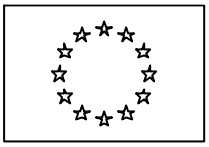

ECONOMIC POLICY COMMITTEE

Brussels, 5 July 2002
EPC/ECFIN/237/02 - final

Reform challenges facing public pension systems:

the impact of certain parametric reforms on pension expenditure

This report is available on the web-site of the Economic Policy Committee:

http://europa.eu.int/comm/economy_finance/epc_en.htm

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EXECUTIVE SUMMARY

The November 2001 report by the Economic Policy Committee (EPC) on budgetary challenges of ageing showed that, on the basis of current policies, ageing populations could lead to a substantial increase in spending on public pensions of between 3 and 5 percentage points of GDP by 2050 in most Member States. Even larger increases were projected for some of them. It also showed that there is only a limited window of opportunity, in general the period up to 2010, to make preparations before the impact of demographics makes itself felt.

The present report, prepared by the Working Group on Ageing Populations (AWG), which is attached to the EPC, presents a number of additional simulations on the quantitative impact of certain changes of the basic parameters of public pension systems on pension expenditure ("parametric reforms") in order to help focus the discussions on the relative merits of different pension reforms in the EU that are currently taking place within the EPC at the behest of the Ecofin Council. The results could also usefully feed into the various policy processes on ageing populations that are evolving at EU level.

The Ecofin Council put forward a "three-pronged strategy" to tackle the economic and budgetary challenges of ageing ...

In March 2001 the Ecofin Council put forward a three-pronged strategy later endorsed by the European Council to address the long-term sustainability of public finances, including the economic and budgetary strains of ageing, namely:

- measures to increase employment rates;
- reforming pension and care systems in order to place them on a sound financial footing including greater recourse to the funding of public pensions;
- running down public debt at a faster pace.

In most Member States an increase in employment rates is a crucial part of a solution to the challenge of ageing populations. The level of inactivity due to unemployment in most Member States is too high, female labour force participation rates in some countries are still relatively low, and the average effective retirement age has decreased during the last decades, leading to a low and, in some cases, very low employment rate for the population aged 55 and above. Life expectancy is expected to increase further in the future, and the share of the elderly will increase while the share of the active population will decrease. This clearly implies some shift in the trade-off between the average level of benefits for people in retirement and the length of the period during which they are paid.

A strengthening of public finances by reducing public debt at a faster pace is a central element in any strategy. The requirements of the Stability and Growth Pact automatically lead to decreasing debt ratios, thereby providing some room for manoeuvre through a fall in the interest burden. There also exists a trade-off here, between exploiting this room for manoeuvre to satisfy present needs/or to reduce the tax burden or exploiting it to pre-fund pension obligations by accumulating budgetary surpluses, e.g. through the establishment of public pension reserve funds.

The setting of priorities between the three dimensions of the three-pronged strategy will differ according to the respective position of each Member State in terms of the sustainability of public finances, the tax ratio, the employment rate, the replacement rate for pensions, and the legislation applicable to older workers as regards the conditions for early-retirement or disability pensions.

The current report focuses on the budgetary impact of certain parametric reforms of the public pension systems. It does not examine the relative weights to be attached to each of the three prongs or the extent to which parametric reforms are needed or sufficient to ensure budgetary sustainability.

Parametric reforms are powerful policies for increasing sustainability

Parametric reforms are aimed at maintaining the basic structure of the existing system while attempting, through changes in the different main parameters of the system, to increase the incentives to work for older workers or to reduce the budgetary cost of ageing. These basic parameters include, for example, the retirement age, the replacement rate and the contribution rate.

In view of the profound diversity of systems, an appropriate set of parametric reforms cannot be the same for every country. Public pension systems can be divided into two broad categories: those providing a basic income irrespective of wages earned or contributions made, i.e. flat-rate systems (Denmark, the Netherlands, the United Kingdom and Ireland), and those where pensions are related to past earnings, while at the same time a minimum pension is preserved, i.e. earnings-related systems (the remaining Member States).

For the purposes of the current report, the AWG simulated on an illustrative basis three selected options for reforming the basic parameters of the public pension systems of the Member States. The comparability of the evaluated impact of the different parametric reform options presented in this report depends highly, amongst others, on the underlying social protection system, the actual indexation rules and the legal retirement age. The country comparisons need therefore to be interpreted with great caution. Overall, the results indicate that all assumed changes in the simulations had a major impact on expected pension expenditure although, as a rule, the individual reforms taken on their own would, under the simulations carried out, only partially absorb the expected increase in pension expenditure by 2050 (see also table below):

- ***Simulation No 1: reducing indexation***

The first simulation tried to assess the potential impact on pension expenditure of a reduction in the indexation of pensions by half a percentage point per year. In earnings-related systems such a measure would absorb, on average, approximately 30% of the expected increase in pension expenditure by 2050 (corresponding to a 0.5-2.0 percentage-point decrease in the share of GDP in 2050). In flat-rate systems, the effect of indexation is much greater than in earnings-related systems (0.6-3.0 percentage points in the share in GDP in 2050), but the relative replacement rate of the flat-rate part of public pensions will decrease considerably and thus lower the relative living standard of pensioners.

- ***Simulation No 2: increasing the activity rate by raising the effective retirement age***

The second simulation looked at the potential effect on pension expenditure of an increase in the effective retirement age. The results show that a one-year increase in the effective retirement age would on average absorb approximately 20% of the expected increase in pension expenditure by 2050 (assuming no increase in the replacement rate). Roughly speaking, if workers were to work one additional year before retiring, the increase in public expenditure on pensions over the period to 2050 would be reduced, on average, by 0.6 to 1 percent of GDP.

Unlike the reduction in indexation, however, the increase in the effective retirement age would not reduce the benefit ratio and thus would not have a negative impact on the relative standard of living of pensioners. In addition to the favourable public finance impact, the benefits of this type of reform are considerably more pronounced in terms of economic growth and avoiding major changes in income distribution. If raising the effective retirement age increases overall employment, the growth effects will have, over and above the simulated primary effects, additional secondary effects on public finances.

- ***Simulation No 3: adjustment of benefits in line with the expected increase in life expectancy***

The third simulation started from the notion that, from the point of view of intergenerational equity, given the same contribution rates and the same active lifetime, a cohort with higher life expectancy should have a proportionally lower pension because pensioners can benefit from pensions for a longer period of time. The simulations showed that on average, approximately 45% of the expected increase in pension expenditure in 2050 is the result of the increased life expectancy. An adjustment of the benefits to account for increased life expectancy could thus have a very significant impact (by 0.4-1.9 percentage points compared with the baseline in 2050), albeit at the expense of a progressively lower replacement rate for pension benefits.

A comparison between Simulations Nos 2 and 3 shows that, in order to offset the impact of the expected higher life expectancy on pension expenditure, without reducing benefits, the effective retirement age would have to rise on average by 2-3 years (which corresponds to the expected rise in life expectancy by 2050).

Illustrative simulations on the impact of certain parametric reforms

	Increase in pension expenditure as a share of GDP from 2000 to 2050 (baseline projection) (1)	*Illustrative impact of certain parametric reforms as a share of GDP in 2050* (2)		
		Half a percentage point change in the indexation of pensions	*Raising the effective retirement age by one year*	*Reducing benefits in line with increase in life expectancy*
Flat-rate systems				
DK	2.8%	2.7	-1.0	-1.7
IRL	4.4%	1.6	-0.4	-
NL	5.7%	2.7	-1.1	-
UK	0%	0.6	-0.2	-0.5
Earnings-related systems				
A	2.5%	1.0	-	-
B	3.3%	0.5	-	-
FIN	4.6%	0.9	-0.6	-1.5
F	3.7%	-	-0.9	-
D	5.0%	-	-0.7	-1.6
I	0.3%	1.2	-0.1	-0.4
P	3.4%	2.0	-0.34	-1.9
E	7.9%	1.9	-	-
S	1.7%	-	-0.3	+1.1

Notes:

(1) See EPC report on budgetary challenges posed by ageing populations: the impact on public spending on pensions, health and long-term care for the elderly, Brussels, October 2001. For several countries the peak change from 2000-2050 will occur before 2050 and exceed the 2050 figure: DK: 4.1%; IRL: 4.4%; NL: 6.2%; UK: -1.1%; A: 4.2%; B: 3.7%; FIN: 4.7%; IT: 2.1%; PT: 4.1%; ES: 7.9%. The present figures do not take account of future changes in tax revenue. For some countries the second tier is quite well developed. Taxes on future pension benefits (which are drawn from the private funds) are expected to be quite high and may to some extent counterbalance the rise in public pension expenditure. As noted in the original report, higher levels of inward migration could offset the projected decline of the total and working age populations projected, but would have to reach levels far above those experienced in the past to have a significant impact on the pressure for increased spending on public pensions. The baseline projections for age related public expenditures of Spain are based on national population data of 1995 (Eurostat data of 1999). Upcoming revisions may lead to improved results.

(2) The calculation used: % deviation of GDP in 2050 from the baseline divided by the baseline in 2050 in % of GDP. Luxembourg and Greece did not participate in the exercise. For most Member States, these projections include the major public pension schemes. Note that the coverage is not fully comparable across countries. For the first simulation, some countries raised their indexation, while others lowered it. For the second simulation, some countries allowed the pension level to increase following an increase in the number of contribution years and higher transformation coefficients under the contribution-based system. The third simulation estimates the impact of increased lifetime expectancy on pension expenditure (as Sweden has a notional defined-contribution system which takes into account changes in life expectancy, it was asked to undertake a projection where increases in life expectancy are not taken into account).

Source: EPC working group on ageing populations.

The results of the AWG simulations have been broadly corroborated by additional simulations carried out for EU-15 on an aggregate level by the Commission's Directorate-General for Economic and Financial Affairs using their recently created ageing model. Their results showed that a stabilisation of the public pension systems in the EU would not appear to be achievable solely by shifting from a system which is fully indexed to wages to one fully based on prices (which would also have negative implications for income distribution).

Their second simulation on an increase in the effective retirement age from its present level of close to 60 to an average age of 65 showed that the impact in terms of budgetary developments would be quite dramatic. If workers were to work one

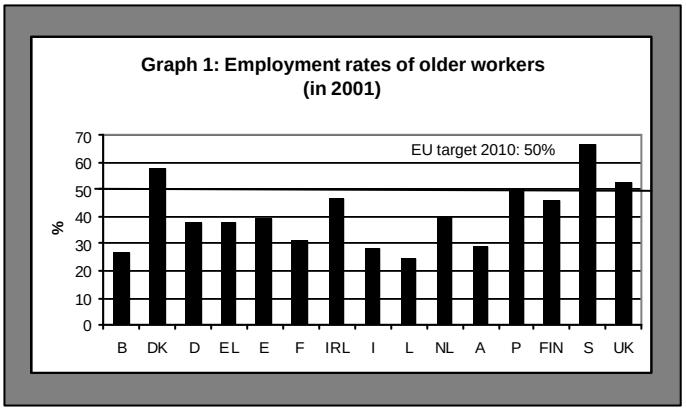
additional year before retiring, the increase in public expenditure on pensions over the period to 2050 would be reduced by 0.84 percentage points of GDP. At the same time growth would be boosted by over 13%, thereby going a long way towards offsetting the GDP loss associated with ageing over the next 50 years and avoiding large changes in income distribution (with the consumption of pensioners and workers both rising relative to the baseline).

Reform priorities could be different in each country

To help shed light on possible priorities for pension reform that can be identified for some Member States on the basis of expected increases in public pension expenditure, the AWG produced an assessment of the three-pronged strategy to address the economic and budgetary challenges of ageing. It combines the information on the activity indicator for elderly people (Graph 1) and the relative replacement rates of the systems (Graph 2) with the sustainability indicator for public finance developed in the EPC report of November 2001.

The information on the sustainability of public finance was taken from the assessment made by the Ecofin Council of the 2001-2 updates of the stability and convergence programmes of the Member States. The Commission identified future long-term risks for the sustainability of public finances, in terms of emerging budgetary imbalances not in line with the stability and growth pact, have been identified in Greece and Spain, as well as in Germany, France, Italy, Austria and Portugal[1]. Whilst the risk for sustainability is low, Belgium faces an important challenge given its high level of public debt. In most cases, the emergence of these risks corresponds to a high level of pension benefits and a relatively low level of activity among older people, pointing to the possible need for corresponding reforms. Although the risks are lower in the case of the other Member States, the parametric simulations produced show that reforms could still be worth carrying out with a view to reducing the risk of fiscal imbalances, offsetting the GDP loss associated with ageing or envisaging trade-offs between the weight attached to all three elements of the strategy.

In most countries the activity rate needs to be raised



Overall, it can be seen from Graph 1 on the left that in some countries a clear policy priority should be placed on increasing the employment rate and the activity rate of older workers by providing stronger incentives for elderly workers to remain in the labour force or introducing disincentives to early retirement. A large number of Member States (Austria, Germany, Denmark, Finland, Italy, Netherlands, Sweden and Luxembourg) already introduced reforms aimed at

[1] See summarising: European Commission (2002), Public finances in EMU – 2002, European Economy Reports and Studies, Directorate-General for Economic and Financial Affairs, Brussels, May 2002.

establishing a closer actuarial link between the retirement age and individual pension benefits. The changes imply that, at the margin, individuals will, to a greater degree, bear the cost associated with their early-retirement decision. However, the graph shows that the countries facing the biggest challenges from low activity rates among older workers are Belgium, France, Italy, Luxembourg and Austria, which have employment rates for people in the 55-65 age group of between 25% and 30%. This seems to be correlated in particular with the eligibility requirement for early-retirement and/or disability schemes. In some countries the difference in the legal and effective retirement ages for males and females also appears to be an issue.

On the basis of current policies in many Member States the pension system and/or other transfers (early retirement, disability, unemployment) do not provide sufficient incentives to remain active (see also recent work by the OECD[2]). So as to raise the overall employment rate for people in the 55-65 age group, at the same time in a number of Member States disincentives for female labour force participation should urgently be removed, and an adjustment of the legal retirement age for females to the one for males be considered. A simple increase in the statutory retirement age will not bring the desired result of an increase in the effective retirement age. The AWG considers that, apart from removing barriers for female labour force participation, reforms of these systems should aim mainly at reducing disincentives to remain in the labour market, e.g. by restricting access to early-retirement, pre-retirement and disability programmes, by removing unwarranted financial biases in tax and pension systems for older workers to leave the labour force early, by allowing more flexible formulas regarding the retirement age (in line with actual labour market behaviour of workers approaching retirement) and by moving towards greater reliance on actuarial fairness of benefits. It may also be noteworthy that in many Member States alternative routes into early retirement other than the main pension system such as disability benefits (which have to be covered by other social security schemes), special early-retirement programmes or unemployment pensions do not entail the degree of actuarial adjustment that pensioners would face in the main schemes. Other constraints for remaining in the labour force that are embedded in the conditions for pension entitlements and impact on the incentives to work, such as the minimum number of years of contribution required for a full career or the rules for the cumulation of benefits, etc. should also be considered.

