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Euro Area Survey and
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P. C. Rother, M. Catenaro
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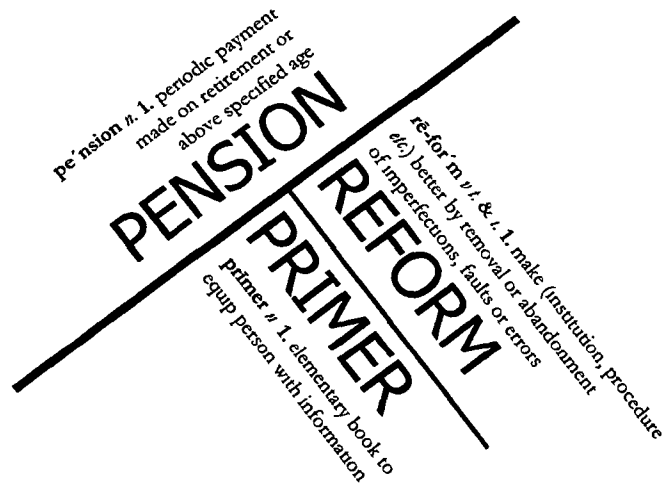
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Abstract

Population ageing will impose a significant burden on European fiscal balances, in particular through pay-as-you-go pension systems. This study presents an independent estimate of this burden for the euro area and quantifies the impact of two reform scenarios. Based on widely used but optimistic assumptions, the present value of future pension deficits through 2050 is estimated at 51% of GDP, adding to the current average explicit debt stock of around 67% of GDP. In this calculation, the deficits currently incurred by many pension systems as revenues fall short of expenditures are not included. Viable parametric reforms represent no durable solution to alleviate the burden sufficiently, as they can balance pension systems at best temporarily. A comprehensive reform, including reforms of current systems and a move towards partial funding, is found to ensure permanent financial viability of the public pension system.

Keywords: Ageing, pensions, pay-as-you-go systems, fiscal sustainability

JEL classification: E17, E66, H50, J10

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Table of Contents

1	Introduction	3
2	Demographics and pensions.....	6
	2.1 Demographic developments	6
	2.2 Implications for public pension systems	7
3	Pensions and institutions	9
	3.1 Euro area public pension systems	9
	3.2 Institutions and structural co-ordination	11
4	Simulation results	13
	4.1 Simulation method	14
	4.2 Assumptions and input variables	14
	4.3 Results for the baseline scenario	15
	4.4 Realistic baseline scenario	18
	4.5 Partial reform	19
	4.6 Comprehensive reform	22
5	Conclusions.....	25
	References	27
A.	Appendix I: Alternative scenarios.....	28
B.	Appendix II: Major variables.....	31

1 Introduction

European populations are growing older. This will have macroeconomic implications as the number of non-working consumers rises with the number of pensioners relative to that of workers. In addition, population ageing will have immediate fiscal effects, most importantly through rising claims on public pension systems and higher expenditure for health and long-term care.

This paper focuses on the effect of ageing on public pension systems in the euro area. This effect is of particular interest because it represents the most important of the immediate fiscal effects of ageing. The projected pension liabilities will challenge countries' ability to preserve fiscal sustainability and comply with the rules of the Stability and Growth Pact. They will thus become an important driver of future fiscal policy decisions. More broadly, given the size of the pension liabilities, governments' strategies to deal with the pension burden will have a sizeable impact on economic expectations and the macroeconomic equilibrium. With the objective of adding insight to the policy discussions, this paper provides an analytical framework and some quantitative benchmarks. In particular, it presents estimates of upcoming pension liabilities and analyses the impact of alternative pension reforms.

Past developments provide some insight regarding the factors driving the behaviour of public pension finances (see also McMorrow and Roeger (2002)). In the EU, public pay-as-you-go pension systems represent the most important income source for the elderly, covering some 90% of retirement income provision. Between 1960 and 2000, total public pension expenditure rose by more than 6 percentage points to some 12% of GDP.¹ At the same time social security contributions rose from around 11% of wages in the 1960s to around 19% in the 1990s. These developments were driven to a large extent by demographic variations, labour market developments and changes in pension system generosity.

Regarding demographic variations, a decline in fertility rates and rising longevity have resulted in a gradual ageing of the overall population. Fertility rates were high after the war, but experienced a sharp decline starting at the end of the 1960s and continuing in the 1970s and 1980s. Since then, average fertility rates have remained broadly constant at levels below 2 children per woman, i.e., less than necessary to maintain a stable population size. At the same time, life expectancy at birth has risen continuously, from less than 70 years in 1960 to around 78 years in 2000. The combined effect of these two trends has been a slowdown in overall population growth and a marked shift in the population structure. In particular, the traditional population pyramid with large sizes of young cohorts and decreasing older cohort sizes has gradually moved towards a more rectangular pattern. The number of persons aged 65 years and above relative to the total population rose steadily from 11% in 1960 to 16% in 2000.

The demographic developments provide only part of the explanation of the increase in overall pension expenditure pressures. As the largest share of public pension expenditures is financed through social security contributions paid on labour income, the development of the labour market variables has an important impact on the

¹ Note that the historical numbers presented here serve only as indications and have different regional and functional coverage than those used for the projections in this note. National developments have deviated significantly from the average in some cases.

stability of the pension system. Labour force participation has remained roughly constant in the EU over the past decades at around 67% to 68%, while employment grew at an annual rate of less than ½%. However, these aggregate numbers hide a development that has become particularly costly to national pension systems. This is the sharp decline in old age labour force participation due also the rise in early retirement. Between 1960 and 2000, the effective retirement age in the EU declined by more than 5 years to below 60. The rise in early retirement has two effects for the pension system: It lowers the number of contributors and simultaneously raises the number of pensioners, resulting in a double burden.

Finally, the overall evolution of the pension system is driven by its generosity. Increases in pension system coverage and more generous benefit formulas have resulted in a steady increase in replacement rates, i.e., the ratio between individual pension and labour income, over the past decades. As a consequence, also the importance of pension income from public sources has risen relative to private sources.

To forecast the future financial development of public pension systems, this paper combines projections for demographics, labour markets and pension policies with additional assumptions regarding macroeconomic and policy parameters. The approach is a partial equilibrium analysis which takes macroeconomic variables, such as interest rates, labour market outcomes and productivity growth, as given. In particular, two baseline scenarios assuming unchanged pension policies and two reform scenarios are analysed. Of the baseline scenarios, one uses the optimistic employment and interest rate assumptions employed by other studies on this issue. These foresee a rapid rise in labour force participation rates, a drop in structural unemployment and a real interest rate of 4%. The other baseline scenario uses more realistic values, namely constant cohort specific participation and unemployment rates and a real interest of 3%. For this scenario, the labour market and real interest rate assumptions have not been derived from a common macroeconomic framework. Rather, they have been combined with the objective of providing a realistic estimate of future pension liabilities. The reform scenarios capture the effects of partial and comprehensive pension reforms, respectively. In particular, the partial reform remains limited to changes in the parameters of the public pay-as-you-go system, such as the retirement age. By contrast, the comprehensive reform assumes a move towards partial funding of the pension system. All projections are based on Eurostat demographic forecasts and assume labour productivity growth of 1¼% per year.

The above assumptions are inserted into country specific models of national pension systems, which generate projections of their financial balances over the projection period. To allow comparability, this study focuses on the present value of these financial balances, using the above growth and interest rate assumptions for discounting and aggregating across countries. The major findings are the following (see also table 1):

- Based on widely used but optimistic assumptions, the present value of future pension deficits through 2050 is estimated at 51% of GDP, implying the need for substantial fiscal adjustment (first column in table 1, covering 9 euro area countries, e-9). This does not include obligations from health and long-term care. The present value of deficits adds to the current level of explicit government debt of more than 67% of GDP in the nine countries.
- However, the assumptions include very favourable labour market expectations. The realistic baseline scenario with constant employment and a lower real interest rate of 3% results in a present value of future deficits of close to 90% of GDP,

with the labour market and the interest rate assumption contributing roughly equal parts to the increase (second and third column, covering the largest 4 euro area countries, e-4).

- The partial reform scenario relying only on parametric changes represents no viable solution, as they can balance pension systems only temporarily and under optimistic assumptions. Higher effective pension ages, lower average benefits and increased contribution rates could reduce the present value of pension deficits to zero through 2050. But such reforms would leave large financing gaps thereafter. In addition, it is unrealistic to assume that the necessary favourable labour market expectations will materialise with further rising contribution rates (fourth column).
- The comprehensive reform scenario can achieve long-term sustainability and a sizeable reduction in contributions to the pay-as-you-go system through a shift toward partial funding (last column). The transition to financial sustainability, i.e., balancing the present value of the pension system deficits beyond the end of the projection period, is not without costs. Some participants will have to bear an additional burden. In our scenario, replacement rates for new retirees fall by up to 23% relative to the unsustainable partial reform, but are higher after 2040. However, other political solutions regarding the distribution of this burden are possible.

Table 1: Main results ⁽¹⁾

	Baseline scenario (e-9), AWG	Baseline scenario (e-4)	Realistic baseline scenario (e-4)	Partial reform (e-4)	Comprehensive reform, incl funding (e-4)
Public pension expenditure in 2050	12.1	12.7	13.5	11.2	7.3
Change from 2000 (percent points)	4.2	4.6	5.3	3.1	-0.8
Present value of pension deficits	-50.6	-47.2	-87.3	unviable	-0.7
Annuity	1.7	1.6	2.5	--	0.0

1) In percent of GDP.

