that gains in life expectancy at birth will slow down compared with historical trends. This is because mortality rates at younger ages are already very low and future gains in life expectancy would require improvements in mortality rates at older ages (which statistically have a smaller impact on life expectancy at birth). On the other hand, the wide range of life expectancies across EU Member States, and also compared with other countries, points to considerable scope for future gains. Currently, life expectancy at birth for females ranges from 76 in Latvia to 83 years in Spain, Italy and France (and 85.3 in Japan), and for males ranges from 64.9 in Latvia to over 77 in Italy (78.3 in Japan).

There is also an open question regarding the general issue of convergence in life expectancy across Member States. According to Eurostat (2004c), 'Mortality rates have experienced tremendous volatility in the past years. There is no evidence of convergence among European countries, but of a loose "moving together". On the other hand, there is no evidence arguing for divergence either.'

1.3.2. The projection used in Europop 2004: methodology and results

A detailed overview of the projection methodology is provided by Eurostat (2004c). The method is based on age-specific mortality rates (ASMR) and other mortality indicators resulting from life tables. The contribution of changes in mortality rates to differences in life expectancy at birth is calculated by decomposing differences in life expectancy at birth between two years. The results allow identifying the improvements in life expectancy experienced in the past by sex and age groups.

Data availability has constrained the choice of methodology. The projection is based on mortality rates from 1985 to 2002, and in some cases since 1982. Corrections were made to compensate for a shorter period used for some countries, based on the average annual gains in life expectancy. Data used are post-census revised population on 1 January per single age to the maximum possible (100 +) and LIPRO software developed by the NIDI is used. The projection of future mortality rates by age and gender is based on the cohort-component method. It involves firstly the estimation of ASMR in the target years 2018 and 2050 on the basis of historical trends and experts' views published in the literature, and using the assumptions and formula outlined below. Secondly, it requires the interpolation of age-specific mortality rates for each single year from 2003 to 2017 and from 2019 to 2049. The interpolation is based on fitting third degree curves.

The assumptions are as follows:

- the trends of decreasing age-specific mortality rates observed over the period 1985 to 2002 continue for one third of the years between 2002 and 2050, that is, until 2018 (considered an intermediate target date);
- the decreasing trends slow down for the remaining two thirds of the projection period, which is from 2019 to 2050. The improvement pattern applied over the period 2002 to 2018 is applied over the longer period 2018 to 2050.

The ASMR in the target dates 2018 and 2050 are estimated according to the following formula: the target-year-specific mortality rates are equal to the average of the single-year-specific 2000–02 mortality rates multiplied by the square of the improvement rate over the period 1985 to 2002. A correction coefficient was used to adjust the target values of ASMR in order to take into account the shorter periods of observation in some countries. Moreover, the final results were refined using the latest national projections, the 2002 revision of the UN projections and the last projections made by Eurostat in 1999. Mortality rates in 2050 were smoothed by moving averages over three single years of age.

The basic methodology used is similar for all countries, but due to the markedly different mortality trends, additional assumptions were made for the EU-10 countries as follows.

- The near future will be a continuation of the recent past but, in the medium and long run, the speed of improvements in mortality reduction will converge gradually towards the pattern of average improvements in the EU-15. In practice, after 20 years of projection, the reduction in mortality rates will be 75 % of the EU-15 average in 2003 (the arithmetic mean of the age-specific mortality rates of high and low scenarios — respectively the same improvement and 50 % improvement). For Cyprus and Malta (already at EU-15 life expectancy levels), a gradual change is assumed from 50 % of the recently observed reduction patterns to no reduction in 2023. After 2023, mortality rates will continue to decline, with lower speed.

- EU-10 countries will start or continue a process of convergence towards the EU-15 countries.

Results of projections of life expectancy in Europop 2004

Tables 1.4 and 1.5 present the projected changes in life expectancy at birth and at age 65 for males and females in the baseline scenario of Europop 2004. It projects large increases in life expectancy at birth being sustained during the projection period, albeit with a considerable degree of diversity across Member States.

The main developments worth highlighting include the following.

- For the EU-25, life expectancy at birth for males is projected to increase by 6.9 years (6.1 for the EU-15) between 2004 and 2050. For females, life expectancy at birth is projected to increase by 5.4 years (5.2 for the EU-15), implying some convergence between males and females.

- The largest increases in life expectancy at birth, for both males and females, are projected to take place in the new Member States. Life expectancy in 2004 is lowest in Estonia, Latvia, Lithuania, Hungary and Slovakia, at 76 or 77 years. Some catch-up takes place over the projection period, with increases in life expectancy of 9 to 10 years, the highest in the EU, projected in Estonia, Latvia, Lithuania and Hungary. Overall, and with the exception of Cyprus and Malta, life expectancy at birth is projected to remain below the EU average in all new Member States, especially for males.

- There is a wide divergence of projected increases in life expectancy at birth amongst EU-15 Member States. For example, life expectancy for males in Belgium is projected to increase by 6.8 years, yet in the Netherlands by only 4 years. Greece and Spain are projected to have relatively low increases in life expectancy compared with other Mediterranean countries such as Italy or Portugal. In most countries, life expectancy ranges between 78 and 82 years in 2004. At the end of the projection period, the countries can be split into three groups: (i) Belgium joins the group with highest life expectancy due to the assumption that the increase in life expectancy at birth will be the largest, (ii) most countries end up with life expectancies of 86 to 88 years, and (iii) Denmark and the Netherlands join the group with lowest life expectancy, around 83 years, due to a low increase projected.

- Life expectancy at age 65 in the EU-25 is projected to increase by 4.6 years for males and by 4.4 years for females over the projection period. In 2050, life expectancy at age 65 will reach 20.5 years for males and 23.9 for females, according to the projections. The projected difference between males and females is of 3.4 years, smaller than the 5.1 year difference in life expectancy at birth.

- The gains projected in EU-10 Member States are larger than in EU-15 by 0.6 years for males and lower by 0.3 years for females, on average. In 2050, life expectancy at age 65 for males is projected to span from 17.3 in Estonia to 22.2 in Italy, and for females, from 20.4 in Slovakia up to 26.1 in France and Italy. In 2050, male life expectancy at age 65 is projected to range between 19 and 21 years in most EU-15 countries. It will exceed 21 years in France, Italy, Portugal and the United Kingdom and be below 19 years in the Netherlands and Denmark, according to the projection. For females, it will be between 22 and 24 years in over half of the countries, above 24.5 years in Belgium, France, Italy and Portugal, and below 21 years in Denmark, Greece and the Netherlands.

- The projected increases in life expectancy at age 65 differ markedly across EU-15 Member States, with gains of 2.9 years in Greece as compared with 5.9 years in Portugal, for males. For females, the gains projected in Portugal reach 5.6 years and in the Netherlands only 1.9 years.

1.3.3. AWG variant scenario for EU-15 Member States

Striking cross-country developments in Europop 2004…

The methodology used to project mortality rates in Europop 2004, based on an extrapolation of trends since the early 1980s, leads to some very interesting developments in life expectancy. The cross-country differences in projected increases in life expectancy and in particular the gaps between some neighbouring countries, led to question whether this would be a suitable population projection for making age-related expenditure projec-

Table 1.4

Projection of life expectancy at birth in Europop 2004

	Males							Females						
	2004	2010	2020	2030	2040	2050	Change	2004	2010	2020	2030	2040	2050	Change
BE	75.5	76.9	78.9	80.4	81.5	82.3	*6.8*	81.6	82.9	85.0	86.5	87.5	88.3	*6.6*
DK	75.2	76.3	78.0	79.3	80.2	80.9	*5.7*	79.6	80.4	81.6	82.5	83.2	83.7	*4.1*
DE	76.1	77.2	78.9	80.2	81.2	82.0	*5.9*	81.7	82.7	84.2	85.4	86.2	86.8	*5.1*
EL	76.4	77.1	78.1	78.9	79.6	80.3	*3.8*	81.4	82.1	83.2	84.0	84.6	85.1	*3.7*
ES	76.6	77.6	79.1	80.2	80.9	81.4	*4.8*	83.4	84.4	85.9	86.9	87.5	87.9	*4.5*
FR	76.2	77.5	79.4	80.8	81.9	82.7	*6.5*	83.4	84.5	86.2	87.5	88.4	89.1	*5.7*
IE	75.5	76.8	78.7	80.2	81.4	82.4	*6.8*	80.7	81.8	83.5	84.9	86.0	87.0	*6.3*
IT	77.3	78.4	80.1	81.5	82.6	83.6	*6.3*	83.2	84.1	85.6	86.8	87.8	88.8	*5.6*
LU	75.0	76.3	78.4	79.9	80.9	81.6	*6.6*	81.4	82.4	83.9	85.1	85.9	86.7	*5.3*
NL	76.2	77.0	78.1	79.0	79.7	80.2	*4.0*	80.8	81.4	82.2	82.8	83.2	83.6	*2.7*
AT	76.2	77.4	79.4	81.0	82.4	83.6	*7.4*	82.1	83.2	84.9	86.1	87.0	87.7	*5.6*
PT	74.2	75.4	77.1	78.5	79.5	80.4	*6.1*	81.0	82.1	83.9	85.1	86.0	86.6	*5.6*
FI	75.3	76.7	78.7	80.2	81.2	81.9	*6.6*	81.9	82.8	84.2	85.3	86.0	86.5	*4.6*
SE	78.1	79.1	80.7	81.9	82.7	83.3	*5.2*	82.4	83.2	84.5	85.4	86.0	86.5	*4.2*
UK	76.4	77.6	79.5	81.0	82.0	82.9	*6.5*	80.9	82.0	83.7	85.0	85.9	86.6	*5.6*
CY	76.3	77.5	79.0	80.2	81.1	81.9	*5.6*	80.8	81.6	82.8	83.7	84.5	85.1	*4.3*
CZ	72.4	73.7	75.9	77.8	78.8	79.7	*7.4*	78.8	79.8	81.3	82.7	83.5	84.1	*5.3*
EE	65.5	66.5	68.9	71.6	73.5	74.9	*9.4*	76.9	77.8	79.5	81.2	82.3	83.1	*6.3*
HU	68.5	70.1	72.8	75.2	77.0	78.1	*9.6*	76.8	78.0	79.8	81.5	82.6	83.4	*6.6*
LT	66.5	67.4	69.6	72.3	74.3	75.5	*9.0*	77.6	78.5	80.1	81.8	82.9	83.7	*6.1*
LV	64.9	65.8	68.0	70.9	72.9	74.3	*9.3*	76.2	76.9	78.6	80.4	81.6	82.5	*6.3*
MT	76.2	77.4	79.0	80.1	81.0	81.8	*5.6*	80.7	81.7	82.9	83.7	84.4	85.0	*4.3*
PL	70.5	72.0	74.6	76.8	78.2	79.1	*8.7*	78.5	79.6	81.3	82.8	83.7	84.4	*5.9*
SK	69.7	70.9	73.1	75.3	76.7	77.7	*8.0*	77.8	78.7	80.3	81.8	82.7	83.4	*5.6*
SI	72.6	73.9	76.1	77.9	78.9	79.8	*7.3*	80.2	81.2	82.8	83.8	84.6	85.1	*5.0*
EU-25	*75.4*	*76.6*	*78.4*	*79.9*	*80.9*	*81.8*	*6.4*	*81.5*	*82.6*	*84.1*	*85.4*	*86.2*	*86.9*	*5.4*
EU-15	*76.4*	*77.5*	*79.2*	*80.5*	*81.5*	*82.3*	*5.9*	*82.2*	*83.2*	*84.7*	*85.9*	*86.7*	*87.4*	*5.2*
EU-10	*70.1*	*71.6*	*74.0*	*76.3*	*77.7*	*78.7*	*8.6*	*78.2*	*79.2*	*80.9*	*82.4*	*83.4*	*84.1*	*5.9*

Source: Eurostat Europop 2004 baseline.

tions, as even small changes in life expectancy (especially mortality rates amongst elderly people) can have a significant impact on pension and healthcare expenditure.

For example, looking at life expectancy at birth for each Member State relative to the EU average, Greece, Spain and the Netherlands move from an above (or close to) average life expectancy at birth for males in 2004 to a negative gap of 1 to 2 years by 2050, whereas countries like Belgium, Austria and Ireland move from being below to above average performers. The relative shifts in position are large. While life expectancy at birth for females in Belgium would increase by 1.4 years relative to the EU-15 between 2004 and 2050, a fall of 2.5 years is projected for the Netherlands. The largest improvements in female life expectancy are projected in Belgium and Ireland, while Denmark, Sweden, the Netherlands and Greece see much smaller increases.

…led to an AWG scenario

Eurostat was asked to produce an additional population projection, hereafter called 'AWG scenario' which incorporates an assumption on the convergence of life expectancy at birth amongst EU-15 Member States. Note, the Europop 2004 assumptions on life expectancy at birth already incorporate a convergence factor for the EU-10 countries, and thus **the AWG scenario does not cover the EU-10.**

Table 1.5

Projection of life expectancy at 65 in Europop 2004

	Males							Females						
	2004	2010	2020	2030	2040	2050	Change	2004	2010	2020	2030	2040	2050	Change
BE	15.8	16.7	18.1	19.2	19.9	20.5	*4.7*	19.7	20.7	22.2	23.4	24.2	24.8	*5.2*
DK	15.2	15.8	16.8	17.6	18.1	18.6	*3.4*	18.0	18.4	19.2	19.7	20.1	20.5	*2.5*
DE	16.1	16.8	18.0	18.9	19.6	20.1	*4.0*	19.5	20.3	21.4	22.3	23.0	23.5	*4.0*
EL	16.4	16.8	17.6	18.2	18.8	19.2	*2.9*	18.5	19.0	19.8	20.4	20.9	21.3	*2.8*
ES	16.7	17.4	18.5	19.3	19.8	20.1	*3.4*	20.7	21.5	22.6	23.4	23.8	24.2	*3.5*
FR	17.0	17.8	19.1	20.2	21.0	21.7	*4.7*	21.3	22.2	23.6	24.7	25.5	26.1	*4.9*
IE	15.4	16.2	17.6	18.7	19.6	20.4	*5.0*	18.6	19.4	20.7	21.8	22.7	23.5	*4.9*
IT	16.7	17.4	18.6	19.9	21.1	22.2	*5.5*	20.6	21.5	22.8	24.1	25.1	26.1	*5.5*
LU	15.7	16.5	17.7	18.6	19.3	19.9	*4.1*	19.6	20.3	21.5	22.3	23.0	23.6	*4.0*
NL	15.4	15.8	16.5	17.0	17.4	17.8	*2.4*	19.0	19.3	19.9	20.3	20.6	20.9	*1.9*
AT	16.2	17.0	18.1	19.2	20.1	20.9	*4.7*	19.7	20.5	21.8	22.8	23.5	24.0	*4.3*
PT	15.6	16.5	18.0	19.4	20.5	21.5	*5.9*	19.0	19.9	21.3	22.6	23.6	24.6	*5.6*
FI	15.7	16.5	17.8	18.8	19.5	19.9	*4.2*	19.5	20.3	21.5	22.3	22.9	23.3	*3.8*
SE	16.7	17.4	18.3	19.1	19.6	20.0	*3.3*	19.8	20.4	21.3	21.9	22.4	22.8	*3.0*
UK	16.2	17.1	18.7	19.9	20.7	21.4	*5.2*	19.1	20.0	21.5	22.8	23.6	24.3	*5.2*
CY	16.2	16.9	17.9	18.7	19.3	19.9	*3.7*	18.3	19.0	19.9	20.6	21.2	21.7	*3.3*
CZ	13.8	14.5	15.8	17.0	17.7	18.4	*4.6*	17.0	17.7	18.8	19.8	20.4	20.9	*3.9*
EE	12.4	12.8	13.9	15.4	16.5	17.3	*4.9*	16.9	17.4	18.4	19.5	20.4	20.9	*4.1*
HU	13.1	13.9	15.4	16.8	17.9	18.6	*5.5*	16.7	17.3	18.5	19.7	20.5	21.1	*4.4*
LT	13.3	13.5	14.6	16.1	17.1	17.9	*4.6*	17.4	17.9	19.0	20.1	20.9	21.5	*4.0*
LV	12.3	12.8	14.1	15.6	16.7	17.5	*5.1*	16.6	17.1	18.2	19.3	20.2	20.7	*4.1*
MT	15.2	16.0	17.1	18.0	18.7	19.2	*4.0*	18.3	19.0	19.9	20.6	21.1	21.6	*3.3*
PL	13.7	14.5	15.9	17.3	18.1	18.8	*5.1*	17.4	18.1	19.2	20.3	21.0	21.5	*4.1*
SK	12.9	13.5	14.7	16.0	16.9	17.6	*4.6*	16.5	17.0	18.1	19.2	19.9	20.4	*3.9*
SI	14.3	14.9	16.2	17.4	18.1	18.7	*4.4*	18.4	19.1	20.3	21.0	21.5	22.0	*3.6*
EU-25	*15.9*	*16.7*	*17.9*	*19.0*	*19.8*	*20.5*	*4.6*	*19.5*	*20.3*	*21.5*	*22.5*	*23.3*	*23.9*	*4.4*
EU-15	*16.3*	*17.1*	*18.3*	*19.3*	*20.1*	*20.8*	*4.4*	*19.9*	*20.7*	*22.0*	*23.0*	*23.7*	*24.3*	*4.4*
EU-10	*13.5*	*14.2*	*15.6*	*17.0*	*17.9*	*18.5*	*5.0*	*17.2*	*17.8*	*19.0*	*20.0*	*20.7*	*21.2*	*4.1*

Source: Eurostat Europop 2004 baseline.

A convergence rule is defined whereby a convergence coefficient is applied to adjust life expectancy levels and narrow the deviation from the EU-15 average. The convergence rule is defined as follows:

$$\tilde{e}^{c,s}_{x,t} = e^{c,s}_{x,t} + k_t \cdot (e^{EU-15,s}_{x,t} - e^{c,s}_{x,t})$$

The expectancy of life e at age x for sex s in country c is forced towards the EU-15 average emerging from the baseline of Europop 2004 by applying a convergence coefficient k varying along time t. The convergence coefficient increases linearly over time from $k = 0$ in 2004 to $k = 0.5$ in 2050, when the range of variation in life expectancy from the baseline of Europop 2004 is halved.

Tables 1.6 and 1.7 show the projections for life expectancy at birth for males and females for the EU-15 countries in the AWG scenario, as well as the difference compared with the baseline Europop 2004 population projection. Tables 1.8 and 1.9 show the projections for life expectancy at age 65. In brief, life expectancy at birth in 2050 is 0.2–0.3 years higher in the AWG scenario than in the Europop 2004 baseline. For females, it is 1.2 years lower in France in the AWG scenario than in Europop

2004 (in 2050). In contrast, it is projected to be 1.5 and 1.6 years higher in Denmark and the Netherlands than in Europop 2004, respectively. Overall, the gap between the countries with the highest and lowest life expectancies projected in 2050 in Europop 2004 is halved in the AWG scenario. Life expectancy at 65 is projected to be lower in the AWG scenario than in the Europop 2004 baseline, by 0.6 years for males and 0.8 years for females in 2050. For females, life expectancy at 65 is 2 years lower in Italy and 1.6 years lower in France in the AWG scenario than in Europop 2004, at the end of the projection period. In Denmark and the Netherlands, it is assumed to be 1.4 and 1.2 years higher in the AWG scenario.

1.4. Projection of net migration flows

1.4.1. Past trends and driving forces

Several phases in migration in Europe can be identified since the 1950s as shown in Graph 1.1. European countries established programmes to recruit foreign workers in the 1950s and 1960s to cope with the increasing labour demand during the economic boom. First they turned to other European countries such as Italy, Portugal and Spain, and then to former colonies or neighbouring countries of western Europe: North Africa in the case of France, the Caribbean and the Indian subcontinent for the United Kingdom, and the former Yugoslavia and Turkey for Germany. After the 1973 oil price shock, policies favouring labour migration were stopped. Nevertheless, net migration inflows continued during the 1970s, averaging 240 000 people per year, mostly due to family unification.

After a brief period of net outflows during the early 1980s recession, net migration flows to the EU rose again, peaking in 1992–93, as the fall of the 'iron curtain' and a number of wars and ethnic conflicts pushed upwards the number of people seeking asylum. Net inflows dropped significantly between 1993 and 1997, partly due to tighter controls over migratory flows in the main receiving countries, but they resumed their growth at the end of the 1990s. Overall, the average annual net entries more than tripled from around 250 000 people per year during the 1980s to more than 800 000 people per year during the 1990s. The 1990s phase is marked by high irregular migration.

The rising trend in net inflows that started at the end of the 1990s continued until 2003 (detailed figures for 2004

Table 1.6

Projection of life expectancy at birth for males in the AWG scenario and difference compared with the baseline Europop 2004

	Levels							Difference					
	2004	2010	2020	2030	2040	2050	Change	2004	2010	2020	2030	2040	2050
BE	75.5	76.9	78.9	80.3	81.4	82.1	*6.6*	0.0	0.0	0.0	– 0.1	– 0.1	– 0.2
DK	75.2	76.4	78.1	79.5	80.6	81.4	*6.2*	0.0	0.1	0.2	0.3	0.4	0.5
DE	76.1	77.2	78.9	80.2	81.2	82.0	*5.9*	0.0	0.0	0.0	0.0	0.0	0.0
EL	76.4	77.1	78.2	79.3	80.2	81.1	*4.6*	0.0	0.0	0.1	0.4	0.6	0.8
ES	76.6	77.6	79.1	80.2	81.0	81.7	*5.1*	0.0	0.0	0.0	0.0	0.1	0.3
FR	76.2	77.4	79.3	80.6	81.6	82.3	*6.1*	0.0	0.0	– 0.1	– 0.2	– 0.3	– 0.4
IE	75.5	76.8	78.7	80.2	81.3	82.2	*6.6*	0.0	0.0	0.0	0.0	– 0.1	– 0.2
IT	77.3	78.3	79.9	81.1	82.1	82.8	*5.5*	0.0	– 0.1	– 0.2	– 0.4	– 0.6	– 0.8
LU	75.0	76.4	78.4	79.9	81.0	81.8	*6.8*	0.0	0.1	0.1	0.1	0.1	0.2
NL	76.2	77.0	78.3	79.4	80.3	81.1	*4.8*	0.0	0.0	0.1	0.3	0.6	0.9
AT	76.2	77.4	79.3	80.8	81.9	82.8	*6.6*	0.0	0.0	– 0.1	– 0.2	– 0.5	– 0.8
PT	74.2	75.5	77.4	79.0	80.2	81.2	*6.9*	0.0	0.1	0.3	0.5	0.6	0.8
FI	75.3	76.7	78.7	80.2	81.2	81.9	*6.6*	0.0	0.0	0.0	0.0	0.0	0.0
SE	78.1	79.0	80.4	81.4	82.1	82.6	*4.6*	0.0	– 0.1	– 0.3	– 0.5	– 0.6	– 0.7
UK	76.4	77.6	79.4	80.7	81.7	82.4	*6.0*	0.0	0.0	– 0.1	– 0.2	– 0.3	– 0.5
EU-15	*76.4*	*77.5*	*79.1*	*80.4*	*81.4*	*82.1*	*5.8*	*1.0*	*0.9*	*0.7*	*0.5*	*0.4*	*0.3*

Source: AWG scenario.

Table 1.7

Projection of life expectancy at birth for females in the AWG scenario and difference compared with the baseline Europop 2004

	Levels							Difference					
	2004	2010	2020	2030	2040	2050	Change	2004	2010	2020	2030	2040	2050
BE	81.6	82.9	84.8	86.1	87.0	87.5	*5.9*	0.0	0.0	– 0.1	– 0.3	– 0.6	– 0.8
DK	79.6	80.5	82.1	83.3	84.3	85.2	*5.6*	0.0	0.1	0.4	0.8	1.1	1.5
DE	81.7	82.7	84.2	85.4	86.2	86.8	*5.1*	0.0	0.0	0.0	0.0	0.0	– 0.1
EL	81.4	82.1	83.3	84.4	85.2	85.9	*4.5*	0.0	0.0	0.2	0.4	0.6	0.8
ES	83.4	84.3	85.6	86.5	87.0	87.3	*3.9*	0.0	– 0.1	– 0.3	– 0.5	– 0.6	– 0.6
FR	83.4	84.4	85.8	86.8	87.5	87.9	*4.5*	0.0	– 0.1	– 0.4	– 0.6	– 0.9	– 1.2
IE	80.7	81.8	83.6	85.0	86.0	86.8	*6.2*	0.0	0.1	0.1	0.1	0.0	– 0.1
IT	83.2	84.0	85.3	86.4	87.2	87.8	*4.6*	0.0	– 0.1	– 0.2	– 0.4	– 0.7	– 1.0
LU	81.4	82.4	83.9	85.1	86.0	86.7	*5.3*	0.0	0.0	0.0	0.1	0.1	0.0
NL	80.8	81.4	82.5	83.5	84.4	85.2	*4.3*	0.0	0.1	0.3	0.7	1.1	1.6
AT	82.1	83.2	84.7	85.9	86.7	87.2	*5.2*	0.0	0.0	– 0.1	– 0.2	– 0.4	– 0.5
PT	81.0	82.2	83.9	85.2	86.0	86.7	*5.7*	0.0	0.0	0.1	0.0	0.0	0.0
FI	81.9	82.8	84.2	85.3	86.0	86.6	*4.8*	0.0	0.0	0.0	0.0	0.0	0.1
SE	82.4	83.2	84.4	85.4	86.1	86.6	*4.3*	0.0	0.0	– 0.1	0.0	0.0	0.1
UK	80.9	82.1	83.8	85.1	86.0	86.7	*5.7*	0.0	0.0	0.1	0.1	0.1	0.1
EU-15	*82.2*	*83.2*	*84.6*	*85.7*	*86.5*	*87.0*	*4.9*	*0.7*	*0.6*	*0.5*	*0.4*	*0.2*	*0.2*

Source: AWG scenario.

Table 1.8

Projection of life expectancy at 65 for males in the AWG scenario and difference compared with baseline Europop 2004

	Levels							Difference					
	2004	2010	2020	2030	2040	2050	Change	2004	2010	2020	2030	2040	2050
BE	15.8	16.7	18.1	19.1	19.7	20.3	*4.5*	0.0	0.0	0.0	– 0.1	– 0.2	– 0.3
DK	15.2	15.9	17.0	17.9	18.6	19.3	*4.1*	0.0	0.1	0.2	0.3	0.5	0.7
DE	16.1	16.8	18.0	18.8	19.5	20.1	*4.0*	0.0	0.0	0.0	0.0	0.0	– 0.1
EL	16.4	16.8	17.6	18.4	19.0	19.6	*3.3*	0.0	0.0	0.0	0.2	0.3	0.4
ES	16.7	17.4	18.4	19.1	19.6	20.0	*3.3*	0.0	0.0	– 0.1	– 0.1	– 0.1	– 0.1
FR	17.0	17.7	18.8	19.5	20.1	20.5	*3.6*	0.0	– 0.1	– 0.4	– 0.6	– 0.9	– 1.1
IE	15.4	16.2	17.6	18.7	19.5	20.2	*4.8*	0.0	0.0	0.1	0.0	– 0.1	– 0.2
IT	16.7	17.3	18.3	19.2	19.8	20.4	*3.7*	0.0	– 0.1	– 0.3	– 0.7	– 1.3	– 1.8
LU	15.7	16.5	17.7	18.7	19.4	19.9	*4.2*	0.0	0.0	0.0	0.0	0.0	0.1
NL	15.4	15.9	16.7	17.5	18.2	18.9	*3.5*	0.0	0.1	0.2	0.5	0.8	1.1
AT	16.2	16.9	18.1	19.1	19.8	20.4	*4.2*	0.0	0.0	0.0	– 0.1	– 0.2	– 0.4
PT	15.6	16.4	17.6	18.6	19.3	19.9	*4.3*	0.0	– 0.1	– 0.4	– 0.8	– 1.2	– 1.6
FI	15.7	16.6	17.9	18.8	19.4	20.0	*4.3*	0.0	0.0	0.0	0.0	0.0	0.0
SE	16.7	17.3	18.3	19.0	19.5	20.0	*3.3*	0.0	0.0	– 0.1	– 0.1	– 0.1	0.0
UK	16.1	16.9	18.2	19.2	19.9	20.4	*4.3*	– 0.1	– 0.2	– 0.5	– 0.7	– 0.9	– 1.0
EU-15	*16.3*	*17.0*	*18.1*	*19.0*	*19.6*	*20.2*	*3.8*	*0.0*	*– 0.1*	*– 0.2*	*– 0.3*	*– 0.5*	*– 0.6*

Source: AWG scenario.

Table 1.9

Projection of life expectancy at 65 for females in the AWG scenario and difference compared with baseline Europop 2004

	Levels							Difference					
	2004	2010	2020	2030	2040	2050	Change	2004	2010	2020	2030	2040	2050
BE	19.7	20.7	22.1	23.1	23.7	24.1	*4.4*	0.0	0.0	– 0.2	– 0.4	– 0.6	– 0.8
DK	18.0	18.6	19.5	20.4	21.2	21.9	*3.9*	0.0	0.1	0.4	0.7	1.0	1.4
DE	19.5	20.3	21.4	22.3	22.9	23.4	*3.9*	0.0	0.0	0.0	0.0	– 0.1	– 0.1
EL	18.5	19.1	20.1	20.9	21.7	22.3	*3.8*	0.0	0.1	0.3	0.5	0.7	1.0
ES	20.7	21.4	22.4	23.0	23.4	23.7	*3.0*	0.0	– 0.1	– 0.2	– 0.3	– 0.4	– 0.4
FR	21.3	22.0	23.1	23.8	24.3	24.5	*3.2*	0.0	– 0.2	– 0.5	– 0.8	– 1.2	– 1.6
IE	18.6	19.4	20.8	21.9	22.7	23.4	*4.8*	0.0	0.1	0.1	0.1	0.0	– 0.1
IT	20.6	21.2	22.2	23.0	23.6	24.1	*3.5*	– 0.1	– 0.3	– 0.6	– 1.1	– 1.5	– 2.0
LU	19.6	20.3	21.4	22.3	22.9	23.4	*3.8*	0.0	0.0	0.0	– 0.1	– 0.1	– 0.2
NL	19.0	19.4	20.1	20.8	21.5	22.1	*3.1*	0.0	0.1	0.2	0.5	0.8	1.2
AT	19.7	20.5	21.7	22.6	23.2	23.6	*4.0*	0.0	0.0	– 0.1	– 0.2	– 0.3	– 0.3
PT	19.0	19.8	21.0	21.9	22.6	23.1	*4.1*	0.0	– 0.1	– 0.3	– 0.6	– 1.1	– 1.5
FI	19.5	20.3	21.4	22.3	22.9	23.3	*3.8*	0.0	0.0	0.0	0.0	0.0	0.0
SE	19.8	20.4	21.3	22.0	22.5	23.0	*3.2*	0.0	0.0	0.0	0.1	0.2	0.3
UK	19.0	19.8	21.1	22.1	22.8	23.3	*4.3*	0.0	– 0.2	– 0.4	– 0.7	– 0.9	– 1.0
EU-15	*19.9*	*20.6*	*21.7*	*22.6*	*23.2*	*23.6*	*3.7*	*0.0*	*– 0.1*	*– 0.3*	*– 0.4*	*– 0.6*	*– 0.8*

Source: AWG scenario.

are not yet available). Net inflows have doubled from 993 000 people in 2000 to over 2 million in 2003. Some of this increase, however, does not only reflect new entries of migrants but also large-scale regularisation programmes which made parts of the migrant population visible in official statistics.

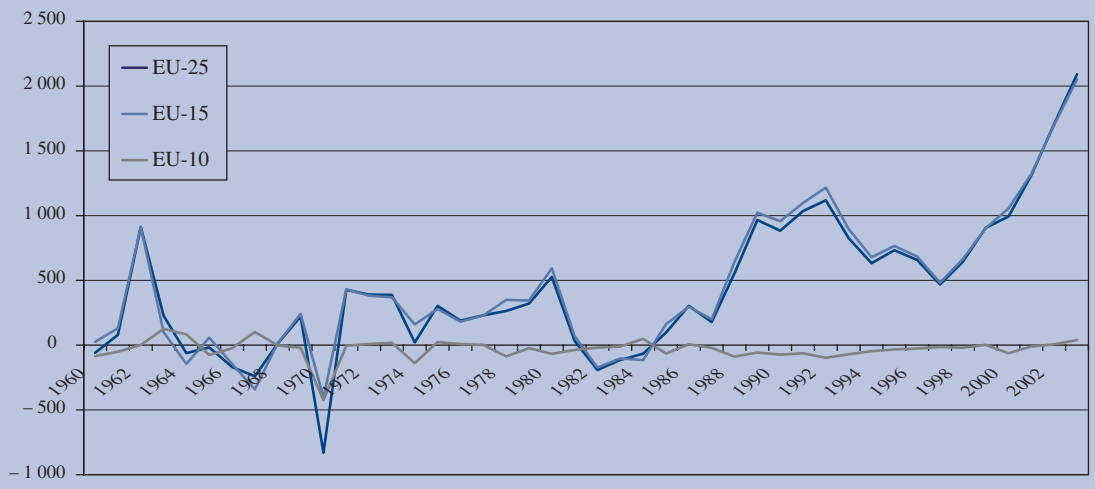
Net migration flows ([1]) per country are characterised by high variability (see Table 1.10). Traditionally, Germany, France and the United Kingdom record the largest number of arrivals in the EU-25, but there has been a recent rise of migration flows to Italy, Spain and Ireland that have switched from countries of origin to destination countries. Spain recorded the highest net inflows in the EU-25 in 2000, after recording net outflows during the 1960s and most of the 1970s and 1980s. However, net migration flows do not show the size of inward and outward movements — due to temporary and return migration. Therefore, net migration flows are much smaller than gross flows. Germany records a comparatively large number of arrivals, but the high number of outflows keeps net immigration, relative to total population, comparable to that of some other countries. Sinn et al. (2001) estimate that only 40 % of immigrants were still living in Germany 10 years after their arrival, and less than 35 % after 25 years.

In most countries, the migrant population originates from traditional sources, with cross-country differences indicating historical ties. In 2000–03, the largest groups of foreigners in Germany originate from Turkey and in the United Kingdom from south-east Asia. In France and Belgium, the bigger groups of immigrants come from northern Africa; in the Netherlands, they originate from Turkey and Africa. The most significant groups in size in Sweden and Finland come from central and eastern Europe and the former Soviet Union. In Spain and Portugal, the biggest group of foreign citizens originates from Latin America and Africa, respectively. In Italy, they come from Africa.

However, inflows have also become more diversified with increasing flows of migrants from new sources in central and eastern Europe, Asia, Africa and Central and

([1]) Net migration is measured as the difference between the total population on 1 January and 31 December for a given calendar year, minus the difference between births and deaths (or natural increase). The approach is different from that of subtracting recorded emigration flows from immigration flows.

Graph 1.1: **Net migration flows, 1960–2003**



Source: Eurostat.

Latin America. Some new groups of migrants have emerged, such as central and east Europeans in Germany, Spain and Italy; Africans in the United Kingdom and Spain and Asians in the Nordic countries and Italy. There has also been a dispersion of flows of immigrants from the same country of origin into different destination countries. For example, nationals from the former Yugoslavia are long-term residents in Germany and Austria and, more recently, in Italy and Sweden. Nationals from Morocco first arrived in France, then Belgium and the Netherlands and more recently in Spain and Italy ([1]).

1.4.2. The projection used in Europop 2004: methodology and results

General underlying assumptions on push and pull factors

Migration flows depend on a complex mix of demographic, economic, policy and political developments in both home and host countries. Projections therefore are often based on a number of subjective assumptions and are subject to a wide margin of error ([2]). The methodology used to project net migration in Europop 2004 is described in Eurostat (2004d).

A number of basic assumptions are employed as follows. Special events such as wars or natural catastrophes are not included. The projected impact of the recent EU enlargement to 25 Member States and the future accession of Bulgaria and Romania are taken into account. Economic growth is assumed to continue at an average pace as observed in the past with no strong fluctuations and the need for labour inputs is assumed to evolve as in the past. Economic disparities between the EU-15 and EU-10 (+ 2) Member States are expected to be maintained, at least in the short run. The timetable for the opening of national EU-15 labour markets to workers from the EU-10 Member States, except Cyprus and Malta, is assumed to match the arrangements negotiated in the Accession Treaty on restrictions to the free movement of labour ([3]). Overall migratory pressure from third countries towards the EU as a whole is expected to remain stable. It is assumed that Member States do not undertake major political actions affecting migratory flows.

In EU-10 Member States, the action of pull and push factors is assumed to change progressively as of 2020. Their

([1]) See European Commission Economic and Financial Affairs DG (2003a).
([2]) For a review of approaches to making migration projections, see Howe and Jackson (2005).
([3]) The following timetable is assumed: 2004, Ireland, Sweden and the United Kingdom; 2006, Belgium, Denmark, Luxembourg, the Netherlands and Finland; 2009, Greece, Spain, France, Italy and Portugal; 2011–12, Germany and Austria. The same timetable postponed by three years is assumed for Bulgaria and Romania.

Table 1.10

Past trends in net migration flows, in thousands

	1960	1965	1970	1975	1980	1985	1990	1995	2000	Cumulated
BE	7.4	30.6	– 32.8	24.7	– 2.4	– 1.3	19.5	1.8	12.9	*403*
DK	– 4.1	– 1.9	21.1	– 10.3	0.5	9.9	8.6	28.6	10.1	*230*
DE	158.9	327.7	– 271.6	– 210	304.4	67.1	656.1	398.3	167.8	*8 520*
EL	– 33.9	– 33.5	– 46.3	58.5	55.8	6	64	77.3	29.3	*765*
ES	– 141.8	– 50.2	– 50.5	14.2	112.6	– 12.2	– 20	60.4	378.5	*469*
FR	143.6	73.4	182.5	13.6	43.9	38	27.5	– 14.5	50.1	*3 503*
IE	– 41.8	– 21.5	– 2.8	17.3	– 0.6	– 39.4	– 7.6	6	31.5	*– 169*
IT	– 93.7	– 88.8	– 123.3	7.9	4.9	– 20.4	24.1	31.5	55.2	*– 872*
LU	0.6	1.8	1.1	3.5	1.3	0.9	4	4.3	3.5	*97*
NL	– 12.9	17.7	32.5	70.3	50.6	20.2	48.6	15	57	*1 006*
AT	– 2	10.6	10.4	– 24.6	9.3	5.7	58.6	2.1	17.2	*520*
PT	– 55.5	– 175.5	– 121.9	347	41.9	– 19.4	– 38.9	22.3	47.1	*– 989*
FI	– 9.1	– 21.1	– 36.5	– 3.8	– 2.2	2.4	8.7	4.2	2.4	*– 80*
SE	– 0.4	32.7	46.6	16.3	9.6	11	34.9	11.7	24.5	*679*
UK	110.6	– 43.6	– 14.8	– 45.1	– 36.2	93	68.4	117	168.5	*458*
CY	– 7.4	– 2.8	– 0.9	0.8	0.3	1.1	9.5	6.6	4	*– 175*
CZ	– 106.6	3.6	– 121.4	2.4	– 41.3	2.1	– 58.9	9.9	– 28	*– 96*
EE	5.6	7.1	6	5.7	6	6.3	– 5.7	– 15.6	0.2	*44*
HU	0.9	5.4	– 1.8	– 9.4	– 7.3	– 80.4	18.4	17.8	16.7	*– 2*
LT	5	5.4	14	5.8	2.1	12.4	– 8.8	– 23.7	– 20.3	*– 32*
LV	19.5	13.4	6.7	12	2.4	12.1	– 13	– 13.8	– 5.4	*151*
MT	– 7.1	– 6.2	– 1.9	1.9	0.8	0	0.8	– 0.2	9.9	*– 44*
PL	– 130.2	– 101.8	– 293.6	– 10.5	– 24.1	– 18.9	– 12.6	– 18.2	– 19.6	*– 1 594*
SK	140	– 6.8	– 35.2	– 3.4	– 11.5	– 3.3	– 2.4	2.9	– 22.4	*– 77*
SI	– 4.3	7.3	3.8	18.6	5.4	3.6	– 0.3	0.8	2.7	*87*
EU-25	*– 59.3*	*– 17.1*	*– 830.3*	*303.4*	*526.8*	*96.7*	*883.5*	*732.7*	*993.2*	*12 802*
EU-15	*25.4*	*58.5*	*– 406.1*	*279.5*	*593.8*	*161.5*	*956.4*	*765.9*	*1 056*	*14 539*
EU-10	*– 84.7*	*– 75.6*	*– 424.2*	*24*	*– 66.9*	*– 64.9*	*– 72.9*	*– 33*	*– 62.3*	*– 1 737*

NB: EU averages are not weighted.

Source: Eurostat.

economic attractiveness is assumed to increase and the push factor is expected to decline due to the ageing of the population, thus changing from (net) sending to (net) receiving countries. EU-10 Member States could become receiving countries for asylum seekers, especially from the Balkans, the former Soviet Union and the Caucasus (at least as an entry door to the EU), and cause a parallel reduction of flows into the EU-15.

In the EU-15 Member States, an increase of migration flows as replacement of the labour force is seen as one possible response to population ageing. Competition to attract migrants is assumed to increase as other developed economies are expected to face labour shortages too. Moreover, existing migration streams originating from Asia could either be diverted to other regions or reduced at source due to economic development. Over the projection period, illegal immigration is assumed to fall from its current level due to more efficient systems and regulations (e.g. through strengthening control at external borders and technological developments) and more effective action against unofficial work.

Constant levels of migration as population declines imply increasing crude rates of net migration. A slight decrease in net migration flows into the EU-15 can be expected in the long run given the changes assumed for the EU-10 and the increasing competitiveness on a worldwide scale.

Some differences, however, in projection methodology between EU-15 and EU-10 Member States

For the EU-10 and accession countries, the projection methodology is as follows:

- net migration in 2003 is estimated by an extrapolation of the trends observed over the period 1994 to 2002, or shorter, depending on data availability;
- minimum values of net migration are assumed for 2012 and 2013, based on national projections and other publications;
- until 2012, migratory flows are distributed according to the existing stock of migrants in the EU-15 and the timetable for liberalising the movement of workers;
- countries are grouped in five clusters and target values are assumed for 2050;
- the minimum values assumed for 2012–13 and the target values for 2050 are bridged using an approximation of a logistic curve.

For the EU-15 countries, the methodology is a multivariate approach with three elements which are combined using a weighting system:

- extrapolation of trends in the time series, based on autoregressive integrated moving average (ARIMA) modelling;
- to ensure international consistency, major countries of origin have been selected on the basis of 2000 census data (including all neighbouring countries and the top five communities of immigrants — other than EU-15 nationals and neighbouring countries), leading to a selection of 71 countries, including the EU-10. Then, the migratory flows projected by the United Nations (2003) are used, except for EU-10 and accession countries for which Eurostat assumptions are used. The migratory flows originating from outside the EU-25 are distributed between the EU-25 and other countries on the basis of observed migratory flows, geographical proximity and cultural and historical linkages. Once the annual share of expected flows is fixed, the distribution across EU Member States is made according to existing networks. An additional number of migrants is added to take into account the demographic pressure from border Member States;
- national forecasts are incorporated to take on board the expertise of national institutes.

After making projections at Member State level, the overall coherence is checked and ad hoc corrections are applied in some cases, leading to a calibrated projection. There is no difference between the weighted and the calibrated projection except for Spain, where the projected values for the period 2004 to 2006 have been increased in order to take into account the impact of the regularisation of illegal immigrants. Between 2006 and 2010, corrections are made to take into account family reunification. From 2010 on, the projected levels are the same as in the weighted projection.

Projected net migration flows in Europop 2004

Table 1.12 presents the projected net migration flows in the baseline of Europop 2004. For the EU-25 as a whole, annual net inflows are projected to fall from some 870 000 people in 2004 (equivalent to 0.23 % of EU-25 population) to some 800 000 by 2010 (0.21 %) and thereafter hovering about 750 000 people over the projection period (0.2 %).

Over the entire projection period, the cumulated net migration to the EU-25 is 39.7 million, of which the bulk is concentrated in the EU-15 (37.1 million). Net migration flows are projected to concentrate in a few destination countries: Germany (8.9 million cumulated over 50 years), Spain (6.2 million), Italy (5.8 million) and the United Kingdom (4.9 million). In the remaining EU-15 countries, cumulated net flows are projected to range between 0.1 million in Luxembourg and 2.8 million in France. According to the assumptions, the recent change of Spain and Italy from origin to destination countries would be confirmed in coming decades, and similarly for Greece, to a lesser extent, with cumulated net flows of 1.7 million until 2050. In comparison, net migration flows to traditional destination countries such as France, Belgium, Luxembourg or the Netherlands would decrease in importance. Hungary and the Czech Republic are projected to attract the bulk of migration flows to EU-10 Member States (0.8 and 0.6 million respectively).

1.4.3. Variant AWG scenario for three EU-15 Member States

In addition to the changes in assumptions on life expectancy at birth, the AWG scenario also includes changes in

the net migration assumptions for three Member States, namely Spain, Italy and Germany (EU-3) ([1]). As regards net migration to Spain, the net flows have not been changed, only the age structure of migrants was adapted. Table 1.13 presents the net migration flows for these countries in the AWG scenario, and the difference compared with the assumptions in the baseline of Europop 2004.

([1]) The changes to the assumptions on net migration in Germany were made to take into account that the age structure of migration was significantly influenced by the reunification and the immigration of German 'resettlers' (Aussiedler) from eastern Europe, which had to be eliminated for the projections. In addition, the level of net migration was adjusted with constant net migration of 200 000 'foreigners' per annum and a decreasing net migration of German 'resettlers'.

1.5. Overall results of baseline population projection to be used

Table 1.14 presents an overview of the baseline population projection to be used in the 2005 projection exercise. As described above, it is a combination of the Europop 2004 baseline population for the EU-10 with the AWG scenario for the EU-15 as regards the assumptions on life expectancy and for EU-3 Member States on migration.

The size and age structure of the EU-25 population are projected to undergo dramatic changes in coming decades due to the dynamics of fertility, life expectancy and migration rates. The overall size of the population is projected to be both smaller and older than it is now. Under

Table 1.11

Projected net migration flows in Europop 2004 (1 000 persons, % of total population simulated net inflows)

	In thousands						As a % of total population		Cumulated
	2004	2010	2020	2030	2040	2050	2040	2050	
BE	24	20	19	19	19	19	0.23	0.17	897
DK	8	7	7	7	7	7	0.15	0.12	323
DE	211	203	194	181	179	179	0.26	0.24	8 980
EL	43	40	39	35	35	35	0.39	0.33	1 743
ES	508	112	110	105	104	102	1.20	0.24	6 235
FR	64	62	60	59	59	59	0.11	0.09	2 823
IE	16	15	14	13	13	12	0.41	0.23	645
IT	330	118	118	114	114	114	0.57	0.22	5 777
LU	3	3	3	3	3	3	0.63	0.43	132
NL	21	33	33	32	31	31	0.13	0.18	1 480
AT	25	24	21	19	20	20	0.31	0.25	985
PT	42	18	16	15	15	15	0.40	0.15	808
FI	6	6	6	6	6	6	0.12	0.12	288
SE	28	24	23	22	22	21	0.31	0.21	1 069
UK	139	116	103	99	99	98	0.23	0.15	4 939
CY	6	6	5	5	5	5	0.83	0.50	238
CZ	4	3	10	22	21	20	0.04	0.22	647
EE	1	– 2	0	2	2	2	0.06	0.15	19
HU	15	13	14	21	21	20	0.15	0.22	795
LT	– 6	– 6	– 1	5	4	4	– 0.16	0.15	28
LV	– 2	– 3	– 1	3	3	3	– 0.09	0.15	30
MT	3	2	2	2	2	3	0.64	0.50	113
PL	– 28	– 35	– 11	36	35	34	– 0.07	0.10	318
SK	– 2	– 2	1	5	5	5	– 0.04	0.10	109
SI	6	6	5	7	7	7	0.31	0.35	287
EU-25	*1 464*	*783*	*789*	*835*	*830*	*822*	*0.32*	*0.18*	*39 710*
EU-15	*1 467*	*801*	*765*	*727*	*724*	*721*	*0.38*	*0.19*	*37 123*
EU-10	*– 3*	*– 18*	*24*	*107*	*105*	*101*	*0.00*	*0.15*	*2 586*

Source: Eurostat Europop 2004 baseline.

Table 1.12

Projection of net migration flows in Europop 2004, percentage of total population

	2004	2010	2020	2030	2040	2050
BE	0.23	0.19	0.18	0.17	0.17	0.17
DK	0.15	0.13	0.13	0.12	0.12	0.12
DE	0.26	0.25	0.24	0.22	0.23	0.24
EL	0.39	0.35	0.34	0.31	0.31	0.33
ES	1.20	0.25	0.24	0.23	0.23	0.24
FR	0.11	0.10	0.09	0.09	0.09	0.09
IE	0.41	0.35	0.30	0.26	0.24	0.23
IT	0.57	0.20	0.20	0.20	0.21	0.22
LU	0.63	0.59	0.54	0.49	0.46	0.43
NL	0.13	0.20	0.19	0.18	0.18	0.18
AT	0.31	0.29	0.24	0.22	0.23	0.25
PT	0.40	0.17	0.14	0.14	0.14	0.15
FI	0.12	0.12	0.11	0.11	0.11	0.12
SE	0.31	0.26	0.24	0.22	0.21	0.21
UK	0.23	0.19	0.16	0.15	0.15	0.15
CY	0.04	0.03	0.10	0.22	0.22	0.22
CZ	0.06	– 0.15	– 0.04	0.15	0.15	0.15
EE	0.83	0.81	0.53	0.50	0.50	0.50
HU	– 0.09	– 0.12	– 0.03	0.15	0.15	0.15
LT	– 0.16	– 0.18	– 0.04	0.15	0.15	0.15
LV	0.15	0.13	0.14	0.22	0.22	0.22
MT	0.64	0.58	0.50	0.50	0.50	0.50
PL	– 0.07	– 0.09	– 0.03	0.10	0.10	0.10
SK	0.31	0.29	0.26	0.35	0.35	0.35
SI	– 0.04	– 0.05	0.02	0.10	0.10	0.10
EU-25	*0.32*	*0.17*	*0.17*	*0.18*	*0.18*	*0.18*
EU-15	*0.38*	*0.20*	*0.19*	*0.18*	*0.18*	*0.19*
EU-10	*0.00*	*– 0.02*	*0.03*	*0.15*	*0.15*	*0.15*

Source: Eurostat Europop 2004 baseline.

the baseline scenario, the EU-25 population is projected to increase slightly by 3 % until 2025, when it will peak at 470 million. Thereafter, a steady decline occurs and, according to the projections, the population in 2050 will be smaller than in 2004, at 449 million.

There are wide differences in population trends until 2050 across Member States. Sharp decreases of total population of 4 to 7 % are projected in Germany, Italy and Portugal. More drastic reductions are projected in most EU-10 Member States, ranging from drops of 12 % in the Czech Republic, Hungary, Poland and Slovakia up to 16–19 % in Estonia, Lithuania and Latvia. Population is projected to grow by 9 % in France, 13 % in Sweden, and over 30 % in relatively small countries, namely Ireland, Luxembourg, Cyprus and Malta.

In 2004, the population is already declining in the Czech Republic, Estonia, Hungary, Lithuania, Latvia, Poland and Slovakia. Population decline in other countries is projected to start in different years ranging from 2015 in Italy to 2045 in France. Ireland, Cyprus, Luxembourg, Malta and Sweden will still have growing populations in 2049.

The age structure of the EU population is projected to change dramatically, as shown in the population pyramids presented in Graph 1.2. The most numerous cohorts in 2004 are around 39 years old. In 2050, they will be around 61 years old for men and 69 years old for women, according to the projections. Elderly people are projected to account for an increasing share of the population; this is due to gains in life expectancy continuing over the projection period. At the same time, the base of the age pyramid becomes smaller during the projection

Table 1.13

Projection of net migration flows in the AWG scenario and difference with the baseline of Europop 2004

Projected flows

	In thousands						As a % of total population		Cumulated 2004–50
	2004	2010	2020	2030	2040	2050	2004	2050	
DE	270.0	230.0	215.0	205.0	200.0	200.0	0.33	0.26	10 180
ES	507.5	112.2	110.3	105.3	104.5	101.6	1.22	0.24	6 235
IT	150.0	150.0	150.0	150.0	150.0	150.0	0.26	0.28	7 050

Difference from Europop 2004

	In thousands						As a % of total population		Cumulated 2004–50
	2004	2010	2020	2030	2040	2050	2004	2050	
DE	59.4	26.8	20.7	24.0	20.7	20.8	0.1	0.0	1 199.6
ES	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IT	– 180.0	31.9	31.9	36.2	36.1	36.2	– 0.3	0.1	6 405.2

Source: AWG scenario.

period due to below-replacement fertility rates. As a consequence, the shape of the age pyramids gradually changes from pyramids to pillars, similar to the developments in the United States (Farnsworth Riche, 2005).

Tables 1.15 to 1.19 present overviews of different population groups in the EU-25: the young, the working-age population, the elderly and the very old. The share of young people (aged 0–14) in total population is projected to decline gradually from 16.4 % in 2004 to 13.5 % in 2050, ranging from 11.5 % in Italy to 16.6 % in Luxembourg at the end of the projection period. According to the projections, the working-age population (aged 15–64) will start to decline as of 2010 and, over the whole projection period, it will drop by more than 15 %. It is only projected to increase in Ireland, Luxembourg, Sweden, Malta and Cyprus. The elderly population (aged 65 and above) will increase very markedly. Its share of total population will increase from 16.5 % in 2004 up to 29.4 % in 2050. Looking at individual Member States, the elderly population is projected to reach levels ranging from 22 % of total population in Denmark up to 35 % in Spain. The fraction of very old people aged 80 years and above is projected to almost triple from 4 % in 2004 to 11 % in 2050. These trends result from declining mortality rates at the 'exit' of the age distribution, together with low fertility rates at its 'entry'.

The old-age dependency ratio (people aged 65 or above relative to the working-age population) is projected to increase from 24.5 % to 51.4 % in the EU-25 over the projection period (see Table 1.19). The increase will be especially rapid between 2012 and 2035, when year-on-year increases of over 2 % are projected. The dependency ratio is projected to more than double by 2050. The EU-25 would move from having four working-age people for every person aged over 65 years to a ratio of only two to one.

1.6. A comparison with other population projections

This section compares the underlying assumptions used in the baseline population scenario for the 2005 age-related expenditure projection with other population projections (see Tables 1.21, 1.22, 1.23 and 1.24). In particular, a comparison is made with the 2004 UN population projection ([1]), the Eurostat population projection of 2000 (which was the basis for the 2001 projections of the

([1]) The United Nations Population Division produces global population projections revised every two years. The latest projections, the 2004 revision, were released early in 2005 and cover the period 2005 to 2050 (final data available over the summer). In 2004, it released a special population projection until 2030.

Table 1.14

Projection of total population in baseline population scenario to be used in the 2005 projection exercise

	Total population						% change		
	2004	2010	2020	2030	2040	2050	2004–20	2020–50	2004–50
BE	10.4	10.6	10.8	11.0	11.0	10.8	*3.7*	*0.6*	*4.4*
DK	5.4	5.5	5.5	5.6	5.6	5.5	*2.5*	*– 0.8*	*1.8*
DE	82.5	83.1	83.5	82.7	80.7	77.7	*1.2*	*– 6.9*	*– 5.8*
EL	11.0	11.3	11.4	11.3	11.1	10.7	*3.6*	*– 6.2*	*– 2.8*
ES	42.3	44.6	45.6	45.4	44.7	43.0	*7.7*	*– 5.8*	*1.5*
FR	59.9	61.5	63.5	64.9	65.6	65.1	*6.0*	*2.6*	*8.8*
IE	4.0	4.3	4.8	5.1	5.3	5.5	*18.1*	*15.1*	*35.9*
IT	57.9	58.5	58.4	57.5	56.1	53.8	*0.9*	*– 7.9*	*– 7.1*
LU	0.5	0.5	0.5	0.6	0.6	0.6	*15.4*	*23.4*	*42.4*
NL	16.3	16.7	17.2	17.6	17.8	17.6	*6.0*	*2.3*	*8.4*
AT	8.1	8.3	8.4	8.5	8.4	8.2	*4.0*	*– 3.2*	*0.7*
PT	10.5	10.7	10.8	10.7	10.5	10.1	*2.9*	*– 6.8*	*– 4.0*
FI	5.2	5.3	5.4	5.4	5.4	5.2	*3.5*	*– 3.5*	*0.0*
SE	9.0	9.2	9.6	9.9	10.0	10.2	*6.6*	*6.4*	*13.4*
UK	59.7	60.9	62.9	64.4	64.7	64.2	*5.5*	*2.0*	*7.6*
CY	0.7	0.8	0.9	0.9	1.0	1.0	*18.5*	*12.6*	*33.5*
CZ	10.2	10.1	9.9	9.7	9.3	8.9	*– 3.0*	*– 10.2*	*– 12.9*
EE	1.4	1.3	1.2	1.2	1.2	1.1	*– 7.6*	*– 9.8*	*– 16.6*
HU	10.1	10.0	9.7	9.5	9.2	8.9	*– 4.2*	*– 8.0*	*– 11.9*
LT	3.4	3.3	3.2	3.1	3.0	2.9	*– 7.7*	*– 9.5*	*– 16.4*
LV	2.3	2.2	2.1	2.0	1.9	1.9	*– 8.8*	*– 11.5*	*– 19.2*
MT	0.4	0.4	0.5	0.5	0.5	0.5	*13.5*	*11.9*	*27.1*
PL	38.2	37.8	37.1	36.5	35.4	33.7	*– 2.9*	*– 9.2*	*– 11.8*
SK	5.4	5.3	5.3	5.2	5.0	4.7	*– 2.0*	*– 10.1*	*– 11.9*
SI	2.0	2.0	2.0	2.0	2.0	1.9	*1.0*	*– 5.7*	*– 4.8*
EU-25	*456.8*	*464.2*	*470.2*	*471.2*	*465.9*	*453.8*	*2.9*	*– 3.5*	*– 0.7*
EU-15	*382.7*	*390.8*	*398.4*	*400.6*	*397.5*	*388.3*	*4.1*	*– 2.5*	*1.5*
EU-10	*74.1*	*73.4*	*71.8*	*70.6*	*68.4*	*65.5*	*– 3.1*	*– 8.8*	*– 11.7*

Source: AWG scenario.

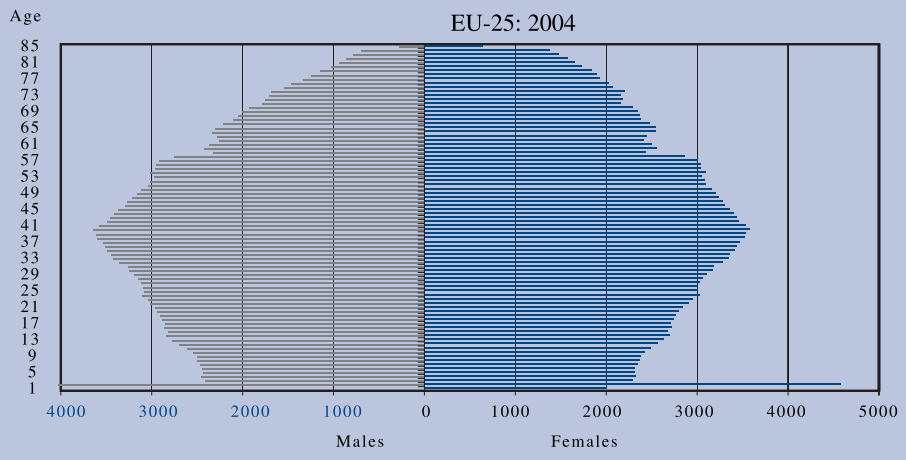
EPC) and the UPE stochastic population projection for the EU-15.

The main results of this comparison are as follows.

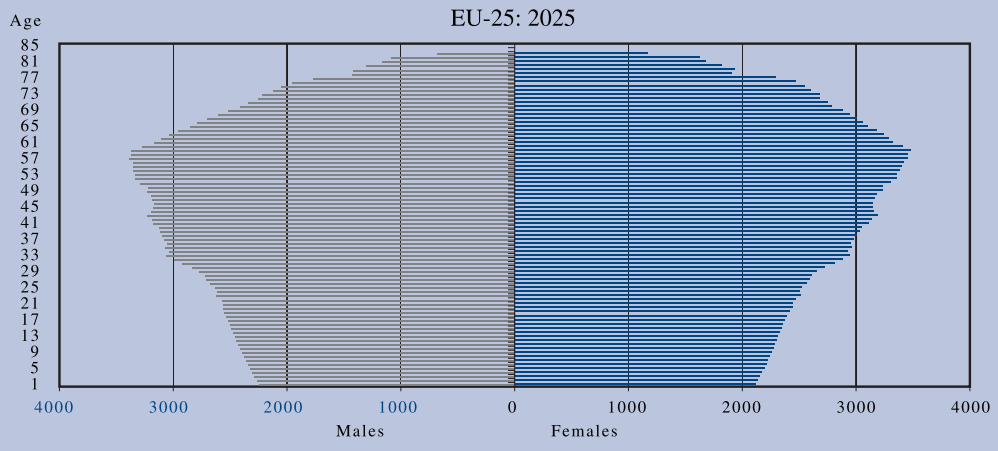
- **Fertility rates**: the fertility rates assumptions in the AWG scenario are generally lower, but close to, those in the population projection of Eurostat 2000. The 2005 projections show a lower fertility rate of 0.1 children per woman in Belgium, Greece, Spain, Italy and Portugal than the 2000 projections, whereas only Finland is projected to have a higher fertility rate by 0.1. Compared with the medium variant of the United Nations 2004 revision of the population projection, the fertility rate is much lower in the baseline scenario, except in France and Italy where the assumptions are identical. The assumptions in the AWG scenario show fertility rates lower by 0.1 to 0.15 child per woman in Belgium, the Netherlands and the United Kingdom, 0.30 child per woman in Greece and as much as 0.40 in Germany and Austria and 0.45 in Spain and Italy. The differences in fertility rates projected in other countries are below 0.05. The assumptions in the baseline scenario are similar to the point estimates in the UPE projection. They are lower in Belgium (by 0.1), the Netherlands and the United Kingdom (by 0.05) and larger in Greece (by 0.1), Germany, France, Austria and Sweden (by 0.05). In the UPE projection, a point forecast of 1.8 children per woman in 2049 is assumed in Belgium, Denmark, Finland, France, Ireland, Luxembourg, the Netherlands, Sweden and the United Kingdom. A level of 1.4 children per woman is

Graph 1.2: **Population pyramids, EU-25, in 2004, 2025 and 2050**

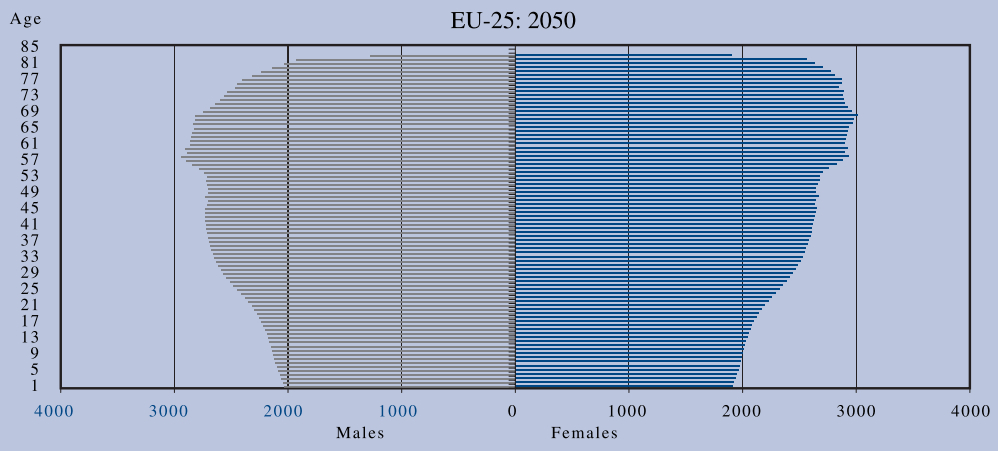
1.2.1 Age pyramid, 2004, population in thousands



1.2.2 Age pyramid, 2025, population in thousands



1.2.3 Age pyramid, 2050, population in thousands



Source: AWG scenario.

Table 1.15

Projection of young population aged 0–14 in the baseline population scenario to be used in the 2005 projection exercise

	Total						% change		
	2004	2010	2020	2030	2040	2050	2004–20	2020–50	2004–50
BE	1.8	1.7	1.7	1.7	1.6	1.6	– 5.7	– 5.6	– 11.0
DK	1.0	1.0	0.9	0.9	0.9	0.9	– 12.9	– 4.1	– 16.4
DE	12.2	11.3	11.0	10.7	9.9	9.5	– 9.7	– 13.5	– 21.9
EL	1.6	1.6	1.6	1.4	1.3	1.3	0.1	– 18.3	– 18.2
ES	6.2	6.6	6.5	5.4	5.1	5.0	6.4	– 23.6	– 18.7
FR	11.1	11.2	10.9	10.6	10.6	10.4	– 1.9	– 5.1	– 7.0
IE	0.8	0.9	0.9	0.9	0.9	0.9	12.1	– 7.0	4.3
IT	8.2	8.1	7.6	6.8	6.5	6.2	– 7.8	– 18.5	– 24.9
LU	0.1	0.1	0.1	0.1	0.1	0.1	4.2	20.9	25.9
NL	3.0	3.0	2.8	2.8	2.9	2.8	– 7.0	– 1.7	– 8.6
AT	1.3	1.2	1.2	1.1	1.1	1.0	– 10.7	– 14.6	– 23.7
PT	1.6	1.7	1.6	1.4	1.4	1.3	– 1.5	– 19.3	– 20.5
FI	0.9	0.9	0.9	0.9	0.8	0.8	– 5.4	– 8.6	– 13.5
SE	1.6	1.5	1.6	1.7	1.6	1.7	2.4	1.6	4.0
UK	10.9	10.4	10.3	10.1	9.7	9.4	– 5.9	– 7.9	– 13.3
CY	0.1	0.1	0.1	0.1	0.1	0.1	– 8.6	– 2.9	– 11.2
CZ	1.6	1.4	1.4	1.3	1.1	1.1	– 12.2	– 18.1	– 28.1
EE	0.2	0.2	0.2	0.2	0.2	0.2	– 5.2	– 18.9	– 23.1
HU	1.6	1.5	1.4	1.3	1.3	1.2	– 13.0	– 12.1	– 23.6
LT	0.6	0.5	0.5	0.5	0.4	0.4	– 21.7	– 17.3	– 35.2
LV	0.4	0.3	0.3	0.3	0.3	0.3	– 4.1	– 19.0	– 22.3
MT	0.1	0.1	0.1	0.1	0.1	0.1	– 2.0	3.5	1.5
PL	6.6	5.6	5.4	5.2	4.6	4.4	– 18.4	– 18.4	– 33.4
SK	0.9	0.8	0.8	0.7	0.6	0.6	– 20.5	– 18.9	– 35.5
SI	0.3	0.3	0.3	0.3	0.2	0.2	– 6.3	– 10.7	– 16.3
EU-25	*74.8*	*71.9*	*69.6*	*65.8*	*62.4*	*60.4*	*– 6.8*	*– 13.3*	*– 19.2*
EU-15	*62.4*	*61.2*	*59.6*	*56.6*	*54.3*	*52.7*	*– 4.5*	*– 11.5*	*– 15.5*
EU-10	*12.4*	*10.7*	*10.4*	*9.9*	*8.8*	*8.6*	*– 16.1*	*– 17.0*	*– 30.4*

Source: AWG scenario.

assumed in Austria, Germany, Greece, Italy and Spain. For Portugal, an intermediate level of 1.6 per woman is assumed. The 80 % intervals in 1949 range from 1.1 to 2.8 children per woman in the group of 'high' fertility rate countries, and from 0.9 to 2.2 children per woman in the group of 'low' fertility rate countries. The intervals span the range from even lower fertility rates than today, below 1.1 up to recuperation well above the replacement level.

- **Life expectancy**: over the projection period, **gains in life expectancy** for females in the AWG scenario are around five years on average (six years for males), that is roughly 1.5 years more than in the Eurostat 2000 projection (two years for males). The projected gains in the AWG scenario are similar to those in the UN projection for females, and two years larger for males, on average. Projected gains are much lower in the baseline scenario than in the UPE projection (by two years for females and by four years for males). As regards the **level of life expectancy**, in general, the AWG scenario results in significantly higher projected life expectancy at birth compared with the projection of Eurostat 2000. In part this stems from an upward revision in the base year, but in most countries the differences in life expectancy at birth for males are considerable, around two years, and over three years in Ireland. The assumptions in the AWG scenario are also higher than in the UN revision, by one to two years in most countries and by over three years in Ireland, Italy and Portugal. The assumptions on female life expectancy are also higher than in the previous Eurostat projection, by

Table 1.16

Projection of working age population aged 15–64 in the baseline population scenario to be used in the 2005 projection exercise

	Total						% change		
	2004	2010	2020	2030	2040	2050	2004–20	2020–50	2004–50
BE	6.8	7.0	6.9	6.6	6.4	6.3	*0.9*	*– 8.6*	*– 7.8*
DK	3.6	3.6	3.5	3.4	3.3	3.3	*– 1.1*	*– 7.5*	*– 8.5*
DE	55.5	54.9	54.0	50.0	46.9	45.0	*– 2.7*	*– 16.7*	*– 19.0*
EL	7.5	7.6	7.4	7.1	6.5	5.9	*– 0.8*	*– 20.7*	*– 21.4*
ES	29.1	30.3	30.1	29.0	26.0	22.9	*3.6*	*– 23.8*	*– 21.0*
FR	39.0	40.0	39.5	38.7	37.7	37.4	*1.4*	*– 5.3*	*– 3.9*
IE	2.7	2.9	3.1	3.3	3.3	3.2	*13.7*	*1.7*	*15.6*
IT	38.5	38.3	37.3	35.1	31.5	29.3	*– 3.3*	*– 21.3*	*– 23.9*
LU	0.3	0.3	0.3	0.4	0.4	0.4	*14.4*	*13.6*	*29.9*
NL	11.0	11.2	11.2	10.8	10.4	10.6	*1.6*	*– 5.3*	*– 3.8*
AT	5.5	5.6	5.6	5.2	4.9	4.7	*0.7*	*– 15.6*	*– 15.0*
PT	7.1	7.1	7.0	6.6	6.1	5.5	*– 1.5*	*– 20.8*	*– 21.9*
FI	3.5	3.5	3.3	3.2	3.1	3.0	*– 5.0*	*– 8.9*	*– 13.5*
SE	5.8	6.0	5.9	5.9	6.0	6.0	*1.1*	*2.4*	*3.6*
UK	39.2	40.4	40.4	39.5	38.3	37.8	*3.1*	*– 6.6*	*– 3.7*
CY	0.5	0.5	0.6	0.6	0.6	0.6	*17.3*	*1.2*	*18.7*
CZ	7.2	7.2	6.5	6.2	5.7	5.0	*– 10.4*	*– 22.5*	*– 30.6*
EE	0.9	0.9	0.8	0.8	0.7	0.7	*– 11.6*	*– 17.2*	*– 26.8*
HU	6.9	6.9	6.3	6.0	5.7	5.2	*– 8.9*	*– 18.1*	*– 25.4*
LT	2.3	2.3	2.1	2.0	1.9	1.7	*– 7.4*	*– 20.1*	*– 26.0*
LV	1.6	1.5	1.4	1.3	1.2	1.1	*– 12.7*	*– 20.0*	*– 30.2*
MT	0.3	0.3	0.3	0.3	0.3	0.3	*7.1*	*4.9*	*12.4*
PL	26.7	27.2	24.9	23.1	22.1	19.4	*– 6.4*	*– 22.2*	*– 27.2*
SK	3.8	3.9	3.7	3.4	3.2	2.7	*– 4.1*	*– 25.1*	*– 28.2*
SI	1.4	1.4	1.3	1.2	1.2	1.1	*– 5.1*	*– 20.1*	*– 24.2*
EU-25	*306.8*	*310.7*	*303.5*	*289.7*	*273.2*	*259.1*	*– 1.1*	*– 14.6*	*– 15.5*
EU-15	*255.1*	*258.7*	*255.5*	*244.8*	*230.7*	*221.3*	*0.2*	*– 13.4*	*– 13.3*
EU-10	*51.7*	*52.1*	*48.0*	*44.9*	*42.5*	*37.8*	*– 7.1*	*– 21.2*	*– 26.8*

Source: AWG scenario.

around two years in most countries and close to three years in Ireland and Portugal. The difference relative to the UN 2004 projection is smaller: life expectancy at birth is assumed to be below half a year or around one year in most countries, and over two years in Ireland, Italy and Portugal. The assumption in the AWG scenario is lower only in Sweden, by half a year. The assumptions are much lower than in the UPE projection, by almost 2.5 years on average for males and close to two years for females. For males during the period 2002–49 the assumptions in the UPE projection range from 6.9 years in the Netherlands to over 10 years in Luxembourg, Portugal and Spain. Slightly lower improvements are expected for female life expectancy, varying between 5.7 years in the Netherlands and 9.6 years in Ireland. The assumed intervals span from 7.4 years for females in Austria up to 12 years for males in Luxembourg.