Apart from these built-in incentives of pension systems, however, retirement behaviour also depends on other factors such as the state of the labour market for older workers, the health of the potential retiree, the labour market status of the spouse etc.

Increasing the activity rate of older workers by providing stronger incentives for elderly workers to remain in the labour force, given that this appears to offer significant economic benefits relative to its costs, should also be a priority in countries with an average employment rate, i.e. Germany, Greece, Spain, Ireland, Finland and the Netherlands.

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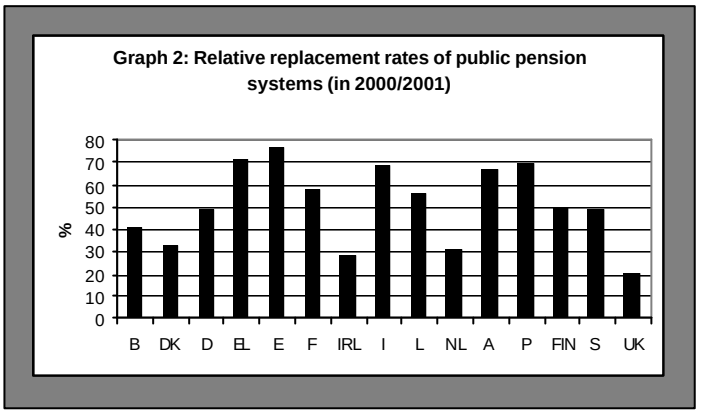
[2] Policy Responses to the challenges of ageing populations – a synthesis; OECD Working Party on Social Policy, Paris, April 2002.

Another focus could be the benefit levels of public pension systems

Reforming pension systems so as to place them on a sound financial footing has an impact on the relative standard of living of pensioners, which is normally measured by the replacement rate for pension benefits (relative to the wage received prior to retirement. In the following, an alternative measure for the relative level of income replacement for a full career is used. This measure tries to capture the pension level during the period in retirement relative to the wage level that would have been received during the same period.



Note: Italy and Sweden: old non-NDC systems before reforms. For the countries with a flat-rate system (DK, IRL, NL, UK) the replacement rate was computed as the flat rate divided by average wage income; it is thus not fully comparable with the other countries.

The relative level of income replacement in the different pension systems is difficult to assess. It depends on many parameters, notably including the indexation rules, the "statutory" (or "legal") replacement rate, the number of years constituting a full career, the minimum age for early retirement, etc. The AWG constructed a synthetic indicator of the relative average (gross) replacement rate across countries, by applying a standard pension formula to a hypothetical individual with a full career, using a number of standardised assumptions for the retirement age and for the remaining life expectancy and the specific parameters of the different EU countries for indexation, the legal replacement rate and the contribution rate. The ratio does not constitute a ratio prior to retirement, but is computed as the average ratio between the pension benefits and the wage that would have been received during the period spent in retirement. The aim of this indicator is to achieve broad consistency across Member States while recognising that special care must be exercised when interpreting it; indeed, it is static and hypothetical, based on calculations presented in Annex 3 and allowing for country-specific features of pension systems presented in Annex 5. The calculations also do not reflect all the features of the systems in place in the different Member States. The comparison of the relative replacement rates of public pensions systems in Graph 2[3] shows that several Member States could pursue reforms aimed at containing average pension benefits without endangering the general adequacy of old-age provision within their systems.

In countries which have a flat-rate pension system like Denmark, the Netherlands, the UK and Ireland, the replacement rate of the public pension system for a full career in general seems low (but is normally supported substantially by second-pillar pension provision).. In most countries with earnings-related systems a high relative replacement rate is related to the combination of wage indexation and the relatively

[3] Without reforms, in flat rate systems indexed to wages the replacement rates will remain the same in 2030 as in 2000. In earnings-related systems, the only difference will come from the fact that the life-expectancy is higher in 2030 than in 2000 (see Annex 3)

small number of career years taken into account in calculating new pensions. In countries with earnings-related systems, where the level of pension benefits appears high enough to be considered a priority for parametric reforms, such reforms could take three directions:

(i) an increase in the number of years of pension contribution taken into account in calculating pensions, e.g. the whole work career, and/or a more actuarial link between benefits and contributions.

(ii) a shift in the indexation of pension benefits from wages to prices or, at least, to a base lower than a wage indexation (for instance, hybrid price and wage indices or prices plus discretionary increases).

(iii) a shift from wages towards prices in the indexation of wages that are taken into account in calculating the reference (pensionable) salary.

Reform strategies need to take into account the time spent in retirement

The results suggest that the ongoing increase in life expectancy has a large impact on the budgetary cost of ageing. In earnings-related systems, the most straightforward answer especially in terms of increased incentives to work would be to link in a more actuarial way the replacement rate or the contribution rate of a cohort to its life expectancy. This option may be particularly relevant when devising reforms of pension systems in Member States where replacement rates are relatively high.

Reforms aiming at linking the replacement rate to the life expectancy of each age cohort have recently been introduced in Sweden and Italy (these reforms are not reflected in Graph 2 above). The new systems will be notionally defined-contribution systems in which while the PAYG character of the system is preserved, individual pension benefits are computed actuarially and are based on effective working-life contributions. The actuarial nature of the new system implies that each individual, as from the point in time when the minimum age is reached, is responsible for his own trade-off between a lower/higher pension and a shorter/longer working life[4]. Accordingly, further increases in life expectancy will not increase the overall pensions received compared with contributions made, neutralising the financial effects for government. Also a number of other Member States have recently introduced features into their pension formulas leading to an adjustment of benefits to the higher life expectancy by an automatic lowering of replacement rates over time.

Lastly, while Member States are regularly introducing a wide range of reforms with the aim of containing the ageing problem facing them, further reforms are needed in view of the expected impact of ageing. The simulations performed by the AWG and the Commission show that in most Member States a combination or *broad package* of so-called "parametric" reforms will be required to address the challenges facing pension systems up to 2050. The design and structure of public pension systems play a crucial role in determining the scale of the budgetary impact of ageing, but also its impact on growth, employment and the living standards of the working population. The benefits of the changes are clear. Timely reform is essential in order to exploit the

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[4] It should however been noted that the reform in Italy will be phased over a very long period.

opportunity provided by the relatively low demographic pressure over the next 5-10 years.

I. BACKGROUND AND AIM OF THE REPORT

The November 2001 report by the EPC on budgetary challenges of ageing showed that, on the basis of current policies and notwithstanding reforms during the 1990s, ageing populations could lead to a substantial increase in expenditures for public pension systems of between 3 and 5 percentage points of GDP by 2050 in most Member States. Even larger increases were projected for some of them.

The report also showed that there is only a limited window of opportunity, in general between now and 2010, to make preparations before the impact of demographics makes itself felt. The report concluded that more effort is therefore required to enhance the long-term sustainability of public finances in view of ageing and that further reforms will be needed in several Member States.

In order to address the challenge of ageing populations, the Barcelona European Council on 16 March 2002 invited the Council to continue to examine the long-term sustainability of public finances as part of its annual surveillance exercise, in particular in the light of the budgetary challenges of ageing. It also called for the reform of pension systems to be accelerated so as to ensure that they not only are financially sustainable but also meet their social objectives.

To complement the projections contained in the report on budgetary challenges posed by ageing populations presented to the Ecofin Council in November 2001[5], the EPC invited the AWG to produce additional sensitivity analyses on the quantitative impact of certain parametric reforms on public pension expenditure so as to help focus the discussions on the relative merits of different pension reforms, as requested by the Ecofin Council in March 2001. As appropriate, the results could also be used as input into the Broad Economic Policy Guidelines and the open method of coordination in the field of pensions.

Parametric reforms are aimed at maintaining the basic structure of the existing system while attempting, through changes in different parameters, to influence the costs, financing or incentive structure of the system in order to keep it in balance. The range of basic parameters defining the different pension schemes include, for example, the retirement age (the statutory old-age retirement age and the effective retirement age), the replacement ratio (defined by direct pension benefits, ceilings, indexation rules, etc.) and the contribution rate.

All Member States except Luxembourg and Greece responded to the request to provide complementary simulations. The effects of simulated parametric changes are presented as relative changes in the projected share of pension expenditure in 2050.

The EPC report on budgetary challenges posed by ageing populations revealed relatively large differences in future pensions expenditure developments in the Member States. Even if the results appear to be within the same range for most

[5] Economic Policy Committee (2001), "Budgetary challenges posed by ageing populations: the impact on public spending on pensions, health and long-term care for the elderly", EPC/ECFIN/655/01 final, 24 October 2001.

countries, there are within this group marked disparities in terms of (i) the level and the evolution of the main determinants of pension expenditure (demography, employment rate, eligibility rate, replacement rate), and (ii) the budgetary challenges resulting from a given increase in pension expenditure.

In general, assessing the effects of policy measures with economic models can have two functions:

- to evaluate the budgetary consequences of possible reforms aimed at helping to resolve well-defined problems or meeting specific constraints;

- realising sensitivity analyses in order to test the robustness of the results of a baseline scenario and to better understand the properties of the model.

The simulations contained in this report serve to illustrate the potential impact of certain parametric reforms in the different countries on pension expenditure and to provide a better understanding of their relative importance when examining the budgetary challenges of ageing populations.

II. PARAMETRIC REFORMS AND PENSION SYSTEMS

Parametric reforms of public pension systems inherently depend on the logic of each system. Each Member State has a pension system with its own characteristics. From a very general point of view, one can broadly distinguish between two types of systems: those where pensions are “not earnings-related” (i.e. “flat-rate”) and those with "earnings-related" pensions. The latter type also includes notional defined-contribution systems.

2.1 Flat-rate systems

Flat-rate (“not earnings-related”) systems in general provide all old-age pensioners with an identical public pension, irrespective of wages earned or contributions paid in. They are essentially redistributive. In such a system, the essential parameters are: the basic amount of the pension and its development (the indexation rule) and the age at which one becomes eligible for such a pension. Four countries have such a system: DK, IRL, NL, UK. In these countries a private second pillar is well developed.

In the projections provided by the Member States in the general report on the budgetary challenges posed by ageing populations, the basic pension was linked to the average wage developments for DK, IRL and NL and to price developments in the UK. It should be noted that in flat-rate systems the indexation mechanism has a pronounced impact both on pension expenditure and on the average replacement rate.

2.2 Earnings-related systems

Most Member States have earnings-related systems, which cover those members of the population who contributed to the system from a certain age. Safety nets normally exist for individuals whose earnings-related pensions do not amount to a certain minimum level.

The general parameters to be taken into account are at two levels: those which apply to the calculation of the pension at the time of retirement and those which apply to the development of this pension:

(i) When calculating the initial level of a pension, normally account is taken of a reference salary (often calculated on the basis of an individual's entire career or the last/best x years of his/her career, with or without a ceiling) and of the replacement rate applicable to it. The legal replacement rate can depend on career length, marital status and the number of incomes in the household.

(ii) The development of the pension during the pensioner’s life is determined by the type of indexation used.

2.3 The role of indexation

In earnings-related systems, the indexation rules influence pension expenditure via three channels:

(i) **Indexation of the reference salary**, i.e.: indexation of former wages (including ceilings) taken into account in calculating the reference salary used for the computation of a new pension.

(ii) **Indexation of pensions** for people already in retirement.

(iii) **Indexation of minimum pensions**.

Indexation of the reference salary. Wages taken into account in calculating the reference salary are usually indexed to wages; roughly speaking, every year the real increase in the "new pension" follows the real increase in average wages for the years taken into account in the reference salary.

Indexation of earnings-related pension benefits for people already in retirement. This second channel can be a candidate for parametric reforms. Pensions of retired people are sometimes indexed to prices, sometimes to wages and sometimes to prices plus a discretionary annual real percentage increase. A change in the indexation rule for the pensions of retired people (what we might call "existing pensions"), e.g. a switch from indexation to prices to an indexation to prices plus 0.5 percentage point per year, will have an impact on the evolution of existing pensions but not of new pensions. The change in indexation of existing pensions will only have a downward impact on the evolution of pensions, and thus on the ratio between pensions and wages, over the lifetime of the pensioners.

Overall, for a stable population and with a constant life expectancy, the replacement of old cohorts by new cohorts implies that the pension expenditure deviation from the baseline is limited and stable in percentage terms (for a numerical example, see Table A4-1 in Annex 4). This steady state is reached after a transition period that is a function of the average number of years during which a pension is drawn. If, as in the projections, life expectancy increases, each new cohort remains longer in the pension system and so the change in the indexation rule for pensions has a longer effect. The longer the life expectancy (the number of years drawing a pension), the larger the impact of a change in the indexation rule (see Annex 4, comparison of Table A4-1 with Table A4-3). On the other hand, a change in the indexation rule in a flat-rate system will result in an ever-increasing deviation of pension expenditure with respect to the baseline. Accordingly, the impact of the indexation rule in earnings-related systems is much more limited than in flat-rate systems (see Annex 4, comparison of Tables A4-1 and A4-2).

Indexation of minimum pensions. As for this third channel, i.e. the indexation rule for minimum pensions that are generally embedded in earnings-related systems, the impact of a change will have the same characteristics as a change to a flat-rate system. Thus, in countries with an earnings-related system, the larger the share of pensioners at the minimum pension level, the greater the impact of a change in the indexation rule.

The indexation rule applied to pension benefits of earnings-related pensions after retirement can be broadly divided into three groups: (i) indexation to prices (with possible discretionary increases): Belgium, France, Italy, Luxembourg, Spain and the UK; (ii) indexation to wages (minus automatic contribution-oriented reductions):

Germany after the 2002 pension reform and Denmark; (iii) mixed indexation or ad hoc systems: Greece, Portugal, Ireland, Netherlands, Austria, Finland and Sweden.

In two countries, Italy and Sweden, the earnings-related system has been reformed and will progressively become a *notional defined-contribution system*. Here, the pension of a new pensioner is determined by an actuarial calculation taking into account the contributions paid during his/her career, which determine the amount of benefits paid out during retirement. In the case of such an actuarial determination, two parameters are important: the yield applied to the notional capitalisation of the contributions and the life expectancy of the retiring cohort. The pension is thus considered as a rent the level of which depends on two factors calculated on the basis of an actuarial formula: (i) the accumulation of life-long contributions, and (ii) the life expectancy of the cohort. Also a number of other Member States have features such as special indexation rules or special "coefficients" in place leading to stronger actuarial links between the level of pension benefits received and the amount of contributions paid in during each individual career, aiming at adjusting benefits to increasing life expectancy.

In notional defined-contribution systems, actual indexation is determined by the rate of return associated with the actuarial formula. Changes in the age-eligibility condition should normally have no net impact in the long run on pension expenditure since the actuarial nature of the system modifies proportionally the replacement rate, which compensates for the change in the number of people receiving a pension.