Three studies recently published by the Economic Policy Committee (EPC), the OECD and the European Commission² provide useful benchmarks regarding methodology and overall results. First and foremost, the report by the EPC's Working Group on Ageing (AWG) has been used as a benchmark for the baseline scenario simulations in this study. The report provides projections by national institutions on expenditures for pensions as well as health and long term care. The projections are based on a set of common projections regarding macroeconomic and demographic variables. Using an analogous data set for its member countries, the OECD study derives comparable results, despite some definitional differences. The European Commission has presented pension expenditure projections based on a macroeconomic equilibrium model for the EU area. The model is calibrated to reflect the most important macroeconomic relationships and is then employed to generate pension expenditure projections and estimates of the impact of various reform scenarios.

² Economic Policy Committee (2001), Dang et al. (2001) and European Commission (2001). The results in the last study are similar to the more extensive contribution by McMorrow and Roeger (2002).

The results regarding pension expenditure projections are quite similar for all these studies. For the aggregate of nine countries analysed in the present study, the EPC study finds an increase in pension expenditure of 3.9 percentage points of GDP between 2000 and 2050, close to the OECD's result of 3.8 percentage points and to this study's 4.2 percentage points. The European Commission, by contrast, projects a much higher increase of 7.1 percentage points. This is basically due to the underlying assumption that both labour market participation and pension system generosity remain unchanged. For a similar set of assumptions regarding the labour market variables, the Commission also reports results close to those of the EPC and this study.

In extending the approach of the above studies, this paper provides a more comprehensive assessment of pension system viability by explicitly taking pension system revenues into account. This allows to derive the present value of pension system deficits as a measure of future burdens that need to be financed through some kind of reform. In addition, only the explicit modelling of the revenue side provides a full picture of the impact of various scenarios, such as the discussed changes in the effective retirement age.

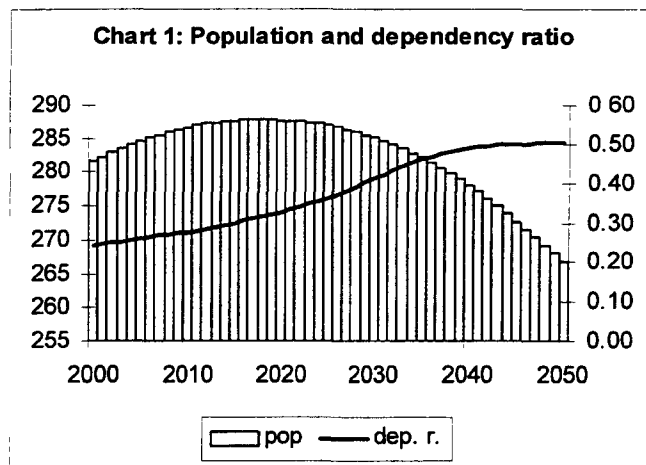
The paper is organised as follows. Section 2 discusses the aggregate demographic developments and the main analytical considerations regarding the pension system impact of ageing. Section 3 comprises a description of European institutional arrangements for monitoring long-term fiscal sustainability in view of ageing. Section 4 presents estimates of the impact of ageing on euro area pension systems through 2050, aggregating individual country estimates. Section 5 summarises and concludes.

2 Demographics and pensions

Demographic developments

The scale of population ageing in Europe is reflected in the rise of the old age dependency ratio, i.e., the share of the population 65 years and older to the population aged 15 to 64. For the countries in this study, this dependency ratio is projected to more than double from 24% in 2000 to 50% in 2050 (see chart 1, right scale). The average increase of around 100% over the projection period is also broadly representative for most countries, with Belgium and France showing a more modest increase around 75% as opposed to the opposite extremes of Spain and Italy with increases of more than 130%.

Two major forces drive the ageing of the populations: increasing life expectancy and low fertility rates. The rise in life expectancy experienced over the past decades is projected to continue. For the euro area, the average life expectancy of women and men is projected to increase by 4 and 5 years to 86 and 80 years, respectively. At the same time, fertility rates have declined sharply and are now well below the rate necessary to maintain a constant population. Even though the average number of children per woman is projected to increase for most countries over the forecast horizon, this increase will not be sufficient to reverse the trend of a shrinking population in the countries in this study after a peak around 2020 (chart 1, left scale, in millions).



The demographic structure of economies is also affected by the pattern of migration which is difficult to predict. Total annual net immigration is forecast at around 500,000 persons for the countries in this study, equivalent to 0.18% of the total population. The total number of people who are projected to immigrate to the euro area over the projection period would, thus, amount to around 9% of the total population in the base year. While total immigration flows may respond to differentials in per capita wealth between the source countries and the euro area and could therefore be modelled economically, policies play a large role in controlling migration and the actual outcomes will depend to a large extent on how much immigration is deemed politically acceptable. It should be noted that the projection only covers legal immigrants who are also entitled to enter the labour market.

Demographic projections should be treated with a considerable degree of caution. Past experience with population projections reveals that forecasters typically assume demographic trends to revert to some trend level observed in the past.³ As a consequence, forecasts generally do not capture systematic changes in demographically relevant behaviour, such as fertility or migration decisions.

Implications for public pension systems

Most pension systems can broadly be categorised into three different pillars, although their specific design varies considerably across countries.⁴ The first pillar is a public pay-as-you-go pension system where social security contributions from current labour income provide the means for current pension payments. In many countries the first pillar pay-as-you-go system provides a basic income for pensioners, in some countries it represents the major part of the pension system. The second pillar consists generally of occupational pension schemes on a funded basis, i.e., participants' contributions are invested and pensions are paid out to the specific participant from the accumulated capital including capital gains. Individual voluntary arrangements through savings or insurance contracts represent the third pillar for pension provision.

Public pay-as-you-go pension systems have grown rapidly in importance throughout the past century. Public pension expenditure relative to GDP in the euro area

³ See R. Lee and S. Tuljapurkar (2001)

⁴ A categorisation into three pillars was first popularised by the World Bank (1994) and has been applied in a wide range of studies although specific classifications vary

countries rose from less than 2% in 1920 to more than 12% in 1993.⁵ This development reflects rising generosity and the continuous widening of these systems, culminating in almost complete coverage of the old age population in several countries. Reasons for the rising importance of public pay-as-you-go systems include its political attraction due to the low initial cost of setting up such systems in particular in times of growing populations. Another benefit from the historical perspective may lie in their independence from long-term private sector contracts. Such contracts had been repeatedly invalidated economically due to wars and inflation in Europe, making the long-term public commitments, which underlie public pay-as-you-go systems, appear more durable.

The increase in the dependency ratio described above puts pressure on pay-as-you-go pension systems, which are the major source of old age pensions in the euro area. With a declining ratio of labour force relative to the number of pensioners, the tax base shrinks while the number of recipients increases, leaving policymakers to adjust the system through reductions in benefits and increases in contributions. It should be noted that in the present situation debt-financing of the gap between pension contributions and payments does not represent a viable alternative. First, governments of the euro area have committed themselves to refrain from excessive public deficits. And second, given the public knowledge of the pension system dynamics, participants in financial markets would at some point anticipate the unsustainability of delaying pension system reform and require higher risk premia on new debt. Indeed, international rating agencies are starting to take a closer look at the impact of ageing on long term fiscal sustainability.

Reforms can focus on all elements of pay-as-you-go systems. Regarding benefits, possible measures include reductions of replacement rates and pensionable incomes, as well as other tightening of eligibility criteria. On the contributions side, increases in the contribution rates and a widening of the tax base through increases in registered labour are possible. One strategy that effectively combines adjustments on the benefits and the contributions side consists in increasing the retirement age, inducing an increase in the supply of labour as well as a reduction in the number of prospective pensioners.

However, the scale of the necessary adjustment of pay-as-you-go parameters may simply be too large to make a solely parametric reform a sufficient solution. For example, as European tax and social contribution rates are already high, any further increase may result in sizeable reductions in labour supply. Furthermore, such an approach could further harm international competitiveness. Significant cuts in benefits, on the other hand, would likely be politically difficult to implement with growing numbers of relatively old voters.

An alternative approach to secure future pensions consists in covering the decline in labour, which lies at the root of the problem, through an increase in capital available for funding pension income. The higher stock of assets for pension funding, held domestically or abroad, would have two beneficial effects for the pension system: overall pension income would rise, generating scope to reduce pensions from pay-as-you-go systems. In addition, the accumulated assets could be depleted to some extent when large cohorts retire. The effectiveness of this approach to pension reform hinges on the increase in the stock of assets underlying the pension system. This increase generally requires higher domestic saving. Conversely, if the additional

⁵ See Tanzi and Schuknecht (2000), Chapter 3, for the data and a more extensive discussion of the historical aspects. Coverage is partial.

private savings serve merely to finance government deficits, aggregate saving will not rise and there will be no augmentation of the asset stock to finance future pension needs.

Strengthening of funding in pension systems can also be expected to induce a number of additional effects, which support growth and thus alleviate the pension problem. First, the direct link between individual contributions and pension entitlements in a funded system can be expected to reduce the perceived tax burden of current pension systems, thus easing distorting effects on the labour market. Second, the increased flow of resources into professionally managed pension funds should lead to a deepening of capital markets and to higher efficiency in financial intermediation. Finally, to the extent that the accumulation of capital induces positive spillovers on productivity, fully funded systems may provide an additional impact on growth. While the above effects could in principle also be generated through individual reforms outside a move to pension funding, the latter's attraction derives from its inherent link with these additional benefits.

In addition to the above macroeconomic effects, a shift to funding may affect the exposure to various risks by each individual participant. In particular, a move toward private funding would replace the risk of the individual internal rate of return being decided by politicians in a public pay-as-you-go system by market determined asset return risks. In addition, a move from public to private provision of pension administration changes the legal basis for the participants. As a consequence, the regulatory and supervision framework would need to be adjusted in parallel to the strengthening of funded pension arrangements.