- **Migration:** The assumptions on net migration flows are higher in the AWG scenario than in the Eurostat 2000 projections, except in Denmark, Luxembourg, the Netherlands, Portugal and Sweden, where lower net migration flows by 0.6 per thousand up to as much as 1 per thousand are assumed. The difference in net migration flows expected ranges from 0.20 per thousand higher in Belgium up to 0.90 per

Table 1.17

Projection of the elderly population aged 65 + in the baseline population scenario to be used in the 2005 projection exercise

	Total						% change		
	2004	2010	2020	2030	2040	2050	2004–20	2020–50	2004–50
BE	1.8	1.8	2.2	2.7	3.0	3.0	*24.3*	*34.0*	*66.5*
DK	0.8	0.9	1.1	1.3	1.4	1.4	*38.3*	*23.2*	*70.4*
DE	14.9	16.9	18.5	22.0	23.9	23.3	*24.4*	*25.8*	*56.6*
EL	2.0	2.1	2.4	2.8	3.3	3.6	*23.0*	*46.5*	*80.1*
ES	7.1	7.7	9.0	11.1	13.6	15.0	*25.4*	*67.9*	*110.5*
FR	9.8	10.3	13.1	15.6	17.3	17.4	*33.1*	*33.0*	*77.0*
IE	0.4	0.5	0.7	0.9	1.2	1.4	*56.4*	*104.0*	*219.0*
IT	11.1	12.0	13.6	15.6	18.1	18.2	*21.9*	*34.6*	*64.1*
LU	0.1	0.1	0.1	0.1	0.1	0.1	*34.8*	*65.9*	*123.7*
NL	2.3	2.5	3.3	4.0	4.5	4.3	*44.7*	*32.0*	*90.9*
AT	1.3	1.5	1.7	2.1	2.4	2.5	*33.9*	*45.9*	*95.4*
PT	1.8	1.9	2.2	2.6	3.0	3.2	*24.7*	*46.9*	*83.2*
FI	0.8	0.9	1.2	1.4	1.4	1.4	*50.5*	*15.0*	*73.0*
SE	1.5	1.7	2.0	2.3	2.5	2.5	*31.7*	*21.8*	*60.4*
UK	9.5	10.1	12.3	14.7	16.7	17.0	*28.5*	*38.7*	*78.2*
CY	0.1	0.1	0.1	0.2	0.2	0.3	*71.1*	*71.5*	*193.4*
CZ	1.4	1.6	2.1	2.3	2.5	2.8	*44.7*	*33.7*	*93.5*
EE	0.2	0.2	0.2	0.3	0.3	0.3	*6.7*	*24.2*	*32.5*
HU	1.6	1.7	2.0	2.1	2.3	2.5	*25.8*	*27.1*	*59.9*
LT	0.5	0.5	0.6	0.7	0.7	0.8	*7.7*	*38.1*	*48.7*
LV	0.4	0.4	0.4	0.4	0.5	0.5	*3.5*	*25.7*	*30.1*
MT	0.1	0.1	0.1	0.1	0.1	0.1	*69.3*	*42.2*	*140.7*
PL	5.0	5.1	6.7	8.2	8.8	9.9	*36.3*	*46.4*	*99.6*
SK	0.6	0.7	0.9	1.1	1.2	1.4	*38.9*	*61.1*	*123.8*
SI	0.3	0.3	0.4	0.5	0.6	0.6	*36.8*	*44.2*	*97.2*
EU-25	*75.3*	*81.5*	*96.7*	*115.1*	*129.6*	*133.3*	*28.5*	*37.8*	*77.1*
EU-15	*65.2*	*70.9*	*83.2*	*99.2*	*112.5*	*114.2*	*27.7*	*37.2*	*75.3*
EU-10	*10.1*	*10.6*	*13.5*	*15.9*	*17.1*	*19.1*	*33.2*	*41.5*	*88.4*

Source: AWG scenario.

thousand in Greece, Spain and Ireland. Compared with the UN 2004 projections, the assumptions in the EPC projection are lower for all EU-15 countries except Belgium, Germany, Spain and Italy, where net migration flows up to 0.4 per thousand higher are assumed. The difference in the assumptions ranges from about 0.1 per thousand lower in Greece, France, the Netherlands and Sweden up to 2–3 per thousand lower in Portugal and Ireland and close to 5 per thousand in Luxembourg. The assumptions made in the AWG scenario are much lower than in the UPE projection, by 0.1 per thousand on average; the difference varies from 1.5 per thousand in Finland and France up to 6 per thousand in Luxembourg.

It is also useful to use the UN population projections to contrast projected population developments in the EU-25 and third countries. The share of the population of what is the EU-25 today halved from close to 14 % of the world population in 1950 to over 7 % in 2000 and is projected to drop below 5 % in 2050, despite net migra-

Table 1.18

Projection of the very old population aged 80 + in the baseline population scenario to be used in the 2005 projection exercise

	Total						% change		
	2004	2010	2020	2030	2040	2050	2004–20	2020–50	2004–50
BE	0.4	0.5	0.6	0.8	1.0	1.2	*48.6*	*83.9*	*173.3*
DK	0.2	0.2	0.3	0.4	0.4	0.5	*16.3*	*106.2*	*139.8*
DE	3.4	4.2	5.8	6.4	7.9	9.9	*68.0*	*70.9*	*187.1*
EL	0.4	0.5	0.7	0.8	1.0	1.2	*91.9*	*70.2*	*226.7*
ES	1.8	2.2	2.7	3.2	4.1	5.3	*54.0*	*94.1*	*199.0*
FR	2.6	3.2	3.8	4.8	6.3	6.9	*46.2*	*79.6*	*162.6*
IE	0.1	0.1	0.2	0.2	0.3	0.4	*46.5*	*181.8*	*312.8*
IT	2.8	3.4	4.3	4.9	5.7	7.2	*53.6*	*68.1*	*158.2*
LU	0.0	0.0	0.0	0.0	0.0	0.1	*62.6*	*133.0*	*278.9*
NL	0.6	0.6	0.7	1.1	1.4	1.6	*30.1*	*124.0*	*191.3*
AT	0.3	0.4	0.5	0.6	0.8	1.0	*38.2*	*120.4*	*204.5*
PT	0.4	0.5	0.6	0.7	0.9	1.1	*57.1*	*78.8*	*180.8*
FI	0.2	0.2	0.3	0.4	0.5	0.5	*48.3*	*84.8*	*174.0*
SE	0.5	0.5	0.5	0.8	0.8	0.9	*7.5*	*81.2*	*94.9*
UK	2.6	2.8	3.2	4.4	5.2	6.5	*25.1*	*99.8*	*149.9*
CY	0.0	0.0	0.0	0.0	0.1	0.1	*71.0*	*144.9*	*318.7*
CZ	0.3	0.4	0.4	0.6	0.8	0.8	*34.1*	*96.9*	*164.0*
EE	0.0	0.1	0.1	0.1	0.1	0.1	*55.4*	*44.1*	*123.9*
HU	0.3	0.4	0.5	0.6	0.8	0.8	*38.6*	*66.3*	*130.5*
LT	0.1	0.1	0.2	0.2	0.2	0.3	*61.3*	*68.3*	*171.5*
LV	0.1	0.1	0.1	0.1	0.1	0.2	*61.7*	*42.9*	*131.0*
MT	0.0	0.0	0.0	0.0	0.0	0.0	*73.5*	*104.0*	*253.8*
PL	0.9	1.2	1.6	2.0	3.1	3.0	*71.0*	*90.7*	*226.0*
SK	0.1	0.1	0.2	0.2	0.4	0.4	*34.5*	*130.8*	*210.4*
SI	0.1	0.1	0.1	0.1	0.2	0.2	*80.3*	*95.1*	*251.8*
EU-25	*18.2*	*21.9*	*27.2*	*33.5*	*42.0*	*49.9*	*49.6*	*83.3*	*174.2*
EU-15	*16.3*	*19.4*	*24.2*	*29.5*	*36.3*	*44.2*	*48.7*	*82.8*	*171.9*
EU-10	*1.9*	*2.5*	*3.1*	*4.0*	*5.7*	*5.7*	*56.9*	*87.0*	*193.4*

Source: AWG scenario.

tion flows projected. The share of the population in today's EU-25 ([1]) was already falling over the period 1950 to 2000, a different trend than in Africa, Asia or Latin America where the share of the population was rising. The share of the population in Oceania also fell over the period 1950 to 2000, by less than 2 %.

Over the period 2000 to 2050, the share of the population in Asia is projected to account for close to 60 % of the world population, however it will grow more slowly than the world population and its share is projected to fall by 3 %. This is particularly true for China, where the share of the population is projected to fall by 5 %. The population in Africa is projected to increase much faster than during the period until 2000, exceeding 20 % of the world population in 2050. The other regions of the world will roughly keep their share in the (growing) world population ([2]).

([1]) The aggregate UN Europe includes the Russian Federation, Moldova and Ukraine, where demographic developments are relatively unfavourable and the sharper drops in share of world population are expected, and other countries from central, eastern and south-eastern Europe.

([2]) The UN projects an increase in the world population from 6.1 billion in 2000 to 9.1 billion in 2050.

Table 1.19

Old age dependency ratio in the baseline population scenario to be used in the 2005 projection exercise

	2004	2010	2020	2030	2040	2050	Change
BE	26.1	26.4	32.2	41.1	46.7	47.2	*21*
DK	22.5	24.9	31.5	37.7	43.3	41.9	*19*
DE	26.8	30.7	34.2	44.0	51.0	51.7	*25*
EL	26.4	28.0	32.7	39.5	50.7	60.4	*34*
ES	24.6	25.3	29.8	38.2	52.5	65.6	*41*
FR	25.2	25.8	33.0	40.2	45.9	46.4	*21*
IE	16.4	17.5	22.5	28.3	36.0	45.2	*29*
IT	28.9	31.4	36.4	44.4	57.6	62.2	*33*
LU	21.0	21.6	24.7	31.6	36.7	36.1	*15*
NL	20.5	22.2	29.2	37.2	42.8	40.6	*20*
AT	22.8	26.3	30.3	40.6	50.0	52.4	*30*
PT	24.9	26.5	31.6	39.2	49.1	58.5	*34*
FI	23.3	25.4	37.0	45.0	46.0	46.7	*23*
SE	26.4	28.0	34.4	38.4	41.4	40.9	*14*
UK	24.3	25.1	30.3	37.3	43.6	45.0	*21*
CY	17.5	19.1	25.5	32.9	36.1	43.2	*26*
CZ	19.7	21.9	31.8	37.1	43.8	54.8	*35*
EE	23.8	24.7	28.7	33.4	36.6	43.1	*19*
HU	22.6	24.3	31.2	35.1	40.3	48.3	*26*
LT	22.3	23.4	26.0	33.4	39.3	44.9	*23*
LV	23.6	25.2	28.0	33.4	37.4	44.1	*20*
MT	19.0	20.4	30.0	36.0	35.9	40.6	*22*
PL	18.6	18.8	27.1	35.7	39.7	51.0	*32*
SK	16.3	16.9	23.5	31.7	38.1	50.6	*34*
SI	21.4	23.6	30.8	40.4	47.7	55.6	*34*
EU-25	*24.5*	*26.2*	*31.9*	*39.7*	*47.4*	*51.4*	*27*
EU-15	*25.5*	*27.4*	*32.6*	*40.5*	*48.8*	*51.6*	*26*
EU-10	*19.6*	*20.4*	*28.1*	*35.4*	*40.2*	*50.4*	*31*

Source: AWG scenario.

Table 1.20

Summary of difference in assumptions made in the 2005 budgetary projection compared with other population projections

	Fertility	Life expectancy	Migration
Eurostat, 2000	Generally lower	Much higher	Generally higher
UN, 2004	Much lower	Higher	Generally lower
UPE (point estimates)	Similar	Much lower	Much lower

Source: Economic and Financial Affairs DG

Table 1.26 shows the old-age dependency ratio in the world (people aged 65 and above over the working-age population). The UN projects an old-age dependency ratio of 49 in the EU-25 in 2050, which is much larger than in the rest of the world with the exception of Japan, where it is projected to reach 70. The EU-25 of today had the highest old-age dependency ratio already in 1950, similar to those of the United States and Oceania, but its increase has been faster over the period 1950 to 2000, rising by nine percentage points. Sharper increases in the old-age dependency ratio are projected during the period 2000 to 2050 than between 1950 and 2000 everywhere. The bigger increases are projected to take place in Japan (by close to 50 %) and in China and the EU-25 (by almost 30 %).

Table 1.21

Assumptions on fertility rates

	AWG baseline scenario			Eurostat 2000			UN 2004 revision			UPE		
	2005	2025	2050	2005	2025	2050	2004	2025	2050	2049	lower limit	upper limit
BE	1.62	1.70	1.70	1.60	1.75	1.80	1.66	1.73	1.85	1.8	1.14	2.84
DK	1.76	1.79	1.80	1.77	1.80	1.80	1.75	1.85	1.85	1.8	1.15	2.82
DE	1.35	1.45	1.45	1.45	1.50	1.50	1.32	1.55	1.85	1.4	0.88	2.21
EL	1.29	1.50	1.50	1.41	1.54	1.60	1.25	1.43	1.78	1.4	0.9	2.18
ES	1.30	1.40	1.40	1.26	1.45	1.50	1.27	1.56	1.85	1.4	0.89	2.21
FR	1.89	1.85	1.85	1.77	1.80	1.80	1.87	1.85	1.85	1.8	1.15	2.83
IE	1.97	1.80	1.80	1.86	1.82	1.80	1.94	1.85	1.85	1.8	1.15	2.83
IT	1.31	1.40	1.40	1.30	1.45	1.50	1.28	1.52	1.85	1.4	0.89	2.20
LU	1.65	1.79	1.80	1.74	1.80	1.80	1.73	1.78	1.85	1.8	1.14	2.84
NL	1.75	1.75	1.75	1.76	1.78	1.80	1.72	1.77	1.85	1.8	1.15	2.82
AT	1.40	1.45	1.45	1.37	1.47	1.50	1.39	1.58	1.85	1.4	0.89	2.20
PT	1.45	1.60	1.60	1.59	1.70	1.70	1.47	1.64	1.85	1.6	1.02	2.51
FI	1.76	1.80	1.80	1.72	1.70	1.70	1.72	1.85	1.85	1.8	1.15	2.82
SE	1.74	1.85	1.85	1.55	1.74	1.80	1.64	1.85	1.85	1.8	1.12	2.89
UK	1.72	1.75	1.75	1.73	1.80	1.80	1.66	1.83	1.85	1.8	1.16	2.80

Sources: AWG scenario; Eurostat 2000 projection; UN world population prospects: The 2004 revision; UPE projections.

Table 1.22

Assumptions on life expectancy at birth for males

	AWG baseline scenario			Eurostat 2000			UN 2004 revision			UPE		
	2005	2025	2050	2005	2025	2050	2005	2025	2050	2049	lower limit	higher limit
BE	75.8	79.7	82.1	76.1	79.2	80.0	75.7	78.6	81.1	84.2	80.3	88.8
DK	75.4	78.9	81.4	75.1	77.9	79.0	74.2	76.8	79.0	83.2	78.3	88.3
DE	76.3	79.6	82.0	75.7	78.7	80.0	75.2	78.1	80.6	84.9	79.8	90.5
EL	76.5	78.8	81.1	76.9	79.7	81.0	75.7	77.7	79.7	82.8	78.2	87.2
ES	76.7	79.7	81.7	75.4	77.6	79.0	75.9	78.5	81.0	85.9	81.1	91.4
FR	76.4	80.0	82.3	75.8	78.8	80.0	75.2	78.1	80.6	85.5	80.6	90.6
IE	75.7	79.5	82.2	74.9	77.8	79.0	74.4	76.7	78.9	84.7	80.1	89.6
IT	77.5	80.5	82.8	76.5	79.6	81.0	75.5	77.5	79.5	85.7	81.4	90.4
LU	75.2	79.3	81.8	75.8	79.4	80.0	75.1	78.3	80.8	85.2	79.9	91.8
NL	76.4	78.8	81.1	76.3	78.8	80.0	75.6	77.6	79.6	82.5	78.1	97.1
AT	76.4	80.1	82.8	75.5	77.9	81.0	75.4	78.3	80.8	84.4	80.3	88.8
PT	74.4	78.2	81.2	72.9	76.1	78.0	72.6	75.5	77.9	84.2	79.1	89.6
FI	75.5	79.5	81.9	74.9	78.1	80.0	74.4	77.8	79.8	84.7	80.0	89.4
SE	78.2	80.9	82.6	77.7	79.5	82.0	77.6	79.6	82.1	84.7	80.3	89.4
UK	76.6	80.1	82.4	76.1	78.9	80.0	75.7	78.6	80.6	83.4	78.7	88.3

Sources: AWG scenario; Eurostat 2000 projection; UN world population prospects: The 2004 revision; UPE projections.

Table 1.23

Assumptions on life expectancy at birth for females

	AWG baseline scenario			Eurostat 2000			UN 2004 revision			UPE		
	2005	2025	2050	2005	2025	2050	2005	2025	2050	2049	lower limit	upper limit
BE	81.9	85.5	87.5	81.9	84.4	85.0	81.9	84.2	86.7	88.3	84.1	92.9
DK	79.7	82.7	85.2	79.5	81.6	83.0	79.1	81.7	83.9	87.3	82.5	92.4
DE	81.9	84.8	86.8	81.6	83.9	85.0	81.2	83.9	86.3	89.1	84.7	94.0
EL	81.5	83.9	85.9	81.7	84.0	85.0	80.9	82.9	84.9	86.9	83.1	91.0
ES	83.6	86.1	87.3	82.8	84.5	85.0	82.8	84.8	87.3	90.1	85.9	94.9
FR	83.6	86.4	87.9	83.6	85.9	87.0	82.8	84.8	87.3	89.7	85.5	94.1
IE	80.9	84.4	86.8	80.2	82.8	84.0	79.6	81.9	84.0	89.9	85.5	95.1
IT	83.3	85.9	87.8	82.7	85.0	86.0	81.9	83.6	85.6	89.8	85.8	94.3
LU	81.5	84.6	86.7	81.7	84.2	85.0	81.4	84.0	86.5	89.4	84.7	95.3
NL	80.9	83.0	85.2	81.5	83.6	85.0	81.0	82.9	84.9	86.4	82.4	91.0
AT	82.3	85.4	87.2	81.6	83.5	86.0	81.5	84.1	86.6	88.7	85.1	92.5
PT	81.2	84.6	86.7	79.9	82.6	84.0	79.6	81.9	84.1	88.4	84.1	93.3
FI	82.0	84.8	86.6	81.8	84.0	85.0	81.5	84.1	86.1	88.7	84.9	93.4
SE	82.5	84.9	86.6	82.4	83.9	86.0	82.6	84.6	87.1	88.7	84.2	94.3
UK	81.1	84.5	86.7	80.9	83.6	85.0	80.7	83.6	85.6	87.5	83.3	92.2

Sources: AWG scenario; Eurostat 2000 projection; UN world population prospects: The 2004 revision; UPE projections.

Table 1.24

Assumptions on net migration flows

	AWG baseline scenario			Eurostat 2000			UN 2004 revision			UPE		
	2005	2025	2050	2005	2025	2050	2005	2025	2050	2049	lower limit	higher limit
BE	0.23	0.17	0.17	0.12	0.15	0.15	0.13	0.13	0.13	0.2	– 0.1	0.46
DK	0.15	0.12	0.12	0.20	0.19	0.19	0.22	0.22	0.22	0.2	– 0.1	0.46
DE	0.33	0.26	0.26	0.30	0.24	0.24	0.28	0.24	0.24	0.4	– 0.1	0.8
EL	1.22	0.32	0.32	0.22	0.24	0.24	0.34	0.33	0.33	0.5	– 0.3	1.22
ES	0.11	0.24	0.24	0.12	0.15	0.15	1.03	0.15	0.15	0.5	– 0.1	1.03
FR	0.11	0.09	0.09	0.08	0.08	0.08	0.10	0.10	0.10	0.2	– 0.3	0.6
IE	0.41	0.27	0.23	0.26	0.13	0.13	0.48	0.53	0.53	0.4	– 0.2	0.93
IT	0.26	0.26	0.22	0.11	0.14	0.14	0.21	0.21	0.21	0.5	– 0.1	1.03
LU	0.63	0.51	0.43	0.54	0.46	0.46	0.92	0.92	0.92	0.6	– 0.2	1.37
NL	0.13	0.18	0.18	0.22	0.22	0.22	0.19	0.19	0.19	0.3	0.0	0.56
AT	0.31	0.09	0.25	0.19	0.25	0.25	0.25	0.25	0.25	0.4	– 0.1	0.8
PT	0.40	0.23	0.15	0.19	0.25	0.25	0.50	0.35	0.35	0.5	– 0.3	1.22
FI	0.12	0.28	0.12	0.10	0.10	0.10	0.15	0.15	0.15	0.2	– 0.1	0.41
SE	0.31	0.43	0.21	0.20	0.23	0.23	0.23	0.23	0.23	0.3	0.0	0.56
UK	0.23	0.18	0.15	0.13	0.12	0.12	0.23	0.22	0.22	0.4	-0.1	0.8

Sources: AWG scenario; Eurostat 2000 projection; UN world population prospects: The 2004 revision; UPE projections.

Table 1.25

Population as a percentage of world population based on the 2004 UN revision

	1950	1960	1970	1980	1990	2000	2010	2020	2030	2040	2050	Change 1950–2000	Change 2000–50
Africa	8.9	9.3	9.8	10.8	12.0	13.4	14.7	16.2	17.8	19.6	21.3	*4.5*	*8.0*
Asia	55.4	56.2	57.9	59.2	60.0	60.4	60.4	60.1	59.4	58.5	57.5	*5.0*	*– 2.9*
China	22.0	21.7	22.5	22.5	21.9	20.9	19.8	18.8	17.6	16.5	15.3	*– 1.1*	*– 5.6*
India	14.2	14.6	15.0	15.5	16.1	16.8	17.3	17.6	17.7	17.6	17.5	*2.6*	*0.8*
Japan	3.3	3.1	2.8	2.6	2.3	2.1	1.9	1.7	1.5	1.4	1.2	*– 1.2*	*– 0.9*
UN Europe	39.2	35.6	30.6	26.3	22.8	19.8	17.6	15.7	14.3	13.3	12.5	*– 19.4*	*– 7.3*
EU-25	13.9	12.3	10.9	9.5	8.2	7.4	6.7	6.1	5.6	5.2	4.9	*– 6.5*	*– 2.5*
EU-15	11.7	10.4	9.2	8.0	6.9	6.2	5.7	5.2	4.8	4.5	4.3	*– 5.5*	*– 1.9*
EU-10	2.2	1.9	1.7	1.5	1.3	1.1	1.0	0.9	0.8	0.7	0.6	*– 1.0*	*– 0.5*
Latin America	12.0	12.9	13.3	13.8	14.0	14.2	14.5	14.6	14.8	15.0	15.0	*2.2*	*0.8*
Northern America	6.8	6.8	6.3	5.8	5.4	5.2	5.1	4.9	4.9	4.8	4.8	*– 1.6*	*– 0.4*
United States	6.3	6.2	5.7	5.2	4.8	4.7	4.6	4.5	4.4	4.4	4.4	*– 1.6*	*– 0.3*
Oceania	7.7	7.3	6.9	6.3	6.0	5.9	5.8	5.8	5.9	6.0	6.1	*– 1.7*	*0.2*

Source: UN world population prospects: The 2004 revision.

Table 1.26

Old age dependency ratio based on the 2004 UN revision

	1950	1960	1970	1980	1990	2000	2010	2020	2030	2040	2050	Change 1950–2000	Change 2000–50
World	9	9	10	10	10	11	12	14	18	22	25	*2*	*14*
Africa	6	6	6	6	6	6	6	7	7	8	10	*0*	*4*
Asia	7	7	7	8	8	9	10	13	18	23	27	*2*	*18*
China	7	9	8	8	8	10	11	17	24	36	39	*3*	*29*
India	6	6	7	7	7	8	9	10	14	18	22	*2*	*14*
Japan	8	9	10	13	17	25	35	48	52	64	71	*17*	*46*
UN Europe	13	14	16	19	19	22	24	29	37	43	48	*9*	*26*
EU-25	13	15	18	19	20	22	24	30	37	44	49	*9*	*27*
EU-15	14	16	19	21	21	23	26	31	39	46	49	*9*	*25*
EU-10	12	13	16	18	17	20	22	28	35	41	51	*8*	*31*
Latin America	7	7	8	8	8	9	10	13	18	23	29	*2*	*20*
Northern America	13	15	16	17	18	19	19	25	31	33	34	*6*	*15*
United States	13	15	16	17	19	19	19	24	31	32	33	*6*	*14*
Oceania	12	12	12	13	14	15	16	21	26	29	31	*3*	*16*

Source: UN world population prospects: The 2004 revision.

2. Labour force projections

2.1. Background to choosing a cohort-component projection methodology

2.1.1. Approaches to making labour force projections

The approach used in the 2001 budgetary projections of the EPC

For the 2001 budgetary projections of the EPC, a mechanical convergence rule was applied to develop the labour force assumptions. This involved imposing a constraint allowing female participation rates to converge to between 5 and 10 percentage points below those of males by 2050. Participation rates for the period up to 2010 were based on ILO projections. For the subsequent period, the participation rates stayed constant for prime ages (aged 20 to 54) and older workers (aged 55 to 64), as well as for people of retirement age and under the age of 20. Participation rates for women aged 20 to 54 and 55 to 64 rose progressively towards a ceiling at the end of the period equal to 5 percentage points below those of men in countries with widely subsidised childcare and 10 percentage points below elsewhere. Some countries deviated marginally from these rules because of the expected impact of recent policies (e.g. higher minimum and statutory retirement ages).

AWG workshop of 10 March 2004

For the 2005 budgetary exercise, the EPC decided to improve upon the mechanical approach used in 2001. To this end, a workshop was held on 10 March 2004 (see Annex 2 for the programme), during which different methodologies used by international institutions to make long-run labour force projections were reviewed:

- **the extrapolation function method**, which fits simple linear or logistic models to existing data, used by the International Labour Organisation and the US Department of Labour — Bureau of Labour Statistics;
- **the cohort component methodology**, developed by the OECD;
- **a 'benchmark' approach** based on alternative scenarios (female versus male, best EU performer, US rates and so on), used by the ECB.

The 2005 labour force projection used by the EPC is based on a cohort component methodology under 'no policy change' ([1]).

Based on the workshop outcome and a detailed review of the economic literature, the EPC agreed to base its 2005 labour force projection on the cohort component methodology developed by the OECD ([2]). The methodology follows a dynamic approach ([3]). Participation rates were projected for males and females by single year of age, taking into account the replacement of older cohorts by more recent ones. The labour force projection shows the outcome for the labour force of extrapolating recent trends in rates of entry and exit from the labour market. This base case projection reflects the working assumption of 'no policy change' and is neither a forecast nor a prediction in that it is not based on any assessment of more or less likely future changes in working patterns or economic conditions.

2.1.2. Past trends and main determinants of labour market performance

The rationale for choosing a cohort-component methodology is to reflect the substantial changes in the labour market situation amongst different age and gender groups over the past years and decades. In recent years,

([1]) For further details on the methodology used see Carone (2005).
([2]) See Scherer (2002), Burniaux et al. (2003) and OECD (2003). The OECD baseline scenario incorporates the projected evolution of a number of control variables (unemployment, fertility) and the projected impact of recent pension reforms, including measures to be phased in gradually. For a recent application of the same cohort method, see also Australian Productivity Commission (2005).
([3]) See Carone (2005), European Commission (2004b, q, u) and European Commission (2005g).

labour force participation has undergone substantial changes, especially for the young, women and the elderly. A variety of factors underlies these changes, in particular the following:

- social factors, such as longer schooling or change in the role of women in households;
- demographic factors, including the decline of fertility rates and modifications of the age structure;
- institutional factors, in particular early-retirement schemes or changes in the age of retirement; and/or
- economic factors, such as the level of the rate of unemployment, the average income by household, the share of part-time employment in total employment or the share of the services sector in the economy.

Even if each country has its own evolution of the labour force (see Tables 2.1 to 2.4), some common stylised facts warrant attention and need to be catered for in any projection exercise. They can be summarised as follows:

- the participation rates of prime-age male workers (aged 25 to 54 years), at around 90 %, remain the highest of all groups. In contrast, the participation rates of men aged 60 to 64 years have recorded a steady decline in the past 30 years, but there are signs of reversal in many countries;
- female participation rates have steadily increased over the past 25 years;
- the participation rates of young people (aged 15 to 24 years) have declined, mostly due to longer schooling;
- looking forward, the population of working age is projected to decline substantially in coming decades, as large cohorts of people enter retirement and are replaced by smaller cohorts of young workers. The increasing share of older workers in the labour force could put downward pressure on the overall participation rate.

Given these trends, the main drivers of change in the overall participation rate will be changes in the labour force attachment of prime-aged females, older workers (especially men) and, to a lesser extent, young people.

2.2. Overview of the projection methodology and main assumptions

Main features of the cohort methodology

The projection follows the OECD methodology with one modification, which is the use of single years of age instead of five-year age groups (see Annex 4 for a detailed description of the method). The methodology takes into account implicitly that women belonging to any given cohort have their own specific level of participation, which is usually higher at all ages than the corresponding level of older generations. This participation gap between subsequent cohorts not only reflects sociocultural factors, but also individual characteristics such as the number of children and level of education. Thus, compared with a standard projection based on the invariance of activity rates, the cohort-based projection contains an autonomous increase of female participation — referred to as a 'cohort effect' — corresponding to the gradual replacement of currently older women, with relatively low participation rates, by younger women who have a much stronger attachment to the labour force. In the long run, this effect leads to a homogenous female population with the same individual characteristics as women who entered the labour force in 2003 ([1]). Similarly, the baseline incorporates a negative 'cohort effect' for men because their participation rates have tended to decrease across generations in a large majority of countries, contrary to what is observed for women.

Two main steps in the labour force projection

There are two main steps in the labour force projection. Firstly, participation rates by single years of age and gender of people in the labour market are projected until 2050 using the cohort approach under the usual neutral assumption of 'no policy change'. The overall participation rate (PR) (referred to both age groups 15 to 64 and 15 to 71) is calculated as a weighted average of age (i) and sex (s) with specific participation rates as follows:

([1]) The method used for the baseline projection is based on the assumption that lifetime participation profiles in the future are parallel to those observed in the past. This implies the assumption that the entry and exit rates calculated for the latest available cohorts (1997–2003) are kept constant in the future. Compared with a static baseline, this method implies a gradual increase of future female participation rates, mostly for women aged 35 and over. The assumption of constant rate of entry and exit, while representing progress compared with the assumption of constant participation rates, still remains mechanical, resting on the assumption that the cross-cohort deviations observed in 2003 would remain unchanged over the future, see Burniaux et al. (2003).

Table 2.1

Historical participation rates: total workers aged 15 to 64

	Total				Males				Females			
	1990	1995	2000	2004	1990	1995	2000	2004	1990	1995	2000	2004
BE	58.7	62.1	65.1	65.9	71.3	72.3	73.7	73.5	46.1	51.7	56.4	58.3
DK	82.4	79.5	80.0	80.1	87.1	85.6	84.2	84.0	77.6	73.3	75.6	76.2
DE	69.9	70.5	71.0	72.1	82.1	79.6	78.8	79.0	57.6	61.3	63.0	65.1
EL	59.1	60.1	63.8	66.5	76.8	77.2	77.4	79.0	42.6	44.2	50.5	54.1
ES	58.7	60.6	65.4	68.7	77.5	75.5	78.8	80.4	40.6	45.8	51.9	56.8
FR	67.1	67.6	68.8	69.5	76.5	74.9	75.2	75.2	58.0	60.6	62.5	63.9
IE	60.7	61.6	68.2	69.5	78.8	76.1	79.9	79.9	41.9	47.1	56.3	59.0
IT	59.8	57.6	60.1	62.7	77.0	73.2	74.1	74.9	43.2	42.4	46.3	50.6
LU	60.2	60.4	64.1	64.6	77.6	75.7	76.6	75.0	42.3	43.7	52.1	54.7
NL	66.2	69.2	75.1	76.6	79.7	79.9	84.1	83.9	52.4	58.3	66.0	69.2
AT		71.5	71.0	71.3		80.8	80.1	78.5		62.3	62.0	64.2
PT	68.8	67.4	71.4	73.0	81.4	76.4	79.2	79.1	57.1	59.1	63.9	67.0
FI		72.1	74.5	74.2		74.8	77.2	76.4		69.4	71.9	72.0
SE		77.8	75.3	77.2		79.6	77.2	79.1		75.8	73.4	75.1
UK	76.5	74.7	75.4	75.2	86.8	83.3	82.8	82.0	66.1	66.0	68.2	68.6
CY			68.9	72.6			81.5	83.0			57.3	62.8
CZ			71.3	70.0			79.1	77.9			63.6	62.2
EE			70.2	70.0			75.6	74.4			65.4	65.9
HU			60.1	60.5			67.9	67.2			52.7	54.0
LT			70.6	69.1			74.2	72.8			67.1	65.6
LV			67.0	69.7			72.4	74.3			62.2	65.3
MT			58.2	58.3			80.2	80.2			36.2	36.0
PL			65.8	64.0			71.7	70.1			59.9	57.9
SK			69.9	69.7			76.7	76.5			63.2	63.0
SI			67.5	69.8			71.9	74.5			62.9	65.0
EU-25	*52.2*	*55.8*	*68.7*	*69.5*	*62.6*	*64.6*	*77.4*	*77.4*	*42.1*	*47.2*	*60.0*	*61.7*
EU-15	*62.9*	*67.2*	*69.1*	*70.4*	*75.3*	*77.7*	*78.3*	*78.5*	*50.6*	*56.8*	*59.9*	*62.3*
EU-10			*66.4*	*65.5*			*72.9*	*71.9*			*60.1*	*59.2*

Source: Eurostat labour force survey, Economic and Financial Affairs DG.

$$PR = \sum_{i=14}^{71} \sum_{s=m,f} PR_{is}^{t} \times p_{is}^{t} \text{ where } p_{is}$$

$$= P_{is}/P \text{ and P = Population} = \sum_{i,s} P_{is}^{t}$$

In the second step, the labour force and the number of people in employment are projected until 2050, given the assumption on unemployment rates in each country. The projection of the labour force growth and composition was obtained by combining the labour force participation rate projection with the projection of the working-age population. In essence, for any year *t*, the potential labour force supply for each age/sex cohort *i* (LF_{is}^{t}) is derived by multiplying the projected group-specific (by age/sex) labour force participation rate (PR_{is}^{t}) by its corresponding population projection:

$$LF_{is}^{t} = PR_{is}^{t} \times P_{is}^{t}$$

Thus, the overall labour force supply in each year *t* is a weighted average of age-sex specific labour supply:

$$\sum_{i=14}^{71} \sum_{s=m,f} LF_{is}^{t} = PR_{is}^{t} \times P_{is}^{t}$$

The projected population and labour force series are then used to calculate the employment rates and the number of employees consistent with unemployment, following the profile agreed.

Table 2.2

Historical participation rates: young workers aged 15 to 24

	Total				Males				Females			
	1990	1995	2000	2004	1990	1995	2000	2004	1990	1995	2000	2004
BE	35.5	33.9	35.3	35.5	37.1	36.0	38.7	37.9	34.2	31.7	31.8	33.0
DK	73.5	73.2	70.7	67.9	76.4	77.1	73.4	69.7	70.5	69.4	67.8	66.0
DE	60.7	52.5	50.4	47.5	62.5	54.6	53.7	50.5	58.8	50.3	47.1	44.4
EL	39.5	36.7	39.0	36.7	44.0	41.3	41.7	40.0	35.3	32.5	36.2	33.5
ES	47.0	41.6	43.6	45.2	51.6	44.6	47.7	50.2	42.5	38.6	39.5	39.8
FR	44.6	35.5	35.5	38.4	47.7	37.3	38.6	42.4	41.6	33.8	32.4	34.3
IE	49.9	44.9	54.2	52.4	53.9	48.2	58.1	55.9	45.6	41.5	50.0	48.8
IT	46.8	38.7	38.4	36.1	50.7	43.9	42.5	40.5	43.0	33.6	34.3	31.7
LU	44.9	40.8	34.7	25.5	48.0	44.0	40.0	26.9	41.7	41.7	29.2	24.0
NL	59.6	62.0	72.9	71.6	59.9	62.2	73.7	72.0	59.2	61.8	72.0	71.1
AT		61.7	55.4	57.5		64.6	60.3	61.7		58.9	50.5	53.3
PT	58.4	43.1	46.3	43.8	63.8	47.2	51.5	47.9	53.0	38.9	41.0	39.5
FI		49.7	52.3	49.7		51.2	53.6	50.6		48.1	51.0	48.8
SE		45.5	40.8	47.2		44.1	41.2	47.0		46.8	40.4	47.3
UK	71.8	63.7	64.8	62.9	76.7	67.9	67.9	65.4	66.7	59.2	61.7	60.5
CY			41.6	41.4			42.5	45.2			39.6	38.0
CZ			44.4	35.2			48.3	38.7			40.6	31.5
EE			37.4	34.8			41.8	41.4			32.7	27.8
HU			38.3	27.9			43.2	31.4			33.3	24.3
LT			36.1	26.2			41.6	31.1			30.4	21.5
LV			37.5	37.2			43.6	43.3			31.1	31.0
MT			58.6	57.0			60.0	61.3			60.7	52.1
PL			37.8	35.9			40.9	39.7			34.8	32.0
SK			46.0	39.3			49.4	42.9			42.5	35.7
SI			39.1	40.3			41.8	45.0			36.4	35.5
EU-25	*42.7*	*39.2*	*45.9*	*44.6*	*45.3*	*41.8*	*49.3*	*48.1*	*40.1*	*36.6*	*42.4*	*41.1*
EU-15	*51.4*	*47.2*	*47.6*	*47.2*	*54.5*	*50.4*	*51.0*	*50.5*	*48.3*	*44.0*	*44.1*	*43.8*
EU-10			*39.5*	*34.8*			*43.1*	*38.7*			*35.8*	*30.8*

Source: Eurostat labour force survey, Economic and Financial Affairs DG.

Data sources and additional assumption on labour input

The basic data on labour force participation rates are derived from the Community labour force surveys of Eurostat, in order to use comparable data on employment, unemployment and activity rates across EU-25 Member States. They consist of age-specific (single-year age groups) and gender-specific participation rates of people aged 15 to 71 years, covering the period 1997–2003. For the starting point of the projection, figures referring to 2003 are used, the most recent figures available.

The employment projection refers exclusively to the number of people, assuming that over the period of projection there will be:

- no changes in hours worked [1];
- no changes in the composition between private and public sector;
- no changes in the share of self-employed and employees;
- no changes in the share of part-time work;

[1] In order to estimate long-run labour productivity and potential growth rates, differences in hours worked per employee across different countries are duly considered. As regards the assumption on hours worked, the approach used was that the negative growth in hours worked per employee gradually disappears over the medium term to reach zero in 2009 for all of the EU-25 countries.

Table 2.3

Historical participation rates: prime age workers aged 24 to 54

	Total				Males				Females			
	1990	1995	2000	2004	1990	1995	2000	2004	1990	1995	2000	2004
BE	76.7	80.4	82.4	83.4	92.2	92.3	91.8	91.8	60.8	68.2	72.8	74.7
DK	91.2	87.1	87.9	88.2	94.5	91.8	91.7	91.5	87.7	82.1	84.0	84.7
DE	80.0	83.3	85.4	85.9	93.9	93.1	93.7	92.9	65.6	73.2	77.0	78.8
EL	72.2	74.2	78.1	81.1	94.3	94.5	94.4	94.6	51.5	55.0	62.0	67.5
ES	70.0	74.3	78.0	80.6	94.2	92.9	93.0	92.5	46.7	55.7	62.9	68.3
FR	83.8	86.1	86.4	86.5	95.6	95.1	94.3	93.5	72.2	77.2	78.6	79.8
IE	69.5	72.8	78.3	79.9	93.3	91.0	92.0	91.8	45.1	54.8	64.6	68.0
IT	72.8	71.9	74.3	77.5	94.0	90.3	90.6	91.4	52.1	53.6	57.9	63.6
LU	72.9	73.9	80.0	81.9	95.4	93.6	94.0	95.1	49.4	53.3	64.6	68.3
NL	76.0	79.4	83.7	85.9	93.4	92.6	93.9	93.7	57.9	65.7	73.2	77.9
AT		83.3	85.3	86.3		93.2	94.0	92.9		73.3	76.5	79.6
PT	79.8	83.4	84.8	86.3	94.0	93.6	92.5	92.2	66.9	74.1	77.4	80.6
FI		85.4	87.9	87.4		88.3	90.8	90.1		82.4	84.9	84.5
SE		89.9	86.8	87.7		92.2	88.6	90.0		87.6	84.9	85.3
UK	84.0	83.4	83.9	83.7	95.0	92.7	91.8	91.0	73.0	74.0	76.2	76.7
CY			81.7	86.1			95.0	95.2			68.3	77.6
CZ			88.4	87.8			94.9	94.5			81.8	80.9
EE			86.9	86.5			90.8	90.1			83.3	83.2
HU			77.3	77.9			84.4	85.0			70.4	70.9
LT			88.8	88.7			89.7	90.6			87.9	86.8
LV			85.5	86.3			87.8	89.7			83.3	83.1
MT			64.5	65.0			94.0	93.3			34.1	36.5
PL			82.4	81.9			88.3	87.8			76.5	76.0
SK			88.4	88.9			93.9	93.8			82.9	84.1
SI			87.4	88.6			90.6	91.0			84.2	86.1
EU-25	*61.4*	*67.1*	*82.7*	*83.5*	*73.8*	*77.1*	*92.2*	*91.8*	*49.0*	*57.0*	*73.1*	*75.2*
EU-15	*73.9*	*80.7*	*82.5*	*83.6*	*88.8*	*92.8*	*92.7*	*92.3*	*59.0*	*68.6*	*72.2*	*74.8*
EU-10			*83.5*	*83.3*			*89.3*	*89.2*			*77.6*	*77.5*

Source: Eurostat labour force survey, Economic and Financial Affairs DG.

- no changes in the wage share ([1]).

While these assumptions may seem too simplistic, one should consider that it would have been extremely difficult to project along these dimensions due to lack of data on cohort-specific hours worked and the impact of part-time work on hours worked.

2.3. Methodology used to project participation rates

2.3.1. Assumptions and adjustments for specific Member States

The following assumptions are made in projecting activity rates by single year of age for males and females from age 15 to 71.

- **Average rates of entry and exit from the labour market**: the cohort model was run using average rates calculated for the period 1998 to 2003 (see Annex 5). This was done to avoid the choice of the year of calculation being overly conditioned by the cyclicality of labour market conditions or possible

([1]) See European Commission (2005m).

Table 2.4

Historical participation rates: older workers aged 55 to 64

	Total				Males				Females			
	1990	1995	2000	2004	1990	1995	2000	2004	1990	1995	2000	2004
BE	22.2	24.2	27.1	31.2	35.4	35.9	37.5	40.4	9.9	13.3	17.1	22.1
DK	57.0	53.6	58.3	63.9	69.3	68.0	66.7	71.2	45.9	40.0	48.9	56.5
DE	42.4	42.8	42.9	47.5	58.3	54.5	52.4	57.2	27.5	31.3	33.4	37.9
EL	41.4	41.9	40.5	41.2	59.4	61.0	57.3	58.9	24.3	24.5	25.4	25.2
ES	40.1	36.6	40.9	44.4	62.3	55.0	60.5	62.7	19.6	19.6	22.6	27.2
FR	32.9	31.4	31.7	39.6	39.4	36.1	35.4	43.4	26.9	27.1	28.2	35.9
IE	42.8	43.0	46.5	50.8	66.4	64.8	64.8	66.9	18.5	21.1	27.9	34.5
IT	32.5	29.0	29.0	31.8	51.7	45.2	42.8	44.0	15.0	14.1	16.1	20.4
LU	27.3	25.6	27.9	30.4	45.5	33.3	38.1	41.7	13.6	13.6	18.2	21.7
NL	30.9	29.9	39.0	46.9	45.8	41.5	51.2	59.1	16.9	18.5	26.7	34.4
AT		30.2	30.4	29.9		42.7	43.6	40.6		18.8	18.1	19.9
PT	47.6	47.4	52.4	53.2	65.9	61.8	64.4	62.8	31.5	34.5	41.7	44.8
FI		39.5	45.9	54.9		41.5	47.3	55.5		37.6	44.6	54.2
SE		67.2	68.3	72.7		71.1	72.1	75.6		63.4	64.6	69.8
UK	53.1	51.5	52.9	57.9	68.3	62.5	63.3	68.1	38.7	40.9	42.8	47.9
CY			50.8	52.5			68.8	73.8			33.3	32.1
CZ			38.2	45.1			54.5	60.2			23.7	31.3
EE			51.2	55.6			63.3	60.9			41.8	51.6
HU			22.9	32.1			34.5	39.6			13.5	25.8
LT			45.3	52.6			57.9	63.7			36.0	44.1
LV			39.8	52.3			54.0	60.3			29.5	46.2
MT			29.7	32.3			55.6	52.6			10.0	10.7
PL			31.3	29.6			40.4	39.1			23.6	21.4
SK			24.4	31.7			40.9	51.7			10.6	14.7
SI			24.1	29.9			34.8	42.5			14.0	18.0
EU-25	*31.2*	*32.4*	*39.4*	*43.8*	*43.4*	*42.6*	*50.5*	*54.3*	*19.9*	*22.8*	*29.0*	*33.8*
EU-15	*37.6*	*39.0*	*40.6*	*45.3*	*52.3*	*51.3*	*51.5*	*55.7*	*24.0*	*27.5*	*30.2*	*35.3*
EU-10			*31.9*	*34.7*			*43.4*	*45.7*			*22.2*	*25.2*

Source: Eurostat labour force survey, Economic and Financial Affairs DG.

statistical errors due to a small sample. The average entry and exit rates are calculated for the period 1998 to 2003 due to limited availability of data for single year of age. They are kept constant over the projection period for computational simplicity, although past trends that could have been extrapolated into the future are overlooked ([1]) (however, the trends appear quite erratic, especially if observed at single year of age). The first year of projection is 2004, in line with the population projection of Eurostat.

- **Correction mechanism for the young cohort**: a correction mechanism is introduced to avoid extrapolating over the next 50 years the drop in participation rates of the young cohort currently observed in some countries, which is due to extended duration of full-time education and increasing delay in entering the labour market. The extrapolation of this drop would have had a mechanical negative consequence on the participation rates of prime-age people over time (unless a correction mechanism to take into account the delay in entering the labour market was introduced in the calculation, which is technically more complicated). A floor is applied to the participation rates of the young aged 15 to 19: participation rates are allowed to increase

([1]) Australian projections were made using use time varying exit and entry rates, see Australian Productivity Commission (2005).

if this is the outcome of the cohort simulation model; otherwise, the rates are kept constant at the level observed in 2003.

- **Conversion of labour force projections**: for a number of Member States, the conversion of projections based on labour force surveys into national account equivalents is made ([1]).

2.3.2. Impact of recently enacted pension reforms

2.3.2.1. Recent pension reforms in some EU Member States

An important feature of this projection is that the baseline scenario takes into account the potential effects of recently enacted pension reforms in 17 EU Member States, including measures to be phased in gradually, on the participation rates of older workers. Some countries have enacted legislation to increase the statutory retirement age for females or for both males and females. Others have changed some provisions of social security programmes (and sometimes of other transfer programmes used as alternative early-retirement paths) that provided strong incentives to leave the labour force at an early age. The findings of a recent international research project based on micro-estimation results (based on a sample of individuals and the matching of individual retirement decisions and retirement incentives) are clear: changing pension plan provisions would have large effects on the labour force participation of older workers ([2]).

The following pension reforms ([3]) are incorporated in the baseline scenario.

Belgium: the standard retirement age for women will increase gradually from age 63 in 2003 to 64 in 2006 and 65 in 2009. Early-retirement (seniority pension) is still possible, but the contribution period will increase from 32 years in 2003 to 35 years in 2005. The 'older unemployment scheme', recently reformed, will have an impact on participation rates of people aged between 50 and 58.

Germany: the transition period of a series of reforms (1992, 1996, 1999, 2001 and 2004) will be completed by 2012 for those born in 1952 or later. The statutory retirement age for women will rise from 60 to 65 by 2010. The age for early-retirement will gradually increase from 60 to 62 by 2010 (only for those with at least 35 years of contribution), with a penalty of 3.6 % per year. A bonus for later retirement is introduced (6 % per year). The penalty for disability pensions before the age of 62 is up to a maximum of 10.8 %. Time spent in school and university will no longer be counted as years worked. The possibility of leaving the labour market at the age of 58 while receiving unemployment benefits until pension retirement (so-called 58er regulation) will be abolished in 2006. In January 2005, a 'sustainability factor' was introduced to adjust State pension payments to population dynamics (the level of retirement benefits will depend on the size of the workforce relative to the number of retirees).

Spain: the latest reform of the pension system in 2002 (Law 35/2002) abolished mandatory retirement age (65) in the private sector. Workers remaining active after 65 will increase their pension benefit by 2 % per year, and both employers and employees are exempted from paying social security contributions. For workers aged at least 60, social contributions are reduced by 50 %; this amount is increased by 10 % to reach 100 % for those aged 65. Early-retirement is possible from 61 years old, with at least 30 years of paid contributions and registered as unemployed for at least 6 months, but with a high penalty, from 6 to 8 % per year (8 % for those with only 30 years of contribution, 6 % for those with at least 40 years of contribution). Pensions became compatible with part-time work (but the pension benefit was reduced according to the length of the working day).

France: the standard retirement age remains 60. Since 2004, gradual alignment of public sector with private sector by increasing the number of contribution years for entitlement to a full pension (from 37.5 to 40 years between 2004 and 2008). Since 2009, the numbers of contribution years will increase following the increase in life expectancy through a rule keeping constant the ratio of the number of contribution years and the number of years in pension to the level of 1.79 as in 2003. The number of contribution years will be increased to 41 in 2012 and 41.75 in 2020, due to the expected gains in life expectancy (by 1.5 years every 10 years). A bonus (3 % per year) will be introduced

([1]) See Carone (2005), European Commission (2005h) and Annex 7.
([2]) See Gruber and Wise (2005).
([3]) The information was provided by the members of the EPC and AWG and completed by other sources.

in case of postponement of retirement. The penalty for early-retirement (before 40 years of contributions) will be changed. Since 2006, the amount of the penalty ('la décote') will decrease gradually from 10 % to 5 % of pension per year of anticipation in 2015 for the private sector and will increase from 0.5 % to 5 % for civil servants).

Italy: for those workers covered by the new notional defined-contributions systems, from 2008 the standard retirement age will be raised to 65 for men and 60 for women (before the 2004 reform, the age period was flexible from 57 to 65). Alternatively, they can retire with at least 40 years of contribution. For those with up to or more than 18 years of contributions at the end of 1995, it will still be possible to retire earlier (seniority pension). In 2004–07, there is a joint requirement on age (57) and years of contribution (35). In 2008–09, the age requirement will rise to 60, while in 2010–13, it will be possible to retire earlier for men aged 61 and from 2014 the minimum age will be 62 (still with 35 years of contribution). Alternatively, it is possible to retire with a minimum years of contribution (38 years in 2004–05, 39 years in 2006–07). From 2008, the minimum contribution period will increase to 40 years. Only women may continue to retire at 57 with 35 years of contribution, but the pension will be calculated according to the less favourable notional-defined contribution system. From 2004 to 2007, a bonus (32.7 % of gross wage, the equivalent of pension contributions normally paid) is received by private sector workers who postpone their retirement. This extra income is not taxed.

Austria: the minimum retirement age for men will increase from 61.5 years to 65 years; for women the age will rise from 56.5 to 60 years. The increase will be phased in gradually beginning in July 2004 and by 2017 early-retirement will be eliminated. Meanwhile, larger penalties are imposed on early-retirement (4.2 % of reduction per year instead of the former 3.75 %, up to a maximum of 15 %), within the ages of 62–65. The statutory retirement age for women will be increased gradually between 2019 and 2034 to reach the retirement age for men at 65. A bonus for later retirement up to the age of 68 years (4.2 % per year, up to a maximum of 10 %) is introduced. From January 2005, harmonised guaranteed pension accounts will be established (act on the harmonisation of pension system, approved in November 2004). In the new system of individual, transparent pension accounts (with a clear reporting of benefits accrued from contributions paid in and other credits acquired, such as from active child and elderly care) the key rule will be: 45-65-80 (45 contribution years, retirement age of 65 and a gross replacement rate of 80 % of average life earnings). Pension benefits will be adjusted to consumer price index, starting in 2006.

Finland: since 2005, flexible old-age retirement (63 to 68 years) with an increase of the accrual rate to 4.5 % for those continuing to work beyond the age of 63 (currently 2.5 % for those working beyond 60). The ceiling on the maximum pension is abolished. A new early-retirement scheme is introduced with a minimum age of 62 and an actuarial reduction of 0.6 % per month prior to 63. For those born after 1950, the unemployment pension scheme will be gradually abolished from 2009 to 2014, and will be replaced by an extended period of unemployment benefit (the so-called 'unemployment pipeline') for the age of 60 to 65 (currently 57 to 65).

Sweden: pension reform was approved by Parliament in 1999. Under the new notional defined contribution system it is possible to retire from age 61 onwards, with an actuarially fair compensation for those who stay on in the labour force. Every year of contributions is important for the pension benefit. A person with an average wage will increase his yearly pension benefit by nearly 60 % if he postpones his retirement decision till age 67 compared with leaving at age 61. Yearly 'statement of account' informs the individual of costs and benefits of retirement. The new system is phased in gradually for generations born between 1938 and 1953, and will affect generations born after 1953 fully.

United Kingdom: between 2010 and 2020, women's pensionable age will gradually rise from 60 to 65, as for men.

Czech Republic: before the pension reform in 2003, men retired at the age of 60 and women at 53–57, depending on the number of children (one year less per child). Since January 2004, the age of retirement is increased constantly over time (two months per year for men and four months per year for women) to reach 63 years for men and 59–63 for women (still depending on the number of children) in 2013. The

so-called 'temporarily reduced pension', an early-retirement scheme, has been abolished, while the so-called 'permanently reduced pension' scheme (allowing early-retirement up to three years before the normal retirement age) is still in place but with a stronger reduction of the pension benefit (0.9 % for each 90 calendar days from the statutory retirement age).

Estonia: changes in the PAYG system include raising the retirement age for females to 63 by 2016 and revising the benefit formula. Legislation passed in mid-September 2001 set up mandatory individual accounts in the second tier (starting operations in mid-2002), while voluntary accounts became the new third tier.

Hungary: the standard retirement age for women will increase to 60 by 2005, 61 by 2007 and 62 by 2009 (before the reform it was 57).

Lithuania: the standard minimum retirement age for women (55 years and 4 months in 1995, 58.5 years in 2003) will increase by six months each year to reach 60 years in 2006. The retirement age for men was gradually increased (two months per year) from 60 years and two months (in 1995) up to 62.5 in 2003.

Latvia: under the new three-pillar system with a defined contribution PAYG based on notional accounts, set up in 1996, the standard age requirement for women (59.5 years in 2003) will increase by six months each year to reach 62 by 2008. The requirement for men reached 62 in 2003.

Poland: all insured people born after 1948 are covered by the new defined contribution PAYG with notional accounts and three-pillar pension system. The standard retirement age remains 65 for male and 60 for female. There will be no early pension for those born after 1948 and retiring after 2006, with the exception of those who worked long enough (20 years) in special conditions.

Slovakia: under the reformed (from 2004) three-pillar pension system, the standard retirement age will increase from 60 to 62 for men (nine months per year) by 2007 and from the former 57 (reduced by one year per child, to reach age 53) to 62 for women by 2016. A worker can still retire earlier if the combined benefit from the first and the newly introduced second pillar equal at least 60 % of the minimum living standard determined by the government. In this case, the pension is reduced by 6 % per year while a bonus of 6 % is introduced for those postponing retirement. It is also possible to get pension benefit while working.

Slovenia: under the new pension and disability insurance act which entered into force on 1 January 2000 (a three-pillar modernised defined benefit PAYG system plus compulsory and voluntary supplementary funded schemes), the standard retirement age has been increased. It is now possible to retire between 58 and 63 for men and at 61 for women (the minimum retirement age was 53 for women and 58 for men before the reform). Women that worked before the age of 18 can retire earlier (but not before the age of 55). Special regulations reduce the age of retirement to 55 in certain cases (before the reform it was possible even below 50). The minimum retirement age is raised from 53 to 58 for women (the same level for men). The accrual rate was reduced by 2 % to 1.5 % since 2000. Later retirement has been encouraged: a person who fulfils the requirement for pension but continues to work beyond the age 63/61 will receive an additional pension increase (3.6 % the first additional year, 2.4 % the second year and 1.2 % in the third, plus the normal rate of accrual, 1.5 % per year).

2.3.2.2. The modelling of pension reform in the baseline labour force projection

Pension reform is modelled by considering the likely impact of reforms on the probability of withdrawing from the labour market when ageing due to changes in the statutory 'normal' age of retirement, or 'early-retirement age' (that is the age at which benefits are first available), or in the rules governing pension rights. This likely impact is incorporated in the baseline labour force projection by means of the probabilistic model already used by the European Commission for the calculation of the **average exit age** from the labour force, using estimated cumulative probabilities of exit from the labour market ([1]).

([1]) For details on the methodology used, see Carone (2005).

More specifically, the analysis of the distribution of the probability of retiring at different ages (from age 50 to 71, separately for males and females) is done for the period 1998 to 2003 for the 17 EU Member States concerned. Then, the relationship between changes in the parameters of the pension systems and the retiring behaviour of older workers is examined. Existing empirical evidence is also taken into account, such as econometric estimates of the impact of changes in the implicit tax rate on continuing to work and retirement behaviour ([1]).

As a starting point, the probability of retirement and the cumulative distribution function (the cumulated distribution of probability of retirement) observed in 2003 are analysed, along with the calculated **average exit age** (see Table 2.5). While the age profiles of the probability of retirement vary across countries, because of differences in the pension system, a common feature is that the distribution is clearly skewed towards the earliest possible retirement age. The distribution of the retirement age presents evidence of spikes at both the minimum age for an early-retirement and the normal/average retirement age, which is either 60 (especially for women) or 65 ([2]).

The expected postponement of retirement is summarised by the difference in the average exit age from the labour force in 2025 (see Table 2.5). As a result of recently enacted pension reforms, the effective retirement age for males is expected to increase by as much as 2.2 years in Poland, 2 years in Germany, Italy and France, 1.8 years in Finland, 1.6 years in Austria, 1.4 years in Slovakia and around 1 year in Spain and Belgium. The expected postponement of retirement for females is similar, or even higher than for males. It is of course much higher in those countries where the main reform is the progressive alignment of the retirement age of females to that of males, such as Belgium, the United Kingdom, Lithuania and Slovakia.

([1]) See Börsch-Supan (2003), Duval (2003), Gruber and Wise (2005).

([2]) See Carone (2005) for a detailed description of the probability of retirement and the average exit of age.

Table 2.5

Impact of pension reforms on the average exit age from the labour force

	Average exit age from the labour force in 2025		Impact of pension reforms on average exit age from the labour force	
	Males	Females	Males	Females
BE	60.2	60.2	0.8	1.7
DK	63.5	62.4	0.0	0.0
DE	63.8	62.5	2.1	1.7
EL	62.5	62.2	0.0	0.0
ES	63.4	62.4	1.1	0.3
FR	61.8	61.5	2.0	2.1
IE	64.4	64.4	0.0	0.0
IT	62.4	60.9	2.0	0.9
LU	59.7	59.3	0.0	0.0
NL	62.3	61.0	0.0	0.0
AT	61.7	60.6	1.6	1.8
PT	64.2	63.6	0.0	0.0
FI	63.4	62.5	1.8	2.0
SE	64.6	63.9	0.7	0.2
UK	63.8	63.3	0.0	1.1
CY	65.3	61.8	0.0	0.0
CZ	63.1	61.0	1.7	2.0
EE	63.1	62.1	0.0	0.3
HU	62.2	61.1	1.2	2.7
LT	63.5	62.0	0.2	1.6
LV	63.1	61.9	0.0	0.4
MT	60.3	56.1	0.0	0.0
PL	61.8	59.6	2.2	2.0
SK	61.6	59.5	1.4	3.4
SI	61.8	60.2	0.0	1.8

Source: Economic and Financial Affairs DG.

2.3.2.3. Simulating the impact of the pension reforms on the participation rate of older workers

Methodology used to assess the impact of pension reform on the participation rate of older workers

The impact of pension reforms on the participation rate of older workers is simulated by calculating the impact of reforms that have either increased the statutory retirement age or removed early-retirement schemes on the participation rates. This is made as follows:

- first, by changing the probability of retiring according to our considered judgement about the factors that affect the retirement decision ([1]). More specifically, the distribution of the frequency (density function and cumulative distribution function) observed in 2003 is shifted. For example, let us assume that in a given country a concentration of the probability of retiring is observed at age 58 over the last five to six years, while a reform removes early-retirement schemes or increases the minimum years of contribution. To calculate the impact of this reform, we shift the peak of the retirement probability away from the previously observed peak at 58 years and closer to the statutory average age (usually 65 for men and 60 for women) ([2]). Within the same methodological framework, another simulation is done, by applying a progressive shift of the probability distribution of retirement for females. This is done for Member States that have recently legislated a progressive increase of the statutory retirement age of females to that of males (usually from 60 to 65), such as Belgium, the United Kingdom and some others, especially EU-10 Member States;
- secondly, the new probabilities of retirement resulting from the simulation are converted into a change in exit rates (following the algorithm presented in Annex 5);
- finally, the observed exit rates (the average over the period 1998–2003) are replaced (at a different time for each country, in line with the timing of reform implementation) with the new estimated exit rates in the cohort-based projection model. Consequently, the participation rates initially estimated, without taking into account the impact of pension reforms, have changed. The magnitude of the expected impact of pension reforms can be inferred by comparing the participation rates calculated with and without the effect of reforms.

Estimates of the impact of pension reforms

Table 2.6 shows the estimated impact of pension reforms on participation rates. Pension reforms are projected to have a sizeable impact on the labour market participation of older workers (aged 55 to 64) in most of the EU Member States in which future implementation of already enacted pension reforms is planned. A stronger impact is expected from changes in the parameters affecting the statutory age of retirement. For example, the labour participation of the group aged 55 to 64 in Italy is projected to record an additional increase of almost eight percentage points by 2025 (ceteris paribus) and five percentage points between 2025 and 2050, which gives an overall impact of about 13 percentage points between 2003 and 2050. This is the estimated impact of the recent reform postponing the statutory age of retirement (to enter into force in 2008) and the gradual move towards a notional defined contribution pension system ([3]). In Germany and Austria, the impact would be around 15 % by 2025. In Slovakia, the impact is estimated to be as much as 21 percentage points by 2025.

Given that changes in overall participation rates are mainly driven by changes in the labour force attachment of prime-age workers, as this group accounts for more

([1]) As regards the impact of delay in eligibility ages, recent estimates by Gruber and Wise (2002) for France, Belgium and the Netherlands suggest, for example, that in these three countries a three-year delay in eligibility ages to old-age and early-retirement schemes could raise the labour force participation of the 55–64 age group by about 20 percentage points. According to Duval (2003), 'past experience suggests a more moderate outcome. For instance, the five-year increase in eligibility ages in New Zealand throughout the 1990s led to a 15 percentage point increase in labour force participation'.

([2]) Technically speaking, the shift in the distribution function of retirement probability can be done rather mechanically in this way. The retirement probability for a generic cohort of people is given by a density function $f(x)$. The cumulated probability is given by a cumulative distribution function $F(x)$. Any time a reform of the pension system (such as changes in the statutory retirement age) has an effect on the age of retirement, it has an effect on the density function. Thus, for example, if the possibility of retirement at age 57 ($x = 57$) is no longer possible and the new age of statutory retirement becomes $n = 60$ then $f(x) = 0$ for $x < n$. Thus, to calculate the new density function $d(x)$, one can use a shift in the cumulative distribution function of $f(x)$. The new density function $d(x)$ is s-$f(x)$, where $s = 1/(1-F(n))$. For a similar approach, see Baldacci and Tuzi (2003).

([3]) For an empirical analysis of the retirement decision of Italian employees see Brugiavini and Peracchi (2003). According to their prediction of retirement probabilities under alternative policies that change social security wealth and derived incentive measures, the male employment rate at age 55 is projected to be 84.3 under the Dini/Prodi pension regime (1995 and 1997 reforms) as compared with 65.6 under the pre-1992 reform regime, see also Brugiavini and Peracchi (2005).

Table 2.6

Estimated impact of pension reforms on participation rates (2025–50), in percentage points (comparison of projections with and without incorporating recent pension reforms)

Male	BE		DE		ES		FR		IT		AT		FI		SE		UK		EU-15	
Age	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*
15–64	1.8	1.7	5.2	4.9	1.7	1.9	2.3	2.7	3.3	4.3	3.3	3.9	2.5	2.6	0.8	0.8	0.0	0.0	2.2	2.2
15–71	1.5	1.4	4.9	4.6	2.0	2.1	2.6	3.1	3.0	3.9	3.1	3.6	3.1	3.2	0.8	0.8	0.0	0.0	2.2	2.2
55–64	6.4	6.5	18.2	18.9	5.5	6.4	10.4	13.0	11.1	15.8	14.4	18.1	10.7	11.0	4.9	4.9	0.0	0.0	8.7	8.7
Female																				
Age	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*
15–64	3.2	3.2	2.5	1.8	0.5	0.3	2.4	3.0	2.8	4.3	3.6	4.0	3.6	3.6	0.5	0.1	2.1	2.3	2.1	2.1
15–71	2.7	2.6	2.2	1.5	0.5	0.4	2.4	3.2	2.3	3.6	3.2	3.5	3.4	3.5	0.1	0.2	1.7	1.8	1.8	1.9
55–64	10.8	11.3	13.5	12.8	1.8	1.7	10.5	14.4	4.7	9.8	15.3	17.9	13.9	14.1	1.2	0.5	8.8	9.8	7.8	9.1
Total																				
Age	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*
15–64	2.5	2.4	3.9	3.4	1.1	1.1	2.3	2.9	3.0	4.3	3.4	3.9	3.0	3.1	1.0	0.4	1.0	1.1	2.1	2.2
15–71	2.1	2.0	3.5	3.0	1.2	1.3	2.5	3.1	2.7	3.7	3.1	3.6	3.2	3.3	0.9	0.4	0.8	0.9	2.0	2.1
55–64	8.6	8.9	15.8	15.8	3.6	4.1	10.4	13.7	7.8	12.8	14.9	18.0	12.3	12.5	3.1	2.7	4.5	4.9	8.2	9.3

Male	CZ		EE		HU		LT		LV		PL		SK		SI		EU-10		EU-25	
Age	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*
15–64	2.4	3.0	1.7	1.9	1.0	1.2	0.0	0.0	0.7	0.7	3.3	6.4	2.3	3.2	2.4	2.9	2.4	2.4	2.3	2.3
15–71	2.3	2.9	2.0	2.1	1.6	1.9	0.3	0.4	0.6	0.6	2.9	5.7	2.0	2.8	2.9	3.5	2.3	2.3	2.2	2.2
55–64	13.3	13.2	5.5	6.4	6.2	6.0	0.0	0.0	0.5	0.6	15.2	22.1	12.2	12.1	10.5	12.5	11.7	11.7	9.1	9.1
Female																				
Age	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*
15–64	3.5	0.0	0.5	-0.4	3.9	0.0	3.7	0.0	1.5	0.0	2.7	0.0	7.4	0.0	2.5	0.0	3.2	4.5	2.2	2.5
15–71	3.3	0.0	0.5	-0.4	3.5	0.0	2.9	0.0	0.8	0.0	2.5	0.0	6.5	0.0	3.0	0.0	2.9	4.0	2.0	2.2
55–64	16.5	0.0	1.8	-0.4	17.4	0.0	15.7	0.0	6.1	0.0	11.5	0.0	29.7	0.0	10.2	0.0	14.0	15.6	8.7	10.2
Total																				
Age	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*	*2025*	*2050*
15–64	2.9	3.6	1.1	1.1	2.5	2.9	1.9	2.3	1.1	1.2	3.0	5.4	4.8	6.3	2.4	3.4	2.8	4.4	2.3	2.5
15–71	2.8	3.4	1.2	1.3	2.6	3.1	1.7	2.0	0.7	0.7	2.7	4.8	4.3	5.4	2.9	3.8	2.6	4.0	2.1	2.4
55–64	14.9	14.9	3.6	4.1	12.2	12.3	8.7	8.8	3.6	3.5	13.3	18.0	21.4	20.9	10.3	14.0	12.9	15.5	8.9	10.4

Source: Economic and Financial Affairs DG.

than 70 % of the total labour force, even such high projected increases in the participation rates of older workers will have only a limited impact on the overall participation rate. For example, the 15 % increase in the participation rate of workers aged 55 to 64 years projected in Germany will lead to an increase in the overall participation rate (workers aged 15 to 64 years) of about 3.5 %.

2.4. Main results of the projection of labour market participation rates

2.4.1. Projection of participation rates

The methodology used leads to project an upward shift in the participation rates of older age groups (mainly from the age of 45) that is particularly strong for women while, by assumption, the participation rate profiles of the young are assumed to remain generally stable, or increase moderately over time.

Table 2.7 presents the projection of the overall participation rates. To summarise the baseline scenario projection, the overall participation rate (for the age group 15 to 64) in the EU-25 is projected to increase by about six percentage points over the period 2003–50 (from 69.4 % in 2003 to 74.6 % in 2025, and to 75.2 % in 2050).

Table 2.8 provides an overview of changes in different age and sex groups. The biggest increase in participation rates is projected for older workers (around 22 percentage points for females and 13 percentage points for males) in both the EU-25 and EU-15, and for women (by 8.4 percentage points in the EU-25 as compared to 3.3 percentage points for males). As a result of these dynamics, the gap between male and female participa-

Table 2.7

Projected changes in participation rates

Country	Age group 15 to 64					Age group 15 to 71				
	Level	Level	Changes in participation rates			Level	Level	Changes in participation rates		
	2003	2050	2003–50	2003–25	2025–50	2003	2050	2003–50	2003–25	2025–50
BE	65.0	70.0	*5.0*	*4.3*	*0.8*	59.2	62.0	*2.8*	*2.0*	*0.8*
DK	79.3	81.3	*2.1*	*1.4*	*0.7*	73.9	73.9	*0.0*	*– 1.0*	*1.0*
DE	72.6	79.0	*6.4*	*6.1*	*0.3*	66.0	69.8	*3.8*	*4.0*	*– 0.2*
EL	65.3	70.0	*4.6*	*4.5*	*0.1*	60.1	61.1	*1.1*	*3.1*	*– 2.1*
ES	67.5	76.8	*9.2*	*8.0*	*1.2*	62.2	66.3	*4.0*	*6.3*	*– 2.3*
FR	69.3	73.1	*3.8*	*2.4*	*1.4*	63.7	65.5	*1.8*	*0.5*	*1.3*
IE	68.8	77.2	*8.4*	*7.4*	*1.0*	65.4	69.3	*3.9*	*5.4*	*– 1.6*
IT	62.9	70.2	*7.4*	*5.2*	*2.2*	57.1	61.4	*4.3*	*3.6*	*0.7*
LU	65.0	68.3	*3.4*	*2.8*	*0.5*	60.1	61.9	*1.8*	*1.0*	*0.7*
NL	76.4	80.5	*4.0*	*2.6*	*1.4*	71.3	72.9	*1.6*	*– 0.2*	*1.8*
AT	72.2	79.1	*6.9*	*5.6*	*1.3*	67.0	69.6	*2.7*	*2.4*	*0.2*
PT	72.7	77.7	*5.0*	*4.4*	*0.5*	68.0	69.9	*1.8*	*3.3*	*– 1.4*
FI	74.5	79.6	*5.1*	*4.4*	*0.7*	68.9	71.1	*2.2*	*1.3*	*0.9*
SE	77.5	81.1	*3.6*	*3.3*	*0.3*	71.8	73.8	*2.0*	*1.5*	*0.5*
UK	75.3	78.3	*3.0*	*2.5*	*0.5*	70.2	70.9	*0.6*	*0.9*	*– 0.3*
CY	70.8	80.7	*9.9*	*10.9*	*– 1.0*	66.9	72.0	*5.1*	*7.9*	*– 2.8*
CZ	70.3	74.5	*4.2*	*6.8*	*– 2.6*	65.7	64.5	*– 1.2*	*3.6*	*– 4.8*
EE	70.1	76.1	*6.0*	*7.2*	*– 1.2*	64.8	68.0	*3.2*	*5.6*	*– 2.4*
HU	60.5	66.4	*5.9*	*8.0*	*– 2.2*	55.4	58.3	*2.9*	*5.6*	*– 2.7*
LT	70.0	77.1	*7.1*	*9.0*	*– 1.9*	64.4	68.4	*3.9*	*7.4*	*– 3.4*
LV	69.3	76.8	*7.4*	*9.3*	*– 1.9*	64.1	68.7	*4.6*	*7.8*	*– 3.1*
MT	58.6	66.0	*7.4*	*8.6*	*– 1.2*	54.3	57.7	*3.4*	*5.2*	*– 1.8*
PL	63.8	71.0	*7.2*	*9.8*	*– 2.5*	59.6	61.0	*1.4*	*5.6*	*– 4.2*
SK	70.1	73.9	*3.8*	*8.1*	*– 4.3*	65.5	62.4	*– 3.2*	*4.1*	*– 7.2*
SI	67.3	73.4	*6.1*	*6.7*	*– 0.6*	62.2	63.8	*1.7*	*3.9*	*– 2.2*
EU-25	*69.6*	*75.5*	*5.9*	*5.3*	*0.6*	*64.1*	*66.8*	*2.7*	*3.2*	*– 0.5*
EU-15	*70.4*	*76.1*	*5.7*	*4.6*	*1.1*	*64.7*	*67.6*	*2.9*	*2.8*	*0.1*
Euro area	*69.1*	*75.3*	*6.2*	*5.1*	*1.1*	*63.3*	*66.6*	*3.2*	*3.2*	*0.1*
EU-10	*65.4*	*71.8*	*6.4*	*8.9*	*– 2.5*	*60.9*	*62.1*	*1.2*	*5.3*	*– 4.1*

Source: Economic and Financial Affairs DG.

tion rates is projected to gradually narrow down, especially in countries with a higher gap in 2003, such as Spain, where a gap of 25 percentage points in 2003 is projected to narrow down to 12 percentage points in 2050, Greece (from 26 to 16 percentage points), and Ireland (down from 21 percentage points to 12 percentage points).

2.4.2. Projection of labour supply

The labour force over the next 50 years is projected by interacting the projections of population and of rates of participation by gender/age group. To sum up the outcome of the baseline scenario, the overall labour force (aged 15 to 64) in the EU-25 is projected to increase by 5 % from 2003 to 2025. In terms of people, this means an increase in labour force of roughly 10.5 million (see Table 2.9 and Graph 2.1).

The increase of labour supply over the period 2003 to 2025 is mainly due to the increase in female labour supply, while the male labour force is projected to remain substantially unchanged (only about two million additional people). However, the positive trend in female labour supply is projected to reverse during the period 2025–50 and, along with the drop in male labour supply, the overall labour force is expected to decrease by as much as 12 %, equivalent to around 27.5 million people (16.5 million if compared with the level in 2003).

