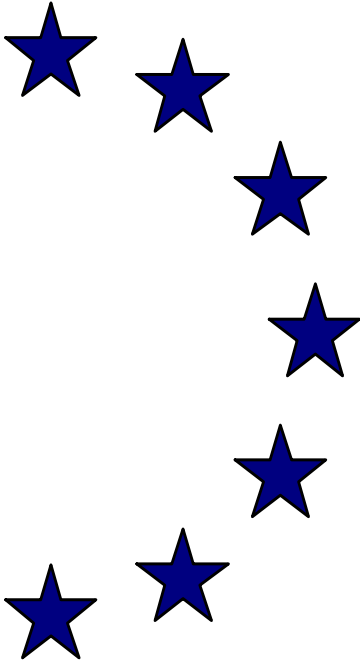


# EUROPEAN ECONOMY

EUROPEAN COMMISSION  
DIRECTORATE-GENERAL FOR ECONOMIC  
AND FINANCIAL AFFAIRS

ECONOMIC PAPERS



ISSN 1725-3187

[http://ec.europa.eu/economy\\_finance/index\\_en.htm](http://ec.europa.eu/economy_finance/index_en.htm)

N° 268

December 2006

**Public pension expenditure in the EPC and  
the European Commission projections:  
an analysis of the projection results**

by

Aino Salomäki

Directorate-General for Economic and Financial Affairs

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European Commission  
Directorate-General for Economic and Financial Affairs  
Publications  
BU1 - -1/13  
B - 1049 Brussels, Belgium

ISBN 92-79-03844-3

KC-AI-06-268-EN-C

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# Public pension expenditure in the EPC and the European Commission projections: an analysis of the projection results

Aino Salomäki \*

## ABSTRACT

This paper reviews the projections of the Economic Policy Committee and the European Commission on age-related expenditure carried out in 2005. It takes a closer look at the results of public pension expenditure projections with a view of analysing the timing of projected changes and the driving factors behind pension expenditure increases, as well as the sensitivity of the projections to certain economic and demographic assumptions. It intends to provide a more in-depth understanding on the evolution of projected public pension expenditure and thereby contributing to the debate on the assessment of the long-term sustainability of public finances.

The paper serves as a quality assessment of public pension expenditure projections, which were carried out by the experts in each Member State. It takes a careful look at the differences in results across Member States. It concludes that differences in the results can qualitatively be explained by different pension policies and systems as well as different population and labour force projections and economic assumptions. However, the contribution of different factors to the results or whether the differences in the results are fully explicable by these factors cannot be disentangled.

The analysis of the projection results suggests that the risks to the baseline projection are on the upside. Among the driving factors which have an impact on the public pension expenditure projections, the employment rate increase, the pension take-up ratio decrease and the benefit ratio decrease have all significant offsetting impact on the increase in pension expenditure. The offsetting effect is the strongest over the first two decades of the projection period. This indicates that the reliability of pension expenditure projections will crucially depend on whether the assumed positive trends in employment and pension take-up actually materialise.

The analysis of sensitivity scenarios suggests that the public pension expenditure projections are sensitive to the assumptions on life expectancy, employment and labour productivity – and hence to wages. However, the sensitivity varies considerably across countries depending on the design of pension systems as to how responsive they are to shocks. The projections are not sensitive to higher or lower interest rates as the public pensions are not funded in the vast majority of Member States.

**JEL classification:** H55, J18, J26

**Keywords:** Pension expenditure, pension projections, ageing, dependency ratio, pension take-up ratio, benefit ratio

**Acknowledgements:** This paper has greatly benefited from additional analysis and explanations on the results of Member States that were provided by the Members of the Working Group on Ageing (AWG) attached to the Economic Policy Committee as well as from the discussions at the AWG. I wish to thank Henri Bogaert, the Chairman of the AWG, and all Members of the AWG for their helpful analytical inputs and comments. I am also grateful to my colleagues Declan Costello and Antoine Deruennes for their suggestions and to Etienne Sail for excellent research assistance. The views expressed in this paper are mine and should not be attributed to the European Commission or Member States.

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## SUMMARY OF MAIN FINDINGS

*This paper analyses public pension expenditure projections at the EU15 and EU10 level with a particular focus on the timing of, and driving factors behind, the projected changes in public pension expenditure as well as the sensitivity of the projections to certain economic and demographic assumptions.*

*The full range of public pension schemes was covered in the projection exercise. This provided a reliable basis for public pension expenditure projections. The projections for each different Member State were made by experts in that State, enabling the country-specific features of pension systems to be properly taken into account. Differences in the results from one country to another can qualitatively be explained by different pension policies and pension systems as well as different population and labour force projections and economic assumptions. However, the contribution of different factors to the results or whether the differences in the results are fully explicable by these factors cannot be disentangled.*

*Overall, the analysis suggests that risks to the baseline projection are on the upside. Among the driving forces which have an impact on the public pension expenditure projections, the employment rate, the pension take-up ratio and the benefit ratio have a significant offsetting impact on the ageing-related projected increase in pension expenditure.*

*This offsetting effect is projected to be strongest over the first two decades of the projection period, so that either no or only minor increases in public pension spending relative to GDP are projected in that period. Thus, the reliability of pension expenditure projections over the whole projection period will crucially depend on whether the assumed positive trends in employment and pension take-up actually materialise. They can therefore also be considered to be risk factors: if they do not materialise, other things being equal, the projected increase in pension expenditure relative to GDP will be higher than in the current projections. This risk is the highest at the beginning of the projection period and is greater in the EU10 than EU15 countries. In the EU10 Member States, the rate of population ageing will be fastest over the next 15 years, but pension expenditure is projected to very largely resist this pressure – and is also expected to do so when the ageing process in the EU10 countries accelerates again at the end of the projection period.*

*One important finding is that benefit ratios are projected to fall over the whole projection period, both in the EU25 as a whole and in almost every country. If the benefit ratios would remain at their current levels, public pension expenditure in EU25 would increase by 2.7 percentage points of GDP by 2050 (in addition to the projected 2.2 percentage points increase). The main driving force behind falling benefit ratios (though the benefit ratio indicator also captures many other features) is the difference between the assumed wage growth rate and the growth rate of average pensions, which is kept in check by below-wage indexation. Only in Luxembourg and Slovenia are earnings-related pensions fully indexed to wage growth rates, while Denmark and the Netherlands have flat-rate pensions that are also indexed to wages. In the remaining countries, public pensions are indexed either to prices only or to hybrid indices allotting different weights to prices and wages. This results in falling benefit ratios in countries which are in transition from higher to lower indexation parameters. The analysis also*

*shows that benefit ratios are falling most strongly in countries which have recently switched to price indexation and which also have the highest projected increases in labour productivity – and hence in wages.*

*While benefit ratios are projected to fall, the analysis also shows that all countries project increases in real average pensions over the same period. This demonstrates that pension policies aim at ensuring and partially increasing the purchasing power of pensioners but not fully compensating to pensioners the increase in living standards of wage earners. When looking at the projected evolution of average pensions in the light of indexation rules, it appeared that pension indexation rules alone did not prove sufficient to explain the projected real increases in average pensions, which can also be quite significantly affected by other factors such as reforms, discretionary decisions and changes in the structure of pensions or pensioners.*

*The fall in the benefit ratio captures two types of calculation assumptions: an assumption regarding the labour productivity growth rate, which was used in calculating the evolution of wages, while the evolution of average pensions is determined by the indexation policies and pension reforms. Both the assumption on wage developments and the rules applied to pension developments must therefore be taken into account when the results showing increasing expenditure and falling benefit ratios are interpreted. If the assumption of the labour productivity growth rate – and hence of wage increases – is too optimistic, the projected increase in pension expenditure relative to GDP will necessarily be underestimated and the fall in the benefit ratio overestimated, giving an overly negative view of the adequacy of public pensions.*

*In addition to the driving forces of the baseline pension projection, the analysis considers a number of sensitivity scenarios. These suggest that the public pension projections are sensitive to the assumptions on life expectancy, employment and labour productivity – and hence to wage developments. But, public pension expenditure is not sensitive to higher or lower interest rates as public pensions are not funded in the vast majority of countries.*

*The size of the assumed shocks modelled in the sensitivity scenarios is not easily comparable and caution should be exercised when interpreting whether the results are more sensitive to one factor than another. However, one way of comparing the introduced shocks in the higher life expectancy and higher employment rate scenarios is to compare the change in the economic dependency ratio that they cause. It appears that the increase of the number of pensioners in higher life expectancy scenario increases the economic dependency ratio (inactive persons relative to the employed) by around 5% while the increase in the number of employed persons in higher employment rate scenarios (one percentage point increase in the overall employment rate or 5 percentage point increase in the employment rate of older workers) decreases the economic dependency ratio by around 1.5%.*