III. HOW DIFFERENT PARAMETERS DETERMINE THE BENEFIT LEVELS OF PUBLIC PENSION SYSTEMS

The AWG considers that recommendations on parametric reforms aimed at alleviating the risk of unsustainability of public finances in the long run or to increase the incentives to work for older workers cannot be the same for every country. They will depend (i) on the relative replacement rate of the systems, which is mainly a function of the value of a small set of parameters, and (ii) on the legislation/legal framework covering older workers who have taken some form of early retirement.

3.1 The effect of different parameters on the benefit levels of pension systems

As noted above, a distinction has to be made between flat-rate systems and earnings-related systems, including notional defined-contribution (NDC) systems. In *flat-rate systems* there are two main parameters: the flat rate and the indexation rule. The level of these parameters is the result of a political choice that takes different considerations into account, such as social exclusion and poverty. *In NDC systems,* by contrast, the pensions are computed on a "purely" actuarial basis, i.e. they represent the outcome of a notional financial asset accumulated through the regular payment of a contribution. The main parameter in this kind of system is the notional interest rate, which is usually based on the growth rate of GDP or GDP per job (wage/salary cost per job). In *standard earnings-related systems* there is a clear link between the level of the pension and the contributions paid, but this link is far from having an actuarial basis. Pensions are determined as a defined benefit using a formula that involves a set of parameters, such as the length of career compared to a particular maximum, the number of years of the reference salary taken into account in the formula, the legal/legal replacement rate applied to this reference salary, the indexation rule of past wages when the reference salary is computed, and the indexation rule for actual pension benefits received. A generalisation of an earnings-related system is given by the following three equations, where the role of the parameters is indicated:

Equation 1 ***New pension***

$$np_R = x \cdot \frac{N}{D} \cdot wref_R$$

where np is the new pension in year R, x is the legal replacement rate, wref is the reference salary, N is the number of years effectively worked and D is the maximum number of years taken into consideration to obtain a full career pension.

Equation 2 ***Reference salary***

$$wref_R = \sum_{t=1}^{T} \frac{(w_{R-t} / T)}{index1_{R-t}}$$

where w is the annual wage received during the years R-t before the date of retirement R, T is the number of years taken into consideration (5 last, 10 last…), and index1 is the indexation rule used in the computation of the reference salary (indexation to prices or to wages).

Equation 3 ***Replacement ratio***

$$rp = \sum_{i=1}^{17} (index2_i \cdot np) / \sum_{i=1}^{17} w_{R+i}$$

where rp is the replacement ratio computed as the average number of pension years (17 in the example below), which depend on the indexation rule of the pension index2, divided by the average salary during these years.

The relative level of income replacement provided by the different systems is determined by the specific parameters of each system, which are provided in detail in Annex 5. For earnings-related systems, cross-country comparability of the level of pension benefits is difficult given that the data on the statistical effective benefit ratio[6] are so heterogeneous between countries (see Table A5-3 on page 45). *To make the level of benefits more comparable, the AWG in table 3.1 computed a synthetic indicator of an average replacement ratio for a full career (gross taxes), using a methodology also used by the OECD, by applying the above formula for the replacement ratio (Equation 3) to a hypothetical individual with a full career as defined by each system, using the specific parameters of the different EU countries.* The same method was applied for the calculation of a "hypothetical" internal rate of return[7]. The standard individual is a private sector worker retiring in 2002 at an age of 65 years with an average income level, a remaining life expectancy following retirement of 17 years, contributions for the duration of a full career as legally specified for each country, and the country-specific indicators that exist currently in the Member States for the legal replacement rate, the contribution rates and other parameters of the different pension formulae (the indexation rules of benefits - indexation to prices and indexation to wages, as the case may be, and the number of years taken into account in the reference salary or the indexation rule for the wages making up this reference salary). The estimates assumed the individual to have the same starting salary in each country and a real wage growth of 1.5 per cent per year and an interest rate of 2 per cent. The ratio, which represents a simple average of the annual replacement rates, does not constitute a ratio prior to retirement, but is computed as the average ratio between the pension benefits and the wage that would have been received during the period spent in retirement. The average replacement rate and the internal rate of return in table 3.1 do not provide a representation of the overall generosity of a pension system but only the description of a specific profile's benefits which derives from the basic parameters of the system based on the maximum years in employment needed for reaching the full replacement rate. In most of the cases the standard worker profile diverges from the basic parameters, for

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6 The following definitions are used in this paper: *replacement ratio:* the ratio of annual pension benefits received by an individual compared with his/her earnings prior to retirement or compared to the average wage; *benefit ratio:* the ratio of the pension expenditure for people aged above 65 or more divided by the population aged 65 or more, over the gross average wage in the economy. In the paper both measures are calculated gross of tax.

7 It should be noted that the IRR as calculated here is in general underestimated relative to the effective one, as people usually retire earlier than 65 with careers shorter than 40/45 years of contributions and somehow faster than the growth rate of the average wage. On the basis of a retirement age of 60 and 40 years of contribution, the replacement rate would on average be 3% lower, and the IRR 0.5% higher.

instance the average retirement age is less than the maximum retirement age or the average number of contribution years is lower than the maximum. These indicators should only be interpreted as synthetic indicators of the parameters given in the table. To get a picture of the relative generosity of the systems would require a deeper analysis of the typical standard profiles of the pensioners and their link with the indicated parameters. The aim of the synthetic indicator is to achieve broad consistency across Member States while recognising that special care must be exercised when interpreting it. The calculations in particular ignore effects stemming from a different retirement age than 65[8] or the speed of the worker's career.

In Table 3.1 the main parameters of Member States' public pension systems for wage earners in the private sector are indicated. The replacement ratio has been computed for every earnings-related system in line with the approach outlined above. The result is a direct function of the parameters shown in the table – the contribution rates, the statutory replacement ratio, the number of years considered for the calculation of the reference salary and for a full career, and the indexation rules. In the case of countries with a flat-rate system, the indicator has been computed as the flat rate divided by average wage income; it is thus statistical and not fully comparable with the other countries. In the case of Sweden and Italy, a fundamental reform has been implemented and has resulted in an NDC system, where the level of pensions paid out is determined by an actuarial calculation. For these countries the indicator is computed using the parameters of the old system. The new defined contribution system has been built so that it guarantees an IRR equal to the growth rate of GDP in Italy and to the average wage growth per employed in Sweden. The table and the subsequently derived replacement rates for the different Member States need, however, to be interpreted with great caution. The parameters presented in the table apply only to the compulsory general pension systems, and different pension systems may co-exist at the level of a Member State, with differing cumulation rules, which makes it difficult to determine an overall level of a global replacement rate.

A qualitative indicator of relative level of benefits has been derived from the average replacement ratio. Systems with replacement ratios above 60% are considered to have a relatively high level of benefits. This is the case for Greece, Italy, Portugal and Spain. Systems with replacement ratios below 40% were considered to have a relatively low level of benefits. This is generally the case for the countries with flat-rate systems: the Netherlands, Denmark, Ireland and the UK, but also Belgium because of the number of years taken into account in the reference salary and the indexation to prices. Italy and Sweden have already reformed their system along the lines of an NDC system and are considered as providing a medium level of benefits based on the post-reform replacement ratios. For the other countries the parameters give a replacement ratio of between 40-60% (medium benefit level): Austria, France, Finland, Germany, Luxembourg and Portugal.

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[8] The comparability of the synthetic indicator of the replacement ratio is greatly affected by the age of retirement to be adopted in so far as systems differ in regard to the presence/absence of either actuarial adjustments or real indexation. For instance, if a lower retirement age were assumed, the replacement ratio would be lower in those systems which provide either actuarial adjustments or indexation only to prices. It would be higher in the systems which do not provide for such adjustments.

Table 3.1 - Relative benefit levels of general public pension systems

Country	Indexation rules *(1)*		"Statutory" replace-ment ratio	Number of years in		Contrib-ution rates	Replacement ratio indicator (before taxes) *(3)*		Indicator of relative benefit levels *(4)*
	Pensions (Index 2)	Reference salary (Index 1)		Reference Salary *(2)*	Full career	(in % of wages)	Average replace-ment ratio in % of average wage	Implicit internal rate of return	
B	P+	P	60	45	45	16.36	40.7	1.2	L
DK	W		Flat Rate		40		32*		L
D	W-	W-	48,9	LL	45	19.1	48.9	1,3	M
EL	P	W	80 (60)	5	35	20	71.2/ 53.4	3.6/2.5	H/M
E	P	P	95	15	35	28.3	76.3	2.5	H
F	P	W/P (*5*)	50	10/25	40	16.35	58 *(6)*	1.5 *(7)*	M
IRL	P	P+	Flat Rate		40		28*		L
I	P	P/P+/W	80/NDC	5/10/LL	40/LL	32.7	69.1/**	1.06 *(9)*	H/**
L	P/W	P/W		LL	40	16	56		M
NL	W		Flat Rate				31*		L
A	P+	P+	80	15	45	22.8	66.8	1.8	H/M***
P	P+	P	80	10/40	40	34.75	69.3/ 56.2	0.8/ 0.1	H/M
FIN	P/W	P/W	60	10	39	21.1	50	1.6	M
S	P/W	P/W	60/NDC	15/LL	30/LL	18.5	48.2/**	3.1 *(9)*	M/**
UK	P	P *(8)*	Flat Rate		-		20.5*		L

Notes:

(1) P+ indicates indexation to prices and irregular real increases. P/W indicates a mix of price and wage indexation. W- indicates indexation to wages minus pension contributions.

(2) LL: lifelong earnings. A "10/LL" indicates that the system is moving from 10 years to LL. In the case of Italy the mid notation refers to the earnings-related system in the transitional period.

(3) Average gross replacement ratio between the pension benefits and the wages that would have been received during the period in retirement (17 years). Figures after the slash indicate the outcome at the end of the transitional period. "*": For flat-rate systems the figure is the effective benefit ratio as reported by the countries (see Annex A5-3). "**": The average replacement ratio in the new NDC systems is computed on the basis of an actuarial formula and is highly dependent on the number of contribution years, and other variables (notably the average retirement age, the work career, wage dynamics and macro-economic assumptions). "***": "M" refers to the real benefit ratio of 56%.

(4) **H** (high): 60% or more; **M** (medium): 40-60%; **L** (low): 40% or less;

(5) W before 1987, P since 1987.

(6) Taking into account the compulsory "régime général" and the two compulsory complementary systems ARRCO-AGIRC.

(7) Only for the general pension system.

(8) Or 2.5%, whichever is the higher.

(9) Old systems, before reforms. The internal rate of return under the reformed NDC systems in those two countries would be the growth rate of GDP (Italy) or of average wage per employed (Sweden).

The approach described above gives a reasonably good picture of the relative level of benefits provided under the different systems. However, it does not take into account other elements peculiar to specific countries, and in particular the progressivity of income taxes which leads to much higher net replacement ratios. Moreover, the level of the replacement ratio depends on the assumption made for the growth in wages: with price indexation, the higher the growth of wages, the lower the replacement ratio. This can lead to a downward bias for catching-up countries when compared with the other countries. Finally, a relatively high level of benefits is quite clearly also related to the contribution rate (with a particularly strong link in the case of actuarially determined calculation rules).

The relative level of benefits of earnings-related systems is analysed in Annex 3 as a function of remaining life expectancy, contribution rates and years taken into account in calculating the reference salary. On a theoretical basis, the Annex assesses the effect of the parameters on the benefit ratio and their link with the contribution rates.

An attempt is made to provide orders of magnitude of theoretical or implicit rates of return in a PAYG system. Some interesting conclusions can be drawn:

- Even in earnings-related systems, the average benefit ratio can turn out to be low when pensions are indexed to prices, the legal replacement rate is low and the number of years taken into account in the reference salary is high.

- Even with relatively generous pensions resulting from wage indexation, high legal replacement rates and high reference salaries, the theoretical internal rate of return on the basis of present contribution rates is lower than the real interest rate in the past. This may be justified within certain limits if this rate of return is certain and not lower than the growth rate of productivity and wages[9].

- With pensions indexed to prices, the benefit ratio decreases. Moreover, as the age of the pensioner increases, the gap between the pension and the current average wage widens. Indexation to prices, in other words, is a powerful policy for reducing the budgetary cost of ageing by lowering the average benefit ratio, albeit, at the expense of the relative living standard of older pensioners.

- Without changes in the pension parameters, increases in life expectancy will automatically enhance the theoretical rate of return of the pension system.

3.2 Legislation and activity of elderly people

An important component of the budgetary cost of ageing is represented by the large number of people who do not work after the age of 55. A low activity rate between 55 and 65 is observed in many European countries, especially those which have legislation/a legal framework enabling employers and employees to take advantage of different early-retirement formulas. In countries where the activity rate is low, a sensible policy recommendation would be to reform the legislation so as to increase the activity rate. This would, on the one hand, increase employment and thus economic growth and social security contributions and, on the other, reduce early-retirement benefits.

Table 3.2 shows the different parameters indicating the scale of inactivity among the elderly. The employment rate diverges markedly between countries with a record low figure in Belgium and high levels in the Nordic countries. It also shows that the problem has more to do with an average retirement age of under 65 and the eligibility requirements for early retirement and disability than with the legal or statutory eligibility requirement for old-age pensions. In some countries the different legal retirement age for males and females also appears to be an issue.

The last column, based on the employment rate, provides an assessment of the relative level of policy priority to be devoted to this issue in the different countries. In every country, the rate of employment could be raised, but in some of them the problem is

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[9] The rate of return in a PAYG system should be the average growth of the real wage, provided that the population and its demographic structure are constant.

acute, e.g. Belgium, France, Italy, Luxembourg and Austria. This seems to be correlated with the eligibility requirements for early retirement. In Denmark, Sweden, the United Kingdom and Portugal, the employment rate is already high and eligibility requirements relatively restrictive. In other countries including the Netherlands, the disability rate is high.

Table 3.2 - Indicators of activity for the elderly

	Employment rate for age group 55-64 in 2001 (in %)	Average retirement age (latest available year*) *(1)*			Eligibility requirement for early retirement in 2002	Eligibility requirement for old-age pensions in years in 2002 *(1)*	Activity indicator *(3)*
		Old age	Early retirement	Disability	Minimum age *(1)*		
B	26.5	62.6	55.6	n.a.	58 *(2)*	65/62 (65/65)	L
DK	58.0	67	61	49	60	65 (67)	H
D	37.8	62.2/62.3	-	52.2/50.3	62	65	M
EL	38.0	60.5	n.a.	50.4	60	65	M
E	38.9	65.3	61	49.6	60	65	M
F	31.0	61.8	n.a.	n.a.	55	60	L
IRL	46.8	62	n.a.	n.a.	55	65	M
I	28.0	61.6	56.3	50.5	55 *(57)*	65/60	L
L	24.4	65	59.5	50.6	57	65	L
NL	39.6	65	60	n.a.	60	65	M
A	28.6	62.6	57.9	49.6	61.5/56.5	65/60	L
P	50.3	65.7	61.9	56.4	55	65	H
FIN	45.7	63.6	60.5	50.7	60	65	M
S	66.9	64.5	62	50	-	61 (65) *(4)*	H
UK	52.3	62.6/60.4	n.a.	n.a.	-	65/60	H

Notes:
* For DK, D, E, EL, A, NL, P, FIN and S the year is 2000; for IT, L and UK, 1999; for B, F and IRL, 1998.
(1) The first figure before the slash is for males, the second one for females. In brackets: after reform (after the end of a transitional period).
(2) Early retirement below 58 is only possible in case of so-called “collective” layoff by firms facing serious problems; this requires approval by the government.
(3) Based on the employment rate; L: 0-30 = low; M: 35-50 = medium; H: 50-100 = high.
(4) 61 for income and pre-funded pensions and 65 for the guarantee pension.