3 Pensions and institutions

3.1 Euro area public pension systems

Main Features

The great majority of the Member States offer labour market-based public pension schemes (see for details Economic Policy Committee, 2001 and 2002). For the private sector, these typically represent pay-as-you-go (PAYG) systems, which in some cases are partly financed by the state budget (i.e. in Belgium, Germany, Greece, Spain, France, Italy, Luxembourg, Austria, and Portugal). Such systems are generally "earnings-related", but can also provide the entire old age population with an identical pension for all ("flat rate"). This second approach mainly characterises countries with well-developed private second pillar schemes, like Ireland and the Netherlands.

As for public sector pension schemes, in three Member States, namely Belgium, Germany, and Greece, the regime for civil servants is financed only by the state budget, whereas in Ireland the scheme for the public sector is entirely PAYG. Remaining countries are characterised by a system that is partly PAYG and partly financed by state budgets (see table 2). Second pillar schemes are rarely mandatory in either the public or the private sectors, whereas individual voluntary schemes remain generally negligible.

Eligibility requirements

The minimum age requirement for old age pensions is generally 65 years across the majority of European Countries. Exceptions are:

- Portugal, where the public sector requirement is 60 years or alternatively 36 years service;
- Greece, where the minimum age for women is 60 in the private sector and 55 for civil servants;
- France, with 60 for men and women in both the private and the public sector;
- Italy, where the minimum retirement age is 65 for men and 60 for women.

Table 2 Euro Area Pension Systems

	B	D	EL	E	F	IRL	I	L	NL	A	P	FIN
FIRST PILLAR												
<i>General</i>												
Universal	No	No	No	Yes	Yes	Yes	No	No	Yes	No	Yes	Yes
Labour-market-based	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
<i>Private sector</i>												
Mandatory	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-	Yes	Yes	Yes
PAYG/FF/SF*	PAYG/ SF	PAYG /SF	PAYG /SF	PAYG /SF	PAYG /SF	PAYG /SF	PAYG SF	PAYG /SF	-	PAYG/ SF	PAYG/ SF	PAYG/ FF
<i>Public sector</i>												
Mandatory	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-	Yes	Yes	Yes
PAYG/FF/SF*	SF	SF	SF	PAYG /SF	PAYG /SF	PAYG	PAYG/ SF	PAYG/ SF	-	PAYG/ SF	PAYG/ SF	PAYG/ FF
<i>Self employed</i>												
Mandatory	Yes	Yes	Yes+	Yes	Yes	Yes	Yes	Yes	-	Yes	Yes	Yes
PAYG/FF/SF*	PAYG/ SF	PAYG /SF	PAYG /SF	PAYG /SF	PAYG /SF	PAYG	PAYG/ SF	PAYG/ SF	-	PAYG/ SF	PAYG/ SF	PAYG/ SF
SECOND PILLAR												
<i>Private sector</i>												
Mandatory	No	No	No	No	Yes+	No	No	No	Yes	No	No	No
<i>Public sector</i>												
Mandatory	No	Yes	No	No	No	Yes	No	No	Yes	No	No	No

Notes:

- (Not applicable)

PAYG (Pay as you go); FF (Fully funded), SF (State financed)

* The basic scheme is mandatory whereas the complementary scheme is voluntary.

+ For part of the private sector.

Source: Economic Policy Committee (2001)

Estimates for the year 2000 provided by Member States (Economic Policy Committee, 2002) show that average effective retirement ages for old age pensions in 2000 ranged from 60.5 years in Greece to 65.7 years in Portugal.

Requirements for the minimum number of contribution years remain more heterogeneous, ranging from no lower limit for the length of employment, as for the earnings-related system in Finland, to Italy's 19 year requirement in both the public and private sectors for earnings-related and mixed systems. Early retirement is possible in the great majority of the Member States, although specific provisions generally depend on the gender of the applicant and the sector of employment.

Indexation and taxation

Indexation rules for existing benefits (see table 3) can be broadly divided into three groups, namely i) indexation to prices (Spain, Italy and Luxembourg); ii) indexation to (net) wages (Germany); iii) mixed indexation or ad hoc systems (Belgium, Greece, Portugal, France, Ireland, Netherlands, Austria and Finland). Regarding the pension benefit level for future pensioners, this is calculated using an explicit indexation to

prices or wages in flat rate systems. In earnings related systems the pension benefit level for future pensioners largely depends on the wages until retirement, so that the pension benefits are implicitly following an indexation to wages. With regard to taxation, pensions are generally treated as personal labour income, with deductions being allowed in some countries (Belgium, Spain, Netherlands, Portugal and Finland).

Table 3 Euro Area Indexation Schemes and Taxation Regimes

B	For private sector: automatic indexation to prices for benefits and fixed transfers and to wages for ceilings, some limited targeted increases of benefits in real terms are possible For civil servants: automatic indexation to wages for benefits	Normal taxation regime but deductions allowed
D	Indexation to net wages in the previous year. In 2000 and 2001, temporarily indexed to prices. Refers to General Statutory Pension Scheme	Taxed as "other income" in the income tax
EL	Primary pensions for state and private sector employees are linked to increases in public sector wages. For the self employed and the professionals (as well as for the supplementary pensions) increases in pensions are ad hoc	Taxed as personal labour income
E	Indexation to projected price increases with lump-sum compensation in case actual inflation is higher than projected one.	Taxed as labour income. Favourable tax treatment for private funds
F	For Regime General, indexation to projected price increase with lump-sum compensation in case actual inflation is higher than projected. For civil servants, indexation to wages of public employees.	Subject to special taxes (6.2% and 0.5%) Complementary pensions are subject to a supplementary health contribution (1 per cent). All pensions are included in the household taxable income
IRL	Pension increases are decided during the budgetary process and are usually ahead of inflation	Subject to income tax.
I	In general, full indexation to prices (CPI index). Partial indexation to prices for higher pensions.	Taxed as wage income, but pensions below a minimum amount (if the pensioner has no other income) are tax-exempt
L	Pensions automatically indexed to price developments. Adjustment to wages by special law	Social security benefits are treated as wages
NL	The public pension benefit is linked to the minimum wage level. For almost all occupational schemes, indexation is contingent on the financial development of the related pension fund. 15 per cent of occupational schemes are indexed to prices and 65 per cent to wages	Public pension benefits are taxed as labour income. For occupational schemes, contributions are tax deductible and benefits are taxed as labour income. Persons above 65 years are exempt from contributions to the AOW. Returns from pension funds are tax-exempt.
A	On an ad hoc basis, reflecting the development of net wages, by and large	Taxed as personal income taxation.
P	For the public sector, the indexation scheme is related to public employees' wages. Conversely, for the private sector the indexation scheme is ad hoc	Taxed as wage income beyond a certain threshold
FIN	Indexation to prices (CPI) for the national pension scheme and to a weighted average of wage and price changes for the earning-related pension scheme.	Taxed according to the rules of general income taxation. Small pensions are entitled to special pension deductions

Source: Economic Policy Committee (2001)

Institutions and structural co-ordination

A comprehensive strategy to examine the economic and social implications of ageing has been put in place at the European level (see table 4). This strategy is based on existing institutional arrangements, such as the Broad Economic Policy Guidelines (BEPG) and the Stability and Growth Pact (SGP), as well as the adoption of the new "open method of co-ordination" in the domain of pensions policy. Reflecting the need for reforms and to provide more substantial guidance on policies, the EU agreed in 2001 on the so-called three-pronged strategy to cope with the projected pressures due to population ageing. The strategy was first reflected in the 2001 BEPG

and comprises three broad objectives, namely to raise employment rates, to reduce government debt rapidly and to reform pension systems, including through greater reliance on funding.

Table 4 European Institutions and Policy Committees Related to Pensions Systems

European Commission	Council	
<ul style="list-style-type: none"> - monitors national pension reform processes - recommends Broad Economic Policy Guidelines - proposes Employment Guidelines and recommendations - contributes to joint Council/Commission report assessing national pension strategies - works with advisory committees on specific aspects - liaises with European Social Partners and relevant NGOs 	<p style="text-align: center;">ECOFIN</p> <p>Broad Economic Policy Guidelines and multilateral surveillance process Stability and Growth Pact</p>	<p style="text-align: center;">Employment and Social Policy (ESP)</p> <p>Employment process and open method of co-ordination applied to social protection, social integration and pensions'</p>
	<p>Economic Policy Committee (EPC)</p> <ul style="list-style-type: none"> - assists the Council and the Commission in the assessment of national pension strategies, with a focus on the economic and budgetary implications of pensions systems as part of the multilateral surveillance process (Article 99 of the Treaty) - assists the Council in drafting the joint Council/Commission report on pension reforms - develops indicators, particularly for the long-term financial sustainability of pension systems and prepares simulations to be carried out by Member States - will work jointly with the SPC on implementing the open method of co-ordination with regard to pensions. <p>Economic and Financial Committee (EFC)</p> <ul style="list-style-type: none"> - assists the Council in its work on the BEPG - assists the Council in its work on Stability and Convergence Programmes 	<p>Social Protection Committee (SPC)</p> <ul style="list-style-type: none"> - assists the Council and the Commission in the assessment of national pension strategies, with a particular focus on the adequacy of pensions and adaptation to a changing society as part of the open method of co-ordination - assists the Council in drafting the joint Council/Commission report on pension reforms - develops indicators, particularly for the adequacy and adaptability of pension systems - will work jointly with the EPC on implementing the open method of co-ordination with regard to pensions <p>Employment Committee (EMCO)</p> <ul style="list-style-type: none"> - assists the Council and Commission in the assessment of progress under the European Employment strategy and in particular the evolution of employment rates
<p>European Parliament</p> <ul style="list-style-type: none"> - is being kept informed by the Council and the European Commission 		
<p>European Council</p> <ul style="list-style-type: none"> - gives general political guidelines and assesses progress at Spring meeting 		

Source: Commission of the European Communities (2001)

Existing Institutional Arrangements

The BEPG are, by the power of the Treaty, at the centre of the economic policy co-ordination process. They provide a framework for the definition of the overall policy objectives and orientations for the Union. In this, they consolidate the existing co-ordination processes (Luxembourg, Cologne and Cardiff) and form the reference for the multilateral surveillance procedure, under which the consistency of national economic policies is monitored. Reflecting also the economic and budgetary challenges posed by the ageing populations, these "guidelines" have been strengthened over the years, putting additional emphasis on the medium and long-term implications of structural policies, as well as on reforms designed to promote economic growth potential. To this aim, they now increasingly emphasise the need for enhanced sustainability of the national pension systems, to be achieved via the implementation of additional labour market reforms, sustained reduction of debt ratios, as well as systemic pension reforms including funding.