*By and large, the projections suggest that a one-year increase in life expectancy increases public pension expenditure by 0.5 percentage point of GDP by 2050 in countries with defined-benefit or flat-rate schemes and about by half that in countries with defined-contribution schemes or other life expectancy adjustments. Higher labour productivity helps contain the pressure on public pension expenditure, while also allowing real average pensions to increase faster than in the baseline scenario, but at the same time reduces the benefit ratio.*



*Sensitivity tests of higher employment rates give somewhat lower bounds for the impact on pension expenditure in terms of percentage of GDP in the long run. This is due to the fact that higher employment rates lead immediately also to higher GDP and enable workers to accumulate further pension rights, thus improving the adequacy of pensions. The impact is also dependant on the design of the pension scheme: in defined-contribution schemes, the impact can even be an increase in pension expenditure while larger decreases in pension expenditure are seen in defined-benefit schemes, in particular if the take-up of non-actuarial early pensions can be reduced. On the average in the EU25, one percentage point increase in employment would decrease public pension spending by 0.1 percentage point of GDP. This magnitude of sensitivity is also borne out by the analysis of the driving factors for the baseline projection, which shows that, by and large, a 10-percentage-point increase in employment would reduce the increase in public pension expenditure by 1-2 percentage points by 2050.*

*The country graphs in the Annex shed additional light on the differences between countries by analysing how different driving forces matter for the public pension expenditure projections of individual countries.*

*The analysis was carried out mainly at the EU15 and EU10 level, though it also focused on countries which were outliers or which showed exceptional developments over time. However, it turned out to be difficult to draw firm conclusions on why a country appears exceptional in one respect or another despite the fact that the projections of each Member State were discussed in a peer review and country fiches tried to explain county-specific features of pension systems and projections. Looking ahead at the next projections, it would warrant devote more effort to make the projections more transparent and use more time for peer reviews. In particular, improved transparency regarding the modelling of the impact of reforms or given assumptions, which often require expert judgement, would result in a better understanding of the results.*

## 1. INTRODUCTION

This note takes a close look at the results of pension expenditure projections. Its primary purpose is to analyse the timing of projected changes and the driving factors behind pension expenditure increases, as well as the sensitivity of the projections to various assumptions. It is a response to the Economic Policy Committee's request that the results of pension expenditure projections be analysed in greater depth, while also contributing to the debate on the assessment of the long-term sustainability of public finances as a whole<sup>1</sup>.

The note analyses only public pension expenditure projections, which are at the core of the assessment of the long-term sustainability of public finances. It mainly treats the EU15 and EU10 en bloc, though it also focuses on countries which either are of particular relevance to the trend or represent a deviation from the trend.

As the pension expenditure projections were conducted by the experts of Member States, the data provided to the Commission services did not always include sufficient information to explain the country-specific features in the projections. Therefore, the members of the Ageing Working Group were invited to provide further explanations and analysis on the results of their countries. This note benefits heavily from these explanations and additional analyses.

The note is structured as follows: Section 2 takes an overall look at the public pension expenditure projections and the timing of the projected changes. Section 3 analyses the effect of driving factors on the changes in projected pensions and their timing by splitting the projection period up into shorter time periods with the aim of disentangling the relative influence of the driving factors over time. Section 4 looks at the sensitivity of the projections to various assumptions used in the projection exercise. The Annex shows the timing of the effect of driving factors by country and the decomposition of the pension take-up ratio by age group in each country.

## 2. PUBLIC PENSION EXPENDITURE

### 2.1. Results of the baseline projection of public pension expenditure

#### *Gross public pension expenditure*

Table 2-1 presents the projections for public pension spending before taxes and social security contributions paid out to the beneficiaries, as a percentage of GDP<sup>2</sup>. In this baseline

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<sup>1</sup> This paper primarily complements the analysis of the age-related expenditure projections presented in the following publication: The Economic Policy Committee and the European Commission (2006), "The impact of ageing on public expenditure: projections for the EU-25 Member States on pensions, health care, long-term care, education and unemployment transfers (2004-2050)", European Economy, Special Reports No 1/2006.

<sup>2</sup> Gross social security and other public pensions correspond conceptually to the coverage of the 2001 projections of public pension expenditure

projection no policy change is assumed; in other words, pensions are projected to evolve in accordance with the current pension legislation, including the reforms legislated before the mid of 2005. At the starting point in 2004, public pension spending accounted for an average of about 10.6% of GDP in the EU Member States, though with a wide variation from the lowest – 4.7% in Ireland – to the highest – 14.2% in Italy. The low levels of public spending on pensions in Ireland and the United Kingdom stem from the fact that the public pension schemes primarily provide flat-rate pensions, with occupational pensions playing an important role in total pension provision. In contrast, the high level of public spending in terms of GDP percentages in countries such as France, Austria, Poland and Italy reflects the fact that pension provision relies mainly on social security schemes and that the principal scheme is earnings-related.

Public pension spending is clearly below the EU average in a number of EU10 Member States such as Cyprus and Malta as well as Estonia, Latvia, Lithuania, and Slovakia. In the latter group of countries, this can be attributed partially to the fact that the current pensions are relatively flat-rate as most of pensioners acquired their pension rights before the collapse of the communist regime in societies which had relatively small wage differences, and in some cases to the fact that the levels of pensions are based only on length of service. It is also partially due to the fact that, in recent years, the economy has grown rapidly, thereby reducing spending as a percentage of GDP from the figures seen, for example, in 2000.

**Table 2-1 Gross public pension expenditure as a share of GDP between 2004 and 2050**

Public pensions, gross as % of GDP									Change	Change	Change
Country	2004	2010	2015	2020	2025	2030	2040	2050	2004-2030	2030-2050	2004-2050
BE	10,4	10,4	11,0	12,1	13,4	14,7	15,7	15,5	4,3	0,8	5,1
CZ	8,5	8,2	8,2	8,4	8,9	9,6	12,2	14,0	1,1	4,5	5,6
DK	9,5	10,1	10,8	11,3	12,0	12,8	13,5	12,8	3,3	0,0	3,3
DE	11,4	10,5	10,5	11,0	11,6	12,3	12,8	13,1	0,9	0,8	1,7
EE	6,7	6,8	6,0	5,4	5,1	4,7	4,4	4,2	-1,9	-0,5	-2,5
GR											
ES	8,6	8,9	8,8	9,3	10,4	11,8	15,2	15,7	3,3	3,9	7,1
FR	12,8	12,9	13,2	13,7	14,0	14,3	15,0	14,8	1,5	0,5	2,0
IE	4,7	5,2	5,9	6,5	7,2	7,9	9,3	11,1	3,1	3,2	6,4
IT	14,2	14,0	13,8	14,0	14,4	15,0	15,9	14,7	0,8	-0,4	0,4
CY	6,9	8,0	8,8	9,9	10,8	12,2	15,0	19,8	5,3	7,6	12,9
LV	6,8	4,9	4,6	4,9	5,3	5,6	5,9	5,6	-1,2	-0,1	-1,2
LT	6,7	6,6	6,6	7,0	7,6	7,9	8,2	8,6	1,2	0,7	1,8
LU	10,0	9,8	10,9	11,9	13,7	15,0	17,0	17,4	5,0	2,4	7,4
HU	10,4	11,1	11,6	12,5	13,0	13,5	16,0	17,1	3,1	3,7	6,7
MT	7,4	8,8	9,8	10,2	10,0	9,1	7,9	7,0	1,7	-2,1	-0,4
NL	7,7	7,6	8,3	9,0	9,7	10,7	11,7	11,2	2,9	0,6	3,5
AT	13,4	12,8	12,7	12,8	13,5	14,0	13,4	12,2	0,6	-1,7	-1,2
PL	13,9	11,3	9,8	9,7	9,5	9,2	8,6	8,0	-4,7	-1,2	-5,9
PT	11,1	11,9	12,6	14,1	15,0	16,0	18,8	20,8	4,9	4,8	9,7
SI	11,0	11,1	11,6	12,3	13,3	14,4	16,8	18,3	3,4	3,9	7,3
SK	7,2	6,7	6,6	7,0	7,3	7,7	8,2	9,0	0,5	1,3	1,8
FI	10,7	11,2	12,0	12,9	13,5	14,0	13,8	13,7	3,3	-0,3	3,1
SE	10,6	10,1	10,3	10,4	10,7	11,1	11,6	11,2	0,4	0,2	0,6
UK	6,6	6,6	6,7	6,9	7,3	7,9	8,4	8,6	1,3	0,7	2,0
EU15 <sup>1)</sup>	10,6	10,4	10,5	10,8	11,4	12,1	12,9	12,9	1,5	0,8	2,3
EU10	10,9	9,8	9,2	9,5	9,7	9,8	10,6	11,1	-1,0	1,3	0,3
EU12 <sup>1)</sup>	11,5	11,3	11,4	11,8	12,5	13,2	14,2	14,1	1,6	0,9	2,6
EU25 <sup>1)</sup>	10,6	10,3	10,4	10,7	11,3	11,9	12,8	12,8	1,3	0,8	2,2