Source: Eurostat and EPC progress report to the Ecofin Council on the impact of ageing populations on public pension systems.

IV. ILLUSTRATIVE SIMULATIONS ON THE IMPACT OF CERTAIN PARAMETRIC REFORMS

The parameters most often referred to in the reforms of pension systems are the indexation rule for pensions, the number of years taken into account in the reference salary and the legal replacement rate. The age of retirement is also often mentioned but, in view of the very low average age of retirement, the early-retirement age and the disability conditions are priorities in many countries.

Given the complexity of retirement systems in the Member States, it was difficult to devise parametric reforms common to all Member States and explore all relevant parameters. The AWG focused its work on simulating modifications of indexation rules, the effective retirement age and the replacement rate.

The AWG ran simulations on the indexation rules ...

Changes in indexation rules can have very different results in the various pension systems in the Member States. Moreover, the indexation rules were different in the baseline scenario, reflecting different policy choices. The AWG decided to perform a sensitivity analysis in order to assess the impact of the indexation rule on the baseline projection in the different Member States.

... the effective retirement age ...

Changes in age eligibility conditions are much more difficult to simulate. Indeed, there is no direct link between the legal (statutory) age eligibility condition and the effective age of retirement. Many systems combine general pension provisions with provisions relating to early retirement and disability allowances. The latter benefits allow the combination of very low employment rates with very low unemployment rates for older workers. It is therefore not obvious whether an increase in the age eligibility condition will result in a decrease in the number of people taking early retirement or with a disability pension.

... and the adjustment of the benefits to the expected increase in life expectancy ...

Changes in the effective replacement rate of pension benefits, whether they increase the contribution period taken into account or reduce the legal replacement rate, are very often mentioned as part of pension reforms undertaken in the Member States. Instead of devising common simulations for the replacement rate, which would in view of the wide diversity of systems have been impossible, the AWG tried to simulate the impact of an increase in life expectancy, ie the increase in time spent in retirement, on the baseline projections. This provides an indication of the magnitude that increased life expectancies have on future pension expenditure or of the magnitude of the advantage if replacement rates were to be actuarially adjusted to the increase in life expectancies**.... *with the following results ....***

The simulations were therefore limited to three types of sensitivity analysis: the indexation rule, the retirement age and life expectancy. The simulations were carried out applying the national models used by the members of the AWG. Their evaluation is not designed to formulate recommendations but should serve to illustrate the

potential impact of certain parametric reform options on pension expenditure and to broaden the analytical basis.

The results should be read together with the results of the baseline projections for the Member States contained in the EPC report of October 2001 (see the third column in tables 4.1, 4.2 and 4.3). As for the projections in the baseline scenario, the coverage of the sensitivity analysis differs between countries and may also be different from the main report (see the notes to Table 4.1). In particular, not all Member States have been able to include simulations for an increase in the effective retirement age via changes in the take-up of early-retirement or disability pensions.

Tables 4.1 to 4.3 give the results in terms of the relative impact on pension expenditure in 2050 and the change in the GDP share of pension expenditure (Tables A1-1 to A1-4 in Annex 1 provide additional information on the timing of the impact and the base levels).

4.1 Simulation No 1: a different indexation of pensions

Two simulations were performed, taking the institutional arrangements in the different countries into account. On the one hand, we tried to assess the potential impact on pension expenditure of a reduction (or an increase) of the indexation of pensions by half a percentage point per year. On the other hand, we tried to simulate the maximum room for manoeuvre achievable by a possible transition from an indexation of pensions linked to the development of average wages to an indexation of pensions linked to prices.

- With a decrease (increase) of 0.5 percentage point per year in the indexation of pensions, pension expenditure would decrease (increase) by between 5% and 25% of the 2050 expenditure level compared with the baseline. This corresponds to a decrease of between 0.6 and 3.0 percentage points in the pension expenditure share of GDP in 2050.

- In *earnings-related systems* such as those in Austria, Belgium, Finland, Italy, Spain and Portugal the decrease (increase) would be between 4% and 15% of the pension expenditure in 2050 (corresponding to a 0.5-2.0 percentage-point decrease in the share of GDP in 2050). The higher results in some countries (Spain, Portugal) might be explained by a relatively high share of people receiving a minimum pension (flat rate).

- In *flat-rate systems* such as those in Ireland, Denmark, the Netherlands and the United Kingdom, the impact is larger: 18-25% of pension expenditure in 2050 (corresponding to a 0.6-3.0 percentage-point decrease (increase) in the share of GDP).

The theoretical result for all flat-rate systems should be an increase of 25%, which is obtained by $(1.005)^{45}$, where 0.005 is the indexation change and 45 the number of years in the period 2005-50[10] (in these cases the average replacement rate also

[10] For modelling purposes, it was agreed that the indexation mechanism would be changed (as a one-off change) in 2005 and would apply up to 2050.

increases by 25 percent). The lower results for some flat-rate countries may be explained by the fact that no system is completely flat-rate. Some countries also simulated a change in indexation affecting only part of their pension expenditure – in the case of the United Kingdom, if the change related only to the basic state pension, the increase would be 13.6%, whereas the denominator is total pension expenditure.

The simulations also confirmed that in flat-rate systems the impact of the change of indexation from prices to wages (or vice versa) would be very high (see Table A1-2 in Annex 1). The simulations suggest that, if there were a change from wages to prices, in countries with flat-rate systems and pensions indexed to wages (DK, NL) a change of such magnitude could fully offset the expected expenditure increase in the baseline, but it would imply at the same time that the replacement rate would fall, to 42% of its 2000 level in 2050.

It should be stressed, however, that these simulations are hypothetical. They are, among other things, not institutionally realistic for notional defined-contribution systems, which is the reason why Sweden, which has a notional defined-contribution system, has not undertaken this exercise. In addition, many countries apply different indexations to different parts of pension systems, with the result that the hypothetical change in the indexation system may also have been applied only to part of the pension stock.

Table 4.1 – Changes in pension expenditure in 2050 with half a percentage point change in the indexation of pensions

	Relative change in pension expenditure in 2050 (% of baseline expenditure)	Change in percentage points of GDP in 2050 (1)	Increase in pension expenditure as a share of GDP from 2000 to 2050 (baseline projection) (4)
Flat-rate systems (2)			
Denmark	20.3	2.7	2.8
Ireland	21	1.6	4.4
Netherlands	20.2	2.7	5.7
United Kingdom (3)	13.6	0.6	0
Earnings-related systems			
Austria	5.9	1.0	2.5
Belgium (4)	5.2 (3.8)	0.5	3.3
Finland	5.6	0.9	4.6
Italy	8.8	1.2	0.3
Portugal	15.1	2.0	3.4
Spain	10.9	1.9	7.9

Notes: (1) The calculation used: % deviation of GDP in 2050 from the baseline divided by the baseline in 2050 in % of GDP. Some countries raised their indexation (A, B, IT, S, UK), while others (DK, IRL, NL) lowered it. For more information on the exact modelling approach (e.g. prices to prices +0.5% or wages to wages +0.5%, etc., see Table A1-1. (2) The theoretical result in all flat-rate regimes must be 25%; the lower increases reported are due to the fact that flat-rate systems are not completely flat rate and not all components of pensions have been considered for this exercise. (3) the UK only modified the basic state pension. (4) B: 3.8% is the figure excluding public-sector pensions. (4) For several countries the peak change from 2000-2050 will occur before 2050 and exceed the 2050 figure: DK: 4.1%; IRL: 4.4%; NL: 6.2%; UK: -1.1%; A: 4.2%; B: 3.7%; FIN: 4.7%; IT: 2.1%; PT: 4.1%; ES: 7.9%.

4.2 Simulation No 2: a one-year increase in the effective retirement age

This simulation looked at the potential effect on pension expenditure of an increase in the effective retirement age (by a decrease in the use of disability and early-retirement schemes without changing the statutory retirement age and the replacement rate). Assessment of the financial impact of this hypothesis is nevertheless complicated because of the existence of numerous early-retirement schemes.

The simulation made the arbitrary assumption that the effective retirement age would increase by one year without allowing pension rights to accrue. This has been simulated as a decrease in the use of disability and early-retirement schemes while the employment rate and thus GDP have been allowed to increase. This also leads to a decrease in old-age pension expenditure relative to GDP, although in absolute terms it remains unchanged. In the following tables, the impact is analysed primarily in terms of pension expenditure. The results of the simulations lead to the following conclusions:

- In *earnings-related systems* the relative decrease in pension expenditure in 2050 is, on average, between 3% and 5% of pension expenditure in the baseline projection. This corresponds to a decrease of 0.1-1.0 percentage point in the pension expenditure share of GDP in 2050.

- The impact is much more pronounced in *flat-rate universal systems*, which cover the entire population and not just the working population. It averages

around 6 percentage points (corresponding to a decrease of 0.2-1.0 percentage point in the share of GDP).

- The hypothesis of a constant replacement rate (i.e. not allowing pension rights to accrue) was not applied in the case of Italy and Portugal, which explains the relatively low impact in these countries. In the case of Italy, the increase in the effective retirement age under the general pension system is offset by the increase in the replacement rate entailed by the actuarial nature of the system. Portugal simulated the impact of an increase of the legal retirement age by one year.

Table 4.2 – Decrease of pension expenditure when raising the effective retirement age by one year

	Relative change in pension expenditure in 2050 (% of baseline expenditure)	Change in percentage points of GDP in 2050	Increase in pension expenditure as a share of GDP from 2000 to 2050 (baseline projection) (4)
Flat-rate systems			
Denmark	- 7.5	- 1.0	2.8
Ireland	- 4.4	- 0.4	4.4
Netherlands	- 8.1	- 1.1	5.7
United Kingdom (1)	- 4.5	-0.2	0
Earnings-related systems			
Finland	- 3.7	- 0.6	4.6
France (2040)	- 5.7	- 0.9	3.7
Germany	- 4.1	- 0.7	5.0
Italy (2)	- 0.7	-0.1	0.3
Portugal (3)	- 2.6	- 0.34	3.4
Sweden	- 2.7	-0.3	1.7

Notes: (1) The simulation in the case of the UK covered only the basic state pension and the state earnings-related pension and its successor. (2) The simulation allowed the pension level (i.e. the pension rights) to increase following an increase in the number of contribution years and higher transformation coefficients under the contribution-based system. (3) The simulation was run as an increase in the statutory retirement age. (4) For the peak change, see the notes to Table 4.3.

It is possible to identify the two main driving forces behind the projected decrease in the level of public pension expenditure when the effective retirement age is raised, namely, a decrease in the number of beneficiaries and an increase in the number of employed (increase in GDP), as shown in Table 4.2a below.

In a number of countries an increase in pension rights (replacement rate) would partly offset the effect of the rise in the effective retirement age. However, this may in part be due to the fact that the hypothesis of a constant replacement rate was not followed, notably in Italy, where this hypothesis is not relevant in the current system. In the case of Germany, the small increase of the benefit component is due to the adjustment necessary in the calculation of the formula used for the indexation of pensions and the secondary effects stemming from productivity and GDP increases.

Table 4.2a – Breakdown of decrease in pension spending when raising the effective retirement age by one year (as % of GDP, cumulative by 2050)

	Number of bene-ficiaries	Benefits	Employ-ment	Total	Residual
Flat-rate systems					
Denmark (1)	-0.5	0	-0.5	-1	0
Netherlands	-0.5	0	-0.6	-1.1	0
United Kingdom	-0.16	0	-0.06	-0.22	+0.02
Earnings-related systems					
Germany	-0.43	0.12	-0.37	-0.7	+0.02
France (2040) (2)	-0.58	0	-0.45	-1.03	+0.09
Finland	-0.4	0.2	-0.4	-0.6	0
Italy (2)	-0.64	0.86	-0.31	-0.09	0
Portugal	- 0.19	0	- 0.15	- 0.34	0
Sweden	0	0	-0.3	-0.3	0

Notes: (1) Higher growth due to increase in labour force, lower expenditure due to fewer beneficiaries on early-retirement schemes, and lower indexation due to lower wages as a consequence of increased labour supply. (2) Hypothesis of a constant replacement rate not followed.

4.3 Simulation No 3: reducing benefits in line with the expected increase in life expectancy

For this simulation, we started from the assumption that, from the point of view of intergenerational equity, there could be reasons to assume that, for the same active lifetime and for the same contribution rate, a cohort with a higher life expectancy should have a proportionally lower pension because it would receive pensions for a longer period of time. In this simulation, we sought to estimate the impact of increased lifetime expectancy on pension expenditure. A simplified assumption made was to keep the time in retirement constant over the whole projection period.

- The results of the simulations depend largely on demographic changes in the different Member States and, in particular, on the increase in life expectancy. Nevertheless, the impact is relatively similar between Member States.

- The results of the simulations show that assuming no increase in life expectancy would reduce pension expenditure by 9-14% percentage points compared with the baseline (corresponding to a decrease of 0.4-1.9 percentage points in the share of GDP). The life expectancy effect is relatively large and contributes substantially to the overall increase in pension expenditure from 2000 to 2050.

- This impact tends to increase over time, provided that the life expectancies continue to rise.

Table 4.3 – Decrease in pension expenditure when assuming no increase in life expectancy

	Relative change in pension expenditure in 2050 (% of the baseline expenditure)	Change in percentage points of GDP in 2050	Increase in pension expenditure as a share of GDP from 2000 to 2050 (baseline projection) (3)
Flat-rate systems			
Denmark	- 12.8	- 1.7	2.8
United Kingdom	- 11.4	- 0.5	0
Earnings-related systems			
Finland	- 9.4	- 1.5	4.6
Germany	- 9.5	- 1.6	5.0
Italy (1)	- 3.1 (- 11.6)	- 0.4	0.3
Portugal	- 14.3	- 1.9	3.4
Sweden (2)	+10.1	1.1	1.7

Notes: (1) The figure of 3.1% for Italy corresponds to the residual effect which is not offset by the revision of the transformation coefficients taking account of the life expectancy of the cohort, as provided for by law. The figure of 11.6% corresponds to the overall effect on pension expenditure due to the increase in life expectancy. This would therefore be the full change if the revision of the transformation coefficients were not required by law. (2) Sweden has a notional defined-contribution system which takes into account changes in life expectancy. It was therefore asked to undertake a projection where increases in life expectancy are not taken into account. This implies an increase in pension expenditure. (3) For the peak change, see the notes to Table 4.3.