Regarding the SGP, the revised code of conduct (2001) approved by the Economic and Financial Committee and endorsed by the Ecofin Council requires additional information on long-term sustainability to be included in countries' stability and convergence programmes. Specifically, an additional table on the "long-term sustainability of public finances" has been compiled since the 2001/2002 round of the programmes. Its aim is to highlight the expected total expenditure on old age pensions and health costs over a fixed projection period (2000-2050), as well as make explicit several key underlying assumptions such as participation and unemployment rates and labour productivity growth. The revised code of conduct also prescribes

that the format of the programme updates should be increasingly standardised, while their content should focus more extensively on an examination of the quality of national public finances. The peer assessment of stability programmes in the Ecofin council also covers this sustainability analysis.

The Open Method of Co-ordination

Alongside the framework of the existing institutional arrangements and as a new tool in the area of policy co-ordination, the "open method of co-ordination" is being applied in the pension domain. This method is intended to involve i) setting common objectives, ii) translating such objectives into national policy strategies and, as part of a mutual learning process, iii) monitoring progress on the basis of commonly agreed and defined sustainability indicators. Its aim is to provide an integrated reporting framework on issues concerning "best practices" for future pension provision, as well as an EU framework to develop a common understanding of national strategies. Moreover, it is designed to enhance the provision of detailed information and analysis regarding national pension strategies that will feed into the formulation of policy recommendations within the BEPG. The Stockholm European Council (March 2001) has stressed that "[in the pension domain] the potential of the open method of co-ordination should be used to the full", albeit in a way which does not infringe the principle of subsidiarity.

Reports

As part of its response to the mandate by the Ecofin for a comprehensive report assessing the overall impact of ageing populations on public finances, the Working Group on Ageing of the EPC (AWG) produced the report "Budgetary challenges posed by ageing populations" (Economic Policy Committee, 2001). The working group, in a first step, developed long-term quantitative simulations through 2050 for pension expenditure, followed by projections over the same period of the impact of ageing on public expenditure on health and care for the elderly. In a second step, the group developed possible indicators considering how the projections for age-related public expenditures could be used to examine the overall long-term sustainability of public finances. The analysis of the working group showed that in a number of Member States further reforms are needed in view of their commitment to ensure sound public finances at all times.

A report on the overall assessment of the impact of ageing on public finances is being prepared, presenting a comprehensive survey of the projected impact of demographic changes. In addition, the major aspects of national pension systems and reform strategies as presented in the national strategy reports under the open method of co-ordination are summarised in a forthcoming joint report of the Economic Policy Committee and the Social Protection Committee on adequate and sustainable pensions.

4 Simulation results

The simulation exercise in this section proceeds in four broad steps. After discussing the simulation method and assumptions, we first analyse a baseline scenario on the basis of assumptions that have been widely applied in the European literature. Second, we study the impact of adopting more realistic assumptions regarding employment and interest rates. Third, we will show that even under the optimistic baseline scenario assumptions a purely parametric reform of pay-as-you-go systems will not suffice to balance the present value of public pension deficits beyond the

forecast horizon. In the final step, a more comprehensive reform scenario is presented which yields a financially viable pay-as-you-go system through a move towards partial funding.

Simulation method

To generate pension projections for the individual countries, we employ the PROST (Pensions Reform Options Simulations Toolkit) software from the World Bank. This application is programmed in Visual Basic for Applications and produces detailed projections in Excel spreadsheets for the development of pension systems based on the specification of the relevant parameters in a base year and their development over time. The most important inputs relate to the demographic structure, labour market assumptions and the specific design of the pension system under consideration. These are complemented by macroeconomic variables, such as productivity growth and interest rates, which are assumed exogenous. The software allows pay-as-you-go systems and funded schemes to be modelled, as well as a wide range of reform scenarios.

The euro area aggregate—referred to as the "aggregate" in this survey—covers nine countries,⁶ which represent 96.1% of the euro area GDP and 96.3% of the total public pension expenditure of the 12 euro area countries. The projections are based on the actual pension system data for 1999, the last year for which a complete data set for all countries was available. However, more recent data were used where available, in particular with regard to changes in pension system generosity. The projection period ranges from 2000 to 2050. The projection is based on the aggregation of the results from individual country models, which replicate the main features of national pension systems. In particular, all country models cover pension arrangements for private sector workers, with the coverage depending on the data availability and the degree of fragmentation of national arrangements. In most cases, disability and survivor benefits have been included, but early retirement schemes and civil service pensions were mostly excluded.⁷ The PROST simulation represents approximately 68% of the total pension expenditure as covered by the AWG.⁸

Assumptions and input variables

The projections are based on the baseline Eurostat demographic forecasts, which have been discussed in section 2. Key economic parameters such as growth rates and real interest rates are applied across countries, which is similar to the AWG approach. Pensions are calculated before taxes so that, depending on the specific characteristics of the tax system, total projected fiscal liabilities could be reduced by rising tax revenues from pensions.⁹ Labour market assumptions are based on a common general framework, but exhibit some variation across countries. Additional input variables are based on national sources.¹⁰

Participation and unemployment rates

Labour market participation is projected to increase, in particular for women. This effect can be seen across all age cohorts, most strongly for older workers aged 55 to 64, and for young women. Although increases are foreseen across all countries, they are very different in magnitude. According to AWG data, the increase in female labour market participation from 2000 to 2050 ranges from 1.7% to 19.3% for the

⁶ Belgium, Germany, Spain, France, Ireland, Italy, Netherlands, Austria, Finland

⁷ Country details can be found in the Appendix

⁸ In 2000, the weighted average of euro area public pension expenditure was 11.6% of GDP according to the AWG and 7.9% in the PROST models.

⁹ It should be noted, however, that in many countries effective tax rates on pensions are relatively low.

¹⁰ A table with major variables is provided in Appendix II.

age group 15 to 54, and from 1.8% to 34% for the age group 55 to 64 years. There is also an increase for men, which affects mostly the cohort aged 55 to 64, although this is not experienced by all countries. Unemployment rates are assumed to fall to their structural levels. The unemployment rate is projected to drop from currently 9.9% to 7.1% in 2020 and, on a slower path, to 6.2% by 2050. In line with this, the employment ratio (total employees as a ratio of 15 to 64 year olds) is expected to rise from 61% to 68%.

Macroeconomic assumptions

Labour productivity growth is projected to converge to a level of 1¼% for almost all countries after 2020, in line with the AWG approach. Until that time, higher productivity growth is assumed, particularly in Spain and Ireland. As a result of the employment and productivity assumptions, real GDP growth is projected to decrease steadily during the first half of the projection period from a current 2.6% to a level of 1.3% to 1.5%, where it will remain through the end of the projection period. Real wages are expected to grow in line with labour productivity. The real interest rate is assumed constant at 4% throughout the projection period. Inflation converges to between 1.5% and 2% in all countries.

Pension system finance

The projections are based on hypothetical contribution rates, to achieve a comparable financing structure across countries. The financing arrangements of several European pension schemes are complex and intransparent, with participants' contributions being supplemented with transfers from the general budget as well as from other parts of the social security administration. To achieve comparability, hypothetical contribution rates were calculated by dividing total pension payments by the wage sum of effective contributors in the base year. Implicitly, this approach supposes that the national schemes are pure balanced pay-as-you-go systems with all expenditures being financed through wage-based contributions at a fixed rate across wage levels. These hypothetical contribution rates were then kept constant over the projection horizon.

The assumption that pension systems are balanced at the start of the projection period means to disregard the deficits that are currently generated in many pension systems as contributions already fall short of expenditures. These deficits add to the future deficits estimated below, so that the actual fiscal burden arising from pension system would exceed the estimations.

Furthermore, the financing side of pension systems is assumed to be integrated into general budgets in the sense that the systems neither receive interest on assets held nor pay interest on debt accumulated. In other words, pension system surpluses reduce the government's overall interest burden while pension system deficits increase it. However, for the reform scenarios discussed below pension surpluses are assumed to accrue to the pension system so that they can be used to finance future pension obligations.

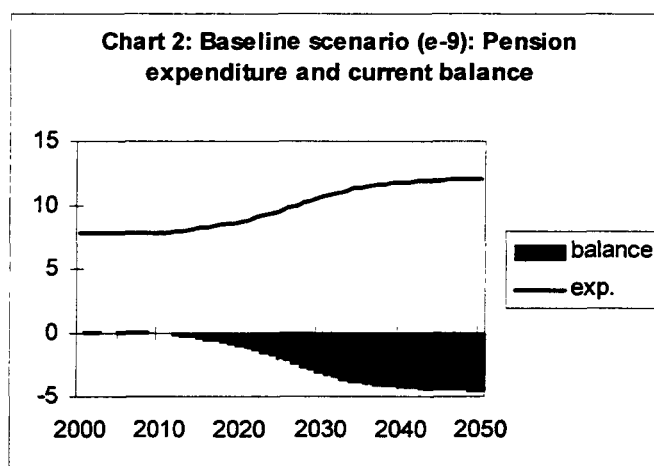
Results for the baseline scenario

Simulation results point to a substantial increase in pension expenditure in the euro area, from a current level of 7.9% to 12.1% of GDP (see table 5). While expenditure will remain almost constant over the next decade, a steep rise is forecast to start in 2010. This will bring expenditure to 10.6% by 2030 and to 12% by 2045 (see chart 2). At the country level, the increase in expenditure varies significantly both in size and timing. For example, the largest increase is recorded in Spain, amounting to 9.0

percentage points.