Table 2.8

Projected changes in participation rate by age groups, 2003–50

Country	Total				Male				Female			
	Total	Young	Prime age	Older	Total	Young	Prime age	Older	Total	Young	Prime age	Older
	(15-64)	*(15-24)*	*(25-54)*	*(55-64)*	*(15-64)*	*(15-24)*	*(25-54)*	*(55-64)*	*(15-64)*	*(15-24)*	*(25-54)*	*(55-64)*
BE	5.0	1.7	6.3	16.0	1.6	1.7	3.3	7.9	8.5	1.5	9.3	23.8
DK	2.1	3.0	1.9	6.2	1.8	4.5	1.7	4.0	2.2	1.3	2.0	8.3
DE	6.4	2.0	3.6	24.0	5.4	2.6	2.3	22.8	7.5	1.3	5.1	25.2
EL	4.6	– 1.4	5.3	10.2	– 0.1	– 1.8	0.4	0.0	9.2	– 1.0	10.2	18.8
ES	9.2	– 2.6	10.3	20.3	3.1	– 2.1	3.6	7.2	15.3	– 3.1	16.9	32.2
FR	3.8	0.9	3.8	15.8	2.0	0.5	1.6	14.1	5.3	1.3	5.7	17.5
IE	8.4	– 0.3	7.7	19.4	3.9	– 0.4	3.5	6.1	12.8	– 0.3	11.8	33.1
IT	7.4	– 0.8	6.3	24.8	4.3	– 0.7	2.5	21.9	10.2	– 0.9	9.7	26.8
LU	3.4	0.0	6.7	11.4	– 0.7	0.8	2.1	6.6	7.5	– 0.8	11.4	16.3
NL	4.0	1.0	5.3	10.5	– 0.8	0.7	– 0.2	2.7	9.0	1.3	10.9	18.4
AT	6.9	1.6	5.1	27.3	3.9	1.0	1.4	24.0	9.8	2.3	8.7	30.1
PT	5.0	– 1.2	5.1	12.5	1.9	– 0.5	1.7	5.6	7.8	– 1.9	8.2	18.2
FI	5.1	1.3	4.7	14.1	4.8	0.9	4.4	14.4	5.3	1.8	5.0	13.7
SE	3.6	3.7	3.5	6.9	3.3	3.0	2.9	7.4	3.9	4.4	4.0	6.3
UK	3.0	1.9	3.2	8.1	0.1	1.7	0.5	1.1	5.7	2.1	5.5	14.7
CY	9.9	5.1	8.6	18.0	6.5	5.8	2.0	11.8	13.0	4.3	14.6	22.8
CZ	4.2	– 0.8	2.8	15.6	1.9	– 1.1	0.6	9.1	6.4	– 0.5	5.2	20.8
EE	6.0	2.0	5.5	7.0	5.2	2.4	5.3	1.4	6.5	1.6	5.3	10.9
HU	5.9	0.1	4.6	20.6	4.0	0.2	3.3	15.8	7.5	0.1	5.8	23.9
LT	7.1	2.3	4.6	17.1	6.4	– 0.2	4.2	12.8	7.6	4.8	4.9	19.3
LV	7.4	3.5	6.6	12.7	7.5	3.6	7.3	10.0	7.2	3.3	5.7	14.1
MT	7.4	2.6	13.9	0.9	0.2	0.4	2.9	– 2.2	15.0	4.8	25.7	2.9
PL	7.2	3.0	8.2	19.4	6.6	2.8	5.6	20.6	7.8	3.2	10.6	17.2
SK	3.8	0.7	3.4	22.9	1.9	– 0.1	1.8	12.2	5.6	1.4	4.9	30.8
SI	6.1	– 2.6	4.7	28.8	4.4	– 3.8	4.0	23.8	7.9	– 1.2	5.5	33.2
EU-25	*5.9*	*2.2*	*5.3*	*17.7*	*3.3*	*2.0*	*2.3*	*13.2*	*8.4*	*2.3*	*8.1*	*21.6*
EU-15	*5.7*	*1.4*	*5.1*	*17.8*	*2.8*	*1.3*	*1.9*	*12.9*	*8.5*	*1.4*	*8.2*	*22.2*
Euro area	*6.2*	*0.7*	*5.6*	*20.1*	*3.2*	*0.7*	*2.2*	*15.5*	*9.1*	*0.6*	*8.9*	*24.3*
EU-10	*6.4*	*1.7*	*6.2*	*18.3*	*5.1*	*1.3*	*4.2*	*16.0*	*7.4*	*2.1*	*8.1*	*19.3*

Source: Economic and Financial Affairs DG.

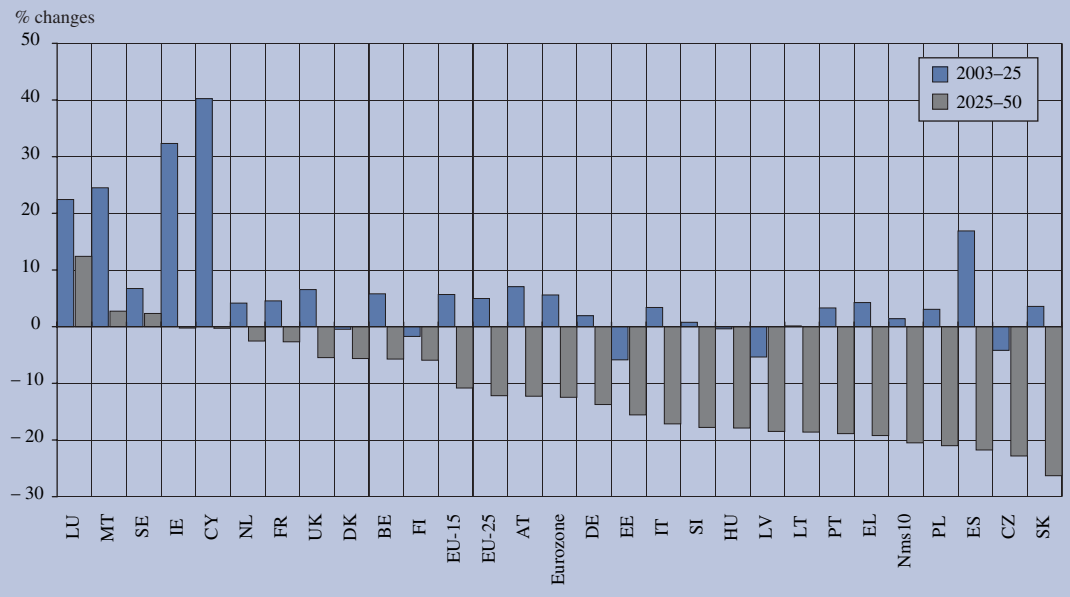
In the medium term (2003 to 2025), most EU-25 countries, except Denmark, Finland, the Czech Republic, Estonia, Hungary and Latvia, are projected to record an increase in labour supply (see Graph 2.1). This trend is projected to reverse in the second part of the projection period (2025 to 2050), when most countries are projected to record a decrease, except Luxembourg (+ 12.4 %), Sweden (+ 2.5 %) and Malta (+ 2.7 %). As already mentioned, the projected negative labour force growth over the period 2025–50 is to be ascribed almost exclusively to negative demographic developments, given that the participation rates over the period 2025–50 are projected to either remain broadly constant or slightly continue to increase, except for EU-10 Member States where a moderate decrease is projected.

As a result of population ageing, the labour force will also age. The baby-boom generation (born between 1946 and 1965) will reach retirement age over the period 2011–30 and will be replaced by a much less numerous baby-bust generation born in the 1970s, 1980s and early 1990s. In the EU-25, the share of the older labour force, that is active people aged 55 to 71 years, is projected to increase from 11 % in 2003 up to a maximum of about 19 % around 2025, and changes very little in the following years. The peak in ageing of the labour force diverges across countries. For example, in Germany it is reached in 2025 (at 23.5 %). In the following 10 years, as older workers of the baby-boom generation retire, the share is projected to go down a bit to 19.5 % in 2035, and start to increase again in the following years. In Italy, the peak of older labour force is projected in 2032–33 (with a share of 22.3 % of the labour force). Spain will reach a higher peak (25.5 %) in 2035, while Portugal will record the highest peak in the EU-25 (26.4 %) in 2038, according to the projections.

2.4.3. Decomposing the population composition effect and the participation effect on labour supply

Tables 2.10 and 2.11 show a decomposition of projected changes of the aggregate participation rate and the overall labour force over the period 2003 to 2050, in order to identify the respective influences of projected changes in participation rates and working-age population, focusing on both age and gender dimensions. The negative effect of the population composition on the overall participation rate (the population effect is negative in all EU-25 Member States), is very clear and is caused by projected developments in the prime-age population to a great extent. The participation effect, due to changes in the participation rates of specific cohorts, is generally positive. The participation effect is moderately negative for the young in some countries, notably Greece, Spain, Ireland, Italy and Portugal.

Graph 2.1: **Labour force projections, 2003–50 (percentage change of total people aged 15 to 64)**



Source: Economic and Financial Affairs DG.

Table 2.9

Labour supply projections, 2003–50 (age group: 15 to 64)

	Males					Females					Total						
	Number of persons (1 000)			Annual growth rate		Number of persons (1 000)			Annual growth rate		Number of persons (1 000)			Annual growth rate		% Change	
	2003	2025	2050	2003–25	2025–50	2003	2025	2050	2003–25	2025–50	2003	2025	2050	2003–25	2025–50	2003–25	2025–50
BE	2 493	2 508	2 381	*0.03*	*– 0.21*	1 918	2 159	2 020	*0.54*	*– 0.27*	4 411	4 667	4 401	*0.26*	*– 0.23*	*5.8*	*– 5.7*
DK	1 512	1 502	1 428	*– 0.03*	*– 0.20*	1 321	1 317	1 234	*– 0.01*	*– 0.26*	2 832	2 820	2 661	*– 0.02*	*– 0.23*	*– 0.5*	*– 5.6*
DE	22 449	22 393	19 278	*– 0.01*	*– 0.60*	17 955	18 796	16 255	*0.21*	*– 0.58*	40 404	41 189	35 533	*0.09*	*– 0.59*	*1.9*	*– 13.7*
EL	2 934	2 915	2 333	*– 0.03*	*– 0.89*	1 946	2 172	1 778	*0.50*	*– 0.80*	4 880	5 087	4 111	*0.19*	*– 0.85*	*4.3*	*– 19.2*
ES	11 446	12 449	9 704	*0.38*	*– 0.99*	7 807	10 058	7 908	*1.16*	*– 0.96*	19 253	22 507	17 613	*0.71*	*– 0.98*	*16.9*	*– 21.7*
FR	14 559	14 999	14 694	*0.14*	*– 0.08*	12 328	13 113	12 671	*0.28*	*– 0.14*	26 887	28 112	27 365	*0.20*	*– 0.11*	*4.6*	*– 2.7*
IE	1 070	1 335	1 328	*1.01*	*– 0.02*	780	1 115	1 115	*1.63*	*0.00*	1 851	2 449	2 444	*1.28*	*– 0.01*	*32.3*	*– 0.2*
IT	14 295	14 232	11 801	*– 0.02*	*– 0.75*	9 762	10 639	8 808	*0.39*	*– 0.75*	24 057	24 871	20 609	*0.15*	*– 0.75*	*3.4*	*– 17.1*
LU	115	132	149	*0.65*	*0.47*	81	107	120	*1.29*	*0.47*	196	239	269	*0.92*	*0.47*	*22.4*	*12.4*
NL	4 664	4 578	4 484	*– 0.09*	*– 0.08*	3 715	4 151	4 024	*0.51*	*– 0.12*	8 379	8 728	8 509	*0.19*	*– 0.10*	*4.2*	*– 2.5*
AT	2 191	2 254	1 999	*0.13*	*– 0.48*	1 764	1 980	1 716	*0.52*	*– 0.57*	3 955	4 234	3 715	*0.31*	*– 0.52*	*7.1*	*– 12.3*
PT	2 746	2 766	2 261	*0.03*	*– 0.80*	2 362	2 512	2 021	*0.28*	*– 0.86*	5 109	5 278	4 282	*0.15*	*– 0.83*	*3.3*	*– 18.9*
FI	1 350	1 328	1 253	*– 0.07*	*– 0.23*	1 244	1 222	1 146	*– 0.08*	*– 0.26*	2 594	2 549	2 399	*– 0.08*	*– 0.24*	*– 1.7*	*– 5.9*
SE	2 337	2 490	2 558	*0.29*	*0.11*	2 155	2 304	2 347	*0.30*	*0.07*	4 491	4 794	4 905	*0.30*	*0.09*	*6.7*	*2.3*
UK	15 987	16 715	15 867	*0.20*	*– 0.21*	13 372	14 566	13 710	*0.39*	*– 0.24*	29 359	31 280	29 577	*0.29*	*– 0.22*	*6.5*	*– 5.4*
CY	188	254	255	*1.37*	*0.02*	153	224	221	*1.76*	*– 0.05*	341	478	476	*1.55*	*– 0.01*	*40.2*	*– 0.3*
CZ	2 805	2 604	2 020	*– 0.34*	*– 1.01*	2 256	2 246	1 725	*– 0.02*	*– 1.05*	5 061	4 850	3 744	*– 0.19*	*– 1.03*	*– 4.2*	*– 22.8*
EE	327	307	266	*– 0.30*	*– 0.58*	315	298	245	*– 0.25*	*– 0.78*	642	605	511	*– 0.27*	*– 0.67*	*– 5.8*	*– 15.6*
HU	2 300	2 249	1 854	*– 0.10*	*– 0.77*	1 903	1 939	1 586	*0.08*	*– 0.80*	4 204	4 188	3 440	*– 0.02*	*– 0.78*	*– 0.4*	*– 17.9*
LT	823	815	680	*– 0.05*	*– 0.72*	800	811	644	*0.06*	*– 0.92*	1 623	1 626	1 324	*0.01*	*– 0.82*	*0.1*	*– 18.6*
LV	567	537	445	*– 0.25*	*– 0.74*	534	506	405	*– 0.25*	*– 0.89*	1 101	1 043	850	*– 0.25*	*– 0.81*	*– 5.3*	*– 18.5*
MT	110	122	124	*0.48*	*0.06*	50	76	80	*1.98*	*0.19*	159	198	204	*1.00*	*0.11*	*24.5*	*2.7*
PL	9 188	9 236	7 452	*0.02*	*– 0.85*	7 731	8 201	6 326	*0.27*	*– 1.03*	16 919	17 438	13 778	*0.14*	*– 0.94*	*3.1*	*– 21.0*
SK	1 444	1 447	1 084	*0.01*	*– 1.15*	1 210	1 302	942	*0.33*	*– 1.28*	2 654	2 748	2 026	*0.16*	*– 1.21*	*3.6*	*– 26.3*
SI	512	514	409	*0.01*	*– 0.90*	431	437	372	*0.06*	*– 0.64*	943	950	782	*0.03*	*– 0.78*	*0.8*	*– 17.8*
EU-25	*118 412*	*120 680*	*106 107*	*0.09*	*– 0.51*	*93 894*	*102 249*	*89 420*	*0.39*	*– 0.53*	*212 306*	*222 929*	*195 527*	*0.22*	*– 0.52*	*5.0*	*– 12.3*
EU-15	*100 148*	*102 597*	*91 518*	*0.11*	*– 0.46*	*78 511*	*86 209*	*76 875*	*0.43*	*– 0.46*	*178 659*	*188 805*	*168 393*	*0.25*	*– 0.46*	*5.7*	*– 10.8*
EU-10	*18 264*	*18 084*	*14 588*	*– 0.05*	*– 0.86*	*15 383*	*16 040*	*12 546*	*0.19*	*– 0.98*	*33 647*	*34 124*	*27 134*	*0.06*	*– 0.91*	*1.42*	*– 20.5*
Euro area	*80 313*	*81 890*	*71 666*	*0.09*	*– 0.53*	*61 663*	*68 022*	*59 584*	*0.45*	*– 0.53*	*141 976*	*149 912*	*131 250*	*0.25*	*– 0.53*	*5.6*	*– 12.4*

Source: Economic and Financial Affairs DG.

Table 2.10

Contribution to the overall change in participation rate, 2003–50 (changes in percentage) (*)

	Partici-pation rates in 2050	Total % change in participa-tion rates	Contribution of group-specific changes in participation rates to change in overall participation rate											Demographic effect						Interac-tion effect
			Total	Young	Prime age	Older	Male	Young	Prime age	Older	Female	Young	Prime age	Older	Total	Young	Prime age	Older	Male	Female	
BE	70.0	*5.0*	7.0	0.3	4.1	2.6	1.9	0.2	1.1	0.6	5.1	0.1	3.0	2.0	– 2.4	0.0	– 3.7	1.3	– 0.6	– 1.8	0.4
DK	81.3	*2.1*	2.9	0.5	1.2	1.2	1.3	0.4	0.6	0.4	1.5	0.1	0.6	0.8	– 0.9	1.9	– 3.5	0.7	– 0.6	– 0.6	0.1
DE	79.0	*6.4*	7.1	0.3	2.3	4.4	3.0	0.2	0.8	2.0	4.0	0.1	1.6	2.3	– 1.6	– 0.5	– 3.2	2.1	0.4	– 0.7	1.0
EL	70.0	*4.6*	4.7	– 0.3	3.4	1.7	– 0.1	– 0.2	0.1	0.0	4.8	– 0.1	3.2	1.6	– 0.8	– 1.2	– 2.2	2.7	2.3	– 1.0	0.5
ES	76.8	*9.2*	9.2	– 0.5	6.8	3.0	1.5	– 0.2	1.2	0.5	7.7	– 0.3	5.5	2.5	– 1.2	– 1.7	– 2.7	3.1	2.5	– 1.7	1.2
FR	73.1	*3.8*	5.0	0.2	2.5	2.4	1.6	0.0	0.5	1.1	3.4	0.1	1.9	1.4	– 1.9	– 0.2	– 3.4	1.7	0.0	– 2.2	0.6
IE	77.2	*8.4*	7.3	– 0.1	4.8	2.6	1.5	0.0	1.1	0.4	5.9	0.0	3.7	2.2	– 0.3	– 3.3	– 0.3	3.3	1.2	– 2.2	1.3
IT	70.2	*7.4*	8.3	– 0.1	4.1	4.5	2.7	– 0.1	0.8	1.9	5.6	– 0.1	3.2	2.5	– 1.9	– 0.1	– 3.2	1.3	0.8	– 1.2	0.8
LU	68.3	*3.4*	6.3	0.0	4.6	1.7	1.3	0.1	0.7	0.5	5.0	– 0.1	3.8	1.2	– 3.0	0.5	– 4.8	1.2	– 2.6	– 2.1	0.1
NL	80.5	*4.0*	5.4	0.2	3.5	1.7	0.2	0.1	– 0.1	0.2	5.2	0.1	3.6	1.5	– 1.5	1.2	– 4.1	1.5	– 0.9	– 1.5	0.1
AT	79.1	*6.9*	8.3	0.3	3.3	4.7	2.5	0.1	0.4	2.0	5.7	0.2	2.8	2.7	– 2.7	– 0.6	– 3.8	1.7	0.6	– 2.1	1.3
PT	77.7	*5.0*	4.9	– 0.2	3.3	2.0	0.9	– 0.1	0.5	0.4	4.0	– 0.2	2.7	1.6	– 0.7	– 1.3	– 2.4	3.0	2.9	– 1.3	0.6
FI	79.6	*5.1*	5.8	0.3	3.0	2.6	2.8	0.1	1.4	1.3	3.0	0.2	1.6	1.3	– 1.0	– 0.1	– 2.7	1.7	0.6	– 0.8	0.3
SE	81.1	*3.6*	4.1	0.7	2.2	1.3	1.9	0.3	0.9	0.7	2.2	0.4	1.2	0.6	– 0.6	0.3	– 2.5	1.5	– 0.4	– 1.5	0.1
UK	78.3	*3.0*	3.7	0.4	2.0	1.4	0.4	0.2	0.2	0.1	3.2	0.2	1.8	1.3	– 1.0	– 0.9	– 2.9	2.8	1.2	– 2.3	0.3
CY	80.7	*9.9*	9.0	1.2	5.3	2.6	2.1	0.7	0.6	0.8	6.9	0.5	4.7	1.7	– 0.3	– 2.8	– 2.6	5.1	2.2	– 3.6	1.2
CZ	74.5	*4.2*	4.2	– 0.2	1.8	2.7	0.8	– 0.1	0.2	0.7	3.4	– 0.1	1.6	1.9	– 1.2	– 1.5	– 3.0	3.4	2.7	– 1.0	1.1
EE	76.1	*6.0*	4.8	0.4	3.4	1.1	1.9	0.3	1.6	0.1	2.9	0.2	1.7	1.0	0.8	– 2.2	– 1.3	4.3	5.0	– 0.9	0.3
HU	66.4	*5.9*	6.3	0.0	2.9	3.5	2.2	0.0	1.0	1.2	4.1	0.0	1.8	2.2	– 1.6	– 0.9	– 2.5	1.8	1.7	– 1.2	1.1
LT	77.1	*7.1*	5.9	0.5	2.9	2.6	2.1	0.0	1.3	0.8	3.8	0.5	1.6	1.7	– 0.3	– 1.9	– 3.7	5.3	3.8	– 2.2	1.4
LV	76.8	*7.4*	6.8	0.8	4.0	2.1	3.3	0.4	2.2	0.7	3.5	0.4	1.8	1.4	– 0.2	– 2.4	– 1.6	3.8	4.6	– 0.8	0.7
MT	66.0	*7.4*	9.4	0.6	8.6	0.1	0.8	0.0	0.9	– 0.2	8.6	0.5	7.9	0.3	– 1.6	– 2.3	– 1.2	1.9	– 0.5	– 1.3	– 0.3
PL	71.0	*7.2*	8.3	0.7	5.1	2.5	3.3	0.3	1.8	1.2	4.9	0.4	3.3	1.2	– 3.0	– 2.9	– 3.9	3.8	2.7	– 2.8	1.8
SK	73.9	*3.8*	5.2	0.2	2.1	3.0	1.3	0.0	0.6	0.7	3.9	0.2	1.5	2.2	– 4.3	– 3.2	– 4.9	3.8	3.2	– 3.7	2.8
SI	73.4	*6.1*	6.9	– 0.5	3.0	4.4	2.7	– 0.4	1.3	1.8	4.2	– 0.1	1.7	2.6	– 3.0	– 1.3	– 3.7	1.9	0.2	– 1.4	2.2
EU-25	*75.5*	*5.9*	*6.7*	*0.4*	*3.4*	*2.9*	*2.0*	*0.2*	*0.7*	*1.1*	*4.7*	*0.2*	*2.6*	*1.8*	*– 1.6*	*– 0.9*	*– 3.1*	*2.4*	*1.1*	*– 1.6*	*0.8*
EU-15	*76.1*	*5.7*	*6.5*	*0.3*	*3.3*	*3.0*	*1.8*	*0.1*	*0.6*	*1.1*	*4.7*	*0.1*	*2.6*	*1.9*	*– 1.5*	*– 0.5*	*– 3.1*	*2.1*	*0.7*	*– 1.5*	*0.6*
EU-10	*71.8*	*6.4*	*7.0*	*0.4*	*4.0*	*2.7*	*2.6*	*0.2*	*1.3*	*1.1*	*4.4*	*0.2*	*2.6*	*1.6*	*– 2.3*	*– 2.3*	*– 3.5*	*3.5*	*2.6*	*– 2.3*	*1.6*

(*) Age group: 15 to 64.

Source: Economic and Financial Affairs DG.

Table 2.11

Contribution to the overall change in labour force, 2003–50 (changes in percentage) (*)

	Labour force in 2050 (in thousands)	Total change in labour force (%)	Contribution of group-specific changes in participation rates to change in overall labour supply												Demographic effect						Interaction effect
			Total	Young	Prime age	Older	Male	Young	Prime age	Older	Female	Young	Prime age	Older	Total	Young	Prime age	Older	Male	Female	
BE	4 400.8	– 0.2	10.7	0.5	6.3	4.0	2.9	0.2	1.7	1.0	7.8	0.2	4.6	3.0	– 10.9	– 0.8	– 11.5	1.4	– 5.4	– 5.4	– 0.2
DK	2 661.4	– 6.0	3.6	0.6	1.6	1.5	1.7	0.5	0.7	0.5	1.9	0.1	0.8	1.0	– 9.5	1.0	– 10.0	– 0.5	– 4.6	– 4.9	– 0.2
DE	35 533.4	– 12.1	9.7	0.5	3.2	6.0	4.2	0.3	1.1	2.8	5.6	0.2	2.2	3.2	– 21.0	– 2.8	– 18.4	0.2	– 11.8	– 9.3	– 0.8
EL	4 110.7	– 15.8	7.2	– 0.4	5.2	2.6	– 0.1	– 0.3	0.2	0.0	7.3	– 0.1	4.9	2.5	– 22.2	– 3.8	– 19.4	0.9	– 12.3	– 9.6	– 0.9
ES	17 612.6	– 8.5	13.6	– 0.7	10.0	4.4	2.2	– 0.3	1.8	0.8	11.4	– 0.4	8.2	3.6	– 21.0	– 4.6	– 18.3	1.9	– 11.2	– 9.5	– 1.2
FR	27 365.2	1.8	7.2	0.3	3.6	3.5	2.4	0.1	0.8	1.5	4.8	0.2	2.7	2.0	– 6.1	– 0.7	– 7.5	2.1	– 2.2	– 3.7	0.5
IE	2 443.5	32.0	10.7	– 0.1	7.0	3.8	2.1	– 0.1	1.6	0.6	8.5	0.0	5.4	3.2	17.2	– 2.4	12.1	7.4	11.1	6.2	4.1
IT	20 609.2	– 14.3	13.2	– 0.2	6.6	7.1	4.3	– 0.1	1.3	3.0	8.9	– 0.1	5.1	4.0	– 25.7	– 2.4	– 22.9	– 0.4	– 14.3	– 11.1	– 2.1
LU	269.2	37.6	9.7	0.0	7.1	2.6	2.0	0.1	1.1	0.8	7.7	– 0.1	5.9	1.9	24.9	3.4	16.8	4.6	14.7	10.2	3.1
NL	8 508.7	1.5	7.1	0.2	4.6	2.3	0.3	0.1	– 0.1	0.3	6.8	0.1	4.7	2.0	– 5.4	0.9	– 7.8	1.5	– 2.5	– 2.9	– 0.1
AT	3 714.8	– 6.1	11.5	0.4	4.6	6.6	3.5	0.1	0.6	2.8	7.9	0.3	3.9	3.7	– 17.5	– 2.7	– 15.8	1.0	– 8.7	– 8.6	– 0.2
PT	4 282.5	– 16.2	6.8	– 0.3	4.5	2.8	1.2	– 0.1	0.7	0.6	5.6	– 0.3	3.7	2.1	– 22.3	– 4.0	– 19.0	0.7	– 10.7	– 11.3	– 0.8
FI	2 398.9	– 7.5	7.8	0.3	4.0	3.4	3.7	0.1	1.9	1.7	4.0	0.2	2.1	1.7	– 14.6	– 1.8	– 13.1	0.3	– 7.2	– 7.4	– 0.7
SE	4 905.2	9.2	5.4	0.9	2.8	1.7	2.5	0.4	1.2	0.9	2.9	0.5	1.6	0.8	3.5	0.9	– 0.3	2.8	2.2	1.3	0.3
UK	29 576.6	0.7	4.9	0.5	2.7	1.8	0.6	0.2	0.2	0.1	4.3	0.3	2.4	1.7	– 4.4	– 1.7	– 5.9	3.1	– 1.0	– 3.2	0.2
CY	476.4	39.9	12.7	1.7	7.5	3.7	3.0	1.0	0.8	1.2	9.7	0.7	6.6	2.4	22.1	– 1.7	12.5	11.3	15.4	7.3	4.9
CZ	3 744.3	– 26.0	6.0	– 0.2	2.5	3.8	1.1	– 0.2	0.2	1.1	4.9	– 0.1	2.3	2.7	– 31.4	– 4.8	– 26.7	0.1	– 16.7	– 14.5	– 0.7
EE	510.5	– 20.5	6.9	0.6	4.8	1.6	2.8	0.4	2.2	0.1	4.1	0.2	2.4	1.4	– 26.0	– 5.5	– 21.4	0.9	– 11.7	– 14.1	– 1.6
HU	3 439.9	– 18.2	10.4	0.0	4.8	5.7	3.7	0.0	1.7	2.0	6.7	0.0	3.1	3.7	– 27.4	– 3.8	– 23.7	0.1	– 14.0	– 13.2	– 1.4
LT	1 323.5	– 18.5	8.4	0.7	4.1	3.7	3.0	0.0	1.8	1.2	5.4	0.8	2.3	2.4	– 26.3	– 4.5	– 24.5	2.7	– 11.7	– 14.3	– 0.7
LV	850.2	– 22.8	9.8	1.1	5.8	3.1	4.7	0.6	3.1	1.0	5.1	0.5	2.6	2.0	– 30.5	– 6.2	– 24.7	0.3	– 14.6	– 15.6	– 2.4
MT	203.7	27.9	16.1	0.9	14.7	0.2	1.3	0.1	1.6	– 0.3	14.7	0.9	13.4	0.4	10.5	– 1.6	7.1	5.0	7.5	2.7	1.6
PL	13 778.0	– 18.6	13.0	1.1	8.0	4.0	5.3	0.5	2.8	1.9	7.7	0.6	5.2	1.9	– 30.3	– 7.0	– 26.0	2.7	– 15.4	– 14.7	– 1.4
SK	2 025.9	– 23.7	7.5	0.2	3.1	4.3	1.8	0.0	0.8	1.0	5.6	0.2	2.2	3.2	– 32.0	– 7.1	– 27.3	2.4	– 15.7	– 16.0	0.7
SI	781.5	– 17.1	10.3	– 0.8	4.5	6.5	4.0	– 0.6	2.0	2.6	6.3	– 0.2	2.6	3.9	– 27.4	– 3.8	– 24.4	0.8	– 15.0	– 12.3	0.0
EU-25	*195 526.8*	*– 7.9*	*9.6*	*0.6*	*4.9*	*4.2*	*2.9*	*0.3*	*1.1*	*1.5*	*6.7*	*0.3*	*3.7*	*2.6*	*– 17.1*	*– 3.0*	*– 15.5*	*1.4*	*– 8.7*	*– 8.2*	*– 0.5*
EU-15	*168 392.8*	*– 5.7*	*9.2*	*0.4*	*4.7*	*4.3*	*2.6*	*0.2*	*0.9*	*1.5*	*6.7*	*0.2*	*3.8*	*2.7*	*– 14.7*	*– 2.2*	*– 13.7*	*1.3*	*– 7.4*	*– 7.1*	*– 0.4*
EU-10	*27 134.0*	*– 18.8*	*10.8*	*0.7*	*6.1*	*4.2*	*4.0*	*0.3*	*2.0*	*1.7*	*6.8*	*0.4*	*4.1*	*2.4*	*– 28.7*	*– 5.9*	*– 24.8*	*2.0*	*– 14.5*	*– 14.0*	*– 1.0*

(*) Age group: 15 to 64.

Source: Economic and Financial Affairs DG.

2.5. Assumptions on structural unemployment

In order to move from labour force projections to employment projections, the EPC agreed to use the NAIRU calculation as the best available proxy for a projection of a structural unemployment rate under a 'no policy change' scenario. As a general rule, it was agreed that unemployment rates converge towards the 2008 Economic and Financial Affairs DG estimates of NAIRU for each country and afterwards they are kept constant. This was considered as a reasonable assumption with the advantage of ensuring consistency with other EU budgetary surveillance procedures. Indeed, these NAIRU estimates are already used for the calculation of the output gap and agreed upon by the Output Gap Working Group (OGWG) of the EPC. The 2008 NAIRU is calculated by projecting the latest estimates (2006) of NAIRU (based on the autumn 2004 Commission services forecast) up to 2008 according to the following simple rule:

$$NAIRU_{t+1} = NAIRU_t + 0.5 \times (NAIRU_t - NAIRU_{t-1})$$

Thus, in order to forecast the NAIRU and to take into account possible lagged effects of recent reforms, 50 % of the most recent decline in actual unemployment rates is attributed to a decline in the NAIRU.

To avoid extrapolating forward high levels of NAIRU for countries still above the EU-15 average (Germany, Greece, Spain, France, Italy and Finland), the EPC agreed a convergence to the 2008 EU-15 average (about 7 %) over a period of 10 years. As regards EU-10 Member States with high unemployment rates (Poland and Slovakia), a convergence towards the 2008 EU-15 average NAIRU within a longer time horizon of 20 years was agreed. For the three EU-10 Member States, where the current unemployment rate is already below the proposed target (Cyprus, Hungary and Slovenia), the estimated trend unemployment rate in 2004 is kept constant (3.8 % in Cyprus, 4.8 % in Hungary and 6 % in Slovenia), while for the remaining EU-10 Member States, the convergence towards the EU-15 2008 average is completed in 10 years.

In order to avoid that the agreed levels of the overall structural unemployment rates $\overline{UR^t}$ change over time as a result of the interaction between cohort-specific structural unemployment rates (Ur_i) and the evolution of size and composition of different age/sex cohorts, as expressed by changes in the respective group's share of the labour force ($\omega_i^t = \frac{LF_i^t}{LF^t}$), the following condition is imposed: $\sum_i Ur_i^t \omega_i^t = \overline{UR^t}$. This means that the weighted average of the group-specific unemployment rates is equal to the agreed overall structural unemployment rate UR^t. Thus, the age/gender cohort-specific unemployment rates are estimated as follows ([1]):

$$Ur_i^t \omega_i^t : \overline{UR^t} = Ur_i^0 \omega_i^0 : UR^0 \text{ and}$$

$$Ur_i^t = Ur_i^0 \times \frac{\overline{UR^t}}{UR^o} \times \frac{\omega_i^0}{\omega_i^t} \text{ where } \omega_i^0 = \frac{LF_i^0}{LF^0}.$$

The methodology agreed by the EPC to guarantee the convergence of the unemployment rate of some Member States towards the 2008 EU-15 average by 2015 had the effect of reducing the euro area average from 8.2 % in 2008 to 6.6 % in 2015. As a result, those countries where unemployment rates were close to the EU-15 average in 2003 (such as Belgium, Italy and the Czech Republic) and below the euro area unemployment rate in 2003, were penalised in terms of relative position within the euro area, ending up with a long-run unemployment rate higher than the euro area average. A simple solution in the final calculation was adapted, which was to reduce by a further 0.5 % the long-term unemployment rate in Belgium, Italy and the Czech Republic (to 6.5 %) to stay in line with the long-term euro area average (6.5 %).

Table 2.12 shows the results of the projection. Overall, a reduction in the unemployment rate of around three percentage points is projected (from 9.2 % in 2005 to 6.2 % in 2025) for the EU-25 and a bit lower (by two percentage points) for the EU-15. This difference is due to the agreed path of convergence for Poland and Slovakia, which implies a substantial reduction in their unemployment rates (to 12.7 percentage points and 10.3 percentage points respectively) over the period 2004 to 2025.

([1]) It is worthwhile noticing that one shortfall of this assumption is that we are forced to move the cohort-specific unemployment rates in the opposite direction of the relative size of the cohort-specific labour force (the weights), that is an increase in the relative size of the labour supply of a specific group, will force a lowering of the group-specific unemployment rate.

Table 2.12

Unemployment rate assumptions (age 15–64, in percentage)

	Total Unemployment rates (aged 15-64)	Budgetary projections: AWG variant scenario Year: 2005										Change
Country	*2003*	*2005*	*2010*	*2015*	*2020*	*2025*	*2030*	*2035*	*2040*	*2045*	*2050*	*2003–25*
BE	8.2	7.7	7.0	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	*– 1.7*
DK	5.5	4.9	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	*– 1.2*
DE	9.9	9.4	8.5	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	*– 2.9*
EL	9.8	9.3	8.6	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	*– 2.8*
ES	11.6	10.4	8.7	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	*– 4.6*
FR	9.0	9.1	8.3	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	*– 2.0*
IE	4.8	4.0	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	*– 1.4*
IT	8.9	8.2	7.3	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	*– 2.4*
LU	3.7	4.0	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	*0.6*
NL	3.7	3.5	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	*– 0.5*
AT	4.3	3.9	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	*– 0.9*
PT	6.7	6.0	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	*– 1.1*
FI	9.2	8.0	6.8	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	*– 2.7*
SE	5.7	5.0	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	*– 1.4*
UK	5.1	4.8	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	*– 0.5*
CY	4.4	4.0	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	*– 0.2*
CZ	7.9	7.8	7.3	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	*– 1.4*
EE	10.3	9.1	7.8	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	*– 3.3*
HU	5.9	5.3	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	*– 1.2*
LT	12.5	11.2	8.9	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	*– 5.5*
LV	10.7	9.1	7.6	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	*– 3.7*
MT	7.6	8.5	8.3	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	*– 0.6*
PL	20.1	18.7	15.8	12.9	9.9	7.0	7.0	7.0	7.0	7.0	7.0	*– 13.1*
SK	17.6	16.7	15.2	12.5	9.7	7.0	7.0	7.0	7.0	7.0	7.0	*– 10.6*
SI	6.8	6.0	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	*– 1.2*
EU-25	*9.3*	*8.7*	*7.8*	*6.7*	*6.4*	*6.1*	*6.1*	*6.1*	*6.1*	*6.1*	*6.1*	*– 3.1*
EU-15	*8.2*	*7.7*	*7.0*	*6.1*	*6.1*	*6.1*	*6.1*	*6.0*	*6.0*	*6.0*	*6.0*	*– 2.2*
Euro area	*9.0*	*8.5*	*7.6*	*6.5*	*6.5*	*6.5*	*6.5*	*6.4*	*6.4*	*6.4*	*6.4*	*– 2.5*
EU-10	*14.8*	*13.8*	*12.0*	*10.0*	*8.3*	*6.6*	*6.6*	*6.6*	*6.6*	*6.6*	*6.6*	*– 8.3*

Source: Economic and Financial Affairs DG.

2.6. Employment projection

Given the population projection, the unemployment rate assumptions and the labour force projection, the overall employment rates (of people age 15 to 64) in the EU-25 are projected to increase from 63 % in 2003 to 70 % in 2025, and to stabilise at 70.7 % at the end of the projection period, as shown in Table 2.13.

Incidentally, the major policy implication of the outcome of the 'no policy change' assumption in the baseline scenario is that under the current policy framework and projected demographic and labour force trends, the Lisbon target of an employment rate of 70 % will be missed in 2010, reached in 2015 by the EU-15 and in 2020 by the EU-25. The same holds for the employment target for older workers (at 47.1 % in 2010 instead of 50 %), while the target for female employment rates will be met, according to the projection.

The number of people employed (according to the European labour force survey definition) is projected to record an annual growth rate of only 0.4 % over the period 2003 to 2025, which will reverse to a higher but negative annual growth rate of about – 0.5 % in the subsequent period 2025 to 2050 (see Table 2.14). As a result

Table 2.13

Employment rate projections, 2003–50

Country	Total (15–64)				Females (15–64)				Older workers (55–64)			
	2003	2010	2025	2050	2003	2010	2025	2050	2003	2010	2025	2050
BE	59.6	62.1	64.7	65.5	51.8	56.0	60.3	61.0	28.1	33.2	42.8	44.4
DK	74.9	76.4	77.3	77.9	70.2	72.0	72.7	73.3	59.8	61.5	65.6	66.7
DE	65.4	70.9	73.2	73.5	59.3	65.8	67.8	68.3	39.5	56.4	65.8	65.7
EL	58.9	62.7	64.9	65.1	44.6	50.0	54.6	55.6	42.1	44.4	51.9	52.9
ES	59.7	66.4	70.3	71.4	46.2	55.6	62.5	64.2	40.6	45.6	59.6	62.5
FR	63.1	64.4	66.7	68.0	57.0	58.9	61.8	63.4	36.3	42.3	49.4	52.9
IE	65.5	70.9	73.6	74.6	55.7	62.7	67.7	69.1	48.8	55.5	66.8	68.9
IT	57.2	61.0	63.6	65.7	44.9	50.0	53.9	56.1	29.4	35.9	49.4	54.6
LU	62.6	64.4	64.9	65.4	51.7	55.6	58.1	58.7	30.3	35.3	40.2	41.8
NL	73.6	75.3	76.5	77.9	66.0	70.1	73.4	75.2	44.4	48.1	53.5	55.2
AT	69.1	73.5	75.1	76.4	61.7	67.8	70.5	71.8	30.1	40.1	54.2	58.0
PT	67.8	71.9	72.9	73.4	61.2	66.4	68.7	69.5	51.4	56.5	63.0	64.7
FI	67.7	70.2	73.8	74.4	65.8	67.9	71.9	72.7	49.4	54.1	62.3	64.9
SE	73.1	74.9	77.4	77.6	71.6	73.5	76.1	76.4	68.8	70.9	75.1	76.6
UK	71.5	72.9	74.2	74.7	65.3	67.3	70.0	71.1	55.4	56.9	62.5	63.9
CY	67.7	73.6	78.2	77.3	59.3	67.0	72.8	72.0	50.2	60.7	65.2	69.1
CZ	64.8	66.8	72.1	69.7	56.6	59.8	66.5	63.8	42.5	48.1	59.8	58.9
EE	62.9	68.4	71.9	70.8	59.3	64.7	68.9	67.4	52.7	55.3	61.7	61.7
HU	56.9	60.8	65.3	63.2	50.7	54.2	60.3	58.6	28.7	39.6	49.8	49.5
LT	61.2	67.3	73.4	71.7	58.4	64.6	71.3	69.0	45.3	53.1	65.1	66.2
LV	61.9	69.9	73.1	71.4	57.8	65.3	69.1	66.7	44.1	53.4	59.2	58.7
MT	54.1	56.7	62.4	61.3	33.7	39.6	49.0	48.6	32.0	29.3	30.3	33.1
PL	51.0	57.0	68.4	66.1	45.8	51.8	64.3	60.9	26.7	35.2	42.7	48.7
SK	57.8	62.1	72.7	68.7	52.2	56.9	68.9	64.3	25.2	38.5	51.7	51.2
SI	62.8	67.7	69.9	69.3	58.0	62.5	65.9	66.4	23.5	40.4	50.0	52.6
EU-25	*63.1*	*66.9*	*70.3*	*70.9*	*55.4*	*60.2*	*64.7*	*65.5*	*39.9*	*47.1*	*56.8*	*58.9*
EU-15	*64.6*	*68.1*	*70.5*	*71.5*	*56.5*	*61.2*	*64.6*	*66.1*	*41.4*	*48.6*	*58.0*	*60.2*
Euro area	*62.9*	*66.9*	*69.4*	*70.5*	*54.1*	*59.4*	*63.1*	*64.6*	*37.4*	*46.0*	*56.5*	*58.8*
EU-10	*55.7*	*60.7*	*69.4*	*67.1*	*50.0*	*55.2*	*65.0*	*62.1*	*31.7*	*39.8*	*49.2*	*51.9*

Source: Economic and Financial Affairs DG.

of these opposite trends, the overall employment in the EU-25 is projected to shrink by about 12 million people (– 2 million women and – 10 million men) over the period 2003 to 2050. Rises in immigration levels in some countries and increases in labour force participation rates moderate the fall in employment caused by the ageing of the population and the negative population growth projected for the period 2025 to 2050.

The number of people employed (according to the European labour force survey definition) is projected to record an annual growth rate of only 0.4 % over the period 2003–25, which will reverse to a higher, but negative, annual growth rate of about – 0.5 % in the subsequent period (2025 to 2050). As a result of these two opposite trends, the overall number of employees in the EU-25 in 2050 is projected to be about 9 million below the level recorded in 2003 (– 600 000 women and – 8.2 million of men).

Table 2.14

Employment projections (age 15 to 64), 2003–50

Country	Persons (in thousands)			Changes (in thousands)			Changes (in %)			Annual growth rate	
	2003	2025	2050	2003–25	2025–50	2003–50	2003–25	2025–50	2003–50	2003–25	2025–50
BE	4 048	4 364	4 115	315	– 249	66	7.8	– 5.7	1.6	0.34	– 0.23
DK	2 677	2 700	2 548	23	– 151	– 129	0.8	– 5.6	– 4.8	0.04	– 0.23
DE	36 419	38 306	33 046	1 887	– 5 260	– 3 373	5.2	– 13.7	– 9.3	0.23	– 0.59
EL	4 400	4 731	3 823	331	– 908	– 577	7.5	– 19.2	– 13.1	0.33	– 0.85
ES	17 026	20 932	16 380	3 906	– 4 552	– 646	22.9	– 21.7	– 3.8	0.94	– 0.98
FR	24 480	26 144	25 450	1 664	– 694	969	6.8	– 2.7	4.0	0.30	– 0.11
IE	1 762	2 366	2 360	604	– 5	599	34.3	– 0.2	34.0	1.35	– 0.01
IT	21 906	23 254	19 270	1 348	– 3 985	– 2 637	6.2	– 17.1	– 12.0	0.27	– 0.75
LU	188	229	258	41	28	69	21.7	12.4	36.8	0.90	0.47
NL	8 066	8 447	8 234	381	– 212	168	4.7	– 2.5	2.1	0.21	– 0.10
AT	3 785	4 089	3 588	304	– 502	– 198	8.0	– 12.3	– 5.2	0.35	– 0.52
PT	4 767	4 985	4 045	218	– 940	– 722	4.6	– 18.9	– 15.2	0.20	– 0.83
FI	2 355	2 384	2 243	28	– 141	– 112	1.2	– 5.9	– 4.8	0.05	– 0.24
SE	4 234	4 587	4 694	353	107	460	8.3	2.3	10.9	0.36	0.09
UK	27 871	29 843	28 218	1 972	– 1625	347	7.1	– 5.4	1.2	0.31	– 0.22
CY	326	458	456	132	– 1	131	40.5	– 0.3	40.1	1.56	– 0.01
CZ	4 661	4 535	3 501	– 126	– 1 034	– 1 160	– 2.7	– 22.8	– 24.9	– 0.12	– 1.03
EE	576	562	475	– 14	– 87	– 101	– 2.4	– 15.6	– 17.6	– 0.11	– 0.67
HU	3 954	3 989	3 276	35	– 713	– 678	0.9	– 17.9	– 17.1	0.04	– 0.78
LT	1 420	1 512	1 231	92	– 281	– 189	6.5	– 18.6	– 13.3	0.29	– 0.82
LV	984	970	791	– 14	– 179	– 193	– 1.5	– 18.5	– 19.7	– 0.07	– 0.81
MT	147	184	189	37	5	42	25.3	2.7	28.7	1.03	0.11
PL	13 519	16 217	12 814	2 698	– 3 404	– 705	20.0	– 21.0	– 5.2	0.83	– 0.94
SK	2 187	2 556	1 884	369	– 672	– 303	16.9	– 26.3	– 13.9	0.71	– 1.21
SI	879	898	738	18	– 159	– 141	2.1	– 17.8	– 16.1	0.09	– 0.78
EU-25	*192 638*	*209 240*	*183 625*	*16 603*	*– 25 615*	*– 9 012*	*8.6*	*– 12.2*	*– 4.7*	*0.38*	*– 0.52*
EU-15	*163 984*	*177 360*	*158 270*	*13 376*	*– 19 090*	*– 5 714*	*8.2*	*– 10.8*	*– 3.5*	*0.36*	*– 0.45*
EU-10	*28 653*	*31 880*	*25 355*	*3 227*	*– 6 525*	*– 3 298*	*11.3*	*– 20.5*	*– 11.5*	*0.49*	*– 0.91*

Source: Economic and Financial Affairs DG.

2.7. Economic dependency ratios emerging from the baseline labour force projection

As a result of different trends in the population by age, the age structure of the labour force is projected to undergo a number of relevant changes. The share of older workers (aged 55 to 64) in the total labour force is projected to almost double, rising from 10 % in 2003 to about 18 % in 2050 in the EU-25 (see Table 2.15). The increase projected is particularly high in Germany (from 11 % to 20 %) and Spain, Italy and Ireland (from about 9 % to 18 %). Lithuania stands out among EU-10 Member States with an increase of more than 10 percentage points in the share of older workers (from 11 % to 22.7 %).

These trends are mirrored in the effective economic old-age dependency ratio (see Table 2.16), and in the total economic dependency ratio (see Table 2.17). It is important to consider the effective economic old-age dependency ratio when assessing the impact of ageing on budgetary expenditure, pension public schemes above all. This indicator shows the balance between the inactive elderly and the economically active population. It is the number of inactive people aged 65 and above, as a percentage of total population employed. The indicator is a result of interacting projected demographic trends with projected developments in the labour force participation rates and unemployment rates. The ratio is projected to rise sharply for the EU-25 from 37 % in 2003 to 48 % in 2025 and 70 % in 2050. The inactive old population (aged 65 and above) is projected to account for close to three quarters of

Table 2.15

Share of older workers (labour force aged 55 to 64 as a percentage of the labour force aged 15 to 64)

	Males			Females			Total			Change		
	2003	2025	2050	2003	2025	2050	2003	2025	2050	2003–25	2025–50	2003–50
BE	8.5	13.4	12.8	5.6	14.3	14.0	7.2	13.8	13.4	*6.6*	*– 0.5*	*6.1*
DK	15.8	18.8	17.2	14.2	18.1	16.8	15.0	18.5	17.0	*3.4*	*– 1.4*	*2.0*
DE	12.2	23.0	20.5	10.2	21.5	19.5	11.3	22.3	20.0	*11.0*	*– 2.2*	*8.7*
EL	12.3	17.8	17.6	9.0	16.6	17.2	11.0	17.3	17.4	*6.3*	*0.2*	*6.5*
ES	11.2	18.8	18.3	7.1	17.7	18.4	9.6	18.3	18.3	*8.8*	*0.0*	*8.8*
FR	8.6	14.3	14.4	8.4	15.0	15.2	8.5	14.6	14.8	*6.1*	*0.1*	*6.3*
IE	11.3	15.9	17.5	7.7	16.7	19.0	9.8	16.2	18.1	*6.4*	*1.9*	*8.3*
IT	10.0	19.2	18.2	6.9	16.9	17.0	8.8	18.2	17.7	*9.5*	*– 0.6*	*8.9*
LU	7.8	12.8	11.6	5.9	12.1	11.6	7.0	12.5	11.6	*5.5*	*– 0.9*	*4.6*
NL	11.4	16.5	14.1	7.9	14.2	13.3	9.9	15.4	13.7	*5.6*	*– 1.7*	*3.9*
AT	9.0	18.2	17.8	6.0	16.1	16.2	7.7	17.3	17.1	*9.6*	*– 0.2*	*9.4*
PT	12.5	18.6	18.5	11.1	18.2	18.5	11.9	18.4	18.5	*6.6*	*0.1*	*6.7*
FI	12.7	17.7	18.0	13.4	18.0	18.3	13.0	17.9	18.2	*4.8*	*0.3*	*5.1*
SE	18.1	20.2	21.1	17.8	19.5	20.6	18.0	19.9	20.9	*1.9*	*1.0*	*2.9*
UK	13.8	17.8	18.0	11.9	18.1	18.5	12.9	18.0	18.2	*5.0*	*0.3*	*5.3*
CY	13.1	16.5	23.9	7.8	14.9	17.9	10.7	15.7	21.1	*5.0*	*5.4*	*10.4*
CZ	12.6	16.8	21.2	8.7	14.6	18.6	10.9	15.8	20.0	*4.9*	*4.2*	*9.1*
EE	12.7	14.3	18.7	13.8	17.9	21.5	13.2	16.1	20.0	*2.9*	*3.9*	*6.8*
HU	8.8	13.5	16.8	7.4	14.2	17.6	8.2	13.8	17.2	*5.6*	*3.4*	*9.0*
LT	11.8	18.1	23.1	10.6	18.0	22.3	11.2	18.1	22.7	*6.9*	*4.7*	*11.5*
LV	11.4	15.1	18.9	11.8	16.7	20.3	11.6	15.9	19.6	*4.3*	*3.7*	*8.0*
MT	10.7	10.9	14.4	6.0	4.5	6.9	9.3	8.5	11.4	*– 0.8*	*3.0*	*2.2*
PL	6.8	11.9	19.7	5.3	9.8	15.7	6.1	10.9	17.8	*4.8*	*7.0*	*11.7*
SK	7.7	13.6	19.8	2.9	11.9	17.1	5.5	12.8	18.6	*7.3*	*5.8*	*13.1*
SI	6.9	16.6	17.4	3.8	14.6	15.9	5.5	15.7	16.7	*10.2*	*1.0*	*11.2*
EU-25	*11.1*	*17.9*	*18.0*	*9.0*	*16.9*	*17.5*	*10.1*	*17.4*	*17.8*	*7.3*	*0.3*	*7.6*
EU-15	*11.5*	*18.7*	*17.7*	*9.5*	*17.8*	*17.5*	*10.6*	*18.3*	*17.6*	*7.7*	*– 0.6*	*7.0*
EU-10	*8.6*	*13.5*	*19.6*	*6.5*	*12.1*	*17*	*7.6*	*12.9*	*18.4*	*5.2*	*5.5*	*10.8*

Source: Economic and Financial Affairs DG.

the employed population in the EU-10 Member States. Extremely high values are projected in some EU countries. In Italy, the economic dependency ratio of the elderly is projected to rise from 49 % in 2003 to as much as 93 % in 2050 and in Greece and Spain it is projected to increase from about 39 % in 2003 to 89 % in 2050.

The total economic dependency ratio is the ratio between total inactive population and employed people. It gives an indication of the average number of people that each economically active person 'supports', and thus is relevant when considering the prospects for potential GDP per capita growth. It is interesting to note that the ratio is projected to decline in the first period of projection (up to 2025) in most EU-25 countries, with the exception of Denmark, France, the Netherlands, Finland and Sweden, while it is projected to rise between 2025 and 2050 in all countries, with larger increases projected in Greece, Portugal and Italy. For the EU-25, this ratio actually falls from 136 % in 2003 to 125 % in 2025, but thereafter it increases to 147 % by 2050. These results need to be interpreted carefully. They show that overall economic dependency is projected to decline up to 2025 mostly due to a better labour market performance (especially the projected increase in female employment rates), but also due to low fertility (i.e. smaller numbers of young people imply a decline in the youth dependency ratio). However, these effects taper off after 2025 and the increase in the total economic dependency ratio between 2025 and 2050 is noticeably sharp. In practice, the negative economic

repercussions of low fertility rates become more evident the further into the future one goes, with successively smaller cohorts entering the labour force. If a projection with a longer-term time horizon was available, say up to 2070 or 2100, it is likely that it would show the total economic dependency ratio continuing to rise steeply.

Table 2.16

Effective economic old-age dependency ratio (inactive population aged 65 and above as a percentage of employed population aged 15 to 64)

Country	Males			Females			Total			Change	
	2003	2025	2050	2003	2025	2050	2003	2025	2050	2003–25	2025–50
BE	31	45	58	59	67	87	43	55	71	*12.2*	*16.0*
DK	22	36	44	36	50	62	28	42	52	*13.7*	*9.8*
DE	27	41	56	53	62	83	39	50	69	*11.7*	*18.3*
EL	29	38	69	62	71	116	41	52	88	*10.9*	*36.5*
ES	27	34	70	61	59	111	40	45	88	*5.0*	*43.4*
FR	29	42	53	51	66	81	39	53	66	*14.0*	*13.2*
IE	17	26	48	32	38	66	23	31	56	*8.0*	*24.9*
IT	32	44	71	74	82	122	49	60	93	*11.4*	*32.6*
LU	22	34	44	48	52	68	33	42	55	*9.1*	*12.6*
NL	19	35	43	36	48	60	27	41	51	*14.5*	*9.5*
AT	22	37	56	45	54	81	33	45	67	*12.3*	*22.6*
PT	22	34	60	38	53	88	30	43	73	*13.3*	*30.1*
FI	24	45	52	42	63	69	33	54	60	*20.5*	*6.7*
SE	29	40	45	42	50	57	35	45	50	*9.8*	*5.7*
UK	24	35	48	41	50	68	32	42	57	*10.0*	*15.3*
CY	14	28	43	24	42	63	18	35	52	*16.3*	*17.1*
CZ	20	36	63	42	59	92	29	47	76	*17.1*	*29.3*
EE	22	26	41	49	55	75	35	41	57	*5.7*	*16.6*
HU	26	37	59	55	68	92	39	51	74	*12.0*	*23.1*
LT	23	26	45	47	50	76	35	38	60	*3.1*	*22.3*
LV	21	26	42	50	53	75	35	39	58	*3.8*	*18.7*
MT	20	40	51	65	75	88	34	54	66	*19.5*	*12.1*
PL	23	35	59	48	59	92	35	46	74	*11.5*	*28.2*
SK	20	29	59	39	48	89	28	38	73	*9.9*	*34.8*
SI	22	39	67	45	60	88	32	49	77	*16.1*	*28.4*
EU-25	*26*	*38*	*57*	*51*	*60*	*86*	*37*	*48*	*70*	*11.2*	*21.8*
EU-15	*27*	*39*	*57*	*52*	*61*	*85*	*38*	*49*	*70*	*11.1*	*20.9*
EU-10	*23*	*34*	*58*	*47*	*58*	*90*	*34*	*45*	*73*	*11.7*	*27.1*

Source: Commission services.

Table 2.17

Total economic dependency ratio (total inactive population as a percentage of employed population aged 15 to 64)

Country	Total inactive population as % of employed (15–64)					Total inactive population as % of employed (15–71)				
	2003	2025	2050	Change 2003–25	Change 2025–50	2003	2025	2050	Change 2003–25	Change 2025–50
BE	156	150	164	*– 6*	*14*	155	148	162	*– 7*	*14*
DK	101	106	116	*5*	*9*	98	102	112	*4*	*9*
DE	127	117	135	*– 9*	*18*	124	114	131	*– 11*	*18*
EL	150	141	181	*– 9*	*40*	144	134	169	*– 10*	*35*
ES	144	118	162	*– 26*	*45*	141	113	154	*– 28*	*41*
FR	144	146	156	*2*	*10*	142	142	151	*0*	*9*
IE	125	108	132	*– 17*	*24*	121	102	122	*– 19*	*20*
IT	162	149	179	*– 12*	*30*	159	145	173	*– 14*	*28*
LU	138	137	149	*– 1*	*12*	137	136	148	*– 1*	*12*
NL	101	107	114	*6*	*7*	99	103	111	*4*	*8*
AT	113	108	128	*– 5*	*20*	112	106	125	*– 6*	*19*
PT	118	116	149	*– 3*	*33*	111	106	133	*– 5*	*27*
FI	121	128	133	*7*	*4*	119	123	127	*3*	*4*
SE	111	113	117	*2*	*4*	109	108	112	*– 1*	*4*
UK	113	114	128	*0*	*14*	109	108	121	*– 1*	*13*
CY	120	96	114	*– 24*	*18*	116	91	105	*– 25*	*15*
CZ	119	116	154	*– 3*	*38*	117	112	147	*– 5*	*35*
EE	135	118	137	*– 18*	*19*	130	112	129	*– 18*	*17*
HU	156	140	172	*– 16*	*32*	156	136	166	*– 19*	*30*
LT	144	107	134	*– 37*	*27*	141	104	129	*– 38*	*25*
LV	137	113	137	*– 24*	*24*	132	107	128	*– 25*	*21*
MT	170	154	168	*– 16*	*15*	168	152	167	*– 16*	*14*
PL	183	127	163	*– 56*	*36*	179	123	156	*– 55*	*32*
SK	146	105	151	*– 41*	*47*	145	104	150	*– 41*	*46*
SI	127	124	157	*– 3*	*33*	124	119	149	*– 6*	*31*
EU-25	*136*	*125*	*147*	*– 11*	*22*	*133*	*121*	*141*	*– 12*	*20*
EU-15	*132*	*126*	*145*	*– 6*	*20*	*129*	*121*	*140*	*– 8*	*18*
EU-10	*159*	*124*	*158*	*– 35*	*35*	*156*	*120*	*152*	*– 36*	*32*

Source: Economic and Financial Affairs DG.

3. Labour productivity and GDP

3.1. Background and general approach

The approach used in the 2001 projection exercise

The age-related expenditure projection needs to provide a GDP growth assumption. In order to derive a projection of output growth from the employment projection outlined in Chapter 2, the EPC also agreed a method of projecting long-term productivity up to 2050. The approach used in 2001 on labour productivity growth (measured as GDP per worker) was to provide convergence towards an annual rate of 1¾ % between 2020 and 2030. Some catch-up was allowed for initially low-productivity Member States. The significant leeway left to individual countries in setting assumptions undermined comparability and there was no firm economic basis for the assumptions employed.

Different approaches surveyed by the AWG at its workshop of 6 May 2004

In a workshop held on 6 May 2004, various approaches to making projections of labour productivity and GDP growth (see Annex 2 for the programme) were reviewed, inter alia the different methodologies used by the international institutions to make long-run labour productivity projections.

- **A purely mechanical approach directly extrapolating recent or past trend growth in labour productivity:** this approach generally involves some assumptions of convergence to a benchmark (e.g. productivity growth in the United States or the average of the EU). It can be useful for catering for the specific situation of catching-up countries characterised by much lower productivity levels in the base year.
- **A judgemental approach based on the balance of upward and downward risks to productivity growth:** this allows one to adjust the baseline projection to take into account certain country-specific circumstances; however, mainly based on experts' knowledge, it often lacks a strong analytical ground.
- **A 'statistical' method based on a production function framework (PF approach),** as used in most macro-models employed by international institutions in their short-term economic forecasts (the OECD, the ECB, the IMF and the EC). This approach, which has been adopted in the EPC projection, is to calculate potential output over the long run using established time-series methods to extrapolate short-term developments and a combination of reasonable ad hoc assumptions for the longer run. In this approach, ageing is mainly taken into account to the extent that it is already influencing developments in the labour force (see Chapter 2).

Two other approaches could be mentioned. However, they are too complex and too heavy to be carried out for each EU Member State, as the effect of each determinant might not be the same across countries and as they might require a specific projection for each contributory factor. Moreover, the cross-country comparability cannot fully be guaranteed given the large number of parameters used and assumptions required. Their use is more appropriate for productivity projections conducted in a single country.

They are the following:

- **econometric analyses in partial equilibrium:** this consists in estimating the effects of different factors on productivity **other things being equal**. While this approach is interesting and elucidating in terms of highlighting the key influences at work, it suffers from the fact that it excludes the crucial systemic effects of ageing, such as behavioural changes and shifts in financial market variables, which must ideally be taken into account in determining the final economic impact of ageing;
- **a general equilibrium approach:** this rests on an analytical framework which combines standard

growth regressions with recent developments in endogenous growth theory. A general equilibrium approach is generally regarded as the most complex but comprehensive methodology for predicting the long-run effects of ageing populations ([1]).

The projection of GDP and labour productivity used by the EPC is based on a production function approach.

Based on these reflections and a review of the economic literature ([2]), a general consensus was reached on the merits of using a production function framework, rather than a purely mechanical approach as it allows one to shed light on the main components of labour productivity growth (namely total factor productivity and the capital stock per worker) while being fully consistent with the Output Gap Working Group (OGWG) approach. This 'production function' approach also aims at obtaining richer medium-term dynamics, taking due account of the effect of population growth on labour productivity in the medium run, through the change in capital intensity. The approach based on a production function is also fairly standard in mainstream macro-models and is often used to make short-term (two or three years) forecasts of productivity by international institutions ([3]).

As part of the approach, it was agreed that all countries converge to the same growth rate of output per worker (1.7 %) at the end of the projection (i.e. the historical US and EU-15 labour productivity growth) ([4]). This long-run convergence in terms of output per worker will allow one to address an important data caveat as regards data comparability across countries: countries use different methodologies to estimate capital inputs which will render total factor productivity growth numbers not fully comparable across countries ([5]). The production function framework requires making some specific statistical assumptions regarding long-run developments in each of its components. The detailed methodology is presented below.

3.2. Methodology

3.2.1. Short description of the production function framework

With a production function, potential GDP can be represented by a combination of factor inputs multiplied with total factor productivity (TFP), which embeds the technological level. Total output can be expressed more formally using a Cobb-Douglas production function with constant returns to scale:

$$Y = TFP \times L^{\beta} \times K^{1-\beta}$$

$$= \left(TFP^{\frac{1}{\beta}} \times L \right)^{\beta} \times K^{1-\beta} = (E \times L)^{\beta} \times K^{1-\beta}$$

where:

L is the supply of labour, that is, total employment (in number of persons employed if there is no change in hours worked per person);

K is the stock of capital;

E is the labour-augmenting technical progress (i.e. Harrod-neutral technical progress). $E \times L$ is then interpretable as total employment in efficiency unit. *TFP* and the labour-augmenting technical progress are linked with a simple relationship: $TFP = (E)^{\beta}$

β is the labour share, in other words, the share of labour costs in total value-added. It is set at 0.65 ([6]).

([1]) See 'The EU review: 2002 review' for an example of this approach.

([2]) See European Commission (2004d, e, f, g and v) and European Commission (2005i).

([3]) Institutions such as the OECD, the ECB and the IMF use such a framework in their model. Moreover, medium-term projections of productivity (say with a horizon of 5 or 10 years) are based on the idea that, after some time, actual labour productivity growth equals the potential labour productivity, which is the ratio of potential output to potential employment. For instance, Downes et al. (2003) develop a medium-term reference scenario on the basis of the production function used to build the long-run supply-side conditions of the OECD's Interlink models. This scenario relies on the assumption that beyond the short-term projection horizon, gaps between actual output and potential output (directly derived from trend TFP and unemployment rate at the medium-term NAIRU) are closed by 2009 in all OECD countries.

([4]) This rate corresponds to the US average annual growth rate of GDP per person employed in the period 1960–2004 and to the EU-15 average annual growth rate of GDP per person employed in the period 1975–2004.

([5]) As rightly pointed out by the OECD, some countries use hedonic price indices to control for quality changes while others do not. Likewise, some countries adjust for changes in capital composition using the capital service approach, while others do not take this important effect into account. These measurement problems affect the estimation of the stock of capital and then that of capital deepening, thereby distorting the computation of TFP growth, which is calculated as the residual part of economic growth, left unexplained by capital and labour growth. These potentially substantial biases might mainly occur at the start of the projection horizon but should fade away with the convergence towards the same TFP rate.

([6]) Although there is some debate about the possibility of further decline of the labour share, most economists assume that it should remain broadly constant in the long run. The EPC agreed to assume that real wages will grow in line with labour productivity and, thus, the wage share will be constant over the projection period. This simple rule is uniformly applied to all Member States in order to allow for consistent cross-country comparisons of the results. The assumption is also well-founded in economic theory. If the real wage is equal to the marginal productivity of labour, it follows that under the standard features of the production function, real wage growth is equal to labour productivity growth and real unit labour costs remain constant.

However, as all these variables can be influenced by the business cycle in the short term, it is safer to project the potential output, in other words, the output adjusted for cyclical movements in the economy. This requires estimating the trend components for the individual production factors, except for the capital stock, which can only adjust in the long run. Estimating potential output therefore amounts to removing the cyclical component from both TFP and labour. Trend TFP is obtained using historical average or more complex detrending techniques. Potential employment is the total employment obtained when the unemployment rate equals the structural unemployment rate (NAIRU). It equals *LF·(1-NAIRU)*, where *LF* stands for total labour force. Therefore, if we assume a stable NAIRU in the medium/long term as predicted, potential employment growth coincides with labour force growth. The potential output denoted *Yp* can be expressed in logarithm as the sum (in logarithm) of **trend TFP** ([1]), potential employment weighted by the labour share in total value-added and the total capital stock multiplied by one minus the labour share. More formally, we get: *Log(Yp)=Log(trendTFP)* $+\beta$ *Log(LF·(1-Nairu))+(1-*β*)logK).*

As a result, potential labour productivity growth comes down to the following expression (where Y, L, E and TFP denote here potential output, potential employment, trend labour-augmenting technical progress and trend TFP):

$$\left(\frac{\dot{Y}}{L}\right) = T\dot{F}P + (1-\beta)\left(\frac{\dot{K}}{L}\right) = \beta\dot{E} + (1-\beta)\left(\frac{\dot{K}}{L}\right)$$

Thus, the projection of TFP growth and the growth in capital per worker, so-called **capital deepening**, are the key drivers of projected labour productivity over the medium run.

In the long-run, according to the neo-classical growth model (Solow model), the economy should reach its equilibrium, also called steady state or balanced growth path, where the ratio of capital stock to labour expressed in efficiency unit, K/(L.E), remains constant over time. As a result, the capital stock per worker grows at the same pace as labour-augmenting technical progress *E*. Therefore, labour productivity growth (i.e. output per worker growth) coincides with TFP growth divided by the labour share:

$$\left(\frac{\dot{Y}}{L}\right) = \left(\frac{\dot{K}}{L}\right) = \dot{E} = \frac{T\dot{F}P}{\beta}$$

It should also be noted that, in the steady state, the contribution of capital deepening to output growth is a simple function of TFP, which becomes the single driver of labour productivity ([2]).

$$contrib\left(\frac{\dot{K}}{L}\right) = (1-\beta)\left(\frac{\dot{K}}{L}\right) = \frac{(1-\beta)}{\beta}T\dot{F}P$$

3.2.2. Specific assumptions on the components of the production function in the short to medium term (2005–09)

The PF approach is applied to historical (starting in the mid-1960s) and forecast data. For the historical period, the series have been taken from the Economic and Financial Affairs DG's AMECO databank, with the Commission services final spring 2005 forecasts for the years 2005–06 being used. In addition, the OGWG also agreed on a 'medium-term extension' model that covers a period of three years from the end of the short-term forecasts, in this case running from 2007 to 2009. It is important to stress that this technical extension is in no way a forecast for these years, but is simply an attempt to illustrate what would happen if the trends of the most recent years were to continue, using established and transparent stochastic trend procedures. The potential growth rates for the three extension years are calculated using the following key inputs.

Trend total factor productivity (TFP): trend TFP is modelled as the HP filtered Solow residual. TFP is calculated until the end of the short-term forecast horizon, using the forecasts for GDP, employment and the capital stock. For the medium-term extension, a TFP forecast is generated with a stochastic trend methodology.

Capital formation based on a constant investment to GDP ratio: the investment to potential GDP series is used as an exogenous variable. Its projection for 2007–09 is based on an autoregressive process allowing for a constant and a time trend estimated until 2006. Note that this makes investment endogenous. For a constant investment to GDP ratio, investment responds to potential output with elasticity equal to one. Simple investment pro-

([1]) It is expressed in terms of labour-augmenting efficiency for the OECD and the IMF. In the IMF's model, Multimod, the production function for each country is specified as a Cobb-Douglas relationship between output and two-factor input — the labour force and the real net capital stock — with a constant and exogenous growth rate of total factor productivity. See equation (2.1).

([2]) As the labour share β is set equal to 0.65, the long-run contribution of capital deepening to labour productivity growth is 0.538 times TFP growth rate.

jections are consistent with the efficient use of physical capital.

3.2.3. Specific assumptions on the components of the production function in the longer run (2010–50)

Three key principles should be borne in mind when carrying out long-term projections.

First, there is a need to ensure consistency between the medium-run trend-based projection and the long-run projection based on convergence rules toward the same value of labour productivity at the end of the projection horizon. There is also an overriding constraint to ensure comparability across the EU through the use of a common methodology for all Member States.

Secondly, as the cross-country comparability of results entails similar assumptions of productivity at the end of the projection, a key issue is whether this convergence should be achieved in growth rate or level. While economic theory shows that the real convergence is conditional upon crucial parameters such as the saving rate and demographic developments, the empirical literature does not support the idea of absolute convergence in levels between countries. So, we will have recourse to the convergence in growth rate in the projection exercise. However, the level matters through its influence on the convergence speed and the need for special TFP growth adjustments in some countries with initially low TFP levels (Greece, Italy, Portugal, Spain and all EU-10 countries).

Thirdly, there were large differences of opinion regarding the need for strict convergence to the same growth rate of labour productivity by 2030 across countries, including the newly acceded Member States. On the one hand, it can be argued that a convergence rule is important to ensure comparability of the age-related pension expenditure calculations. On the other hand, it is reasonable to assume ongoing differences after 2030, with these differences reflecting the different starting levels and growth rates of respective countries; different assumptions on convergence in growth rates; and finally the huge diversity in the EU-25. As a compromise, it was agreed that the TFP projections could converge quickly to the same growth rate in order to take account of the EU-15 countries which had very low or very high TFP growth rates at the start of the projection exercise. For the EU-10 Member States, whilst accepting that it would be wrong to treat them as a homogeneous group, concerns were nevertheless expressed that the differences across countries were too great and persisting for too long a period. In addition, the capital deepening assumption for these countries could be adjusted to allow for greater convergence.

As a caveat, it should be noted that average hours worked per person are supposed constant after 2010. Some argue that the rise in female and older people participation might be accompanied by an increase in the part-time employment rate, leading to a decline in hours worked and less productivity than expected in the medium/long run (only in the transition to the steady state), although further capital deepening can have an offsetting effect.

Total factor productivity: the key driving force of labour productivity growth at the end of the projection horizon

This is a crucial issue since in the long run (2010–50), the growth in labour productivity (output per person employed) broadly coincides with TFP growth divided by the labour share (set at 0.65). A prudent assumption for TFP would be that country-specific TFP growth would converge by 2030–50 to the past TFP growth rate recorded for the EU as a whole over a long period (1970–2004), that is, 1.1 % per annum, with the speed of the convergence process perhaps dictated by the size of the initial gap in TFP levels. According to the AMECO database, this rate is almost identical to that experienced in the leading economy in the world, the United States, in the same period. However, it is slightly lower than that seen in the United States more recently (around 1.2 % since 1990 compared with 0.8 % in the EU-15). In effect, it is safer to base long-term TFP projections on long-term past trends rather than on most recent developments which are more likely to be influenced by special factors (such as the ICT boom in the 1990s).

Therefore the assumptions are as follows:

- the TFP growth rates will converge to 1.1 % by 2030 for all EU-15 Member States, with different speeds of convergence for individual Member States depending on the gap in TFP levels;
- for the EU-10 Member States, TFP will converge to 1.75 % by 2030 and, at the same pace, to 1.1 % in 2050. In order to allow for a faster convergence both across the EU-10 and between the EU-15 and the EU-10, three quarters of the convergence towards 1.75 % and subsequently to 1.1 % is achieved in 2015 and 2035 respectively;

- as the TFP level as a percentage of the EU-15 average appears too low at the end of the projection period, some ad hoc adjustments have been made for Greece ([1]), Portugal ([2]), and Spain ([3]). These adjustments aim at avoiding any strong divergence in productivity level in cohesion countries, which are often considered to belong to the 'convergence club', as opposed to the 'frontier club'. For Italy ([4]), the slightly faster convergence in growth rate takes into account the fact that recent (unfavourable) productivity trends may partly reflect special circumstance (i.e. the short-term adverse effect of labour market reforms and dynamic employment on productivity) and should not be extrapolated for too long a time period.

These assumptions suggest that the projection relies on some degree of arbitrariness, which illustrates the uncertainty surrounding all long-term projections. Moreover, for the sake of simplicity, the assumptions are not taking into account some specific effects of ageing population, as TFP is supposed to be exogenous. In particular, while rising participation, which is likely to benefit less skilled workers or those without work experience, may depress TFP, the projected rise in educational attainment can be expected to enhance TFP growth. Likewise, the change in the age structure of working population may weigh down on TFP given the age profile of productivity. Nonetheless, available studies suggest that older workers are not systematically less productive than younger ones, the main factor being the level of education. Some also argue that older workers may be more inflexible and more reluctant to innovations and technological changes. Given a great deal of uncertainty attached to this, this dimension has not been included in productivity projections. On balance, the assumptions for TFP remain reasonable and are meant to avoid strong divergence in TFP levels.

Capital formation: transition to the steady state

In the medium run (up to 2009), the 'investment rule' is run: capital stocks are derived from the ratio of investment to GDP ratio until 2009. As the latter is extrapolated from historical values using time-series techniques, it turns out broadly constant up to 2009. This scenario works very well for EU-15 Member States but leads to excessively optimistic investment performances for a number of EU-10 Member States since it extrapolates forward very high investment rates which are associated with the structural transition process. Moreover, this rule is fine provided that the user's cost of capital remains stable, which should not be the case with a declining economic growth rate associated with ageing ([5]). Lastly, this rule may lead to fluctuating capital deepening at the end of the projection horizon, while the neoclassical growth model predicts that the capital stock per worker should broadly follow the labour-augmenting technical progress in the long run.