4.4 Additional simulations by DG ECFIN concerning a reduction in the replacement rate

The results of the AWG's simulations have been broadly corroborated by additional simulations carried out at an aggregate level for EU-15 by the Commission's Directorate-General for Economic and Financial Affairs (DG ECFIN) using its recently created ageing model, which, on the basis of the EPC's figures, analysed a reduction in the generosity of the public pension system (for detailed results, see Annex 2).

(i) The first ECFIN simulation concerned a reduction in the replacement ratio achieved by a partial shift from wage to price indexation.

According to DG ECFIN's results, in order to reduce the increase in pension expenditure by 2.75 percentage points, as suggested in the EFC's simulations for the next 50 years undertaken in 2001, Member States would have to lower the net replacement ratio of the system from its present level of 74% to 58% in 2050. However, even with full price indexation, while social security contributions would fall by 8 percentage points relative to the baseline, there would still be an increase in contributions from 16% to 18.5% of wages. *Stabilisation of the EU's public pension system would therefore not appear to be achievable solely by shifting from a system which is 100%-indexed to wages to one based exclusively on prices.* In addition, such measures would have negative implications for income distribution leading to a significant fall in pensioners' consumption over the simulation period.

(ii) The second ECFIN simulation concerned an increase in the effective retirement age, from its present level of close to 60 to an average statutory retirement age of 65.

This simulation is driven by two essential factors: firstly, by the increase in the effective retirement age, which will be strongly felt only in the period up to 2010 and, secondly, the ongoing increase in life expectancy over the period up to 2050. Under the simulation, the number of years spent in work rises to its 1960s' level of 45, which, however, is still insufficient to stabilise the system. This could be achieved only if Member States were to link the retirement age to changes in life expectancy. DG ECFIN's results clearly show that an increase in the effective retirement age to the statutory age has major benefits in terms of growth and budgetary sustainability, as well as being relatively favourable with regard to income distribution. *In terms of budgetary developments, the impact would be quite dramatic with a fall of over 4 percentage points in public pension expenditure in 2050 compared with the baseline.* Social security contributions would be reduced by 4.5 percentage points, as against 11 percentage points in the baseline.

As a rule of thumb, the public expenditure impact of an increase in the effective retirement age is that, if workers were to work one additional year before retiring, the increase in public expenditure on pensions over the period to 2050 would be reduced by 0.84 of a percentage point of GDP. In addition to this very favourable impact on public finance, the increase in the average working life to the statutory age – i.e. from 60 to 65 years of age - would appear at the same time to boost growth by over 13%, thereby going a long way towards offsetting the GDP loss associated with ageing over the next 50 years and avoiding large changes in income distribution (with the consumption of pensioners and workers both rising relative to the baseline).

V. ASSESSING THE RESULTS AGAINST THE THREE-PRONGED STRATEGY

Following the November 2000 progress report of the AWG on the impact of ageing populations on public pension systems [11], the Ecofin Council in March 2001 the Ecofin Council developed a three-pronged strategy later endorsed by the European Council for addressing the long-term sustainability of public finances, including the challenges caused by ageing populations which involved:

- increasing employment rates;
- reforming the pension and care systems so as to place them on a sound financial footing;
- running down public debt at a faster pace.

Parametric reforms are powerful policies for increasing the sustainability of pension systems …

For the purposes of this report, the AWG analysed three policy options for individual parametric reforms with regard to their long-term impact on pension expenditure: (i) a change in the indexation of pensions, (ii) an increase in the effective retirement age and (iii) reducing benefits in line with increased life expectancy. The purpose of the simulations was to illustrate the relative importance of different parameters relative to expected expenditure increases in the baseline contained in the EPC report on budgetary challenges of ageing populations.

In view of the limitations of the exercise in terms of the time available for carrying out the simulations, no standardised methodology with detailed instructions was established. Cross-country comparability is therefore limited, and the results must be interpreted with special care. The AWG is confident, however, that the results will give some idea of the magnitude of the possible impact of certain parametric reforms on pension expenditure.

All assumed changes in the simulations had a major impact on expected pension expenditure as identified in the final report by the EPC on budgetary challenges posed by ageing populations although, as a rule, the individual reforms taken on their own (to the assumed extent of these simulations) would only partially absorb the expected increase in pension expenditure.

The AWG did not consider whether or not such reforms are realistic in the national political economy context, whether they would be sustainable in terms of Member States' basic socio-political choices or to what extent they would be necessary or indeed sufficient to ensure the sustainability of public finance. Nevertheless, by combining the information on the relative replacement ratio of the systems and the indicator of the activity of elderly people with the indicator of

[11] Progress report to the Ecofin Council on the impact of ageing populations on public pension systems, EPC/ECFIN/581/00-EN of 6 November 2000.

sustainability applied in the previous report, we can shed some light on the policy priorities that can be identified in certain countries.

Reform priorities differ from country to country

In its report on budgetary challenges posed by ageing populations (the impact on public spending on pensions, health and long-term care for the elderly), the EPC in October 2001 proposed a method for assessing the sustainability of pension systems which was endorsed by the Ecofin Council on 4 November 2001. This method has been applied by the Commission and the Ecofin Council in their assessment of the sustainability of public finances in the 2001-2 updates of the stability and convergence programmes and has led to specific recommendations for the different Member States. It is clear that the indicators used here to assess the sustainability of public finances remain indicative and should be read with the appropriate caution.

The AWG considers that, for the purpose of developing policy recommendations for parametric reforms in the EU, this approach, which focuses only on the sustainability of public finances, has to be complemented by the other two elements of the three-pronged strategy put forward by the Ecofin Council. Table 5.1 below pulls together the three indicators for assessing the situation in the different countries in the light of the three-pronged strategy. It shows that the specific recommendations for each Member State must be quite different as a function of the differences in the institutional set-ups. The appropriate choice of reform measures clearly depends to a large degree on the inherent characteristics of the individual national system, its sensitivities to the main determinants of pension expenditure, and the budgetary challenges it is facing.

The risk for the sustainability of public finances, in terms of emerging budgetary imbalances that fail to respect the stability and growth pact requirement, has been identified in the case of Greece and Spain , as well as in Germany, France, Italy, Austria and Portugal[12]. Whilst the risk for sustainability is low, Belgium faces an important challenge given its high level of public debt. In most cases, the high risk for sustainability corresponds to a relatively high level of pension benefits and a relatively low level of activity among older people. Although the risk for sustainability is lower in the other Member States, the illustrative simulations performed by the AWG show that parametric reforms are worth considering if governments wish to reduce the risk for fiscal sustainability, to offset the GDP loss associated with ageing, or to envisage trade-offs between all three aspects of the strategy, and this depends on the relative position of countries in regard to the main parameters of public pension systems.

[12] See European Commission (2002), Public finances in EMU – 2002, European Economy Reports and Studies, Directorate-General for Economic and Financial Affairs, May 2002.

Table 5.1 - Indicators for the three-pronged strategy for addressing the challenges of ageing (*L = low; M = medium; H = high)*

	Activity of elderly people (employment rate for age group 55-64) *(1)*	**Relative replacement rate of pension systems** *(2)*	**Are public finances sustainable?** *(3)*
B	L	L	Appears to be sustainable, but conditional *(4)*
DK	H	L	Appear to be sustainable
D	M	M	Risk of emerging budgetary imbalances
EL	M	H/M	Risk of emerging budgetary imbalances
E	M	H	Risk of emerging budgetary imbalances
F	L	M	Risk of emerging budgetary imbalances
IRL	M	L	Appear to be sustainable, but conditional
I	L	H/**	Appears to be sustainable, but conditional *(4)*
L	L	M	Appear to be sustainable
NL	M	L	Appear to be sustainable
A	L	H/M	Risk of emerging budgetary imbalances
P	H	H	Risk of emerging budgetary imbalances
FIN	M	M	Appear to be sustainable
S	H	M/**	Appear to be sustainable
UK	H	L	Appear to be sustainable

Notes:
(1) Indicator based on assessment made in Table 3.2.
(2) Indicator based on assessment made in Table 3.1. Before reforms; the indicator after the slash refers to the situation after the reform. "**" The average replacement ratio in the new NDC systems is computed on the basis of an actuarial formula and is highly dependent on the number of contribution years, but also on other variables notably the average retirement age, work career, wage dynamics and macro-economic assumptions.
(3) See summarising: Public finances in EMU – 2002, and the detailed Council assessments of the sustainability of public finances in the 2001-2 updates of the stability and convergence programmes. For some countries the already high tax burden was identified as a key policy challenge.
(4) High debt.

In Table 5.2 the countries are broken down by the relative level of the replacement rates and activity. The countries between brackets are assessed as having a low risk for public finance sustainability.

Table 5.2 – Countries broken down by level of benefits and activity (a)

Activity \ **Benefits**	**Low**	**Medium**	**High**
Low	(B)	F, (L), A	(I)
Medium	(IRL), (NL)	D, (FIN)	EL, E
High	(DK), (UK)	(S)	P

Note: (a) Countries between brackets are considered as having a lower risk for public finance sustainability attributable to ageing.

In most countries the activity rate needs to be increased ...

The AWG considers that, in the light of the indicators, a clear policy priority should be attached in Belgium, Italy, Luxembourg and Austria to increasing employment and the activity rate, particularly of older workers. Given that this policy option offers significant benefits relative to its costs, it should also be a priority for countries where the employment rate is somewhat higher, notably in Germany, France, Greece, Spain, Ireland, Finland and the Netherlands. It is perhaps worth noting that low activity rates for older workers and high benefit levels may in some cases be related. On the basis of current policies in many Member States the pension system and/or other transfers (early retirement, disability, unemployment) do not provide sufficient incentives to remain active (see also recent work by the OECD[13]). In some countries also the low female participation rate of females in the labour force seems to be an issue.

For the same reasons, attaching a policy priority to increasing the activity rate also seems worthwhile in Belgium, Italy and Luxembourg, even if in these countries the risk of fiscal unsustainability is lower. Table 3.2 above reveals the close link between the employment rate and the minimum age for early retirement in countries where the activity rate of the elderly is low, especially in Belgium, France, Italy and Luxembourg[14]. In Austria and the Netherlands, where the problem seems to lie more in the disability schemes, reform priorities should be determined accordingly.

... the benefit level of public pension systems may be another focus

In the case of reforms aimed at reducing the benefit levels of pensions, the room for manoeuvre depends on the relative level of pensions during retirement. Firstly, it can be seen from Table 5.2 that in countries like Denmark, the Netherlands, the United Kingdom and Ireland, which have a flat-rate system, the average replacement rate seems low. Nevertheless, it should be remembered that the relative replacement rate of these countries is computed in Table 3.1 on the basis of a statistical method and can have a downward bias when compared with the figures for the other countries. Moreover, the replacement rate in the case of flat-rate systems is an inverse function of the wage level prior to obtaining a pension. Finally, indexation to prices as in the United Kingdom has a huge bearing on the relative replacement rate of the flat-rate part of public pensions. Lastly, it should be emphasised that not all systems will remain equally generous in the future as at present (see, for example, the change in the benefit ratio projected in the EPC report of October 2001, notably Table 3.6). In this respect, recent reforms in a number of Member States increasing the actuarial link of benefits to life expectancy, the budgetary impact of which will increase over time, are noteworthy.

In the countries where the *benefit levels of public pensions* may be considered higher, parametric reforms could take three directions:

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13 Policy Responses to the challenges of ageing populations – a synthesis; OECD working party on social policy, Paris April 2002.

14 The results once again emphasise the importance of adequately addressing the question of the rules governing access to the different early-retirement systems, e.g. the age at which eligibility for them begins or whether or not such systems have an appropriate degree of actuarial adjustment of benefits to offset the longer period during which benefits are received.

(i) an increase in the number of years of pension contribution taken into account in calculating pensions and/or a more actuarial link between benefits and contributions.

(ii) a reduction in the indexation of pension benefits via a shift from wages to prices or, at least, to a base lower than wages (for instance, prices plus discretionary increases or wages minus pension contributions).

(iii) a reduction in the indexation of the wages taken into account in the reference salary via a shift from wages to prices.

It can be seen from Table 3.1 that in most countries a high degree of relative benefit levels is related to the combination of indexation to wages and a relatively small number of years of work taken into account for the calculation of new pensions. By contrast, for example in Belgium, where the number of years taken into account in the reference salary is very high and the indexation of pensions is very low, the level of benefits appears as low as in flat-rate systems.

The simulations suggest that the increase in life expectancy has a large impact on the budgetary cost of ageing. In earnings-related systems, the most straightforward answer should be to link the replacement rate or the contribution rate of a cohort to its life expectancy. This has been done in Italy and Sweden, where the actuarial characteristics of the legal system have been reinforced. This reinforcement has the advantages of simultaneously increasing the incentives to work longer and enhancing the credibility of the pension systems in the eyes of the public facilitating the task of building public consensus behind the policies on ageing.

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ANNEX 1: RESULTS IN TERMS OF GDP: COMPLEMENTARY PROJECTIONS OF THE QUANTITATIVE IMPACT OF CERTAIN PARAMETRIC REFORMS

TABLE A1-1. Half a percentage point (+0.5) change in the indexation of pensions

Annual change in pension expenditure relative to the baseline scenario, in percentage points of GDP

	Baseline 2000						Baseline 2050	
MS	% of GDP	2010	2020	2030	2040	2050	% of GDP	Change 00-50
Flat-rate systems			From prices to prices+0.5pp index					
UK	**5,5%**	0,1	0,2	0,5	0,5	0,6	**4,4%**	**-1,1**
			From wages to wages - 0,5pp index					
Denmark	**10,5%**	-0,8	-1,5	-2,0	-2,4	-2,7	**13,3%**	**2,8**
NL	**7,9%**	-0,2	-0,7	-1,5	-2,3	-2,7	**13,6%**	**5,7**
Ireland	**4,6%**	-0,2	-0,4	-0,7	-1,1	-1,6	**9,0%**	**4,4**
Earnings-related systems			From prices to prices+0.5pp index					
Italy	**13,8%**	0,4	0,8	1,2	1,3	1,2	**14,1%**	**0,3**
Portugal	**9,8%**	0,5	1,0	1,4	1,8	2,0	**13,2%**	**3,5**
Spain	**9,4%**	0,4	0,6	0,9	1,4	1,9	**17,3%**	**7,9**
		From the current index (close to prices+0.5pp) to a price index						
Fin *(er)*	**11,3%**	-0,4	-0,7	-0,8	-0,9	-0,9	**15,9%**	**4,6**
A *(er)*	**14,5%**	..	..	..	-0,9	-1,0	**17,0%**	**2,5**
		From prices to prices+0.5pp index (applied to 72% of the stock)						
B *(er)*	**10,0%**	0,1	0,3	0,4	0,5	0,5	**13,3%**	**3,3**

fr = flat-rate system
er = earnings-related system

TABLE A1-2. A change in the pension indexation from prices to wages.