Table 5 Baseline scenario, e-9

	2000	2010	2020	2030	2040	2050	absolute change (ppt of GDP)
Current balance (% of GDP)	0.0	0.0	-1.0	-3.1	-4.3	-4.5	-4.5
Pension expenditure (% of GDP)	7.9	7.8	8.7	10.6	11.8	12.1	4.2
Dependency ratio	24.3	27.7	32.7	41.2	49.1	50.2	6.3
Employment ratio ¹	1.64	1.58	1.55	1.54	1.49	1.47	-0.9
Average pension / GDP per worker	16.5	15.2	14.8	14.4	14.2	14.2	-1.2
Eligibility ratio	1.20	1.17	1.16	1.17	1.13	1.16	-0.2
Residual							0.2



In line with this development, the current balance of the pension systems is projected to turn negative. While at present the system is balanced by assumption, it will start to incur deficits by approximately 2010, which rise to a level of about 4.5% of GDP per year by 2050. The present value of the deficits is equal to 50.6% of GDP, which can be interpreted as an additional (implicit) debt burden on top of governments' explicit debt stock averaging around 67% of GDP in 2001.¹¹ The present value of the deficits is equivalent to a constant negative annuity of 1.7% of GDP; in other words, current revenues of the pension system would need to be increased permanently by 1.7 percentage points of GDP to achieve a zero present value of deficits through 2050. Note however, that large deficits arise also beyond the forecast horizon. Thus, if a longer period were taken into account, the permanent increase necessary for a balanced system would be higher. As an alternative measure for the degree of the upcoming financing problems, the necessary contribution rate to maintain a balanced pay-as-you-go system in every period would need to rise from below 30% to close to 40% by the end of the projection period. Similarly, continuous balance would require average benefits to fall by close to one half, all other variables remaining equal.

¹¹ For analyses of fiscal sustainability, public assets, as currently accumulated in some countries, need to be taken into account.

Should demographic developments turn out less favourable than in the above projection, the fiscal burden could increase substantially. In their stochastic simulations of US fiscal policies through 2070, Lee and Tuljapurkar (2001) report a 95% confidence interval for tax rates to balance the fiscal accounts ranging from 25% to 53% around the median estimate of 38%, indicating that prudent policies should take additional precautions.

To analyse the individual effects driving the pension expenditure ratio to GDP, it can be decomposed into four explanatory factors, namely the dependency ratio, employment, benefit generosity and eligibility. The dependency effect is measured by the ratio of the population over 64 relative to the working age population between 15 and 64. The employment effect is measured by the share of total employment in the working age population from 15 to 64. The average pension relative to GDP per worker is shown as the benefit variable. Finally, eligibility is given by the ratio of the number of pensions relative to the population over 64. Algebraically, the following formula applies:

$$\text{pension expenditure ratio} = (\text{dependency ratio}) * (\text{employment ratio})^{-1} * (\text{average pension}) * (\text{eligibility ratio})$$

Table 5 also shows the contribution of the four components to the increase in pension expenditure. The contribution to the absolute percentage point change (last column) has been approximated by log-linearisation. The total increase in pension expenditure of 4.2 percentage points of GDP is driven by the rise in the dependency ratio, while the other factors exert smaller offsetting effects. The dependency ratio increases steadily from a current 24.3% to a level of approximately 50% by 2040, where it remains thereafter. This development is equally due to a decrease in the working age population and an increase in the age group over 64. *Ceteris paribus* this evolution of the dependency ratio would cause pension expenditure to increase by 6.3 percentage points.

In line with the labour market assumptions outlined above, employment increases at a relatively continuous rate. This is mainly due to higher female participation and to higher participation of the older age cohorts in general. The declining inverse employment ratio as shown in table 5 represents a corresponding increase in employment. The employment effect alone would reduce the pension expenditure by 0.9 percentage points.

Average pensions diminish from 16.5% of GDP per employee to 14.2% by the end of the projection period, a reduction of 15%. This development reflects recent pension reforms and also the indexation of pensions to inflation, which leads to a decline in the level of pensions relative to wages. It is worth noting that a fall in this benefit ratio is not equivalent to a fall in pensions in real terms. The relatively lower benefits would result in a fall of pension expenditure of 1.2 percentage points regardless of other factors, making it the largest offsetting effect.

The eligibility ratio is projected to follow a volatile trend and fall marginally from 1.20 to 1.16. It accounts for the number of pensions rather than for the number of pensioners and is higher than one as there are many cases in which a pensioner receives more than one pension. The change in the eligibility ratio reflects two largely offsetting developments. On one hand, eligibility criteria are being tightened in many pension systems. On the other hand, increased labour market participation, in particular by women, leads to a higher number of entitlements. The change in the

eligibility ratio over time would account for a reduction in pension expenditure by 0.2 percentage points regardless of other factors.

The results are in line with the projections of the AWG. Based on a wider coverage of national pension systems but including the same set of countries, the AWG aggregate pension expenditure rises by 3.9 percentage points of GDP, from 11.7% in 2000 to 15.6% in 2050. The very similar percentage point increase in the PROST simulation with a smaller coverage implies that the components not covered in the PROST simulation remain broadly constant relative to GDP. This is indeed what the national projections for the Working Group indicate, as rising expenditures in some components, such as civil servants' pensions, are offset by decreasing expenditures on other items, including disability and early retirement pensions.

Realistic baseline scenario

However, the AWG projections are optimistic on at least two accounts, namely regarding assumptions on smaller pension expenditure items and labour market developments. In addition, lowering the assumed real interest rate to 3% has a material impact on the results. With more realistic assumptions on employment and the interest rate level, the present value of pension deficits turns out some 40 percentage points of GDP higher.

Regarding the first point, the implicit assumption that the expenditure items not captured in the PROST model remain constant relative to GDP reflects underlying policy changes that are not guaranteed. Most importantly, offsetting increases in civil service pensions through savings on disability and early retirement schemes requires a tightening in their eligibility criteria that may be politically difficult to achieve.

Second, the AWG approach is based on optimistic labour market assumptions, in particular regarding the increase in labour participation rates and the decline in unemployment. To gain an insight into the importance of the labour market assumptions for the above results, the base model, which assumes a significant rise in labour participation rates, has been rerun with the assumption of no changes in labour market variables. In particular, participation rates remain flat, as do unemployment rates and the effective retirement age. Replacement rates have been adjusted to reflect the shorter working histories of new pensioners in this set-up. The realistic baseline scenario was implemented for the four largest euro area countries (e-4: Germany, France, Italy and Spain) covering close to 80% of euro area GDP and 82% of the total euro area public pension expenditure.

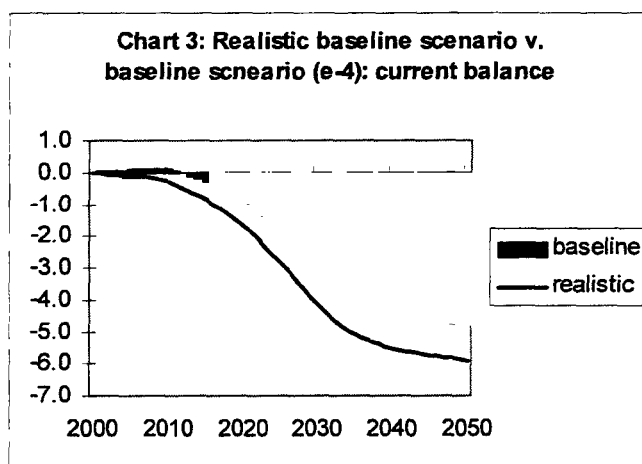
To obtain an assessment of the sensitivity of the results with regard to the interest rate assumption, the realistic baseline scenario is based on a real interest rate of 3%. This results in an interest rate growth differential of around 1½% for most of the projection period, in line with an historical 25 year average for large euro area countries. The effect of the interest rate assumption occurs mainly through its impact on the discount factor in the calculation of the present value of the deficits.

The resulting realistic baseline scenario is compared with the original baseline scenario for the four major countries (e-4) in table 6 and chart 3. Comparing the baseline scenario (e-4) with that for the full set of nine countries (table 5) shows that the overall behaviour is very similar. In particular, the expenditure pressure for the large countries is projected somewhat above the average. On the other hand, the present value of the pension deficits is marginally lower at 47% of GDP. Turning to the realistic baseline scenario, the assumption of flat labour market developments has

a substantive impact on the results. The current deficit deteriorates to 5.9% of GDP by 2050, about one percentage point more than in the baseline scenario. This effect is driven by the less favourable development of the employment ratio, which is only partly offset by the reduction in the replacement rate relative to the baseline scenario. The present value of deficits rises by about 40 percentage points of GDP to an average of around 87% of GDP. This increase by around 40 percentage points of GDP is driven in about equal parts by the employment and the interest rate assumption. The individual increases range from 23 points in France to close to 60 points in Spain. Analogously, the average annuity necessary to cover this deficit rises to 2.5% of GDP.

Table 6 Baseline scenario vs. realistic baseline scenario, e-4

	2000	Baseline scenario (e-4)			Realistic baseline scenario (e-4)		
		2002	2050	absolute change	2002	2050	absolute change
Current balance (% of GDP)	0.0	0.0	-4.8	-4.8	-0.1	-5.9	-5.9
Pension expenditure (% of GDP)	8.1	8.1	12.7	4.6	8.2	13.5	5.3
Dependency ratio	24.7	25.5	51.7	27.0	25.5	51.7	27.0
Employment ratio ¹	1.65	1.62	1.46	-0.2	1.65	1.67	0.0
Average pension / GDP per worker	16.7	16.4	14.4	-2.3	16.4	13.4	-3.3
Eligibility ratio	1.20	1.19	1.17	0.0	1.19	1.16	0.0



4.5 Partial reform

To cope with the fiscal burden, parametric reforms of pay-as-you-go systems have been discussed in political and academic circles. In the following, the characteristics and results of one possible scenario are modelled. Despite looking only at one specific set of reforms, the exercise will show that partial reforms will generally not be sufficient to balance pension systems as the necessary additional burden on participants is unrealistically high while leaving a substantial financial gap at the end of the projection period.