1) excluding Greece

The main results of the 2005 projections are as follows:

- The projections show very different increases in public pension spending over the period between 2004 and 2050, ranging from a decrease of 5.9 percentage points of GDP in Poland to an increase of 9.7 p.p. of GDP in Portugal and 12.9 p.p. of GDP in Cyprus.
- In the EU15 Member States, public pension spending is projected to rise by 2.3 p.p. of GDP on average and to rise in all countries except in Austria. In Austria, the spending peaks around 2035 but decreases thereafter. In Italy and Sweden, where the pension schemes are notional defined-contribution, the projected increases over the entire period 2004-2050 are very small. However, pension spending will peak in 2040 for Italy with an increase of about 2 percentage points and in Sweden the increase between 2010 and 2040 is projected to be about 1.5 percentage points of GDP.
- Relatively moderate increases (between 1.7 and 3.5 percentage points) in public pension expenditure are projected in many of the EU15 Member States such as Germany, the United Kingdom, France, Finland, Denmark and the Netherlands. Somewhat larger increases are projected in Belgium (5.1 p.p.) and Ireland (6.4 p.p.). In Ireland, the increase will largely be due to the maturing of the social security pension system.
- The largest rises in pension expenditure in the EU are faced by Portugal (an increase of 9.7 p.p. of GDP), Luxembourg (7.4 p.p.) and Spain (7.1 p.p.).
- In the EU10 Member States, public pension expenditure is projected to fall by 1 p.p. of GDP by 2030 on average but then to rise by 1.3 p.p. by 2050, with an overall increase of 0.3 p.p. between 2004 and 2050. However, the developments show very diverse trends in different countries: from a fall of 5.9 p.p. of GDP in Poland to an increase of 6.7 p.p. in Hungary, 7.3 p.p. of GDP in Slovenia and 12.9 p.p. in Cyprus. If Poland is excluded from this group, the projected increase in public pension spending is 4.9 p.p. of GDP in the remaining nine new Member States.
- The projected decreases in Poland, Estonia and Latvia, as well as the projected small increases in Lithuania and Slovakia, stem partly from the pension reforms enacted during the last decade. These countries have switched part of the public old-age pension scheme into private funded schemes, so that public provision will decrease while the private part, which remains mandatory, will increase. Furthermore, the GDP growth rate is projected to be relatively high, in particular during the next two decades, and to be higher than the increase in the level of pensions, as pensions are either only indexed to prices or only partially indexed to wages.
- In Malta, the projected decrease in pension spending after 2020 stems from the current parameters of the pension scheme, notably the fact that the maximum pension is indexed to prices, which will lead to relatively flat-rate pensions over time and to a situation where virtually all pensions will develop only in line with prices.
- The challenges faced by Cyprus, Slovenia, Hungary and the Czech Republic are among the biggest in the EU.

### ***Overall assessment of the coverage of public pension schemes***

The coverage of public pension schemes was carefully examined during the projection exercise. 'Public pensions' are here intended to include all social security pensions and also those public pensions which do not constitute a specific scheme but are paid directly from government budgets, such as public sector employees' pensions. The pensions cover old-age, early, disability and survivors' pensions, whether earnings-related, flat-rate or means-tested. Public pensions of this study are also intended to cover benefits which can be considered equivalent to pensions, namely social assistance when provided as a minimum pension and unemployment or disability benefits when provided on long-term basis.

The reports by Member States show that very considerable effort has been made to guarantee a very broad and comparable coverage of public pensions. Only minor schemes have been reported as not covered by the following countries:

- Means-tested minimum benefits from social assistance (when equivalent to a minimum pension) to elderly people in Germany and Luxembourg, and means-tested minimum pensions in Cyprus, Austria and Poland. In addition, some supplementary benefits paid to those on minimum or low pensions are not covered in the projections of Cyprus and Hungary. In general, these benefits do not exceed 0.5% of GDP.
- Farmers' and miners' pensions (0.8% of GDP) are not covered by Germany. Small anticipatory pensions are not covered by France.
- Disability pensions are not covered by the United Kingdom. The new French disability scheme, established in 2004 and covered by health insurance, is not covered in the projections for France.

Overall, the coverage of public pensions in the projections can be considered to be very good.

In addition, the projections broke pensions down into strictly age-related pensions, i.e. old-age and early pensions, on one hand, and other pensions, i.e. disability and survivors' pensions, on the other. The reason for separating them on the basis of the beneficiary's age rather than the name of the pension was both to improve cross-country comparability of age-related pension expenditure and to make coverage more transparent, as categorisation varies from one country to another. Some countries for instance consider disability pensions (benefits) as part of their sickness insurance scheme while in others they fall under the pension scheme; and in some countries, the pension retains the same classification from the time when it is first granted until payment ends, while in most countries, an early or disability pension is transformed into an old-age pension when the beneficiary reaches the standard old-age retirement age.

However, it turned out that it is not so easy to bridge the gap between national practices and the sought-after EU-wide common definition. The quality of coverage of the two separate categories of public pensions, namely (i) old-age and early pensions and (ii) other pensions, is clearly poorer than the coverage of all public pensions taken together. In particular, Germany, France, Cyprus and Slovenia did not provide a breakdown of public pensions, while in Malta, the breakdown overestimates the role of 'other pensions' by categorising all specific pension schemes as such when, in fact, they are equivalent to old-age pension schemes.

Therefore, total public pensions is a more reliable variable than strictly age-related pensions in the public pension expenditure projections. The analysis that follows is consequently based on total public pensions.

## **2.2. Timing of the overall increases in public pension expenditure**

The projected increase in public pension expenditure shows very different patterns for different Member States. Graph 2-1 groups the countries according to the projected increase in public pension expenditure.

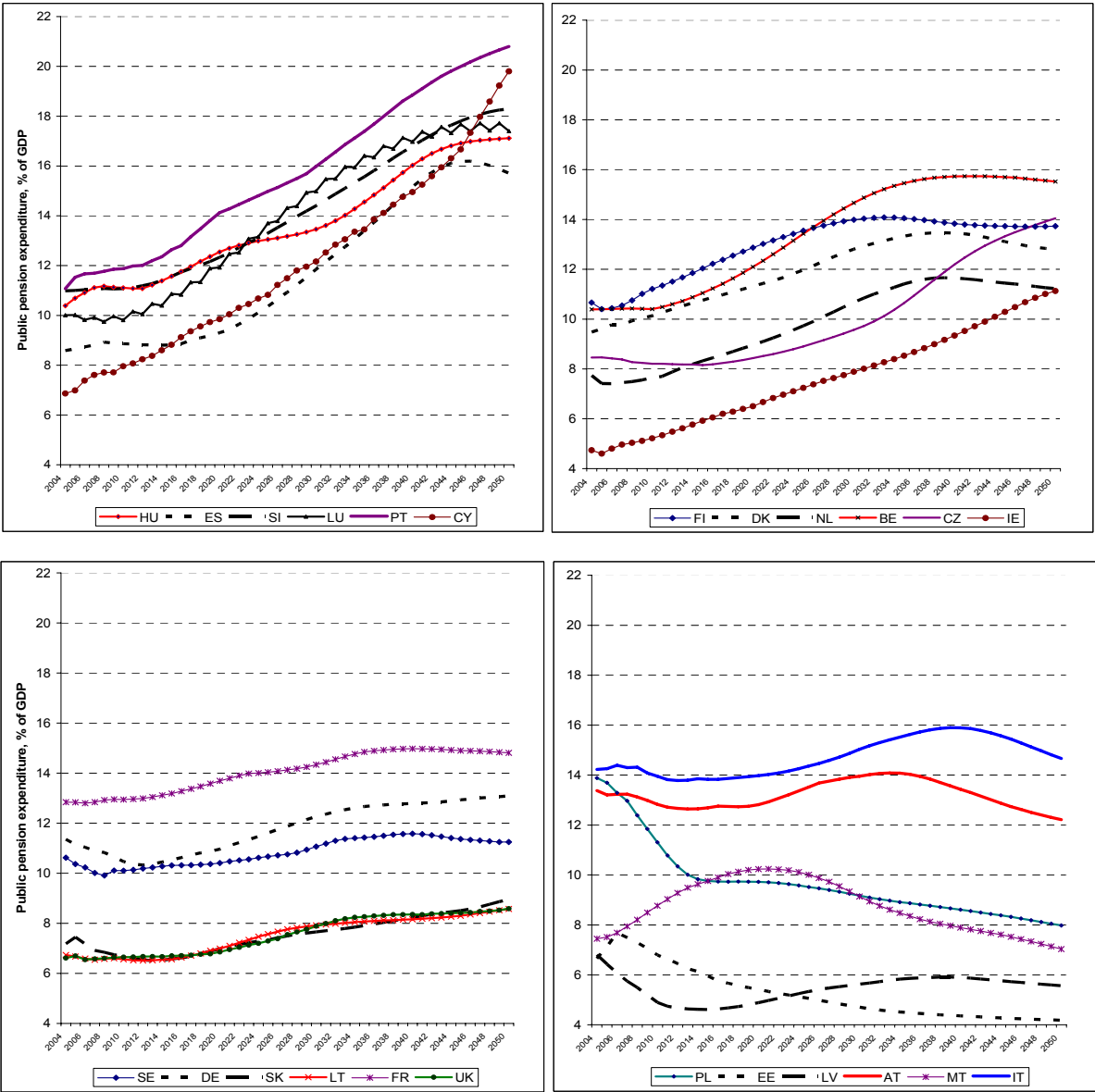
The first picture shows relatively similar patterns for countries with the fastest increase (between 6.7 and 12.9 percentage points of GDP) in public pension expenditure. In particular, in Portugal, Slovenia, Hungary and Luxembourg, both the starting level of pension spending and the pace of the increase are quite close to each other, while Cyprus and Spain start from a somewhat lower level and show a different rate of increase at the end of the projection period. The pension spending at the end of the projection period is at a high level in all these countries, between 16 and 21% of GDP.