Therefore, one might impose that, in the long run, the capital stocks adjust to the steady state path: the so-called 'capital rule' provides that the growth rate of the capital stock is set equal to the sum of growth rate of employment and labour-augmenting technical progress. As seen in Section 3.2.1, this fulfils the steady state property, as the ratio of capital stock to labour expressed in efficiency units remains constant over time. Then the labour productivity growth coincides with that of labour-augmenting technical progress.

However, this scenario results in very sharp shifts in investment rates for a large number of countries in the year in which the rule is introduced. When this rule is introduced from 2010 onwards, the investment rate is

([1]) Three quarters of the TFP convergence process to 1.1 % is achieved by 2015 (high convergence from a lower level than that of the steady state). Then TFP growth converges linearly to reach 1.1 % in 2030. This would raise the GDP per capita level relative to the EU-15 by 2.4 % in 2030.

([2]) TFP growth converges in 2013 towards 1.6 % (i.e. three quarters of the intermediate target for the EU-10, say 1.75 %) and stays at that level until 2026. Then TFP growth converges to 1.1 % in 2030 like the other EU-15 countries. The projections of TFP allow for a fairly smooth convergence path to 1.6 % and then to 1.1 % by using reasonable transition periods (2010–12 and 2027–29) and a quadratic convergence pattern (rather than linear) so as to avoid implausible and too mechanistic dynamics. This ad hoc adjustment is motivated by the need to allow some real convergence to Portugal, given their low initial level of productivity and the strong catch-up dynamics in the EU-10. However, as Portugal has been already in the EU-15 since 1986, benefiting from a favourable economic environment to catch-up, its productivity convergence is projected to be significantly lower than in the EU-10. The Portuguese delegation to the AWG also claims that such an adjustment is consistent with closing of the human capital gap in Portugal and broadly corresponds to the estimated effect of increasing the average number of years of formal education in the same way as observed in Ireland, Italy, Spain and Greece in 1970–98. It assumes that the human capital catch-up has been delayed and is expected to broadly have the same magnitude as that recorded by the other cohesion countries (plus Italy) in the past. This will bring about a rise of five percentage points in the GDP per capita level relative to EU-15 in 2030.

([3]) The new GDP and employment national accounts data released for Spain are used at the start of the projection period. Moreover, the TFP convergence to 1.1 % is achieved by 2012 instead of 2030, which brings about an increase of around three percentage points in GDP per capita relative to the EU-15.

([4]) Italy converges to 1.1 % by 2015 instead of 2030. This higher speed of convergence would result in an average labour productivity growth rate for Italy over the period 2011–50 of around 1.7 %. This labour productivity growth rate is now similar to the average rates assumed for other large euro area countries such as Germany and France.

([5]) Indeed, movements in interest rates are supposed to broadly follow developments in potential output in the long run, as indicated in the golden rule of the Solow model.

unacceptably large for a number of countries. In addition, the introduction of the rule in 2010 results in relatively pessimistic productivity projections for a large number of the catching-up Member States whilst making little difference for those countries which are already close to their long-run TFP growth rate.

Therefore, a transition between the investment rule and the capital rule should be worked out to smooth the profile of investment. The following pattern for capital formation has been used:

- the capital stock dynamics is derived from the investment/GDP ratio until 2009, which is kept broadly constant ('investment rule');
- the transition to the constant capital/labour ratio assumption is introduced gradually in the period 2010–30 in a linear manner ('transition rule');
- the capital/labour (in efficiency unit) ratio is constant from 2030 to 2050 ('capital rule').

3.3. Main results of baseline projections

Results for the EU-25, EU-15 and EU-10

Table 3.1 presents the outcome of the projections for potential growth rates up to 2050 as well as its determinants. For the EU-25, the annual average potential GDP growth rate of 2.4 % in the period 2004 to 2010 is projected to decline sharply, down to 1.5 % in the period 2021–30 and stabilise at 1.2 % in the period 2031–50. The projected fall in potential growth rates is much higher in the EU-10 (3.6 percentage points) than in the EU-15 (about 1 percentage point). For the EU-10, the potential growth rate of 4.5 % between 2004 and 2010 is projected to fall to only 0.6 % between 2041 and 2050, lower than the projected growth rate of 1.3 % for the EU-15 at the end of the projection period. Over the whole period 2004–50, output growth rates remain much higher in the EU-10 than in the EU-15, reflecting the strong expected economic catch-up in the EU-10 Member States. However, GDP growth rates in the EU-25 are very close to those in the EU-15, as the latter represents more than 90 % of the EU-25 total output at the start of the projection period.

Table 3.2 and Table 3.3 indicate the contribution of productivity per person employed and employment to projected potential growth rates. The much stronger decline in potential growth rates in the EU-10 occurs especially because of less favourable demographic projections in the EU-10. Moreover, the productivity growth rates of the EU-10 and the EU-15 Member States are assumed to converge to the rate of 1.7 % at the very end of the projection horizon. This means that, compared with the period 2004–10, labour productivity growth should slightly increase in the EU-15 and sharply fall in the EU-10 from a quite high starting level of 3.6 %.

Table 3.4 and Table 3.5 show the contribution of the main determinants of productivity per person employed, that is, TFP growth and capital deepening. TFP growth explains most of productivity growth per person employed. This is all the truer since in the long run, the capital deepening contribution follows TFP growth (times the labour share). By construction, TFP growth converges toward the rate of 1.1 % at the end of the projection for all Member States, which, given the use of the 'capital rule', implies a labour productivity growth rate of 1.7 % for all countries in the steady state (reached in 2030 for the EU-25 and in 2050 for the EU-10).

While the capital deepening profile gets in line with that of TFP growth from 2030, the capital dynamics in the period 2004–30 is more complex and worth describing further. In the EU-15, the contribution of capital deepening rises from 0.4 percentage points in 2004–10 to 0.7 percentage points in 2011–30, mirroring the positive impact of the demographic slowdown on the capital/labour ratio. Then, the capital deepening contribution takes its 'steady state' value of 0.6 percentage points in the period 2030–50. For the EU-10, the capital deepening contribution is initially very high (around 1.6 percentage points between 2004 and 2020), consistent with the catching-up process of converging economies and the strong slowdown in employment growth. Then, the contribution gradually declines to the steady state value of 0.6 percentage points, as the growth in the capital stock slowly adjusts to employment growth. Overall, the contribution of capital deepening in the EU-10 is almost the double of that in the EU-15 on average over the whole period 2004 to 2050.

Table 3.6 presents the projections for GDP per capita growth rates. As expected, the projected decline in output per capita growth rates in both the EU-15 and the EU-10 is smaller than the projected fall in output growth rates, since total population growth rates should drop over the period 2004–50.

As a consequence of faster growth in GDP per capita in the EU-10 than in the EU-15 and despite the very severe population ageing in the EU-10, the levels of income per capita in the EU-10 are projected to increase from 50 % of the EU-15 average in 2004 to 78 % in 2050 (see Table 3.7). As indicated in Table 3.8, these developments result from the strong rise in projected EU-10 productivity levels relative to the EU-15, which reach 83 % in 2050.

Cross-country differences

All EU-25 Member States should experience a marked slowdown in their potential growth rates in the future owing to the across-the-board demographic decay. However, growth rates differ substantially from country to country, as shown in Table 3.1. It is expected that in the first half of the projection period, productivity growth will be the main source of discrepancy across countries, reflecting different historical trends in productivity growth, while employment developments have a dominant role in the second half of the projection period due to the mechanical effect of productivity convergence, along with uneven demographic developments. It should also be noted that productivity growth varies across the EU-10 very strongly.

Table 3.1

Projected potential growth rates based on underlying assumptions to be used in baseline EPC projection exercise (annual average growth rates)

	2004–10	2011–20	2021–30	2031–40	2041–50	2004–50
BE	2.4	2.1	1.4	1.5	1.5	1.7
DK	2.0	1.9	1.4	1.3	1.8	1.7
DE	1.7	1.8	1.0	1.1	1.2	1.3
EL	2.9	2.0	1.2	0.8	0.8	1.5
ES	3.0	2.5	1.5	0.6	0.6	1.6
FR	2.2	1.9	1.7	1.6	1.6	1.8
IE	5.5	4.1	2.6	1.8	1.4	2.9
IT	1.9	1.8	1.2	0.8	1.1	1.3
LU	4.0	3.0	2.9	3.0	3.0	3.1
NL	1.7	1.8	1.4	1.6	1.8	1.7
AT	2.2	2.1	1.2	1.2	1.3	1.5
PT	1.9	2.4	1.9	0.8	0.8	1.5
FI	2.7	1.9	1.5	1.6	1.4	1.8
SE	2.7	2.7	2.1	1.8	1.9	2.2
UK	2.8	2.5	1.7	1.5	1.5	2.0
CY	4.3	4.1	2.9	2.3	1.5	2.9
CZ	3.5	2.9	2.2	1.0	0.7	2.0
EE	6.1	3.7	2.4	1.6	0.8	2.7
HU	3.7	2.8	2.3	1.2	1.0	2.1
LT	6.5	4.3	2.3	1.4	0.9	2.8
LV	7.7	4.4	2.4	1.5	0.7	3.1
MT	2.2	2.7	2.9	2.2	1.7	2.4
PL	4.6	3.8	2.7	1.2	0.5	2.4
SK	4.6	4.2	2.6	0.9	0.3	2.4
SI	3.7	2.8	2.1	1.3	1.0	2.1
EU-25	*2.4*	*2.2*	*1.5*	*1.2*	*1.2*	*1.7*
EU-15	*2.2*	*2.1*	*1.4*	*1.2*	*1.3*	*1.6*
EU-10	*4.5*	*3.5*	*2.5*	*1.2*	*0.6*	*2.3*

Source: Economic and Financial Affairs DG.

Table 3.2

Determinants of potential growth rates: labour productivity (annual average growth rates)

	2004–10	2011–20	2021–30	2031–40	2041–50	2004–50
BE	1.5	1.8	1.8	1.7	1.7	1.7
DK	1.9	1.9	1.8	1.7	1.7	1.8
DE	0.9	1.5	1.7	1.7	1.7	1.6
EL	2.1	1.8	1.8	1.7	1.7	1.8
ES	1.1	2.0	1.8	1.7	1.7	1.7
FR	1.4	1.7	1.7	1.7	1.7	1.7
IE	3.4	3.1	1.9	1.7	1.7	2.3
IT	0.7	1.6	1.7	1.7	1.7	1.6
LU	1.8	2.1	1.8	1.7	1.7	1.8
NL	1.1	1.7	1.7	1.7	1.7	1.6
AT	1.5	1.8	1.8	1.7	1.7	1.7
PT	1.2	2.5	2.4	1.7	1.7	1.9
FI	2.1	2.1	1.9	1.7	1.7	1.9
SE	2.2	2.5	2.0	1.7	1.7	2.0
UK	2.1	2.3	1.9	1.7	1.7	1.9
CY	2.4	2.9	2.8	2.1	1.8	2.4
CZ	3.4	3.2	2.8	2.1	1.8	2.6
EE	5.3	4.2	3.1	2.1	1.8	3.2
HU	3.2	3.0	2.8	2.1	1.8	2.5
LT	5.7	4.1	3.1	2.1	1.8	3.2
LV	6.5	4.9	3.3	2.1	1.8	3.5
MT	1.0	1.9	2.5	2.1	1.8	1.9
PL	3.8	3.3	2.9	2.1	1.8	2.7
SK	3.9	3.6	3.0	2.1	1.8	2.8
SI	3.3	3.1	2.8	2.1	1.8	2.6
EU-25	*1.5*	*2.0*	*1.9*	*1.8*	*1.7*	*1.8*
EU-15	*1.3*	*1.9*	*1.8*	*1.7*	*1.7*	*1.7*
EU-10	*3.6*	*3.4*	*2.9*	*2.1*	*1.8*	*2.7*

Source: Economic and Financial Affairs DG.

This results in different changes in projected GDP per capita levels relative to the EU-15 average across countries, as shown in Table 3.7. For the EU-15, while the relative levels of GDP per capita decline somewhat in Austria, Germany, Greece, the Netherlands, Spain and Italy between 2004 and 2050, they are projected to remain broadly unchanged in Belgium, Denmark, France and Portugal and to increase in Ireland, Luxembourg, Finland, Sweden and the United Kingdom. They are projected to increase in all EU-10 Member States, although at different paces. Belgium, Cyprus, Denmark, France, Ireland, Luxembourg, the Netherlands, Austria, Finland, Sweden and the United Kingdom would exceed the EU-15 average in terms of GDP per capita in 2050. However, these results should not be misinterpreted: a decline in GDP per capita relative levels does not mean that GDP per capita falls in the considered country, but only that GDP growth is lower in that country compared with the EU-15 average. Indeed, Table 3.6 clearly shows that GDP per capita is projected to grow by at least 1.5 % a year on average in all countries over the whole projection period.

Summing up

The projections of GDP are based on projections of future growth in labour productivity and employment. In particular, projected labour productivity growth relies on assumptions about total factor productivity growth and capital stock developments. Although such patterns may or may not be realised in practice, it is based on the reasonable principle that cross-country discrepancies in

Table 3.3

Determinants of potential growth rates: employment (annual average growth rates)

	2004–10	2011–20	2021–30	2031–40	2041–50	2004–50
BE	0.9	0.3	– 0.4	– 0.2	– 0.2	0.0
DK	0.1	0.0	– 0.4	– 0.4	0.1	– 0.1
DE	0.8	0.2	– 0.8	– 0.6	– 0.5	– 0.2
EL	0.9	0.2	– 0.6	– 0.9	– 0.9	– 0.3
ES	1.9	0.5	– 0.4	– 1.1	– 1.1	– 0.1
FR	0.8	0.2	0.0	– 0.1	– 0.1	0.1
IE	2.0	1.0	0.7	0.0	– 0.3	0.6
IT	1.1	0.2	– 0.5	– 0.9	– 0.6	– 0.2
LU	2.2	1.0	1.1	1.3	1.3	1.3
NL	0.6	0.1	– 0.3	– 0.1	0.1	0.0
AT	0.7	0.3	– 0.6	– 0.5	– 0.5	– 0.2
PT	0.7	– 0.1	– 0.5	– 0.9	– 0.9	– 0.4
FI	0.6	– 0.2	– 0.4	– 0.1	– 0.3	– 0.1
SE	0.6	0.2	0.0	0.0	0.2	0.2
UK	0.7	0.2	– 0.2	– 0.2	– 0.2	0.0
CY	1.9	1.2	0.1	0.2	– 0.3	0.5
CZ	0.1	– 0.3	– 0.6	– 1.1	– 1.1	– 0.6
EE	0.7	– 0.5	– 0.7	– 0.5	– 1.0	– 0.4
HU	0.5	– 0.2	– 0.4	– 0.9	– 0.8	– 0.4
LT	0.8	0.1	– 0.9	– 0.7	– 0.9	– 0.4
LV	1.2	– 0.6	– 0.9	– 0.6	– 1.1	– 0.5
MT	1.2	0.8	0.4	0.1	– 0.1	0.4
PL	0.7	0.4	– 0.2	– 0.8	– 1.3	– 0.3
SK	0.7	0.6	– 0.4	– 1.2	– 1.5	– 0.4
SI	0.4	– 0.3	– 0.7	– 0.8	– 0.8	– 0.5
EU-25	*0.9*	*0.2*	*– 0.4*	*– 0.5*	*– 0.5*	*– 0.1*
EU-15	*0.9*	*0.2*	*– 0.4*	*– 0.5*	*– 0.4*	*– 0.1*
EU-10	*0.9*	*0.2*	*– 0.4*	*– 0.9*	*– 1.2*	*– 0.9*

Source: Economic and Financial Affairs DG.

labour productivity growth should be allowed at the start of the projection but should fade away towards the end of the projection horizon.

Given the decline in labour supply, the annual average potential GDP growth rate of 2.4 % for the EU-25 in the period 2004 to 2010 is projected to decline to 1.2 % in the period 2031–50. The projected fall in potential growth rates is much higher in the EU-10 than in the EU-15. For the EU-10, potential rates of 4.5 % between 2004 and 2010 are projected to fall to only 0.6 % between 2041 and 2050, lower than the projected growth rate of 1.3 % for the EU-15 at the end of the projection period. This occurs in part because the productivity growth rates between the EU-10 and the EU-15 are assumed to have converged by then, but especially because of less favourable demographic projections in the EU-10.

Table 3.4

Determinants of labour productivity: total factor productivity (annual average growth rates) (*)

	2004–10	2011–20	2021–30	2031–40	2041–50	2004–50
BE	1.2	1.2	1.1	1.1	1.1	1.1
DK	1.2	1.2	1.1	1.1	1.1	1.1
DE	0.8	1.1	1.1	1.1	1.1	1.1
EL	0.9	0.8	1.0	1.1	1.1	1.0
ES	0.3	1.1	1.1	1.1	1.1	1.0
FR	1.0	1.1	1.1	1.1	1.1	1.1
IE	2.6	2.0	1.2	1.1	1.1	1.5
IT	0.5	1.1	1.1	1.1	1.1	1.0
LU	0.8	1.1	1.1	1.1	1.1	1.1
NL	0.7	1.1	1.1	1.1	1.1	1.1
AT	0.9	1.1	1.1	1.1	1.1	1.1
PT	0.6	1.6	1.5	1.1	1.1	1.2
FI	2.0	1.6	1.3	1.1	1.1	1.4
SE	1.8	1.8	1.3	1.1	1.1	1.4
UK	1.4	1.5	1.2	1.1	1.1	1.2
CY	1.3	1.6	1.7	1.4	1.2	1.4
CZ	1.2	1.6	1.7	1.4	1.2	1.4
EE	2.5	2.1	1.8	1.4	1.2	1.7
HU	1.2	1.5	1.7	1.4	1.2	1.4
LT	3.0	2.2	1.8	1.4	1.2	1.8
LV	3.1	2.4	1.9	1.4	1.2	1.9
MT	0.1	1.2	1.6	1.4	1.2	1.1
PL	2.4	2.0	1.8	1.4	1.2	1.7
SK	2.2	2.1	1.8	1.4	1.2	1.7
SI	1.1	1.5	1.7	1.4	1.2	1.4
EU-25	*1.0*	*1.3*	*1.2*	*1.1*	*1.1*	*1.2*
EU-15	*0.9*	*1.2*	*1.1*	*1.1*	*1.1*	*1.1*
EU-10	*2.0*	*1.9*	*1.8*	*1.3*	*1.1*	*1.6*

(*) TFP growth rates can also be seen as the contribution in percentage points to the growth in labour productivity (i.e. GDP per person employed growth).

Source: Economic and Financial Affairs DG.

Table 3.5

Determinants of labour productivity: capital deepening (contribution in percentage points)

	2004–10	2011–20	2021–30	2031–40	2041–50	2004–50
BE	0.3	0.6	0.7	0.6	0.6	0.6
DK	0.7	0.7	0.6	0.6	0.6	0.6
DE	0.1	0.4	0.6	0.6	0.6	0.5
EL	1.2	1.0	0.7	0.6	0.6	0.8
ES	0.8	0.9	0.7	0.6	0.6	0.7
FR	0.4	0.6	0.6	0.6	0.6	0.6
IE	0.8	1.0	0.7	0.6	0.6	0.8
IT	0.2	0.6	0.6	0.6	0.6	0.5
LU	1.0	1.0	0.7	0.6	0.6	0.7
NL	0.4	0.6	0.6	0.6	0.6	0.6
AT	0.6	0.7	0.7	0.6	0.6	0.6
PT	0.5	0.9	0.8	0.6	0.6	0.7
FI	0.1	0.5	0.6	0.6	0.6	0.5
SE	0.4	0.7	0.7	0.6	0.6	0.6
UK	0.7	0.8	0.7	0.6	0.6	0.7
CY	1.1	1.3	1.1	0.7	0.6	1.0
CZ	2.2	1.6	1.1	0.7	0.6	1.2
EE	2.8	2.1	1.3	0.7	0.6	1.4
HU	2.0	1.5	1.1	0.7	0.6	1.1
LT	2.7	2.0	1.3	0.7	0.6	1.4
LV	3.4	2.6	1.4	0.7	0.6	1.6
MT	0.9	0.8	0.9	0.7	0.6	0.8
PL	1.4	1.3	1.1	0.7	0.6	1.0
SK	1.6	1.5	1.2	0.7	0.6	1.1
SI	2.1	1.6	1.1	0.7	0.6	1.2
EU-25	*0.5*	*0.7*	*0.7*	*0.6*	*0.6*	*0.6*
EU-15	*0.4*	*0.7*	*0.7*	*0.6*	*0.6*	*0.6*
EU-10	*1.6*	*1.5*	*1.1*	*0.7*	*0.6*	*1.1*

Source: Economic and Financial Affairs DG.

Table 3.6

Projected GDP per capita growth rates (period averages)

	2004–10	2011–20	2021–30	2031–40	2041–50	2004–50
BE	2.1	1.9	1.2	1.5	1.7	1.6
DK	1.8	1.8	1.2	1.3	2.0	1.6
DE	1.6	1.7	1.1	1.4	1.6	1.5
EL	2.6	1.8	1.3	1.0	1.2	1.5
ES	2.0	2.3	1.5	0.8	1.0	1.5
FR	1.7	1.6	1.5	1.5	1.7	1.6
IE	4.2	3.1	1.9	1.3	1.1	2.2
IT	1.6	1.8	1.4	1.0	1.5	1.5
LU	3.0	2.1	2.0	2.3	2.4	2.3
NL	1.3	1.5	1.2	1.5	1.9	1.5
AT	1.9	1.9	1.1	1.3	1.5	1.5
PT	1.5	2.3	2.0	1.1	1.2	1.6
FI	2.4	1.7	1.5	1.7	1.7	1.8
SE	2.3	2.3	1.7	1.6	1.8	1.9
UK	2.4	2.2	1.4	1.5	1.6	1.8
CY	2.9	3.1	2.3	2.0	1.3	2.3
CZ	3.6	3.2	2.5	1.4	1.1	2.3
EE	6.6	4.2	2.8	2.0	1.2	3.1
HU	3.9	3.1	2.6	1.4	1.3	2.4
LT	7.0	4.8	2.5	1.7	1.2	3.2
LV	8.3	5.0	2.8	1.9	1.0	3.5
MT	1.3	2.0	2.4	1.9	1.4	1.8
PL	4.7	4.0	2.9	1.6	1.0	2.7
SK	4.7	4.3	2.8	1.3	0.8	2.7
SI	3.6	2.8	2.2	1.5	1.3	2.2
EU-25	*2.2*	*2.1*	*1.6*	*1.4*	*1.5*	*1.7*
EU-15	*1.9*	*1.9*	*1.4*	*1.3*	*1.6*	*1.6*
EU-10	*4.6*	*3.8*	*2.7*	*1.5*	*1.1*	*2.6*

Source: Economic and Financial Affairs DG.

Table 3.7

Projected GDP per capita levels relative to the EU-15

	2004	2010	2030	2040	2050
BE	108	109	107	108	109
DK	110	110	107	107	111
DE	101	99	94	95	95
EL	72	74	72	70	68
ES	85	86	90	86	81
FR	105	104	101	103	103
IE	132	150	177	176	167
IT	100	98	97	94	94
LU	194	207	226	248	270
NL	108	105	98	100	103
AT	116	117	113	113	112
PT	68	66	73	71	68
FI	108	111	110	114	115
SE	112	115	123	126	129
UK	104	107	111	112	113
CY	81	87	107	113	110
CZ	64	71	89	90	86
EE	46	60	86	91	87
HU	54	60	76	77	75
LT	43	58	86	89	87
LV	42	60	93	99	94
MT	68	65	73	77	76
PL	45	53	75	77	73
SK	48	57	83	83	77
SI	73	80	94	96	94
EU-25	*92*	*93*	*97*	*97*	*97*
EU-15	*100*	*100*	*100*	*100*	*100*
EU-10	*50*	*59*	*80*	*82*	*78*

Source: Economic and Financial Affairs DG.

Table 3.8

Projected productivity levels relative to the EU-15

	2004	2010	2030	2040	2050
BE	122	117	115	115	115
DK	98	100	100	100	100
DE	94	92	88	88	88
EL	84	80	79	79	79
ES	91	87	88	88	88
FR	113	113	110	110	110
IE	128	143	161	161	161
IT	116	112	108	108	108
LU	129	133	134	134	134
NL	93	94	92	92	92
AT	109	108	106	106	106
PT	60	63	71	71	71
FI	104	108	112	112	112
SE	104	107	116	116	116
UK	95	102	107	107	107
CY	77	77	94	97	97
CZ	59	69	86	90	90
EE	46	58	82	85	86
HU	61	66	81	84	84
LT	46	57	80	83	84
LV	42	57	88	91	92
MT	80	76	81	84	84
PL	54	59	76	78	79
SK	52	58	76	79	80
SI	71	77	96	99	100
EU-25	*93*	*94*	*97*	*97*	*98*
EU-15	*100*	*100*	*100*	*100*	*100*
EU-10	*56*	*62*	*80*	*82*	*83*

Source: Economic and Financial Affairs DG.

4. Interest rates

4.1. Background

In the 2001 projection exercise, the real interest rate was assumed to be 4 % over the entire projection period. For the 2005 projection exercise, this assumption was considered as too high, especially in light of the negative impact of ageing populations on potential growth rates discussed in Chapter III ([1]).

In addressing the issue, an alternative approach was considered, namely to use a uniform assumption over the projection period. In particular, a simple economically-based method would consist of deriving a common real interest rate from the production function for the **EU as a whole** ([2]). According to the golden rule derived from the Solow growth model, the optimal real interest rate, which maximises the per capita consumption, equals the sum of labour growth and labour augmenting technical progress growth. In other words, interest rates in the long run, should be close to the growth rate of output for the EU-25 average. This method has the merit of including the effect of population ageing in the real interest rate setting, through the decreasing growth in labour, in a way consistent with the production function approach. However, for the sake of clarity and simplicity, this method was rejected, and instead efforts were concentrated on examining what would be a reasonable baseline assumption.

Real interest rates: a long-term perspective

The Economic and Financial Affairs DG examined whether an assumption of 4 % is reasonable in a baseline scenario. While this rate broadly corresponds to the real long-term interest rates recorded on average in both the EU-15 and the United States since the early 1990s (see Graphs 4.1 and 4.2), over a longer time period (the last 40 years), the average real interest rates were slightly lower, ranging from 2.0 to 3.7 % in the main EU countries (see Table 4.1). Over the last 40 years, the average real interest rates have ranged from around 2 % to slightly over 3.5 % in EU countries and the United States for the period 1961–2003. The average rates for Belgium (3.7 %), Germany (3.6 %), Spain (3.5 %), France (3.1 %) and the United States (3.1 %) were at the higher end of the range. While interest rate developments have not been stable over time, rates have been clearly below 4 % since the launch of the third stage of EMU.

Overall, the past data suggest that an assumption of 4 % for real interest rates is on the high side and that a real interest rate of 3 % would be a more appropriate assumption. Further evidence provides some justification for using this somewhat lower assumption, while suggesting that too low an interest rate should not be assumed. In particular:

- a recent ECB working paper ([3]) suggests that the natural real interest rate for the euro area would have declined over the period 1994–2000, from around 3.7 % to 3 %, after remaining stable for about a decade. This paper refers to the short-term equilibrium real interest rate, which implies that the 'natural' long-term real interest rate was at least 3 % in 2000 (i.e. in the extreme case that the yield curve is perfectly flat). Starting with a rate of 2 % or 2.5 % therefore seems a fairly pessimistic assumption. Moreover, the current level of actual long-term interest rates (around 2.3 % for the EU-15 in 2004) may partly reflect the specific situation characterised by a fairly loose monetary policy and sticky headline inflation at a level slightly above 2 % ([4]);

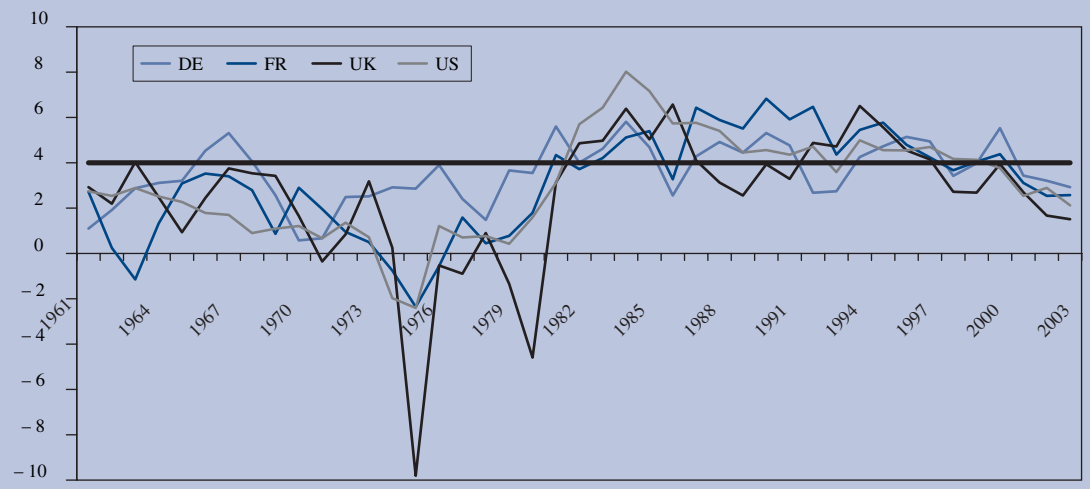
([1]) See European Commission (2005b) and (2005k).

([2]) This is in line with the fact that nominal interest rates are expected to be broadly the same in the European financial markets, which is characterised by a high level of integration. Moreover, inflation rates are expected to be close across countries, given the existence of a single monetary policy in the euro area and the process of nominal convergence in the new Member States.

([3]) Giammarioli and Valla (2003).

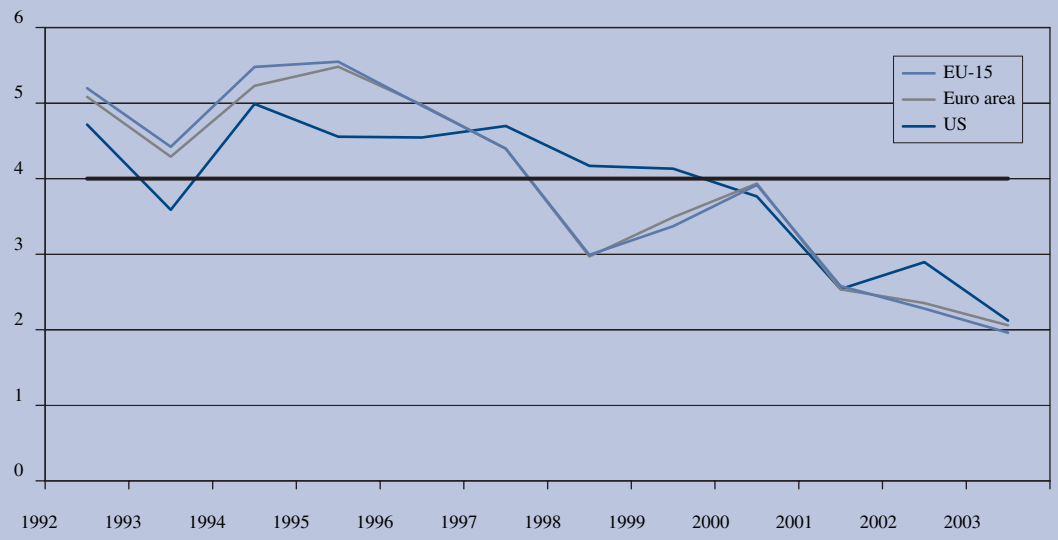
([4]) Current real interest rates are also influenced by the saving/investment balance. Despite fiscal deficits in Europe, current saving surpluses in East Asia and outside the OECD may help keep real rates low.

Graph 4.1: **Real interest rates in the United States and selected EU countries, 1960–2004**



Source: AMECO database. The real interest rate is computed with the deflator GDP.

Graph 4.2: **Real long-term interest rates (in percentage) in the EU, euro area and United States, 1990–2004**



NB: The real interest rate is computed with the deflator GDP.
Source: Economic and Financial Affairs DG, AMECO.

Table 4.1

Four-decade average of real long-term interest rates (percentage)

	BE	DE (1)	ES (2)	FR	IT	NL	FI	SE	UK	US
Average 19	3.7	3.6	3.5	3.1	2	2.8	2.8	2.7	2.5	3.1

(1) Data for western Germany until 1991.
(2) Data start from 1979 in Spain.
NB: The long-term interest rate corresponds to an aggregate measure of government bond yields (10 years' maturity), deflated using the GDP deflator. These figures are very close to those given by New Cronos (Eurostat).

Source: DG-ECFIN AMECO database.

- while the long-term real interest rate should roughly follow GDP growth, the relation is far from being strict. This casts some doubt on the pessimist claim that the decline in GDP growth induced by ageing should necessarily translate into very low interest rates in the long run. Over the last two decades, real interest rates in the euro area were higher than real GDP growth, as seen in Graph 4.3. In this respect, it should be borne in mind that the golden rule (Solow model) gives the normative (or optimal) level of natural interest rate under the assumption of maximised inter-temporal consumption. In practice, the long-term interest can be different from GDP growth given that the economies are not necessarily running at the optimal level. Moreover, the real interest rate may incorporate a preference for the liquidity, risk premia (inflation volatility, etc.). For instance, using a more complex specification of consumer optimisation, the Ramsay-Cass-Koopmans model shows the importance of time preference (i.e. 'impatience' for present consumption) and the aversion for risk in determining real interest rates, in addition to the growth in labour augmenting technical progress (1);

- presumably drawing upon the life-cycle consumption hypothesis, some studies argue that in coming decades, real interest may rise as a result of a sell-off of assets by older-age cohorts pulling their prices down. This is sometimes referred to as the 'asset meltdown hypothesis'. Overall, it was considered that this argument should be viewed with caution and that it may not provide a strong basis to justify a large projected rise in real interest rates. The empirical evidence for such an effect is weak and the literature is fairly mixed on this issue (for example, see a short review in Oliveira et al., 2005). Indeed, many elderly people appear to be net savers in contradiction to what is suggested by the life-cycle consumption hypothesis. Moreover, this hypothesis is based on a partial equilibrium framework, which overlooks potentially important changes in economic behaviours induced by interest rate developments.

(1) See, for instance, Koopmans (1965), Cass (1965) or Barro and Sala-i-Martin (1995).

4.2. Assumptions on interest rates to be used in the 2005 EPC projection of age-related expenditure

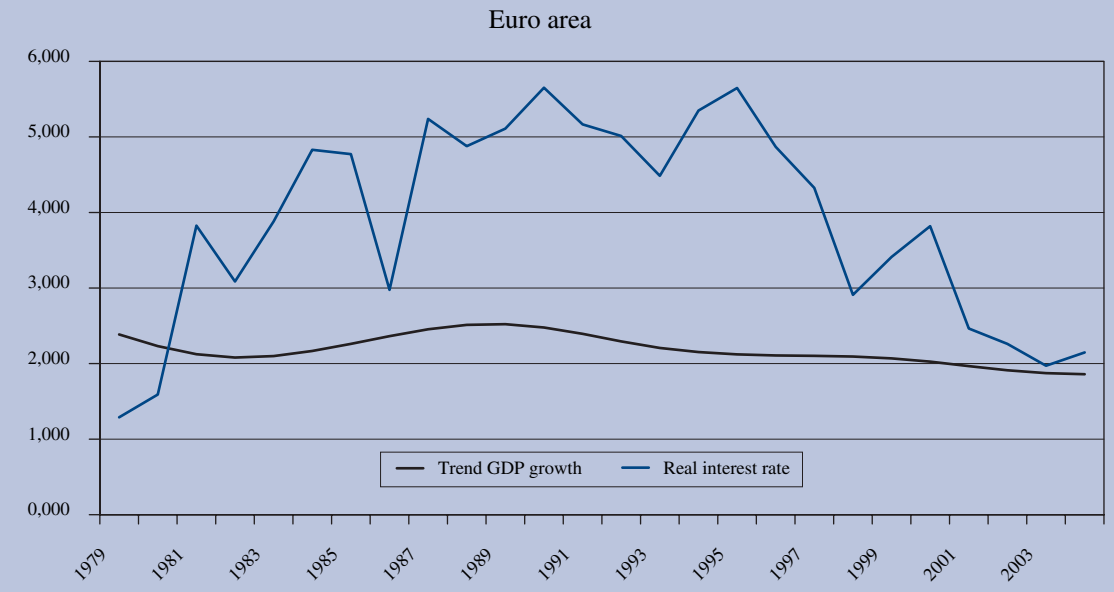
The EPC agreed the following:

- to assume a constant real interest rate in the baseline scenario with a prudent value of 3.0 % (2) — the Indicators Sub-Group attached to the Social Protection Committee (SPC) intends to use the same assumption for their projections to calculate replacement on pensions (3);

- to run a sensitivity test (see Chapter 5).

(2) The EPC agreed that projections should be reported in 2004 prices. However, for technical reasons, some countries may need to introduce an assumption on inflation into their models, and in this event, the EPC agreed that it should be 2 % for all countries. This means that the nominal long-term interest rate stands at 5 %.
(3) The option of making a specific assumption on the rate of administrative costs on funded pension schemes was also considered, see European Commission Economic and Financial Affairs DG (2005k) and Ministry of Finance Finland et al. (2005). However, for the sake of simplicity and given the uncertainties related to their level and the risk of introducing inconsistencies with public pension schemes, this aspect was not taken into account.

Graph 4.3: **GDP growth and long-term real interest rate over the last two decades**



NB: The long-term interest rate corresponds to an aggregate measure of government bond yields (10 years' maturity), deflated using the GDP deflator.
Source: European Commission, AMECO database.

5. Sensitivity tests

5.1. Background

Given the uncertainty surrounding many assumptions underpinning long-run projections, it is necessary to carry out a number of sensitivity tests so as to quantify the responsiveness of projection results to changes in key underlying assumptions. In presenting the results of the projection of age-related expenditure, and when using the projections to assess the sustainability of public finances, it is important to avoid a presentation which gives the impression that the baseline scenario represents the 'best guess' as regards likely future developments in coming years. Instead, the baseline scenario should be presented as a prudent 'no policy change' scenario which is a starting point for making projections. Moreover, the presentation and assessment of the impact of ageing populations on particular age-related expenditure items should be made with reference to all scenarios (baseline and sensitivity tests): this is needed so that a clear picture emerges of the key factors driving the projection results and the potential sources of risk to future expenditure developments.

In addition to running a baseline projection based on the assumptions outlined in Chapters 1 to 4 of this report, the EPC has also agreed to run a series of sensitivity tests, an overview of which can be seen in Table 5.1 below ([1]). The sensitivity tests introduce a change or shock to a single underlying assumption/parameter in the projection framework. A uniform shock is applied to all Member States.

A bottom-up approach has been followed to produce the overall set of assumptions, i.e. from population projections through labour input and to GDP growth projections. Therefore, each sensitivity test may involve the recalculation of all assumptions and to run again the labour force and productivity function-based models, in order to keep a consistent macroeconomic framework. Additional details on the quantitative impact of the sensitivity tests (e.g. on the size/age structure of population, on employment/participation rates and on economic dependency ratios) can be found in annex 9.

5.2. Sensitivity tests on the population projections

In contrast with the approach undertaken in the 2001 budgetary projection, it was considered not useful to run budgetary sensitivity tests on the basis of the high/low population scenarios. This is because in these scenarios, all components of demographic change move in the direction needed to achieve a higher/lower total population size at the end of the projection period. While these scenarios lead to very big differences in total population size at the end of the projection period relative to the baseline scenario, the age structure of the population, proxied by the old-age dependency ratio, is similar in all three cases. Hence, the high/low population scenarios do not provide a useful indication of the sensitivity of projection results to changes in the ageing of the population. Instead, the following sensitivity test will be carried out for population change.

High life expectancy: Gains in life expectancy have important implications for spending on pensions, healthcare and long-term care, and are a major potential source of financial pressure/risk for social protection systems. A sensitivity test on life expectancy will be run involving a decrease of 15 % in age-specific mortality rates (ASMRs) by 2050, via a linear increase from 0 % in 2004. This translates into an increase in life expectancy at birth of roughly 1 to 1.5 years for males and females in most Member States (see Tables 5.4 and 5.5). Note that the shock applied to mortality rates is uniform across Member States even if its outcome in terms of projected changes in life expectancy at birth is not uniform.

([1]) European Commission (2005j).

Table 5.1

Overview of planned sensitivity tests: difference in assumptions compared with the baseline scenario

Population	Labour force		Productivity	Interest rates
High life expectancy	***High employment rate***	***High employment rate amongst older workers (aged 55–64)***	***High/low productivity***	***High/low interest rate***
Decrease of 15 % in age-specific mortality rates (ASMRs) by 2050, via a linear increase from 0 % in 2004. This leads to an increase in life expectancy at birth of roughly 1–1.5 years by 2050.	Employment rate increases by 1 p.p. over the period 2005–15 and remains 1 p.p. higher over the period 2015–50. The change in the employment rate is reflected in a parallel change in unemployment rate (NAIRU).	Employment rate of older workers increases by 5 p.p. over the period 2005–25 (that is about 0.25 per year) and remains 5 p.p. higher over the period 2025–50. The change in the employment rate is reflected in a parallel change in participation rate.	Labour productivity increases/decreases by 0.25 over the period 2010–15 (that is about 0.04 per year) and remains 0.25 p.p. higher/lower over the period 2015–50	Interest rate 1 p.p. higher/lower than the 3 % in baseline scenario.

Source: EPC/AWG.

Table 5.4 presents the impact of the assumptions on higher life expectancy on the size and age structure of the population. The largest changes occur in the numbers of elderly (5 % higher in the EU-25 than in the baseline scenario, 4.9 % in the EU-15 and 5.8 % in the EU-10) and amongst the very old (10.2 % higher than in the baseline scenario, 9.8 % in the EU-15 and 12.9 % in the EU-10). Overall, the old-age dependency ratio would be 2.5 percentage points higher in this high life expectancy scenario compared with the baseline scenario.

5.3. Sensitivity tests on the labour force projections

The following two sensitivity tests have been suggested. First, the impact of an increase in the **total employment rate** (for people aged 15 to 64) would be examined. In particular, compared with the baseline scenario outlined in Chapter 2, the employment rate is assumed to increase by one percentage point over the period 2005–15, and to remain one percentage point higher over the period 2015–50 (see Table 5.5). The change in the employment rate is reflected in a parallel change in the unemployment rate (NAIRU).

Secondly, sensitivity tests would be carried out to assess the impact of an increase in the **employment rate of older workers** (aged 55 to 64). Compared with the baseline scenario, the employment rate of older workers would increase by five percentage points over the period 2005–25 (i.e. by about 0.25 per year) and remain five percentage points higher over the period 2025–50 (see Table 5.5). The change in the employment rate is reflected in a parallel change in the participation rate.

5.4. Sensitivity tests on other macroeconomic assumptions

Productivity

The EPC agreed to run a sensitivity test as follows: **labour productivity growth** is assumed to increase/decrease by 0.25 over the period 2010 to 2015 (that is about 0.04 per year), and remain 0.25 percentage point higher/lower than in the baseline scenario.

Interest rates

The EPC agreed to run the following sensitivity test: **real interest rates** are set one percentage point higher/lower than the 3 % in the baseline scenario.

Table 5.2

Assumptions for sensitivity tests on high male life expectancy (1)

	Assumptions on life expectancy for males in sensitivity tests			Difference compared with baseline scenario				
	2004	2020	2050	2010	2020	2030	2040	2050
BE	75.5	79.4	83.6	*0.2*	*0.6*	*0.9*	*1.2*	*1.5*
DK	75.2	78.7	83.1	*0.2*	*0.6*	*0.9*	*1.3*	*1.6*
DE	76.1	79.5	83.7	*0.2*	*0.6*	*1.0*	*1.4*	*1.8*
EL	76.4	78.8	82.8	*0.2*	*0.6*	*0.9*	*1.3*	*1.7*
ES	76.6	79.6	83.3	*0.2*	*0.6*	*0.9*	*1.3*	*1.6*
FR	76.2	79.9	83.9	*0.2*	*0.6*	*0.9*	*1.2*	*1.5*
IE	75.5	79.3	84.1	*0.2*	*0.6*	*1.0*	*1.4*	*1.9*
IT	77.3	80.4	84.4	*0.2*	*0.5*	*0.9*	*1.2*	*1.6*
LU	75.0	79.0	83.4	*0.2*	*0.6*	*0.9*	*1.3*	*1.7*
NL	76.2	78.8	82.7	*0.2*	*0.5*	*0.9*	*1.3*	*1.7*
AT	76.2	79.8	84.3	*0.2*	*0.5*	*0.9*	*1.2*	*1.5*
PT	74.2	78.0	82.9	*0.2*	*0.6*	*1.0*	*1.3*	*1.7*
FI	75.3	79.3	83.5	*0.2*	*0.6*	*0.9*	*1.2*	*1.5*
SE	78.1	80.9	84.2	*0.2*	*0.5*	*0.8*	*1.2*	*1.5*
UK	76.4	79.9	84.1	*0.2*	*0.6*	*0.9*	*1.3*	*1.7*
CY	76.3	79.6	83.5	*0.2*	*0.6*	*0.9*	*1.3*	*1.6*
CZ	72.4	76.4	81.4	*0.2*	*0.6*	*0.9*	*1.3*	*1.7*
EE	65.5	69.6	77.0	*0.3*	*0.7*	*1.2*	*1.7*	*2.2*
HU	68.5	73.5	80.1	*0.3*	*0.7*	*1.1*	*1.5*	*1.9*
LT	66.5	70.4	77.7	*0.3*	*0.8*	*1.2*	*1.7*	*2.1*
LV	64.9	68.8	76.4	*0.3*	*0.8*	*1.2*	*1.7*	*2.2*
MT	76.2	79.5	83.4	*0.2*	*0.5*	*0.9*	*1.2*	*1.6*
PL	70.5	75.2	81.0	*0.2*	*0.6*	*1.0*	*1.4*	*1.8*
SK	69.7	73.7	79.5	*0.2*	*0.6*	*1.0*	*1.4*	*1.8*
SI	72.6	76.7	81.6	*0.2*	*0.6*	*1.0*	*1.4*	*1.7*
EU-25	*75.6*	*78.9*	*83.3*	*0.2*	*0.6*	*1.0*	*1.3*	*1.7*
EU-15	*76.4*	*79.7*	*83.8*	*0.2*	*0.6*	*1.0*	*1.4*	*1.7*
EU-10	*71.4*	*74.7*	*80.5*	*0.2*	*0.6*	*1.0*	*1.4*	*1.7*

(1) The sensitivity tests involve changes with respect to the baseline EPC scenario. The calculations were carried out by Eurostat.

Source: Commission services.

Table 5.3

Assumptions for sensitivity tests on high female life expectancy

	Assumptions on life expectancy for females in sensitivity tests			Difference compared with baseline scenario				
	2004	2020	2050	2010	2020	2030	2040	2050
BE	81.6	85.3	88.8	*0.2*	*0.5*	*0.8*	*1.0*	*1.3*
DK	79.6	82.6	86.9	*0.2*	*0.5*	*0.9*	*1.2*	*1.6*
DE	81.7	84.7	88.2	*0.2*	*0.5*	*0.8*	*1.1*	*1.5*
EL	81.4	83.8	87.3	*0.2*	*0.5*	*0.8*	*1.1*	*1.4*
ES	83.4	86.1	88.6	*0.2*	*0.4*	*0.7*	*1.0*	*1.3*
FR	83.4	86.3	89.2	*0.2*	*0.5*	*0.8*	*1.0*	*1.3*
IE	80.7	84.2	88.6	*0.2*	*0.5*	*0.9*	*1.3*	*1.8*
IT	83.2	85.8	89.1	*0.2*	*0.5*	*0.7*	*1.0*	*1.3*
LU	81.4	84.5	88.3	*0.2*	*0.5*	*0.9*	*1.2*	*1.6*
NL	80.8	83.0	86.7	*0.2*	*0.5*	*0.8*	*1.2*	*1.5*
AT	82.1	85.2	88.5	*0.2*	*0.5*	*0.7*	*1.0*	*1.3*
PT	81.0	84.4	88.0	*0.2*	*0.5*	*0.7*	*1.0*	*1.3*
FI	81.9	84.7	87.9	*0.2*	*0.5*	*0.7*	*1.0*	*1.3*
SE	82.4	84.9	88.0	*0.2*	*0.5*	*0.8*	*1.1*	*1.4*
UK	80.9	84.3	88.1	*0.2*	*0.5*	*0.8*	*1.1*	*1.5*
CY	80.8	83.3	86.5	*0.2*	*0.5*	*0.8*	*1.1*	*1.4*
CZ	78.8	81.8	85.5	*0.2*	*0.5*	*0.8*	*1.1*	*1.4*
EE	76.9	80.0	84.7	*0.2*	*0.6*	*0.9*	*1.2*	*1.5*
HU	76.8	80.4	85.0	*0.2*	*0.5*	*0.9*	*1.2*	*1.5*
LT	77.6	80.7	85.3	*0.2*	*0.6*	*0.9*	*1.2*	*1.5*
LV	76.2	79.2	84.1	*0.2*	*0.6*	*0.9*	*1.3*	*1.6*
MT	80.7	83.4	86.4	*0.2*	*0.5*	*0.8*	*1.1*	*1.4*
PL	78.5	81.8	85.9	*0.2*	*0.5*	*0.8*	*1.1*	*1.4*
SK	77.8	80.8	84.8	*0.2*	*0.5*	*0.8*	*1.1*	*1.4*
SI	80.2	83.3	86.5	*0.2*	*0.5*	*0.8*	*1.1*	*1.4*
EU-25	*81.8*	*84.5*	*88.0*	*0.2*	*0.5*	*0.8*	*1.1*	*1.4*
EU-15	*82.2*	*85.1*	*88.4*	*0.2*	*0.5*	*0.8*	*1.1*	*1.4*
EU-10	*79.7*	*81.4*	*85.6*	*0.2*	*0.5*	*0.8*	*1.1*	*1.4*

Source: Commission services.

Table 5.4

Impact of assumptions on high life expectancy on the size and age structure of the population

	Total population		Working-age population (15–64)		Elderly (65 +)		Very old (80 +)		Old-age dependency ratio	
	2025	2050	2025	2050	2025	2050	2025	2050	2050	Difference vis-à-vis baseline
BE	10 934	11 008	6 749	6 302	2 485	3 105	682	1 284	49	*2.1*
DK	5 597	5 585	3 498	3 280	1 215	1 455	324	586	44	*2.5*
DE	83 661	79 167	52 415	45 094	20 274	24 567	6 691	10 939	54	*2.7*
EL	11 464	10 928	7 293	5 893	2 650	3 726	728	1 317	63	*2.8*
ES	45 782	43 688	29 817	23 001	10 025	15 684	2 970	5 748	68	*2.6*
FR	64 510	66 056	39 248	37 540	14 528	18 157	4 075	7 502	48	*2.0*
IE	4 940	5 551	3 219	3 174	824	1 499	195	491	47	*2.0*
IT	58 263	54 673	36 593	29 405	14 576	19 091	4 637	7 831	65	*2.7*
LU	546	651	354	395	99	150	26	59	38	*1.8*
NL	17 533	17 908	11 047	10 601	3 683	4 549	871	1 819	43	*2.3*
AT	8 528	8 298	5 452	4 709	1 901	2 579	578	1 104	55	*2.4*
PT	10 787	10 213	6 848	5 531	2 416	3 370	669	1 185	61	*2.4*
FI	5 462	5 298	3 234	3 023	1 355	1 478	338	592	49	*2.2*
SE	9 795	10 317	5 934	6 057	2 190	2 595	639	1 024	43	*2.0*
UK	64 019	65 113	40 237	37 860	13 521	17 799	3 749	7 092	47	*2.0*
CY	900	989	586	592	174	267	42	89	45	*2.0*
CZ	9 860	9 060	6 294	5 038	2 240	2 903	504	872	58	*2.8*
EE	1 232	1 150	784	675	250	309	65	102	46	*2.6*
HU	9 645	9 095	6 123	5 205	2 150	2 661	538	854	51	*2.8*
LT	3 152	2 943	2 064	1 727	614	820	171	298	47	*2.6*
LV	2 082	1 915	1 330	1 116	417	522	118	177	47	*2.7*
MT	470	515	296	309	101	132	23	43	43	*2.0*
PL	37 014	34 313	23 738	19 476	7 907	10 452	1 643	3 355	54	*2.7*
SK	5 261	4 832	3 521	2 752	1 006	1 471	195	430	53	*2.8*
SI	2 024	1 937	1 286	1 068	468	625	117	224	58	*2.9*
EU-25	*473 460*	*461 205*	*297 958*	*259 826*	*107 069*	*139 966*	*30 586*	*55 018*	*54*	*2.4*
EU-15	*401 820*	*394 455*	*251 939*	*221 867*	*91 742*	*119 804*	*27 171*	*48 574*	*54*	*2.4*
EU-10	*71 640*	*66 750*	*46 019*	*37 959*	*15 327*	*20 162*	*3 415*	*6 444*	*53*	*2.7*

Source: Commission services.

Table 5.5

Assumptions for sensitivity test on higher employment rate of total and older workers: difference compared with the baseline scenario

	High employment rates of total workers (aged 15–64)					High employment rate of older workers (55–64)					
	2005	2010	2015	2025	2050	2005	2010	2015	2020	2025	2050
BE	0.1	0.5	1.0	1.0	1.0	0.2	1.4	2.6	3.8	5.0	5.0
DK	0.1	0.5	1.0	1.0	1.0	0.2	1.4	2.6	3.8	5.0	5.0
DE	0.1	0.5	1.0	1.0	1.0	0.2	1.4	2.6	3.8	5.0	5.0
EL	0.1	0.5	1.0	1.0	1.0	0.2	1.4	2.6	3.8	5.0	5.0
ES	0.1	0.5	1.0	1.0	1.0	0.2	1.4	2.6	3.8	5.0	5.0
FR	0.1	0.5	1.0	1.0	1.0	0.2	1.4	2.6	3.8	5.0	5.0
IE	0.1	0.5	1.0	1.0	1.0	0.2	1.4	2.6	3.8	5.0	5.0
IT	0.1	0.5	1.0	1.0	1.0	0.2	1.4	2.6	3.8	5.0	5.0
LU	0.1	0.5	1.0	1.0	1.0	0.2	1.4	2.6	3.8	5.0	5.0
NL	0.1	0.5	1.0	1.0	1.0	0.2	1.4	2.6	3.8	5.0	5.0
AT	0.1	0.5	1.0	1.0	1.0	0.2	1.4	2.6	3.8	5.0	5.0
PT	0.1	0.5	1.0	1.0	1.0	0.2	1.4	2.6	3.8	5.0	5.0
FI	0.1	0.5	1.0	1.0	1.0	0.2	1.4	2.6	3.8	5.0	5.0
SE	0.1	0.5	1.0	1.0	1.0	0.2	1.4	2.6	3.8	5.0	5.0
UK	0.1	0.5	1.0	1.0	1.0	0.2	1.4	2.6	3.8	5.0	5.0
CY	0.1	0.5	1.0	1.0	1.0	0.2	1.4	2.6	3.8	5.0	5.0
CZ	0.1	0.5	1.0	1.0	1.0	0.2	1.4	2.6	3.8	5.0	5.0
EE	0.1	0.5	1.0	1.0	1.0	0.2	1.4	2.6	3.8	5.0	5.0
HU	0.1	0.5	1.0	1.0	1.0	0.2	1.4	2.6	3.8	5.0	5.0
LT	0.1	0.5	1.0	1.0	1.0	0.2	1.4	2.6	3.8	5.0	5.0
LV	0.1	0.5	1.0	1.0	1.0	0.2	1.4	2.6	3.8	5.0	5.0
MT	0.1	0.5	1.0	1.0	1.0	0.2	1.4	2.6	3.8	5.0	5.0
PL	0.1	0.5	1.0	1.0	1.0	0.2	1.4	2.6	3.8	5.0	5.0
SK	0.1	0.5	1.0	1.0	1.0	0.2	1.4	2.6	3.8	5.0	5.0
SI	0.1	0.5	1.0	1.0	1.0	0.2	1.4	2.6	3.8	5.0	5.0
EU-25	*0.0*	*0.4*	*0.9*	*0.9*	*0.9*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
EU-15	*0.1*	*0.5*	*1.0*	*1.0*	*1.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
EU-10	*0.1*	*0.5*	*1.0*	*1.0*	*1.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*

Source: Commission services.

Part II

Age-related expenditure items: coverage, projection methodologies and data sources

6. Pensions

6.1. Background and approach

The coverage of pensions in the 2001 projection exercise

In the 2001 exercise, projections for public spending on pensions were made by the national authorities using their own national pension models on the basis of underlying assumptions agreed by the EPC. Clearly, the use of different national models implies a lack of comparability in the projections. The EPC nonetheless considered that it would be appropriate in the 2005 projection exercise to continue with the approach. This is because of the great diversity in the institutional design of pension systems at Member State level which would be extremely difficult to model at international level.

As regards coverage, the 2001 exercise was designed to cover all public pensions and income transfers to people aged over 55 years, in other words, those schemes classified as general government expenditures in the national accounting framework and thus having an impact on public finances. It encompassed old-age schemes, early-retirement pensions, survivors' and children's pensions, disability pensions and other transfers to the elderly; it had to cover contributory and non-contributory pensions including minimum pensions, public and private sector employees as well as schemes for the self-employed. However, the coverage of pension projections differed somewhat across countries. In some cases, Member States were unable to make projections for all public pension schemes, particularly smaller regimes applying to specific industries or professions. In addition, not all Member States were able to include projections for early-retirement pensions and disability pensions/benefits.

Survey to improve comparability and coverage of pension expenditure

In light of the mandate of the EPC, a questionnaire survey on the coverage of the pension projections was carried out ([1]), inter alia examining the possibilities of extending the projections to occupational and private schemes as well as contributions. The questionnaire focussed on three issues:

- the envisaged coverage of the 2004 pension expenditure projections;
- what is feasible in terms of the disaggregation of pensions;
- whether it would be feasible to project contributions to pension schemes.

The survey results ([2]) including the main conclusions under each broad heading are presented in the section below.

6.2. Main findings of questionnaire survey

6.2.1. Coverage of pension projections

The responses suggest that the coverage of pensions can be somewhat extended from that in the previous exercise, notably regarding mandatory private pension schemes, while the coverage of social security and other public pensions would remain largely the same as in the previous exercise. As regards the quasi-mandatory or major occupational pension schemes, the questionnaire showed that these schemes play a significant role in five Member States (Denmark, Ireland, the Netherlands, Sweden and the United Kingdom). However, only three of these countries are ready to include these schemes in the projections, while two countries have stated that they lack necessary data and, thus, they will be unable to make the projections.

([1]) See European Commission (2004a) and (2004c).
([2]) European Commission (2004i).

The questionnaire also revealed that the concepts used in the exercise need to be made more explicit. There are borderline questions regarding the sectoral division between public and private sector, the concepts of social security, occupational and private supplementary pensions and the concepts of pensions and age-related benefits.

The main focus of the projections is on the burden of ageing on public finances. Nevertheless, it appeared that public pensions are not a fully clear concept in this regard. The great majority of public pensions (minimum, flat-rate or earnings-related pensions) are organised in social security schemes, which means that the scheme is statutory and that the general government sector (State, local government or social security institution) administers the scheme. Usually, it also involves a social security contribution specific to the scheme, which is defined as part of total taxes in the national accounting framework. However, the concept should also cover non-contributory schemes which are statutory and administered by the general government sector, covering pensions such as public sector employees' pensions paid out directly from the State budget or tax-financed minimum pensions or equivalent benefits.

Occupational pensions are pensions provided on the basis of occupational activity and on the basis of a collective agreement or a contract agreed between the social partners or at the company level between the firms and the employees. The decisive distinction with a social security pension is that it is not statutory but based on an agreement. Due to this definitional clarification, the Danish labour market pensions should be included as occupational pensions while they were included in public pensions in the 2001 projection exercise. As regards the distinction to supplementary private pensions, the decisive factor is that in the case of supplementary private pensions, the insurance policy is a fully individual decision taken by the insured person, while an occupational pension is based on an agreement or contract between employers and employees.

There is also the question regarding the borderline between social security pensions and mandatory private pensions. The latter type of pensions are common in a number of EU-10 Member States (Estonia, Hungary, Latvia, Lithuania, Poland and Slovakia) and in Sweden, where a part of the social security old-age pension has been switched to a private fund. In these cases, the fund manages the scheme and is responsible for the financial risk attached to the scheme. According to the Eurostat decision ([1]), these schemes will not be classified as social security schemes.

Regarding the concept of age-related pensions and other income transfer expenditure (used in the previous projections), in practice, it does not appear to be feasible to make a distinction according to the age limit in pensions that most often are paid both to people above and below the age of 55 years (i.e. disability and survivors' pensions). Therefore, it is suggested that all pensions will be included in the projections and the definition of an age limit will be removed. On the other hand, the concept of pension does not always have the same coverage in different Member States. For instance, while in most countries disability is covered by a pension scheme, in some countries it is part of sickness insurance or constitutes its own form of social security, either based on its own contribution or being tax-financed. For the reasons of comparability, equivalent cash benefits granted for a long period for old-age, early-retirement, disability, survivors' and specific pensions due to reduced capacity to work or due to labour market reasons should also be included.

Furthermore, regarding the comparability of net pension expenditure across countries, the questionnaire showed large differences in the taxation of pensions across countries, ranging from tax-free to equally with wages taxed pensions. Despite the difficulties that some Member States reported in estimating the taxation of pensions, it was suggested that social security and other public pensions should, where possible, be projected also in net terms, deducting the taxes paid on pensions.

6.2.2. Disaggregation of pensions

In addition to the classification of pensions by institutional sectors, it was also reviewed whether disaggregations according to the type of pension and the age of the beneficiary would be possible. The aim of the disaggregation is to elaborate further which pensions are most influenced by the ageing of the populations and whether the pension policies in place affect differently different types of pensions, in particular old-age and early-retirement pensions.

The questionnaire survey, however, revealed that Member States differ as regards their possibilities to break

([1]) Eurostat decision on classification of funded pension schemes in the case of government responsibility or guarantee, 30/2004, 2 March 2004.

down pensions in the projections. In particular, a great number of countries reported that early-retirement schemes cannot be separated from old-age schemes, due either to the fact that early retirement is built in to the old-age scheme, or to the standard retirement age being low and varying between sexes and/or increasing during the coming years. Moreover, in some countries disability and widows' pensions are not converted into old-age pensions at the standard retirement age of the beneficiary and their separation by the standard retirement age can only be based on estimates. Also, it is not feasible to break down pensions, notably disability and widows' pensions, according to the age group of the beneficiaries regarding the assumed early-retirement age of 55 years.

Nevertheless, in order to make a distinction between broadly defined age-related pensions and other pensions, it was suggested that social security and other public pensions should be broken down into: (i) old-age and early-retirement pensions, and (ii) others (mainly disability and survivors' pensions). Mandatory private pensions are predominantly old-age pensions and, hence, there is no need to disaggregate them further.

6.2.3. Projection of contributions

Information on the financial arrangements of social security and other public pensions was collected (see Table 6.1), and possibilities were investigated to make projections on contribution accumulations. The aim was to review whether more accurate information on the financial challenge facing social security and other public pension schemes than the mere expenditure increase could be provided.

The responses showed that, on the one hand, a great number of countries include the projection of contributions in national exercises as normal practice and see no particular problems in projecting contributions. On the other hand, some countries report major difficulties due to the fact that the pension contribution is not separated from the overall social contribution rate, or that even a specific pension contribution can cover different types of pensions.

Some countries argue that if one assumes that the contribution base evolves in line with the GDP growth (which would be the most feasible assumption to use) in a pure PAYG system, the increase in pension expenditure as a share of GDP would correspond exactly to the increase of the pension system deficit as a share of GDP and, hence, a separate projection of contributions would not produce any additional value. However, this is not always the case. For instance, many of the EU-10 Member States anticipate that an increasing part of the social security pension contributions will be transferred to a private-funded pension scheme and, consequently, the contributions to the social security pension scheme will decrease. However, the liabilities already borne in the social security schemes will not diminish in the same proportion and the request for other sources of funding will increase. Contrary to this, countries where there are major reserve funds for the future financing of the social security pension systems would face a smaller financing gap than anticipated on the basis of a pure PAYG assumption.

6.3. Overall conclusions on the coverage and disaggregation of the pension projections

Based on the above, the EPC has agreed the following related to the coverage of the pension projections:

- The projections cover social security and other public pensions as well as mandatory private pensions as defined above in the section 'coverage of pension projections'. A list of the pension schemes to be covered in the projection exercise is provided in Table 6.2. As far as the projections of occupational pensions are concerned, the EPC agreed that those Member States where these pensions are of major importance provide the projections on a voluntary basis. Projections should be done both for gross and net pensions.
- As regards disaggregation, the social security and other public pensions are broken down into two categories (see Table 6.3 below):
    - first, old-age and early-retirement pensions (including minimum and earnings-related pensions), and, if possible, disability and widows' pensions paid out to people over the standard retirement age. The disability and widows' pensions are identified separately from the old-age and early-retirement pensions;
    - secondly, other pensions (disability, survivors', partial pensions without any lower age limit, including minimum and earnings-related pensions). Mandatory private pensions are not broken down in sub-groups.
- As regards the projections of contributions to social security and mandatory private pension schemes,

Table 6.1

Contribution rates in public pension schemes in 2005

	Contribution rate, percentage of wages [1]	Observations [2]
BE	37.94 % (social security) Employer: 24.87 % Employee: 13.07 % 'Wage moderation' contribution: 7.48 % Small additional social security contributions depend notably on the firm size; different measures lead to a marked reduction in the effective rates compared with the abovementioned rates.	The contribution rate covers all branches of social security, including healthcare, unemployment, disability, family allowances, and the general pension scheme for wage-earners and self-employed. The contributions account for approximately two thirds of the total social security revenues; specific social security taxes and transfers from the State budget account for the rest. Means-tested minimum pensions are financed by taxes. In order to finance the future increase in pension expenditure, the Belgian authorities plan to accumulate budgetary resources in a public 'ageing fund' using the decrease in interest payments.
CZ	28.00 % Employer: 21.50 % Employee: 6.50 %	The contribution rate covers both earnings-related and flat-rate social security pensions. In 2004, the social security pension system was in balance for the first time since 1996.
DK	ATP: DKK 2 700 (EUR 360) per year (about 1 % of the average wage) Employer: two thirds Employee: one third SAP (Suppl. early-retirement scheme): DKK 4 680 (EUR 630) per year Employee: one third Government subsidy: two thirds	The contribution rate to the statutory supplementary pension schemes of the private sector (ATP) covers about one third of the transfer payments; the remaining two thirds are subsidised from tax revenues. The respective Civil Service supplementary pension scheme is financed completely by taxes. A specific contribution to SP (special pension saving) scheme was suspended in 2004 and 2005. The flat-rate public old-age pension and civil servants' pensions are financed completely by taxes.
DE	19.5 % in 2004 and 2005 Employer: *9.75* % Employee: *9.75* %	Subsidies from the Federal budget account for 27.5 % of pension expenditure in 2004 (33 % in 2003). In addition, social assistance pensions are financed by taxes. A target has been set that the contribution rate should not exceed 20 % until 2020 and 22 % until 2030.
EE	22 % Employer: 16 % to the I pillar scheme 4 % to the III pillar scheme (or 20 % to I pillar if the person has not joined the III pillar scheme) Employee: 2 % to the III pillar scheme, only to those who have joined	Pension insurance contributions covered 94 % of social security pensions in 2004. Special pensions to some groups of government officials (policemen, parliamentarians, judges) are financed from the government budget.
EL	20 % (if insured before 31.12.1992) Employer: 13.33 % Employee: 6.67 % 30 % (if insured *betw. 1.1.1993–31.12.2002*) Employer: 13.33 % Employee: 6.67 % State: 10.00 % After 1.1.2003 Employer: 13.33 % Employee: 6.67 % State: 1 % of GDP in 2003–08 on aver., 1 % of GDP in 2009–32	Tax subsidies to the financing of contribution-based pensions would have to rise from the current 4.8 % of GDP to 15.5 % in 2050. In addition, pensions of uninsured persons over 65 and civil servants are financed by taxes. The current contribution rate is applied equally to all employees and covers only pension benefits.
ES	28.3 % (social security, except healthcare and unemployment benefits) Employer: 23.6 % Employee: 4.7 %	The contribution rate covers contributory benefits for old-age, disability and survivors' pensions and maternity benefits. The social security sector is expected to produce a surplus until 2015, thereafter a deficit. Means-tested minimum pensions are financed by taxes.
FR	Basic scheme: Employer: 9.8 % (below ceiling) Employer: 1.6 % (above ceiling) Employee: 6.55 % (below ceiling) Mandatory supplementary scheme: Rate varies between 7.5–20 % (incl. employer and employee contributions), depending on wage level and employee status	The contribution rate covers old-age and survivors' pensions; disability pensions are covered by health insurance contributions. The contribution rate will be raised by 0.2 percentage points in 2006. Further, employment measures are expected to reduce unemployment, which would allow the transfer of unemployment contributions to pension financing.

(Continued on the next page)

Table 6.1 (continued)

IE	12.5–14.75 %, excluding the health levy Employer: 8.5–10.75 % Employee: 4 %; self-employed: 3 %	Social insurance (flat-rate) pensions are financed by contributions. In recent years, the Social Insurance Fund has been in surplus. Means-tested social assistance pensions are financed by taxes. In the future, due to the extension of the contributory scheme, there will be a shift from tax funding to contributions.
IT	32.7 % Employer: 23.81 % Employee: 8.89 % The self-employed: Farmers: 20 % as of 2013 Shopkeepers: 19 % as of 2013 Artisans: 19 % as of 2014	Contribution rate covers old age, survivors' and disability pensions of the social security scheme. Social assistance pensions are financed by taxes (2.3 % of GDP in 2003).
CY	12.6 % of wages	In addition, social (minimum flat-rate) pensions (8.5 % of total pension expenditure) and civil servants' earnings-related pensions (27 % of total pension expenditure) are financed from the State budget. The total contribution to social security for employees, covering sickness, maternity, unemployment, work injury and pensions, is 16.6 %, of which employers pay 6.3 %, employees 6.3 % and the State budget 4.0 %. The financing of pensions requires 12.6 % of wages in total.
LV	25.51 % of the total social insurance contribution (33.09 % of which employers 24.09 % and employees 9 %) is needed to finance the pensions in 2004. However, the contribution to the NDC pension scheme is fixed at 20 % (not separated between employer and employee), of which 2 % to the funded scheme up to 2006, increased gradually to 10 % by 2010	The total social insurance contribution covers old-age, survivors' and disability (3.23 %) pensions, work injury (0.09 %), maternity, sickness and unemployment benefits and funeral benefits. The NDC pension contribution covers minimum pensions, old-age, actuarial early-retirement and survivors' pensions.
LT	26 % Employer: *23.5 %* Employee: *2.5 %*	The pension contribution rate is further broken down by type of pension: (basic) old-age pension (10.5 %), supplementary old-age pension (10.5 %), disability and survivors' pensions (4.9 %). In 2004, a private (second tier of the I pillar) scheme was introduced with a switch of a contribution rate at 2.5 % (employee's part) to a private fund. This rate will be increased to 5.5 % (2.5 % by the employee + 3.0 % from the employer's total contribution) by 2007. In 2004, the State Social Insurance Fund went into surplus. State pensions to defence officers, policemen and officials of some law-enforcement institutions as well as social assistance pensions are financed from the State budget.
LU	24 % Employer: 8 % Employee: 8 % State: 8 %	One third of the contribution rate is financed by taxes. The guaranteed minimum income for old people and public sector employees' pensions is financed by taxes. Currently, the contribution rate allows accumulating the pension fund over its statutory requirement. The future development of the contribution rate depends heavily on the growth rate. It is estimated that the current rate can be maintained for the whole period up to 2050 with a growth rate of 5 % p.a., but it would have to rise from 2030 onwards if the growth rate was inferior, even to 46 % with a growth rate of 2 %. Further, public sector pensions are financed form the State budget, 2.5 % of GDP in 2004.
HU	26.5 % Employer: 18 % Employee: 8.5 % (fully to the PAYG scheme, if not joined the second tier of the I pillar); 0.5 % to the PAYG scheme; and 8.0 % to the funded scheme when joined	Disability pensions and survivors' benefits (13 % of all pension expenditure) are financed by health insurance contributions and transfers from the government budget. Social insurance fund required a subsidy of 23.6 of its total expenditure from the State budget (1.8 % of GDP) in 2004. Also, supplementary means-tested allowances guaranteeing the minimum old-age income are financed by taxes (0.6 % of GDP).
MT	30 % Employer: 10 % Employee: 10 % State (tax revenues): 10 % (with a substantial variation acc. to age and wage level of the employee) (Self-employed: 15 % + State: 7.5 %)	Covers all social insurance, including all pensions, short-term benefits, hospital, community and elderly care. It is estimated that the financing of pensions requires 9 % of the employer's and 8 % of the employee's contribution, and the total of 15 % of the self-employed's contribution.