The hypothetical reforms balance the national pension systems, i.e., they reduce the present value of deficits over the projection horizon to zero. This is achieved through a combination of changes in three parameters: (i) a gradual increase in the effective retirement age by one year until 2010 with unchanged replacement rates; (ii) a rise in the contribution rates by 10%, e.g., from 30% to 33%; and, finally, a reduction in average replacement rates sufficient to balance the system, i.e., reducing the present

value of deficits to zero in 2002. The reform scenario was implemented for the e-4 countries with reforms starting in 2002.

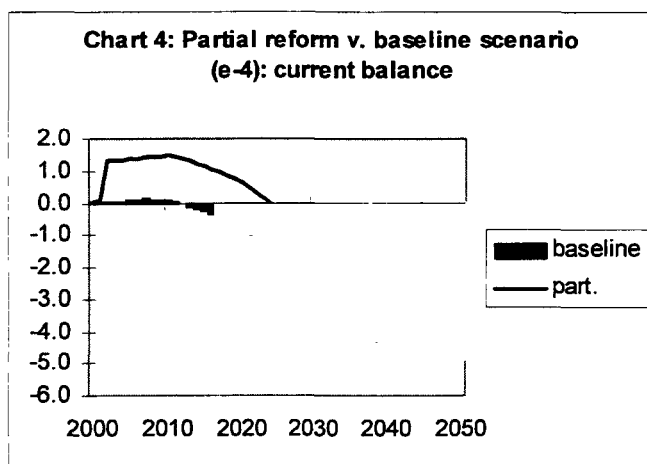
In view of the diverse behaviour of national pension schemes, the overall reform scenario was adjusted for the individual countries. For Italy, the effective retirement age was assumed to be unchanged relative to the baseline scenario, as the reformed Italian pension system does not allow for an increase in the retirement age without an actuarially fair compensation. This strongly reduces the potential impact of such a reform on pension system finances. Contribution rates for France were left unchanged relative to the baseline scenario as the total reform need is relatively small. The results are presented in table 7 and compared with the respective baseline scenario for the four large countries.

Table 7 Partial reform vs. baseline scenario, e-4

	2000	Baseline scenario(e-4)			Partial reform (e-4)		
		2002	2050	absolute change	2002	2050	absolute change
Current balance (% of GDP)	0.0	0.0	-4.8	-4.8	1.3	-2.8	-2.8
Pension expenditure (% of GDP)	8.1	8.1	12.7	4.6	7.5	11.2	3.1
Dependency ratio	24.7	25.5	51.7	27.0	25.5	51.7	27.0
Employment ratio ¹	1.65	1.62	1.46	-0.2	1.62	1.45	-0.2
Average pension / GDP per worker	16.7	16.4	14.4	-2.3	15.3	13.0	-3.8
Eligibility ratio	1.20	1.19	1.17	0.0	1.18	1.16	0.0

The partial reform induces an upward shift in the current balance as shown in chart 4, so that the present value of deficits through 2050 is equal to zero. This compares with a present value of 47% of GDP and a constant negative annuity of 1.6% of GDP in the baseline scenario for the four countries analysed. The behaviour of the balance over time remains as in the baseline scenario, exhibiting a significant deterioration over the projection period. Note that the distribution of the burden from lower average replacement rates is left open. Thus, lower benefits may be imposed on existing pensioners through a reduction in pension indexation or on current contributors through lower accrual rates.

The use of the real interest rate of 4% for the calculation of the present value implies that the surpluses generated during the first half of the projection period are invested at this rate. Alternatively, they can be thought of being used to reduce explicit government debt. Given the size of the accumulated surpluses, which remain below 20% of GDP for all countries, the latter interpretation has the favourable side aspect that it takes care of the problem of how to invest surpluses from the social security system. It should be clear, however, that any shortfall in the return on publicly managed funds relative to the market interest rate, as has been observed historically in many countries, would increase the overall burden of the parametric reform.



The balancing of the system is driven by lower replacement rates and higher contributions, but the increase in the retirement age has only a marginal impact on the employment ratio. The number of employed rises by less than 2% as a result of the reform. Simplistically, this can be explained by the effect that in the countries under study almost the entire cohort at retirement age starts to receive a pension while only a fraction had been working until that date. Reasons for this include eligibility rules requiring only limited labour market participation throughout the entire career and the existence of dependants' pensions. Thus, postponing the transition from work to pension by one year adds only relatively few new employed to the economy.

However, the above scenario is not viable for two reasons. First, the assumed rise in contribution rates cannot be reconciled with the assumption of significantly rising employment rates. The assumed increase in contribution rates raises the hypothetical aggregate contribution rate from 33.9% to 36.3%. Higher contribution rates raise the disincentives to work (at least in the official economy) so that the projected employment rates remain almost certainly out of reach in this scenario. This holds also for the hypothetical contribution rate applied in this study, as the final incidence of the financial burden of the social security system is concentrated on labour income.

Second, the reform only balances the pay-as-you-go systems through 2050 and leaves them with substantial deficits after that date. As chart 4 shows, the aggregate deficit in 2050 is close to 2½% of GDP and is deteriorating. In other words, despite the measures of the partial reform scenario, there remains a need for substantial pension reforms. On the simplistic assumption of no further parameter changes after 2050, the aggregate present value of deficits through 2100 discounted to 2002 exceeds 20% of GDP.¹²

While the above considerations refer to a specific reform scenario, the overall result applies more broadly. Balancing a pay-as-you-go system permanently in view of the projected adverse demographic developments requires substantial increases in contribution rates or severe cuts in benefits, including through actuarially unrewarded increases in the effective retirement age. Specific reforms can basically affect only the distribution of the adjustment burden.

¹² The overall benefit of such a reform would be further reduced if the increase in the effective retirement age was the result of specific tax incentives

4.6 Comprehensive reform

In view of the above results, a workable pension reform needs to balance the pension system while providing strong incentives for increased labour market participation. Strengthening incentives for labour market participation means reducing the tax burden on labour. At the same time, the sustainability of the pension system requires that the ensuing drop in revenues be matched by lower benefits. The move towards a partially funded pension system can achieve these objectives. In particular, it allows current contributors to the pension system to accumulate wealth for their own retirement while it reduces tax distortions as contributions to the funded pillar are perceived as savings rather than taxation. In such an environment, the strong increases in employment as assumed in the above simulations become a realistic projection.

The simulation of the partial shift to funding has been set up to focus on how future pensioners will be affected relative to the partial reform scenario. The most important reform parameters are the following. In all four countries, contribution rates to the pay-as-you-go system are reduced immediately and permanently by 6 percentage points. That amount is invested into a funded pillar which carries a net return of 4% after taxes and administrative costs. All working age generations participate in the partial shift to funding. Replacement rates for new old age pensioners are reduced to achieve balance of the system, namely a zero present value of deficits.¹³ Existing pensioners remain unaffected by the reform, i.e., their pension levels and indexation mechanisms remain as in the partial reform case. With a view to making the payment streams from the funded pillar comparable to those from the pay-as-you-go system, the benefits from the funded pillar are expressed as hypothetical annuities. These annuities represent a constant payment stream to the pensioners but cannot be bequeathed, which distinguishes them from actual annuity plans found in financial markets. The indexation of the hypothetical annuities has been matched to that of the pay-as-you-go pensions. Finally, the assumptions on effective retirement ages and labour market developments are as in the partial reform scenario.

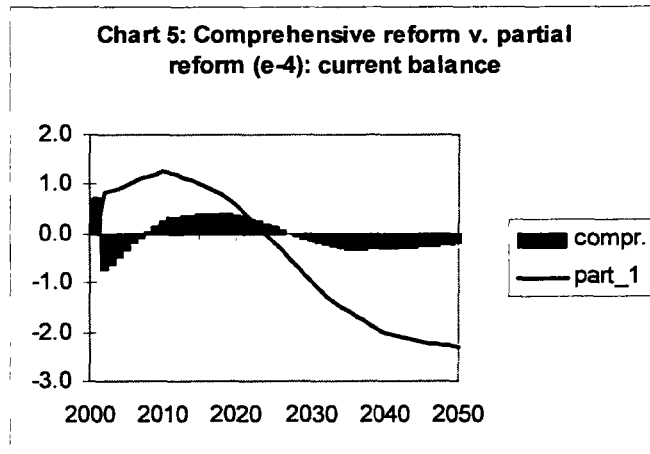
The set up allows to focus on one variable to assess the effects of the reform, subject to the condition that the pay-as-you-go pillar is balanced. This variable is the ratio of the replacement rate for new old age pensioners in the reform case relative to that in the partial reform scenario. As existing pensioners are treated identically in both scenarios and total contributions for pension insurance remain unchanged, the reform effects can be fully captured by the change in the total replacement rate for newly retiring participants. Technically, this requires a recalculation of the partial reform scenario using the assumption that the system is balanced solely through reductions in the replacement rates for new pensioners, rather than in the average replacement rate for all existing pensioners as described in the previous section.

The comprehensive reform balances the pay-as-you-go system through 2050 whereas the behaviour of the revised partial reform scenario (to account for the adjustment solely through replacement rates for new retirees) is not substantially changed from the original partial reform (see table 8 and chart 5). The balancing of the system is achieved through a pronounced reduction in the replacement rate which matches the reduction in contributions. The pay-as-you-go system remains in balance through 2100 assuming no further parameter changes.