Annual change in pension expenditure relative to the baseline scenario, in percentage points of GDP

	Baseline 2000						Baseline 2050	
MS	% of GDP	2010	2020	2030	2040	2050	% of GDP	Change 00-50
			From prices (baseline) to wages					
UK *(fr)*	**5,5%**	0,4	1,0	1,9	2,6	3,0	**4,4%**	**-1,1**
			From (close to) wages to prices					
DK *(fr)*	**10,5%**	-2,6	-4,3	-5,7	-6,4	-6,9	**13,3%**	**2,8**
NL *(fr)*	**7,9%**	-1,4	-3,2	-5,2	-7,0	-7,8	**13,6%**	**5,7**
		From prices to wages-0,5pp (1,25pp change, applied to 72% of the stock)						
B *(er)*	**10,0%**	0,3	0,7	1,0	1,2	1,2	**13,3%**	**3,3**

TABLE A1-3. Raising the effective retirement age by one year

Annual change in pension expenditure relative to the baseline scenario, in percentage points of GDP

MS	Baseline 2000 % of GDP	2010	2020	2030	2040	2050	Baseline % of GDP	2050 Change 00 - 50
		No increase in the level of pensions						
Flat-rate systems								
Denmark	**10,5%**	-0,9	-1,0	-1,0	-0,8	-1,0	**13,3%**	**2,8**
Ireland	**4,6%**	-0,3	-0,3	-0,3	-0,4	-0,4	**9,0%**	**4,4**
NL	**7,9%**	-0,9	-1,1	-1,1	-1,1	-1,1	**13,6%**	**5,7**
UK	**5,5%**	-0,2	-0,2	-0,2	-0,2	-0,2	**4,4%**	**-1,1**
Earnings-related systems								
Germany	**11,8%**	-0,5	-0,7	-0,8	-0,6	-0,7	**16,9%**	**5,0**
France	**12,1%**	-1,0	-1,1	-1,0	-0,9		**15,8%**	**3,7**
Finland	**11,3%**	-0,6	-0,6	-0,6	-0,6	-0,6	**15,9%**	**4,6**
Port	**9,8%**	-0,1	-0,1	-0,2	-0,3	-0,34	**13,2%**	**3,4**
Sweden	**9,0%**	-0,2	-0,3	-0,3	-0,3	-0,3	**10,7%**	**1,7**
Italy (1)	**13,8%**	-0,6	-0,5	-0,6	-0,2	-0,1	**14,1%**	**0,3**

(1) Increased pension levels due to increased contribution years and higher transformation coefficients under the contribution-based system

TABLE A1-4. Assuming no increase in life expectancy

Annual change in pension expenditure relative to the baseline scenario, in percentage points of GDP

MS	Baseline 2000 % of GDP	2010	2020	2030	2040	2050	Baseline % of GDP	2050 Change 00 - 50
		Keeping the time spent in retirement unchanged						
Flat-rate systems								
Denmark	**10,5%**	-0,3	-0,8	-1,3	-1,6	-1,7	**13,3%**	**2,8**
UK	**5,5%**	-0,1	-0,3	-0,4	-0,5	-0,5	**4,4%**	**-1,1**
Earnings-related systems								
Germany	**11,8%**	0,0	-0,3	-0,8	-1,3	-1,6	**16,9%**	**5,0**
Italy	**13,8%**	0,0	-0,3	-0,5	-0,5	-0,4	**14,1%**	**0,3**
Finland	**11,3%**	-0,1	-0,2	-0,7	-1,2	-1,5	**15,9%**	**4,6**
		Keeping the life time net benefit unchanged						
Portugal	**9,8%**	-1,2	-1,9	-2,5	-2,2	-1,9	**13,2%**	**3,4**
		Removing the life expectancy adjustment from the current system						
Sweden	**9,0%**	0,0	0,2	0,5	0,8	1,1	**10,7%**	**1,7**

ANNEX 2: PARAMETRIC REFORMS OF THE PAYG PENSION SYSTEM: RESULTS OF SIMULATIONS USING ECFIN'S "AGEING" MODEL

In Chapter 5 of the publication "The EU Economy : 2001 Review", the Commission's DG ECFIN presented the results of a number of "parametric" pension reform simulations using its "ageing" model. Simulations for the EU-15 as a whole gave an idea of the magnitude of the impact of some selected reforms on a range of variables, including economic growth, the sustainability of public finances and the income distribution consequences of changing pension systems in terms of the differential impact of the various pension reforms on the working-age population and on pensioners. In terms of individual "parametric" reforms, the impact of two options were analysed: (i) a reduction in the generosity of the PAYG pension system brought about through changes in the system's replacement ratio and (ii) an increase in the effective retirement age.

Parametric simulation No A2-1: Reductions in the replacement rat) achieved via a partial shift from wage to price indexation

This simulation simply took the EPC's own figures for the change in pension expenditure over the period 2000-50 due to changes in the benefit ratio and used these figures to work out the implied change in the system's net replacement ratio (NRR), which is equal to the gross replacement rate adjusted for differences in the effective rate of taxation imposed on workers and pensioners. In order to reduce the increase in pension expenditure by 2¾ percentage points, as suggested in the EPC's simulations for the next fifty years, EU governments, according to the model, would have to cut the net replacement rate (NRR) of the system from its present level of 74% to 58% in 2050. This reduction in generosity could be achieved in many ways, including direct cuts in benefits, changes in the eligibility criteria, such as the number of years needed for full pension entitlement, or changes to the indexation rules. For simplicity's sake, it is assumed that all of the reduction in generosity is achieved through a shift in public pension schemes towards some form of price indexation. As an additional simulation showed, however, this drop of 16 percentage points in the NRR is not equivalent to a shift to full price indexation. Full price indexation would, in fact, result in the net replacement rate falling to 45%, implying therefore that, relative to the baseline assumption of no change in the NRR over the next fifty years, the present "reform" efforts in terms of the generosity of the PAYG system are equivalent to the introduction of a "hybrid" form of indexation, hybrid in the sense that governments may not wish to go for full price indexation but instead may decide to retain some of the link between pensions and wage developments.

What are the budgetary, economic and income distribution consequences of such a significant decline in the net replacement ratio? In terms of the budgetary consequences, would a move from a system assuming 100% real wage indexation to a hybrid wage/price system or, more dramatically, a move to full price indexation lead to stabilisation of the pension system in terms of social security contributions (SSCs)? In terms of SSCs, a move to a hybrid index would have the effect that the increase in SSCs as a percentage of wages would be about 4 percentage points lower in 2050 than in the baseline scenario, whereas even with full price indexation, while SSCs would fall by 8 percentage points relative to the baseline, there would still be an increase in contributions from 16% to 18½% of wages. Consequently, while the budgetary gains

would be significant, stabilisation of the EU's PAYG pension system would not appear to be achievable solely by shifting from a system which is 100% indexed to wages to one based exclusively on prices.

In addition, as one can see from Table A2-1, a decline in the generosity of the PAYG pension system, equivalent to a move to a hybrid indexation system, will have an insignificant impact in terms of living standards, with the fall in the replacement ratio offsetting only marginally the GDP loss associated with ageing. Furthermore, such a decline in pension generosity will have implications in terms of income distribution since, while the fall in SSCs will ensure that the consumption of the working-age population actually increases relative to the baseline over the next fifty years, these reforms will have large negative implications for pensioners' consumption, which is expected to fall by over 7½% over the same period.

TABLE A2-1 REDUCTION IN PENSION GENEROSITY

	GROWTH	BUDGETARY IMPACT		INCOME DISTRIBUTION	
	GDP PER CAPITA (% DIFF. FROM BASELINE)	SOCIAL SECURITY CONTRIBUTIONS (% OF WAGES)	PUBLIC PENSION EXPENDITURE (% OF GDP)	WORKING-AGE POPULATION'S CONSUMPTION (% DIFF. FROM BASELINE)	PENSIONERS' CONSUMPTION (% DIFF. FROM BASELINE)
2000	0	16.1	10.5	0	0
2030	+1.1	20.7	13.6	+3.0	-4.9
2050	+2.1	22.7	14.9	+6.4	-7.6

Parametric simulation No A2-2: Increase in effective retirement age

In this retirement simulation, the effective retirement age, which is presently close to 60 in the EU, is brought gradually back up to the average statutory retirement age of 65 over the next ten years. Part of the rationale for this simulation is the fact that since the 1960s there has been an enormous deterioration in the so-called "passivity" ratio, which measures the number of years worked relative to the number of years spent in retirement. In the 1960s the passivity ratio was about 3[15] but by 2000 this ratio had fallen to below 2 owing to increases in life expectancy and falls in the effective retirement age to less than 60. Under the retirement scenario, the passivity ratio is expected to improve over the next ten years but then to deteriorate again over subsequent decades. This pattern of change is driven by two essential factors : firstly, by the increase in the effective retirement age, which will impact strongly only in the period up to 2010, and, secondly, the ongoing increase in life expectancy over the period as a whole. Under the retirement simulation the number of years spent in work rises to the 1960s' level of 45, which unfortunately is still insufficient to stabilise the passivity ratio. The latter objective could be achieved only if governments were to link the retirement age to changes in life expectancy.

[15] In other words, workers spent three years in employment for every year spent in retirement.

TABLE A2-2 INCREASE IN EFFECTIVE RETIREMENT AGE TO 65

	GROWTH	BUDGETARY IMPACT		INCOME DISTRIBUTION	
	GDP PER CAPITA (% DIFF. FROM BASELINE)	SOCIAL SECURITY CONTRIBUTIONS (% OF WAGES)	PUBLIC PENSION EXPENDITURE (% OF GDP)	WORKING-AGE POPULATION'S CONSUMPTION (% DIFF. FROM BASELINE)	PENSIONERS' CONSUMPTION (% DIFF. FROM BASELINE)
2000	0	16.1	10.5	0	0
2030	+8.7	18.3	12.0	+5.2	+13.8
2050	+13.1	20.5	13.4	+10.8	+16.3*

* Given that pensioners do not receive any additional pension entitlements from working the five extra years assumed in the simulation, this higher level of consumption relative to that of the working-age population simply reflects the fact that lifecycle consumers will have a shorter period in which to consume their accumulated lifetime wealth.

It is clear from Table A2-2 that an increase in the effective retirement age (ERA) to the statutory age has major benefits in terms of growth and budgetary sustainability, as well as being relatively favourable with regard to income distribution. In terms of budgetary developments, the impact is quite dramatic, with the increased burden on workers over the period in terms of SSCs being reduced to 4½ percentage points as against 11 percentage points in the baseline and with an equivalent strong improvement in terms of public expenditure on pensions, which would fall by over 4 percentage points in 2050 compared with the baseline. As a rule of thumb, the public expenditure impact of an increase in the ERA is of the order of 1 to 1 (i.e. if workers were to work on average one additional year before retiring, the increase in public expenditure on pensions over the period to 2050 would be reduced by 0.84 of a percentage point of GDP). This strong budgetary gain is, however, predicated on the assumption that any additional years in employment do not yield any additional pension benefits[16].

In addition to the very favourable public finance impact, the increase in the average working life also appears to simultaneously meet the other key policy objectives of boosting growth and avoiding large changes in income distribution, which in the longer term could call into question the political sustainability of any pension reforms that have been set in place. The increase in the retirement age has a significant effect on the level of GDP, which grows by over 13% compared with the baseline, thereby going a long way on its own towards offsetting the GDP loss associated with ageing over the next fifty years. Finally, this reform option is also relatively beneficial from an income distribution perspective, with the consumption of both the working-age population and pensioners rising relative to the baseline.

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16 This assumption is crucial since, in a separate simulation based on an actuarially fair adjustment of pensions to reflect the increased number of contribution years, the budgetary gain from an additional year of work falls from 0.84 of a percentage point of GDP to 0.6 while the GDP gain stays roughly the same as in the main simulation. The definition of "actuarially fair" used in this simulation is based on the assumption that, in return for the extra five years of contributions, the generosity of one's annual pension would increase by slightly less than 12% relative to what it would otherwise have been but pensioners will receive this higher pension for, on average, five years less than in the baseline scenario. Consequently, while the fiscal gain is reduced, it still remains relatively substantial.

ANNEX 3: THE EFFECTS OF SELECTED PARAMETERS ON THE REPLACEMENT RATES IN EARNINGS-RELATED SYSTEMS

The purpose of the work below is to illustrate the different effects of the various parameters in earnings-related systems on the average benefit rate for pensioners.

We assume an individual who has a full career of 45 years between the age of 20 and 65. At the age of 65 he retires and receives a pension which is 60% or 75% of a reference salary (the "legal replacement rate"). The reference salary can be computed as the average of the last 5, 10, or 20 years of his career (in our hypothesis the best years) or the average of the wages of his full career. The general assumption is that the wage increases every year by 1.5% in real terms. When he is retired, the pension of the individual can be indexed to prices or to wages during the pension period. We envisage two life expectancies at the age of 65: (i) 17 years, which is the figure for the present cohort aged 65, and (ii) 21 years, which is the figure for the cohort aged 65 in 2050.

Table A3-1 below shows that, for a life expectancy of 17 years, a legal replacement rate of 75% and a reference salary computed on the basis of the last five years of the career:

- with the pension indexed to prices, the average benefit ratio during the pension period will be 64,8% of the average wage;
- with the pension indexed to wages, it will be 72,8%.

Where the pension is indexed to wages, the average benefit ratio remains stable over time. For the sake of illustration, with a life expectancy of 21 years, the average benefit rate remains at 72,8%. On the contrary, with indexation to prices, when life expectancy increases, the average benefit rate decreases (see graph below).

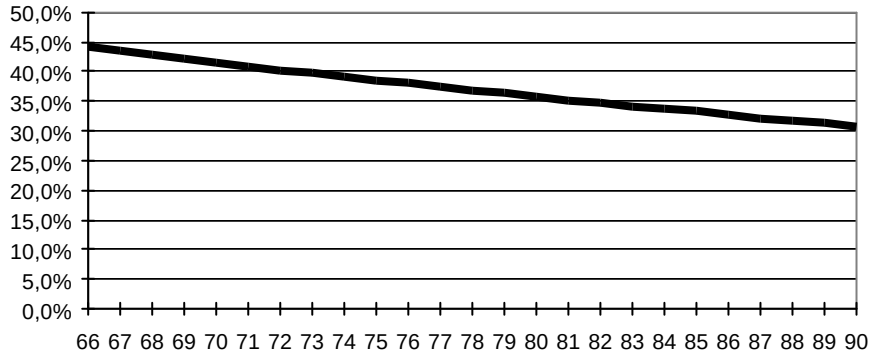
The decrease in the average benefit ratio when the number of years taken into account for the computation of the reference salary increases is also illustrated in Table A3-1. The most unfavourable case is when the legal replacement rate is 60% with price indexation and with the reference salary computed on the 45 years of the full career, which results in an average benefit rate of 39% (approximately the case in the private sector in Belgium). The most favourable case is when the legal replacement rate is 75%, with wage indexation and a reference salary computed on the last five years of the career, which results in an average replacement rate of 72.8% (more or less the case in Germany before the recent reform).