(Continued on the next page)

Table 6.1 (continued)

NL	17.9 % (old-age pension) 1.25 % (survivors' scheme) Employee: 19.15 %	A target has been set to ensure that the old-age pension contribution rate will not be raised above 18.25 %. The contribution rate of 17.9 % is expected to produce a surplus until 2010. Thereafter, the deficit is covered from the reserve fund and taxes. In addition, a contribution rate of 1.25 % is paid for the survivors' scheme and a rate of between 7.09 and 13.93 % for disability benefit schemes.
AT	22.8 % Employer: 12.55 % Employee: 10.25 %; different rates in the civil service schemes without any ceilings	The contribution rate was harmonised for all groups in 2004; however, the rates paid by the self-employed (17.5 %) and farmers (15 %) are lower but subsidised up to 22.8 % from general tax revenues. Furthermore, contributions are paid from tax revenues for periods of childcare, military/civilian service, sickness benefits, maternity allowances and long-term care. There is a deficit guarantee for the statutory pension insurance to be covered from the Federal budget. In 2004, the government financing of the pension system accounted for 2.6 % of GDP.
PL	Total pension contribution: 32.52 % of gross wage, of which: 19.52 % (old-age pension) 13.00 % (disability and survivors' pensions) Paid by: employer: 16.26 %, of which 9.56 % (old-age) 6.50 % (disability and survivors') employee: 16.26 %, of which 9.56 % (old-age) 6.50 % (disability and survivors') (In addition: 0.97–3.86 % [work injury; paid by employer] and 2.45 % [sickness and maternity; paid by employee])	The earnings-related old-age pension contribution consists of a notional defined-contribution scheme (12.22 %) and a pre-funded defined-contribution scheme (7.3 %); these rates are to be kept constant in the future. The outflow of the funded contributions creates a financing gap in the PAYG social insurance scheme — in 2004 it was 1.2 % of GDP, while the total subsidy for the financing of pensions amounted to 3.8 % of GDP. Disability and survivors' pensions are financed from separate contributions (13.0 %). Farmers' old-age and disability pensions are financed up to 90 % of the pension payments from State budget subsidies (1.7 % of GDP in 2004). Furthermore, minimum pension guarantee (topping-up a small pension from earnings-related pension system) as well as contributions during selected career breaks (maternity and parental leave, periods out of work due to the care of a disabled child, unemployment benefit period) are financed by taxes (or other public sources).
PT	34.75 % (contributory cash benefits) Employer: 23.75 % Employee: 11 %	The contribution rate covers all contributory benefits (pensions, sickness, unemployment, maternity, professional deceases, family benefits). Means-tested universal non-contributory social pension and other benefits are financed by taxes (3.3 % of GDP in 2000). The social security sector currently produces a surplus of 1.7 % of GDP, projected to turn into a deficit of 1.5 % of GDP by 2050.
SI	24.35 % Employer: 8.85 % Employee: 15.50 %	The contribution rate covers old-age, survivors' pensions, disability pensions and health insurance contributions for retired persons. The public pension scheme is subsidised by State budget. It is currently in surplus (0.1 % of GDP in 2005) but, without reforms, would fall into a deficit about 2010, increasing to 10 % of GDP in 2050 under current policies and activity rates.
SK	24 % in 2005 Employer: 17 %, of which 14 % to old-age scheme 3 % to disability scheme Employee: 7 %; of which 4.0 % to old-age scheme 3.0 % to disability scheme	In addition, employers pay a contribution of 4.75 % of wages into the Reserve Solidarity Fund. A mandatory funded pension scheme was introduced in 2005. For those who join the scheme, half of the old-age pension contribution (9 %) are passed on to personal accounts of private funds. This introduction of the mandatory funded pension scheme is estimated to result in a deficit in the financing of the social security pensions by 1.3 % of GDP as of 2006.
FI	Earnings-related pensions in 2005: Employer: 17 % (private sector) 18.8 % (State sector) 23.7 % (municipalities) Employee: 4.6 % National basic pensions: Employer: 1.4–4.5 % (private sector)	The earnings-related pension contribution for the private sector (21.6 %) is estimated to rise by about 5 percentage points (taking account of the 2005 reforms). Means-tested (against pension income) national basic pensions and the pensions of sea-farers, self-employed persons and farmers are partially financed by taxes; the subsidy totalling to about 2 % of GDP in 2004.
SE	18.5 % (old-age pension) Employer: 10.21 % Employee: 7 % Note that the contributions add up to 17.21 % only because the contribution paid by the employee (7 %) is deducted from the income of which contributions are defined. 1.7 % (survivors' scheme)	The earnings-related pension system is a notional defined-contribution system (16 %) and a pre-funded defined-contribution system (2.5 %); these rates are to be kept constant in the future. Income guarantee pensions (means-tested against public pensions), disability and survivors' pensions and contributions during career breaks are financed by taxes.

(Continued on the next page)

Table 6.1 (continued)

UK	19.85 % (social security except health) in 2005: Employer: 10.9 % in 2005 Employee: 8.95 % in 2005 (Class 1 contribution rates; for those not contracted out, earnings between the primary threshold and the upper earnings limit for employees)	The contribution rate covers the basic State pension and the additional earnings-related pension (SERPS/State second pension) as well as disability and widows' benefits, contributory jobseeker's allowance, maternity and guardian allowances, redundancy payments. Means-tested minimum income guarantee/pension credit benefits and civil servants' pensions are financed by taxes. The contribution rates to private pension schemes vary considerably: in 2004, in open funds 9–17 % and in closed funds 7–21 % of wages.

([1]) The rates apply to the general, first-pillar social protection schemes. In many Member States, there are floors or ceilings for earnings which are subject to contributions. Rates may also be different for the self-employed.
([2]) The observations are based on the information given in the 2005 national strategy reports and by the Ageing Working Group.

Sources: National strategy reports 2005; European Commission, Missoc and Ageing Working Group update in 2005.

these should be carried out in the context of budgetary revenue projections where taxes and social security contributions are already shown separately. In countries where it is feasible to make separate projections for pension contributions, such projections are carried out.

- Projections should be done for both gross and net pensions. The EPC agreed that the estimation of net pension can be done either through an average pensioner approach or on the basis of aggregate income and tax statistics, depending on data availability or model specification at country level.

Table 6.2

Planned coverage and specification of the 2005 pension projection exercise

	General description of the coverage (as presented in the responses to the questionnaire);	**Specification of schemes** (the names of the schemes covered and possible schemes, e.g. for minor groups, that are not covered)
BE	***Social security pensions: old-age and early pensions***	
	Minimum benefits w63/m65+	State budget (social assistance)
	E-r old-age 60+ and widows 65+, public sector	Schemes
	E-r old-age 60+ and widows 65+, private sector	
	E-r old-age 60+ and widows 65+, self-employed	
	Early pensions 58+, private sector	
	Disability and widows' pensions 55–64, public sector	
	Disability and widows' pensions 55–64, private sector	
	Disability and widows' pensions 55–64, self-employed	
	Early-retirement benefit for labour market reasons	
	Social security pensions: other	
	Disability and widows' pensions – 54, public sector	
	Disability and widows' pensions – 54, private sector	
	Disability and widows' pensions – 54, self-employed	
	Other early-retirement 50–54, private sector	
CY	***Social security pensions: old-age and early pensions***	
	Social (minimum) pensions	State budget
	E-r old-age and widows	Social insurance scheme
	Early old-age pensions, 58–64, miners	
	Social security pensions: other	
	Invalidity and disablement pensions, – 62	

(Continued on the next page)

Table 6.2 (continued)

CZ	***Social security pensions: old-age and early pensions***	
	Minimum and e-r old-age pensions, 61+ (63+ as of 2013), all sectors	
	Proportional old-age pensions, 65+, all sectors	
	Widows' and disability pensions, 55–60	
	Early pensions (with temporary or permanent reductions)	
	Social security pensions: other	
	Widows' and disability pensions – 54	
	Orphans' pensions	
DK	***Social security pensions: old-age and early pensions***	
	Public flat-rate old-age pensions, all citizens	State budget
	Old civil servants old-age pensions 65+, central and local government	State budget
	Voluntary early-retirement schemes, all wage earners	State budget and employees' contributions
	Social security pensions: other	
	Occupational pensions	
	Labour market pensions (e-r old-age, disability and spouse's pensions), private sector	
	Labour market pensions (e-r old-age, disability and spouse's pensions), new public sector schemes	ATP
	Labour market supplementary pensions	SP
	Special pension savings plan	SAP
	Labour market supplementary pensions for recipients of anticipatory pension	
DE	***Social security pensions: old-age and early pensions***	
	E-r old-age, widows' and disability schemes, all ages, all sectors	Public pension scheme + civil servant pension scheme
	Early pensions for long-time workers	Public pension scheme
	Early pensions for labour market reasons	Public pension scheme
	Early pensions for women	Public pension scheme
	Social security pensions: other	
	Pensions for severely handicapped	Public pension scheme
EL	***Social security pensions: old-age and early pensions***	
	Minimum pensions	State budget, EKAS (Pensioners' Social Solidarity Supplement Fund)
	Old-age flat-rate pensions, farmers aged	OGA (Farmers' fund)
	Old-age e-r pensions, other self-employed	TEVE
	E-r old-age and supplementary old-age pensions, private sector	IKA (and funds joining IKA), ETEAM auxiliary fund connected to IKA
		State budget
	E-r old-age pensions, public sector (civil servants, army, public power corporation), aged	
	E-r supplementary pensions, public sector	Auxiliary funds
	Disability pensions, all ages	
	Widows pensions, all ages	
	Early pensions, aged	
	Social security pensions: other	
	Orphans' pensions	
ES	***Social security pensions: old-age and early pensions***	
	E-r old-age and war pensions, aged, all sectors	Social insurance scheme
	Early pensions, aged, all sectors	Social insurance scheme
	Disability pensions, aged, all sectors	Social insurance scheme
	Widows' pensions, aged, all sectors	Social insurance scheme
	Social security pensions: other	

(Continued on the next page)

Table 6.2 (continued)

EE	***Social security pensions: old-age and early pensions***	
	Minimum flat-rate pensions, all citizens	National pension scheme (State budget)
	E-r old-age (aged, 63+ as of 2016), disability and widows' (all ages) pensions, all sectors	Pension Insurance Fund
	Early pensions, aged, sectors	
	Social security pensions: other	
	Private mandatory pensions	
	Individual funded pensions, mandatory for young people born 1983–	Private funds
FR	***Social security pensions: old-age and early pensions***	
	Minimum old-age and widows' pensions	State budget
	E-r old-age pensions, 60+, private sector	CNAVTS (national pension fund for salaried workers)
	E-r old-age pensions, 60+, agricultural workers	MSA (mutual agricultural solidarity fund)
	Mandatory supplementary funded old-age pensions, non-executive workers, private sector	ARRCO (association of supplementary pension schemes for non-executive employees)
	Mandatory supplementary funded old-age pensions, executive workers, private sector	AGIRC (general association of pension institutions for executives)
	E-r old-age pensions, 57.5+ (60+ as of 2008), public sector	Civil and military pension code, CNRACL (local government and hospitals), specific funds for public sector enterprise workers
		Cancava (craftsmen), Organic (tradesmen), CNBF (lawyers)
	E-r old-age pensions, self-employed	CNAVPL (independent professions)
	Disability and widows pensions, 65+, all sectors	FSV
	Anticipated old-age and early-retirement pensions	Unedic
	Disability pensions – 64	Health insurance, State budget (government employees)
	Social security pensions: other	
	Widows pensions – 54	State budget
HU	***Social security pensions: old-age and early pensions***	
	E-r old-age and anticipatory old-age pensions, all sectors	National pension insurance fund + State budget
	Widows pensions, 62+, all sectors	National pension insurance fund + State budget
	Disability pensions, 62+, all sectors	National pension insurance fund + State budget and national health insurance
	Social security pensions: other	
	Disability pensions, – 61, all sectors	National pension insurance fund + State budget
	Widows pensions, – 61, all sectors	National pension insurance fund + State budget and national health insurance
	Private mandatory pensions	
	Individual funded pensions, mandatory to people entering the labour market	Private funds
IE	***Social security pensions: old-age and early pensions***	
	Minimum flat-rate old-age non-contributory pensions, 66+, all sectors	Social assistance (State budget)
	Widow/widower's non-contributory pensions (66+), all sectors	
	Blind persons, carers, lone parents (66+), all sectors	
	Flat-rate old-age contributory and retirement pensions, 65+, all sectors	Social insurance scheme
	Widow/widower's contributory pension, 66+, all sec.	
	Invalidity pensions, 65+, all sectors	
	Social security pensions: others	
	Widow/widower's non-contributory pensions, – 65, all sectors	Social assistance
	Blind persons and carers, – 65, all sectors	
	Disability pensions, – 65, all sectors,	
	Pre-retirement allowance, 55–65, all sectors	
	Widow/widower's contributory pensions, – 65	Social insurance scheme
	Occupational pensions	
	Pensions, lump sum and spouses' benefits	
	Public sector occupational pensions (civil service, defence forces, Gardai, education, non-commercial State bodies, health and local authorities)	State budget

(Continued on the next page)

Table 6.2 (continued)

IT	***Social security pensions: old-age and early pensions***	
	Social assistance pensions	State budget
	E-r old-age, disability and widows pensions, w60+/m65+, all sectors	AGO (general social insurance scheme)
	Early-retirement, disability and widows pensions, w55–59/m55–64, all sectors	AGO
	Early (seniority) pensions, all sectors	AGO
	Social security pensions: other	
	Disability and widows' pensions, – 54, all sectors	AGO
LV	***Social security pensions: old-age and early pensions***	
	Old-age minimum benefits (those without sufficient insurance records), 67+	State budget (social assistance)
	Old-age minimum guaranteed pension, 62+	Social insurance scheme
	E-r old-age pensions, granted –1995, all sectors	Social insurance DB scheme
	E-r old-age pensions, 62+, granted 1996+, all sectors	Social insurance NDC scheme
	Special service pensions (early pensions), selected professions, public sector	State budget
	Disability pensions, granted –1995 and not transformed to old-age pensions, all sectors	Social insurance scheme
	Social security pensions: other	
	Disability pensions, – 62, all sectors	Social insurance scheme
	Orphans' pensions – 24,	Social insurance scheme
	Special service survivors' pensions, public sector	State budget
	Private mandatory pensions	
	Individual funded old-age pension, mandatory for people born 1971+	Private funds
LT	***Social security pensions: old-age and early pensions***	
	Social assistance pensions	State budget
	Old-age, disability and widows' pensions, w60+/m62.5+, all sectors	Social insurance scheme
	Officials and military personnel disability and widows' pensions, w60+/m62.5+, public sector	State budget
	Special public service (state) pensions, selected professions	State budget
	Social security pensions: other	
	Disability and widows pensions, –w60/–m62.5, all sectors	Social insurance scheme
	Officials and military personnel disability and widows' pensions, –w60/–m62.5, public sector	State budget
	Length of service pensions, selected professions, public sector	State budget
	Early-retirement unemployment benefit (changed into early-retirement pension as of mid-2004)	Unemployment fund (social insurance scheme as of mid-2004)
	Private mandatory pensions	
	Individual funded old-age pension, voluntary to switching to the IInd tier of the Ist pillar, after switching nobody is allowed to come back solely to the Ist tier of the Ist pillar, all sectors	Private funds (started in 2004)
LU	***Social security pensions: old-age and early pensions***	
	Minimum benefits	RMG (social assistance)
	E-r old-age, disability and widows pensions, 65+, private sector and self-employed	RGAP (general pension insurance scheme)
	E-r old-age, disability and widows pensions, 65+, public sector	RSP (special pension scheme), State budget
	Early (anticipated) pensions	RGAP, RSP
	Social security pensions: other	
MT	***Social security pensions: old-age and early pensions***	
	Minimum pensions	Social security scheme
	E-r old-age, disability and widows' pensions, w60+/m61+/s-e 61+	Social security scheme

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Table 6.2 (continued)

NL	***Social security pensions: old-age and early pensions***	
	Public flat-rate old-age pensions, 65+, all citizens	State budget, AOW (general old-age pensions act)
	Widows pensions, w55+, all sectors	State budget, ANW (widows' pensions act)
	Disability benefits, all sectors	State budget, WAO (disability benefit act)
	Social security pensions: other	
	Occupational pensions	
	Occupational old-age pensions, 65+, all sectors	Private funds
	Occupational early-retirement pensions, all sectors	Private funds, VUT (early-retirement pension schemes)
AT	***Social security pensions: old-age and early pensions***	
	Minimum pensions	State budget
	E-r old-age, disability and widows pensions, w60+/m65+, private sector	ASVG (general social insurance scheme)
	E-r old-age, disability and widows pensions, w60+/m65+, private sector	Civil servants pensions scheme
	E-r old-age, disability and widows pensions, w60+/m65+, private sector	Farmers and self-employed people schemes
	E-r early (anticipated), disability and widows pensions, –w59/–m64, all sectors	ASVG, civil servants pensions scheme, farmers and self-employed people schemes
	Social security pensions: other	
PL	***Social security pensions: old-age and early pensions***	
	Minimum (means-tested) benefits	State budget
	E-r old-age, w60+/m65+, disability, widows' and early-retirement pensions, w55–59/m55–64, to persons born –1948, partially to those born 1949–68, private and public sector, self-employed	ZUS (Social insurance institute), DB scheme
	E-r old-age and anticipatory pensions, to persons born 1969– and partially to those born 1949–68, private and public sector, self-employed	FUS (Social insurance fund), NDC scheme
	E-r old-age, disability and widows pensions, all ages, farmers	KRUS (Farmers social insurance scheme, DB scheme)
	Armed forces old-age pensions	State budget
	Social security pensions: other	
	Disability and widows pensions, –54, private and public sector, self-employed	ZUS (Social insurance institute, DB)
	Private mandatory pensions	
	Individual funded old-age pensions, mandatory to people born 1969+	Private open pension funds
PT	***Social security pensions: old-age and early pensions***	
	Minimum (non-contributory) pensions	State budget
	E-r old-age, 65+, disability and widows pensions, 55+, employees and self-employed, private sector	GR (general social insurance scheme)
	E-r old-age, 65+, disability and widows pensions, 55+, farmers	Ressaa (special social insurance scheme for farmers)
	E-r old-age, 65+, disability and widows pensions, 55+, employees, public sector	State budget (CGA = civil servants scheme)
	Early-retirement	
	Social security pensions: other	
SK	***Social security pensions: old-age and early pensions***	
	Social pensions, 65+, all sectors	State budget
	E-r old-age, w53–57+/m60+ (w62+ 2016 and m62+ 2006), disability and widows pensions, w55–56/m55–64, all sectors	Social insurance pension scheme
	Early-retirement	
	Social security pensions: other	Social insurance pension scheme
	Disability and widows pensions, –54, orphans pensions	
	Private mandatory pensions	
	Individual funded old-age pension, mandatory to people entering labour market 2005+	Private funds, start to operate in 2005

(Continued on the next page)

Table 6.2 (continued)

SI	***Social security pensions: old-age and early pensions***	
	Minimum pensions	State budget
	E-r old-age (w58-63+/m58–65+), disability and widows' pensions, 55+, all sectors	Social insurance pension scheme
	Special compulsory pensions to workers in high-risk occupations, private sector	
	Social security pensions: other	
	Disability and survivors pensions, –54, all sectors	Social insurance pension scheme
	Occupational pensions	
	Collective supplementary pensions, 58+, all sectors	Open mutual pension funds
FI	***Social security pensions: old-age and early pensions***	
	National (minimum) pension	National pension insurance scheme
	E-r old-age, flexible 62–68+, disability and widows pensions, 55+, early pensions, unemployment pensions, 60+, private sector and the self-employed	TEL (private sector employees, most industries), LEL (private sector industries with short-time contracts), YEL (self-employed), MYEL (farmers), TaEL (artists)
	E-r old-age, flexible 62–68+, disability and widows pensions, 55+, early pensions, unemployment pensions, 60+, public sector	VEL (central government employees), KVTEL (municipal sector employees), KiEL (church employees)
	Social security pensions: other	
	Disability and survivors pensions, –54, all sectors	All above schemes
SE	***Social security pensions: old-age and early pensions***	
	Minimum pensions	State budget
	E-r old-age and anticipated pensions, flexible age, all sectors	Social insurance scheme, NDC scheme
	Disability pensions and widows allowances, 55+	State budget
	Occupational (supplementary) pensions, old unfunded and new funded schemes, public sector	State budget and pension funds
	Social security pensions: other	
	Disability pensions and survivors benefits, –54	State budget
	Occupational pensions	
	Occupational (supplementary) pensions, private sector	Private funds
	Private mandatory pensions	
	Individual mandatory funded old-age pensions	Private funds
UK	***Social security pensions: old-age and early pensions***	
	Basic State (minimum) pensions + their additions, 66+, all citizens	National insurance scheme
	Pension credits and council tax benefits, 60+, all citizens	State budget
	State second pension (S2P)/State earnings-related pensions (SERPS), w60+/m65+ (w65+ 2020), all sectors	National insurance scheme
	Disability allowances + their additions, 55+, all citizens	State budget
	Widows' benefits + their additions, 55+, all citizens	State budget
	E-r old-age pensions, 60+, public sector employees	State budget and employee contributions
	Social security pensions: other	
	Disability and incapacity allowances, –54, all citizens	State budget
	Widows benefits, –54, all citizens	State budget
	Occupational pensions	
	Supplementary funded old-age pensions, private sector	Private funds

E-r = earning related.

Table 6.3

Reporting framework for the pensions projections

A. Fixed table									
	2000	2001	2002	2003	2004	2005	2006	2007	2008
	Statistical figures in 2004 prices				Base year	Projections in 2004 prices			
GDP (Economic and Financial Affairs DG projection, in 2004 prices)									
GDP (used in projections, in 2004 prices)									
Pension expenditure									
Social security pensions, gross, in million euro									
Old-age and early pensions									
Of which: earnings-related pensions									
Private sector employees									
Public sector employees									
Other pensions (disability, survivors)									
Occupational pensions, gross, in million euro									
Private mandatory pensions, gross, in million euro									
Total pension expenditure, gross, in million euro									
Social security pensions, net, in million euro									
Old-age and early pensions									
Of which: earnings-related pensions									
Private sector employees									
Public sector employees									
Other pensions (disability, survivors)									
Occupational pensions, net, in million euro									
Private mandatory pensions, net, in million euro									
Total pension expenditure, net, in million euro									
Number of pensioners, in 1 000									
Social security pensions									
Old-age and early pensions									
Of which: earnings-related pensions									
Private sector employees									
Public sector employees									
Other pensions (disability, survivors)									
Occupational pensions									
Private mandatory pensions									
All pensions, in 1 000									
Of which: aged –54									
aged 55–59									
aged 60–64									
aged 65 +									

(Continued on the next page)

Table 6.3 (continued)

Contributions (employee + employer)		
Social security pensions, in million euro		
Old-age and early pensions		
Of which: earnings-related pensions		
Private sector employees		
Public sector employees		
Other pensions (disability, survivors)		
Occupational pensions, in million euro		
Private mandatory pensions, in million euro		
Total pension contributions, in million euro		
Number of contributors (employees), in 1 000		
Social security pensions		
Old-age and early pensions		
Of which: earnings-related pensions		
Private sector employees		
Public sector employees		
Other pensions (disability, survivors)		
Occupational pensions		
Private mandatory pensions		
All pensions, in 1000		
Assets of pension funds and reserves		
Social security pensions, in million euro		
Occupational pensions, in million euro		
Private mandatory pensions, in million euro		
All pensions, in million euro		
B. Additional information		
Additional information		

6.4. Additional definitions and clarifications

6.4.1. Overview of data reporting requirements

Member States have been invited to run pension expenditure projections, for the period from 2000 (as the base year) up to 2050, to be provided in annual data for each year of the projections. There are six broad groups of information to provide:

- gross pension expenditure;
- net pension expenditure;
- number of pensioners;
- contributions to pension schemes;
- number of contributors to pension schemes;
- assets of pension funds.

Concerning the most recent pension reforms, the cut-off date for their inclusion in the projections is the end of 2004, that is reforms legislated by the end of 2004, irrespective of their implementation period, can be included in the projections.

In addition, the following reporting norms are to be respected.

- **Monetary values:** all countries should report monetary values in millions of euro. Country aggregates should be in millions of euro, without any decimals. Where relevant, countries should report the exchange

rate used to convert amounts to euro, preferably the average exchange rate for 2004.

- **Numbers of people:** the numbers of people (pensioners/contributors) should be provided in thousands, without any decimals.

- **Pension expenditure:** pensions should cover pensions and equivalent cash benefits granted for a long period (over one year) for old-age, early-retirement, disability, survivors (widows and orphans) and other specific purposes which should be considered as equivalents or substitutes for the abovementioned types of pensions, in other words, pensions due to reduced capacity to work or due to labour market reasons. Pensions should include earnings-related pensions, flat-rate and means-tested pensions that aim at providing a social minimum pension and supplements which are a part of the pension and are granted for an indefinite period on the basis of certain criteria but which are not directly linked to the remuneration of costs such as supplements aimed at supporting the purchase of home or healthcare services. Pensions and benefits can be paid out from specific schemes or directly from government budgets. In particular, social assistance should be included if it is equivalent to minimum pension. Instead, housing subsidies should be excluded from pensions and considered as other means-tested social transfers. Short-term disability benefits should be considered as sickness benefits and prolonged unemployment benefits to older workers within unemployment benefits. Pensions should not include (additional) benefits in the form of reimbursements for certain costs to beneficiaries or directly provided goods and services for the specific needs of beneficiaries. Also, they should not include social security contributions paid by pension schemes on behalf of their pensioners to other social protection schemes, notably, to health schemes.

- **Gross pensions:** pensions should be recorded as gross benefits, that is, without a deduction of tax and compulsory social security contributions by beneficiaries paid on benefits. In those countries where pensions are not taxable income the gross pensions are equal to net pensions.

- **Net pensions:** pensions should be recorded as net benefits, deducting from the gross pension the estimated tax and compulsory social security contributions by beneficiaries paid on pensions.

6.4.2. Broad categories of pension expenditures

Social security and other public pensions

The aim is to cover those pension schemes that affect public finances, in other words, the schemes that are considered to belong to the general government sector in the national account system. Social security pensions are defined as the schemes that are statutory and that the general government sector administers. Usually, there is also a specific social security contribution to the scheme, which is defined as part of total taxes in the national accounting system but the scheme can also be financed either partially or fully by general taxes as well and, thus, ultimately, the government bears the financial risk attached to the scheme. The pensions provided by the social security schemes can be either earnings-related, flat-rate or means-tested. In addition, this category should cover pensions that are paid directly from the State or other public sector entity budget without forming a specific scheme such as special pensions to public sector and armed forces' employees. Also cash benefits as an equivalent to pensions, notably social assistance, should be included in this category.

Regarding the borderlines between social security and occupational pensions, the identification of pension schemes into these categories in the abovementioned summary note should be followed. As to the statutory funded part of the old-age pension schemes that are attached to notional defined contribution schemes in some countries (Sweden, Latvia, Poland), this should be excluded from social security schemes and included in the private sector schemes in accordance with the Eurostat decision.

Occupational pensions

Occupational pensions are pensions provided by schemes that link the access of an individual to such a scheme to an employment relationship between him/her and the scheme provider and that are based on contractual agreements between employers and employees either at the company level or their organisations at the union level rather than being statutory by law. The schemes can be quasi-mandatory in the sense that, on the basis of a nation- or industry-wide bargaining agreement, the employers are obliged to provide an occupational pension scheme to their employees while the participation for an individual remains voluntary. The

schemes are run by private sector pension funds, insurance companies or the sponsoring companies themselves (in balance sheets).

Occupational schemes can be equivalent to statutory earnings-related pension schemes or complementary to them. In particular, it would be desirable to include in the projections the schemes that play an equivalent role to social security schemes in the pension provision.

Private mandatory pensions

Private individual pensions are based on individual insurance contracts between the individual and the private pension scheme provider, usually an insurance company or a pension fund. The insurance contract specifies a schedule of contribution in exchange of which benefits will be paid when the members reach a specific retirement age. The scheme provider administers the scheme managing the pension assets through a separate account on behalf of its members. The access to such a scheme does not require an employment relationship, even though in some cases the contribution may be set on the basis of the wage.

For the most part, these schemes are fully voluntary but they can also be statutory. In the latter case, they are close to social security schemes. The decisive distinction is, however, that the transactions are between the individual and the insurance provider and they are not recorded as government revenues or government expenditure and, therefore, do not have an impact on government surplus or deficit. Consequently, the insured people have the ownership of pension assets. This means that the owner enjoys the rewards and bears the risks regarding the value of the assets. However, in some cases, there are government guarantees to these pension schemes, which increase the government involvement. Nevertheless, such a guarantee is a contingent liability by nature and these liabilities are not considered as economic transactions until they materialise. Thus, the Eurostat decision further specifies that a government guarantee is not an adequate condition to classify such schemes as social security schemes.

The pension expenditure projections should cover the individual schemes that switch a part either voluntarily or statutorily (especially to new entrants to the labour market) from the current social security scheme to private funds. Such schemes will have an increasing relevance in the future in a number of countries (Sweden, Estonia, Hungary, Latvia, Lithuania, Poland and Slovakia).

6.4.3. Breakdown of social security pensions

Old-age and early pensions

Old-age and early pensions should be considered as one category of pensions due to the fact that in many countries a proper distinction between these pensions cannot be made either because the early-retirement is built-in in the old-age pension system or the standard retirement age varies between sexes and will increase or become more flexible with time. Early pensions should include in addition to genuine (actuarial) early-retirement schemes also other early pensions that are granted for a specified age group below the statutory retirement age primarily on the basis of reduced work capacity or labour market reasons. In addition, also disability and widows' pensions paid out to people over the standard retirement age should be included in this category in order to reflect properly the expenditure related to old age. Pensions of this category should include both earnings-related pensions and flat-rate or means-tested minimum pensions of these types.

Other pensions

Other pensions should include disability, survivors' and partial pensions paid to people below the standard retirement age and without any lower age limit. These should include both earnings-related pensions and flat-rate or means-tested minimum pensions of these types.

Earnings-related pension to private sector employees

Within the category of old-age and early social security pensions, a separation of earnings-related pensions to public and private sector employees is requested in order to follow the projected evolution of pensions between private and public sector employees. The flat-rate or means-tested minimum pensions that are not based on employment but only guarantee a certain social minimum should be excluded (while the minima of earnings-related pension scheme should be included). If it is possible to follow the pension accrual of those people who have worked both in the private and public sector, this distinction could be made both regarding the expenditure of pensions and the number of pensioners. Otherwise, estimates can be made on the basis of a full career in one of the sectors.

Earnings-related pension to public sector employees

As above, employees of the public sector should include those working in the national, regional and municipal government bodies as well as social security institutions. In practice, where there are different pension schemes for public and private sector employees, the borders of the schemes can be followed.

6.4.4. Additional information on numbers of pensioners, contributors and contributions to pension schemes and assets of pension funds

Number of pensioners

The number of pensioners of each type of pensions should be considered separately, allowing for the fact that the same person may be a recipient of several types of pensions, for instance, a recipient of a social security pension and a private mandatory pension. Thus, the detailed lines should reflect the number of the recipients of the specific pension but the figures on summary lines, in particular, the number of all pensioners is not likely to match the summing up of the sub-totals. Ideally, the number of all pensioners should be the number of people who receive pension benefits but calculated only once in case of a receipt of multiple-type pensions. If an exact figure is not available, an estimate is preferred to the mere summing up.

Contributions

The contributions should include the contributions to pension schemes paid both by employers and employees as well as self-employed, as the purpose is to provide information as to whether a financial gap in the pension system prevails. If the pension contribution is part of a broader social security contribution rate, an estimate should be provided for the share of the pension contribution, in other words, on the basis of the most recent expenditure structure. In case the pension is financed by general tax revenues, no estimate should be provided here.

It would be the most important to provide estimates of pension contributions to social security and private mandatory schemes, notably concerning the category of old-age and early pensions. As to other pensions such as disability and survivors' pensions, contributions should be reported separately only if these pensions form their own schemes. In the case where they are part of the old-age pension scheme, no separation of contributions between different types of pensions is requested but the total contribution should be presented in the context of old-age and early pensions.

Number of contributors

As in the case of the number of pensioners, the number of contributors to each type of pensions should be considered separately, allowing for the fact that the same person may be a contributor to several schemes, as in the case of pension systems in which a part from a social security scheme is switched to a private (mandatory) pension scheme. However, the line of total pensions should count contributors only once in cases where the person contributes to more than one scheme at the same time. Thus, the number of contributors will approach the number of the employed people.

As for contributions, it would be the most important to provide estimates of the numbers of contributors to social security and private mandatory schemes, notably concerning the category of old-age and early pensions. The number of contributors to other schemes (disability, survivors') should be presented only in case of separate schemes for these purposes.

Assets of pension funds

The information on assets in pension funds, including pre-financing to specific reserves within the government sector, is requested separately concerning social security schemes, occupational pension schemes and private pension schemes. This information is an important complement to the contribution information when the financial balance of the pension schemes is assessed.

It would be the most important to provide at least the information on the current situation concerning the years from 2000 up to the most recent year for which the information is available. Projections of assets evolution remain optional. In the case of being able to provide projections on assets, the assumed rate of return on assets should also be reported. Moreover, it would be important to know the factors affecting the accumulation, in particular, if the accumulation is not based on the surplus of pension contributions over pension payments. For example, in some countries, accumulation of pension reserve funds (for social security schemes) is based on the surplus in the social security schemes or on deliberate decisions to put aside a fraction of government revenues.

7. Healthcare

7.1. Agreement to model non-demographic as well as demographic drivers of healthcare spending

Background

This section outlines the approach that the EPC will use to project public spending on healthcare in the EU-25 Member States. The work has benefited from discussions in the workshop organised by the OECD on 4 June 2004, the presentations and discussions at the AWG meeting of October 2004, and especially from the joint OECD–AWG–Commission workshop of 21–22 February 2004 on 'Understanding trends in disability among elderly populations and the implications of demographic and non-demographic factors for future health and long-term care costs' ([1]). Helpful written contributions were made by AWG members ([2]), including Belgium, Denmark and Italy. Valuable input was also received from Ilija Batljan from the University of Stockholm ([3]).

The projections on healthcare need to be viewed in the context of the overall projection exercise, and as such the following considerations should be borne in mind.

- The healthcare projections will be made on the basis of the baseline assumptions on population, labour force and macroeconomic variables agreed by the EPC and outlined in Chapters 1 to 4 of this report. Many of the sensitivity tests agreed by the EPC and described in Chapter 5 of this report will also be carried for the projections on healthcare spending.
- A separate projection exercise will be made for spending on long-term care and is described in Chapter 8 of this report.
- The choice of the methodology used to project future expenditure on healthcare in a multilateral setting of 25 Member States is constrained by the availability and comparability of data. Annex 7 provides more details on the coverage of the projection exercise and on the definition of expenditure (both public and private) on healthcare and long-term care.

Ageing is only one driver of healthcare expenditures

The 2001 projection exercise of the EPC (Economic Policy Committee, 2001) was designed to assess the impact of demographic variables on healthcare spending. The methodology consisted of applying profiles of average health expenditure per capita, provided for a base year by Member States, to a population projection of Eurostat. The projections were run under the assumption of constant age and sex-contingent demand and consumption of healthcare over time. They were also made under two cost assumptions, which were that expenditures per capita grow exactly at the same rate as GDP per capita (which can be considered as neutral in macroeconomic terms), and expenditures per capita increase at the same rate as GDP per worker (to reflect labour intensity of the healthcare sector).

The 2001 report of the EPC clearly recognised the limitations of this projection methodology, in particular regarding the strong assumption of holding age-related expenditure profiles constant over time, the failure to link expenditures to years of remaining life (death-related costs), and the absence of non-demographic drivers of spending from the projection exercise.

The literature stresses that the demand for healthcare (and social care) depends ultimately on the health status of (elderly) citizens and functional ability, not on

([1]) The presentations and papers circulated at the conference can be downloaded from: http://europa.eu.int/comm/economy_finance/events/2005/events_brussels_0205_en.htm

([2]) See Englert et al. (2004), Madsen (2004), Ragioneria Generale dello Stato (2004b).

([3]) Batljan was a visiting fellow with the Economic and Financial Affairs DG in March and April 2005. Batljan (2004), Batljan and Lagergren (2004), Batljan and Lagergren (2005).

age *per se*. While age is a useful indicator of health status of an elderly population (as shown by the steep upward slope of age-related expenditure profiles), it is not the causal factor. Healthcare spending is mostly driven by ([1]):

- the health status of the population;
- economic growth and development;
- new technologies and medical progress;
- the organisation and financing of the healthcare system;
- healthcare resource inputs, both human and capital.

Agreement on the need to extend projections to cover non-demographic factors

Given these considerations, the EPC has recognised the need to include non-demographic factors in the projection exercise. The methodology agreed by the EPC has limitations which need to be underlined and the following considerations/caveats should be borne in mind.

- Ideally, projections would take into account changes in the health status of the population over time, looking at the prevalence of different medical conditions (which may change over time linked to factors such as lifestyle) and the costs of treating each medical condition (which may be affected by technological developments). While a projection methodology looking at specific medical conditions may be feasible at a national level (see Holly, 2005), it is not a practical approach given the lack of comparable epidemiological data on the health status across EU populations in a base year, let alone a comparable projection on how this could evolve in coming decades.
- Healthcare spending is to a large extent determined by the policy decisions of national governments, for example whether specific treatments are provided by public health systems, the coverage of people eligible for public health services, the 'quality' of public healthcare (policy choices/preferences for waiting lists, sizes of hospital wards, etc.). The different institutional arrangements of healthcare systems across Member States imply that these factors cannot be taken into account in projections made at a multilateral level, although they can be included in national projections when clear policy goals/targets exist (see Wanless, 2002).
- The lack of comparable data is a major constraint on the EPC projection exercise. The only comparable data which are available are essentially of a macro nature. While lack of comparable data is a constraint for this projection exercise, the situation may improve in coming years. For example, results have recently become available from the first SHARE survey on the economic, social and health conditions for 13 countries (see Börsch-Supan et al., 2005). SHARE is financed under the fifth research framework programme of the EU.

7.2. The approach to be used to project healthcare spending

7.2.1. Using several different approaches to project healthcare spending

Rather than trying to construct an all-encompassing projection methodology to capture all demographic and non-demographic factors, a pragmatic approach has been adopted to tackle the issue from a variety of different angles. Four different approaches have been considered to be used to project healthcare spending, and several different scenarios could be run under each approach. This would mark a departure from the method followed in the 2001 projection exercise, where there was a single baseline scenario and several variant scenarios derived from that baseline.

An overview of all approaches is presented in Table 7.1 below, and can be summarised as follows.

- **Approach I — application of age-related expenditure profiles to different scenarios as regards future developments in the health status of elderly citizens:** by assuming that age-related spending per capita on healthcare remains constant over time,

([1]) A detailed analysis of the factors driving healthcare spending over the long run can be found in European Commission (2005d) which also reviews methodologies used by the various national authorities and international organisations to making projections of healthcare spending. Another note, European Commission (2004w), reviews both aggregate and microeconomic measures that have been taken to control healthcare spending in Member States: The policy challenges facing healthcare systems in EU Member States as a result of demographic change are also reviewed in 'Healthcare in an ageing society: a challenge for EU countries', Background Paper of the Netherlands EU Presidency for the Informal Health Council in Noordwijk, 9–10 September 2004.

Table 7.1

Overview of the different approaches to making healthcare projections

Approach I Application of age-related expenditure profiles to different developments in health status	Approach II Death-related costs	Approach III Changes in unit costs	Approach IV (OECD exercise only) Extrapolation of total cost developments on the basis of past trends
'Pure ageing' scenario (based on the 'expansion of morbidity hypothesis' where a larger share of gains in life expectancy are spent in bad health)	Linking health expenditure to remaining years of life, based on a profile derived from existing national studies	'Pure ageing' scenario run assuming costs evolve according to various assumptions (e.g. GDP per worker)	Decomposing demographic and non-demographic drivers (based on OECD approach)
'Constant health' scenario (based on the 'dynamic equilibrium' hypothesis where all gains in life expectancy are spent in good health)		Disaggregating costs (wages, investment, pharmaceuticals) and applying different assumptions on evolution of costs for each component	
'Improved health' scenario (based on the 'compression of morbidity' hypothesis where healthy life expectancy increases by more than life expectancy at birth)			

Source: Economic and Financial Affairs DG.

the 2001 projection exercise implicitly assumed that a share of the gains in life expectancy up to 2050 would be spent in bad health. The literature points out that this assumption is possibly overly pessimistic. A scenario could be run which repeats the 2001 projection exercise (the 'pure ageing' scenario). However, an additional stylised scenario could be run by shifting the age-related expenditure profiles outwards linked to the projected gains in life expectancy: such stylised scenarios could implicitly assume that some of the projected gains in life expectancy up to 2050 are spent in good health.

- **Approach II — death-related costs:** projections could be run linking healthcare spending to years of remaining life. As explained in European Commission (2004n), there is strong evidence that a large share of total spending on healthcare during a person's life is concentrated in the final years of life. Based on data available from micro-studies from several national sources, it would be possible to run projections based on a constructed stylised profile of 'death-related' costs.

- **Approach III — changes in unit costs**: future healthcare spending as a share of GDP will be heavily influenced by the evolution of prices in the healthcare sector, especially if they exceed price inflation in the economy as a whole. A number of scenarios could be considered. It would be possible

to repeat the approach used in 2001 budgetary projections and to run the 'pure demographic scenario' with a modified assumption that costs evolve in line with GDP per worker (or labour productivity). Other scenarios could be run by disaggregating costs in the healthcare sector into its component parts (wages, capital investment, pharmaceuticals), and by running projections with various assumptions on evolution of costs for each of these components.

- **Approach IV — extrapolation of cost developments on the basis of past trends:** the OECD (see Oliveira Martins et al., 2005; OECD 2005), has developed a methodology, using past data, to decompose changes in spending on healthcare which are due to demographic and non-demographic factors, and has made projections by extrapolating these trends into the future. The EPC will not carry out projections under this approach, but instead will take account of the OECD projections when reaching overall conclusions on the future challenges for healthcare spending.

7.2.2. Approach I — Application of age-related expenditure profiles to different developments in health status

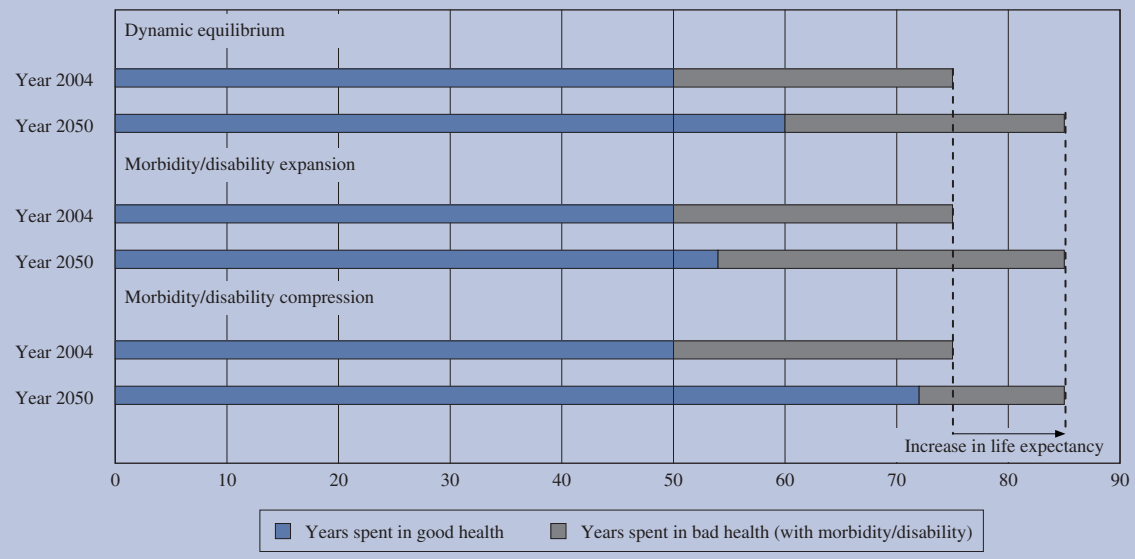
7.2.2.1. Stylised scenarios based on the literature on trends in healthcare

The literature points to three hypotheses on the evolution of healthcare status

There is debate in literature as to the extent to which, as life expectancy increases, the health status (or morbidity) of the population may change. The debate has been summarised as offering three main hypotheses, which are illustrated in Graph 7.1.

- In the **expansion of morbidity hypothesis** (Gruenberg, 1977; Olshansky et al., 1991; Verbrugge, 1984), as life expectancy increases, older people become more vulnerable to chronic diseases and spend more time in ill-health (represented by the grey-shaded area on the graph). As illustrated in the graph, most of the additional gains in life expectancy are spent in bad health. This is the de facto assumption used in the baseline scenario in the 2001

Graph 7.1: **Different hypotheses for the evolution of healthy life expectancy**



Source: Eurostat.

EPC projection exercise. It can be argued that this is a pessimistic scenario, and is illustrative of what could happen if there were no improvements in the epidemiological trends.

- In the **dynamic equilibrium hypothesis**, as life expectancy increases the time spent in ill-health during a lifetime will remain nearly constant (Manton, 1982; Manton et al., 1995). In Graph 7.1 above, this is characterised by the number of years in good health (the dark blue shade) increasing by the same number of years as life expectancy at birth: hence, the total period spent in bad health during a lifetime is unchanged. The term 'dynamic equilibrium' proposed by Manton is meant to capture the overall changes in life expectancy and severe disability. Clearly, not everybody will enjoy the benefits of all gains in life expectancy being spent in full health. Instead, a more likely prospect is that part of the gains in life expectancy will be spent in moderate health and the prevalence of chronic illness may increase; however, severe disability which is connected to the most costly part of healthcare services may be postponed to the final phase of life (meaning that age-related disability rates could decline). In essence, these effects may cancel out so that the average number of years spent in morbidity would remain unchanged. It is worth noting that this scenario is in methodological terms very close to what was proposed by the Danish authorities (see Madsen, 2004) in their proposed scenario, including 'death-related costs' with a 'full longevity correction'.

- The **compression of morbidity hypothesis** is more optimistic, and postulates that as life expectancy increases the time spent in ill health will decline (Fries, 1980; 1983; 1989; 1993). Graph 7.1 represents this by decreasing the total period of time spent in bad health during a lifetime. Thus, health life expectancy grows by more than life expectancy at birth.

Recent studies have not provided strong evidence in favour of any of the above hypotheses (dynamic equilibrium, compression of morbidity, expansion of morbidity). Results have differed significantly not only across countries, but also across genders.

Translating these hypotheses into projection scenarios

Running scenarios that simulate each of the three hypotheses would involve using comparable data on the health status for each age cohort for all Member States. As discussed above, these data are not currently available. In the absence of comparable data on the health status of citizens across Member States, a simple projection methodology has been proposed (European Commission, 2005p). It is illustrated in Graph 7.2 below. In essence, it assumes that spending on healthcare is a proxy for morbidity, which changes proportionately to the evolution of the number of years spent in bad health. It is important to keep in mind that age-related expenditure profiles are not direct measures of morbidity or the need for healthcare services: they also encompass measures of other demand and supply factors that affect healthcare use, such as availability of services and treatments and age-related rationing.

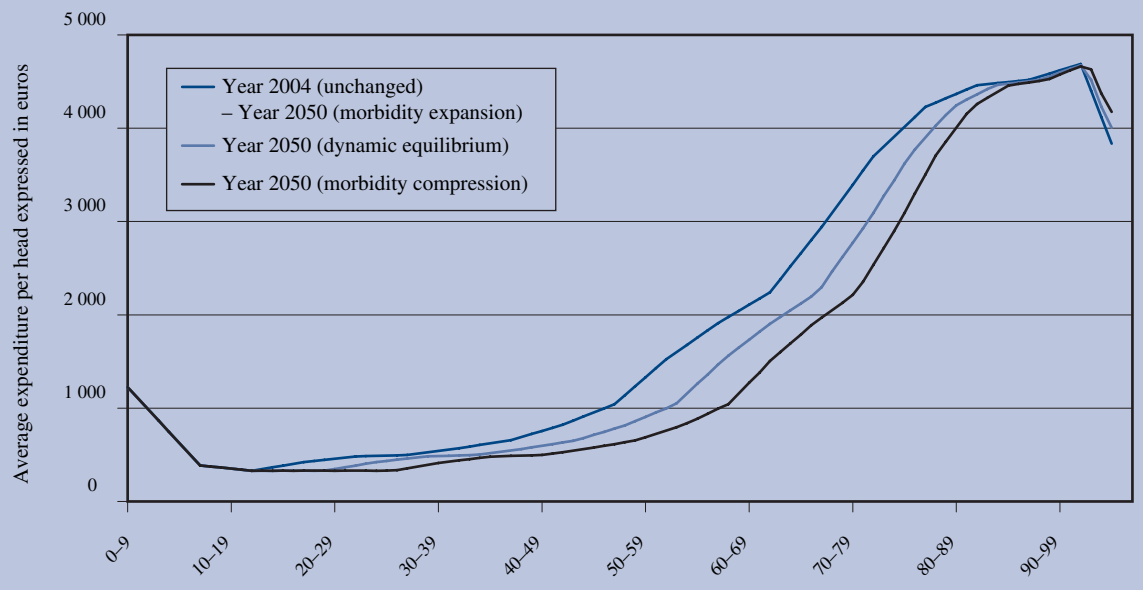
Annex 6 describes the projection methodology in more detail. In brief, age-related expenditure profiles (by age and gender) will be collected from the Member States for a base year (the dark blue line in Graph 7.2).

- In a **'pure ageing scenario'**, the age-related expenditure profiles would be assumed to remain unchanged (as in the 2001 exercise) throughout the projection time horizon, and it would be applied to the new baseline population projection of Eurostat. This approach would be inspired by the 'expansion of morbidity' hypothesis in the literature, as it de facto would assume that the gains in life expectancy up to 2050 are assumed to be spent in bad health.

- A **'constant health scenario'** (based on the 'dynamic equilibrium' hypothesis) could be run by progressively outwards-shifting the age-related expenditure profile in proportion to the projected increase in life age-specific expectancy embedded in the baseline population projection. This is illustrated in Graph 7.2 by the light blue line, which illustrates the age-related expenditure profile that would be applied in the year 2050. For each age cohort, the outward shift in the age-related expenditure profile is equivalent to the projected gain in life expectancy (at each age) between 2004 and 2050.

- An **'improved health scenario'** (based on the 'compression of morbidity' hypothesis) would also involve an outward shift in the age-related expenditure profile over time. However, the shift would be greater (by a stylised factor) than the projected increases in age-specific life expectancy. It is illustrated by the black line in Graph 7.2.

Graph 7.2: **Modelling different scenarios for future morbidity/disability and longevity using age profiles on healthcare costs**



Source: Economic and Financial Affairs DG.

The data requirements (see Annex 7 for more details) for this approach are as follows:

- healthcare expenditure per capita by age and sex cohorts in a base year — these data are collected by Member States;
- population by age and sex cohorts based on the baseline population scenario as described in Chapter 1 of this paper;
- projected changes over time in total life expectancy (derived from mortality tables) by age and sex cohorts.

7.2.3. Approach II — Death-related costs

7.2.3.1. Evidence that healthcare costs are concentrated in the final years of life

There is conclusive empirical evidence that the last years of life, irrespective of how long people live, are associated with high healthcare costs. The fact that healthcare consumption is, to a substantial extent, concentrated in the final phase of life needs to be taken into account when projecting future healthcare costs. At the same time, rising life expectancy shifts the final phase of life to higher ages. This changes the proportion of people at a particular age who have a specific number of years left to live. Decreasing numbers of people, in a given age group, having few remaining years of life result in the average healthcare cost falling for all age groups, except the oldest.

The first researchers to find a positive relation between healthcare costs and the remaining time to death were Roos et al. (1987). Their findings were confirmed by further studies by, for example, Lubitz and Riley (1993), Cutler and Meara (1999), Zweifel et al. (1999), Serup-Hansen et al. (2001), Batljan and Lagergren (2004), referring in most cases to hospital spending.

In most studies, the analysis covers only the last one or two years of life. Some authors, however, argue that the relationship disappears once people surviving more than two years are taken into consideration. According to Zweifel et al. (1999) and Caisse Nationale de l'Assurance Maladie de Travailleurs Salariés (2003), the correlation between time to death and healthcare spending exists only during the last two years of life and practically disappears once the time span broadens to three or more years from the moment of death. However, such assumption is rejected by Batljan and Lagergren (2004),

who investigate the impact on healthcare and long-term care spending further away from the moment of death. According to their findings, the impact, although much weaker, exists even up to six years before death.

Cutler and Meara (1999) and Zweifel et al. (1999), using US and Swiss data respectively, show that, while controlling for health status and proximity to death, age itself does not have an effect on healthcare spending. Instead, there is a transmission mechanism in which the intermediate variable between the age and healthcare consumption is health status (higher morbidity and disability incidence at higher ages) and proximity to death.

This conclusion is challenged by Seshamani and Gray (2004) who, using the British data, indicate that age does matter, although they do not question the importance of proximity to death as an explanatory variable for healthcare spending. Brockmann (2002) strongly supports this critique, arguing that in Germany, hospital care expenses on the elderly decrease significantly with age. Also Caisse Nationale de l'Assurance Maladie de Travailleurs Salariés (2003) finds that the death-related cost profiles vary according to the age of deceased persons. Indeed, while the former finds that the expenditure curve for non-surviving patients drops almost linearly until it flattens out at the highest ages, the latter argues that the average healthcare cost of a person who is 45–54 years old in the year of her death is almost twice as high as the cost of an 85 + year-old deceased person ([1]). These observations, confirmed also by Grignon (2003) using French data and Levinsky et al. (2001) using US data, may be explained in three ways ([2]):

- healthcare rationing done by doctors, either for utilitarian reasons (devoting limited resources to the treatment of younger age cohorts) and professional reasons (e.g. less knowledge about the treatment of older patients, the higher probability of death among older patients);
- voluntary restraining from receiving healthcare by older people who find the investment in health will not pay back any more;
- generation effect which reflects differences in perceived needs, mentality and habits between older and younger generations.

Overall, the literature indicates that the higher the share of a gender/age group in its terminal period of life, the higher its average healthcare and long-term care expenditure. This is an important conclusion for the possible consequences of population ageing on healthcare and long-term care costs.

7.2.3.2. Main empirical results of existing studies

While there are several theoretical approaches to the issue of death-related costs, reliable and well documented empirical results are lacking. Some studies present only approximate or partial estimates. This is the case with, for example, Grignon (2003), who estimates the proportion with healthcare and long-term care spending of a person who is going to die within one year to that of a 'survivor' (parameter *k*) to approximate five.

Caisse Nationale de l'Assurance Maladie de Travailleurs Salariés (2003) presents approximate values of *k* for the sample of French population insured in the general health funds over the period 1992–2002. From the graphs presented there (detailed results are missing), one can conclude that *k* varies from around 8.8 for the age group 45–54 to less than 2 for the oldest (85 +). In other words, health spending on a person aged 45 to 54 who dies within one year is 8.8 times higher than that on a survivor of the same age cohort, whereas the proportion between survivors and non-survivors is only two for people aged 85 +.

Table 7.2

A comparison of spending levels between a person having *n* remaining years of life and a survivor in France

	Number of remaining years of life			
Age cohort	**0**	**1**	**2**	**3**
34-44	6.5	5.5	3.0	2.0
45-54	8.8	6.8	2.5	1.5
55-64	3.3	2.3	1.5	1.0
65-74	2.6	2.3	1.3	1.0
75-84	2.8	2.4	1.5	1.2
85+	1.8	1.7	1.2	1.0

Source: DG ECFIN calculations on the basis of : Caisse Nationale de l'Assurance Maladie des Travailleurs Salariés (2003), Le viellissement de la population et son incidence sur l'évolution des dépenses de santé, Point de conjoncture no.15 - juillet 2003

([1]) This decrease in death-related costs with age applies to all age groups older than 45 years. For younger people the death-related costs are much lower, given the fact that at younger ages death is in most cases casual and is not preceded by costly therapy. Moreover, the incidence is so small that it can be omitted in the analysis.

([2]) The opposite conclusion is drawn by Roos et al. (1987). Using Canadian data, they conclude that total health costs among decedents increase with age. This result is probably due to the data sources used which cover not only acute care and visits to physicians, but also stays in nursing homes, which as an element of long-term care is very closely correlated with age.

Cislaghi et al. (2002) analyse the hospitalisation cost among the Tuscan population over the period 1997–2000 and estimate costs per capita in 2004. Assuming the hypothesis of an increase in survival leading to a larger share of elderly people in total population, they compare per capita expenditure estimated according to two different methodologies: assuming costs of deceased (people in their last year of life) and survivors are the same and distinguishing between the two groups. The results show that per capita hospitalisation cost is 3.3 % (EUR 531: EUR 514) higher in the former case than in the latter ([1]).

A well documented source of results from the Swedish Skåne region is provided by Batljan and Lagergren (2004). Their results are divided by gender, type of care (inpatient/outpatient) and the number of remaining years to death (from nought to six). According to their estimates, a person with no remaining years of life (deceased in the same calendar year) spends 21.5 times more on inpatient healthcare compared with a person who is going to survive more than six years. The proportion of costs in other categories is presented in Table 7.3. Similar results are presented for outpatient care costs. Given lack of data, however, distinction is only made here between non-survivors (people deceased within one year) and survivors.

Empirical evidence based on Swiss data is provided by Zweifel et al. (1999) (see Table 7.4). They show that the relative cost of death in comparison with the 'normal' costs not only differs across the age cohorts, but also shows a clear downward trend over time. In particular, they compare average healthcare expenditure per capita for decedents and survivors in two years, 1983 and 1992, and discover that while the total level of spending grew significantly, death-related costs were increasing much slower than overall costs.

More detailed results are available in a series of academic papers based on the data gathered mainly in hospitals and covering the territory of the whole countries or specific regions. On the basis of individual medical records of the population, the authors calculated the ratio of costs borne by decedents to those borne by survivors, disaggregated — where possible — by the number of remaining years of life, age cohorts and gender. Table 7.5 shows, in a condensed form, the results of those studies.

([1]) It should be borne in mind that it is **not** the proportion of death-related to 'normal' costs.

Table 7.3

Relative death-related costs in healthcare in the Skåne region of Sweden

Number of remaining years of life	Per capita spending in thousands of SEK (approx.)			Proportion in per capita spending between non-survivors and total population		
			Inpatient care			
	Males	Females	All	Males	Females	All
0	55.2	48.1	51.6	25.1	18.5	21.5
1	35.6	33.6	34.6	16.2	12.9	14.4
2	20.7	20.8	20.7	9.4	8.0	8.6
3	15.7	16.3	16.0	7.1	6.3	6.7
4	14.2	13.6	13.9	6.5	5.2	5.8
5	11.6	11.4	11.5	5.3	4.4	4.8
6	9.4	9.0	9.2	4.3	3.5	3.8
>6	2.2	2.6	2.4	1.0	1.0	1.0
			Outpatient care			
0	17.3	15.4	16.7	6.9	5.0	6.0
>0	2.5	3.1	2.8	1.0	1.0	1.0

Source: Batljan and Lagergren (2004), p. 17.

Table 7.4

Per capita spending on healthcare (in Swiss francs)

	All population		Elderly (aged 65 +)	
	1983	1992	1983	1992
Deceased	9 150	15 000	n.a.	n.a.
Survivors	860	2 800	n.a.	n.a.
Proportion between deceased and survivors	10.6	5.3	5.6	3.7

Source: Zweifel et al. (2004), p. 489.

Table 7.5

Ratio between cost borne by a person with *N* remaining years of life and a survivor, by age cohort (males, females or aggregate)

Denmark

N	0–1	1–2	2–3
Age cohort			
50–59	10.6	6.7	5.5
60–69	8.0	4.3	3.4
70–79	4.8	2.7	2.0
80–89	2.4	1.9	1.6
90 +	1.8	1.7	1.0

Source: Madsen M. (2004), *Methodologies to incorporate 'death-related' costs in projections of health and long-term care based on Danish data*, Ministry of Finance, Denmark.

Germany

N	0	1	2
Age cohort			
0–24	30.3	14.0	11.6
25–34	31.8	13.3	14.9
35–44	31.5	20.5	12.5
45–54	20.6	8.2	5.8
55–64	17.7	5.4	3.0
65–74	12.1	4.1	3.0
75–84	6.6	2.4	1.8
85 +	4.3	1.2	0.9

NB: Average number of hospital days/year according to survival status measured as a proxy for healthcare spending.

Source: Busse R., Krauth C., Schwartz F. (2002), 'Use of acute hospital beds does not increase as the population ages: Results for a seven-year cohort study in Germany', *Journal of Epidemiology and Community Health*, Vol. 56, pp. 289–293.

Spain

N	0
Age cohort	
0	7.6
1–5	71.1
6–10	82.1
11–15	92.7
16–20	96.5
21–25	75.6
26–30	48.9
31–35	40.7
36–40	43.7
41–45	43.5
46–50	35.0
51–55	26.9
56–60	21.7
61–65	15.8
66–70	11.9
71–75	9.4
76–80	7.4
81–85	6.3
86 +	5.0

Source: Ahn, N., García, J. R., Hercé, J. A. (2005), *Demographic uncertainty and healthcare expenditure in Spain*, FEDEA, Documento de trabajo 2005-07.

Italy

	Males	Females
N	0	0
Age cohort		
1–4	67.0	84.9
5–9	78.6	159.1
10–14	70.9	108.4
15–19	40.5	46.3
20–24	26.4	33.8
25–29	29.9	26.5
30–34	30.9	27.6
35–39	40.8	37.9
40–44	35.6	41.9
45–49	31.7	32.3
50–54	21.4	27.5
55–59	17.2	24.0
60–64	12.2	16.9
65–69	8.5	12.1
70–74	6.2	8.3
75–79	4.5	5.4
80–84	3.3	3.7
85–89	2.4	2.6
90 +	1.7	1.6

Source: Own calculations on the basis of Gabriele, S., Cislaghi, C., Costantini, F., Innocenti, F., Lepore, V., Tediosi, F., Valerio, M., Zocchetti, C. (2005), *Demographic factors and health expenditure profiles by age: the case of Italy*. A deliverable for the Enepri AHEAD (Ageing, health status and determinants of health expenditure) project.

Austria		
	Males	Females
N	0	0
Age cohort		
0–4	50.9	67.0
5–9	156.6	240.0
10–14	173.9	205.1
15–19	135.2	113.1
20–24	136.6	77.2
25–29	131.9	63.1
30–34	128.1	70.5
35–39	103.2	84.4
40–44	77.7	59.7
45–49	48.1	52.1
50–54	32.4	35.0
55–59	25.6	30.0
60–64	20.8	26.2
65–69	13.6	17.1
70–74	10.5	11.8
75–79	7.8	8.6
80–84	6.7	7.2
85+	6.2	5.4

Source: Riedel, M., Hofmarcher, M. M., Buchegger, R., Brunner, J. (2002), *Nachfragemodell Gesundheitswesen. Endbericht, Teil II.* Studie im Auftrag des Bundesministeriums für Soziale Sicherheit und Generationen, Institut für Höhere Studien (IHS), Vienna.

7.2.3.3. A summary of methodologies that have been used to include death-related costs in the long-term projections

Several projections of healthcare and long-term care costs have been carried out both in North America and the EU Member States. The methods summarised below are proposed by Serup-Hansen et al. (2002), Pellikaan and Westerhout (2004), Batljan and Lagergren (2004) and Ragioneria Generale dello Stato (2004). Although not all studies outline the methodology in detail and despite some differences in approach, a number of main characteristics can be identified.

The population is decomposed into groups according to age, gender and possibly other features with a potential effect on healthcare spending (such as various levels of disability or morbidity). Then the average healthcare cost for each group is calculated. Total current healthcare spending is thus the sum of the averages multiplied by the respective sizes of the population in those groups. However, while in the traditional approach the same technique applies to the future (constant age profiles and changing demography), taking into account death-related costs requires additional complications.

The total number of observations is not only decomposed into age and gender groups, but is also divided between people who, in a given moment in time, are going to die within a specific period of time and those who are going to survive. That period should be short enough to reflect the strong effect of concentration of costs in a close proximity to death. In most studies, it is set at one year (four quarters) from death, or — to avoid the problem of unavailability of data as far as exact date of death is concerned — the same calendar year as the date of death is taken as a criterion. Such decomposition creates two groups of populations: survivors and non-survivors, to which different average costs will be applied. According to this nomenclature, survivors are defined as those who live during the whole calendar year and non-survivors (decedents) as those who die during that year. Obviously, the share of survivors and that of non-survivors make up to unity. In Batljan and Lagergren (2004), the whole population is divided into seven groups: people with nought, one, two, three, four, five, and six plus years to live. The advantage of such an approach is that it does not restrict death-related costs to a deliberately chosen number of years before death, even if, as mentioned, several studies prove that 'death proximity' affects healthcare spending only during a very short terminal phase of life.

For the future projections to offer a value-added with respect to the traditional method, the share of survivors and non-survivors in an age group must evolve in line with the process of population ageing. To reflect that evolution, decreasing mortality rates can be incorporated into the model as an indicator for decreasing relative number of non-survivors in each respective age ([1]) group.

The healthcare profile of a gender-age group $T_{s,j}$ can be calculated as follows:

$$T_{(s,j,t)} = (1 - \sigma_{(s,j,t)}) \times U_{(s,j,t)} + \sigma_{(s,j,t)} \times D_{(s,j,t)} \quad [1]$$

where:

$T_{(s,j,t)}$ is the average per capita healthcare cost of the cohort of gender *s* and age *j* at time *t;*

([1]) The model may be refined even more by allowing for different (and convergent over time) mortality rates for males and females.

$\sigma_{(s,j,t)}$ is the mortality rate of the cohort of gender *s* and age *j* at time *t;*

$U_{(s,j,t)}$ is the healthcare cost profile of survivors in the cohort of gender *s* and age *j* at time *t;*

$D_{(s,j,t)}$ is the healthcare cost profile of non-survivors (cost of death) in the cohort of gender *s* and age *j* at time *t.*

Given the difficulty with establishing the exact level of death-related costs $D_{(s,j,t)}$ due to the lack of data and incomparability among countries, a useful modification to the methodology is proposed by Ragioneria Generale dello Stato (2004). Instead of including the direct cost of death in the model, a coefficient expressing the proportion of costs borne by a non-survivor to those borne by a survivor in a given gender-age cohort can be used. In this way, equation [1] becomes:

$$T_{(s,j,t)} = U_{(s,j,t)}\left[(1-\sigma_{(s,j,t)}) + k_{(s,j,t)} \times \sigma_{(s,j,t)}\right] \quad [2]$$

where:

$k_{(s,j,t)} = D_{(s,j,t)} / U_{(s,j,t)}$ is the proportion of healthcare and long-term care consumption of a non-survivor to the consumption of a survivor.

This modification eliminates $D_{(s,j,t)}$ from the model and replaces it with $k_{(s,j,t)}$ which can be estimated from the existing studies and, under the assumption of constancy/consistency across the regions and countries, used as a benchmark for all the Member States.

Moreover, assuming that the age profiles of death-related costs and 'normal' (survivors') costs are constant over time ([1]), the average profile would vary only in line with changes in the probability of death. Thus, assuming $k_{(s,j,t)} = k_{(s,j,t0)}$ for each *t*, equation [2] becomes:

$$T_{(s,j,t)} = U_{(s,j,t_0)}\left[(1-\sigma_{(s,j,t)}) + k_{(s,j,t_0)} \times \sigma_{(s,j,t)}\right] \quad [3]$$

A survivor's cost profile in base year is:

$$U_{(s,j,t_0)} = \frac{T_{(s,j,t_0)}}{[(1-\sigma_{(s,j,t_0)}) + k_{(s,j,t_0)} \times \sigma_{(s,j,t_0)}]} \quad [4]$$

And consequently [3] becomes:

[5]

$$T_{(s,j,t)} = T_{(s,j,t_0)} \times \frac{\left[(1-\sigma_{(s,j,t)}) + k_{(s,j,t_0)} \times \sigma_{(s,j,t)}\right]}{[(1-\sigma_{(s,j,t_0)}) + k_{(s,j,t_0)} \times \sigma_{(s,j,t_0)}]}$$

which is the way to calculate future costs of healthcare, taking into account development of mortality rate over time and constant relative cost of death.

Available evidence (Ragioneria Generale dello Stato, 2004, Lubitz and Riley, 1993) clearly shows that the parameter *k* decreases along with the age profile as the probability of death increases significantly with age. However, for the sake of simplicity, one can assume its constancy and consider the same coefficient for males and females irrespective of age.

Pellikaan and Westerhout (2004) propose a useful modification of methodology when precise data on death-related costs for various age groups are missing. They assume that the youngest and the oldest people consume higher amounts of health and long-term care than the middle-aged population. The highest cost is attributed to the oldest group, those aged 95 +, which is considered as a benchmark for the other groups. This benchmark is multiplied by a coefficient specific for each age cohort reflecting the difference in costs, to obtain the healthcare and long-term care spending for those cohorts. The coefficient reflects the difference in average in costs between the oldest group and the other ones and is chosen arbitrarily on the basis of the available data.

Another useful refinement of the methodology proposed by Pellikaan and Westerhout (2004) is a division between death-related costs driven by healthcare spending and long-term care spending. Since healthcare and long-term care expenditures differ considerably as for composition and driving forces, the Dutch study decomposes total death-related costs into a healthcare and a long-term care component, depending on age. As has been mentioned, age profiles for the two types of expenditure differ a lot. While healthcare expenditure is an irregular (bent rightwards) U-shaped curve, long-term care spending may be presented as an exponentially rising curve. Thus, as people age, a relatively larger and larger share of their total costs is spent on long-term care, associated almost entirely with old-age disability, while the relative share of healthcare costs decreases (even if it increases in total terms).

([1]) Such constancy is generally not the case. As Grignon (2003) argues, the death-related costs curve becomes more and more convex over time, but the evolution is so slow that omitting it in the projections should not result in a significant deterioration of their quality (see*:* Caisse Nationale de l'Assurance Maladie des Travailleurs Salariés, 2003).

7.2.3.4. *Projection methodology option in the 2005 EPC projection of age-related expenditure*

A possible methodology to take account of so-called death-related costs is the following (see European Commission, 2005s). Having the data on mortality rate for each age and sex cohort, one can divide the total population in this cohort into subgroups according to their distance to death. As a result, one can distinguish *n* subgroups of decedents (depending on the predefined number of years to death *n-1* taken into account) and a subgroup of survivors. On the basis of the average healthcare cost per capita and the proportion of cost borne by a decedent to that borne by a survivor, the absolute cost for each subgroup of decedents and survivors can be calculated. Then, multiplying the size of each subgroup by its respective cost (which is **kept constant** over the entire projection period), one obtains total cost borne by each age group.

According to different studies, there are clear differences between men and women in the distribution of healthcare costs by remaining years of life, meaning that, given the same number of remaining years of life, costs are higher for men than for women. Furthermore, healthcare costs per number of remaining years for the oldest old have been found to be lower than for the elderly age groups. Age-based healthcare rationing, differences in frailty, prevalence of different diseases among men and women, and gender discrimination have been suggested as main explanations behind those differences. However, for the purpose of making projections, it is not plausible to assume that those differences will persist in the future (Batljan, 2005). Therefore, there is no need to differentiate between genders or age groups for people over 65 years, while calculating death-related costs which are to be used for future projections.

The proposed method is theoretically consistent with the **dynamic equilibrium** hypothesis. The possible small difference in results between the two scenarios (which describe the same phenomenon from two different perspectives) results from one simple fact. While the pure demographic scenario takes into account costs which are statistically related to death but which are borne during $n \rightarrow$ *total lifespan* last years of life, the second methodology assumes that only a predefined number of years ([1]) prior to death count in the calculations.

The data requirements for this projection approach include:

- future population by age, sex and number of remaining years of life, based on projections of mortality rate by age and sex cohorts (available from Eurostat);
- proportion of health expenditure borne by decedents (those who are going to die in nought to five years time) and survivors (those who are going to survive), decomposed by age and sex cohorts. Based on data available from micro-studies from several national sources, it would be possible to run projections based on constructed stylised profile of 'death-related' costs. This data are collected by Member States.

7.2.4. Approach III — Projections based on the development of unit costs

Scenario looking at the evolution of costs under different assumptions

Future healthcare spending as a share of GDP will be heavily influenced by the evolution of prices in the healthcare sector relative to the rest of the economy. A number of additional scenarios on the evolution of future costs may be carried out:

- a fast growth/slow growth sensitivity test where costs are assumed to change 1 % faster/slower than the evolution of prices based on GDP per capita;
- a scenario, as in 2001, where costs evolve in line with GDP per worker ([2]).

([1]) In practice, in most countries, the data are available only for the last year of life (one can trace people who die within the same calendar year).

([2]) The rationale behind this assumption is the fact that healthcare may be considered as a relatively labour-intensive sector and its costs are determined to a large extent by wages developments. According to macroeconomic assumptions, wages in the whole economy are supposed to follow the labour productivity. Then, if wages in the healthcare sector are assumed to evolve in line with economy-wide wages, the methodology works. The main difference between the two assumptions (GDP per capita and GDP per worker) relates to whether a change in the rate of participation in the labour market has an impact on the absolute level of healthcare expenditure. Using the cost assumption of GDP per capita, higher participation and thus employment, leading to a higher GDP per capita is accompanied with a higher absolute level of expenditure, as the results expressed as a percentage of GDP are projected to be constant. Using the GDP per worker cost assumption, higher participation rates do not have an impact on the absolute level of health expenditure, thus leading to a decrease of expenditure when expressed as a share of GDP. The main implication of this difference is that under the GDP per capita cost assumption, higher participation does not help in cushioning the budgetary consequences of ageing on health expenditure, whereas under the GDP per worker cost assumption it does.

The usefulness of this exercise is not only to show the sensitivity of the results to the assumption on cost developments. It is also an indirect way to capture the possible impact of technology on healthcare spending. While there is widespread agreement on the importance of technology as a key factor in shaping healthcare spending, the empirical evidence is very mixed. Technology can contribute to lower spending (by more effective and cheaper treatments), but it can contribute to higher spending by widening the range of medical conditions that can be treated.

Scenarios based on a decomposition of unit costs

Another possible approach is to decompose the total healthcare spending on the cost side (European Commission, 2005t) ([1]). Using OECD data, one can divide healthcare spending into the components of costs, disentangling labour costs (wages in healthcare sector), costs of medical equipment, infrastructure and other medical durables (investment in fixed capital), costs of pharmaceuticals and other medical non-durables, and other costs (including costs of administration and other health-related functions, like education, training, R & D). It would then be possible to run projections for spending with various assumptions on evolution of costs for each of these components (possibly calibrated on the basis of past trends).

To run such an exercise, data are needed on the current composition of costs. This may be partially taken from the OECD data, which has calculated total, public and private expenditure on medical goods with disaggregation into costs of therapeutic appliances and other medical durables, and costs of pharmaceuticals and other medical non-durables. Moreover, the same OECD database provides price index of total expenditure on pharmaceuticals and other medical non-durables. The price index of medical durables may be proxied by the price index in the whole economy.

The most challenging issue remains the treatment of labour costs which, according to different studies, account for more than 50 % of total costs on healthcare spending. Neither the OECD nor Eurostat provide data on the share of wages in total healthcare costs, nor do they provide sectoral wage indices. Some, albeit incomplete, data are available in the WHO 'European health for all' database. There are, however, a few studies which analyse wage developments in the health sector in comparison to economy-wide wages. From those studies, it may be possible to derive a differential vis-à-vis economy-wide wages growth and to apply it to the future projections.

Overall, the data required to make these projections include the following:

- share of various cost components: wages, investment in medical equipment and infrastructure, spending on pharmaceuticals (data available at OECD and WHO, complemented by national sources);
- wage index in the healthcare sector/extra margin of growth over the economy-wide wages growth (Eurostat, NewCronos database; OECD, STAN industrial database);
- price index in the whole economy (Eurostat);
- price index of expenditure on pharmaceuticals and other medical non-durables (OECD, complemented by national sources).

7.2.5. Approach IV — Extrapolation of total cost developments on the basis of past trends

As shown by the OECD (Bjornerud and Oliveira Martins, 2005), with detailed data on the past changes in the population structure and assuming a constant age-related expenditure profile of spending on healthcare, one can decompose past changes in healthcare spending into those which are due to demographic and those due to non-demographic factors. To make this decomposition, a counterfactual average annual growth rate of expenditure is calculated by assuming that the population structure remains constant over time at a level of a given year in the past (say 1970). The difference in growth rates in spending on healthcare between actual developments and the counter-factual estimates are attributed to 'pure' age-related factors. After having abstracted from the effects of changes in total population and in population structure, the remaining growth in spending on healthcare is attributed to non-demographic factors. It is then possible to make forward-looking projections of healthcare spending, tak-

([1]) The OECD has detailed data on the current decomposition of spending into sectors of healthcare: personal and collective healthcare; inpatient, outpatient, day, home care and ancillary services. However, such decomposition would be useful only if any kind of data on the possible future developments of the respective components existed. Unfortunately, such data are not available, while extrapolating the (short) past time series into the future is too risky, given the wide range of health, economic, institutional and legal factors affecting the use of different sectors of care.

ing account of new population projections, as well as the contribution of non-demographic factors to healthcare spending. This methodology, developed by the OECD, can be considered as an alternative or complementary approach to the present projection exercise.