In the second group of countries (BE, DK, FI, IE, NL and CZ) the projected increase in public pension expenditure is between 3 and 6.4 percentage points of GDP, while the starting level of pension expenditure varies significantly, between 4.7 and 10.7% of GDP. In 2050, the diversity in pension spending is projected to be somewhat smaller, between 11 and 15% of GDP.

In the third group of countries (DE, FR, UK, LT, SK and SE), the projected increase is relatively continuous but small, at 2 percentage points or slightly less, and in Sweden only 0.6 p.p. However, the starting levels of pension spending vary quite significantly, between 7 and 13% of GDP. This group is also relatively heterogeneous in terms of both how their pension systems are structured and the likely explanations for a projected increase in pension spending.

In the fourth group of countries (PL, EE, LV, AT, MT and IT), the projected increase between 2004 and 2050 in public pension expenditure is negative, with the exception of Italy where it is virtually the same at the end as at the start of the projection period (but with a clear increase to the peak). However, the level of pension spending itself (at both the start and the end of the period) in these countries is very different: three of them (IT, AT, PL) are at about 14% of GDP and the other three (EE, LV and MT) at about 7% of GDP. The shape of the projected increase also varies considerably: three countries (IT, AT and MT) project a peak in pension spending before the end of the projection period while the three others (PL, EE and LV) project a very sharp decrease at the beginning of the period.

**Graph 2-1 Projected public pension spending as % of GDP, 2004-2050**



**2.3. Peaks in public pension expenditure**

The pressure for increased public pension spending over the projection period may vary for different reasons, notably due to the timing of the retirement of the baby-boom generation. Many Member States see their peak in public pension spending before the end year of the projections, for instance BE, DK, FR, IT, NL and SE around 2040 and FI and AT already around 2030. On the other hand, many countries project a fall in public pension spending as a percentage of GDP at the beginning of the projection period, for instance DE, IT, AT and SE. Thus, for most countries, the projected increase in public pension spending from the trough year to the peak year is more than the projected increase between 2004 and 2050. Moreover, in many EU10 countries, public pension spending drops significantly at the beginning of the projection period due to the switch to private funded schemes.

In the EU15, the increase between 2011, the trough year, and 2041, the peak year, is projected to be 2.7 percentage points of GDP, 0.4 percentage points more than the increase between 2004 and 2050. In the EU10, the trough year will be 2014 and the increase from 2014 to 2050 is projected to be 1.9 percentage points, as opposed to only 0.3 percentage points between 2004 and 2050.

For some countries, the projected fall at the beginning and the peak before the end of the projection period will create a hump-shaped trend over the projection period. This corresponds only partially to demographic pressures. The old-age dependency ratios will start increasing in all countries already from the beginning of the projection period and continue to increase up to end of the period (with the exceptions of Finland, which reaches the peak in the old-age dependency ratio in 2036, and Denmark, Sweden and the Netherlands, which reach the peak around 2040), but the pension expenditure projections deviate from these demographic changes due to the impacts of pension reforms. Increasing employment rates will mainly affect the first part of the projection period. Consequently, pension spending increases by less than implied by the demographic changes in that period, and notably over the first five to ten years. Similarly, the projected fall in pension spending after the peak year can be explained by the projected fall in the benefit ratio. However, many countries project that the current level of public pension spending can be more or less maintained over the next 10 – and even 20 – years. For IT, AT and SE, public pension expenditure is projected to be at the same level in 2024 as in 2004.

The projected fall in the benefit ratio is most striking in Malta, where pension spending is projected to peak in 2021 and then fall. This is due to the current indexation rule of pensions, whereby the pension cap will be indexed to prices only, so that most pensions will approach the cap level, and then become flat-rate, with no increase in average real pensions.



**Table 2-2 Peaks and troughs in public pension expenditure as a share of GDP**

Country	Start year	Trough year (before peak)	Trough value	Decrease from 2004 to through	Staying at/ reaching the level of 2004	Peak year (the first if several)	Peak value	Increase from trough to peak	End year	Change 2004-2050
	2004								2050	
BE	10,4				2010	2038	15,7	5,3	15,5	5,1
CZ	8,5	2015	8,2	-0,3	2021	2050	14,0	5,8	14,0	5,6
DK	9,5					2038	13,5	4,0	12,8	3,3
DE	11,4	2012	10,3	-1,0	2014	2049	13,1	2,8	13,1	1,7
EE	6,7					2006	7,7	1,0	4,2	-2,5
GR										
ES	8,6	2005				2045	16,2	7,6	15,7	7,1
FR	12,8				2007	2038	15,0	2,2	14,8	2,0
IE	4,7	2005	4,6	-0,1	2005	2050	11,1	6,5	11,1	6,4
IT	14,2	2012	13,8	-0,4	2023	2038	15,9	2,1	14,7	0,4
CY	6,9					2050	19,8	12,9	19,8	12,9
LV	6,8	2015	4,6	-2,2		2035	5,9	1,3	5,6	-1,2
LT	6,7	2012	6,5	-0,2	2017	2050	8,6	2,1	8,6	1,8
LU	10,0	2008	9,7	-0,3	2010	2045	17,7	8,0	17,4	7,4
HU	10,4					2050	17,1	6,7	17,1	6,7
MT	7,4					2019	10,2	2,8	7,0	-0,4
NL	7,7	2006	7,4	-0,3	2011	2038	11,7	4,3	11,2	3,5
AT	13,4	2013	12,6	-0,8	2024	2032	14,1	1,5	12,2	-1,2
PL	13,9					2004	13,9		8,0	-5,9
PT	11,1					2050	20,8	9,7	20,8	9,7
SI	11,0				2007	2050	18,3	7,3	18,3	7,3
SK	7,2	2013	6,5	-0,7	2023	2050	9,0	2,5	9,0	1,8
FI	10,7	2005	10,4	-0,3	2008	2032	14,1	3,7	13,7	3,1
SE	10,6	2008	9,9	-0,7	2024	2040	11,6	1,7	11,2	0,6
UK	6,6	2006	6,5	-0,1	2010	2050	8,6	2,1	8,6	2,0
EU15	10,6	2011	10,3	-0,3	2017	2041	13,0	2,7	12,9	2,3
EU10	10,9	2014	9,2	-1,7	2044	2050	11,1	1,9	11,1	0,3
EU12	11,5	2011	11,2	-0,3	2017	2043	14,2	3,0	14,0	2,5
EU25	10,6	2012	10,3	-0,3	2018	2040	12,8	2,5	12,8	2,2

### 3. DRIVING FACTORS AND THEIR IMPACT ON PROJECTED PUBLIC PENSION EXPENDITURE

#### 3.1. Factors driving the change in public pension expenditure

The factors driving the increases in pension spending can be further analysed by decomposing the results of the projections into four main explanatory factors, namely:

- *A dependency effect (or a population ageing effect)*, which measures the changes in the dependency ratio over the projection period as the ratio of persons aged 65 and over to the population aged 15 to 64;
- *an employment effect*, which measures changes in the share of the population of working age (15 to 64) relative to the number of the employed, i.e. an inverse employment rate;
- *a pension take-up effect<sup>3</sup>*, which measures changes in the share of pensioners relative to the population aged 65 and over. In effect, it measures the take-up of pensions relative to the number of old people. For some countries (DE, ES, LV, LT, AT), the reported number of pensioners represents the number of pensions rather than the

<sup>3</sup> This effect is also known as ‘eligibility effect’ in the literature.

number of pensioners. However, this bias should not affect the evolution in the take-up ratio over time;

- a *benefit effect*, which captures changes in the average pension relative to output per employed person. Average pension and output per worker, approximating the average wage, are measured each year of the projection exercise for the total population of pensioners and employees. Thus, the benefit ratio captures several features at the same time. First, it reflects the assumed increases in average pensions due to the indexation rules, the maturation of the pension system and longer contribution periods. Second, it reflects also the changes in average wages driven by the assumptions of labour productivity growth rates. Third, it also captures the changes in the structure of the respective population groups as these groups measure the projected groups of pensioners and wage earners each year of the projection exercise. In particular, it should be noted that the benefit ratio does not measure the level of the pension for any individual relative to his/her own wage and, hence, is not equivalent to a replacement rate indicator<sup>4</sup>.

The following equation is used:

$$\frac{PensExp}{GDP} = \frac{Pop65+}{Pop(15-64)} \times \frac{Pop(15-64)}{EmplNo} \times \frac{PensNo}{Pop65+} \times \frac{PensExp/PensNo}{GDP/EmplNo} .$$

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<sup>4</sup> Table 2-2 of the Annex in the main report (European Economy, Special Report 2006:1) presents the gross and net replacement ratios of pensions calculated for a hypothetical individual with a full career of 40 years on average earnings.

**Table 3-1 The contribution of the decomposed factors to the change (in % between 2005 and 2050) in all public pensions**

	Public pensions, gross		Due to growth in:				Interaction effect (residual)
	start level, as % of GDP in 2005 <sup>2)</sup>	% change 2005-50 <sup>2)</sup>	Dependency ratio	Employment rate	Take-up ratio	Benefit ratio	
			<u>Pop(65+)</u> Pop(15-64)	<u>Employed</u> Pop(15-64)	<u>Pensioners</u> Pop65+	<u>Average pension</u> GDP per worker	
BE	10,4	49,7	61,6	-8,2	-2,4	-8,1	6,9
DK	9,6	33,3	65,1	-3,7	-24,1	-4,6	0,6
DE	11,1	17,4	65,8	-10,3	-5,6	-29,6	-2,8
GR							
ES	8,7	81,4	105,0	-19,7	-17,5	-1,3	14,9
FR	12,8	15,4	63,6	-7,0	-12,9	-25,7	-2,7
IE	4,6	141,9	107,0	-9,9	-20,7	19,5	46,0
IT	14,3	2,8	78,5	-13,8	-21,4	-35,3	-5,1
LU	10,0	73,7	56,3	-31,1	16,2	16,8	15,6
NL	7,4	51,4	71,9	-2,1	-19,3	-4,3	5,1
AT	13,2	-7,5	84,5	-10,1	-43,3	-32,3	-6,4
PT	11,5	80,3	88,5	-0,9	-3,9	-20,1	16,6
FI	10,4	32,0	72,9	-7,7	-25,2	-6,0	-1,9
SE	10,4	8,5	45,6	-6,2	-2,0	-26,7	-2,2
UK	6,7	28,3	64,2	-1,8			
CY	7,0	183,5	94,4	-16,2	12,4	19,8	73,0
CZ	8,5	65,9	109,3	-3,6	-36,8	-9,1	6,1
EE	7,1	-41,4	60,3	-7,7	-26,8	-73,1	5,8
HU	10,7	60,1	79,4	-10,3	-33,4	16,3	8,1
LT	6,7	28,5	72,1	-16,0	-27,3	0,1	-0,4
LV	6,4	-13,4	62,7	-11,1	-20,6	-40,7	-3,7
MT	7,5	-6,4	80,8	-13,6	-10,5	-53,6	-9,5
PL <sup>3)</sup>	13,7	-41,7	108,3	-26,7	-54,5	-68,0	-0,8
SK	7,4	20,3	122,0	-19,0	-34,0	-40,6	-8,2
SI	11,0	66,2	99,7	-8,5	-26,8	-7,5	9,3
EU15 <sup>1)</sup>	10,5	22,1	72,1	-9,2	-15,2	-24,7	-1,5
EU10	10,9	2,6	100,0	-16,9	-43,6	-29,1	-7,7
EU12 <sup>1)</sup>	11,5	23,2	74,8	-10,8	-13,8	-23,1	-4,9
EU25 <sup>1)</sup>	10,6	20,9	76,1	-10,7	-20,2	-22,7	-1,9

1) excluding countries which have not provided information

2) The base year of the decomposition calculations is 2005 (instead of 2004 which was the base year of the projections) because the changes have been measured as the sum of changes over 5-year periods.

3) In the Polish projections, the number of pensioners has been corrected since the first publication of the results, resulting in a greater take-up ratio effect and smaller benefit ratio effect.

Table 3-1 shows an overview of the impact of the decomposed factors in terms of percent changes in public pension expenditure between 2005 and 2050. The relative increase in pension expenditure is a more useful basis to analyse the sensitivity of pension expenditure to different driving factors than the increases in percentage points of GDP. The findings can be summarised as follows:

- In almost all countries, the **old-age dependency ratio** weighs on the increase in pension spending by far more than the projected total increase of pensions, while the other factors offset part of the increase coming from the ageing of the population. The strongest offsetting effect comes from the decline in the benefit ratio in the EU15 and from the decline in the take-up ratio in the EU10 Member States.
- On average, if there were no offsetting factors, demographic pressure alone would push public pension spending upwards by over 70 per cent in real terms in the EU15 and by 100 per cent in the EU10. Public pension expenditure would double from the current level in Spain, Ireland, the Czech Republic, Poland and Slovakia<sup>5</sup>.
- The offsetting factors, however, are projected to have a very large impact on the increase. In the EU15, they are expected to offset 70% of the pressure caused by demographic development, resulting in a real increase in public pensions of only 22%. In the EU10, almost all of the demographic pressure is projected to be offset by increasing employment rates, lower take-up of pensions and lower benefit ratios.
- Cyprus is the only country where the take-up ratio is projected to increase spending. This seems to be in contrast with labour force and employment projections, which assume a significant increase in the employment rate of older workers due to the cohort effect. However, in the pension expenditure projections this employment increase does not translate into a reduced pension take-up rate. Instead, the pension take-up behaviour is in line with the fact that no pension reforms have been enacted in recent years. . The benefit ratio is projected to increase in Cyprus, Ireland and Hungary. The offsetting impact of the take-up and benefit ratios of pensions is projected to be small in Belgium.
- The magnitude of the effect of increasing employment rates varies substantially across countries, depending on the current level of employment rates and the estimated effect of the recently undertaken labour market and pension reforms as well as the estimated cohort effect on employment. Countries with current low rates of employment such as Spain, Italy, Cyprus, Lithuania, Poland and Slovakia are projected to have the largest offsetting effect from increasing employment.