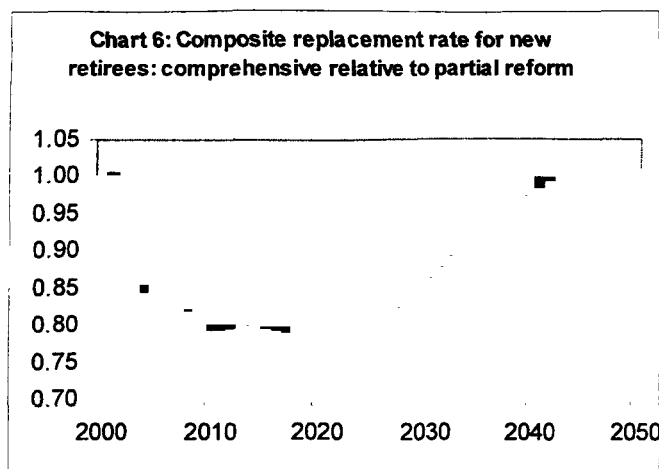
¹³ In practice, replacement rates for all newly retiring workers are cut linearly to reduce expenditure to equal revenues.

Table 8 Partial reform (rev.) vs. comprehensive reform, e-4

	2000	Partial reform (rev.) (e-4)			Comprehensive reform (e-4)		
		2002	2050	absolute change	2002	2050	absolute change
Current balance (% of GDP)	0.0	0.8	-2.3	-2.3	-0.8	-0.2	-0.2
Pension expenditure (% of GDP)	8.1	8.0	10.7	2.6	7.9	7.3	-0.8
Dependency ratio	24.7	25.5	51.7	27.0	25.5	51.7	27.0
Employment ratio ¹	1.65	1.62	1.45	-0.2	1.62	1.45	-0.2
Average pension / GDP per worker	16.7	16.3	12.4	-4.3	16.2	8.5	-8.2
Eligibility ratio	1.20	1.18	1.16	0.0	1.18	1.16	0.0



The simulations reveal that the partial shift to funding leaves some generations of future pensioners worse off than in the partial reform case. As shown in chart 6, replacement rates for new old age pensioners turn out up to 23% lower relative to the partial reform scenario. In other words, in the comprehensive reform scenario, participants retiring before around 2040 will receive lower pensions than in the partial reform scenario. Only after that date will the total replacement rate be somewhat higher than in the partial reform scenario. Note that the ratio of the replacement rates declines somewhat close to the end of the projection period. This is a result of ageing within the working age population which also induces by assumption a higher average wage level and, thus, a lower ratio of the average annuity to the average wage in the economy.



Changing the assumption on the return on investment in the funded pillar affects the long-term outcome for pensioners, while in the medium term the impact is limited. To assess sensitivity of the results, simulations were run assuming real returns of 3% and 5%, respectively. As the size of the funded pillar is to a large extent driven by the effect of compound interest, the impact of the alternative return assumptions is relatively limited through around 2025. With growing size of the funded pillar, the importance of the return assumption becomes more important. By 2050, total replacement rates under the high (5%) return assumption exceed those of the baseline (4%) by close to 20%. By contrast, the low (3%) return assumption results in a shortfall of some 12%, implying that the replacement rate under the comprehensive reform scenario would also fall short of the replacement rate under the unsustainable partial reform. This last result reflects the fact that the pension system is still not financially balanced in the partial reform scenario, offering excessive returns and incurring persistent deficits at the end of the forecast horizon.

The above set-up represents a polar case in assuming that all working age contributors immediately participate in the newly established funded pillar. While this outcome might be feasible if participation is mandatory, it could be difficult to find the necessary political support for such an approach. In particular, older workers close to retirement would likely be strongly opposed to a large cut in pay-as-you-go benefits as they have little time to build up assets in the funded pillar. Making participation voluntary, in particular for older workers, might be more acceptable (see Palacios and Whitehouse, 1998, for a discussion of the options). It should be noted that a gradual transition towards a funded pillar would smooth out replacement rates at the cost of additional fiscal burdens to finance the continuation of the pay-as-you-go system for a part of current workers.

The reduction in the replacement rate for some generations with the introduction of a partially funded system reflects the basic theoretical finding that the inherent debt of pay-as-you-go systems always has to be financed. The debt is incurred as the first generations of pensioners in a pay-as-you-go system receive pension benefits without having contributed fully to the system. In an ongoing pay-as-you-go system this debt is continuously rolled over to following generations. The interest cost of the debt is reflected in the rate of return disadvantage of pay-as-you-go systems relative to funded schemes (see Sinn, 2000). A transition to funding requires the redemption of the inherent debt which imposes a burden on current or future generations. As long as the return to funding does not exceed the cost of debt financing or the shift to

funding does not reduce other existing distortions, the move will always induce some net loss to current or future generations. Conversely, the beneficial effects of a move to funding, e.g., through a reduction of tax distortions or a higher return on investment, need to offset the above cost if the move is to be favourable.

5 Conclusions

Population ageing is putting pressure on public pay-as-you-go pension systems. The scale of such systems in the euro area makes significant reforms in the near future inevitable. The need for reform has also been acknowledged at the European level, where an institutional framework for the monitoring and co-ordination of national pension reform policies is being implemented.

The numerical projections in this paper underline the urgency of the problem and provide an assessment of the viability of alternative reform approaches. The pension projections for the baseline scenario are in line with those of the AWG, implying that the chosen projection method is reliable. Pension expenditure is projected to rise by more than 4 percentage points of GDP between 2000 and 2050. The present value of deficits is 51% of GDP, equivalent to an annuity of 1.7% of GDP throughout the projection period. Actual deficits currently incurred by public pension systems add to these deficits as the study assumes initially balanced pension finances. In addition, the AWG results are based on optimistic assumptions regarding labour market projections as well as developments outside public pensions for private sector employees. Assuming unchanged labour market variables and a real interest rate of 3% yields a total burden of close to 90% of GDP. Labour market and the interest rate assumptions contribute about equally to this increase.

A partial reform approach is found incapable of solving the ageing problem despite favourable macroeconomic assumptions. The reform balances the pension systems over the projection period by lowering benefits, raising the effective retirement age and increasing the contribution rates. However, further rises in contribution rates are incompatible with the necessary rise in employment rates to balance the system. In addition, even if the optimistic labour market projections materialise in the reform scenario, the pay-as-you-go systems run an aggregate deficit of close to 2½% of GDP at the end of the projection period. The aggregate present value of this deficit through 2100 exceeds 20% of 2002 GDP. While the above results refer to a specific reform scenario, the overall message from alternative scenarios would remain basically unchanged due to the fundamental problems of pay-as-you-go systems facing adverse demographic developments.

A comprehensive reform, including a move towards partial funding, is found to achieve permanent financial viability of the public pension system and induce necessary employment growth. Shifting part of the pay-as-you-go contributions into a funded pillar and reducing replacement rates makes the pay-as-you-go systems fully sustainable. New pensioners offset the reductions in pay-as-you-go pensions through benefits from the funded pillar, but total replacement rates remain below those in the partial reform case until 2040. The distribution of this reform burden is a political question. In addition to leaving it on new pensioners as in the reform scenario, it could be imposed on current pensioners through lower indexation, on future generations through raising public debt, or on any combination of these groups. It should be noted, however, that also the benefits of a move to partial funding are uncertain and fiscal prudence remains indispensable. Uncertainties include, for example, demographic forecasts as well as projected asset returns.

The results carry broader economic policy implications. First, the ageing-induced burdens call for rapid measures to strengthen fiscal sustainability. An optimal set of measures would most likely not be restricted to pension reform measures and its design requires further discussion. Second, a widespread strengthening of funded pension arrangements changes the structure of risks borne by the pension system participants and requires adapting the regulatory and monitoring framework. Finally, the accumulation of large pension funds can affect the euro area's external balance as well as the operation of capital markets and the transmission of monetary policy. While these last effects are likely to occur only gradually, prudence mandates continuous monitoring of the developments.

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A. Appendix I: Alternative scenarios

Assumptions

Four alternative scenarios were modelled to assess the sensitivity of the baseline scenario results (see chapter 4) to changes in macroeconomic or policy variables. The scenarios capture the effects of changes in the retirement age, migration behaviour, productivity growth and the interest rate. In particular, relative to the baseline scenario, in:

- scenario 1 retirement age is increased by 1 year by 2010, remaining at the increased level thereafter,
- scenario 2 net migration is increased by 100% throughout the projection period,
- scenario 3 productivity growth is increased by 0.5 percentage points throughout the projection period,
- scenario 4 the real interest rate is set to 3% throughout the projection period.

The scenarios are simulated for the four largest euro area countries. In particular, scenarios 2 to 4 are modelled for Germany, France, Italy and Spain. Scenario 1 excludes Italy, because its reformed notional defined contribution system does not allow for changes in the retirement age without actuarially fair increases in the replacement ratio, depriving such a reform of its major budgetary impact. The starting year for reforms is 2000.

Scenario 1 (retirement age)

With an increase in the retirement age, pension expenditure in the three large countries will grow from a current 8.5% of GDP to 13.3% of GDP by 2050 as compared to 13.7% in the respective baseline scenario (table A1).¹⁴ Similarly, the current balance improves relative to the baseline scenario, but it remains clearly in deficit. The balance is projected to fall to a maximum deficit of 5.1% of GDP by 2050 compared with 5.4% in the baseline scenario. This deficit corresponds to a present value of 33.9% of GDP, equivalent to an annuity of 1.0%, which compares with 46.1% and 1.5%, respectively, reflecting the strong cumulation effect over the projection period. The effect of later retirement varies across countries. While in France a decrease in pension expenditure of 0.3 percentage points of GDP is observed, 0.7 percentage points are found in Spain.