8. Long-term care

8.1. Overall approach to making the projection on long-term care spending

Background

This chapter outlines the proposed methodology for making projections on long-term care spending as part of the 2005 EPC projection exercise. In preparing this proposal, which has yet to be fully endorsed by the EPC, the work has benefited from discussions at the AWG meeting of October 2004, and especially from the joint OECD–AWG–Commission workshop of 21 and 22 February 2004 on 'Understanding trends in disability among elderly populations and the implications of demographic and non-demographic factors for future health and long-term care costs'. It is largely based on a suggestion of Adelina Comas-Herrera ([1]) of the LSE ([2]).

This proposal needs to be seen in the context of the overall projection exercise. In particular, there are strong overlaps with the proposal for the approach to projecting healthcare spending (see Chapter 7), and issues related to coverage of the exercise and statistical definitions are dealt with in Annex 7.

([1]) A visiting fellow in the Economic and Financial Affairs DG in 2004 and 2005.

([2]) It represents the views of the Economic and Financial Affairs DG alone, and does not necessarily reflect the views of Adelina Comas-Herrera and the co-authors of the paper presented at the conference of 21–22 February 2005. The proposal is very similar to that outlined in the paper of Adelina Comas-Herrera, Raphael Wittenberg and Linda Pickard entitled 'Making projections of public expenditure on long-term care for the European Member States: methodological proposal for discussion' presented at the Commission–AWG–OECD workshop of 21–22 February 2005. The proposal outlined in the paper of Comas-Herrera et al. builds on a methodology developed by a team from the Personal Social Services Research Unit (PSSRU), led by Raphael Wittenberg and including Linda Pickard, Bleddyn Davies, Robin Darton and Derek King. It also builds on the experience of the 'European study of long-term care expenditure', which involved Joan Costa-Font, Cristiano Gori, Alessandra di Maio, Concepció Patxot, Linda Pickard, Alessandro Pozzi, Heinz Rothgang and Raphael Wittenberg: the project was partly funded by the Employment and Social Affairs DG of the European Commission.

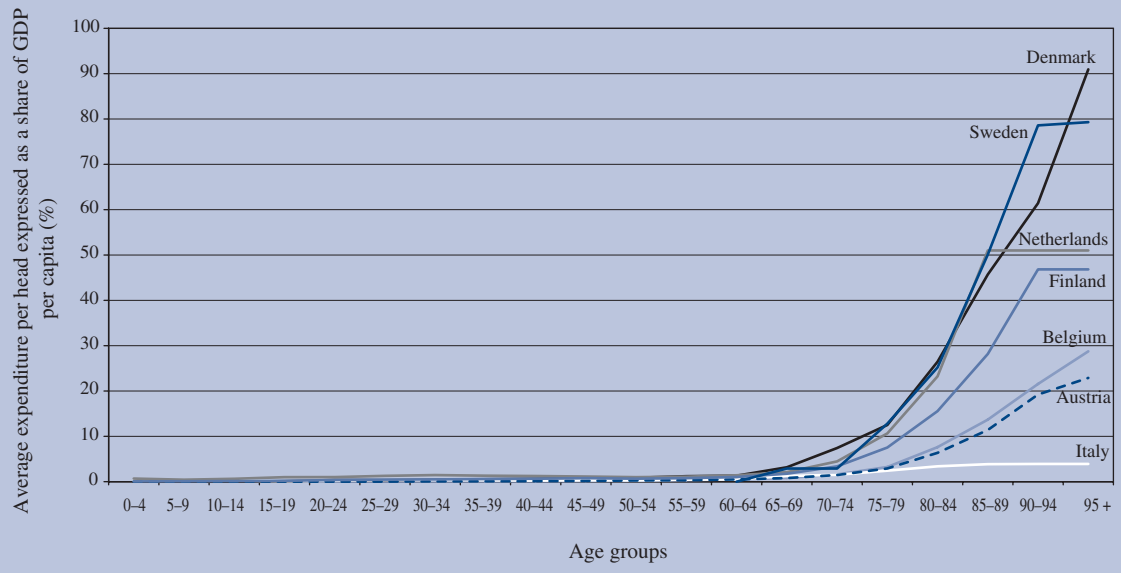
Limitations of the 2001 projection exercise of the EPC

The 2001 EPC exercise included projections for long-term care. Projections were made by applying a constant age-related expenditure profile for long-term care (collected by national authorities for a base year and presented in Graph 8.1) to the 2000 population projection of Eurostat. As with healthcare expenditure, projections were made with two cost assumptions: evolving in line with GDP per capita and GDP per worker. Like for healthcare, the methodology followed in 2001 has a number of important limitations, and indeed these were recognised in the report of the EPC.

First, the projection methodology used in 2001 holds age-specific spending on long-term care in a base year (usually 2000) constant over the projection period; this implicitly assumes that, as life expectancy increases, the number of years spent in disability will increase too. Such an assumption can be considered pessimistic, particularly as increases in life expectancy at older ages are mostly due to reductions in age-specific mortality. However, the literature points to other potential developments including a 'dynamic equilibrium' hypothesis (in which the time spent in disability would remain nearly constant) and a 'compression of morbidity' hypothesis (in which the time older people spend in disability would decrease as life expectancy increases). Given the lack of empirical evidence supporting any one of these three theories on the possible evolution of disability rates, it would be prudent for the AWG to run scenarios for all eventualities.

The use of age-related expenditure profiles makes it difficult to model changes in disability over time, as they measure expenditure in services rather than underlying need. As demand (and subsequent expenditure) in services is explained by other factors, as well as disability, that vary with age (such as household type, availability of informal care, income and housing tenure), changes in age-specific expenditure profiles are not necessarily equivalent to changes in disability rates.

Graph 8.1: **Age-related expenditure profiles for per capita spending on long-term care used by the EPC/AWG for the 2001 projection exercise**



Source: EPC (2001) from national sources.

A second limitation of the 2001 projection methodology is that it did not allow the investigation of scenarios about institutional arrangements for the provision and financing of long-term care by the public sector. It assumed, implicitly, a 'no policy change' scenario. This approach is an appropriate starting point for making long-run projections; however, it could usefully be complemented with additional scenarios to assess the impact of possible future policy changes. Pressure for more public provision/financing of long-term care services could grow substantially in coming decades due to changes in family structure and the growing labour market attachment of females, trends which may severely constrain the supply of informal care provision.

This can be seen in Graph 8.1 and Table 8.1. There is a very wide dispersion of spending per capita as a share of GDP on long-term care across Member States (much wider than for healthcare spending). This is due to differences in institutional settings. The prevalence of institutionalised care in Nordic countries explains the high per-capita spending for older-age cohorts. Much lower spending per-capita in countries such as Italy could be explained by the prevalence of informal care provision within families. When an extrapolation is made on the basis of a low starting level of spending, the projected increase in spending as a share of GDP is consequently low (see Table 8.1). It would be misleading to interpret such results as meaning that there are limited risks as regards future pressure for public spending on long-term care.

A related limitation of the 2001 projection methodology is that it implicitly assumes that the balance between care provided in institutional and home-based settings will remain unchanged over the projection period. As above, this is a reasonable starting point for a 'no policy change' scenario, but it would be useful to complement this with additional policy scenarios as unit costs differ substantially between both settings and there is evidence that most people would prefer to be cared for in their own home.

A more comprehensive methodology is needed to take account of future needs

Given these considerations, the Economic and Financial Affairs DG has proposed that the EPC agrees on a projection methodology which is substantially different from that used in 2001. It is proposed that the Commission and AWG build a simple macro-simulation or cell-based models similar to those used for Germany, Italy

Table 8.1

Results of the 2001 EPC baseline projections for public spending on healthcare and long-term care

	Healthcare			Long-term care			Total		
	Exp as % of GDP in 2000	Projected increase 2000–50		Exp as % of GDP in 2000	Projected increase 2000–50		Exp as % of GDP in 2000	Projected increase 2000–50	
		per capita	*per worker*		*per capita*	*per worker*		*per capita*	*per worker*
BE	5.3	1.3	1.5	0.8	0.8	0.8	6.1	2.1	2.3
DK	5.1	0.7	1.1	3.0	2.1	2.5	8.1	2.8	3.6
DE	5.7	1.4	2.1						
EL	4.8	1.7	1.6						
ES	5.0	1.7	1.5						
FR	6.2	1.2	1.9	0.7	0.5	0.6	6.9	1.7	2.5
IE	5.9		2.3	0.7		0.2	6.6		2.5
IT	4.9	1.5	1.7	0.6	0.4	0.4	5.5	1.9	2.1
NL	4.7	1.0	1.3	2.5	2.2	2.5	7.2	3.2	3.8
AT	5.1	1.7	2.0	0.7	1.0	1.1	5.8	2.7	3.1
PT	5.4	0.8	1.3						
FI	4.6	1.2	1.8	1.6	1.7	2.1	6.2	2.9	3.9
SE	6.0	1.0	1.2	2.8	2.0	2.1	8.8	3.0	3.3
UK	4.6	1.0	1.4	1.7	0.8	1.0	6.3	1.8	2.4
EU **(*)**	*5.3*	*1.3*	*1.7*	*1.3*	*0.9*	*1.0*	*6.6*	*2.2*	*2.7*

(*) Weighted average.

Source: EPC (2001).

and Spain in the European study of long-term care expenditure. The proposed methodology aims to maximise the number of factors that can be investigated, while making sure that the projections can be carried out using mostly macro-level data. This would help ensure that a large number of Member States would be able to be included in the projections. Specifically, the methodology proposed would enable the investigation of the impact of changes in the assumptions made about:

- the future numbers of elderly people (through changes in the population projections used);
- future numbers of dependent elderly people (by making changes to prevalence rates of dependency);
- the balance between formal and informal care;
- the balance between home and institutional care (by changing the proportion of people using home care, institutional care and relying exclusively on informal care);
- the costs of a unit of care.

8.2. Overview of the proposed projection methodology

Graph 8.2 below is taken from the paper by Comas-Herrera et al. (2005) and provides an overview of the proposed projection methodology. The square boxes indicate data that needs to be entered into the models to make projections for each required year, and the round boxes indicate calculations that are produced within the model, for each year. The main steps can be summarised as follows.

- **Step 1**: Taking the baseline population projection prepared by Eurostat outlined in Chapter 1 of this report (by age and gender), a projection is made of the dependent population (who are assumed to need some form of long-term care service), and the non-dependent population who are assumed not to be in need of long-term care services. This projection of the dependent population will be made by extrapolating age- and gender-specific dependency ratios of a base year (to be estimated using existing indicators of disability from comparable sources) to the agreed baseline population projection. It is worth stressing

at this point the difference between the term 'dependency' and 'disability' used in this report. The term 'disability' refers to some functional impairment of an individual. The term 'dependent' refers to that share of the population who have some disability which requires the provision of a care service. There are many people who have some form of disability and can lead completely independent lives without the need for care services.

- **Step 2**: The dependent population is split into three groups depending on the type of care they receive: (i) informal care ([1]) (which has no impact on public spending), (ii) formal care at home, and (iii) formal care in institutions (both of which impact on public spending but their unit costs may differ). This split can be made by calculating the 'probability of receiving different types of long-term care by age and gender'. This will have to be calculated for a base year using data on the numbers of people with dependency, the numbers of people receiving formal care at home and the numbers of dependent people in long-term care institutions. It is proposed to assume that the difference between the total number of dependent people and the total number of people receiving formal care (at home or in institutions) is the number of people who rely exclusively on informal care.

- **Step 3**: This involves the calculation of public spending by multiplying the number of people receiving long-term care services at home and institutions by the respective average public expenditure per year, per user. By adding this up, public total expenditure in services is obtained. Public expenditure on cash benefits ([2]) for people with a disability could be added in order to obtain total public expenditure on long-term care.

8.3. Possible scenarios to be carried out in the projection exercise

Applying age-related expenditure profiles to different assumptions on the evolution of dependency

The advantage of the methodology described above is that it will allow the EPC/AWG to examine different scenarios regarding the evolution of dependency rates, policy settings and unit costs. Table 8.2 below outlines the scenario which the Economic and Financial Affairs DG proposed be carried out as part of the projection exercise.

- **Scenario I** is a **pure demographic** scenario, as the main changes between the base year and the projection are driven by changes in the numbers of older people. This scenario leaves dependency rates (or age-related expenditure profiles for the countries for which dependency rates were not available) unchanged. As the population projections assume substantial increases in life expectancy, leaving dependency rates unchanged effectively increases the number of years that older people would spend being dependent. This can be considered a pessimistic scenario. The scenario also assumes that use of services, given dependency, will remain unchanged over time. Costs would be assumed to evolve in line with GDP per capita. This scenario is based on similar assumptions to that used in the 2001 projection exercise of the EPC.

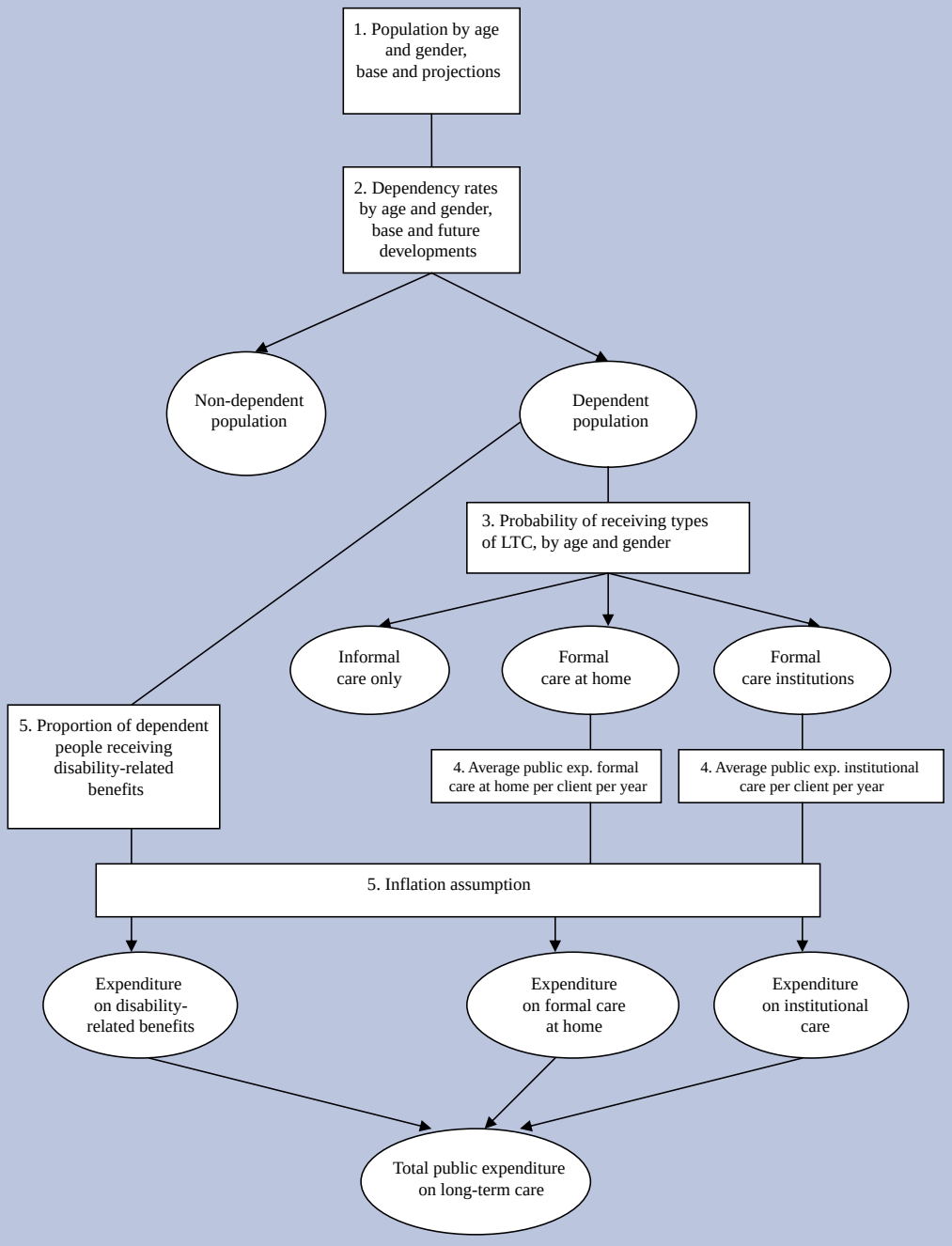
- **Scenario II** is a **constant dependency/disability scenario** and would be inspired by the 'dynamic equilibrium' hypotheses. In this scenario, decreased dependency rates would be achieved by shifting the age-specific dependency rates in line with projected change in age-specific life expectancy. Like Scenarios I and II, 'no policy change' is assumed and costs would evolve in line with GDP per capita.

- **Scenario III** is a **reduced dependency/disability scenario** inspired by the compression of morbidity hypotheses. Although it is a 'no policy change scenario', it is based on an optimistic evolution of future dependency trends: an assumption that the number of years in good health (or free from disability) will increase faster than life expectancy. As in the previous scenario, unit costs would change in line with GDP per capita.

While these scenarios on morbidity/disability are equivalent to those envisaged under approach I for healthcare outlined in Chapter 7, the method for actually introducing them in the projection model would be slightly different. For healthcare, it is envisaged to shift the age-related expenditure profile outwards in line with projected changes in age-specific life expectancy. For long-term care, rather than shifting the age-related expenditure

([1]) In the model three types of care are mutually exclusive even if in reality a person may be provided simultaneously with more than one type of care.
([2]) Over time these could be assumed to grow in line with the growth in the numbers of people with a dependency.

Graph 8.2: **Proposed model structure for projecting long-term care needs and expenditure**



Source: Comas-Herrera et al. (2005).

profile directly, it is proposed to shift the age-specific dependency rates in line with projected change in age-specific life expectancy (Box 2 in Graph 1). This greater degree of precision in the projections for long-term care is possible as comparable data on dependency rates are available for a number of European Union countries.

Table 8.2

Proposed scenarios for long-term care projections

	I (2001 EPC projection)	II	III	Variants (assuming neutrality with respect to disability status)			IV
				III. a	III. b	III. c	
Disability status over time	Pure demographic scenario — disability rates held constant at 2004 level	Constant dependency/ disability scenario — age-specific disability rate increase in line with gains in life expectancy	Reduced dependency/ disability scenario — age-specific disability rate increase slower than gains in life expectancy	Same as I	Same as I	Same as I	Same as I
Policy setting	Probability of receiving care held constant at 2004 level	Same as I	Same as I	Probability of receiving care set at stylised threshold levels	Same as I	Probability of receiving care set at stylised threshold levels	Same as I
Unit costs	Unit costs held constant at 2004 level and evolve in line with GDP per capita	Same as I	Same as I	Same as I	Unit costs develop at a higher/lower rate than GDP per capita	Unit costs develop at a higher/lower rate than GDP per capita	Costs are linked to years of remaining life according to estimates from national sources

Source: AWG.

A number of variant scenarios could be run to estimate the impact of possible policy and unit costs changes. It is proposed that these be run on the assumption that dependency rates evolve in line with scenario I, the pure demographic scenario. The following scenarios are suggested:

- **Scenario IIIa** would consider changes in the **probability of receiving different types of long-term care**. A number of stylised cases could be developed. For example, it would be possible to design shocks to gauge the impact of a higher percentage of the dependent population receiving care from the public sector (either in a home or institutional setting): such a situation could arise if the supply of informal care declines, for example due to higher female participation rates. An alternative shock would be to alter the proportion of people receiving care in a home or institutional setting. This could be relevant if there are large differences in unit costs of receiving care services in a home versus institutional setting.

- **Scenario IIIb** would involve a change in the assumptions on the evolution of the **unit cost of providing long-term care**. It would be possible to quantify the impact of an assumption of unit costs evolving at a faster/slower pace than GDP per capita. Particular attention should be paid to wages, given that it can account for between 80 and 90 % of the total cost of the provision of long-term care.

- **Scenario IIIc** would involve a **combination of the shocks under IIIa and IIIb**, that is, a higher percentage of the dependent population being eligible to receive care from the public sector coupled with unit costs evolving faster/lower than GDP per capita.

Ideally, the detailed specification of these variants could be calibrated against results from micro-studies or past trends, see Comas-Herrera (2005) for some options.

Consideration could also be given to linking costs to years of remaining life

A supplementary Scenario IV, taking account of so-called death-related costs, could be run, in line with what is proposed for the projections on healthcare spending. This scenario would require a refinement in the data on costs per capita used. Instead of applying the same costs

for all care users, separate figures could be applied for those who are going to die within nought, one, two, three, four and five years ([1]). Those costs would be applied to respective subgroups of care users characterised by a given number of remaining years of life, whose size is calculated using projections of mortality rates.

The feasibility of this scenario needs to be explored by the AWG, since it would involve the collection of new data where spending on long-term care is decomposed between people who die and survivors. In practice, this may prove to be infeasible for some Member States.

8.4. Data requirements

To run the projection exercise described above, the following data inputs for each projection year would be required:

- **population by age group and gender:** this can be obtained from Eurostat, for each country and for each projection year required. It already incorporates the mortality rates by age and gender, which is necessary to run alternative scenarios of different evolution paths in dependency/disability rates;

- **prevalence rates of dependency by age and gender:** these data would need to be gathered from comparable sources for all the countries, for the base year;

- **probability of receiving different types of long-term care by age and gender:** this would need to be calculated in the base year, using data on the numbers of people with dependency, the numbers of people receiving formal care at home and the numbers of dependent people in long-term care institutions. It is proposed to assume that the difference between the total number of dependent people and the total number of people receiving formal care (at home or in institutions) is the number of people who rely exclusively on informal care;

- **average public expenditure per individual (for formal care at home and institutional care):** these figures can be obtained by dividing total public expenditure on formal care at home and institutional care by the total number of users of formal care at home and the total number of dependent residents in institutions. For scenario IV on 'death-related costs', separate costs for each subgroup according to the number of remaining years of life will be needed;

- **public expenditure in disability-related benefits:** this would be obtained from estimates from each country to be collected via the AWG. Attention should be paid to the extent to which these benefits may overlap with pension payments and health-related benefits.

In addition, the following data would be required for each Member State:

- total public long-term care expenditure (using OECD or Economic and Financial Affairs DG common definition);

- total expenditure on LTC-related cash benefits to be included;

- total public expenditure on LTC institutional care (or percentage of public expenditure in LTC attributable to institutional care);

- total public home (domiciliary) LTC expenditure (or percentage of public expenditure in LTC attributable to domiciliary care);

- total number of dependent people resident in LTC institutions, by age and gender (those non-dependent should be omitted);

- total number of users of formal care at home (domiciliary) care;

- recipients of cash benefits by age and gender;

- dependency rates by age and gender;

- numbers of older people, by age and gender, for the base year (and projections for each year of interest).

([1]) If such precise data are not available, it is enough to distinguish between costs of people who are going to die within the same calendar year (decedents) and of those who are going to survive (survivors).

9. Education

9.1. Background

The agreed approach to making long-run projections for spending on education

The number of children and young people in the EU is expected to fall over the next decades (see Chapter 1). This has raised the question of whether savings in education expenditure can be expected, and if so, to what degree these savings could offset the expected increase in old-age-related expenditure. The budgetary projections exercise in 2001 was supplemented by a first set of education expenditure projections in 2003 ([1]). In the mandate of the AWG for producing a new set of projections in 2005, education spending is also included. In response to the mandate, a variety of projection methodologies have been examined by the Commission and the AWG ([2]), and a workshop was organised on 17 June 2004 (see programme in Annex 2).

Projecting education expenditure is not an easy task and there are only a few examples available of long-term projections of this budgetary item ([3]). Several issues warrant attention and need preliminary clarification.

- A delimitation of what education expenditure and the education sector should include must be made. Education can encompass only schooling or include tertiary education and even adult education. Pre-primary education can be included or not. For the purpose of modelling long-term trends in expenditures, the education sector can be divided into at least two sub-sectors: compulsory and non-compulsory education. In compulsory education virtually the entire population in the relevant age group is enrolled, but frictions in the system may lead to somewhat less than 100 % enrolment. For non-compulsory education, work is an alternative and projections should take labour participation developments of the relevant age groups into account.

- Being in education is not an exclusive status. For people above a certain age, different 'statuses of activity' are possible, including studying full time, working and studying part time, working full time or neither work nor study. These different statuses do not only depend on legislative arrangements, but also on individual decisions and developments in the labour markets. Overall, these considerations require assumptions on the number of people combining part-time studies and part-time work and the number that neither studies nor works.

- Education expenditure takes different forms. Generally, the public sector funds education either by bearing directly the current and capital expenses of educational institutions (direct expenditure for educational institutions), by supporting students and their families with scholarships and public loans, or by transferring public subsidies for educational activities to private firms or non-profit-making organisations (transfers to private households, institutions and other entities). In the former case, public expenditure is in the form of public consumption, while in the latter two, it is a transfer. Assumptions on the development of each of these elements must be made.

- Non-demographic drivers can be important to the actual development of expenditures. Costs are often determined by the number of classes rather than the number of students, implying that keeping costs per student constant if the number of students changes constitutes an approximation of reality. Income increases and changes in demand for different labour categories may lead to structural trends in costs per student and/or enrolment rates. As the education expenditures projections are part of a large exercise, simplifying assumptions may be warranted.

([1]) See European Commission (2003b, 2003c) and Montanino et al. (2004).
([2]) See European Commission (2004e,s, and 2005o).
([3]) A brief overview is included in Montanino, A., Przywara, B. and Young, D. (2004), 'Investment in education: the implications for economic growth and public finances', *European Economy* — Economic papers.

Differences compared with the last exercise

For the 2005 exercise, the EPC/AWG has agreed on the coverage and methodology for projecting expenditures on education which is outlined in Sections 9.2 and 9.3 respectively. Overall, the present projection exercise introduces a number of improvements compared with the previous one.

- First, more reliable and comparable data are used in the projections, which benefit from the renewed UOE education database ([1]). Since June 2004, the UOE database has provided detailed information on enrolment and expenditures in the different education levels for all 25 EU Member States. This includes enrolment by both age and level, while in the 2003 exercise, breakdown was only possible by level.

- Secondly, consistency between enrolment rates and labour participation rates is ensured. The methodology allows people aged 15 or older to work, to study, to both work and study (part-time students) or to neither work nor study (drop-outs). As the shares of part-time students and drop-outs are kept constant, changes in labour participation translate directly into corresponding changes in enrolment rates.

- Thirdly, the methodology allows for different assumptions for the development of each cost element, enabling a more detailed analysis. However, as the value-added from such an analysis is considered to be low compared with the increased complexity it would entail, these possibilities are not exploited in the present exercise.

- Fourthly, pre-primary education has been excluded from the exercise. The conclusion from the 2003 exercise was that projections of pre-primary education are very difficult, as the institutional settings of pre-primary systems are very different across countries and include a large share of private institutions in several Member States. There are also serious data problems with information on pre-primary education. This exclusion should thus improve the comparability of the exercise.

9.2. Data used and coverage of the projections

As mentioned above, the data from the UOE database are used. However, some missing data have made it necessary to include additional assumptions in some cases (see Annex 9). The base year is 2002 (most recent harmonised data) and it refers to the financial year which is, in general, identical to the calendar year and thus running from 1 January to 31 December. The same year refers to the school/academic year 2001/02.

The exercise requires assumptions on future developments of both direct education expenditure and transfers to private households and firms. The former may be paid by either national or local governments and can take two different forms:

- purchases by the government agency itself of educational resources to be used by educational institutions (e.g. direct payments of teachers' salaries by a central or regional education ministry);

- payments by the government agency to educational institutions that have responsibility for purchasing educational resources themselves (e.g. a government appropriation or block grant to a university, which the university then uses to compensate staff and to buy other resources).

Both these forms of expenditure are included in the Eurostat database. In addition, Eurostat provides data on transfers to private households and firms.

The projections cover public education expenditure for schooling and tertiary education. In particular, projections are run for primary (ISCED 1), lower secondary (ISCED 2), upper secondary and post-secondary non-tertiary (ISCED 3 and 4), and tertiary education (ISCED 5 and 6). This allows making a breakdown between compulsory schooling (ISCED 1 and 2), non-compulsory schooling (ISCED 3 and 4) and tertiary education (ISCED 5 and 6). ISCED levels 4 and 6 play a marginal role and are often assimilated to levels 3 and 5 respectively. They will be treated as a part of these levels also in this exercise. Box 9.1 gives details on ISCED classifications.

([1]) The data collection on statistics of education is administered jointly by the United Nations Educational, Scientific and Cultural Organisation, Institute for Statistics (Unesco-UIS), the OECD, and Eurostat. The goal of this data collection is to provide internationally comparable data on key aspects of the education systems. The data collection, including methodological explanations, is available online through the Eurostat NewCronos database at : http://epp.eurostat.cec.eu.int/portal/page?_pageid=1996,45323734&_dad=portal&_schema=PORTAL&screen=welcomeref&open=/&product=EU_MAIN_TREE&depth=1.

Box 9.1: **ISCED classification**

The education systems differ between countries. The International Standard Classification of Education (ISCED, last revised in 1997) makes it possible to compare educational levels in spite of these differences. The differences may nevertheless affect certain figures.

ISCED level 1 — Primary education: The starting age varies between four and seven years of age, and the education level generally lasts five to six years. Programmes are designed to give pupils a sound basic education in reading, writing and mathematics along with an elementary understanding of other subjects.

ISCED level 2 — Lower secondary education: This level is part of the compulsory schooling in all countries analysed. Programmes are typically more subject-focused. The end of this level usually coincides with the end of full-time compulsory education.

ISCED level 3 — Upper secondary education: This level starts at the end of full-time compulsory education, typically 15 or 16 years. Instruction is even more subject-oriented and teachers often need to be more qualified than at ISCED 2 level. Education can be general or pre-vocational (two types of education often aggregated) or vocational. Many programmes enable access to ISCED 5.

ISCED level 4 — Post-secondary non-tertiary education: These programmes straddle the boundary between upper-secondary and tertiary education from an international point of view. They serve to broaden the knowledge of ISCED 3 graduates, and are either designed to prepare students for studies at level 5 or to prepare students for direct labour market entry.

ISCED level 5 — First stage of tertiary education: This level does not lead directly to an advanced research qualification, but covers programmes of at least two years' duration, divided between.

- **Type A:** programmes that are theoretically based and/or preparatory to research (history, philosophy, mathematics, etc.) or give access to professions with high skill requirements, such as medicine, dentistry, and architecture;

- **Type B:** programmes that are practically oriented/occupation specific and mainly designed for participants to acquire the practical skills and know-how needed for employment in a particular occupation or trade, the successful completion of which usually culminates in a qualification relevant for the labour market.

ISCED level 6 — Second stage of tertiary education: This covers programmes leading to an advanced research qualification (e.g. PhD or doctorate), which are devoted to advanced study and original research and not based on coursework only.

Unlike in 2003, pre-primary education (ISCED 0) is excluded from the exercise. This improves the comparability across countries as the institutional settings of pre-primary systems are very different between countries and sometimes include a large share of privately financed institutions. There are also serious data problems with information on pre-primary education. Pre-primary education on average represents less than 0.5 % of GDP.

9.3. Projection methodology

9.3.1. Overview

The methodology includes a detailed decomposition of total education expenditure into different key variables, which allows for different assumptions to be made for each cost element if so desired. Both direct education expenditure, in other words, expenditure directly carried out by the government (either national or local) to run public institutions, and transfers to private households, educational institutions and other entities are included. The different education levels are treated separately to capture existing differences of, for example, cost structure within the education system.

9.3.2. Decomposition of education expenditure

More precisely, total education expenditure is first decomposed into the key variables for public education expenditure projections — expenditure per student and

number of students — for the base year. Expenditure per student is further decomposed into wages, number of teaching and non-teaching staff and other current and capital expenditures, including transfers. In addition, the share of direct public over total direct expenditure is calculated. Next, assumptions are made for each cost category, enrolment rates and number of young people. This methodology builds on the one used in the 2003 projections. It benefits from the renewed Eurostat education database and is built to fit with the kind of data available. Graph 9.1 provides an overview of the approach for projecting education expenditures.

Number of students and enrolment rates

The number of students (S) in education level x is obtained as:

$$S_x = \sum_{y=1}^{100} S_x^y \qquad [1]$$

which is the sum of the number of students enrolled by age (y) in the specific education level x. In practice there is no maximum age limit to be enrolled in education, in particular for higher education. Hence, all ages are included in each education level.

The enrolment rate by education level x and age y is obtained as:

$$e_x^y = \frac{S_x^y}{POP^y} \qquad [2]$$

where POP^y is population of age y ([1]).

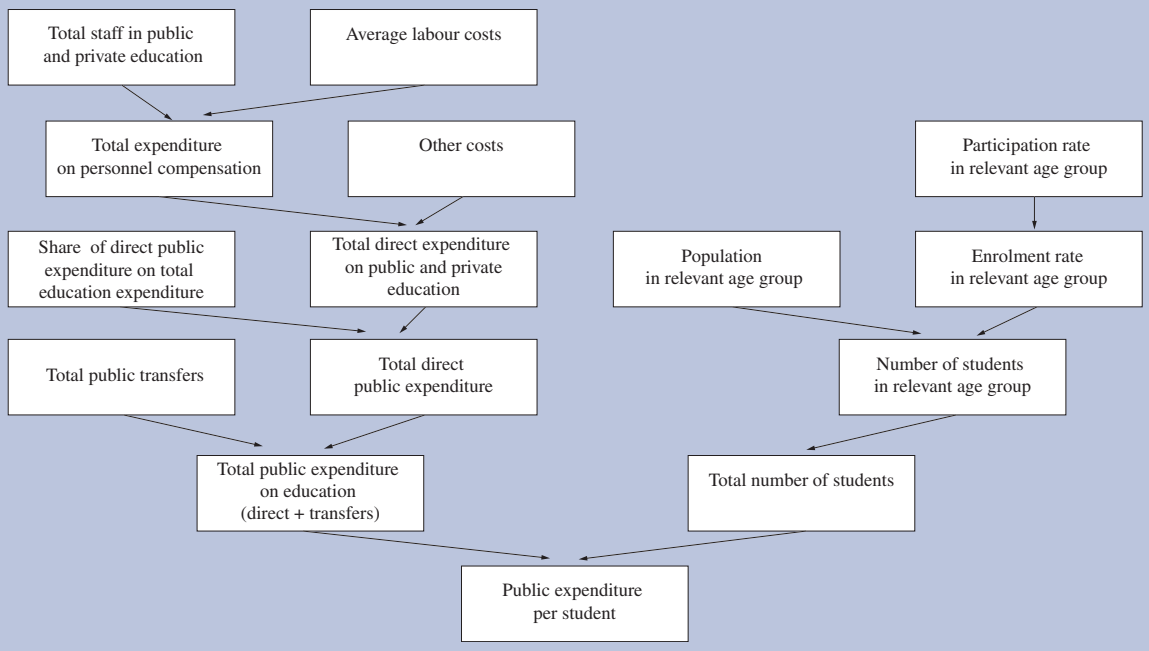
The enrolment rate by age is the sum of the number of students of the specific age (y) in the different education levels as a share of total population in age y, in other words:

$$e^y = \left(\sum_{x=1}^{6} S_x^y \right) / POP^y \qquad [3]$$

The enrolment rate by age together with the enrolment rates by age and education level are used to project

([1]) This is sometimes referred to as a net rate, while the gross rate is the total number of students divided by the number of people in the age group considered relevant. In 2003, gross rates had to be used as the age of the students was not available, but as the effective limits can exceed the typical age, this led to gross rates above 100 % in some cases.

Graph 9.1: **Overview of the education expenditure projection exercise: decomposition of public expenditure for each level of education**



Source: EPC (2001) from national sources.

enrolment and the distribution across education levels of future cohorts.

Expenditure per student

Expenditure per student is simply total expenditure divided by the number of students. This is calculated for each educational level. The figures show that yearly expenditure per student differs widely across education levels and across countries. According to Eurostat, a student in tertiary education in Sweden cost almost 17 times the cost of a primary education pupil in Slovakia (measured in PPPs) in 2002. These differences reflect different levels of wages for teaching and non-teaching staff, different student-to-staff ratios and also different levels of investment and other costs associated with education. For each education level *x*, education expenditure per student can be written as:

$$ES = \frac{T}{S} \times w + \frac{K}{S} \qquad [4]$$

where all variables refer to education level *x* and where:

- *T* is the total number of teachers and non-teaching staff;
- *w* are the gross wages and social contributions paid for school staff;
- *K* are other costs, current and capital;
- *S* is the number of students enrolled in education level *x*, obtained through equation 1.

This decomposition of expenditure per student allows addressing the different factors behind the observed level of expenses. It should be considered that this decomposition is clearly a simplification of complex variables that determine expenditure per student. As pointed out in the Economic and Financial Affairs DG–AWG seminar on education projections of 17 June 2004, a key variable seems to be class size. Costs present discontinuity so that main changes appear when an additional class is created or cancelled. Given the difficulties in having proper information on this variable, the best approximation available may be the staff-to-students ratio. It gives an idea of how many resources (teaching and non-teaching staff) are provided to the system, given a certain number of individuals enrolled in education.

The average wage per employee differs according to the ratio between teaching and non-teaching staff and the seniority of the staff. Other things being equal, a higher share of teachers and an older labour force involved in the education system normally implies a higher average wage. Finally, other costs apart from wages may vary according to past levels of investment. A high current level may be caused by low levels in the past and/or may imply low levels of spending in the future. An example of this decomposition is presented in Table 9.1.

Table 9.1

Decomposition of expenditure per student, example for selected countries in ISCED level 1 (year 2002)

	CZ	DE	NL
Staff	32	179	98
Pupil	604	3 373	1 287
Wage	20	63	45
Other costs	407	3 405	1 805
Expend. per student	1 717	3 837	4 660

Source: Economic and Financial Affairs DG calculations on Eurostat data.

The decomposition allows applying different assumptions on the future trends of each underlying variable and thus addressing the role of the wage setting, the capacity of the education system to adapt to demographic changes, as well as other institutional factors. However, in the context of the general long-term budgetary exercise, the value-added from such an analysis is considered to be low compared with the increased complexity it would entail. These possibilities are therefore not exploited at the present stage.

9.3.3. Forward-looking assumptions applied

Number of students

Future developments of the number of students enrolled in each level of education depend on individual behaviour, and in particular on whether education is an alternative to work. For the current exercise, education is considered compulsory up to and including 14 years. The projection assumes that enrolment rates for those up to 14 years remain constant at the base-year level, implying no behavioural changes for this age group.

The projected number of students up to and including 14 years enrolled in each level of education is obtained by:

- estimating the total number of students in each age group by multiplying the expected number of children in each age group, as it follows from the population projections, with the enrolment rate in the base year (equation 3);
- distributing the students of age *x* across the different education levels according to the distribution in the base year.

The projection of the number of students aged 15 years and above takes into account labour market developments. An increase in the participation rate in the labour market implies a decrease in the enrolment rate. No other changes in enrolment rates are included in the projection.

The combination of part-time studying and part-time working is quite frequent in some countries, especially for tertiary education. In addition, a share of the targeted population neither studies nor works. To allow for this, a share c_x is introduced, allowing $p_x+e_x \neq 1$, and rather demanding that for all single ages *x*:

$$e_x + p_x - c_x \times e_x = 1 \qquad [5]$$

where

e_x – enrolment rate for age *x* regardless of the level of education and including part-time students

p_x – participation rate for age *x*

c_x – working students less drop-outs to students ratio, that is, the difference between people both studying and working and people neither studying nor working. This is measured as a share of the total number of students, both for age *x*.

In the projections, the share c_x is kept constant and solving for e_x future enrolment can be projected according to the following formula:

$$e_x = \frac{1 - p_x}{1 - cx} \qquad [6]$$

Once the number of students is obtained, the students of age *x* are again distributed across the different education levels according to the distribution in the base year.

Expenditure per student

As shown by equation [4], expenditure per student in each education level depends on three main variables: (i) the staff-to-students ratio, (ii) the average wage, and (iii) the other-costs-to-student ratio. In the projections, the assumptions for each of the variables are:

- the staff-to-students ratio remains constant over the projection period, implying that the number of teaching and non-teaching staff adjusts immediately to changes in the number of students;
- the average wage develops in line with GDP per worker for the whole economy;
- the ratio of other costs to total expenditure is kept constant, so that an increase in the wage component would lead to additional other current and capital expenditures;
- the share of direct public expenditure to total direct expenditure is kept constant.

Transfers to households and private institutions

Public expenditure in education is carried out mainly directly by governmental institutions. However, part of the expenses consists of transfers to private households, educational institutions and other entities. In the projections, the current share of transfers over total direct public education expenditure (available from Eurostat) ([1]) is kept constant over time. The sum of direct expenditure and transfers to private households gives the total expenditure in public education.

([1]) See NewChronos Eurostat database.

10. Unemployment benefits

10.1. The projection methodology

The EPC/AWG has agreed to repeat the 2003 projections using the same methodology

Projections for public spending on unemployment benefits up to 2050 will be carried out according to the methodology already used in the previous exercise ([1]). Although expenditure on unemployment benefits is not an age-related expenditure, the EPC/AWG decided to take this item into account for the sake of consistency with the macroeconomic scenario used in its long-run projections of age-related expenditure, and notably the assumptions on participation and unemployment rates. The EPC/AWG has decided to repeat the exercise, using the same methodology, for the 2005 budgetary projection exercise ([2]). The remainder of this chapter describes the agreed methodology with reference to the existing projection results.

The methodology

In order to assess whether and by how much unemployment benefit (UB) expenditure will be affected by changes in the unemployment situation in Member States, as implied by the assumptions in Chapters 1 to 4, a simple calculation is used. Projections are broadly based on per capita unemployment insurance spending in a base year, multiplied by the (already) projected number of unemployed people in future years. This simple calculation implies assuming, under a no-policy change hypothesis, unchanged replacement rates, duration, entitlement conditions, eligibility criteria, take-up rates, tax structure and a constant share of wages in the income distribution over time (that is, the wage per worker grows at the same rate as labour productivity, i.e. GDP per worker).

To see why the latter is true, it is helpful to decompose the total unemployment benefit spending UB, as follows:

$$(1) \qquad UB = GRR \times pcw \times \frac{UBr}{U} \times U$$

where

GRR is the gross replacement rate,

pcw is the per capita wage,

UBr is the number of recipients (unemployed people receiving unemployment benefits), and thus the ratio $\frac{UBr}{U}$ is the take-up.

Given that per capita wages can be written as: $pcw = \frac{W}{Y} \times \frac{Y}{L}$ (where L is employment, Y is GDP and W is total wages) then UB can be rewritten as:

$$(2) \qquad UB = GRR \times \frac{W}{Y} \times \frac{Y}{L} \times \frac{UBr}{U} \times U$$

where W/Y is the share of wages in the income distribution and Y/L is labour productivity.

Per capita UB is: $UBpc = \frac{UB}{U} = GRR \times \frac{W}{Y} \times \frac{Y}{L} \times \frac{UBr}{U}$ and this can be expressed in terms of GDP per worker (or Ypc =Y/L):

(3)

$$\frac{UBpc}{Ypc} = \frac{(UB)/U}{(Y)/L} = GRR \times \frac{W}{Y} \times \frac{Y}{L} \times \frac{UBr}{U} \times \frac{L}{Y}$$

([1]) European Commission (2003a).
([2]) European Commission (2004l).

Thus, the total expenditure as a percentage of GDP can be expressed as:

(4) $$\frac{UB}{Y} = GRR \times \frac{W}{Y} \times \frac{UBr}{U} \times \frac{U}{L}$$

Given that L = LF (1-*u*), where LF = labour force and *u* = unemployment rate, the ratio (U_t/L_t) can also be written as $u_t/(1-u_t)$ and:

(5) $$\frac{UB}{Y} = GRR \times \frac{W}{Y} \times \frac{UBr}{U} \times \frac{u}{(1-u)}.$$

In order to carry out the projection, we assume no change in both the GRR and the take-up ratio (UBr/U), and a constant share of wages in income distribution (W/Y), as a result of the assumption that wages grow at the same rate as labour productivity. Thus, only the unemployment rate (or the ratio of unemployed to employed people that is the ratio *u/(i-u)*) will change over time, driving changes in the UB expenditure (as a percentage of GDP).

The basic approach applied to run projections for UB expenditure (as a percentage of GDP) is the following (a formal illustration of the methodology is presented in Annex 10).

- First, an estimate is made of the average amount of UB received by each unemployed person (and as a percentage of GDP per worker) in the base year ($Ubpc^b/Ypc^b$). This is done by dividing the average amount of UB expenditures (as a percentage of GDP per worker) over the period 1998–2002 ([1]) by the average number of unemployed people over the same period ([2]). In the absence of reasonable assumptions on the future number of UB beneficiaries (which is the result of entitlement and eligibility rules that affect coverage, take-up rates, and so on) and the average duration of unemployment spells, the calculation assumes that all these elements remain unchanged. This approximation is fairly neutral and does not lead to a systematic bias in the projections of benefit spending. In order to guarantee the comparability of projections across countries, standardised figures provided by Eurostat on social protection expenditure are needed (instead of country-specific figures coming from national databases). Specifically, we use the two main components (i.e. 'kind of benefits') of the Eurostat definition of social protection spending related to unemployment that is benefit spending for 'partial unemployment' and 'full unemployment'. A breakdown by kind of benefit of the total social protection expenditure related to unemployment ([3]) in 2002 is provided in Table 10.1.

- For each projection year, multiply the unemployment benefit/GDP ratio per head in the base year (from step 1) by the corresponding expected future number of unemployed people for each country and each of the year of projections (basic figures are reported in Tables 10.1–10.2). Then, to express the results in terms of national GDP for each projection year, the result is divided by the projected employment level in each projection year. The projections of employed and unemployed people are those already presented in Chapter 2, and refer to the 'current policy' macroeconomic scenario.

- This generates projections of UB spending, expressed as a share of GDP ([4]).

([1]) Latest available figures provided by Eurostat, 'Social protection expenditure', see Table 2.

([2]) Figures are provided by Member States, consistent with those used in the pension projections. In the case of Italy, the average amount of UB received by each unemployed person (as a percentage of GDP) in the base year was increased to allow for the increase (from 30 % to 40 % in 2001 and more recently from 40 % to 60 % of the reference wage, and the planned increase in the duration from 6 to 12 months) in the insurance coverage provided by the so-called 'ordinary unemployment benefit' (which accounts for about 10 % of total UB spending). The financial effect of these measures is estimated by national authorities to be about 7 % of the total UB expenditure.

([3]) In the Eurostat-Esspros database, the category 'unemployment' also includes spending on placement services and job search assistance, early-retirement benefit for labour market reasons, vocational training, lump sum benefit redundancy compensation, mobility and resettlement benefits.

([4]) The projection does not take into account that unemployment benefits are subject to income tax, so that after tax UB spending as a percentage of GDP is lower. This should be taken into account when assessing fiscal sustainability. Still, given the assumption of invariant tax structure, results in terms of changes in the after-tax UB spending (as a percentage of GDP) over the projection period would be broadly the same as those obtained by using before-tax spending as in this projection exercise.

Table 10.1

Public spending on social protection related to unemployment in 2002, as percentage of GDP

Kind of benefit	EU-15	EU-12	BE	CZ	DK	DE	EE	EL	ES	FR	IE	IT	LV	LT	LU	HU	MT	NL	AT	PL	PT	SI	SK	FI	SE	UK
Social protection benefits: unemployment (a+b)	1.8	1.9	3.2	0.7	2.7	2.5	:	1.6	2.7	2.2	1.3	0.4	:	:	0.8	0.6	1.2	1.4	1.5	:	0.9	0.8	0.8	2.5	1.7	0.9
Cash benefits (a)	1.6	1.8	3.2	0.6	2.6	2.2	:	0.5	2.4	2.2	1.1	0.4	:	:	0.8	0.5	1.1	1.4	1.1	:	0.9	0.7	0.6	2.3	1.4	0.8
Full unemployment benefits	1.0	1.1	1.9	0.2	1.3	1.2	:	0.4	1.5	1.5	0.8	0.3	:	:	0.3	0.3	1.0	1.4	0.8	:	0.8	0.3	0.3	1.6	1.0	0.5
Partial unemployment	0.0	0.0	0.4	:	:	0.0	:	0.1	0.0	0.0	:	0.0	:	:	0.0	:	:	0.0	:	:	0.0	0.0	:	0.0	0.0	0.0
Placement services and job search assistance	0.0	0.0	0.0	:	0.1	0.0	:	0.0	0.0	:	0.1	0.0	:	:	0.0	0.0	0.0	0.0	0.1	:	0.0	0.1	0.1	0.1	0.1	0.0
Early retirement benefit for labour market reasons	0.2	0.2	0.4	0.0	:	0.3	:	0.1	0.0	0.2	:	0.1	:	:	0.2	0.1	:	0.0	0.1	:	0.0	0.2	0.0	0.5	0.0	0.0
Periodic benefit vocational training	0.2	0.2	0.1	0.0	1.3	0.5	:	0.0	0.0	0.2	0.2	0.0	:	:	0.0	:	0.0	0.0	0.1	:	0.0	0.0	:	0.1	0.3	0.1
Other periodic cash benefits	0.0	0.0	0.4	:	:	0.0	:	0.0	0.1	:	:	0.0	:	:	0.2	0.1	0.1	0.0	0.0	:	0.0	0.0	:	0.0	:	0.0
Lump sum cash benefits	0.2	0.2	0.0	0.4	0.0	0.1	:	0.1	0.7	0.3	0.1	0.0	:	:	0.1	0.1	:	0.0	0.1	:	0.0	0.1	0.3	0.0	0.1	0.3
Lump sum benefit vocational training	0.0	0.0	0.0	:	0.0	:	:	0.0	:	:	0.0	0.0	:	:	0.1	:	:	0.0	:	:	0.0	:	:	0.0	:	0.0
Lump sum benefit redundancy compensation	0.2	0.1	0.0	0.2	:	0.1	:	0.0	0.6	0.3	0.1	0.0	:	:	0.0	0.1	:	0.0	0.0	:	0.0	:	0.3	0.0	0.1	0.3
Other lump sum cash benefits	0.0	0.0	0.0	0.2	0.0	0.0	:	0.0	0.0	0.0	:	0.0	:	:	0.0	0.0	:	0.0	0.1	:	0.0	0.1	0.0	0.0	:	0.0
Benefits in kind (b)	0.2	0.2	0.1	0.0	0.1	0.3	:	1.1	0.3	0.0	0.2	0.0	:	:	0.0	0.1	0.0	0.0	0.4	:	0.0	0.1	0.1	0.2	0.3	0.1
Mobility and resettlement benefits	0.0	0.0	0.0	:	:	0.1	:	0.1	0.0	:	:	0.0	:	:	0.0	:	:	0.0	0.0	:	0.0	:	:	0.0	0.0	0.0
Vocational training	0.1	0.1	0.0	0.0	:	0.2	:	0.9	0.3	:	0.1	0.0	:	:	0.0	0.1	0.0	0.0	0.1	:	0.0	0.0	0.0	0.1	0.2	0.1
Other benefits in kind	0.0	0.0	:	0.0	:	0.0	:	0.1	0.0	0.0	0.0	0.0	:	:	0.0	:	0.0	0.0	0.3	:	0.0	0.0	:	0.0	0.0	0.0

Source: Eurostat-Esspros database.

Table 10.2

Unemployment benefit spending as percentage of GDP, 1998–2002

Country	Aver. 1998–2002	1998	1999	2000	2001	2002 (*)
Belgium	2.20	2.3	2.2	2.1	2.1	2.3
Denmark	1.42	1.7	1.4	1.4	1.3	1.3
Germany	1.16	1.2	1.2	1.1	1.1	1.2
Greece	0.42	0.5	0.4	0.4	0.3	0.5
Spain	1.46	1.6	1.4	1.4	1.4	1.5
France	1.30	1.3	1.3	1.2	1.2	1.5
Ireland	0.92	1.3	1.0	0.8	0.7	0.8
Italy	0.34	0.4	0.4	0.3	0.3	0.3
Luxembourg	0.22	0.2	0.2	0.2	0.2	0.3
Netherlands	1.50	1.9	1.6	1.3	1.3	1.4
Austria	0.76	0.8	0.8	0.7	0.7	0.8
Portugal	0.72	0.7	0.7	0.7	0.7	0.8
Finland	1.82	2.2	2.0	1.7	1.6	1.6
Sweden	1.38	1.8	1.6	1.4	1.1	1.0
United Kingdom	0.42	0.4	0.4	0.3	0.5	0.5
Cyprus	0.39	0.4	0.4	0.4	0.3	0.4
Czech Republic	0.24	0.2	0.3	0.3	0.2	0.2
Estonia	0.10	0.1	0.1	0.1	0.1	0.1
Hungary	0.30	0.3	0.3	0.3	0.3	0.3
Lithuania	0.16	0.2	0.2	0.2	0.1	0.1
Latvia	0.46	0.5	0.5	0.5	0.4	0.4
Malta	0.94	0.9	1.0	0.9	0.9	1.0
Poland	0.40	0.4	0.4	0.4	0.4	0.4
Slovakia	0.44	0.5	0.6	0.5	0.3	0.3
Slovenia	0.54	0.8	0.7	0.5	0.4	0.3
EU-25	*0.99*	*1.1*	*1.0*	*0.9*	*0.9*	*1.0*
EU-15	*1.01*	*1.1*	*1.0*	*0.9*	*0.9*	*1.0*
EU-12	*1.10*	*1.2*	*1.1*	*1.0*	*1.0*	*1.2*
EU-10	*0.36*	*0.4*	*0.4*	*0.4*	*0.3*	*0.3*

(*) Estonia, Latvia, Lithuania and Poland: 2001.

Source: Eurostat — Social protection expenditures database (Espros).

11. References and written contributions submitted to the Ageing Working Group

Australian Productivity Commission (2005), *Economic implications of an ageing Australia*, Research Report, Canberra, Australia.

Balassone, F. and D. Franco (2000), *Assessing fiscal sustainability: a review of methods with a view to EMU*, Banca d'Italia.

Baldacci, E. and D. Tuzi (2003), 'Demographic trends and pension system in Italy: an assessment of 1990s reforms', in *Labour*, No 17, Vol. 17, special issue.

Barro, R. J. and X. Sala-i-Martin (1995), *Economic growth*, McGraw-Hill, USA.

Batljan, I. and M. Lagergren (2004), 'Inpatient/outpatient healthcare costs and remaining years of life-effect of decreasing mortality on future acute healthcare demand', *Social Science and Medicine*, 59 (2004) 2459–2466.

Batljan, I. and M. Lagergren (2005), 'Demographic influence on healthcare and long-term care demand — Different methods?', presentation to the joint EC–AWG–OECD workshop of 21–22 February 2005.

Batljan, I. (2004), 'How to refine estimation of demographic influence in healthcare demand: different methods', presentation to the joint AWG–OECD meeting of 3 June 2004.

Belonne, B. and E. Chion (2004), 'Impact of ageing on health expenditures', Ministère de l'économie, des finances et l'industrie, France, presentation to the joint AWG–OECD meeting of 3 June 2004.

Bjornerud, S. and J. Oliveira Martins (2005), 'Disentangling demographic and non-demographic drivers of health spending: a possible methodology and data requirements', presentation to the joint EC–AWG–OECD workshop of 21–22 February 2005.

Bjornerud, S., C. de la Maisonneuve and J. Oliveira Martins (2005), 'OECD WP1 project — health and long-term care expenditure projections, 2005–05: methodology and first baseline results', presentation to the AWG meeting of 16 June 2005.

Börsch-Supan, A., H. Jürges and O. Lipps (2003), 'SHARE — Measuring the ageing process in Europe', *ZUMA-Nachrichten*, Vol. 53, pp. 96–113.

Börsch-Supan, A. (2003), 'Labour market effects of population aging', *Labour*, Vol. 17, special issue, Blackwell Publishing.

Börsch-Supan, A., A. Brugiavini, H. Jürges, J. Mackenbach, J. Siegrist and G. Weber (eds) (2005), 'Health, ageing and retirement in Europe: first results from the survey of health, ageing and retirement in Europe', SHARE project through the fifth research framework programme of the European Union, Mannheim Research Institute for the Economics of Aging (MEA).

Börsch-Supan, A. (2005), 'Using new data on elderly people to project future trends in healthcare use and expenditures. Preliminary evidence from the EU research project SHARE', presentation to the joint EC–AWG–OECD workshop of 21–22 February 2005.

Brockmann, H. (2002), 'Why is less money spent on healthcare for the elderly than for the rest of the population? Healthcare rationing in German hospitals', *Social Science & Medicine*, No 55, pp. 593–608.

Brugiavini, A. and F. Peracchi (2005), 'Fiscal implications of pension reforms in Italy', in Gruber, J. and A. Wise (eds)(2005), *Social security programmes and*

retirement around the world: Fiscal implications, NBER website, 26 July 2005: http://www.nber.com/books/intlSS-p3/index.html.

Brugiavini, A. and F. Peracchi (2003), 'Wealth and retirement decisions', *Labour*, Vol. 17, special issue, Blackwell Publishing.

Bureau of Labour Statistics (1997), *Handbook of methods*, 'Chapter 13: Employment projections', USA, April.

Burniaux, J., R. Duval and F. Jaumotte (2003), 'Coping with ageing: a dynamic approach to quantify the impact of alternative policy options on future labour supply in OECD countries', OECD Economic Department WP No 371.

Cai, L. and J. Lubitz (2005a), *Compression of disability for older Americans, 1992–2002*, National Center for Health Statistics/Centers for Disease Control and Prevention.

Cai, L. and J. Lubitz (2005b), 'Compression of disability for older Americans, 1992–2002', presentation to the joint EC–AWG–OECD workshop of 21–22 February 2005.

Caisse Nationale de l'Assurance Maladie des Travailleurs Salariés (2003), 'Le viellissement de la population et son incidence sur l'évolution des dépenses de santé, des tendances de fond aux mouvements de court terme'. *Point de conjoncture*, No 15, Juillet 2003.

Carone, G. (2004), 'Unemployment benefit expenditure projections', Economic and Financial Affairs DG, presentation to the AWG meeting of 17 June 2004.

Carone, G. (2005), 'Long-term labour force projections for the EU-25 Member States: a set of data for assessing the impact of ageing', Economic and Financial Affairs DG, European Commission, *Economic Papers*, No 235.

Cass, D. (1965), 'Optimum growth in an aggregative model of capital accumulation', *Review of Economic Studies*, 32, 233–240.

Cislaghi, C., F. Tediosi, S. Bartolacci, R. Berni. and S. Forni (2002), 'Hospital expenditure as function of the distance from birth and death', presentation at the fourth European Conference on Health Economics, Université Paris V, 7–10 July 2002.

Comas-Herrera, A. and R. Wittenberg (eds) (2003), *European Study of Long-Term Care Expenditure*, report to the European Commission, Employment and Social Affairs DG. PSSRU, discussion paper 1840.

Comas-Herrera, A., R. Wittenberg and L. Pickard (2003), *Making projections of long-term care: examples and methodological issues*, PSSRU discussion paper 2004.

Comas-Herrera, A. (2004a), *Projections of future long-term care expenditure in Germany, Italy, Spain and the United Kingdom*, presentation to the AWG meeting of 17 June 2004.

Comas-Herrera, A., R. Wittenberg and L. Pickard (2004b), *Making projections of long-term care: examples and methodological issues*, PSSRU discussion paper, Personal Social Services Research Unit, LSE.

Comas-Herrera, A., R. Wittenberg and L. Pickard (2005a), *Making projections of public expenditure on long-term care for the European Member States: Methodological proposal for discussion*, London School of Economics and Political Science.

Comas-Herrera, A., R. Wittenberg and L. Pickard (2005b), 'Making projections of public long-term care expenditure for European countries: a proposed methodology and data requirements', presentation to the joint EC–AWG–OECD workshop of 21–22 February 2005.

Conseil Supérieur des Finances (2004), *Comité d'Etude sur le Viellissement, Rapport Annuel*, Avril 2004.

CPB Netherlands Bureau for Economic Policy Analysis (2000), *Ageing in the Netherlands*, August 2000.

CSIS (2002), *The global retirement crisis*, Centre for Strategic International Studies, April 2002.

Cutler, D. and E. Meara (1999), 'The concentration of medical spending: An update', *NBER Working Paper*, No 7279.

Dang, T-T., P. Antolin and H. Oxley (2001), 'The fiscal implications of ageing: projections of age-related spending', *OECD Economics Department Working Papers*, ECO/WKP(2001)31, Paris.

Downes, J., A. Drew and P. Ollivaud (2003), 'The OECD medium-term reference scenario: economic outlook', *OECD Economics Department Working Papers*, No 372, Paris.

Economic Policy Committee (2001), *Budgetary challenges posed by ageing populations*, EPC/ECFIN/655/01-EN of 24 October 2001, available at: http://europa.eu.int/comm/economy_finance/epc/epc_sustainability_ageing_en.htm.

Economic Policy Committee (2002), 'Reform challenges facing public pension systems: the impact of certain parametric reforms on pension expenditure', EPC/ECFIN/237/02 of 5 July 2002.

Economic Policy Committee (2003a), *The impact of ageing populations on public finances: overview of analysis carried out at EU level and proposals for a future work programme*, EPC/ECFIN/407/04-rev.3-EN of 22 October 2003.

Economic Policy Committee (2003b), *Budgetary challenges posed by ageing population: the impact on public spending on education*, EPC/ECFIN/435, 22 October 2003.

Economic Policy Committee (2003c), 'Work programme for the 2004/05 long-run budgetary projection exercise', note from the Economic and Financial Affairs DG to the AWG (ECFIN/1/04-EN) of 8 January 2004.

Economic Policy Committee (2005), letter by the AWG to Mr Evereaers, Director in Eurostat on the Europop 2004 population projection summarising comments from AWG members on mortality assumptions, ECFIN/CPE(2005)REP/5064.

Englert, M. (2004), 'Assessing the budgetary cost of ageing and projecting healthcare (+ care for the elderly) expenditure', Federal Planning Bureau of Belgium, presentation to the joint AWG–OECD meeting of 3 June 2004.

Englert, M., M. J. Festjens, M. Lopez-Novella (2004), *L'évolution à long terme des dépenses de soins de santé*, Journée d'Etudes: 'Budget 2005', Institut Belge des Finances Publiques.

European Commission, Economic and Financial Affairs DG (2003), *Economic aspects of immigration*, Note for the attention of the Labour Market Working Group (LMWG), ECFIN/361/03-EN of 12 September 2003.

European Commission, Economic and Financial Affairs DG (2004a), *Coverage of pensions and pension contributions in budgetary projections*, note for the attention of the AWG meeting of 4 February 2004, ECFIN/67/04-EN.

European Commission, Economic and Financial Affairs DG (2004b), *Approaches to making long-run labour force projections: considerations for the EPC budgetary projection exercise*, note for the attention of the AWG meeting of 10 March 2004, ECFIN/118/04-EN of 26 February 2004.

European Commission, Economic and Financial Affairs DG (2004c), *Questionnaire on the coverage of the projection exercise on pension expenditure and contributions (including to social security schemes and occupational pensions)*, note for the attention of the AWG meeting of 10 March 2004, ECFIN/121/04-EN.

European Commission, Economic and Financial Affairs DG (2004d), *Illustrative long-run growth projections for the EU-15 and AC10 countries up to 2050*, note for the attention of the AWG meeting of 6 May 2004, ECFIN/214/04-EN.

European Commission, Economic and Financial Affairs DG (2004e), *ECFIN's global growth scenario 2000–50*, note for the attention of the AWG meeting of 6 May 2004, ECFIN/213/04-EN.

European Commission, Economic and Financial Affairs DG (2004f), *Effects of ageing on long-run productivity growth: a theoretical discussion and empirical assessment*, note for the attention of the AWG meeting of 6 May 2004, ECFIN/216/04-EN.

European Commission, Economic and Financial Affairs DG (2004g), *Approaches to making long-run productivity projections: considerations for the budgetary projection exercise of the AWG*, note for the attention of the AWG meeting of 6 May 2004, ECFIN/218/04-EN of 28 April 2004.

European Commission, Economic and Financial Affairs DG (2004h), *Approaches to making long-run structural unemployment projections: considerations for the budgetary projection exercise of the AWG*, note for the attention of the AWG meeting of 6 May 2004, ECFIN/219/04-EN.

European Commission, Economic and Financial Affairs DG (2004i), *Summary of responses by Member States on the coverage of pension expenditure in the projection exercise of the AWG*, note for the attention of the AWG meeting of 6 May 2004, ECFIN/215/04-EN. Also see revision after 4 May 2004 meeting of the AWG, ECFIN/215/04-EN Rev. 1.

European Commission, Economic and Financial Affairs DG (2004j), *Summary note on the budgetary projection exercise of the EU's AWG*, note for the attention of the joint AWG–OECD meeting of 3 June 2004, ECFIN/284/04-EN of 27 May 2004.

European Commission, Economic and Financial Affairs DG (2004k), *Long-term education expenditure projections: issue for discussion*, note for the attention of the AWG meeting of 17 June 2004, ECFIN/305/04-EN.

European Commission, Economic and Financial Affairs DG (2004l), *Unemployment benefit expenditure projections: methodology and results*, note for the attention of the AWG meeting of 17 June 2004, ECFIN/202/04-EN of 23 March 2004.

European Commission, Economic and Financial Affairs DG (2004m), *The budgetary projection exercise of the EU's AWG: progress report to the EPC*, ECFIN/REP/50149-EN of 1 July 2004.

European Commission, Economic and Financial Affairs DG (2004n), *Incorporating death-related costs in the long-term budgetary projections of healthcare and long-term care: a review of existing methodologies and results*, note for the attention of the AWG meeting of 9 September 2004, ECFIN/REP/50281 of 3 September 2004.

European Commission, Economic and Financial Affairs DG (2004o), *Underlying assumptions for the AWG budgetary projection exercise: measures to be taken in response to the comments of AWG members at their meeting of 8 and 9 November 2004*, ECFIN/REP/50711/04 of 8 December 2004.

European Commission, Economic and Financial Affairs DG (2004p), *Reporting framework for pension expenditure and contributions: definitions and clarifications*, note for the attention of the ZAWG meeting of 8 and 9 November 2004, ECFIN/REP50496 Rev. 1 of 29 October 2004.

European Commission, Economic and Financial Affairs DG (2004q), *Labour force projections: a proposal for the data to be used in the AWG budgetary projection exercise*, note for the attention of the AWG meeting of 8 and 9 November 2004, ECFIN/REP50493/04-EN of 28 October 2004.

European Commission, Economic and Financial Affairs DG (2004r), *Long-run labour productivity and potential growth rate projections for the EU-25 countries up to 2050*, note for the attention of the AWG meeting of 8 and 9 November 2004, ECFIN/REP50485/04-EN of 28 October 2004.

European Commission, Economic and Financial Affairs DG (2004s), *A methodology for education expenditure projections in the context of the 2005 budgetary projections*, note for the attention of the AWG meeting of 8 and 9 November 2004, ECFIN/REP50519/04-EN of 5 November 2004.

European Commission, Economic and Financial Affairs DG (2004t), *Modelling pension entitlements: a cooperation project between the Commission and the OECD*, note for the attention of the AWG meeting of 13 December 2004, ECFIN/REP50698/04-EN of 6 December 2004.

European Commission, Economic and Financial Affairs DG (2004u), *An adjusted set of labour force projections for the budgetary projection exercise in light of the comments made by AWG members*, note for the attention of the AWG meeting of 13 December 2004, ECFIN/REP50710/04-EN of 8 December 2004.

European Commission, Economic and Financial Affairs DG (2004v), *An adjusted set of long-run labour productivity projections for the EU-25 countries up to 2050: effects of introducing changes suggested at 8–9 November meeting*, note for the attention of the AWG meeting of 13 December 2004, ECFIN/REP50703/04-EN.

European Commission, Economic and Financial Affairs DG (2004w), *Controlling healthcare expenditures: some recent experiences with reform*, note for the attention of the Economic Policy Committee, ECFIN/157/04 Rev. 1 of 16 March 2004.

European Commission, Economic and Financial Affairs DG (2005a), *The budgetary projection exercise of the AWG: agreements reached and next steps*, second progress report sent to the EPC, ECFIN/REP50307/05-EN of 28 January 2005.

European Commission, Economic and Financial Affairs DG (2005b), *Clarification on the underlying assumptions for the real interest rate for the AWG budgetary projection exercise*, note for the attention of the AWG meeting of 25 January 2005, ECFIN/REP50182/05-EN.

European Commission, Economic and Financial Affairs DG (2005c), *Outstanding issues as regards the assumptions on the labour force for the budgetary projection exercise: conversion into national account figures and possible sensitivity tests*, note for the attention of the AWG meeting of 25 January 2005, ECFIN/REP50203/05-EN of 14 January 2005.

European Commission, Economic and Financial Affairs DG (2005d), *Factors driving public expenditures on health/long-term care over the long run and an overview of methodologies used to make expenditure projections*, note for the attention of the AWG meeting of 18 and 19 April 2005, ECFIN/REP51821/05-EN of 15 April 2005.

European Commission, Economic and Financial Affairs DG (2005e), *Proposal for a methodology to project healthcare expenditure*, note for the attention of the AWG meeting of 18 and 19 April 2005, ECFIN/REP5181/05-EN of 14 April 2005.

European Commission, Economic and Financial Affairs DG (2005f), *Overview of the underlying assumptions on population and labour force for the budgetary projection exercise of the AWG*, note for the attention of the AWG meeting of 18 and 19 April 2005, ECFIN/REP51752/05-EN of 13 April 2005.

European Commission, Economic and Financial Affairs DG (2005g), *Country file with the overall set of population, labour force and macroeconomic projections to be sent to each Member State*, note for the attention of the AWG meeting of 18 and 19 April 2005, ECFIN/REP51824/05-EN of 13 April 2005.

European Commission, Economic and Financial Affairs DG (2005h), *Conversion of labour force projections into national account equivalent figures: replies from Member States*, note for the attention of the AWG meeting of 18 and 19 April 2005, ECFIN/REP51735/05-EN of 12 April 2005, plus addendum.

European Commission, Economic and Financial Affairs DG (2005i), *Final set of long-run labour productivity, labour input and potential growth rate projections for the EU-25 countries up to 2050*, note for the attention of the AWG meeting of 18 and 19 April 2005, ECFIN/REP51729/05-EN.

European Commission, Economic and Financial Affairs DG (2005j), *Sensitivity tests and policy scenarios for the budgetary projection exercise: some suggestions*, ECFIN REP 5163 of 13 April 2005.

European Commission, Economic and Financial Affairs DG (2005k), *The assumption on real interest rates in the AWG budgetary projection exercise: some comments in response to the queries of Mr Stanton, Chairman of the indicators sub-group attached to the Social Protection Committee*, note for the attention of the AWG meeting of 18 and 19 April 2005, ECFIN/REP51758/05-EN of 13 April 2005.

European Commission, Economic and Financial Affairs DG (2005l), *Outstanding issues as regards the conversion of labour force projections into national account equivalents for Luxembourg*, note for the attention of the AWG meeting of 16 June 2005, ECFIN/REP52789/05-EN of 13 June 2005.

European Commission, Economic and Financial Affairs DG (2005m), *The assumption on wage developments in the AWG budgetary projection exercise*, note for the attention of the AWG meeting of 16 June 2005, ECFIN/REP/5231/05-EN of 13 May 2005.

European Commission, Economic and Financial Affairs DG (2005o), *Data collection for the projection of education expenditure: information note and questionnaire to the Member States*, note for the attention of the AWG meeting of 16 June 2005, ECFIN/REP/52740/05-EN.

European Commission, Economic and Financial Affairs DG (2005p), *Preliminary results of the healthcare projections — approach I application of the age-related expenditure profiles to different developments in health status*, note for the attention of the AWG meeting of 16 June 2005, ECFIN/REP/52772/05-EN of 10 June 2005.

European Commission, Economic and Financial Affairs DG (2005q), *Data collection for projections of healthcare and long-term care expenditure — questionnaire for Member States*, note for the attention of the AWG meeting of 16 June 2005, ECFIN/REP/52670/05-EN of 6 June 2005.

European Commission, Economic and Financial Affairs DG (2005r), *Suggestions for future work on the analysis of the sustainability of public finances in the EU*, note for the attention of the AWG meeting of 16 June 2005, ECFIN/REP/52742/05-EN of 8 June 2005.

European Commission, Economic and Financial Affairs DG (2005s), *Approach II to project healthcare expenditure taking account of 'death-related costs': revised preliminary projection results*, note for the attention of the Ageing Working Group of the EPC of 17 and 18 October 2005, ECFIN/REP/54733 of 11 October 2005.

European Commission, Economic and Financial Affairs DG (2005t), preliminary results of the healthcare expenditure projections — approach IV: decomposing unit costs and applying different assumptions on evolution of costs, note for the attention of the Ageing Working Group of the EPC of 17 and 18 October 2005, ECFIN/ REP/54746 of 12 October 2005.

Eurostat (1996), *Esspros manual 1996*.

Eurostat (2003), *Health in Europe. Results from 1997–2002 surveys*. European Commission, Luxembourg.

Eurostat (2004a), *Report on the work in progress on the Eurostat population projections*, note of Eurostat of the AWG meeting 6 May 2004, ESTAT/F-1(POP/o2(2004) of 30 April 2004.

Eurostat (2004b), *Europop 2004: methodology for drafting fertility assumptions in the EU-15 Member States*, ESTAT/F/1/POP/06(2004)/FS REV.1, 2 December 2004

Eurostat (2004c), *Europop 2004: methodology for drafting mortality assumptions*, ESTAT/F/1/POP/06(2004)/ KG Rev. 1, 3 December 2004.

Eurostat (2004d), *Europop 2004: Summary note on assumptions and methodology for international migration*, ESTAT/F-1/POP/19(2004)/GL.

Eurostat (2004e), *Comparison of the age dependency ratios between Europop 2004 and other sets of projections'*, ESTAT/F/1/POP/20(2004)/KG Rev. 1, 8 December 2004.

Eurostat (2005a), *Some comments on the note of Harry Ter Rele*, note for the attention of the AWG meeting of 25 January 2005, ESTAT/F/1GL, 24 January 2005.

Eurostat (2005b), *Cross-country convergence of mortality levels: experience from previous Eurostat projections*, note for the attention of the AWG, 9 February 2005.

Eurostat (2005c), 'EU-25 population rises until 2025, then falls', Eurostat press release 448/2005 of 8 April 2005.

Eurostat (2005d), 'AWG ad hoc scenario', presentation to the AWG meeting of 16 June 2006.

Farnsworth Riche, M. (2005), 'The new demographics of ageing', presentation at the US–UK dialogue on pensions, held from 19 to 21 July 2005 by the AARP in Washington.