Table A3-1 Average gross benefit ratio during retirement in an earnings-related system, as a function of selected parameters (in %)[17]

Years taken account in the calculation of the reference salary	Life expectancy at 65			
	17 years		21 years	
	Legal replacement rate		Legal replacement rate	
	75%	60%	75%	60%
	with price indexation of pensions			
Last 5	64,8	51,8	63,0	50,0
Last 10	62,5	50,0	60,7	48,6
Last 15	60,3	48,2	58,6	46,9
Last 20	58,2	46,5	56,5	45,2
45	49,0	39,0	47,6	38,0
	with wage indexation of pensions			
Last 5	72,8	58,2	72,8	58,2
Last 10	70,2	56,2	70,2	56,2
Last 15	67,7	54,2	67,7	54,2
Last 20	65,4	52,3	65,4	52,3
45	55,0	44,0	55,0	44,0

Graph A3-1: Benefit ratio during the pension period

(legal rep.rate 60%; indexation to prices)



Note : Figures from the above calculations.

[17] The assumptions taken into account are as follows: (i) annual rate of wage growth: 1.5%; (ii) average replacement rate: average pension during the 16 or 20 years of pensions divided by average wage during the same period; (iii) computed for a full career of 45 years; (iv) pension formula: $p = (60\% \text{ or } 75\%) \cdot \sum_{i=0}^{N} w^r_i / N$ where w^r is the real wage and p the amount of pension at the time of retirement i.e. at the age of 65. N is the number of years taken into account in the calculation (here 45 years); (v) approximate life expectancy at 65: 16 years in 2000, 20 years in 2050.

Table A3-2 Contribution rates in % of wages in earnings-related systems
(employers and employees, in 2001)

Belgium	16.36
Germany	19.1
Greece	20
Spain	23.6 employer + 4.7 employee
France	16.35 *(1)*
Italy	32.7
Luxembourg	16
Austria	22.8 *(2)*
Portugal	34.75
Finland	21.1
Sweden	18.5

Notes: (1) Only Régime général without ARRCO-AGIRC. (2) Only private employees' scheme.
Source : Member States

Table A3-3 shows the theoretical internal rate of return (IRR), i.e. the lifetime benefits calculated as a rate of return for the lifetime contributions, which the AWG computed for the pension contributions made under the earnings-related systems described above. Two alternative contribution rates are assumed: 16% and 19%.

In comparison with past real interest rates, these IRRs seem very low. However, at least in theory, there is no uncertainty or risk involved.

Table A3-3 Theoretical internal rate of return of pensions in earnings-related systems (*in %; for a full career of 45 years*)

		Life expectancy at 65			
		17 years		**21 years**	
		Legal replacement rate		**Legal replacement rate**	
Years taken into account in the calculation of the reference salary	**Contribution rate**	**75%**	**60%**	**75%**	**60%**
		Price indexation			
Last 5	16%	2,67	1,95	3,20	2,53
	19%	2,12	1,37	2,68	1,99
45	16%	1,76	1,01	2,35	1,66
	19%	1,18	0,41	1,82	1,11
		Wage indexation			
Last 5	16%	3,01	2,30	3,59	2,93
	19%	2,46	1,74	3,08	2,41
45	16%	2,12	1,38	2,76	2,08
	19%	1,55	0,80	2,24	1,55

The IRR is a "social" IRR. It must be compatible with the growth rate of wages in the economy and the life expectancy of each cohort. As productivity and wages are supposed to be growing at 1.5%, Table A3-3 indeed shows that in some countries certain configurations of the parameters of the pension system lead to higher IRRs and other configurations to lower IRRs.

The arithmetic behind the implicit IRR in a PAYG can be illustrated as follows. For a stable population, the return on the contributions in a PAYG system is equal to the

growth rate of the average wage or productivity. This can be shown with a very simple overlapping generation model:

Assuming (i) a constant contribution rate "c", (ii) a working population "l" and (iii) a retired population n, n < l, and depending on the share f of people who die on retirement, we assume two periods:

- contributions raised in the first period: $c \cdot w_1 \cdot l_1$
- contributions raised in the second period: $c \cdot w_2 \cdot l_2$

In order to balance the PAYG system, we should have the following constraint:

(1) $c \cdot w_2 \cdot l_2 = p_2 \cdot n_2$

where p_2 is the individual pension for those who retire in the second period n_2.

If the contributions of the first period were invested, they would give an income in the second period of:

(2) $p_2 \cdot n_2 = (1+r) \cdot c.w_1 \cdot l_1$

Replacing $p_2 \cdot n_2$ in (1) gives:

(3) $c \cdot w_2 \cdot l_2 = (1+r) \cdot c \cdot w_1 \cdot l_1$

If the population is stable, l_1 equals l_2 and equation (3) shows that the implicit return of the PAYG system is equal to the growth rate of the real wage rate.

What happens if the implicit rate of return of a defined-benefit PAYG system is higher than the average wage increase? This means that the defined benefit is too high relative to the wage growth rate and that up to now the system has been balanced by the increase in the working population. This situation is not sustainable if, as is forecast, the working population is stabilising or even decreasing.

If we now assume that the system is designed to make the implicit rate of return equal to the average wage growth rate, how should the system evolve as a function of demographic shocks? The system may then show a deficit or a surplus, by b: $b = c \cdot w_2 (l_2 - l_1)$. There should be a surplus if the population is increasing. In other words, in current PAYG systems, other factors being equal, there should have been a surplus accumulated during the period of an expanding labour force i.e. especially during the period when the baby-boom generation has been part of the labour force. For many reasons, in particular "financing the generosity of pensions for the earlier generation", this has not taken place in most countries. There is no trust fund in most countries.

On the other hand, if we assume an increase in life expectancy and no change in the number of people in the labour force, then in a well-understood PAYG system the increase in life expectancy would entail a reduction in benefits or an increase in contributions for the generation of workers with a higher life expectancy.

The calculations presented above suggest that, even in earnings-related systems, the average benefit ratio can be low if, at the same time, pensions are indexed to prices, the legal replacement rate is low and the number of years taken into account in the reference salary is high.

Even with generous pensions resulting from indexation to wages, high legal replacement rates and high reference salaries, the theoretical internal rate of return on the basis of present contribution rates seems to be lower than the past real interest rate. This may be justified within certain limits if this rate of return is certain and not lower than the growth rate of productivity or real wages.

With pensions indexed to prices, the benefit ratio decreases and the gap between the pension and the current average wage widens with the age of the pensioner.

Without changes in the pension parameters, increases in life expectancy raise the theoretical rate of return of the pension system. The rise is not significantly different under price and wage indexation.

In conclusion:

1. Indexation to prices is a powerful policy to reduce the budgetary cost of ageing by reducing the average benefit ratio but at the expense of the relative living standard of older pensioners.

2. Indexation to prices instead of wages cannot be regarded as a substitute for measures needed on account of an increase in life expectancy. A more appropriate answer would be to adapt the legal replacement rate in line with the life expectancy of the age cohort. Obviously, the contribution rate could also be adjusted, but in most Member States this is not considered an option.

3. A low theoretical IRR may be justified because public pension systems could give a clear, transparent non-risky income during the pension period. Complementary, market-based pension systems should be developed in order to increase the overall return on the savings allocated to pensions.

ANNEX 4: THE IMPACT OF A CHANGE IN THE INDEXATION RULE IN EARNINGS-RELATED SYSTEMS: AN ILLUSTRATIVE EXAMPLE

The examples below, which are of a purely illustrative nature, show that:

- under earnings-related systems any change in indexation is less dramatic than under flat-rate systems;

- in earnings-related systems the impact of changes in indexation rules is limited and stable over the first few years. What drives pension expenditure in earnings-related systems is the calculation of new pensions when people retire, rather than the indexation rules for existing pensions;

- if life expectancy increases in earnings-related systems, this is accompanied by a relative increase in the impact of changes in indexation; in the example, the gap with the basic simulation widens;

- in flat-rate systems the impact of changes is also constant over a number of years and then increases proportionally.

Table A4-1 below shows with a numerical example the impact, in an earnings-related system, of the change in the indexation rule for pensions from indexation to prices to indexation to prices plus 0.5% each year. This indexation is applied to the existing pensions already paid during the previous year (called "old pensions" in the table).

The "new pensions", i.e. the pensions of those who retire during the current year, are computed on the basis of a reference salary. We shall assume that the new pensions at the beginning of the system amount to 100. During the following year, it is assumed that the new pensions will amount to the same figure simply increased by the growth in the average reference salary, say, 4% (2% inflation and 2% real wage growth). This is shown in the column "New pensions".

The system is put in place in the first year. In the second year, the total amount of pensions paid by the system is the amount of the new pensions: 104 (100 increased by 4%, reflecting the growth in the reference salary), plus the existing pensions, i.e. the total of the previous year adjusted for the indexation rule.

It is assumed that the people who have begun to receive a pension during the first year die after three years (assumption: "pensioner survives three years"). From that moment, in this example the system reaches maturity. The amount of the pensions of those who die is deducted from the amount of existing pensions (this amount corresponds to the new pension rights opened three years ago and adjusted for the indexation rule).

The table has two parts: the first where the indexation rule is indexation to prices, and the second where the indexation rule is indexation to prices during the first six years, followed for the remaining period by an indexation to prices plus 0.5 % per year. The last column gives the deviation of the pension total computed with the second indexation rule from the pension total reflecting the simple indexation to prices. It is clear from the table that, when the indexation rule changes after six years, the percentage deviation reaches a stable level two years later, i.e. after a period during

which all the population having benefited from an indexation in the old or existing system has disappeared.

The same example has been computed in **Table A4-2** for a flat-rate system. It can be seen that a change in the indexation rule in a flat-rate system leads to a deviation from the baseline scenario that increases every year. Unlike in earnings-related systems, in the flat-rate systems the change in the indexation rule does not result in a deviation with an asymptotic percentage. The percentage deviation does not converge to a steady state level[18].

In **Table A4-3**, the numerical example given in Table A4-1 is modified. The pensioners remain in the pension system for four years instead of three. A comparison of the deviation of the pension total in Tables A4-1 and A4-3 shows that the increase in life expectancy increases the impact of the change in the indexation rule. In Table A4-3, the transition period is now three years and the deviation converges to 1% instead of 0.75% in Table A4-1.

[18] It can also be seen that in absolute value the increase in pensions is much higher in earnings-related systems. This would not be the case if the indexation rule in both systems was indexed to wages.

Table A4-1: Change in the indexation rule in earnings related systems: a numerical example

	Indexation rule: prices				*Indexation rule: prices + 0.5%*				Deviation
Year	New pensions	Index rule	Old pensions	Total (1)	New pensions	Index rule	Old pensions	Total (2)	(2-1) in %
1	100.0	1.000	0.0	100.0	100.0	1.000	0.0	100.0	
2	104.0	1.020	102.0	206.0	104.0	1.020	102.0	206.0	0.00
3	108.2	1.040	210.2	318.4	108.2	1.040	210.2	318.4	0.00
4	112.6	1.061	218.7	331.3	112.6	1.061	218.7	331.3	0.00
5	117.2	1.082	227.5	344.7	117.2	1.082	227.5	344.7	0.00
6	121.9	1.104	236.7	358.6	121.9	1.104	236.7	358.6	0.00
7	126.8	1.126	246.2	373.1	126.8	1.132	247.5	374.3	0.50
8	131.9	1.149	256.2	388.1	131.9	1.160	258.1	390.1	0.75
9	137.3	1.172	266.5	403.8	137.3	1.189	268.5	405.8	0.75
10	142.8	1.195	277.3	420.1	142.8	1.219	279.4	422.2	0.75
11	148.6	1.219	288.5	437.1	148.6	1.250	290.7	439.3	0.75

Table A4-2: Change in the indexation rule in flat rate systems: a numerical example

	Indexation rule: prices				*Indexation rule: prices + 0.5%*				Deviation
Year	New pensions	Index rule	Old pensions	Total (1)	New pensions	Index rule	Old pensions	Total (2)	(2-1) in %
1	100.0	1.000	0.0	100.0	100.0	1.000	0.0	100.0	
2	102.0	1.020	102.0	204.0	102.0	1.020	102.0	204.0	0.00
3	104.0	1.040	208.1	312.1	104.0	1.040	208.1	312.1	0.00
4	106.1	1.061	212.2	318.4	106.1	1.061	212.2	318.4	0.00
5	108.2	1.082	216.5	324.7	108.2	1.082	216.5	324.7	0.00
6	110.4	1.104	220.8	331.2	110.4	1.104	220.8	331.2	0.00
7	112.6	1.126	225.2	337.8	113.2	1.132	226.4	339.5	0.50
8	114.9	1.149	229.7	344.6	116.0	1.160	232.0	348.1	1.00
9	117.2	1.172	234.3	351.5	118.9	1.189	237.9	356.8	1.51
10	119.5	1.195	239.0	358.5	121.9	1.219	243.8	365.8	2.02
11	121.9	1.219	243.8	365.7	125.0	1.250	250.0	374.9	2.53

Table A4-3: Change in the indexation rule in earnings related systems: impact of a change in life expectancy

	Indexation rule: prices				*Indexation rule: prices + 0.5%*				Deviation
Year	New pensions	Index rule	Old pensions	Total (1)	New pensions	Index rule	Old pensions	Total (2)	(2-1) in %
1	100.0	1.000	0.0	100.0	100.0	1.000	0.0	100.0	
2	104.0	1.020	102.0	206.0	104.0	1.020	102.0	206.0	0.00
3	108.2	1.040	210.2	318.4	108.2	1.040	210.2	318.4	0.00
4	112.6	1.061	324.8	437.4	112.6	1.061	324.8	437.4	0.00
5	117.2	1.082	337.9	455.1	117.2	1.082	337.9	455.1	0.00
6	121.9	1.104	351.5	473.4	121.9	1.104	351.5	473.4	0.00
7	126.8	1.126	365.7	492.6	126.8	1.126	365.7	492.6	0.00
8	131.9	1.149	380.5	512.5	131.9	1.154	382.4	514.4	0.50
9	137.3	1.172	395.9	533.2	137.3	1.183	399.2	536.5	0.83
10	142.8	1.195	411.9	554.7	142.8	1.213	416.0	558.8	1.00
11	148.6	1.219	428.5	577.1	148.6	1.244	432.8	581.4	1.00
12	154.6	1.243	445.8	600.4	154.6	1.275	450.3	604.9	1.00

Annex 5: Factors taken into account in the calculation of pensions in the EU

The general pension formula is given by:

$$np = x.\frac{N}{D}.wref$$

where: np: new pension
x legal replacement rate
N: number of years of the career
D: maximum number of years of the career taken into account
wref: reference salary

If the legal system is a flat-rate system, np=flat rate. If the legal system is an earnings-related system, then: $wref_t = \sum_{i=0}^{T} (w_{t-i} / index1_{t-i})$

where index1 is the indexation rule for past earnings taken into consideration in the pension calculation. As for "old pensions" (p), the evolution is given by: $p_t = index2_t . p_{t-1}$

Table A5-1 Reference salary taken into account for the calculation of pensions in the Member States' general pension schemes