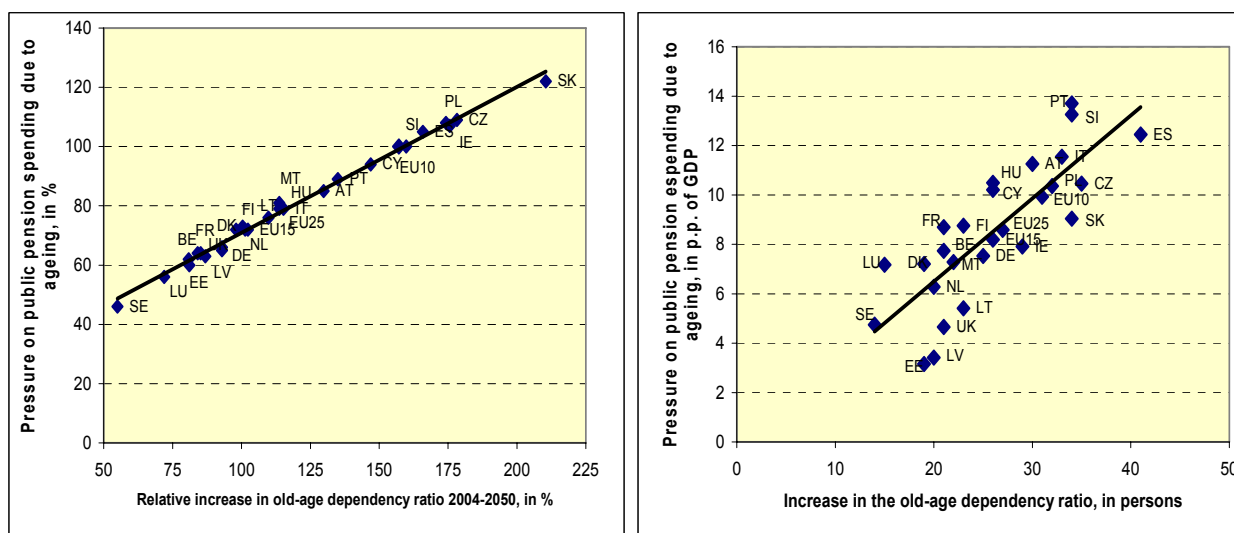
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<sup>5</sup> In Luxembourg, the pressure on public pension spending coming from changes in the dependency ratio, employment rate and eligibility rate should be considered together because a considerable part of the labour supply is provided by cross-border workers, making the trends of the employed persons and the resident population inconsistent with each other. Thus, the population components alone do not correctly reflect the driving forces of pension expenditure developments, while the three components together reflect the evolution of the number of persons accruing pension rights in the system.

## Dependency effect

While the old-age dependency ratio is a mere demographic indicator, its impact as a driving force on pension expenditure is self-evident and there is a very clear correlation between these two indicators. When compared with the point of departure in 2004, the pace of the ageing of the population will be the slowest in Sweden and Luxembourg and the fastest in Slovakia, the Czech Republic, Poland and Ireland. Here it is therefore the percent increases in the old-age dependency ratios that are measured, not the levels of the dependency ratios (the first picture of Graph 3-1). In general, the EU10 countries will experience a sharper ageing of the population and a greater pressure on public pension spending due to ageing than the EU15 countries, while the latter start from a higher level of old-age dependency ratios and pension spending in 2004. In the EU15, the old-age dependency ratio will double, which is estimated to lead to an increase of about 70% in public pension spending, while in the EU10, a 160% increase in the old-age dependency ratio is estimated to double pension spending.

**Graph 3-1 Increase in public pension expenditure (p.p. of GDP between 2004 and 2050) driven by the dependency ratio relative to the increase in the old-age dependency ratio**



## Employment effect

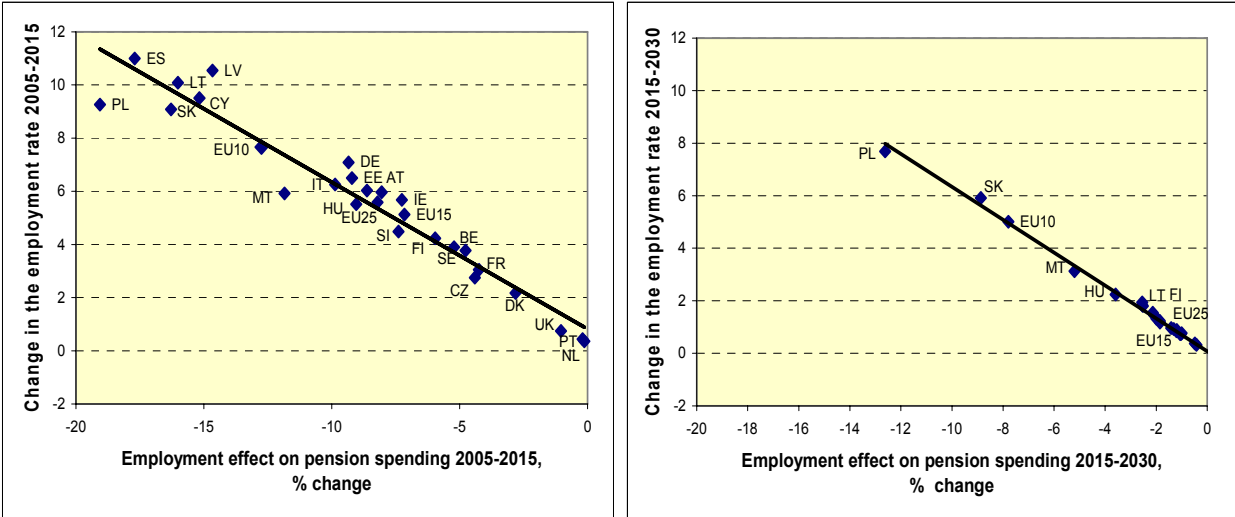
**Employment rates** are projected to increase in all countries, although to varying degrees. In general, larger increases in employment rates are projected for countries with currently low employment rates and high unemployment rates. Particularly large increases in employment are projected for Poland (+14 p.p. by 2050) and increases of over 10 p.p. also for Spain, Slovakia, Lithuania and Cyprus.

Employment rate increases are fastest at the beginning of the projection period. In the EU15 and most of the EU10 countries, over two thirds of the employment rate increase is projected

to occur by 2015, while in Hungary it is projected to last until 2020 and in Poland and Slovakia until 2025. Thus, the offsetting impact of the increased employment rates on public pension expenditure will mainly occur before 2015. Graph 3-2 below shows the interdependence between these variables. Overall, a six percentage point increase in the employment rate is projected to result in a reduction of 10% in public pension expenditure (corresponding to one percentage point of GDP). This relationship is quite common as can be seen from the graphs below.

Over the period 2015-2030, employment increases have only a minor offsetting impact on public pension expenditure, except in Poland and Slovakia. In Poland, the employment rate is projected to increase further by almost 8 percentage points, offsetting 13% of pension expenditure (over 1 percentage point relative to GDP), while in Slovakia a 6 percentage point increase in employment will offset 9% of pension expenditure (a good 0.5 percentage point relative to GDP). After 2030, employment rates will decrease in the EU10 and will consequently have an increasing impact on public pension expenditure.

**Graph 3-2 Employment effect on the decrease in public pension spending during the periods 2005-2015 and 2015-2030**



**Take-up ratio effect**

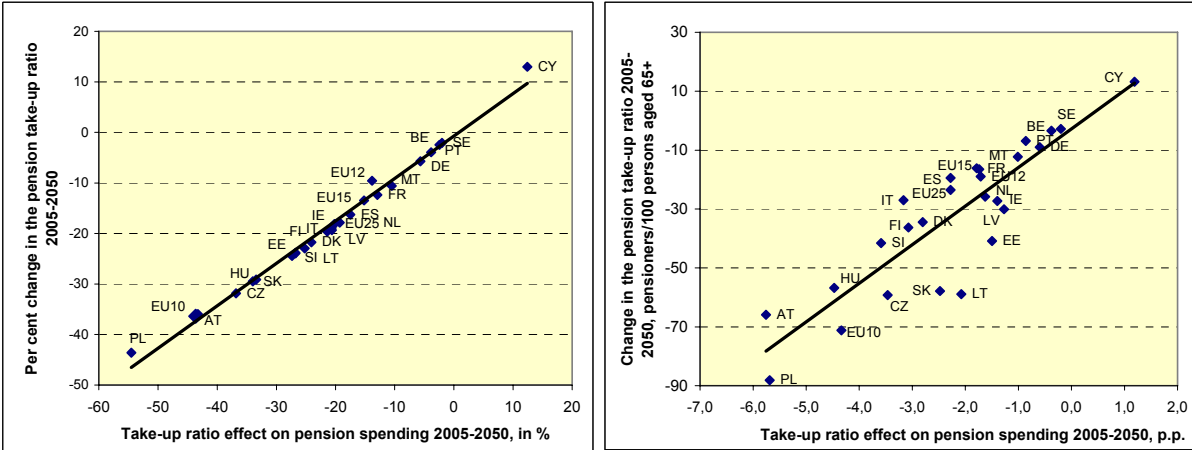
The **pension take-up ratios**, i.e. the number of pensioners relative to the number of persons aged 65 and more, are projected to decrease in all countries (with the exception of Cyprus). On the average, in the EU15, the take-up ratio is projected to fall by about 20 persons (from 144 to 124 relative to 100 elderly persons) and in the EU10 by over 70 persons (from 199 to 125). Large decreases in the pension take-up ratio over the period 2005-2050 are projected in particular for Poland (by 90 persons), Austria (by almost 70 persons) and the Czech Republic, Hungary, Lithuania and Slovakia (by about 60 persons relative to 100 elderly persons). In contrast, the number of pensioners relative to the number of older people in the population is projected to remain, by and large, unchanged in Belgium, Germany and Sweden.