Federal Ministry of Finance, Austria (2004), *Remarks on the EC labour force projections in the EPC*, 19 November 2004.

Federal Planning Bureau, Belgium (2004a), presentation on 'Long-term projections of the labour force', presentation to the AWG meeting of 10 March 2004.

Federal Planning Bureau, Belgium (2004b), 'Comments on the projected mortality rates in Europop 2004', note sent to the AWG meeting of 13 December 2004.

Fries, J. F. (1980), 'Ageing, natural death, and the compression of morbidity', *The New England Journal of Medicine*, Vol. 303, pp.130–135.

Fries, J. F. (1983), 'The compression of morbidity', *Milbank Memorial Fund Quarterly*, Vol. 61, pp. 397–419.

Fries, J. F. (1989), 'The compression of morbidity: near or far?', *Milbank Memorial Fund Quarterly*, Vol. 67, pp. 208–232.

Fries, J. F. (1993), 'Compression of morbidity: life span, disability, and healthcare costs', *Facts and Research in Gerontology*, Vol. 7, pp. 183–190.

Genre, V. and R. Gómez-Salvador (2004), 'Labour force developments in the euro area since the 1980s', presentation to the AWG meeting of 10 March 2004.

Getzen, T. E. (1992), 'Population ageing and the growth of health expenditures', *Journal of Gerontology: Social Sciences*, 47, No 3, pp. S98–S104.

Getzen, T. E. (1999), 'Forecasting health expenditures: short, medium and long term', special issue: 'Health care financing: The next millenium', *Journal of Health Care Finance*.

Giammarioli, N. and N. Valla (2003), 'The natural real rate of interest in the euro area', *ECB Working Paper*, No 233, May 2003.

Grammenos, S. (2003), 'Feasibility study: Comparable statistics in the area of care of dependent adults in the European Union', *Eurostat Working Papers and Studies*, European Commission, Luxembourg.

Grignon, M. (2003), 'Les consequences du viellissement de la population sur les dépenses de santé', *Questions d'Economie de la Santé*, No 66, Mars 2003.

Gruber, J. and D. A. Wise (2005), 'Social security programmes and retirement around the world: fiscal implications — Introduction and summary', *NBER Working Paper*, No 11290.

Gruber, J and D. A. Wise (eds) (2005), *Social security programmes and retirement around the world: fiscal implications*, NBER website, 26 July 2005: http://www.nber.com/books/intlSS-p3/index.html

Gruenberg, E. M. (1977), 'The failure of success', *Milbank Memorial Fund Quarterly*, Vol. 55, pp. 3–24.

Hendrickx, K., N. Fasquelle and C. Streel (2003), *Long-term trends of social expenditure: methodological framework and modelling principles for socioeconomic projection*¸ Federal Planning Bureau of Belgium, 29 August 2003.

Holly, A. (2005), 'Health-based predictive models: How to extrapolate existing medical information into the projections of future healthcare expenditure?', presentation to the joint EC–AWG–OECD workshop of 21 and 22 February 2005.

Howe, N. and R. Jackson (2005), *Projecting immigration: a survey of the current state of practice and theory*, report of the CSIS Global Aging Initiative, Center for Strategic International Studies, Washington, April 2005.

Huber, M. (2005), 'The need to improve the comparability of long-term care expenditure data: recent estimates from a selection of OECD countries and follow-up work', presentation to the joint EC–AWG–OECD workshop of 21 and 22 February 2005.

ILO (2000), 'Estimates and projections of the economically active population 1950–2010' in *Sources and Methods: Labour Statistics*, Geneva.

Jacobzone S., E. Cambois and J. M. Robine (2000), 'Is the health of older persons in OECD countries improving fast enough to compensate for population ageing?', *OECD Economic Studies*, No 30.

Jaumotte, F. (2003), 'Female labour force participation: past trends and main determinants', *OECD Economic Department Working Paper*, No 376.

Koopman, T. (1965), 'On the concept of optimal economic growth', in *The econometric approach to development planning*, Amsterdam, North Holland.

Lafortune, G. (2005), 'Impact of population ageing on health and long-term care expenditure: Assessing the effect of morbidity, disability and other cost drivers', presentation to the joint EC–AWG–OECD workshop of 21 and 22 February 2005.

Latulippe, D. (1996), 'Effective retirement age and duration of retirement in the industrial countries between 1950 and 1990', ILO, Issues in Social Protection DP No 2.

Levinsky, N. G., W. Yu, A. Ash, M. Moskowitz, O. Saynina and E. J. Emanuel (2001), 'Influence of age on Medicare expenditures and medical care in the last year of life', *Journal of the American Medical Association*, No 286 (11), pp. 1349–1355.

Lubitz, J. D. and G. F. Riley (1993), 'Trends in medicare payments in the last year of life', *New England Journal of Medicine*, No 328, pp. 1092–1096.

Mackenbach, J., M. Avendaño, C. Looman, K. Andersen-Ranberg (2005), 'Health problems among the elderly in Europe: first results of the SHARE project', presentation to the joint EC–AWG–OECD workshop of 21 and 22 February 2005.

Macura, M., A. L. MacDonald and W. Haug (eds) (2005), *The new demographic regime, population challenges and policy responses*, United Nations.

Madsen, M. (2004), *Methodologies to incorporate 'death-related costs' in projections of health and long-term care based on Danish data*, Ministry of Finance, Denmark dated 4 November 2004. Note for the attention of the AWG meeting of 8 and 9 November 2004.

Manton, K. G. (1982), 'Changing concepts of morbidity and mortality in the elderly population', *Milbank Memorial Fund Quarterly*, Vol. 60, pp. 183–244.

Manton, K. G., Stallard E. and L. Corder (1995), 'Changes in morbidity and chronic disability in the US elderly population: Evidence from the 1982, 1984 and 1989 national long-term care surveys', *Journal of Gerontology: Social Sciences*, No 50(4), pp. S194–S204.

Manton, K. G. and V. L. Lamb (2005), 'Medicare cost effects of recent US disability trends in the elderly: future implications', presentation to the joint EC–AWG–OECD workshop of 21 and 22 February 2005.

McMorrow, K. (2004), 'A possible overall framework for the macro projections used by AWG: a focus on the Output Gap Working Group agreed production function approach thinking', presentation to the AWG meeting of 6 May 2004.

Mestdagh, J. and M. Lambrecht (2003), 'The AGIR project: Ageing, health and retirement in Europe. Use of healthcare and nursing care by the elderly', data for Belgium, Federal Planning Bureau Working Paper 11-03.

Ministère de l'économie, des finances et l'industrie, France (2004), 'Consequences of ageing on health expenditures', note for the attention of the joint AWG–OECD meeting of 3 June 2004.

Ministère de l'économie, des finances et l'industrie, France (2005), 'Hypothèses associées aux futures projections 2005 du AWG', 6 January 2005, note for the attention of the joint AWG–OECD meeting of 25 January 2005.

Ministerio dell'Economia e delle Finanze, Italy (2004), 'Assessing the effects of new policies on long-term sustainability: kick off note on the potential impact on EPC working groups', 4 November 2004.

Ministry of Finance, Denmark (2005), 'EPC work on sustainability — no policy versus policy scenarios', note dated 15 March 2005 for the attention of the AWG meeting of 18 and 19 April 2005.

Ministry of Finance, Finland, Ministry of Social Affairs and Health, Finland, Ministry of Finance, Sweden, Ministry of Health and Social Affairs, Sweden (2005), 'Real interest rate assumptions in the ISG and AWG calculations', letter dated 26 April 2005.

Ministry of Finance, Sweden (2004), 'Long-term projections of labour supply in Sweden', note for the attention of the AWG meeting of 10 March 2004, Economics Affairs Department, 5 March 2004.

Montanino, A., B. Przywara and D. Young (2004), 'Investment in education: the implications for economic growth and public finances', *Economic Papers*, No 217, European Commission, Directorate-General for Economic and Financial Affairs.

Mortensen, J. (2005), 'Report on a research project on ageing, health and retirement (AGIR)', presentation to the joint EC–AWG–OECD workshop of 21 and 22 February 2005.

Mourre, G. (2004), 'Approaches to making long-run productivity projections', Economic and Financial Affairs DG, presentation to the AWG meeting of 6 May 2004.

National Bureau for Economic Research (2004), 'The foundations of disability decline', *NBER Progress Report*, October 2004.

Nicoletti, G. (2004), 'Thinking about long-term productivity', presentation to the AWG meeting of 6 May 2004.

OECD (2000), *A system of health accounts*, version 1.0.

OECD (2003), *Labour force participation of groups at the margin of the labour market: past and future trends and policy challenges*, Working Party No 1 on Macroeconomic and Structural Policy Analysis, ECO/CPE/WP1(2003)8.

OECD (2004a), *Report on the Joint EC/OECD ad hoc meeting of experts on revised projections of the fiscal cost of ageing*, ECO/CPE/WP1(2004)5.

OECD (2004b), *OECD health data 2004.*

OECD (2004c), *Data on long-term care services*, Working Party on Social Policy, Health Policy Statistics, meeting held in Paris, 30 September and 1 October 2004, DELSA/ELSA/WP1/HS(2004)3.

OECD (2004d), *Refinement and extension of the international classification for health accounts (ICHA)*, Working Party on Social Policy, Health Policy Statistics, meeting to be held in Paris on 30 September and 1 October 2004, DELSA/ELSA/WP1/HS(2004)6.

OECD (2004e), 'Health expenditure and financing (Parts 4 and 5)' in *OECD health data 2005*, Working Party on Social Policy, Health Policy Statistics, meeting held in Paris, 30 September and 1 October 2004, DELSA/ELSA/WP1/HS(2004)8.

OECD (2004f), *Estimating expenditure on long-term care*, Working Party on Social Policy, Health Policy Statistics, meeting held in Paris on 30 September and 1 October 2004, DELSA/ELSA/WP1/HS(2004)9.

OECD (2004g), 'Estimating expenditure on long-term care', Working Party on Social Policy, Health Policy Statistics. Available at: http://www.oecd.org/document/14/0,2340,en_2649_37407_33822862_1_1_1_37407,00.html

OECD (2005), *Projecting OECD health and long-term care expenditures: what are the main drivers?*, Working Party No 1 on Macroeconomic and Structural Policy Analysis, ECO/CPE/WP1(2005)14 of 23 September 2005.

Oliveira Martins J., F. Gonand, P. Antolin, C. de la Maisonneueve and K. Yoo (2005), 'The impact of ageing on demand, factor markets and growth', *OECD Economic Working Papers*, No 249.

Olshansky, S. J., M. A. Rudberg, B. A. Carnes, C. K. Cassel, J. A. Brody (1991), 'Trading off longer life for worsening health', *Journal of Ageing and Health*, Vol. 3, pp.194–216.

Pellikaan, F., E. Westerhout (2004), *The AGIR project: Ageing, health and retirement in Europe. WP4: Alternative scenarios for health, life expectancy and social expenditure. The influence of living longer in better health on health expenditures, pension expenditures and government finances in the EU*, CPB Centraal Planbureau.

Pickard, L. M. (2003), 'Trends in and projections for informal care'. Chapter in: A. Comas-Herrera and R.Wittenberg (eds), *European study of long-term care expenditure*. Report to the European Commission, Employment and Social Affairs DG. PSSRU discussion paper 1840.

Przywara, B. and D. Costello (2005), 'Projections of expenditures on health and long-term care at EU level', presentation to the joint EC–AWG–OECD workshop of 21 and 22 February 2005.

Ragioneria Generale dello Stato (2004a), 'Mid-long term forecast of the workforce', note for the attention of the AWG meeting of 17 June 2004.

Ragioneria Generale dello Stato (2004b), 'How to take account of death-related costs in projecting healthcare expenditure — the evidence from Italy and a proposal for the EPC–AWG', note for the attention of the AWG meeting of 10 March 2004.

Ragioneria Generale dello Stato (2005), 'Moving from quarterly to the continuous labour force survey', note dated 14 April 2004 for the attention of the AWG meeting of 18–19 April 2005.

Robine, J. M. and J. P. Michel (2004), 'Looking forward to a general theory on population ageing', *Journal of Gerontology: Medical Sciences 2004*, Vol. 59A, No 6, pp. 590–597.

Robine, J. M., C. Jagger and H. van Oyen (2005), 'Interpreting international evidence on the evolution of morbidity and disability prevalence over time and perspectives for extended healthy life expectancy', presentation to the joint EC–AWG–OECD workshop of 21 and 22 February 2005.

Röger, W. (2004), 'Some reflection on growth decomposition and the long-term driving forces behind productivity growth', presentation to the AWG meeting of 6 May 2004.

Roos, N. P., P. Montgomery and L. L. Roos (1987), 'Healthcare utilisation in the years prior to death', *The Milbank Quarterly*, No 65, pp. 231–254.

Rothgang, H. and A. Comas-Herrera (2003), 'Dependency rates and health expectancy'. Chapter in: A. Comas-Herrera and R. Wittenberg (eds), *European study of long-term care expenditure*. Report to the

European Commission, Employment and Social Affairs DG. PSSRU discussion paper 1840.

Scherer, P. (2002), 'Age of withdrawal from the labour force in the OECD countries', *Labour Market and Social Policy Occasional Papers*, No 49-DELSA.

Serup-Hansen, N., J. Wickstroem, I. Soenboe Kristiansen (2001), 'Future healthcare costs — do healthcare costs during the last year of life matter?', *Health Policy*, No 62, pp. 161–172.

Seshamani, M., A. Gray (2004), 'Ageing and healthcare expenditure: the red herring argument revisited', *Health Economics*, No 13, pp. 303–314.

Sinn, H. W. and M. Werding (2001), 'Immigration following EU eastern enlargement', CESifo Forum, Summer.

Suzman, R. (2005), 'Beyond social astronomy: From understanding to interventions', presentation to the joint EC–AWG–OECD workshop of 21 and 22 February 2005.

Toossi, M. (2002), 'A century of change: the US labour force, 1950–2060' in *Monthly Labor Review*, US Department of Labour, BLS, May.

Turner, D. (2004), 'The OECD method of estimating NAIRU and its role in potential output', presentation to the AWG meeting of 6 May 2004.

United Nations (2003), *World Population Prospects: The 2002 Revision, Volume II: Analytical Report.*

United Nations (2004), *World Population Prospects: The 2002 Revision, Volume III: Analytical Report.*

United Nations (2005), *Assumptions underlying the results of the 2004 Revision of World Population Prospects, World Population Prospects: The 2004 Revision Population Database.*

United Nations (2005), *World Population Prospects: The 2004 Revision*, Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat.

van Wissen, L. (2004), 'Key issues in population projection making at the EU level', presentation to the AWG meeting of 4 March 2004, NIDI and Faculty of Spatial Sciences, University of Groningen.

Vaupel, J. and J. Oeppen (2002), 'Broken limits to life expectancy', *Science Magazine*, Vol. 296, 10 May 2002.

Verbrugge, L.M. (1984), 'Longer life but worsening health? Trends in health and mortality of middle-aged and older persons', *Milbank Memorial Fund Quarterly*, Vol. 62, pp. 475–519.

Visco I. (2001), 'The fiscal implications of ageing populations in OECD countries', speech to the Oxford Centre on Population Ageing Pensions Symposium, 7 June 2001.

Wanless, D. (2002), *Securing our future health: Taking a long-term view*. final report, HM Treasury.

Wen, X. (2005), 'Assessing the impact of changes in survey methodologies on disability trends over time: the case of Australia', presentation to the joint EC–AWG–OECD workshop of 21 and 22 February 2005.

Westerhout, E. (2005), 'Quantifying factors behind health and long-term care expenditure: Evidence from the EU research AGIR project', presentation to the joint EC–AWG–OECD workshop of 21 and 22 February 2005.

Westerhout, E. and F. Pellikaan (2005), 'Can we afford to live longer in better health?', CPB Document, No 85, June 6, 2005.

White, K. (2002), 'Longevity advances in high income countries, 1955–96', *Population and development reviews*, 28(1): 59–76, March 2002.

Wolfson, M. C. and G. Rowe (2005a), 'Disability and informal support: Prospects for Canada', *Statistics Canada.*

Wolfson, M. C. and G. Rowe (2005b), 'Disability and informal support, prospects for Canada', presentation to the joint EC–AWG–OECD workshop of 21 and 22 February 2005.

Woodbury, R. (2001), *Disability decline: What we know; and what we'd like to know*, National Institute on Ageing-National Bureau of Economic Research Workshop Summary, NIH Stone House, 30 November 2001.

World Health Organisation, Regional Office for Europe (2005), 'European health for all' database (HFA-DB): http://data.euro.who.int/hfadb/

Zweifel, P., S. Felder and M. Meiers (1999), 'Ageing of population and healthcare expenditure: a red herring?', *Health Economics*, No 8, pp. 485–496.

Annexes

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Annex 2. Workshops and conferences organised by the Economic and Financial Affairs DG and the AWG to prepare the projection of age-related expenditure

5 February 2004 Population projections

Factors shaping fertility rates and life expectancy over the long run
Ms Josianne Duchêne, UCL Institut de Démographie

Approaches to long-run population projections: what are the key issues for policy-makers?
Mr Frans Willekens, University of Groeningen

Dealing with risk and uncertainty in population projections: designing sensitivity tests
Professor Juha Alho, University of Joensuu

10 March 2004 Labour force projections

A dynamic approach to quantify the impact of different policy options on future labour supply
Mr J.-M. Burniaux — OECD

Effects of old-age pension and early retirement schemes on labour market participation of older workers
Mr R. Duval — OECD

Different scenarios to project labour force participation in the euro area
Mr R. Gomez-Salvador — European Central Bank

Past projections on national and regional labour force in the EU: methodology and post-mortem assessment
Mr H. Cruijsen — Statistics Netherlands

National experiences
Sweden: methods used in the Swedish calculations of the future labour supply, and the number of persons requiring different types of social transfers

Belgium: methodology for labour force projections

Approaches to making long-run labour force projections: considerations for the AWG budgetary projection exercise
Mr G. Carone – European Commission, Economic and Financial Affairs DG

6 May 2004 Macroeconomic assumptions

A possible overall framework for the macro-projections used by AWG: a focus on the Output Gap Working Group agreed production function approach
Mr Kieran McMorrow — European Commission, Economic and Financial Affairs DG

The OECD macroeconomic framework: different concepts of NAIRU (short-term versus long-term) and the method to project total factor productivity
Mr Dave Turner — OECD Economics Department

Some reflection on growth decomposition and the long-term driving forces behind productivity growth
Mr Giuseppe Nicoletti — OECD Economics Department
Mr Werner Röger — European Commission, Economic and Financial Affairs DG

Recent experiences on the impact of convergence on productivity and other macroeconomic variables
Poland, Ms Agnieska Chłoń-Domińczak — Polish Ministry of Economy, Labour and Social Policy
Slovakia, Mr Ludovit Odor — Slovakian Ministry of Finance

Approaches to making long-run productivity projections: considerations for the AWG budgetary projection exercise
Mr Gilles Mourre — European Commission, Economic and Financial Affairs DG

Approaches to making long-run structural unemployment projections: considerations for the AWG budgetary projection exercise

Mr Giuseppe Carone — European Commission, Economic and Financial Affairs DG

First discussion on the responses to the questionnaire on the coverage of pensions and pension contributions in the budgetary projections

General discussion with AWG members on methodological issues to be addressed in the secondary budgetary projections exercise

3 June 2004 Joint AWG/OECD meeting

Workshop on healthcare and long-term care projections

Impact of ageing on health expenditures
Mr Benoît Bellone and Mr Emmanuel Chion — French Directorate of Forecasting and Economic Analysis

Assessing the budgetary cost of ageing and projecting healthcare (and care for elderly) expenditure: the Belgian experience
Mr Michel Englert — Federal Planning Bureau — Belgium

How to refine estimation of demographic influence on healthcare demand — Different methods?
Mr Ilija Batljan — Swedish Ministry of Health and Social Affairs

Evolution of relative prices of health services: role of technology and demand
Introduction by the Australian OECD delegate

17 June 2004 Education projections, unemployment transfers and long-term care

Main driving forces of education expenditures
Mr Torberg Falch, Norwegian University of Science and Technology, Trondheim, Norway

Data availability for the analysis of education expenditures
Mr Pascal Schmidt from Eurostat

Modelling long-term education expenditures. Experiences from the past AWG exercise
Mr Andrea Montanino, European Commission, Economic and Financial Affairs DG

Discussion and main conclusions on modelling education expenditures

Comparative projections of future long-term care expenditures for four EU Member States
Ms Adelina Comas-Herrera, LSE London School of Economics and Political Science

Coverage of pensions and pension contributions in budgetary projections
Ms Aino Salomäki, European Commission, Economic and Financial Affairs DG

Methodology for unemployment benefit projection
Mr Giuseppe Carone, European Commission, Economic and Financial Affairs DG

21/22 February 2005 Workshop organised by the European Commission, the AWG and the OECD, 'Understanding trends in disability among elderly populations and the implications of demographic and non-demographic factors for future health and long-term care costs'

Session 1 What do we know about health and disability trends amongst elderly populations?

Introduction
Mr Henri Bogaert (Chairman of AWG) and Mr Peter Scherer, Head of Health Division, OECD Secretariat

Impact of population ageing on health and long-term care expenditure: Assessing the effect of morbidity, disability and other cost drivers
Mr Gaetan Lafortune, Health Division, OECD Secretariat

Interpreting international evidence on the evolution of morbidity and disability prevalence over time and perspectives for extended healthy life expectancy
Mr Jean-Marie Robine, University of Montpellier and REVES (network on health expectancy), France

Assessing the impact of changes in survey methodologies on disability trends over time: The case of Australia
Mr Xingyan Wen, Australian Institute of Health and Welfare

Compression of disability for older Americans, 1992–2002
Mr James Lubitz, National Center for Health Statistics, United States

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Mr Richard Suzman, National Institute on Ageing, National Institutes of Health, United States

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Ms Vicki Lamb, Duke University, United States

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Mr Johan Mackenbach, University Medical Centre, Rotterdam, the Netherlands

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Mr Alberto Holly, Institute of Health Economics and Management at the University of Lausanne, Switzerland

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Mr Axel Börsch-Supan, Mannheim Research Institute for the Economics of Ageing, Germany

Quantifying factors behind health and long-term care expenditure: evidence from the EU research project AGIR
Mr Ed Westerhout, The Netherlands Bureau for Economic Policy Analysis

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Mr Jørgen Mortensen, Centre for European Policy Studies, Belgium

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Mr Bartosz Przywara and Mr Declan Costello, European Commission, Economic and Financial Affairs DG

Making projections of public long-term care expenditure for European countries: a proposed methodology and data requirements
Ms Adelina Comas Herrera, London School of Economics and Political Science

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Mr Ilija Batljan, Department of Social Work, Stockholm University, Sweden and Mr Mårten Lagergren, Stockholm Centre of Gerontology, Sweden

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Population projections
Mr Frans Willekens, Director, Netherlands Interdisciplinary Demographic Institute

Labour force assumptions
Ms Agar Brugiavini, Università Ca' Foscari, Venezia

Productivity and other macroeconomic assumptions
Mr Jørgen Mortensen, Director, Centre for European Policy Studies
Mr Ray Barrell, Senior Research Fellow, National Institute of Economic and Social Research

A view from the pensions industry and actuaries
Mr Mike Orszag, Head of Research, Watson Wyatt

A financial analyst's view
Mr Moritz Kraemer, Standard and Poors

Annex 3. The conversion of projections figures based on labour force surveys (LFS) on national account figures

Why the conversion is relevant for the labour force projections

Many Member States use figures based on national account methodology as input for their pension models. This raises the issue of converting labour force projections based on labour force surveys (LFS) into equivalent national accounts (NA) figures. This would help ensure consistency between the labour supply projections and GDP and age-related projections.

The transformation of the LFS-based projections carried out using the cohort method in NA equivalent figures poses a number of conceptual and statistical problems that have to be addressed, including:

- **the residence of the workers:** NA figures make a distinction between domestic employment and national employment. Of course the domestic definition (including both residents and non-residents who work for resident producer units, thus including non-resident seasonal workers and non-resident frontier workers) is the one used in the calculation of GDP figures. In LFS, the concept generally used is employment on a national basis ([1]);

- **the age of the workers:** in NA definitions, there is no limit as regards the age considered. LF statistics generally start from the age of 15 and reliable figures are published up to 64 or 71 (but are available for older persons as well).

The transformation of LFS into NA figures is a rather complex exercise, carried out by the national statistical institutes in Member States. Eurostat, in conjunction with the OECD, has just launched a general questionnaire in order to get more information on the specific methodologies used by Member States to make this transformation. The aim of the Eurostat/OECD questionnaire is to explain in reasonable detail the differences between the original sources on employment (usually LFS but also administrative sources) and NA figures.

Looking at the two sets of figures in Table A.1, one can see that the size (and the trend) of difference between LFS and NA figures varies across countries. In terms of employment (LFS and employment in the domestic concept), the difference ranges from a low of 2– 3 % in Sweden, the Netherlands and Belgium, to a high of 8–10 % in Italy and 10–12 % in Austria over the latest four to five years.

To ensure the necessary degree of consistency as regards the labour force assumptions to be used in the budgetary projection exercise, national authorities were invited to provide written explanations to the AWG on:

- which kind of figures they intend to use in their pension model in order to carry out the projections of the pension spending. In particular, AWG members are requested to specify if they are going to use directly employment/unemployment figures provided by the Commission and based on labour force statistics or if they need to transform these figures into national accounts equivalents;

- in the event of a Member State needing to use NA-equivalent projections, they are requested to report details on: (i) the reason why these transformations are necessary; and (ii) the nature and the size of transformations they deem necessary to make to the

([1]) From the Eurostat metadata definition: 'Employment (ESA 1995, 11.11) covers all persons engaged in some productive activity (within the production boundary of the national accounts). Employed persons are either **employees** (ESA 1995, 11.12, working by agreement for another resident unit and receiving remuneration) or **self-employed** (ESA 1995, 11.15, owners of unincorporated enterprises). Annual figures for employment are understood to be annual averages, not end-of-year or middle-of-year values. They are recorded according to the **domestic concept**, i.e. employment figures are indicating employment in resident production units, not employment of nationals. The corresponding total figures (no breakdown by industry) according to the national concept can be found in the auxiliary indicators domain. Units presented are headcount, not jobs (i.e. persons in multiple employment are counted only once, in the industry of their primary employment), and hours worked.' See http://europa.eu.int/comm/eurostat/newcronos/reference/sdds/en/brkdowns/brkdowns_sm.htm#concepts

Table A.1

Comparison of employment figures in national account and labour force statistics, domestic and national

	(Thousand persons)						As percentage of LF data					
	1998	1999	2000	2001	2002	2003	1998	1999	2000	2001	2002	2003
BE	99	4	– 5	92	66	68	2.6	0.1	– 0.1	2.3	1.6	1.7
CZ	228	127	137	153	180	204	4.7	2.7	2.9	3.3	3.8	4.3
DK	39	76	71	55	58	50	1.5	2.8	2.6	2.0	2.1	1.8
DE	2 079	1 982	2 424	2 394	2 421	2 387	5.9	5.5	6.7	6.6	6.7	6.6
EE	– 1	1	– 1	– 1	– 1	– 2	– 0.2	0.1	– 0.1	– 0.2	– 0.2	– 0.3
EL	– 62	– 40	– 31	– 11	– 47	– 96	– 1.6	– 1.0	– 0.8	– 0.3	– 1.2	– 2.4
ES	890	641	368	163	90	– 51	6.4	4.4	2.4	1.0	0.6	– 0.3
FR	966	1 173	1 185	1 042	1 002	811	4.3	5.2	5.1	4.4	4.2	3.4
IE	31	30	4	6	14	17	2.1	1.9	0.2	0.4	0.8	1.0
IT	2 013	2 005	2 049	2 067	2 179	2 231	9.8	9.7	9.7	9.6	10.0	10.1
CY		25	18	9	7	– 2		9.1	6.0	2.8	2.1	– 0.5
LV	4	1	3	3	– 6	– 9	0.4	0.1	0.3	0.3	– 0.6	– 0.9
LT	8	– 31	– 22	– 21	5	5	0.5	– 2.1	– 1.5	– 1.5	0.4	0.4
LU	68	74	84	94	100	106	39.9	42.3	46.4	51.0	53.1	56.2
HU	34	0	0	– 24	0	47	0.9	0.0	0.0	– 0.6	0.0	1.2
MT			3	2	0	– 1			2.0	1.0	0.3	– 0.9
NL	341	341	254	205	181	197	4.6	4.5	3.2	2.5	2.2	2.4
AT	379	387	409	410	429	410	10.5	10.5	11.0	11.0	11.6	11.0
PL	436	434	492	1 036	1 178	– 531	2.8	2.9	3.4	7.3	8.5	– 3.9
PT	– 93	– 71	– 77	– 102	– 115	– 116	– 1.9	– 1.4	– 1.5	– 2.0	– 2.2	– 2.3
SI	– 47	– 16	– 6	– 17	– 14	– 5	– 5.1	– 1.8	– 0.7	– 1.9	– 1.6	– 0.5
SK	– 79	– 69	– 77	– 84	– 97	– 99	– 3.6	– 3.2	– 3.6	– 4.0	– 4.6	– 4.6
FI	– 6	– 43	– 32	– 29	– 13	– 6	– 0.3	– 1.9	– 1.4	– 1.2	– 0.5	– 0.3
SE	132	109	139	27	28	30	3.3	2.7	3.4	0.6	0.6	0.7
UK	– 251	– 495	– 518	– 573	– 570	– 585	– 0.9	– 1.8	– 1.9	– 2.0	– 2.0	– 2.0
EU-25			*6 870*	*6 897*	*7 076*	*5 060*			*3.6*	*3.6*	*3.7*	*2.6*
EU-15	*6 625*	*6 175*	*6 323*	*5 842*	*5 825*	*5 453*	*4.3*	*3.9*	*4.0*	*3.6*	*3.6*	*3.3*
EU-10	*#N/A*	*#N/A*	*547*	*1 055*	*1 252*	*– 392*			*1.9*	*3.6*	*4.3*	*– 1.4*

	(Thousand persons)						As percentage of LF data					
	1998	1999	2000	2001	2002	2003	1998	1999	2000	2001	2002	2003
EUROStat												
BE	149	54	45	143	115	119	3.9	1.3	1.1	3.5	2.8	2.9
CZ	228	127	137	153	180	204	4.7	2.7	2.9	3.3	3.8	4.3
DK	39	76	71	55	58	50	1.5	2.8	2.6	2.0	2.1	1.8
DE	2 017	1 917	2 357	2 335	2 367	2 338	5.7	5.3	6.5	6.4	6.5	6.5
EE	1	3	3	2	2	2	0.1	0.5	0.5	0.4	0.4	0.4
EL	– 62	– 40	– 31	– 11	– 47	– 96	– 1.6	– 1.0	– 0.8	– 0.3	– 1.2	– 2.4
ES	891	642	359	161	93	– 41	6.5	4.4	2.3	1.0	0.6	– 0.2
FR	966	1 173	1 185	1 042	1 002	811	4.3	5.2	5.1	4.4	4.2	3.4
IE	31	30	4	6	14	17	2.1	1.9	0.2	0.4	0.8	1.0
IT	1 558	1 562	1 580	1 536	1 605	1 623	7.6	7.6	7.5	7.1	7.4	7.4
CY		25	18	9	7	– 2		9.1	6.0	2.8	2.1	– 0.5
LV	4	1	3	3	– 6	– 9	0.4	0.1	0.3	0.3	– 0.6	– 0.9
LT	8	– 31	– 22	– 21	5	5	0.5	– 2.1	– 1.5	– 1.5	0.4	0.4
LU	5	4	4	5	5	7	2.9	2.1	2.3	2.5	2.6	3.6
HU	34	0	0	– 24	0	47	0.9	0.0	0.0	– 0.6	0.0	1.2
MT			3	2	0	– 1			2.0	1.0	0.3	– 0.9
NL	331	331	244	196	171	187	4.5	4.3	3.1	2.4	2.1	2.3
AT	379	387	409	410	429	410	10.5	10.5	11.0	11.0	11.6	11.0
PL	436	434	492	1 036	1 178	– 531	2.8	2.9	3.4	7.3	8.5	– 3.9
PT	– 93	– 71	– 77	– 102	– 115	– 116	– 1.9	– 1.4	– 1.5	– 2.0	– 2.2	– 2.3
SI	– 30	5	– 6	– 17	– 14	– 5	– 3.3	0.6	– 0.7	– 1.9	– 1.6	– 0.5
SK	0	0	0	3	4	3	0.0	0.0	0.0	0.1	0.2	0.1
FI	– 8	– 45	– 34	– 31	– 15	– 8	– 0.4	– 2.0	– 1.5	– 1.3	– 0.6	– 0.4
SE	119	98	129	16	18	22	3.0	2.4	3.1	0.4	0.4	0.5
UK	– 251	– 495	– 518	– 573	– 570	– 585	– 0.9	– 1.8	– 1.9	– 2.0	– 2.0	– 2.0
EU-25			*6 353*	*6 333*	*6 487*	*4 451*			*3.4*	*3.3*	*3.4*	*2.3*
EU-15	*6 072*	*5 624*	*5 726*	*5 188*	*5 131*	*4 738*	*4.0*	*3.6*	*3.6*	*3.2*	*3.1*	*2.9*
EU-10			*627*	*1145*	*1 356*	*– 286*			*2.1*	*3.9*	*4.7*	*– 1.0*

original dataset of projections provided by the Commission, based on labour force statistics.

Reactions from Member States that apply national account-based figures

Six Member States indicated that they need to adapt Economic and Financial Affairs DG projections. For the time being, Germany, Belgium and Luxembourg have already documented the conversion of Economic and Financial Affairs DG projections in NA-equivalent figures according to the methodology reproduced below. As for the others:

- **Denmark** is proposing to increase Economic and Financial Affairs DG employment figures by 2 % in order to get NA-equivalent figures;

- **France** indicated that they intend to adjust Commission figures to take into account Corsica and overseas territories (included in NAs but not in LFSs). The difference between the two sets of figures is actually of about one million employees. Their working assumption will be that Corsica and overseas territories employment grow at the same rate as in metropolitan France;

- **Austria** is proposing to apply the same methodology as Germany in order to get SNA-equivalent figures;

- **Sweden** is using different age profiles, while keeping the overall employment rate equivalent to Economic and Financial Affairs DG labour force projections.

The Belgium transformation of labour force projections

(carried out by the Federal Plan Bureau)

The employment and unemployment evolutions proposed by the AWG have been taken into consideration. Nevertheless, the Federal Plan Bureau model uses an administrative concept of employment and unemployment, and this administrative concept is also taken into consideration for defining the other socioeconomic categories of the model. These concepts are different from the (un)employment concepts used by the AWG projection, namely the concepts of the labour force survey (hereafter named survey or AWG concept).

As far as employment is concerned, the evolution of the employment rate is forecast according to sex and age categories following the evolutions of employment rates proposed by the AWG, that is to say:

$$TEADMc,s,t=TEADMc,s,t-1+(TEWGAc,s,t-TEWGAc,s,t-1)$$

where:

TEADM stands for the employment rate as an administrative concept;

TEWGA stands for the employment rate as an AWG concept;

c stands for the age category (15–19 to 55–59 and 65–71 years ([1]));

s stands for sex.

As far as unemployment is concerned, the same principle has been applied, but the exercise has been limited to inferior and mid-range age categories (up to the category 35–39 years old), that is to say:

$$TUPADMc,s,t=TUPADMc,s,t-1+(TUPWGAc,s,t-TUPWGAc,s,t-1)$$

where:

TUPADM stands for the unemployment rate (in percentage of the population) as an administrative concept;

TEWGA stands for the unemployment rate (in percentage of the population) as an AWG concept;

c stands for age categories from 15–19 to 35–39 years.

The activity evolution proposed by the AWG are such that, once applied to superior age categories, the methodology mentioned above leads to contradictions in the distribution of activity rates by age category or to demographic impossibilities ([2]). The desirable distribution of activity rates by age category is the same as the AWG distribution, namely converging activity rates for the age

([1]) For the 60–64 age group, it is mainly the attitude towards early retirement that drives the evolution of employment (see below).

([2]) The demographic impossibility means that the sum of the activity rate, early retirement rate (pre-pension rate) and disability rate exceeds 100 %.

categories between 35–39 and 45–49 years to the highest level of the distribution by age, and, afterwards, a decreasing activity rate according to age. Therefore, as from the 40–44 age category, two unemployment notions are defined: the AWG unemployment and the residual unemployment (by sex and age category), which is the difference observed in 2003 between the AWG unemployment rate and the administrative unemployment rate, that is:

TUPRESc,s,2003=TUPADMc,s,2003-TUPWGAc,s,2003

where *TUPRES* stands for the residual unemployment rate (as a percentage of the population);

c stands for the age category, from 40–44 to 55–59 years.

In projections, the AWG unemployment rate follows the imposed profile. The residual unemployment rate is calibrated so as to match the desired distribution of activity rates and the demographic constraint, considering the socio-economic projection of the other 'inactive' socio-economic groups (mainly the disabled and the early retired or pre-pensioners). In the context of increasing activity rates considered by the AWG, the AWG unemployment and the administrative unemployment do not have a parallel evolution in the higher age categories.

The difference between the overall employment rate projected by Belgium and that of the AWG (especially the gap for the age group 15–64, starting at 1.4 percentage points and rising to 1.9 % between 2022 et 2028) is explained as follows:

(1) a different projection for the age group 60–64 (especially for women, for whom the initial difference of 2.5 percentage points goes up to 8.3 % in 2023 and 2024);

(2) a composition effect (in particular, the difference for the age group 15–59 shifts from 1.3 % at the starting year of the projection to 1.4 % since 2006).

Finally, it is worth stressing that demographic figures used by Belgium are referred to as '30 June', that is the average between figures at 1 January of the two years.

The main differences between the two sets of figures are reproduced in Tables A.2 below.

The German transformation of labour force projections

The main differences between the two sets of figures are reproduced in Table A.3 below.

The methodology for making the conversion in Germany is as follows. Data on labour force, employment and unemployment based on labour force statistics (survey data) diverge from the corresponding figures based on national accounts. In fact, this difference increased during the last years, inter alia, because of the implementation of ESNA 98 and some revisions of employment data. As projection exercises on challenges posed by ageing populations are based on macroeconomic analyses, an adjustment of labour force and employment data to national account figures is necessary because a breakdown of these figures by age and sex is provided by survey data only.

In 2003 the number of employed people in Germany was 36.777 million according to LFS survey data while the national account number of employed exceeds that figure by some 1.5 million (38.3 million). One of the important reasons for this difference is an underestimation of the so-called mini-jobs (Geringfügig Beschäftigte) in the surveys. On the other hand, unemployment figures based on LFSs were, in 2003, about 3.99 million while based on national accounts only 3.84 million were unemployed. Due to these differences, total labour force based on national accounts was about 1.3 million higher compared with LFSs.

For the **base year adjustment**, the idea is to adjust the inactive population to avoid activity rates higher than 100 %. Furthermore, to avoid large increases of activity rates for the younger and the elderly, the adjustment is made for three age groups: '15–24', '25–54' and '55–72'. In absolute terms, labour force must be adjusted by 1 337 000. Referring to the adjustment of national survey data (Mikozensus) to national accounts (2003 figures) based on a correction of mini-jobs, the share of the absolute difference by the mentioned age groups is:

- 15–24: 25.8 %
- 25–54: 37.6 %
- 55–72: 36.6 %.

Table A.2

Conversion of employment projections in national account equivalent in Belgium

Participation rate (administrative concept) - Men

	2003	2004	2005	2010	2020	2030	2040	2050
15–19	18.6	18.8	19.1	19.8	19.7	19.6	19.6	19.7
20–24	69.6	70.5	71.2	71.6	71.9	71.9	71.8	71.9
25–29	91.4	91.2	91.2	91.8	92.1	92.0	92.0	92.0
30–34	93.1	93.4	93.7	93.5	93.9	93.9	93.9	93.9
35–39	93.3	93.8	93.9	94.6	94.7	94.7	94.7	94.7
40–44	92.7	92.8	93.1	94.3	94.6	94.8	94.8	94.8
45–49	91.5	91.5	91.6	92.8	94.5	94.5	94.6	94.6
50–54	86.6	86.7	86.5	87.5	90.5	90.9	91.0	91.0
55–59	70.9	71.1	71.0	72.7	76.7	77.3	77.5	77.4
60–64	34.5	35.0	35.6	35.7	38.2	39.3	40.2	40.6
Total 15–64 - Men	77.0	77.1	77.1	76.7	77.3	77.4	77.8	77.8
Total 15–64	71.0	71.5	71.7	72.8	74.9	75.2	75.5	75.5

Participation rate (AWG concept) - Men

	2003	2004	2005	2010	2020	2030	2040	2050
15–19	12.5	12.7	13.0	13.7	13.7	13.5	13.6	13.6
20–24	63.4	64.3	64.9	65.3	65.6	65.6	65.6	65.7
25–29	91.4	91.2	91.2	91.9	92.1	92.1	92.1	92.1
30–34	94.4	94.6	94.9	94.7	95.1	95.1	95.1	95.1
35–39	94.3	94.8	95.0	95.6	95.7	95.7	95.7	95.7
40–44	92.7	93.1	93.7	95.6	96.0	96.3	96.2	96.2
45–49	89.7	90.0	90.2	92.9	95.1	95.2	95.2	95.2
50–54	81.8	81.9	82.3	85.5	90.2	90.7	90.9	90.8
55–59	53.4	53.9	54.1	57.5	63.4	64.4	64.6	64.6
60–64	20.2	19.8	19.7	22.2	26.3	27.5	27.8	27.8
Total 15–64 - Men	72.8	73.0	73.0	73.0	73.9	74.1	74.6	74.5
Total 15–64	64.9	65.3	65.6	66.7	69.0	69.5	70.0	70.0

Differences: PR (administrative) - PR (AWG)

	2003	2004	2005	2010	2020	2030	2040	2050
15–19	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1
20–24	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3
25–29	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30–34	– 1.2	– 1.2	– 1.2	– 1.2	– 1.2	– 1.2	– 1.2	– 1.2
35–39	– 1.0	– 1.0	– 1.0	– 1.0	– 1.0	– 1.0	– 1.0	– 1.0
40–44	0.0	– 0.3	– 0.6	– 1.3	– 1.4	– 1.5	– 1.5	– 1.5
45–49	1.8	1.5	1.3	– 0.1	– 0.6	– 0.6	– 0.6	– 0.6
50–54	4.9	4.8	4.2	2.0	0.3	0.2	0.2	0.2
55–59	17.5	17.2	16.9	15.3	13.2	12.9	12.8	12.8
60–64	14.3	15.2	15.8	13.5	11.9	11.8	12.4	12.8
Total 15–64 - Men	4.2	4.2	4.2	3.7	3.4	3.3	3.2	3.3
Total 15–64	6.1	6.2	6.2	6.0	5.8	5.7	5.5	5.5

(Continued on the next page)

Table A.2 (continued) Conversion of employment projections in national account equivalent in Belgium

Participation rate (administrative concept) - Women

	2003	2004	2005	2010	2020	2030	2040	2050
15–19	15.3	15.4	15.4	15.7	15.7	15.5	15.6	15.6
20–24	64.4	65.6	66.5	66.9	67.3	67.3	67.2	67.4
25–29	86.7	87.0	86.9	86.8	87.4	87.4	87.4	87.4
30–34	86.1	85.8	86.0	88.7	89.1	89.1	89.1	89.1
35–39	85.2	85.8	86.8	86.9	89.0	89.4	89.4	89.4
40–44	82.6	83.8	84.5	87.5	89.2	89.4	89.4	89.4
45–49	77.0	77.6	78.6	84.4	87.4	88.8	89.1	89.1
50–54	62.6	63.8	64.8	72.9	82.7	84.2	84.3	84.3
55–59	47.5	48.6	49.6	57.4	72.0	73.8	74.9	75.1
60–64	13.6	16.9	19.5	29.1	37.6	39.5	38.9	38.0
Total 15–64 - Women	65.0	65.7	66.3	68.8	72.4	73.0	73.2	73.2

Participation rate (AWG concept) - Women

	2003	2004	2005	2010	2020	2030	2040	2050
15–19	8.4	8.5	8.5	8.8	8.8	8.6	8.7	8.7
20–24	53.0	54.2	55.2	55.6	56.0	55.9	55.9	56.0
25–29	82.8	83.1	83.0	82.9	83.5	83.5	83.4	83.4
30–34	80.6	80.3	80.5	83.2	83.5	83.5	83.5	83.5
35–39	79.1	79.7	80.7	80.8	82.9	83.4	83.3	83.3
40–44	76.1	77.5	78.4	81.9	83.7	83.9	83.9	83.9
45–49	67.7	69.2	70.9	78.2	81.4	83.0	83.3	83.3
50–54	54.6	56.1	57.3	66.7	77.8	79.5	79.7	79.7
55–59	29.2	30.5	31.8	41.6	58.8	60.8	62.0	62.2
60–64	7.2	8.0	8.6	11.5	19.9	22.4	23.1	23.2
Total 15–64 - Women	56.8	57.5	58.0	60.3	64.1	64.9	65.4	65.4

Differences: PR (administrative) - PR (AWG)

	2003	2004	2005	2010	2020	2030	2040	2050
15–19	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9
20–24	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4
25–29	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
30–34	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
35–39	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1
40–44	6.5	6.3	6.1	5.7	5.5	5.4	5.4	5.4
45–49	9.3	8.5	7.7	6.2	5.9	5.8	5.8	5.8
50–54	8.0	7.7	7.5	6.2	4.9	4.7	4.7	4.7
55–59	18.4	18.1	17.8	15.8	13.3	13.0	12.9	12.9
60–64	6.4	8.9	10.9	17.6	17.7	17.2	15.9	14.9
Total 15–64 - Women	8.2	8.2	8.2	8.4	8.2	8.1	7.9	7.8

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Table A.2 (continued) Conversion of employment projections in national account equivalent in Belgium

Administrative unemployment rate by age group (as % of population) - men

	2003	2004	2005	2010	2020	2030	2040	2050
15–19	4.8	4.7	4.6	4.3	4.3	4.3	4.2	4.3
20–24	15.9	15.5	15.4	14.6	14.2	14.2	13.8	13.8
25–29	12.4	12.2	12.0	11.3	10.5	10.7	10.7	10.5
30–34	9.3	9.2	9.2	9.4	8.9	8.8	8.8	8.7
35–39	7.9	7.9	7.9	8.0	8.0	7.6	7.8	7.8
40–44	7.2	6.8	6.4	5.6	6.0	5.6	5.6	5.7
45–49	7.3	6.8	6.5	4.7	4.4	4.5	4.2	4.4
50–54	9.1	9.0	8.3	5.7	3.9	4.1	3.9	3.9
55–59	13.8	13.4	13.0	11.3	9.0	8.7	8.7	8.7
60–64	10.7	11.2	11.6	11.4	9.8	9.2	9.3	9.2
Total 15–64 - Men	9.7	9.5	9.3	8.4	7.9	7.7	7.7	7.7
Total 15–64	10.1	9.9	9.7	9.1	8.5	8.4	8.3	8.3

AWG unemployment (as % of population) - men

	2003	2004	2005	2010	2020	2030	2040	2050
15–19	3.7	3.6	3.5	3.2	3.2	3.1	3.0	3.1
20–24	13.2	12.9	12.8	12.0	11.6	11.5	11.1	11.2
25–29	10.2	10.0	9.8	9.1	8.3	8.5	8.5	8.3
30–34	6.8	6.7	6.7	6.9	6.4	6.3	6.3	6.2
35–39	5.9	5.9	5.9	6.0	6.0	5.6	5.8	5.8
40–44	5.1	4.9	4.8	4.8	5.2	4.9	4.9	5.0
45–49	4.3	4.1	4.0	3.6	3.9	4.0	3.8	3.9
50–54	3.4	3.3	3.2	2.8	2.6	2.9	2.8	2.8
55–59	1.7	1.6	1.5	1.4	1.1	1.2	1.3	1.2
60–64	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2
Total 15–64 - Men	5.6	5.4	5.3	4.9	4.7	4.8	4.8	4.7
Total 15–64	5.3	5.2	5.1	4.7	4.5	4.5	4.6	4.5

Differences: UR (administrative) - UR (AWG)

	2003	2004	2005	2010	2020	2030	2040	2050
15–19	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
20–24	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
25–29	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
30–34	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
35–39	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
40–44	2.1	1.9	1.6	0.8	0.7	0.7	0.7	0.7
45–49	2.9	2.6	2.5	1.0	0.5	0.5	0.5	0.5
50–54	5.8	5.7	5.1	2.9	1.2	1.1	1.1	1.1
55–59	12.1	11.8	11.5	9.9	7.9	7.5	7.5	7.5
60–64	10.4	10.9	11.3	11.2	9.6	9.1	9.1	9.1
Total 15–64 - Men	4.1	4.0	4.0	3.5	3.1	3.0	2.9	3.0
Total 15–64	4.7	4.7	4.6	4.4	4.0	3.8	3.7	3.8

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Table A.2 (continued) Conversion of employment projections in national account equivalent in Belgium

Administrative unemployment rate by age group (as % of population) - women

	2003	2004	2005	2010	2020	2030	2040	2050
15–19	4.0	4.0	3.9	3.7	3.7	3.7	3.6	3.7
20–24	16.8	16.5	16.4	15.9	15.6	15.7	15.4	15.5
25–29	14.3	14.0	13.9	13.3	12.7	12.9	13.0	12.8
30–34	12.1	12.0	12.0	12.1	11.7	11.6	11.8	11.6
35–39	10.4	10.3	10.4	10.4	10.4	10.1	10.3	10.4
40–44	9.0	8.6	8.4	7.9	8.1	7.8	7.8	8.0
45–49	8.6	7.6	6.7	4.7	4.7	4.7	4.5	4.7
50–54	10.8	10.4	10.1	8.5	7.1	7.1	7.0	7.0
55–59	13.0	12.7	12.4	10.3	7.6	7.5	7.3	7.3
60–64	4.0	5.9	7.2	11.9	10.0	9.3	9.2	9.2
Total 15–64 - Women	10.5	10.3	10.1	9.7	9.1	9.0	8.9	9.0

AWG unemployment (as % of population) - women

	2003	2004	2005	2010	2020	2030	2040	2050
15–19	2.6	2.5	2.4	2.2	2.2	2.2	2.1	2.2
20–24	10.6	10.3	10.2	9.7	9.3	9.5	9.2	9.2
25–29	9.2	9.0	8.8	8.2	7.6	7.9	7.9	7.8
30–34	7.0	6.9	6.9	7.0	6.6	6.5	6.7	6.5
35–39	5.6	5.5	5.6	5.6	5.6	5.3	5.5	5.6
40–44	5.3	5.1	5.0	4.9	5.3	5.1	5.1	5.3
45–49	4.9	4.7	4.5	4.1	4.3	4.4	4.2	4.5
50–54	2.8	2.7	2.7	2.3	2.2	2.4	2.4	2.4
55–59	0.9	0.8	0.8	0.7	0.6	0.6	0.7	0.6
60–64	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Total 15–64 - Women	5.1	4.9	4.8	4.4	4.2	4.3	4.3	4.3

Differences: UR (administrative) - UR (AWG)

	2003	2004	2005	2010	2020	2030	2040	2050
15–19	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
20–24	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3
25–29	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1
30–34	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1
35–39	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
40–44	3.7	3.5	3.4	3.0	2.7	2.7	2.7	2.7
45–49	3.7	2.9	2.1	0.6	0.4	0.3	0.3	0.3
50–54	8.0	7.7	7.5	6.2	4.9	4.7	4.7	4.7
55–59	12.2	11.8	11.6	9.6	7.0	6.8	6.7	6.6
60–64	3.8	5.7	7.1	11.8	9.9	9.2	9.1	9.1
Total 15–64 - Women	5.4	5.4	5.3	5.3	4.9	4.7	4.6	4.7

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Table A.2 (continued) Conversion of employment projections in national account equivalent in Belgium

Total employment rate

	2003	2004	2005	2010	2020	2030	2040	2050
MEN - administrative								
15–59	70.6	71.0	71.2	72.6	74.2	74.4	74.3	74.4
15–64	67.3	67.7	67.8	68.3	69.5	69.6	70.2	70.1
15–71	62.3	62.7	63.0	63.6	63.0	62.0	63.0	63.2
MEN - AWG								
15–59	70.7	71.1	71.3	72.7	74.1	74.4	74.3	74.4
15–64	67.2	67.5	67.6	68.1	69.2	69.3	69.8	69.7
15–71	61.8	62.1	62.4	63.0	62.2	61.1	62.0	62.2
WOMEN - administrative								
15–59	58.1	59.0	59.7	63.3	67.6	68.2	68.2	68.3
15–64	54.5	55.4	56.1	59.0	63.3	64.0	64.3	64.1
15–71	49.5	50.3	51.1	54.0	56.3	55.7	56.4	56.6
WOMEN - AWG								
15–59	55.4	56.2	56.9	60.5	64.7	65.4	65.4	65.5
15–64	51.8	52.6	53.2	55.9	59.9	60.6	61.0	61.0
15–71	46.8	47.6	48.3	51.0	53.1	52.6	53.4	53.6
T15–71	1.6	1.7	1.7	1.8	2.0	2.0	2.0	1.9
TOTAL - administrative								
15–59	64.4	65.0	65.5	68.0	70.9	71.3	71.3	71.4
15–64	61.0	61.6	62.0	63.7	66.4	66.8	67.3	67.2
15–71	55.9	56.5	57.0	58.8	59.7	58.9	59.7	59.9
T15–71	1.6	1.7	1.7	1.8	2.0	2.0	2.0	1.9
TOTAL - AWG								
15–59	63.1	63.7	64.2	66.6	69.5	69.9	69.9	70.0
15–64	59.5	60.1	60.5	62.0	64.6	65.0	65.5	65.4
15–71	54.3	54.9	55.3	57.0	57.7	56.9	57.8	58.0
T15–71	1.6	1.7	1.7	1.8	2.0	2.0	2.0	1.9
Differences								
H15–59	– 0.2	– 0.1	– 0.1	0.0	0.1	0.0	0.0	0.0
F15–59	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
T15–59	1.3	1.3	1.3	1.4	1.4	1.4	1.4	1.4
H15–64	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.4
F15–64	2.8	2.8	2.9	3.1	3.4	3.4	3.2	3.1
T15–64	1.4	1.5	1.5	1.6	1.8	1.8	1.8	1.7
H15–71	0.6	0.6	0.6	0.6	0.8	0.9	0.9	1.0
F15–71	2.6	2.7	2.8	3.0	3.2	3.2	3.0	3.0
T15–71	1.6	1.7	1.7	1.8	2.0	2.0	2.0	1.9

Employment and unemployment - administrative concepts (in thousands)

	2003	2004	2005	2010	2020	2030	2040	2050
Employment	4 188.6743	4 248.91	4 296.73	4 490.87	4 619.64	4 456.64	4 355.14	4 281.35
Unemployment (including older persons unemployed)	684.558	673.63023	665.9124	634.45157	582.37482	548.79901	528.98243	524.05279
Unemployment rate	0.1404731	0.1368461	0.134185	0.1237877	0.1119518	0.1096405	0.1083065	0.1090549

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Table A.2 (continued) Conversion of employment projections in national account equivalent in Belgium

Employment and unemployment - AWG (in thousands)								
Unemployment 15–64	363 120	353 178	348 037	327 959	308 927	297 050	290 625	286 052
Difference: total (administrative) - total (AWG) (in thousands)								
Employment admin. - AWG 15–64	140	144	150	155	176	184	175	167
Employment admin. - AWG 15–71	124	125	130	134	145	146	141	135
	in % of AWG							
Employment admin. - AWG 15–64	3.47	3.5	3.62	3.58	3.96	4.3	4.18	4.05
Employment admin. - AWG 15–71	3.04	3.03	3.11	3.09	3.24	3.39	3.35	3.25
Difference: total (administrative) - total (AWG) (in thousands)								
Unemployment admin. - AWG 15–64	321	320	318	306	273	252	238	238
Unemployment admin. - AWG 15–71	321	320	318	306	273	252	238	238
	in % of AWG							
Unemployment admin. - AWG 15–64	88.52	90.73	91.33	93.45	88.52	84.75	82.02	83.2
Unemployment admin. - AWG 15–71	88.52	90.73	91.33	93.45	88.52	84.75	82.02	83.2

Source: Federal Plan Bureau, Belgium.

These shares are used for the adjustment of LFS data to national accounts.

Regarding the **steps of calculation of the adjustment for the year 2003**:

$$NLF_j^{NA} = Pop_j - LF_j^{NA}$$

$$NLF_j^{NA,k} = NLF_j^{LFS,k} \times \frac{NLF_j^{NA,Total}}{NLF_j^{LFS,Total}}$$

$$NLF_i^{NA,k} = NLF_i^{LFS,k} \times \frac{NLF_j^{NA,K}}{NLF_j^{LFS,K}} \quad \text{for } i = 15 \text{ to } 72$$

$$LF_i^{NA,k} = Pop_i^k - NLF_i^{NA,k}$$

$$ar_i^{NA,k} = \frac{LF_i^{NA,k}}{Pop_i^k}$$

where:

NLF	=	inactive population
Pop	=	population
LF	=	labour force
ar	=	activity rates
NA, LFS	=	national accounts, labour force
i	=	single year age group
j	=	age groups 15–24, 25–54, 55–72
k	=	sex.

After adjustment of labour force, the unemployment data have to be adjusted. Here, a differentiation by major age groups is not necessary as the difference between LFS data and NA data is not that large. Apart from this, calculation is identical to adjustment of labour force data.

Table A.3

Conversion of employment projections in national account equivalent in Germany

Employment (1 000 persons)								
	2003	**2004**	**2005**	**2010**	**2020**	**2030**	**2040**	**2050**
Labour force projections								
15–64	36 419	36 659	36 890	38 911	39 722	36 504	34 663	33 046
15–71	36 777	37 051	37 325	39 338	40 303	37 249	35 224	33 621
Adjusted series in NA equivalent, including mini-jobs: June 2005								
15–64	37 705	37 949	38 176	40 185	41 033	37 745	35 812	34 157
15–71	38 265	38 553	38 835	40 846	41 840	38 777	36 614	34 958
Difference: NA-equivalent adjusted — LF baseline projections								
15–64	1 286	1 290	1 286	1 274	1 311	1 242	1 149	1 111
15–71	1 488	1 502	1 511	1 508	1 537	1 528	1 389	1 337
Growth rates in employment (%)								
	2003	**2004**	**2005**	**2010**	**2020**	**2030**	**2040**	**2050**
Labour force projections								
15–64		0.7	0.6	1.3	– 0.5	– 1.0	– 0.2	– 0.6
15–71		0.7	0.7	1.3	– 0.4	– 0.9	– 0.3	– 0.6
Adjusted series in NA equivalent, including mini-jobs: June 2005								
15–64		0.6	0.6	1.3	– 0.5	– 1.0	– 0.2	– 0.6
15–71		0.8	0.7	1.2	– 0.4	– 0.9	– 0.3	– 0.6
Difference: NA-equivalent adjusted — LF baseline projections								
15–64		– 0.01	– 0.03	– 0.03	0.01	0.00	0.01	0.01
15–71		0.01	0.00	– 0.05	0.02	0.02	– 0.02	0.01

Table A.4

A comparison of employment figures in labour force and national account statistics in Germany, 2003

	Labour force statistic	**National accounts**
Labour force	40 766	42 103
Employment	36 777	38 265
Unemployment	3 989	3 838

$$UN^{NA,k} = UN^{LFS,k} \times \frac{UN^{NA,Total}}{UN^{LFS,Total}}$$

$$UN_i^{NA,k} = UN_i^{LFS,k} \times \frac{UN^{NA,k}}{UN^{LFS,k}} \text{ for } i = 15 \text{ to } 72$$

$$ur_i^{NA,k} = \frac{UN_i^{NA,k}}{LF_i^{NA,k}}$$

$$EM_i^{NA,k} = LF_i^{NA,k} - UN_i^{NA,k}$$

$$er_i^{NA,k} = \frac{EM_i^{NA,k}}{Pop_i^k}$$

where:

UN	=	unemployed
EM	=	employment
Pop	=	population
LF	=	labour force
ur	=	unemployment rates
er	=	employment rates
NA, LFS	=	national accounts, labour force
i	=	single year age group
k	=	sex

Turning to the **adjustment of projections**, as the adjustment of labour force data to national accounts is a shift of the level of participation rates, there should be no change of the projected development of these figures. Therefore, the difference between LFS activity, employment and

unemployment rates and the adjusted ones should be kept constant over the projection time horizon. The following formula shows the methodology of the adjustment of participation rates, which is identical to the adjustment of projected employment and unemployment rates.

$$diff\ ar_i^k = ar_i^{NA,k} - ar_i^{LFS,k}$$

$$ar_{i,t}^{NA,k} = ar_{i,t}^{LFS,k} + diff\ ar_i^k$$

where:

ar	=	activity rates
diff ar	=	difference activity rates
NA, LFS	=	national accounts, labour force statistics
k	=	sex
i	=	single year age group
t	=	time

As the formulas show, the adjustment is an additive. The increase of activity rates due to adjustment to national accounts is constant over time. Using a coefficient would lead to an increase of activity rates in absolute terms over time which does not seem to be plausible.

When **using the adjusted figures** for calculations on projected GDP and productivity, it is important to use the figures' 'employment total' which is the sum of employment of all ages. It would not be correct to use only the employment in the age bracket 15–65.

Table A.5

Comparison between adjusted and non-adjusted (Economic and Financial Affairs DG) figures

Participation rate by age groups

Adjusted

Age	2003	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
15–19	34.9	35.8	37.6	36.4	37.0	36.5	36.5	36.6	36.7	36.8	36.7
20–24	72.5	72.9	73.0	73.4	73.2	73.3	73.2	73.2	73.2	73.2	73.2
25–29	81.8	83.0	85.4	85.4	85.6	85.5	85.5	85.5	85.5	85.5	85.5
30–34	87.9	88.1	88.2	89.7	89.7	89.8	89.8	89.8	89.8	89.8	89.8
35–39	89.2	89.9	90.8	90.7	91.9	91.9	92.0	91.9	92.0	92.0	92.0
40–44	90.0	90.3	91.6	92.2	92.2	93.2	93.2	93.2	93.2	93.2	93.2
45–49	89.3	90.4	91.3	92.4	93.0	93.0	93.8	93.8	93.8	93.8	93.8
50–54	84.8	85.8	89.7	90.9	91.9	92.5	92.5	93.3	92.8	92.6	92.6
55–59	70.6	71.9	79.4	83.1	83.7	84.5	84.8	85.2	85.7	85.3	84.9
60–64	29.9	30.6	44.8	55.7	57.9	58.3	58.3	57.8	59.1	59.1	59.2
65–71	9.3	9.8	9.5	11.6	12.0	12.1	12.1	11.7	11.3	12.0	11.9
15–64	74.6	75.6	79.4	80.7	80.9	80.5	80.4	81.1	81.3	81.0	80.9
15–71	68.2	68.4	71.4	74.0	73.1	71.8	70.1	69.8	71.5	72.4	71.6
15–24	54.1	54.5	56.3	55.8	56.0	55.6	55.2	55.3	55.7	55.8	55.8
25–54	87.5	88.3	89.7	90.4	90.9	91.1	91.3	91.5	91.4	91.3	91.3
55–64	47.8	49.7	64.1	70.3	71.9	71.4	70.0	71.1	72.9	72.4	71.7
15–54	80.5	81.1	82.7	83.4	83.8	83.8	83.8	83.8	83.7	83.6	83.7

Difference

Age	2003	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
15–19	5.7	5.7	5.5	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6
20–24	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
25–29	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
30–34	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
35–39	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
40–44	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
45–49	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
50–54	1.7	1.7	1.6	1.6	1.7	1.7	1.7	1.7	1.7	1.7	1.7
55–59	1.6	1.5	1.6	1.5	1.5	1.6	1.6	1.5	1.6	1.5	1.6
60–64	3.5	3.5	3.4	3.4	3.4	3.4	3.4	3.5	3.4	3.4	3.4
65–71	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
15–64	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1
15–71	2.2	2.2	2.1	2.1	2.2	2.2	2.3	2.3	2.2	2.2	2.2
15–24	4.0	4.0	3.9	3.9	3.9	3.9	4.0	4.0	3.9	3.9	3.9
25–54	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
55–64	2.6	2.6	2.4	2.4	2.4	2.5	2.6	2.5	2.5	2.5	2.5
15–54	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9

Annex 4. The cohort methodology to project labour force developments

Overall approach of the cohort methodology

The dynamic cohort method used in the Economic and Financial Affairs DG AWG projections ([1]) is based on a model that calculates the rates of entry and exit from the labour market for each of the latest available generations ([2]). This is the same methodology already used by the OECD ([3]), although our estimates differ from previous OECD estimates in two ways. Firstly, because we use the new Eurostat population projections, and secondly because we use data based on single years of age rather than the five year-age groups used by the OECD (referring to 2000 figures). As in the OECD, our projections are based on fixed exit and entry rates, based on the last observed values of these rates (but we use an average over the period 1997–2003 and the OECD only the rates observed in 2000) ([4]).

The dynamic cohort approach is based on the estimates of the (net) exit and entry rates into the labour market of a 'synthetic' generation/cohort. The cohort is 'synthetic' because, due to the lack of true longitudinal data on participation behaviour of each individual, we do not really observe the same person over years but we assume that those aged x + 1 at year t + 1 are representative of the same generation (aged x at time t) observed one year later. Due to the lack of specific information on individual behaviour patterns, this assumption neglects inflows and outflows from the labour market that cancel each other out ([5]).

The participation rate projections are produced by applying these entry and exit rates observed over the period 1997–2003 to each projected (by Eurostat) single-year cohort of the working age population over the period 2004–50. These entry and exit rates, calculated with reference to the latest available data (1997–2003), are kept constant over the entire period of projections. Thus, for example, we calculate the entry (or exit) rate of persons aged X, for X = 15 to 71 (and thus of the generation born in 2002-X, that is in the last 56 years) and apply this rate to persons aged X in 2004, 2005, 2006 and so on up to 2050 to get projections of future participation rates. This is different from the static projection method, which keeps constant over the period of projection the participation rate of persons aged X. In essence, in this way the method takes implicitly into account that women belonging to any given generation or cohort have their own specific level of participation, and this is usually higher at all ages than the corresponding level of participation of older cohorts. This participation gap between subsequent generations reflects not only socio-cultural factors but also individual characteristics, such as number of children and level of education. Thus, the cohort approach used in the simulation tends to produce an autonomous increase of female participation — referred to as a 'cohort effect' — corresponding to the gradual replacement of currently older women by younger women.

The calculation of entry rates

We calculate the rate of entry into the labour market for people previously inactive, as follows.

The number of persons who enter the labour market, while taking into account the upper limit on participation (the maximum amount of people in the labour force is

([1]) See Carone (2005).
([2]) The method is a dynamic version of the Latulippe (1996) methodology, developed by Sherer (2003).
([3]) See Burniaux et al. (2003).
([4]) Recently, a labour force projection exercise was carried out by the Australian Government, along the same methodological approach but using time varying entry and exit rates that allow entry and exit rates to evolve over time. These time varying rates were calculated by using Richards curves (which are very flexible growth curves that can encompass a logistic curve, a Gompertz or other growth curves according to the value of their parameter) and non-linear least squares estimates subject to maximum and minimum limits on the long-run participation rates. For details see Australian Productivity Commission (2005).

([5]) This means, for example, that if in year t there are 100 persons aged x in the labour force and that the years after when aged x + 1 these same persons leave the labour force (for whatever reason, such as being discouraged, have died or emigrated), but they are replaced by 100 different persons aged x + 1, previously out of the labour force, we do not observe any change in the size of our 'synthetic cohort'. As a consequence we calculate net rates of exit and entry that are equal to zero, while the actual (gross) value is 100 %.

the number of persons of working age for each age-group) can be expressed as:

$$NLF_x^{t+1} = (Popmax_{wa} - LF_x^t) - (Popmax_{wa} - LF_{x+1}^{t+1})$$

where $LF_x^t + NLF_{x+1}^{t+1} \leq Popmax_{wa}$

where *NLF* is the number of people expected to become active between age x and x + 1, $Popmax_{wa}$ is the maximum population of working age that can potentially enter the labour market (which is usually a bit less than the overall civilian population of working age, due, for example, to illness/inability) and *LF* is the number of active persons (in the labour force) aged x in year t and aged x + 1 in year t + 1.

By multiplying and dividing for the population aged x at time t (which is supposed to remain the same as the population aged x + 1 at time t + 1), we get:

$$NLF_x^{t+1} = [(\mathrm{Pr}_{\max} - \mathrm{Pr}_x^t) - (\mathrm{Pr}_{\max} - \mathrm{Pr}_{x+1}^{t+1})] \times Pop_x^t$$

where Pr_{max} is the upper limit to the participation rate (we assume 0.99 for both male and female ([1])). Thus, we can calculate the rate of entry (*Ren*) by dividing the number of people expected to become active by the number of people inactive at time t, that is:

$$Ren = \frac{NLF_x^{t+1}}{Pop_{\max_{wa}} - LF_x^t} =$$

$$[(\mathrm{Pr}_{\max} - \mathrm{Pr}_x^t) - (\mathrm{Pr}_{\max} - \mathrm{Pr}_{x+1}^{t+1})] \times \frac{Pop_x^t}{Pop_{\max_{wa}} - LF_x^t}$$

which, taking into account that $PR_x^t = \frac{Pop_x^t}{LF_x^t}$ and

$\mathrm{Pr}_{\max} = \frac{Popmax_{wax}^t}{Pop_x^t}$ can be reformulated as:

$$Ren_{x+1} = [(\mathrm{Pr}_{\max} - \mathrm{Pr}_x^t) - (\mathrm{Pr}_{\max} - \mathrm{Pr}_{x+1}^{t+1})] \times \frac{1}{(\mathrm{Pr}_{\max} - \mathrm{Pr}_x^t)}$$

or $Ren_{x+1} = \left[1 - \frac{(\mathrm{Pr}_{\max} - \mathrm{Pr}_{x+1}^{t+1})}{(\mathrm{Pr}_{\max} - \mathrm{Pr}_x^t)}\right] \geq 0$

or $Ren_{x+1} = \left[\frac{\mathbf{Pr}_{x+1}^{t+1} - \mathbf{Pr}_x^t}{\mathbf{1} - \mathbf{Pr}_x^t}\right] \geq \mathbf{0}$ when $\mathrm{Pr}_{max} = 1$

And rearranging we obtain the analytical formulation used for projecting participation rates. Thus, projections of participation rates based on these entry rates are:

$$\boldsymbol{PR_{x+1}^{t+1} = Ren_{x+1} \times (PRmax - PR_x^t) + PR_x^t]}$$

Thus, projections of participation rates for each single-year cohort (x + 1) can be calculated by applying the entry rates observed in a given year or period (we have used the average of the entry rates observed over the period 1997–2003, that is the average of six rates) over the period of projections (t = 2004–50).

The calculation of exit rates

In the same way, when participation rates for two adjacent single-year age groups are falling, we can calculate the **exit rate** (that is the net reduction in the labour force relative to the number of people who were initially in the labour force in the same cohort the year before) as follows.

The number of persons that leave the labour market at time t + 1 is equivalent to:

$$OP_x^{t+1} = LF_x^t - LF_{x+1}^{t+1}$$

where *OP* is the number of individuals expected to become inactive between age x and x + 1, and *LF* is the number of active persons (in labour force) aged x in year t and aged x + 1 in year t + 1.

By multiplying and dividing for the population aged x at time t, which is supposed to remain the same as the population aged x + 1 at time t + 1, we get:

$$OP_x^{t+1} = (PR_x^t - PR_{x+1}^{t+1}) \times Pop_x^t$$

where *PR* are the participation rates.

Thus, we can calculate the (conditional) rate of exit (*Rex*) by dividing the number of people that become inactive at time t + 1 by the number of people active at time t, that is:

([1]) Burniaux et al. (2003) used as maximum value for participation rate (PR_{max}) 0.99 for male and 0.95 for female.

$\boldsymbol{Rex} = \dfrac{OP_x^{t+1}}{LF_x^t} = (PR_x^t - PR_{x+1}^{t+1}) \times \dfrac{Pop_x^t}{LF_x^t}$, which can also be rearranged as:

$$\boldsymbol{Rex} = \frac{OP_x^{t+1}}{LF_x^t} = 1 - \frac{PR_{x+1}^{t+1}}{PR_x^t}$$

Thus, we can use this ***Rex*** to project participation rates of older workers as:

$$\boldsymbol{PR_{x+1}^{t+1} = (1 - Rex_{x+1}) \times PR_x^t} \text{ and}$$

$$\boldsymbol{PR_{x+n}^{t+n} = (1 - Rex_{x+1})(1 - Rex_{x+2})(1 - Rex_{x+3}) \times \ldots \times (1 - Rex_{x+n-1}) \times PR_x^t}$$

Annex 5. Methodology to calculate the average exit age from the labour force ([1])

Average exit age from the labour force

In order to estimate the 'average exit age' (or effective retirement age) from the labour force we have used the methodology employed by the European Commission, which is a probability model using the single-year cohort participation rates. The 'average exit age' is included in the list of the structural indicators to monitor progress towards Lisbon and Barcelona targets (in particular: 'the progressive increase of about five years in the effective average age at which people stop working in the European Union by 2010') ([2]) and originally applied to five year-age cohorts. The methodology is based on the comparison of labour force participation rates over time.

The conditional probability for each person to stay in the labour force at age *a* in the year *t*, (conditional upon stay in labour force in year *t-1*), can be calculated using the observed activity rates (Pr) as follows:

$$\underline{\textit{Probability to stay}} = cProb_{a,t}^{stay} = \frac{\Pr_a^t}{\Pr_{a-1}^{t-1}} \text{ where}$$

$$0 \le c\Pr ob_{a,t}^{stay} \le 1$$

Thus, at time *t*, the conditional probability for each person to exit at age *a* ($c\Pr ob_{a,t}^{ex}$) is simply equal to:

$$\underline{\textit{Probability of exit}} =$$

$$= cProb_{a,t}^{ex} = 1 - \frac{\Pr_a^t}{\Pr_{a-1}^{t-1}} = 1 - cProb_{a,t}^{stay} \text{ where}$$

$$0 \le c\Pr ob_{a,t}^{ex} \le 1$$

If we assume that nobody will retire before a minimum age *m* (we assume *m* = 50), the (unconditional) probability that any person will still be in the labour force (that is the probability of not retiring before a given age *a*) can be calculated as the product of all the conditional probabilities to stay from age *m* to age *a-1*:

$$\underline{\textit{Probability of not retiring before}} =$$

$$= Prob_{a,t}^{notret} = \prod_{i=m}^{a-1} cProb_i^{stay}$$

Thus, the probability of retiring at age *a* can be calculated as the product of the unconditional probability of not retiring from age *m* to *a* and the (conditional) probability of exit, that is:

$$\underline{\textit{Probability of retiring}} =$$

$$= Prob_{a,t}^{ret} = Prob_{a,t}^{notret} cProb_{a,t}^{ex}$$

By assuming that everybody will be retired by a given age *M* (given data limitation we have to assume that *M* = 71), the sum of the probability of retiring between the minimum age *m* and the maximum age *M* is equal to 1:

$$\sum_{a=m}^{M} \Pr ob_a^{ret} = 1$$

The 'average exit age' or effective age of retirement from the labour market is then calculated as the weighted sum of the retirement ages (between the minimum and the maximum age of retirement, say 50–71), where the weights are the probability of retiring at each age *a*, as follows:

$$\underline{\textit{Average exit age}} = \text{Aea} = \sum_{a=m}^{M} \Pr ob_a^{ret} \times a$$

([1]) See Carone (2005).
([2]) For details of this method see: Latulippe (1996), Scherer (2002), European Commission (2003) and Burniaux et al. (2003).