Country	Base period for the calculation of the reference salary (T)	Ceiling	Indexation rule for past earnings (index1)
B	Average lifetime earnings (45 years)	Yes: on wages included in the pension computation, not on contributions	Prices
DK	Flat-rate system – no reference period is taken into account	flat rate	-
D	Lifetime earnings. Pensions are individually calculated according to a specific formula: "personal credit earning points" depend, on the one hand, on the length of a particular career and, on the other, on the relationship between individual earnings and average earnings. The more years involved and the higher the wage (and accordingly the contributions), the higher the credit points. There is no explicit reference salary in the formula used for the calculation of new pensions.	Yes, on earnings included in the benefit formula as well as on the tax base for annual contributions (approx. 1.8 * current average earnings of the insured population)	Average gross wage growth is only used as a starting point and adjusted according to a calculation rule that reduces the pension adjustment from now on (newly introduced formula) and again from 2011 onwards. These were introduced to reflect extended life expectancy.
EL	Average earnings over the last 5 years	Yes, for the wage base upon which pensions are calculated. For pre-1993 labour market entrants, also on contributions. For post-1993 labour market entrants, no ceiling on contributions.	Past earnings indexed to increases in civil servants' wages
E	Average earnings over the final 15 years	Yes: both on wages used to compute individual social contributions and on pension benefits (there is a maximum pension benefit)	Prices. Applied to only 13 of the final 15 years. Earnings in the latest 2 years are not indexed.
F	For generation 1948 and following: average earnings over the best 25 years (for generation 1933: 10 years, for generation 1934: 11 years, etc.).	The ceiling was €28 224 in 2002 ("plafond de la securité sociale")	Prices since 1987 Wages before 1987
IRL	For social welfare pension: payment is a flat rate decided each year	flat rate	Decided each year as part of the budgetary process
I	Earnings-related regime: the average wage over either the last 5 or 10 years for contributions paid respectively before or after 1992 for the employed; 10 or 15 years for the self-employed	No	Inflation, inflation plus 1% only for contributions paid after 1992
	Contribution-based regime: lifelong contributions	Contributions must be paid on wages up to €76 443 in 2001	Nominal GDP

	Mixed regime: the average wage over the last 5 years for the earnings-related component; contributions paid after 1995 for the contribution-based component		Inflation for the earnings-related component; nominal GDP for the contribution-based component
L	Two parts: Part one of pension: proportional to number of years of the lifetime career; Part two of pension: proportional to average lifetime earnings	Yes	Prices and wages
NL	Flat-rate system. The level of the pension is totally unrelated to past salaries.	-	-
A	Average earnings over the best 15 years; in case of early retirement, over the best 18 years	Yes, on wages, in the pension computation and on the contribution side	Annual pension adjustment value
P	Best 10 years' earnings over the final 15 years. After the reform this will become average lifetime earnings by 2035.	No	Prices
FIN	Earnings-related pension : Average earnings over the last 10 years in each employment relationship	No ceiling	Average of the consumer price index and wage index (0.5*p+0.5*w)
S	The reformed old-age system does not include a reference salary. Pensions are based on lifetime earnings. The reference salary in the former PAYG system is 60% of the best 15 years of earnings out of 30.	Yes, pension rights are projected on earnings up to €31 550 per year, but contributions and taxes are paid on total earnings.	Average wage growth
UK	Basic state pension: 44 qualifying years for men to receive the maximum payment; 39 years for women. By 2020 state pension age will be equalised at 65 for both men and women. The full number of qualifying years will then be 44 years for men and women. To obtain the minimum pension (25%), at least 10 or 11 qualifying years.	The basic state pension is flat rate. The maximum rate in 2001/02 is €117 per week	The basic state pension is increased by a minimum of 2.5% or prices, which ever is greatest
	Additional state pension: depends on the amount of earnings between the lower and upper earnings limit for National Insurance from 1978 until the end of the last complete tax year before the individual reaches state pension age.	The amount of additional state pension depends on contributions throughout a person's working life. In 2001/02 the maximum amount of additional pension is €240 per week, which is reached if a person has contributed at the upper earnings limit since 1978.	Revalued in line with earnings each year while it is accruing. Pensions being paid are uprated in line with prices each year.

Table A5-2 Factors taken into account in the calculation of the replacement rate in the Member States' general pension schemes

Country	Gross legal full (maximum) replacement ratio for old-age pensions (x)	Factors taken into account in the calculation			Indexation rule of "old pensions" (index2)
		Maximum number of years in employment needed for reaching the full replacement rate (D)	Description of other factors taken into account, such as marital status or number of incomes in the household	Flat rate or minimum pension in 2002	
B	60%	45	x=75% for married people with one income	€9 072-11 336	Prices plus limited selective adjustment to welfare
DK	39% (flat rate in 2002 for singles divided by average gross wage income). After taxes, the max. net compensation rate was 55% in 1998.	40	Reduction in max pension for couples by approx 23%. Pension subject to means testing	€14 162 in 2002 for single people and €10 373 for couples	Wages
D	48.9% in 2001 (calculated as a statistic and referring to gross average pension divided by gross average wage)	45	Up to three years imputed for every child raised	None	Net wages; 2001 and after: gross wages minus pension contributions, with the same gradual reductions phased in as in the case of new pensions.
EL	80% + 20% (possible increase) for pre-1993 labour market entrants; 60% + 20% (possible increase) for post-1993 entrants	35	For pre-1993 labour-market entrants: Non-linear formula, number of dependants For post-1993 labour-market entrants: Pension= 1.714% years of contribution *wage base	Approx. €440	Prices or ad hoc increases

E	Around 95% of average earnings in the final 15 years. When ceilings are taken into account, this percentage is much lower.[19]	35		€6 321.6 (married, with one income) €5 360 (single)	Prices
F	50%	Full replacement rate reached at 65 or after 60 when individual has worked for: 37.5 years for generation 1933 and preceding … 40 years (160 quarters) for gen. 1943 and following Any missing quarter to reach 65 years or the number of quarters reduces the rate by 1.25%.	On top of the rule to obtain the full replacement rate, the pension is further reduced by $1/150^{th}$ for any missing quarter to reach 150 quarters. Every woman has 8 bonus quarters for each child she brought up. Everyone, male or female, that brought up at least 3 children is entitled to a 10% bonus on his/her pension revenue.	€6 308 for those who worked for 150 quarters. Any missing quarter reduces the rate by 1/150th (Minimum contribution).	
IRL	For social welfare pensions: flat rate	For public sector pension: 40 years	For social welfare pensions: Extra payment if over 80 and if person is with a "qualified" adult	For social welfare pensions: Basic flat rate payment in 2002 is €147 per week	For social welfare pensions: payment decided each year as part of budgetary process. For public sector pensions: payments increased in line with changes in public sector pay

[19] 100% of the regulatory base after 35 years of contributions. This base is calculated by dividing by 210 the contribution bases (CB), i.e. the actual monthly wage, for the 180 months prior to retirement. There are maximum and minimum CBs for each professional category. CBs for the 24 months prior to retirement are computed in nominal terms. The remaining CBs are indexed to prices.

I	Earnings-related regime: 80% of reference wage	40		Minimum pension: €5105 in 2002	Prices, according to the amount of pension: 100% of the inflation rate for the part of the pension up to 3 times the minimum (€5105 in 2002), 90% for the part between 3 and 5 times the minimum, 75% for the part 5 times higher than the minimum
	Contribution-based regime: no upper limits	No upper limit			
	Mixed regime: 80% for the earnings-related component; nothing for the contribution-based component				
L		40	Minimum pension in 2001 for a career of 40 years: €1 108 per month		Prices and wages
NL	70% of the (current) net minimum wage for single persons and 50% for married persons		A duration of residence in the NL shorter than 50 years leads to a proportionally smaller pension		
A	80%	45	None	No	Pension adjustment formula
P	80%	40	-	-	Discretionary
FIN	Earnings-related pension : 60%	39 years ; from the age of 23 to 59 the accrual rate is 1.5% per year and from the age of 60 to 64 2.5 % per year			For pensioners under 65 the average mean of the consumer price index and wage index (0.5*p+0.5*w); for pensioners over 65 the weighted average of consumer price index and wage index (0.8*p+0.2*w)
	National pension : flat rate	40 years' residence	40 years' residence	Pension guarantee in [I class municipality]: single €488, married €429 per month	Consumer price index

S	The annuity in the NDC PAYG is calculated by dividing the individual's lifetime contributions (indexed with average wage) by a divisor with unisex life expectancy, and not by a benefit formula (the replacement ratio in the former PAYG system is 60%)	-	-	The guarantee pension is graduated to make it possible to have a small guarantee component, while receiving the main part of a benefit from the two earnings-related systems. The guarantee together with a means-tested housing allowance is higher than the minimum income.	Average growth of real wage minus 1.6 (the system is front-loaded; a return of 1.6% p.a. is factored into the annuity). Benefits will then be adjusted annually for the difference between the growth of average earnings and the 1.6% used to calculate the annuity.
UK	No legal replacement rate				

Table A5-3 Benefit ratio of public pensions in 2000/2001[20] (seniority and old-age pension for the main schemes, gross of taxes) pension expenditure for people above 65+ divided by the population aged 65+, divided by the average wage in the economy ($\frac{pensionsage65+}{N65+} / Averagewage$)

B	**31.2%** *(51.1% for civil servants)*
DK	**32%** (in 2000 and 2001) In Denmark only people above 67 can receive the public old-age pension. This measure can take account therefore only of people aged 67+
D	**40%** (including civil service pensions)
EL	**53%**
E	**51%** (in 2000) (average old-age pension gross of taxes divided by average gross taxes + employee social contribution wage in the economy
F	**46%** (1997) (gross pension expenditure of 65+/average gross wages)
IRL	**29.7%** (based on first pillar pensions only; the wage used is average industrial earnings)
I	**46.4%**
L	**50%** of average wage (all categories of pensions)
NL	**31%**
A	**56%** (median of old-age pensions divided by the median of the contribution base)
P	**32.5%** (1999) (average pensions for people aged 65+ divided by the average wage in the economy) *(108.5% forthe civil servants' scheme)*
FIN	**46.1** % (both earnings-related and national pension included)
S	**53%** (2000) (before taxes; 56% after taxes)
UK	**20.5%** Note that pension expenditure for people aged 65+ excludes public –sector occupational pensions

[20] The figures do not permit full comparibility in view of large differences in national systems. For example, Member States with flat-rate systems generally have a well developed second pillar of pension provision and hence the benefit ratios presented do not necessarily provide any information on the relative and absolute standard of living of pensioners in the Member States.

Table A5-4 Reference salary taken into account for the calculation of pensions in the Member States' schemes for civil servants

Country	Base period for the calculation of the reference salary (T)	Ceiling	Indexation rule for past earnings (index1)
B	Average earnings over the last five years		
DK			
D	Final salary (unless promoted during the last two years)	None	None
EL	Earnings of the last month	Contributions levied on part of the salary	Past earnings indexed to increases in civil servants' wages
E			
F	The last wage on condition that it was for at least 6 months; otherwise the wage before	None	Civil servants wages
IRL	Final pay (average earnings over the last 3 years if recently promoted)	None	Increases in line with the pay of the grade in which the former civil servant once served
I	Earnings-related regime: last wage or average of the last 10 years (the latter starting from 2008), for contributions paid, respectively, before or after 1992	None	Inflation or inflation plus 1%, for contributions paid after 1992
	Contribution based regime : lifelong contributions	Contributions must be paid on wages up to €76 443 in 2001	Nominal GDP
	Mixed regime: last wage for the earnings related component; contributions paid after 1995 for the contribution based component		Inflation for the earnings-related component; nominal GDP for the contribution-based component
L			
NL			
A	Last wage; 15 phased in between 2003-2019	None	Pension adjustment formula
P	Last wage for those who started working prior to September 1993, after that they are subject to the same rules as those of the private sector scheme		
FIN	Earnings related pension: Average earnings over the last 10years	None	Average of the consumer price and wage index (0.5*p+0.5*w)

S	Average earnings over the five last years before retirement (the system presented is the present. There will however be a gradual shift towards a NDC-system starting in 2003	30 base amounts (1 base amount in 2001 = SEK 37,900). Different replacement rates for wages below (10%) and above 7.5 base amounts (65%)	Price indexing

Table A5-5 Factors taken into account in the calculation of the replacement rate in the Member States' schemes for civil servants

Country	Gross legal full (maximum) replacement ratio for old-age pensions (x)	Factors taken into account in the calculation			Indexation rule for "old pensions" (index2)
		Maximum number of years in employment needed for reaching the full replacement rate (D)	Description of other factors taken into account, such as marital status or number of incomes in the household	Flat-rate or minimum pension in 2002	
B	75%				Wages of civil servants occupied in a corresponding function
DK					
D	75% (gradually being reduced to 71.75%)	35-40 (the latter being fully effective by 2030); more years in case of part-time work	Marital status and number of dependent children; mark-ups for every child raised		Gross wages of civil servants (with gradual reductions phased in by law and aimed at accumulating reserves to cover in part the future increases in pension spending)
EL	80% + 20% (possible increase)		Number of dependants	No minimum pension	Civil servants' wages
E	Flat rates for each professional category of civil servants	35			Prices
F	75% of the wage without "bonuses", which sometimes account for an important part of the remuneration of civil servants	37.5	Every woman has 1 bonus year for each child she brought up; everyone (male or female) who has brought up at least 3 children is entitled to a 10% bonus on his/her pension revenue	€10 468 for at least 25 years; each missing year in 25 years reduces the minimum pension by 4%	

IRL	1/80 of reckonable pay for each year of service (max of 0.5 times pensionable pay); in addition, lump-sum payment of 3/80 of reckonable pay for each year or service (max of 1.5 times of pensionable pay); spouses pension is ½ of member's pension	40			Increase in line with changes in public sector pay
I	Earnings-related regime: 80% of reference wage	40		Minimum pension: €5105 in 2002	Prices, according to the amount of pension: 100% of the inflation rate for the part of the pension up to 3 times the minimum (€5105 in 2002), 90% for the part between 3 and 5 times the minimum, 75% for the part 5 times higher than the minimum
	Contribution-based regime: no upper limits	No upper limit			
	Mixed regime: 80% for the earnings-related component; nothing for the contribution-based component				
L					
NL					
A	80%	40			Pension adjustment formula
P	100%	36			Nominal wage increase for civil servants

FIN	Earnings related pension: 60-66 % National pension: flat rate	39-30 years: before 1993 the accrual rate from the age of 23 to 59 was 2.2% per year and after 1993 1.5% per year, from the age of 60 to 64 2.5% per year 40 years residency	40 years residency	Pension quarantee in I class municipality; single EUR 488, married EUR 429 per month	For pensioners under 65 the average of the consumer price and wage index (0.5*p+0.5*w); for pensioners over 65 the weighted averagae of consumer price and wage index (0.8*p+0.2*w) Consumer price index
S	65%	30			Price index

ANNEX 6: MEMBERS OF THE EPC'S WORKING GROUP ON AGEING POPULATIONS

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