The changes in the take-up ratios include, first of all, changes in the number of people receiving pensions. While under current policies almost all people over 65 years of age

receive pensions, policies have been put in place to increase the effective retirement age and to reduce the number of persons taking up pensions before the standard retirement age. Many countries have also increased the statutory retirement age, and will increase it still further. Furthermore, the composition of the pensioner population may change due to other reforms. For instance, the take-up of pensions by women may increase thanks to their increasing participation in the labour market and the acquisition of their own pension rights, while the take-up of survivors' pensions may decrease.

The pension take-up ratio has a clear linear relationship with its effect on public pension expenditure, when measured as per cent changes from the initial level (first picture of Graph 3-3). When the change in the take-up ratio is measured as numbers of persons and its impact on pension expenditure as a percentage point of GDP (second picture of Graph 3-3), the initial levels make the relationship appear less clear. In particular, the initial levels of take-up ratios are significantly higher in the EU10 countries than in the EU15. Towards the end of the projection period there is a significant convergence in the take-up ratios across countries. The effect of decreasing take-up ratios is spread over the whole projection period, however, with a stronger effect in the first half of the projection period. In the EU15, two thirds of the effect is projected to materialise before 2030 and in the EU10 three quarters.

**Graph 3-3 Pension take-up ratio effect on the decrease in public pension spending between 2005 and 2050**



*The benefit ratio effect*

**Benefit ratio**, average pension relative to output per worker (approximating the evolution of average wages), captures several features. It covers the projected evolution of average pensions, affected by both increases of pensions and the composition of pensioners, and the projected evolution of average wages, affected by both of increases of wages and the composition of wage earners. Thus, several factors can affect the evolution of benefit ratios, including<sup>6</sup>:

<sup>6</sup> Country-specific features have been described in the country notes describing the main characteristics of national pension systems and the methodologies and models used in the projection exercise. The notes are available at the website: [http://ec.europa.eu/economy\\_finance/epc/epc\\_country\\_fiches\\_en.htm](http://ec.europa.eu/economy_finance/epc/epc_country_fiches_en.htm)

- Indexation rules of pensions which are applied to the pool of pensions that remain in payment from year to year and most affect the evolution of average pensions;
- The evolution of average pensions is also influenced by the levels of initial pensions, affected by entitlement rules (accrual of pension rights, ceilings, supplements), and the levels of expiring pensions;
- Other factors applied to the initial level or annual adjustment of pensions such as life expectancy adjustment and sustainability factor corrections;
- The timing of reforms; for instance, a change in the indexation rule affects the evolution of average pensions more in the transition period than in the steady state when the change has been fully implemented;
- Systemic pension reforms such as a switch from public schemes to private schemes and their timing;
- The composition of pensioners, notably the pools of pensioners on minimum (or flat-rate) pensions and earnings-related pensions, through the composition of new and expiring pensioners;
- Wage developments, assumed to be equal to the labour productivity growth rates;
- Composition of wage earners (no explicit assumption was made on changes in the composition of wage earners, e.g. regarding part-time vs. full-time work, education or wage level).

The benefit ratios embedded in the projections show a declining trend for almost all countries. In only four countries (CY, IE, LU and HU) is it projected that average pension benefits will increase relative to wages. The average fall in the benefit ratio is projected to be 24% in the EU15 and 30% in the EU10 between 2005 and 2050.

A projected decrease in the benefit ratio mainly reflects the fact that pensions in payment will not be raised at the same pace as the wages increase for those who stay in the labour market. There are several reasons for this. Firstly, particularly large decreases in the benefit ratios are projected in countries that have recently moved (Italy) or decided to move to price indexation such as France<sup>7</sup> and Austria<sup>8</sup> and that are in a transition from a wage indexation towards price indexation. Secondly, as far as public pensions are concerned, the projected decrease in the benefit ratio in many EU10 Member States is partially due to the switch to private schemes. Thirdly, many Member States have undertaken measures that adapt pension benefits to future demographic or employment changes such as adapting the pension benefit to life expectancy of new pensioners (SE, LV, PL, IT, FI and FR) or adapting the pension benefit to the relationship between the numbers of the employed and pensioners (DE).

The projected increases in the benefit ratio may in some cases reflect the maturation of the pension system, i.e. the fact that higher pensions will be accrued through contributions paid to the system during longer working careers. In some countries, in particular Ireland, the benefit ratio increases significantly at the beginning of the projection period. This is due to the Government's commitments to increase the level of pensions up to 2007, which are included in the projections. In Hungary, the projected increase in the benefit ratio is mainly due to the

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<sup>7</sup> In France, the main social security pension scheme was moved to price indexation in 1987 and the public sector employees' scheme in 2003.

<sup>8</sup> Table 2-3 of the Annex of the main report (European Economy, Special Report 2006:1) describes the indexation rules of Member States' pension schemes.



introduction of taxation on pensions, which will increase gross pensions, measured by the benefit ratio, while net pensions will not increase at the same pace.

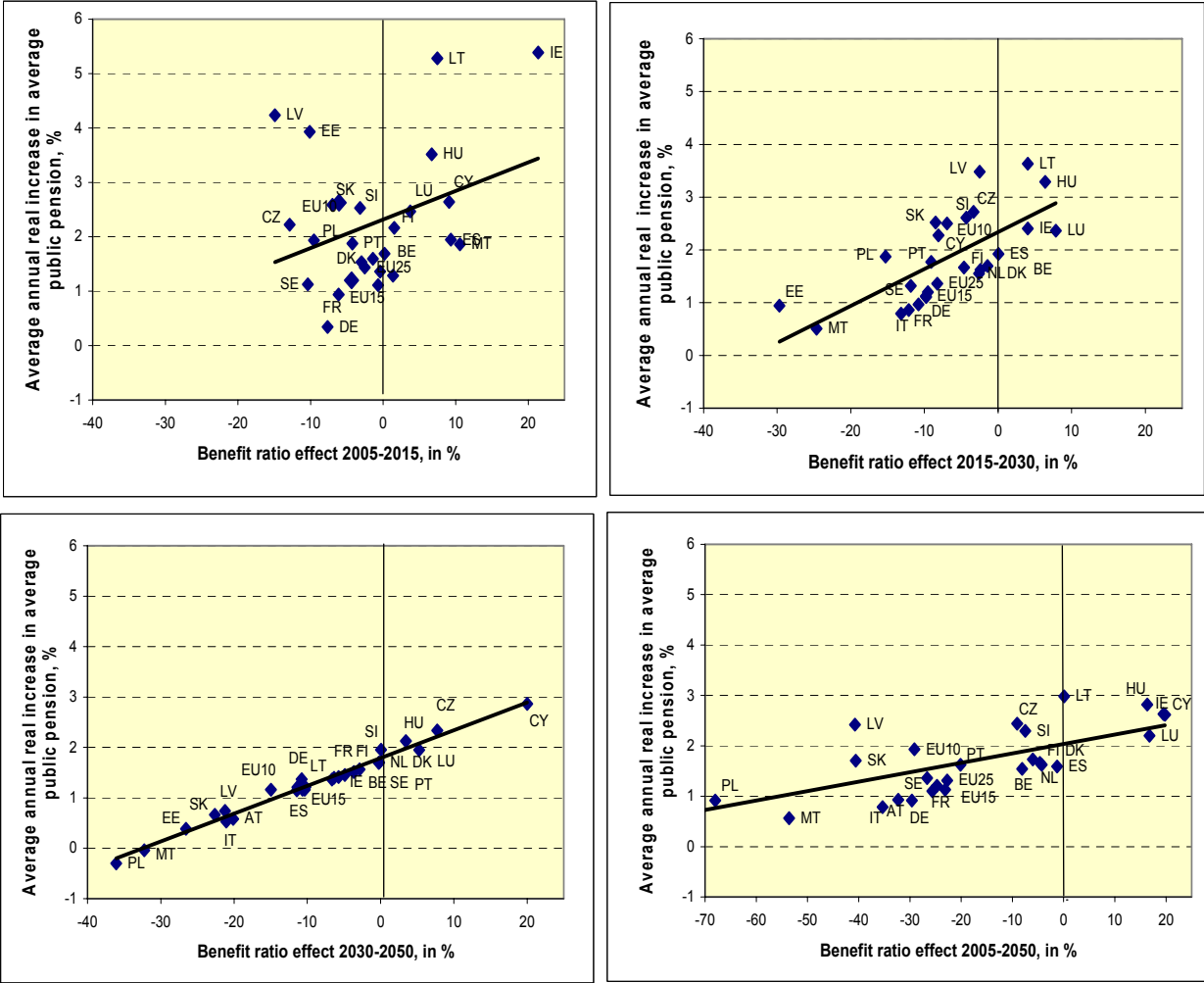
Graph 3-4 below investigates more in depth the extent to which the evolution of average public pensions affects the benefit ratio. It should be noted, in particular, that all countries project positive real growth rates in average public pensions over the whole projection period (with the exceptions of Poland, where the real increase in average public pensions is projected to be negative between 2035-2050, and Latvia between 2045-2050.) On average, in the EU15, the average public pension in real terms is projected to increase by 1.2% per year and in the EU10 by 1.8% per year, in the latter despite the fact that the social security pensions constitute a decreasing part of the total statutory pension provision in many countries. Looking at the trend line, it suggests that an annual real increase of average pensions by 2% would keep the benefit ratio unchanged, which would be close to the assumed labour productivity growth rate, 1.8% per year in the EU25 over the period 2005-2050. The trend line also demonstrates that the benefit ratio is very sensitive to a change in the annual real increase in pensions. For instance, an annual real increase in public pensions by only 1% would reduce the benefit ratio by over 50% over the whole projection period.