Annex 6. Methodology to take account of changes in the healthcare status of elderly citizens — Approach I to project healthcare spending

Projection methodology for the 'pure ageing' scenario based on the 'expansion of morbidity' hypothesis

In the **pure ageing** scenario, all gains in life expectancy are assumed to be spent in bad health while the number of years spent in good health remains constant. The extension of lifespan will not affect an average individual's health status at any given age, and consequently his or her age-related expenditure on healthcare will not change over time. One can approximate this situation by assuming that healthcare cost per capita remains constant in GDP per capita-adjusted terms over the whole projection period. Based on this assumption, the projection is then made in the following manner.

First, for the time horizon of the projection exercise (2004–50), the age-related expenditure profiles (showing the average healthcare spending per capita for each year of age (from 0 to 100 or less, according to data availability)) are assumed to grow in line with the same two cost assumptions as used in the 2001 exercise: GDP per capita and GDP per worker (based on the assumptions agreed by the AWG for the 2005 budgetary projection exercise). Therefore:

$$c'_{g,a,n} = c_{g,a}\Delta Ypc_n \qquad [1a]$$

where:

$c'_{g,a,n}$ is cost per capita of a person of a given gender g and age a in a given year n of the projection period adjusted to the GDP per capita growth;

$c_{g,a}$ is constant cost per capita of a person of a given gender g and age a;

ΔYpc_n is GDP per capita rate growth in year n;

$$\Delta Ypc_n = \left(\frac{Y_n}{\sum p_{g,a,n}} - \frac{Y_{n-1}}{\sum p_{g,a,n-1}}\right) \Big/ \left(\frac{Y_{n-1}}{\sum p_{g,a,n-1}}\right)$$

Y_n is GDP in year n;

$p_{g,a,n}$ is the projected population of a given gender g and age a in a given year n.

Or alternatively:

$$c'_{g,a,n} = c_{g,a}\Delta Ypw_n \qquad [1b]$$

where:

ΔYpw_n is GDP per worker rate growth in year n,

$$\Delta Ypw_n = \left(\frac{Y_n}{\sum w_{g,a,n}} - \frac{Y_{n-1}}{\sum w_{g,a,n-1}}\right) \Big/ \left(\frac{Y_{n-1}}{\sum w_{g,a,n-1}}\right)$$

$w_{g,a,n}$ is the projected number of people employed of a given gender g and age a in a given year n.

Secondly, this unit cost for each year is multiplied by the projected population of each year of age (using the baseline population projection outlined in Chapter 1):

$$S_{g,a,n} = c'_{g,a,n}p_{g,a,n} \qquad [2]$$

where:

$S_{g,a,n}$ is spending on healthcare realised by people of a given gender g and age a in a given year n.

Next, the resulting total healthcare spending is divided by the GDP projected using the rates of change agreed by the Ageing Working Group in order to obtain share of healthcare expenditure in GDP:

$$T_n = \frac{\sum S_{g,a,n}}{Y_n} \qquad [3]$$

where:

T_n is the share of total healthcare spending in GDP in a given year *n*.

Projection methodology for scenarios on health status

To capture possible changes in the health status (morbidity) of populations over time, an additional assumption is required to run the **constant health** scenario based on the 'dynamic equilibrium' hypothesis and the **improved health** scenario based on the 'compression of morbidity' hypothesis. This is achieved by 'linking' changes in life expectancy to changes in morbidity (proxied by the age-related expenditure profile). In other words, for each year and for each age/gender, the age-related expenditure profile is shifted outwards, providing modified values of cost per capita, which are then applied in the same manner as the pure ageing scenario described above. As regards the scale of the outward shift in the age-related expenditure profile:

- for the constant health scenario, it is directly proportional to the increase in life expectancy for each cohort;
- in the improved health scenario, the same outward shift is assumed to be multiplied by a factor of two.

This additional procedure can be explained in more detail (*to clarify, a concrete numerical example is presented in brackets*).

First, the change in life expectancy in relation to the base year is found for each year of the projections (*for example, total life expectancy for a 50-year-old man in Austria is expected to increase from 29.15 years in 2004 to 33.07 years in 2030, thus by 3.92 years*) ([1]):

$$\Delta e_{g,a,n} = e_{g,a,n} - e_{g,a,o} \qquad [4]$$

where:

$e_{g,a,n}$ is life expectancy of an average person of a given gender *g* and age *a* in year *n*.

Second, for each year of projection, the respective reference age on the original age profile curve is obtained by subtracting that change from the concerned age cohort ([2]). This is done only for those sections of the age-profile where the cost per capita is growing ([3]) (*for example, for the age cohort of 50 years old, the value of cost per capita for that age in 2030 will be the same as the value of cost per capita for the age cohort of* $50 - 3.92 = 46.08 \approx 46.1$ *years in 2004*).

Third, the precise value of cost per capita assigned to that reference age is picked up:

$$c_{g,a,n} = e_{g,a-\Delta e_{g,a,n},o} \qquad [5]$$

where:

$c_{g,a,n}$ is cost per capita assigned to a person of a given gender *g* and age *a* in a given year *n* of the projection period;

$c_{g,a-\Delta e_{g,a,n},o}$ is cost per capita assigned to a person of a given gender and age $a - \Delta e_{g,a,n}$ (specified with a precision to a decimal part of a year) in the base year.

Fourth, the resulting value of cost per capita serves then as an input value to the basic calculations presented earlier in equations [1] to [3].

The procedure described above is used to run the projections according to constant health scenario. In the improved health scenario, the shift of the age profile is

([1]) In the constant health scenario, the total number of years spent in bad health during a person's lifetime is assumed to remain the same while life expectancy increases, so the morbidity rate must evolve in line with mortality rate for each age cohort. Thus, if between time *t* and *t + 1*, total life expectancy increases by *n* years for a cohort of age *x*, healthy life expectancy for that very same age cohort must also increase by *n* years in order for the dynamic equilibrium hypothesis to be valid. If healthy life expectancy increases by *n* years, then the health status (and consequently healthcare spending) of this cohort of age *x* at time *t + 1* will be the same as the health status (and health care spending) of the cohort of age *x-n* at time *t*.

([2]) The changes in life expectancy and thus shifts in the age profile from one year to another are sometimes very small (in a range of a 10th part of a year). However, the data gathered by the Member States do not provide detailed information on costs per capita by single year of age (the most detailed item available is a five-year average), so an additional calculation needs to be performed. To solve this problem, the intermediate values can be obtained by simple extrapolation/trend-smoothening method from the existing average figures. This way, it is possible to assign a concrete value of cost per capita to each 10th part of a year of age.

([3]) For the young and the oldest old the reference age remains the same over the whole projection period.

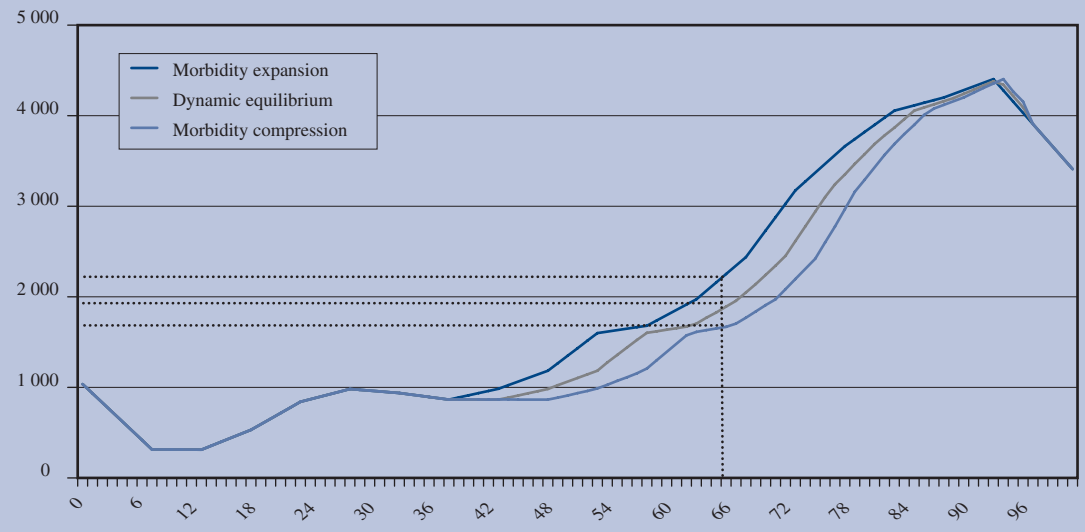
twice as large as in dynamic equilibrium scenario. Thus, equation [5] may be rewritten in the following way:

$$c_{g,a,n} = c_{g,a-2\Delta e_{g,a,n},o} \qquad [5a]$$

The outward shift in the age-related expenditure profile can be displayed graphically as shown below, using Austria as an example. It illustrates the actual difference in healthcare cost per capita at the end of the projection period between the three scenarios. As an example, the points where the dotted vertical line crosses the age curves projected on the vertical axis indicate the healthcare cost per capita of a 65-year-old person in 2050 (after the curves have shifted) according to each one of the three scenarios ([1]).

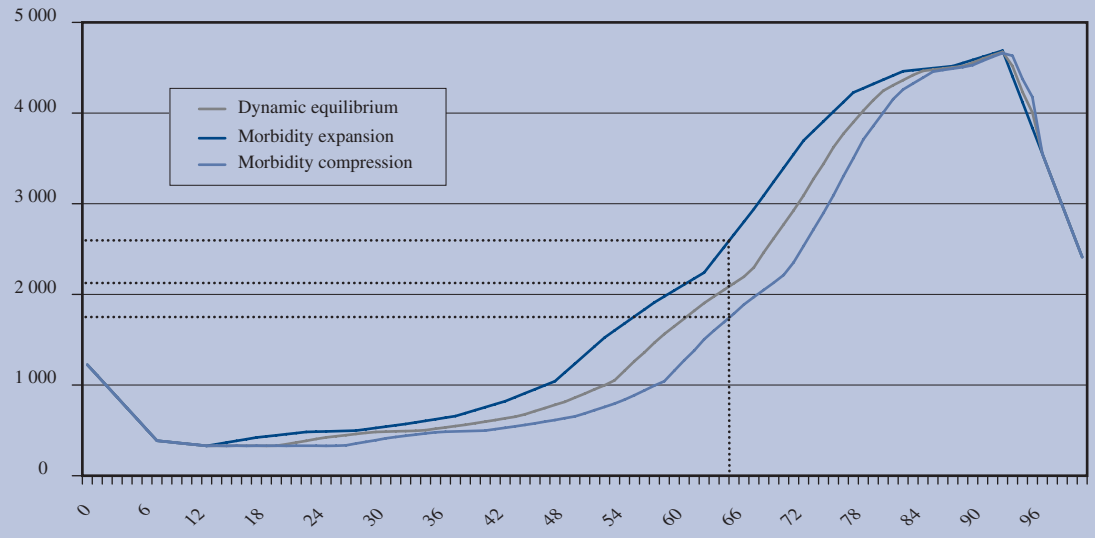
([1]) As can be seen in the graph, an additional limitation has been put to the 'movements' of the age profile. The cost per capita has been expressly kept constant over the projection period for the sections of the age profile where the cost per capita is decreasing, i.e. for ages from 0 to 15–20 and from 90 to 100 + for men, and from 0 to 35–40 and from 90 to 100 + for women (The ages quoted are just an approximation presented as an illustration of the issue. In fact, the age at which unit cost of healthcare starts increasing (for the young) and falling (for the old) varies across countries. Each country's calculations have taken into consideration respective data). It has been done in order to avoid the counter-intuitive results of increasing cost per capita over time while the age profile is shifting outwards, which would be the case if the negatively sloped sections of the curve also shifted.

Graph A.1: **Age profile for males: expenditure on healthcare per capita in 2050 (in euro)**



Source: Economic and Financial Affairs DG.

Graph A.2: **Age profile for females: expenditure on healthcare per capita in 2050 (in euro)**



Source: Economic and Financial Affairs DG.

Annex 7. Coverage of the projection exercise on healthcare and long-term care: definitions and data sources

1. Definition of healthcare expenditure

Member States are recommended to use the OECD System of Health Accounts classification in which the concept of healthcare (including both acute healthcare and long-term care) is defined as follows ([1]): Activities of healthcare in a country comprise the sum of activities performed either by institutions or individuals pursuing, through the application of medical, paramedical and nursing knowledge and technology, the goals of:

- promoting health and preventing disease;
- curing illness and reducing premature mortality;
- caring for persons affected by chronic illness who require nursing care;
- caring for persons with health-related impairment, disability, and handicaps who require nursing care;
- assisting patients to die with dignity;
- providing and administering public health;
- providing and administering health programmes, health insurance and other funding arrangements.

Within this boundary, general public safety measures, such as technical standards monitoring and road safety, are not considered as part of expenditure on health. Activities such as food and hygiene control and health research and development are considered health related, but are not included in total health expenditure.

Total healthcare can be divided into the functional components of healthcare (HC) and healthcare-related (HC.R) items according to the International Classification for Health Accounts (ICHA) which is presented in the manual, *A system of health accounts* (see Table A.5).

2. Definition of long-term care expenditure

Long-term care includes a wide range of activities. It includes both the services that may be classified as part of healthcare and those that enter the scope of the broadly defined social protection.

The concept of long-term care and definition of long-term care recipients is based on the definition presented in the pilot questionnaire, 'Data on long-term care recipients', prepared by the OECD in the framework of their project to collect comparable data on long-term care expenditure ([2]).

Long-term care is a range of services required by persons with a reduced degree of functional capacity, physical or cognitive, and who are consequently dependent on help with basic activities of daily living (ADL), such as bathing, dressing, eating, getting in and out of bed or chair, moving around and using the bathroom. The underlying physical or mental disability can be the consequence of chronic illness, frailty in old age, mental retardation or other limitations of mental functioning, such as cognitive capacity.

This central personal care component is frequently provided in combination with help with basic medical services such as help with wound dressing, pain management, medication, health monitoring, prevention, rehabilitation or services of palliative care. Depending on the setting in which long-term care is provided and/or national programme design, long-term care services can include lower-level care of home help or help with instrumental activities of daily living (IADL) more

([1]) OECD (2000), *A system of health accounts.* Version 1.0, p. 42.

([2]) OECD (2005), 'Data on long-term care recipients', pilot questionnaire, p. 3.

Table A.6

ICHA–HC classification of functions of healthcare

ICHA code		Functions of healthcare
HC.1		Services of curative care
HC.2		Services of rehabilitative care
HC.3		Services of long-term nursing care
HC.4		Ancillary services to healthcare
HC.5		Medical goods dispensed to outpatients
	(HC.1–HC.5)	*Total expenditure on personal health*
HC.6		Services of prevention and public health
HC.7		Health administration and health insurance
	(HC.6–HC.7)	*Total expenditure on collective health*
	(HC.1–HC.7)	*Total current expenditure*
ICHA code		**Health-related functions**
HC.R.1		Capital formation of healthcare provider institutions
HC.R.2		Education and training of health personnel
HC.R.3		Research and development in health
HC.R.4		Food, hygiene and drinking water control
HC.R.5		Environmental health
HC.R.6		Administration and provision of social services in kind to assist living with disease and impairment
HC.R.7		Administration and provision of health-related cash benefits

Source: OECD (2000), *A System of Health Accounts*, pp.114–115.

generally, such as help with the activities of housework, meals, shopping, transport and social activities.

Long-term care is provided in a variety of settings. It can be provided at home and in the community, or in various types of institutions, including nursing homes and long-stay hospitals. Mixed forms of residential care and (internally or externally provided) care services exist in the form of assisted living facilities, sheltered housing, and so on, for which a wide range of national arrangements and national labels exist.

The notion of long-term care services usually refers to services delivered over a sustained period of time. The period of at least six months, which is the most often mentioned as the threshold, may be used as the guiding line in this exercise.

For persons with ADL restrictions who are cared for at home, the numbers of recipients include recipients of consumer-choice programmes, care allowances and other social benefits to care assistants, including family and friends, that are granted to care recipients or their households for the primary purpose of supporting care activity at home. Services for persons cared for at home may include community care services such as daycare centres and respite care to support informal carers. However, only care services for which external payment is made should be included. Services provided free-of-charge within households, for example by relatives, are excluded from recipients and expenditure data, just as domestic work is excluded from the economic accounts.

3. The distinction between healthcare and long-term care expenditures

According to the SHA classification and in line with the above discussion, in order to divide total healthcare into acute healthcare and long-term care for the sake of long-term budgetary projections, the following distinction should be used.

Acute healthcare includes:

- services of curative care (HC.1);
- services of rehabilitative care (HC.2);
- ancillary services to healthcare (HC.4);
- medical goods dispensed to outpatients (HC.5);
- prevention and public health services (HC.6);
- part of health administration and health insurance (HC.7), related to the above functions proportion-

ately to these expenditures out of total acute healthcare expenditures (this component includes public reimbursement of private payments for healthcare services and goods);

- investment in medical facilities (HC.R.1);
- a component of healthcare which is reported in national statistics as part of social protection (see section 1.4.1 below) ([1]).

Long-term care includes:

- services of long-term nursing care (HC.3);
- part of health administration and health insurance (HC.7), related to the abovementioned function proportionately to these expenditures out of total long-term care expenditures (this component includes public reimbursement of private payments for healthcare services and goods);
- components of long-term care which are reported in national statistics as social protection (see section below) ([2]).

([1]) Further healthcare-related items (HC.R.2–HC.R.7) are not included in the definition of health or long-term care (also in the context of health expenditure). The only exception is income maintenance and support in cash which, as an element of the social protection, is classified within HC.R.7 and should be taken into account while calculating acute healthcare expenditure.

([2]) Note that the first two bullets are components of long-term care reported as health expenditure in national statistics or international data reporting.

4. Acute health and long-term care components in social expenditure

In order to distinguish acute health and long-term care components of social expenditure, Member States are recommended to follow the European system of integrated social protection statistics (Esspros) classification ([3]). The Esspros database classifies social benefits according to eight main functions of social protection.

The acute healthcare component: based on that classification, an extra component of acute healthcare expenditure, which is not included in the ICHA–HC classification of healthcare ([4]), but which should be included in the calculations of healthcare expenditure, is **income maintenance and support in cash** in connection with physical or mental illness, excluding disability, which is classified within the sickness/healthcare function (1).

The long-term care component: on the other hand, expenditure on long-term care should include some kinds of benefits, which are not classified in the ICHA–HC classification, but are classified as social protection benefits within disability function (2) and old age function (3). In particular, the most relevant benefits classified within the **disability function** (2) to be included in the long-term care expenditure are the following ([5]).

([3]) Eurostat (1996), *Esspros manual 1996*.

([4]) As stated earlier, it is classified as part of the HC.R.7, which is not considered as a component of 'pure' healthcare.

([5]) Eurostat (1996), pp. 55–56.

Table A.7

The functions of social protection

Function	Brief description
1. Sickness/Healthcare	Income maintenance and support in connection with physical or mental illness, excluding disability. Healthcare in ended to maintain, restore or improve the health of the people protected irrespective of the origin of the disorder.
2. Disability	Income maintenance and support in cash or kind (except healthcare) in connection with the inability of physically or mentally disabled people to engage in economic and social activities.
3. Old age	Income maintenance and support in cash or kind (except healthcare) in connection with old age.
4. Survivors	Income maintenance and support in cash or kind in connection with the death of a family member.
5. Family/children	Support in cash or kind (except healthcare) in connection with the costs of pregnancy, childbirth and adoption, bringing up children and caring for other family members.
6. Unemployment	Income maintenance and support in cash or kind in connection with unemployment.
7. Housing	Help towards the cost of housing.
8. Social exclusion not elsewhere classified	Benefits in cash or kind (except healthcare) specifically intended to combat social exclusion where they are not covered by one of the other functions.

Source: Eurostat (1996), Esspros *manual 1996*, p. 37.

- Care allowance: benefit paid to disabled people below standard retirement age as established in the reference scheme who need frequent or constant assistance to help them meet the extra costs of attendance (other than medical care). The benefit must not be a reimbursement of certified expenditure, which would be classified as benefit in kind.

- Accommodation: provision of lodging and possibly board to disabled people in appropriate establishments.

- Assistance in carrying out daily tasks: practical help provided to disabled people to assist them with daily tasks. Home help is included in this category, as well as the payment of an allowance to the person who looks after the disabled person.

Similarly, benefits classified within the **old age function** (3) to be taken into consideration include the following items ([1]).

- Accommodation: provision of lodging and sometimes board to retired people either in specialised institutions (old people's homes, nursing homes) or staying with families. The provision can be of temporary or indefinite duration.

- Assistance in carrying out daily tasks: practical help provided to old people to assist them with daily tasks. Home help is included in this category, as well as the payment of an allowance to the person who looks after an elderly person.

5. Definition of the public component of expenditure on acute healthcare and long-term care

As the projections have a clear public finance focus, and investigate the long-term sustainability of the public finances, projections should be run of public expenditure on health and long-term care only. Therefore, the following definitions of public expenditure, consistent with the system of health accounts classifications, are recommended to be followed.

Public expenditure on healthcare is health expenditure incurred by public funds. Public funds are State, regional and local government bodies and social security schemes. Public capital formation on health includes publicly financed investment in health facilities plus capital transfers to the private sector for hospital construction and equipment ([2]). Public expenditure on healthcare should therefore include:

- publicly-funded healthcare which is provided by both publicly and privately owned providers (where public funds are provided by State, regional and local government bodies, and social security schemes);

- public capital expenditure in the health sector. This includes publicly-financed investment in health facilities; capital transfers to the private sector for hospital construction and equipment; and subsidies from the government to health service providers;

- health funds for State employees.

In the case of **long-term care**, the notion of 'public' refers to services that are funded from public sources. A programme is considered as public in this sense, even in cases where recipients have to contribute to a substantial part of the programme funding in the form of private cost sharing.

Public sources are government administrations at various levels of government (local, regional, national), or social security/social insurance programmes. Recipients under public programmes may receive services from either public or private providers, or both ([3]).

6. Additional data requirements for running long-term care projections

The AWG in its work refers broadly to the OECD publications on the topic, mostly by the Working Party on Social Policy ([4]), as well as the *European study of long-term care expenditure* ([5]), where the similar projections for four European countries have been presented in detail.

As regards the **total number of long-term care recipients,** this should include:

([1]) Eurostat (1996), pp. 58–59.

([2]) OECD health data, 2004.
([3]) OECD (2005), p. 5.
([4]) OECD (2004c) and OECD (2004f).
([5]) A. Comas-Herrera and R.Wittenberg (2003).

- persons who receive the above described type of moderate- to high-level assistance with basic activities of daily living (which may be delivered in combination with lower level care such as help with housework, gardening, other social assistance);

- persons who receive long-term care by a paid family member or other non-professional who receive substantial support in form of cash payments under a social programme to support care at home;

and exclude:

- disabled persons of working age who receive income benefits or benefits for labour market integration without long-term care services;

- persons with only mild disablement who receive some low-level services, such as help with housework, transport, or 'meals on wheels', without additional services to help them with basic activities of daily living;

- persons receiving 'informal' services from relatives or other carers free-of-charge.

The number of recipients should be measured at one precise point of time, preferably at the end of the year, in order to avoid the multiplication of recipients of short-term or occasional services.

Services at home include services provided by external home-care providers, both public and private, in a person's private home on a long-lasting basis. This includes living arrangements in specially designed or adapted flats for persons who require help on a regular basis, but where this living arrangement still guarantees a high degree of autonomy and self-control over other aspects of a person's private life. Also included are services received on a day-care basis or in the form of short-term stays in institutions, for example in the form of respite care, provided that the receipt of services is regular and lasting at least six months. During these stays, persons are not considered as 'institutionalised' as defined in this questionnaire, but rather as temporarily receiving services, which support their continued living at home ([1]).

On the basis of this definition, the total number of dependent people receiving formal long-term care on a regular basis at home and total public expenditure on long-term home-care should be gathered. Total number of dependent people should be disaggregated into gender and age groups, and total public spending should be reported either in absolute terms (in euro) or in relative terms (in percentage of public expenditure in long-term care attributable to home-care). The number of long-term care recipients should be measured at one precise point of time, preferably at the end of the year.

As regards public expenditure on and the number of recipients of **long-term care services in institutions**, this should cover services in institutions provided to people with moderate to severe functional restrictions who live permanently or for an extended period of time (usually for six months or longer) in specially designed institutions, or in a hospital-like setting where the predominant service component is long-term care, although this may frequently be combined with other services (basic medical services, help with getting meals, social activities, etc.). In these cases, eligibility is often explicitly assessed and defined by level (severity) of dependency and level of care needs.

This excludes residents in homes for the elderly such as retirement homes who are not dependent on help with basic functional limitations. Access to these institutions is frequently granted only under the condition that residents are still in a fairly good health status and have no major functional limitations.

However, residents in these institutions should be included in cases where disablement has onset later, where residents have been moved to specially served sections/wards, such as for dementia patients, or where residents have been admitted who are moderately to severely dependent and receive long-term care services accordingly ([2]).

On the basis of this definition, the total number of dependent people receiving formal long-term care in institutions and total public expenditure on long-term institutional care should be gathered. The total number of dependent people should be disaggregated into gender and age groups, and total public spending should be reported either in absolute terms (in euro) or in relative terms (in percentage of public expenditure in long-term care attributable to home-care).

([1]) OECD (2005), p. 4.

([2]) OECD (2005), p. 4.

The number of long-term recipients should be measured at one precise point of time, preferably at the end of the year.

Account also needs to be taken of **care allowances and other cash benefits**. A different category of people who are beneficiaries of public long-term care-related spending, and therefore should also be included in the calculations of total spending on long-term care, but who do not necessarily use formal care in institutions or at home, are those who receive care allowances or other cash benefits.

The social programmes offering care allowances have been introduced in a number of countries in order to allow households more choice over care decisions, and to support care provided at home. They are addressed to persons with long-term care needs who live in their own homes. However, the design of these programmes varies widely across countries, which reduces the comparability between them.

At least three types of cash programmes and/or consumer choice programmes can be distinguished:

- payments to personal budgets and consumer-directed employment of care assistants;
- payments to a person needing care who can spend it as she/he likes, but has to acquire sufficient care;
- payments to informal care givers as income support.

For this data collection, the strategy is that persons with long-term care needs (as defined above), who receive cash benefits that are targeted towards support in the assistance they need on a regular basis and which they receive either by professional services or by family or friends, should be included in the number of service recipients. This should also be done in cases where households have a choice to decide to either spend that money on professional services or care assistants or to keep the money in their overall household budget.

An important boundary issue are recipients of benefits in cash to carers where these are relatively small amounts. The question is then whether these should be considered as qualifying the informal carers as ‘paid’ carers due to these payments and therefore to include the person cared for in the number of long-term care recipients. The basic rule here would be that persons should be included as recipients on the basis that the benefits are granted with the primary goal of supporting households to address care needs with ADL restrictions and that they are subject to a corresponding needs assessment. Pure income support, on the other hand, should be considered social support and should not be included in expenditure on care or in numbers of recipients.

The following two pieces of data should be gathered taking into account the above considerations:

- total number of recipients of long-term care-related cash benefits (by age and gender);
- total public expenditure on long-term care-related cash benefits.

Annex 8. Additional tables on the projected impact of ageing populations on potential growth and its determinants: sensitivity tests

Table A.8

Difference in total participation rates (aged 15–64) between baseline AWG scenario and sensitivity tests

	High life expectancy		High employment		High employment, older workers	
	2025	2050	2025	2050	2025	2050
BE	– 0.01	– 0.02	0.00	0.00	1.11	1.04
DK	– 0.01	– 0.01	0.00	0.00	1.10	1.00
DE	0.00	– 0.01	0.00	0.00	1.27	1.14
EL	0.00	0.00	0.00	0.00	1.15	1.14
ES	0.00	0.00	0.00	0.00	1.14	1.10
FR	0.00	– 0.01	0.00	0.00	1.04	1.00
IE	0.00	0.00	0.00	0.00	0.92	1.01
IT	0.00	0.00	0.00	0.00	1.24	1.12
LU	– 0.01	– 0.02	0.00	0.00	1.05	0.94
NL	– 0.01	– 0.03	0.00	0.00	1.12	0.99
AT	– 0.01	– 0.02	0.00	0.00	1.21	1.14
PT	0.00	0.00	0.00	0.00	1.10	1.09
FI	0.00	– 0.01	0.00	0.00	1.09	1.07
SE	0.00	0.00	0.00	0.00	1.03	1.07
UK	0.00	– 0.01	0.00	0.00	1.09	1.09
CY	0.00	0.00	0.00	0.00	0.96	1.21
CZ	– 0.01	– 0.02	0.00	0.00	0.99	1.24
EE	0.00	– 0.02	0.00	0.00	0.97	1.20
HU	– 0.01	– 0.03	0.00	0.00	0.94	1.14
LT	0.00	0.00	0.00	0.00	1.05	1.28
LV	– 0.01	– 0.03	0.00	0.00	1.01	1.24
MT	– 0.01	– 0.03	0.00	0.00	0.91	1.12
PL	– 0.02	– 0.03	0.00	0.00	0.92	1.29
SK	– 0.01	– 0.05	0.00	0.00	0.95	1.32
SI	– 0.01	– 0.03	0.00	0.00	1.15	1.15
EU-25	*0.00*	*– 0.01*	*0.00*	*0.00*	*1.15*	*1.14*
EU-15	*0.00*	*– 0.01*	*0.00*	*0.00*	*1.18*	*1.11*
EU-10	*– 0.01*	*– 0.03*	*0.00*	*0.00*	*0.97*	*1.27*

Source: Economic and Financial Affairs DG.

Table A.9

Difference in employment rates (aged 15–64) between baseline AWG scenario and sensitivity tests

	High life expectancy		High employment		High employment, older workers	
	2025	2050	2025	2050	2025	2050
BE	– 0.01	– 0.02	1.0	1.0	1.11	1.04
DK	– 0.01	– 0.01	1.0	1.0	1.10	1.00
DE	0.00	0.00	1.0	1.0	1.27	1.14
EL	0.00	0.00	1.0	1.0	1.15	1.14
ES	0.00	0.00	1.0	1.0	1.14	1.10
FR	0.00	– 0.01	1.0	1.0	1.04	1.00
IE	0.00	0.00	1.0	1.0	0.92	1.01
IT	0.00	0.00	1.0	1.0	1.24	1.12
LU	– 0.01	– 0.02	1.0	1.0	1.05	0.94
NL	– 0.01	– 0.02	1.0	1.0	1.12	0.99
AT	– 0.01	– 0.02	1.0	1.0	1.21	1.14
PT	0.00	0.00	1.0	1.0	1.10	1.09
FI	0.00	0.00	1.0	1.0	1.09	1.07
SE	0.00	0.00	1.0	1.0	1.03	1.07
UK	0.00	– 0.01	1.0	1.0	1.09	1.09
CY	0.00	0.00	1.0	1.0	0.96	1.21
CZ	0.00	– 0.02	1.0	1.0	0.99	1.24
EE	0.00	– 0.02	1.0	1.0	0.97	1.20
HU	– 0.01	– 0.03	1.0	1.0	0.94	1.14
LT	0.00	0.00	1.0	1.0	1.05	1.28
LV	0.00	– 0.03	1.0	1.0	1.01	1.24
MT	– 0.01	– 0.02	1.0	1.0	0.91	1.12
PL	– 0.01	– 0.03	1.0	1.0	0.92	1.29
SK	– 0.01	– 0.04	1.0	1.0	0.95	1.32
SI	– 0.01	– 0.02	1.0	1.0	1.15	1.15
EU-25	*0.00*	*– 0.01*	*1.0*	*1.0*	*1.12*	*1.11*
EU-15	*0.00*	*– 0.01*	*1.0*	*1.0*	*1.15*	*1.08*
EU-10	*– 0.01*	*– 0.03*	*1.0*	*1.0*	*0.95*	*1.25*

Source: Economic and Financial Affairs DG.

Table A.10

Difference in total dependency ratio between baseline AWG scenario and sensitivity tests (inactive population as a percentage of the labour force aged 15–64)

	High life expectancy		High employment		High employment, older workers	
	2025	2050	2025	2050	2025	2050
BE	0.7	3.0	0.0	0.0	– 3.7	– 3.7
DK	0.7	3.0	0.0	0.0	– 2.7	– 2.6
DE	0.8	3.4	0.0	0.0	– 3.4	– 3.3
EL	0.8	4.0	0.0	0.0	– 3.7	– 4.2
ES	0.6	3.3	0.0	0.0	– 3.1	– 3.5
FR	0.7	2.7	0.0	0.0	– 3.3	– 3.3
IE	0.5	2.5	0.0	0.0	– 2.4	– 2.9
IT	0.9	3.9	0.0	0.0	– 4.2	– 4.2
LU	0.6	2.6	0.0	0.0	– 3.5	– 3.3
NL	0.7	2.9	0.0	0.0	– 2.8	– 2.6
AT	0.6	3.0	0.0	0.0	– 3.1	– 3.2
PT	0.6	3.0	0.0	0.0	– 2.9	– 3.3
FI	0.7	2.7	0.0	0.0	– 3.0	– 3.0
SE	0.6	2.4	0.0	0.0	– 2.7	– 2.8
UK	0.6	2.5	0.0	0.0	– 2.9	– 3.1
CY	0.5	2.4	0.0	0.0	– 2.2	– 3.1
CZ	0.8	3.8	0.0	0.0	– 2.6	– 4.0
EE	0.8	3.3	0.0	0.0	– 2.6	– 3.5
HU	0.9	4.2	0.0	0.0	– 3.1	– 4.4
LT	0.7	3.2	0.0	0.0	– 2.6	– 3.7
LV	0.8	3.5	0.0	0.0	– 2.6	– 3.6
MT	0.8	3.1	0.0	0.0	– 3.2	– 4.2
PL	0.8	3.8	0.0	0.0	– 2.7	– 4.4
SK	0.6	3.8	0.0	0.0	– 2.3	– 4.2
SI	0.8	4.0	0.0	0.0	– 3.3	– 3.8
EU-25	*0.7*	*3.2*	*0.0*	*0.0*	*– 3.2*	*– 3.4*
EU-15	*0.7*	*3.1*	*0.0*	*0.0*	*– 3.3*	*– 3.3*
EU-10	*0.8*	*3.8*	*0.0*	*0.0*	*– 2.7*	*– 4.2*

Source: Economic and Financial Affairs DG.

Table A.11

Difference in share of older workers between baseline AWG scenario and sensitivity tests (labour force aged 55–64 as percentage of labour force aged 15–64)

	High life expectancy		High employment		High employment, older workers	
	2025	2050	2025	2050	2025	2050
BE	0.02	0.05	0.0	0.0	1.4	1.3
DK	0.03	0.06	0.0	0.0	1.1	1.0
DE	0.04	0.08	0.0	0.0	1.3	1.2
EL	0.03	0.07	0.0	0.0	1.4	1.3
ES	0.02	0.06	0.0	0.0	1.2	1.2
FR	0.02	0.06	0.0	0.0	1.2	1.2
IE	0.02	0.04	0.0	0.0	1.0	1.1
IT	0.02	0.04	0.0	0.0	1.5	1.3
LU	0.02	0.04	0.0	0.0	1.3	1.2
NL	0.02	0.05	0.0	0.0	1.2	1.1
AT	0.03	0.06	0.0	0.0	1.3	1.2
PT	0.02	0.06	0.0	0.0	1.2	1.2
FI	0.03	0.06	0.0	0.0	1.2	1.1
SE	0.02	0.06	0.0	0.0	1.0	1.1
UK	0.02	0.05	0.0	0.0	1.2	1.1
CY	0.02	0.07	0.0	0.0	1.0	1.2
CZ	0.04	0.10	0.0	0.0	1.1	1.3
EE	0.06	0.18	0.0	0.0	1.1	1.3
HU	0.05	0.13	0.0	0.0	1.2	1.4
LT	0.07	0.19	0.0	0.0	1.1	1.3
LV	0.07	0.20	0.0	0.0	1.1	1.3
MT	0.01	0.04	0.0	0.0	1.3	1.5
PL	0.03	0.11	0.0	0.0	1.1	1.5
SK	0.04	0.11	0.0	0.0	1.1	1.5
SI	0.03	0.08	0.0	0.0	1.3	1.3
EU-25	*0.03*	*0.07*	*0.0*	*0.0*	*1.2*	*1.2*
EU-15	*0.03*	*0.06*	*0.0*	*0.0*	*1.3*	*1.2*
EU-10	*0.04*	*0.12*	*0.0*	*0.0*	*1.1*	*1.4*

Sources: Economic and Financial Affairs DG.

Table A.12

Difference in effective economic old-age dependency ratio between baseline AWG scenario and sensitivity tests (inactive population aged 65 and above as percentage of employed population, 15–64)

	High life expectancy		High employment		High employment, older workers	
	2025	2050	2025	2050	2025	2050
BE	0.8	3.2	– 0.9	– 1.1	– 0.9	– 1.1
DK	0.8	3.1	– 0.6	– 0.7	– 0.6	– 0.7
DE	0.8	3.7	– 0.7	– 0.9	– 0.9	– 1.1
EL	0.9	4.3	– 0.8	– 1.4	– 0.9	– 1.5
ES	0.6	3.6	– 0.7	– 1.3	– 0.7	– 1.3
FR	0.7	3.0	– 0.8	– 1.0	– 0.8	– 1.0
IE	0.5	2.7	– 0.5	– 0.8	– 0.4	– 0.8
IT	0.9	4.1	– 1.0	– 1.4	– 1.1	– 1.6
LU	0.6	2.7	– 0.6	– 0.8	– 0.7	– 0.8
NL	0.7	2.9	– 0.6	– 0.7	– 0.6	– 0.6
AT	0.6	3.1	– 0.6	– 0.9	– 0.7	– 1.0
PT	0.6	3.2	– 0.6	– 1.1	– 0.6	– 1.1
FI	0.7	3.0	– 0.7	– 0.8	– 0.8	– 0.9
SE	0.7	2.5	– 0.6	– 0.7	– 0.6	– 0.7
UK	0.6	2.6	– 0.6	– 0.8	– 0.6	– 0.8
CY	0.4	2.3	– 0.6	– 1.0	– 0.6	– 1.0
CZ	0.7	3.8	– 0.8	– 1.3	– 0.7	– 1.5
EE	0.8	3.6	– 0.6	– 0.9	– 0.6	– 1.0
HU	1.0	4.3	– 0.8	– 1.2	– 0.8	– 1.4
LT	0.7	3.5	– 0.6	– 0.9	– 0.6	– 1.1
LV	0.9	3.8	– 0.6	– 0.9	– 0.5	– 1.0
MT	0.8	3.2	– 0.9	– 1.1	– 0.8	– 1.2
PL	0.7	3.9	– 0.8	– 1.3	– 0.8	– 1.6
SK	0.7	4.0	– 0.6	– 1.1	– 0.5	– 1.4
SI	0.5	3.7	– 1.0	– 1.6	– 1.1	– 1.7
EU-25	*0.7*	*3.4*	*– 0.7*	*– 1.0*	*– 0.8*	*– 1.1*
EU-15	*0.7*	*3.3*	*– 0.7*	*– 1.0*	*– 0.8*	*– 1.0*
EU-10	*0.7*	*3.9*	*– 0.8*	*– 1.3*	*– 0.7*	*– 1.5*

Source: Economic and Financial Affairs DG.

Table A.13

Difference in total economic dependency ratio between baseline AWG scenario and sensitivity tests (total population less employed as percentage of employed population, 15–64)

	High life expectancy		High employment		High employment, older workers	
	2025	2050	2025	2050	2025	2050
BE	0.8	3.2	– 3.8	– 4.0	– 4.2	– 4.1
DK	0.8	3.1	– 2.6	– 2.7	– 2.9	– 2.7
DE	0.8	3.7	– 2.9	– 3.2	– 3.7	– 3.6
EL	0.9	4.3	– 3.7	– 4.3	– 4.2	– 4.8
ES	0.6	3.6	– 3.1	– 3.6	– 3.5	– 4.0
FR	0.7	2.9	– 3.6	– 3.7	– 3.8	– 3.7
IE	0.5	2.6	– 2.8	– 3.1	– 2.6	– 3.1
IT	0.9	4.1	– 3.9	– 4.2	– 4.8	– 4.7
LU	0.6	2.7	– 3.6	– 3.8	– 3.8	– 3.5
NL	0.7	2.9	– 2.7	– 2.7	– 3.0	– 2.7
AT	0.7	3.1	– 2.7	– 2.9	– 3.3	– 3.4
PT	0.6	3.2	– 2.9	– 3.3	– 3.2	– 3.6
FI	0.7	2.9	– 3.1	– 3.1	– 3.3	– 3.3
SE	0.7	2.5	– 2.7	– 2.8	– 2.8	– 3.0
UK	0.6	2.6	– 2.8	– 3.0	– 3.1	– 3.3
CY	0.5	2.5	– 2.5	– 2.7	– 2.4	– 3.3
CZ	0.8	4.0	– 3.0	– 3.6	– 2.9	– 4.4
EE	0.8	3.5	– 3.0	– 3.3	– 2.9	– 3.9
HU	1.0	4.4	– 3.6	– 4.2	– 3.4	– 4.8
LT	0.7	3.5	– 2.8	– 3.2	– 2.9	– 4.1
LV	0.8	3.7	– 2.9	– 3.3	– 2.9	– 4.1
MT	0.8	3.3	– 4.0	– 4.3	– 3.7	– 4.8
PL	0.8	4.1	– 3.3	– 3.9	– 3.0	– 5.0
SK	0.7	4.1	– 2.8	– 3.6	– 2.6	– 4.7
SI	0.8	4.2	– 3.2	– 3.7	– 3.6	– 4.2
EU-25	*0.7*	*3.4*	*– 3.2*	*– 3.4*	*– 3.5*	*– 3.8*
EU-15	*0.7*	*3.3*	*– 3.2*	*– 3.4*	*– 3.6*	*– 3.7*
EU-10	*0.8*	*4.1*	*– 3.2*	*– 3.8*	*– 3.0*	*– 4.7*

Sources: Economic and Financial Affairs DG.

Table A.14

Difference in labour supply between baseline AWG scenario and sensitivity tests (thousands of persons, aged 15–64)

	High life expectancy		High employment		High employment, older workers	
	2025	2050	2025	2050	2025	2050
BE	4	11	0	0	76	66
DK	3	6	0	0	40	34
DE	43	91	0	0	697	542
EL	5	11	0	0	85	68
ES	23	49	0	0	346	258
FR	27	69	0	0	417	382
IE	2	6	0	0	30	32
IT	19	45	0	0	460	334
LU	0	1	0	0	4	4
NL	7	18	0	0	126	106
AT	4	8	0	0	67	55
PT	6	14	0	0	77	61
FI	2	7	0	0	37	34
SE	3	9	0	0	63	67
UK	26	74	0	0	449	422
CY	0	1	0	0	6	7
CZ	6	11	0	0	64	63
EE	2	3	0	0	8	8
HU	8	14	0	0	58	60
LT	4	8	0	0	23	23
LV	3	6	0	0	14	14
MT	0	0	0	0	3	4
PL	22	48	0	0	222	253
SK	4	7	0	0	34	37
SI	1	2	0	0	15	12
EU-25	*222*	*520*	*0*	*0*	*3 419*	*2 945*
EU-15	*174*	*419*	*0*	*0*	*2 973*	*2 464*
EU-10	*48*	*101*	*0*	*0*	*446*	*481*

Sources: Economic and Financial Affairs DG.

Table A.15

Difference in labour supply (aged 15–64) between baseline AWG scenario and sensitivity tests (annual growth rate)

	High life expectancy		High employment		High employment, older workers	
	2025	2050	2025	2050	2025	2050
BE	0.00	0.01	0.00	0.00	0.07	0.00
DK	0.00	0.01	0.00	0.00	0.06	– 0.01
DE	0.00	0.01	0.00	0.00	0.08	– 0.01
EL	0.00	0.01	0.00	0.00	0.08	0.00
ES	0.00	0.01	0.00	0.00	0.07	0.00
FR	0.00	0.01	0.00	0.00	0.07	0.00
IE	0.00	0.01	0.00	0.00	0.06	0.00
IT	0.00	0.01	0.00	0.00	0.08	– 0.01
LU	0.00	0.01	0.00	0.00	0.07	– 0.01
NL	0.00	0.01	0.00	0.00	0.07	– 0.01
AT	0.00	0.00	0.00	0.00	0.07	0.00
PT	0.01	0.01	0.00	0.00	0.07	0.00
FI	0.00	0.01	0.00	0.00	0.06	0.00
SE	0.00	0.00	0.00	0.00	0.06	0.00
UK	0.00	0.01	0.00	0.00	0.07	0.00
CY	0.00	0.01	0.00	0.00	0.06	0.01
CZ	0.01	0.01	0.00	0.00	0.06	0.01
EE	0.01	0.01	0.00	0.00	0.06	0.01
HU	0.01	0.01	0.00	0.00	0.06	0.01
LT	0.01	0.02	0.00	0.00	0.06	0.01
LV	0.01	0.02	0.00	0.00	0.06	0.01
MT	0.00	0.00	0.00	0.00	0.06	0.01
PL	0.01	0.01	0.00	0.00	0.06	0.02
SK	0.01	0.01	0.00	0.00	0.06	0.02
SI	0.01	0.01	0.00	0.00	0.07	0.00
EU-25	*0.00*	*0.01*	*0.00*	*0.00*	*0.07*	*0.00*
EU-15	*0.00*	*0.01*	*0.00*	*0.00*	*0.07*	*0.00*
EU-10	*0.01*	*0.01*	*0.00*	*0.00*	*0.06*	*0.02*

Source: Economic and Financial Affairs DG.

Table A.16

Difference in employment between baseline AWG scenario and sensitivity tests (thousands of persons, aged 15–64)

	High life expectancy		High employment		High employment, older workers	
	2025	2050	2025	2050	2025	2050
BE	4	10	67	63	75	66
DK	2	6	35	33	38	33
DE	40	85	524	450	665	514
EL	5	11	73	59	83	67
ES	21	46	298	229	339	253
FR	25	64	392	374	407	374
IE	2	6	32	32	29	32
IT	18	42	366	293	453	329
LU	0	1	4	4	4	4
NL	7	17	110	106	124	104
AT	3	8	54	47	66	54
PT	6	13	68	55	75	60
FI	2	6	32	30	35	32
SE	3	9	59	60	61	65
UK	25	71	402	378	440	413
CY	0	1	6	6	6	7
CZ	5	10	63	50	62	62
EE	1	3	8	7	8	8
HU	7	13	61	52	57	59
LT	4	8	21	17	22	22
LV	3	5	13	11	13	14
MT	0	0	3	3	3	3
PL	20	45	237	194	218	249
SK	3	7	35	27	33	36
SI	1	2	13	11	15	12
EU-25	*208*	*488*	*2 976*	*2 591*	*3 333*	*2 872*
EU-15	*163*	*393*	*2 517*	*2 213*	*2 896*	*2 399*
EU-10	*45*	*95*	*459*	*378*	*436*	*473*

Source: Economic and Financial Affairs DG.

Table A.17

Difference in employment (aged 15–64) between baseline AWG scenario and sensitivity tests (annual growth rate)

	High life expectancy		High employment		High employment, older workers	
	2003–25	2025–50	2003–25	2025–50	2003–25	2025–50
BE	0.004	0.006	0.070	– 0.001	0.077	– 0.005
DK	0.004	0.005	0.058	0.000	0.064	– 0.005
DE	0.005	0.006	0.062	0.000	0.078	– 0.007
EL	0.005	0.007	0.070	0.000	0.080	– 0.001
ES	0.005	0.007	0.065	– 0.001	0.074	– 0.003
FR	0.004	0.006	0.068	– 0.001	0.071	– 0.004
IE	0.004	0.007	0.062	– 0.001	0.057	0.004
IT	0.003	0.006	0.071	– 0.002	0.088	– 0.009
LU	0.004	0.005	0.070	0.00	0.073	– 0.007
NL	0.004	0.005	0.059	– 0.001	0.066	– 0.008
AT	0.004	0.005	0.060	– 0.001	0.073	– 0.005
PT	0.005	0.008	0.062	0.000	0.068	– 0.001
FI	0.004	0.007	0.061	0.000	0.066	– 0.001
SE	0.003	0.005	0.059	0.000	0.061	0.002
UK	0.004	0.007	0.061	0.000	0.067	0.000
CY	0.004	0.007	0.059	0.001	0.056	0.013
CZ	0.005	0.007	0.063	0.002	0.062	0.016
EE	0.011	0.015	0.063	0.001	0.061	0.013
HU	0.008	0.009	0.069	0.002	0.065	0.014
LT	0.011	0.015	0.062	0.001	0.065	0.014
LV	0.013	0.015	0.062	0.001	0.063	0.014
MT	0.002	0.004	0.072	0.001	0.066	0.014
PL	0.006	0.009	0.067	0.002	0.061	0.024
SK	0.006	0.009	0.063	0.003	0.059	0.024
SI	0.005	0.007	0.065	0.000	0.074	0.001
EU-25	*0.004*	*0.007*	*0.064*	*0.000*	*0.071*	*– 0.001*
EU-15	*0.004*	*0.006*	*0.064*	*– 0.001*	*0.074*	*– 0.005*
EU-10	*0.006*	*0.009*	*0.065*	*0.002*	*0.062*	*0.019*

Source: Economic and Financial Affairs DG.

Annex 9. Detailed assumptions made in the education projections

Table A.18

Detailed assumptions made in the education projections

Country	Data situation	Assumptions made
Belgium	Complementary information has been provided by the Belgian authorities for year 2003 (enrolment rate and number of personnel); but still the financial information for level 2 is included in level 3.	The number of personnel has been estimated for each level of education by applying the 2003 student-to-staff ratio to the 2002 figures. Expenditure has been split between level 2 and level 3/4 assuming that the salary level is the same across the three levels. For all other expenditure items the ratio between different categories of expenditure is kept at the levels provided by the combined figures.
Denmark	Data for personnel are missing for level 2 and 5.	The number of staff in level 2 and 5 has been estimated using EU-15 average class size.
Estonia	Personnel data for 2002 are missing. Data are provided exclusively for public spending. Data for Finance 2 (expenditure breakdown by type of expenditure: personnel, other than personnel) are missing.	The 2001 student-to-staff ratio is applied to the 2002 figures. The private sector is assumed to be totally absent from the education system. Total public spending is broken down by type (wage and non-wage related) according to ratios for EU-25.
Greece	Financial data for level 2 and 3 are combined.	The salary level is assumed to be equal across level 2 and 3. Other expenditures are assumed to have the same ratio between level 2 and 3 as salaries.
Spain	Financial data for levels 2 and 3/4 are combined.	The salary level is assumed to be equal across level 2 and 3/4. Other expenditures are assumed to have the same ratio between level 2 and 3/4 as salaries. As no data is given for level 4, financial data and staff data for level 4 are assumed to be included in level 3 data.
Hungary	Data about Finance 2 are missing. Hungarian authorities have provided additional information on breakdown of spending in public institutions.	Total direct spending has been broken down by type (wage and non-wage related) assuming the same distribution in private institutions as in public institutions.
Ireland	Data for personnel for level 2 and 3/4 are combined.	The data have been broken down according to class size information provided by Irish authorities.

Source: Economic and Financial Affairs DG.

Annex 10. Methodology for core projections of unemployment benefit expenditure

The basic methodology

In order to assess whether and by how much the projected changes in labour market performance will affect unemployment benefit (UB) expenditure (as a percentage of GDP), a simple methodology similar to the one used for projecting healthcare expenditures has been used. Thus, the basic approach to be applied to the projections of UB expenditure is the following:

- estimate the average amount of UB received by each unemployed person (in national currency terms);
- divide the base year UB expenditure profiles by the base year GDP per worker;
- for each projection year, multiply the deflated per capita UB spending (from step 2) by the corresponding expected future size of the unemployed population. The result gives the total expenditure in the projection year expressed as a share of GDP per worker;
- express the results in terms of national GDP for each projection year. This is done by dividing the result (from step 3) for each projection year by the projected employment level in each projection year.

This generates projections of UB expenditure, expressed as a share of GDP, where average expenditure per head grows at the same rate as GDP per worker in each projection year.

Formal illustration

Step 1 — *Estimation of current per capita expenditure*

In order to obtain current per capita spending, total UB expenditure (UB) in the base year can be decomposed according to the following identity:

$$ub_{pc}^{b} = \frac{UB^{b}}{UP^{b}}$$

where:

UB^b	=	total expenditure on UB in base year in national currency;
$ub_{pc}{}^{b}$	=	average UB expenditures for each unemployed person in base year expressed in national currency;
UP^b	=	numbers of unemployed persons in base year;
b	=	base year.

Step 2 — *Expressing per capita expenditure in terms of per capita GDP*

Base year UB expenditure for unemployed person (ub_{pc}^{b}) can be deflated by base-year GDP per worker, such that:

$$yub_{pc}^{b} = \frac{ub_{pc}^{b}}{(GDP^{b}/E^{b})}$$

where:

yub_{pc}^{b}	=	average UB expenditure for each unemployed person in the base year *b*, expressed as a share of base year GDP per worker;
E^b	=	total employment in base year; and
GDP^b	=	national GDP in base year.

Step 3 — *Matching the base-year profiles to the future labour market structure*

The 'deflated' per capita expenditure for the base year yub_{pc}^{b} is then matched to the unemployment vector UP^t for each of the projection years *t* from 2000–50 as follows:

$$yub_{pc}^{b} \times UP^{t} = \frac{ub_{pc}^{b}}{(GDP^{b}/E^{b})} \times UP^{t} = \frac{\overline{UB^{t}}}{(GDP^{t}/E^{t})}$$

where:

$\overline{UB^t}$	=	projected total UB expenditure in projection year *t* (the bar above the variable denotes that it is a projection).

This step generates the projected total UB expenditure expressed as a share of GDP per worker, under the implicit assumption that UB expenditure per head grows at the same rate as GDP per worker. This, in turn, implies (see equation 3 in the main test) unchanged unemployment benefit schemes (mainly gross replacement rates, coverage, take-up ratio) and a constant wage share in income distribution, that is, average wage per capita grows at the same rate as labour productivity (GDP per worker).

Step 4 — *Expressing the results as a share of projected national GDP for each projection year*

The results can then be expressed in terms of projected national GDP for each of the projection years by dividing by projected employment levels as follows:

$$\frac{\overline{UB^t}}{GDP^t} = \frac{yub^b_{pc} \times UP^t}{E^t}$$

Thus, projections of UB expenditure as a share of GDP can be generated using only UB expenditure and GDP levels in the base year, and existing projections for the unemployed and employed persons, already used in projection exercises on pensions and healthcare expenditures.

Annex 11. External review organised by the Economic and Financial Affairs DG and the AWG on the underlying assumptions to be used to make age-related expenditure projections: summary of the presentations and discussion

1. Population projections

Mr Frans Willekens (Director, Netherlands Interdisciplinary Demographic Institute) focused his comments on the fertility and mortality assumptions. As regards **fertility**, the methodology adopted by Eurostat is based on cohort fertility rates. However, cohort rates are distorted by period effects and the big issue in Europe today is whether currently there is a postponement of childbearing which in coming years will be recuperated (and thus fertility rates are low temporarily), or whether there is a reduction in desired family size which would mean that the observed reduction in fertility rates will be long-lasting. According to **Mr Willekens**, the assumption that cohort and period fertility rates coincide in 2050 is reasonable, and so is the assumption on the convergence of fertility rates for the EU-10 countries. However, the projections do not take into account the impact of the heterogeneity in the population (as some women have their first child early, while others do so at higher ages). In contrast, the assumption that the currently low fertility in Spain will remain more or less at the same level appears to be strong, as well as the assumption of no convergence in fertility rates for EU-15 Member States.

Mr Willekens recommended focusing on the underlying socio-economic and cultural mechanisms driving fertility rates. There has been a decline of marriage as an institution, but other types of 'social contracts' and stable relationships play an important role today in determining fertility patterns. He argued that when considering future prospects, changes in age-related fertility rates may not be the most telling indicator, and that more insights can be gained through parity analysis which looks at the percentage of women who are childless and/ or who have more than two or three children. He suggested that the AWG pay close attention to an ongoing study being financed by the EU's sixth research framework programme, called MicMac, which combines micro- and macro-simulations. Inter alia, this study will make a micro-simulation of the parity distribution that is coherent with the assumed total fertility rates.

As regards **life expectancy**, **Mr Willekens** explained that the Europop 2004 of Eurostat projects shows considerably different gains across countries during the projection horizon, which leads to different trajectories in neighbouring countries. At face value, this does not seem reasonable. However, when account is taken of different institutional settings across countries, a lack of convergence in mortality rates is not unreasonable. He noted that the AWG has decided to use a variant scenario prepared by Eurostat, based on a convergence rule. However, the convergence coefficient used is exogenous rather than being based on past trends or epidemiological evidence. All in all, the difference between both scenarios amounts to one year.

Survival functions are a main instrument to project mortality rates. When considering policy questions affected by life expectancy, he urged policy-makers to pay more attention to risk factors which affect survival functions. To underline this point, he presented evidence from the 'Framingham heart study', an influential longitudinal study identifying the effects of cardiovascular diseases. Evidence from this study shows that people who both smoke and are very obese (measured in terms of body mass index) have a life expectancy at age 40 that is 13 years below average (with 95 % confidence interval). These conclusions have led some authors, notably Olshansky et al. (2005) ([1]), to suggest a potential decline

([1]) S. J. Olshansky, D. J. Passaro et al. (2005), 'A potential decline in life expectancy in the United States in the 21st century', *New England Journal of Medicine*, Volume 352: 1138–1145, Number 11.

in life expectancy in the United States in the 21st century on account of the effects of diabetes and obesity, although this view is at odds with that of others, notably Vaupel (2002) ([1]). **Mr Willekens** also recommended paying more attention to mortality of the oldest-old.

As regards **migration**, **Mr Willekens** noted that the projection is based on net migration flows although migration policies are made in terms of inflows. He stressed that the rationale for the AWG variant concerning net migration flows to Germany, Spain and Italy was not elaborated upon.

In conclusion, **Mr Willekens** recalled the three questions he had been asked to answer.

- Is there is a sufficient degree of consistency in the approach across countries? **Mr Willekens** said the methodology is consistent across countries. While it is more difficult to judge the assumptions, there does not appear to be much difference between the Europop 2004 scenario and the AWG variant scenario.

- Do the demographic assumptions lead to over/under-optimistic outcomes of the population projections? The assumptions on fertility and migration are not overly optimistic but, in **Mr Willekens**' view, mortality is likely to decline further than assumed.

- How could the Commission and AWG deal with the uncertainty surrounding future developments of mortality rates? Should consideration be given to the use of stochastic population projections? **Mr Willekens** advocated a move to information-based projections rather than to stochastic projections and stressed the need to reduce uncertainty on trend developments. This can be done by introducing all knowledge available in a systematic way in the forecasting. Risk management should also be introduced, attempting to quantify uncertainty and the cost of being wrong. He cautioned against overestimating the benefits of stochastic projections in terms of their capacity to quantify uncertainty, as they can give a misleading sense of precision and can be too mechanistic (most stochastic projections disregard most substantive knowledge about the components of demographic change).

2. Labour force assumptions

Ms Agar Brugiavini (Professor, Universita' Ca' Foscari, Venezia) stressed that to make labour force projections, detailed information on the age-cohort-gender structure of the population is required for a large number of countries and with common definitions. This explains why the Commission and AWG use the Eurostat labour force survey rather than longitudinal data (which would be ideal to help disentangle cohort and timing effects but which are not available). A comparison of data on participation rates by age/gender from the LFS, the European Community household panel (ECHP) and the survey of health, ageing and retirement in Europe (SHARE) points to the need for further investigation. In general, the participation rates for workers aged 15 to 64 drawn from the LFS are higher relative to those from the ECHP. For older workers, aged 55 to 64, especially females, the ECHP and SHARE tend to agree with each other but not with the LFS.

Ms Brugiavini acknowledged the trade-off between complexity and tractability facing the AWG in making projections for 25 countries. However, she suggested that some improvements could be made to the projection methodology. The AWG uses a cohort-component methodology to take into account the differences in the labour market attachment of different cohorts. For example, younger cohorts of women tend to have a higher attachment to the labour force than earlier cohorts and women are accordingly projected to have higher participation rates in the future than their grandmothers and great grandmothers. However, the methodology 'freezes' the situation of **'limit' cohorts** who have just entered the labour market: she argues that their dynamic behaviour may be more complex than is assumed by the AWG and it is very uncertain how they will behave, aged 50–60 years old, in 2050. Moreover, some women are not captured by the cohort methodology and remain outside the labour force because their entry in the labour market is not observed: for example, housewives may decide to enter the labour market at a late stage in life. This is supported by evidence from the recently published SHARE survey (http://www.share-project.org) which indicates a high variability across countries in the labour market status of women, and whether they work full time or part time at different ages.

([1]) J. O. Vaupel (2002), 'Broken limits to life expectancy', *Science*, Volume 296: 1029–1031.

Attention should also be paid to some problems with the **length of the working life** taking place between the entry and exit probabilities modelled by the AWG. In practice, working life could be shorter. This is particularly true for women who, even if they work, tend to have a 'less complete' career than men. ECHP data show that in Spain, Greece, Portugal and Italy, women have a shorter working life than men. As pension expenditure depends on worker's seniority, it is important to project the length of working life. In Italy for example, the years of contribution to pension systems are smaller for women than for men.

The adjustment proposed to take into account the **effect of pension reforms** is very useful. However, there is an additional dynamic complexity, which is, how to forecast a retirement age in notionally defined contributions pension systems where there is a window of retirement ages? It is unknown whether people will choose to retire at 58 or 64 years old. **Ms Brugiavini** suggested that alternative pathways to retirement be investigated further, for example by looking at the age pattern of the disabled in northern countries which suggests that de facto many persons are using these schemes as a pre-pension. Are they in or out of the labour force? They are collecting benefits while they are not retired. This could make the picture more blurred due to an under or over estimation of exits from the labour force. When future waves of data are available, the SHARE database ([1]) will provide micro-data on health and retiring, allowing analysis of these issues in more depth.

Summing up, **Ms Brugiavini** concluded that the work and results of the labour force projections are impressive, but that some adjustments could possibly be made. There are large cross-country differences in projected changes in participation rates which need to be explained thoroughly. More research is required on the labour market effects of reforms to provide financial incentive to work, to improve workplace conditions and enhance the health status of the older population.

3. Productivity and other macroeconomic assumptions

Mr Jørgen Mortensen (Senior Research Fellow, Centre for European Policy Studies, Brussels) raised two general remarks on the productivity assumptions.

- **Education:** he noted that there is a strong relationship between investment in human capital, measured as level of educational attainment, and productivity, as suggested by Barro (1996) and even more strongly by de la Fuente (2004) ([2]). Projections prepared by the Economic and Financial Affairs DG (2004) ([3]) point to a rise in educational attainment by 2.7 years during the period 2000 to 2050. An increase in educational attainment of this magnitude would raise the entry age to the labour market, and thereby affect the labour supply. It seems pertinent to take into account more explicitly the effect of educational attainment on productivity in the AWG assumptions. The projected rise in educational attainment can be expected to gradually boost productivity growth, while the rise in labour force participation of elderly workers and women could depress it and these factors tending to depress productivity growth are already at work. Consequently, the growth of productivity could be slower than assumed during the next 10 to 15 years, but it could pick up subsequently and exceed the projected rate in response to the rise in educational attainment and skills. In conclusion, the EU may follow the US model, but with a lag of 30 to 40 years, so the main recommendation would be to prepare for one or two lean decades.

- **The consequences of an ageing workforce on labour productivity: Mr Mortensen** pointed out that existing studies suggest that older workers are not systematically less productive than younger workers; it depends on skills and area of activity (with age having much less of an impact in the services sector compared with manufacturing where the physical condition of a person may be of more direct relevance for productivity). Evidence seems to suggest that older workers are relatively more productive in the United States than in certain EU Member States. On balance, there is probably a larger wedge between labour costs and productivity for older workers in EU countries than in the United States.

Mr Mortensen then examined the possible trade-off between labour force participation and productivity growth. In the United States, as more people were drawn

([1]) For the time being, data are available only for one year.

([2]) De la Fuente (2004) finds an elasticity of growth to the increase in educational attainment above 0.5.

([3]) European Commission (2004), 'Quality and efficiency in education', Chapter 1, *European Economy*, Special Report, No 3.

into the labour market, recorded increases in TFP were adversely affected for a couple of decades. In the EU, a similar trade-off would seem to be taking place and it could have an implication on the assumption of a certain convergence in the growth of total factor productivity, as increases in labour force participation are projected. Part-time work could also be taken into account more explicitly because the projections assume an increase in the participation rate of women and older workers who tend to do more part-time work than prime-age men. The increase in participation rates may lead to a temporary lower productivity per person employed (but not per hour worked).

Mr Ray Barrell (Senior Research Fellow, National Institute of Economic and Social Research) concentrated his remarks on the labour productivity assumptions, and in particular the issue as to whether **convergence** should be assumed to occur across countries. In the literature, convergence is assumed to take place because technology spreads from innovative cores (leading economies) to the periphery (economies far from the production frontier of leading economies). This means that convergence should mainly affect the low productivity countries and not the best performing ones. It is also important to consider convergence in both levels and growth rates.

The evidence on past **productivity growth** per person/hour shows that productivity convergence is not uniform. The mean deviation calculated for the 1980s, the 1990s and the last five years does increase, and there could be long-term divergences. The United States can be considered the technological frontier for growth, and over the period 1970 to 2005, its calculated productivity growth averaged 1.59 % per annum. Recent events in the last 10 and the last five years with productivity growth per person/hour of 2.18 and 1.99 respectively are probably an outlier. In this light, **Mr Barrell** argued that the assumed trend of 1.1 % in total factor productivity is very high, as based on short-term trends rather than very long-term trends.

Labour productivity (1970–2003) shows some convergence in the EU (excepting Spain where there may be data problems). The AWG projects average levels of total factor productivity to converge to the EU-15 level in 2050. But convergence in productivity levels over time is not as complete as we would like. Excluding Luxembourg, the dispersion of productivity around the mean level would increase between 2020 and 2050 which means that disparities in individual countries' productivity levels are rising in the EU-25.

Technical progress is not exogenous. It is influenced by increased education, which raises the quality of the workforce. While low experience workers are generally less productive, the age-earnings profiles for the United Kingdom, which is meant to capture the age-productivity profile, are relatively flat, especially after 15 years of experience. The feedback of lengthening working lives in the projections should not be ignored. Although older people are generally not less productive than the young, they may be less flexible and their increasing number may make markets function less well. Growth is also likely to be influenced by a set of other factors. For instance, the difference from a technology frontier, for example, the distance from the United States, may matter. A panel analysis (for the period 1961–2004, 14 countries including non-EU Member States such as the United States, Canada, Japan) indicates the existence of a catch-up to the United States. The more rapid the labour force growth, the more rapid is technological growth.

Real interest rate assumptions can be central to the sustainability of public finances. Market rates for Europe can be judged from OATS in France that give a rate around 2 % in 2030. An alternative is to look at long rates and deduct the assumed 2 % inflation which again gives around 2 %. US long real rates should be similar to those in Europe and indexed bonds from 2008 to 2028 yield just over 2 %. Current long real rates suggest even 3 % to be too high, but they may be misleading. Real rates depend on the saving–investment balance, government deficits matters and saving surpluses in East Asia and outside the OECD are keeping real rates low. However, it would be worth the AWG preparing a scenario with 2 % real interest rates and lower productivity growth, but not to abandon the 3 %, as interest rates could go up again. Volatilities are low, so risk premia may be low. Dynamic efficiency requires the real long rate to exceed the growth rate. Output and inflation volatility affect the level of sustainable output and hence the macroeconomic framework affects public finance sustainability.

4. A financial analyst's view

Mr Moritz Kraemer (Director Europe, Credit Market Services, Standard and Poor's) started his intervention by questioning some of the **demographic**

assumptions. He drew attention to the differences in assumptions on life expectancy across countries. He also questioned why immigration is projected to go down over time at the same time as the UN is projecting a big increase in the population of countries near Europe's borders, like Africa. He also emphasised the link between migration and unofficial work, as shown by regularisation programmes, and suggested that assumptions on the black economy be included in the projection exercise.

Regarding the **labour force projections**, **Mr Kraemer** suggested that using hours worked would be superior to projecting the number of persons employed. More restricted labour supply in the future due to population ageing may require more flexible arrangements to retain older workers and this is likely to affect work practices/contracts in the future. The AWG assumes a convergence of NAIRU, but **Mr Kraemer** argued that there is no underlying reason why the NAIRU of different countries should automatically converge in the future on the basis of unchanged policies. He also noted that the approach is asymmetric, since there are large falls in countries with high starting NAIRU positions but almost no change in countries with low starting positions.

Uniform **interest rates** are assumed, but interest rates are not the same in different sovereign borrowers in the euro zone.

Evidence seems to suggest a negative trade-off between labour market participation and productivity growth, so it is hard to have a lot of employment growth and a lot of productivity growth at the same time, as implied in the projection. On the one hand, ageing can lead to a lower transmission of technology (as there are relatively more elderly workers in the workforce) but, on the other hand, the shortage of labour may boost technological growth and its rapid transmission, resulting in higher productivity increases.

He considered some **differences in growth rates** across countries to be difficult to justify. In particular, the AWG projects very high potential growth in the Baltic countries. In the most recent past, their high growth went hand in hand with high imbalances that would be difficult to sustain over the long term. Overall, he considered that the projected growth rates for the new Member States are too optimistic. Although the convergence of new Member States towards the levels of old Member States is probable, it is unlikely to alter the relative ranking of countries. Hence, the convergence that emerges on the basis of the current assumptions seems to be too great.

5. A view from the pensions industry and actuaries

Mr Mike Orszag (Head of Research, Watson Wyatt) advised caution in assuming that **mortality improvements** will slow down or that they will converge across countries. Recalling the Vaupel/Olshansky debate on the limits to life expectancy gains, Vaupel finds no evidence of a slowdown in mortality improvements while Olshanky argues that mortality improvements will slow down due to infectious diseases and obesity. The AWG population projections, in which projected gains in life expectancy slow down over time, reflect the approach of Olshansky and, indeed, this is the case in most official population projections. However, this may lead to an underestimation of pension costs.

Mr Orszag pointed out that official projections have consistently underestimated the gains in life expectancy and that expert predictions on upper limits to life expectancy have been surpassed. Referring to UN data, the highest improvements in life expectancy at birth between 1950 and 2005 amounted to 15 years in southern Europe and 11.5 years in western Europe, but they were close to 30 years in Asia and North Africa. Some countries have experienced declining life expectancy though, indicating a high variation in the world. **Mr Orszag** also noted that there is not much evidence of convergence in life expectancy in the world, or of conditional convergence. There is some evidence of fertility convergence, but not much.

Mr Orszag also expressed reservations on the stochastic population projections on the grounds that there is a degree of uncertainty surrounding the trend in mortality rates. The real annuity factor shows the discounted cost of providing a pension. As life expectancy changes, so do interest rates. Investigating the sources of volatility in real annuity factors indicates that 25 % of raw variances are due to mortality, 10 % of the variances for a 60-year-old male are due to mortality and 7 % for a 60-year-old woman. Therefore, mortality volatility around the trend is important, but its importance can be overstated. It is more important to present the trends in mortality and to have a clear alternative assumption. **Mr Orszag** concluded that it would be important to have a variant with much higher life expectancy gains. Convergence in mor-

tality improvements may happen, although there is not much evidence about it.

6. The debate from the floor

During the discussion, Eurostat noted the strong constraint imposed by data availability. On the relationship between demographic components and GDP per capita, Mr Willekens said that the economy has no direct effect on fertility and mortality, although it is important for the intention to migrate. On the increase of obesity in Europe, he acknowledged that demographers look at developments in the United States because of a lack of data in Europe, but that there is also some evidence that obesity is increasing in Europe. It was suggested that heavy drinking could be considered as a risk factor in Europe. Mr Orszag said that it would be appropriate to also publish the tables of life expectancy at age 65. On the question of continuous increases in life expectancy, he stressed the limited evidence that mortality rates at higher ages will slow down, with only some evidence for the United States. As no slowdown is seen so far, it would be reasonable to include a scenario with no slowdown and he underlined governments' responsibilities in presenting the possible outcome of such a scenario.

Mr Willekens said that migration is the most difficult component to forecast, and that it is not wise to fix one number, but he recommended running different sensitivity tests, for example doubling migration flows and seeing what difference it makes to population ageing, and when.

On the NAIRU, Ms Brugiavini argued that the assumption is too exogenous, and that there are some missing links, such as part-time, that may affect long-run numbers. For Italy, the participation rates by cohort are projected to remain constant after a certain year. With the available data, the labour market is frozen, but this cannot be done for younger and older workers. It would be ideal to use longitudinal data and possibly a stochastic approach as well. Mr Barrell said that it is reasonable to assume some convergence in NAIRU, as it is a policy variable, and that some convergence should be in place. Mr Mortensen was hesitant to talk about scarcity of labour as it depends on labour market institutions. He agreed that the NAIRU is a political number.

The experts agreed they consider the assumptions to be optimistic, in particular the mortality assumptions (Mr Willekens) and the growth projections (Mr Barrell considers them too diverse as well). Mr Mortensen also found the assumptions on labour productivity and TFP to be on the optimistic side until 2020. It was also felt that the assumption of 'no policy change' was somewhat asymmetric, while the simplicity of the assumptions was considered to be a strength of the exercise.

The worst case would be that the projected increase in life expectancy is not followed by an increase in healthy life expectancy and that the duration of ill-health and disability increases. Mr Kraemer argued that not all assumptions are equally important. The assumptions on life expectancy at birth are not so critical for the projection results as people born today will be 50 at the end of the projection horizon. He considers the assumptions on fertility to be very low (it is also a policy number as some countries may adopt measures) and is of the view that net migration will be higher as a whole. His overall opinion is that the labour force projections are a bit pessimistic but the results look optimistic on growth. Mr Orszag advised to bring across a message on what would happen if all Member States did like the best performers. The over-65s in the workforce should be further investigated and also how past reforms have an impact on labour market participation.

On the use of the AWG budgetary projections by the market, Mr Kraemer commented that they are a 'scare story' in many instances, but that they tend to be forgotten because of their long time horizon. However, he saw scope for using projections with an extended horizon and for investors to start asking whether it is worth holding 30-year bonds of certain countries. He wondered also how Member States would take into account the projections in their stability programmes.

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