Table A1 Early retirement scenario v. baseline scenario (e-3)

	baseline scenario			retirement scenario	
	2000	2050	absolute change (ppt of GDP)	2050	absolute change (ppt of GDP)
Current balance (% of GDP)	0.0	-5.4	-5.4	-5.1	-5.2
Pension expenditure (% of GDP)	8.5	13.7	5.1	13.3	4.7
Dependency ratio	24.1	49.3	6.7	49.3	6.7
Employment ratio ¹	1.6	1.5	-0.7	1.4	-0.8
Average pension / GDP per employed	17.5	15.4	-1.1	15.4	-1.1
Eligibility ratio	1.3	1.2	-0.2	1.2	-0.3
Residual			0.5		0.3

The increase in the retirement age affects the pension system through an increase in employment and a reduction in the number of pensioners. Age specific

¹⁴ This is less than McMorrow and Roeger's (2002) estimated reduction of pension expenditure of 0.8 percentage points of GDP per year of additional work. One explanation may be that the present study already takes planned increases in the effective retirement ages and reductions in pension generosity into account, making additional reforms less effective.

unemployment rates are assumed unchanged and all additional employees are assumed to contribute to the pension system. To isolate the effect of the changing contribution-pensioner ratio, average replacement ratios have been set unchanged relative to the baseline scenario. Looking at the decomposition, employment is going up and the eligibility ratio is going down, while the dependency ratio is unaffected. The effects add up to the joint reduction of expenditure by 0.4% percentage points of GDP compared to the baseline scenario. The dependency ratio, however, remains as the driving force behind the rising expenditure over time.

Scenario 2 (migration)

The doubling of net migration across all age cohorts brings the total number of immigrants to 848,000 in 2000. Due to the downward trend in Germany, which is only partially offset by the developments in Spain and Italy, projected net immigration is 766,000 in 2050. It amounts to 0.36% of the total population in 2000 and decreases to 0.31% in 2050. Over the projection period, the total number of net immigrants to the euro area adds up to approximately 16.5% of the total population in 2000. The age structure of the migrants is based on the simplistic base line projections by Eurostat.

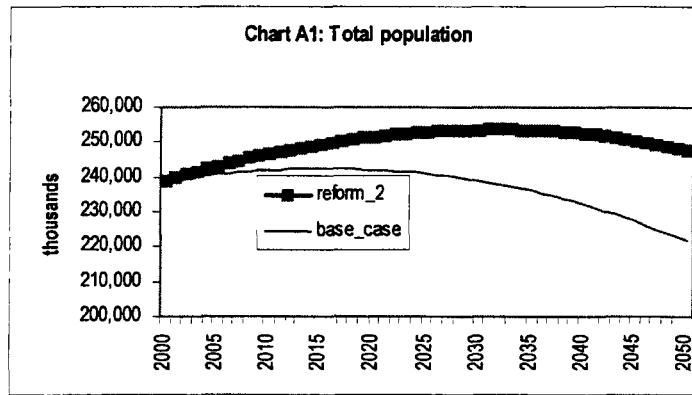
This scenario has strong beneficial effects on the pension system in the four countries as can be seen in table A2. Expenditure will rise by only 3.4% of GDP to 11.6% as compared to 12.7% of GDP in the respective baseline scenario. In line with aggregate expenditure the current balance improves to a deficit of 3.8% of GDP by 2050, the present value of which amounts to 33.2% of GDP. A negative annual annuity of 1.0% over the projection horizon is equivalent to this present value. In comparison, the respective baseline scenario results were 45.0% as the present value of the system's deficits and a 1.5% annuity.

Table A2 Migration scenario v. baseline scenario (e-4)

	baseline scenario			migration scenario	
	2000	2050	absolute change (% of GDP)	2050	absolute change (% of GDP)
Current balance (% of GDP)	0.0	-4.8	-4.8	-3.8	-3.8
Pension expenditure (% of GDP)	8.1	12.7	4.6	11.6	3.4
Dependency ratio	24.7	51.7	6.6	46.9	5.7
Employment ratio ¹	1.6	1.5	-0.9	1.5	-1.0
Average pension / GDP per employed	16.7	14.4	-1.2	14.4	-1.2
Eligibility ratio	1.2	1.2	-0.2	1.2	-0.1
Residual			0.3		0.1

The increase in migration affects pension systems through the improved age structure of the population. For ease of comparison, migrants are assumed to have the same labour market characteristics as the domestic population and average replacement rates have been assumed unchanged from the baseline scenario as in scenario 1. The dependency ratio is projected to rise by less than in the baseline scenario, namely from 24.7% to 46.9% as compared to 51.7% in the baseline scenario. The change of the dependency ratio is only 2.4 percentage points in France, while it accounts for 5 to 6 percentage points for the other countries.

As shown in chart A1 total population increases to a peak of 254 million (in 2032) instead of 242 million (in 2015) as compared with the baseline scenario, and declines less strongly to 246 million in 2050 as compared with 222 million in the baseline scenario.



Scenario 3 (productivity)

Based on a productivity growth rate, which is 0.5 percentage points higher throughout the projection period than in the baseline scenario, pension expenditure in the four countries is projected to increase by 3.7 percentage points to 11.8% of GDP by 2050 (table A3). This is 0.9 percentage points of GDP below the respective baseline scenario result. In line with this lower increase in expenditure, the balance is projected to improve over time, i.e. to develop less negatively to a deficit of 4.2% of GDP by 2050 as compared to 4.8% of GDP in the baseline scenario. Over the projection period, the pension system is expected to generate deficits with a present value of 44.0% of GDP, which is equivalent to a constant negative annuity of 1.3%. The relatively small difference compared with the baseline scenario results (45.0% and 1.5%, respectively) is explained by the change in the discount factor with higher productivity and therefore higher output growth rates. On the country level, there are again significant differences. Increased productivity causes the strongest expenditure effect in Spain with a cut of 1.4 percentage points, while in Germany this effect accounts only for a reduction of 0.4 percentage points.

Table A3 Productivity scenario v. baseline scenario (e-4)

	baseline scenario			productivity scenario	
	2000	2050	absolute change (% of GDP)	2050	absolute change (% of GDP)
Current balance (% of GDP)	0.0	-4.8	-4.8	-4.2	-4.2
Pension expenditure (% of GDP)	8.1	12.7	4.6	11.8	3.7
Dependency ratio	24.7	51.7	6.6	51.7	6.6
Employment ratio ¹	1.65	1.46	-0.9	1.46	-0.9
Average pension / GDP per employed	16.7	14.4	-1.2	13.4	-1.7
Eligibility ratio	1.20	1.17	-0.2	1.17	-0.2
Residual			0.3		0.0

The change in the productivity growth assumption affects the pension system through higher GDP growth, higher wages and social security contributions, and—depending on the indexation rules—the relative increase of existing pensions. The benefit ratio, expressed as average pension per GDP per employed, is assumed to fall more clearly from a current 16.7% to 13.4% by 2050 as compared to 14.4% in the baseline scenario, reflecting the dominance of inflation indexed pension systems in the sample countries. The remaining variables are not affected by a change in productivity.

Scenario 4 (interest rate)

A lower real interest rate of 3% throughout the projection period affects the present value of the pension system's deficit through its impact on the discount factor, but none of the other factors that were shown in the tables above. Under this scenario, the pension system is expected to generate deficits with a present value of 64.6% of GDP, compared with the baseline scenario result of 45.0% of GDP. The impact of the interest rate assumption on the annuity is smaller as it only works through the distribution of payments over time. The lower interest rate yields an annuity of 1.7% of GDP, compared with 1.5% in the baseline scenario.

B. Appendix II: Major variables

Table B1 Major variables (baseline scenario,E-9) ⁽¹⁾

	2000	2050
Population	281,736,000	266,763,000
Net migration	507,823	470,000
Old age dependency ratio	24.3	50.2
Average life expectancy men	75.1	80.1
Average life expectancy women	81.8	85.8
Fertility rate	1.4	1.6
Real GDP growth (in percent)	2.6	1.4
Productivity growth (in percent)	1.8	1.8
Real interest rate (in percent)	4.0	4.0
Inflation (in percent)	1.8	1.7
Employment ratio (in percent)	61.0	68.0
Unemployment rate (in percent)	9.9	6.2
Aggregate replacement rate (all pensions)	16.5	14.2
Average retirement age (old age pensions)	62.0	63.0

1) Variables as defined in the text.

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Summary Findings

Population ageing will impose a significant burden on European fiscal balances, in particular through pay-as-you-go pension systems. This study presents an independent estimate of this burden for the euro area and quantifies the impact of two reform scenarios. Based on widely used but optimistic assumptions, the present value of future pension deficits through 2050 is estimated at 51% of GDP, adding to the current average explicit debt stock of around 67% of GDP. In this calculation, the deficits currently incurred by many pension systems as revenues fall short of expenditures are not included. Viable parametric reforms represent no durable solution to alleviate the burden sufficiently, as they can balance pension systems at best temporarily. A comprehensive reform, including reforms of current systems and a move towards partial funding, is found to ensure permanent financial viability of the public pension system.

HUMAN DEVELOPMENT NETWORK

About this series...

The World Bank Pension Reform Primer aims to provide a timely and comprehensive resource for those engaged in the design and implementation of pension reforms around the world. Policymakers and those who advise them will find useful information on other reform experiences, the current thinking of pension specialists and a vast array of cross-country evidence. A flexible and dynamic format ensure that key developments are updated as they occur.

The World Bank set out a conceptual framework for fundamental pension reform in *Averting the Old Age Crisis: Policies to Protect the Old and Promote Growth*. This study, published in 1994, helped shape the global debate about the impact of population ageing on pension systems. The Pension Reform Primer builds on this pioneering work and on the experience of the World Bank and other international institutions in the last five years. It focuses on practical questions.

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