When the interrelation between the evolutions of average pensions and benefit ratio is investigated over different time periods, we see quite different patterns. All countries are very close to the trend line in the period 2030-2050, while the picture is very scattered at the beginning (2005-2015) of the projection period. This is largely due to the fact that the benefit ratio is affected by general economic and wage developments, which, in fact, in the projection exercise are quite diversified across countries at the beginning of the projection period, while relatively standardised assumptions for all countries were used over the period 2030-2050.

In particular, over the period 2004-2015, it is striking that in some EU10 countries (EE, LV, SK), despite substantial annual real increases in average pensions (between 3 and 5 per cent per year) benefit ratios fall. This can be explained by the assumed very rapid increases in labour productivity; for instance by over 5% per year in Latvia and Estonia.

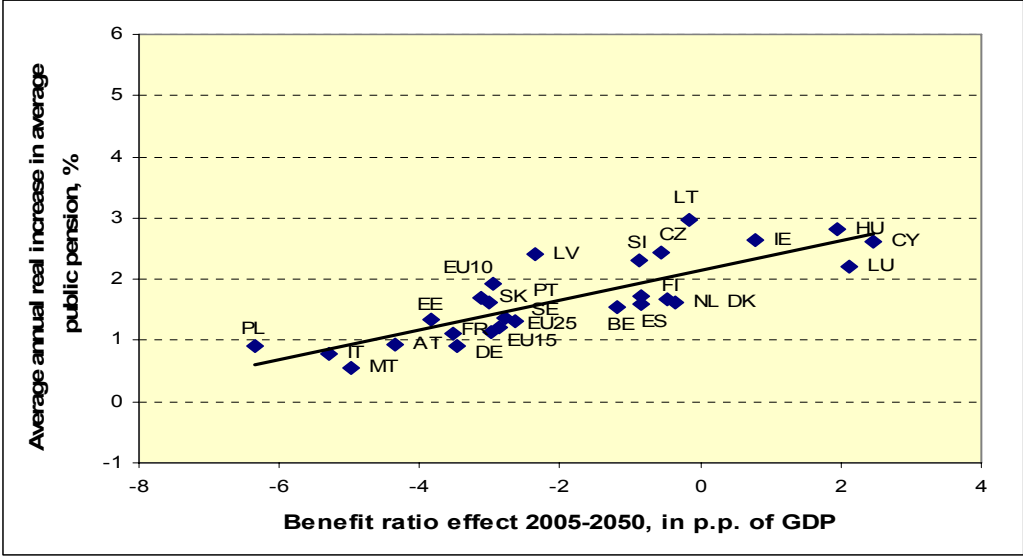
This analysis suggests that the benefit ratio alone and its impact on the increase in pension spending are quite difficult to interpret because they also reflect changes in labour productivity assumption. Benefit ratio can decrease despite a positive development in average pensions. Moreover, the benefit ratio seems to be very sensitive to the annual real increase of average pensions: small changes in average pension increase appear as large numbers in benefit ratios. It should also be borne in mind that the benefit ratio captures features of two different types, namely, changes in average pensions which are largely driven by the indexation rules and changes in average wages which are driven by the given assumptions on labour productivity growth rates. If those assumptions are too optimistic, the pension expenditure projections will exaggerate the fall in the benefit ratio. Therefore, it is difficult to draw firm conclusions as to whether the falling benefit ratios represent a possible adequacy problem.

**Graph 3-4 Projected real increases in average public pensions and in the benefit ratio during the periods 2005-2015, 2015-2030 and 2030-2050**



The graphs above (Graph 3-4) show the benefit ratio effect on public pension spending in terms of percentage increase from 2005 to 2050, while **Graph 3-5** shows the effect on pension spending in terms of the percentage point increase of GDP. While the latter picture is very similar to the fourth picture in Graph 3-4, the differences in country positions are affected by their starting positions regarding the level of public pension spending in 2005.

**Graph 3-5 Projected real increases in average public pensions and the benefit ratio effect on public pension spending in percentage points of GDP between 2004 and 2050**



**3.2. Timing of projected increases in average public pensions**

Instead of analysing the timing of the changes in benefit ratios, it is more useful to look at the timing of the projected increases in average pensions. These changes reflect more directly the impact of pension policies and, hence, make it possible to analyse whether the projected changes can be explained by the indexation rules and whether they are comparable across countries with the same type of indexation rules.

Graph 3-6 below shows the average annual real increases of average public pensions over 5-year periods from 2005 to 2050 in comparison with the labour productivity (wage) growth rates for the EU15 and EU10. For the EU10, it also shows the development of all statutory pensions (in the graph: ‘EU10 to’), including the part of pensions which is being switched into private pension funds.

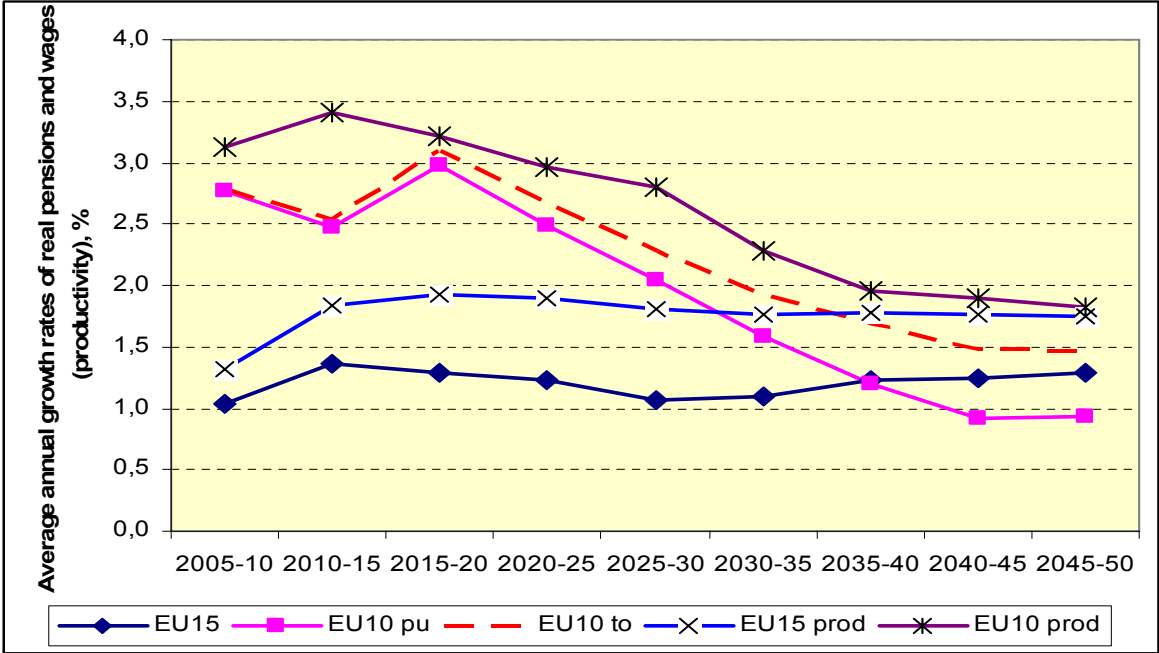
In the EU15 the average real increase of average public pension between 2005 and 2050 is projected to be 1.2% per year in comparison with labour productivity growth of 1.7% per year. The difference between the average growth rates widens from an initial 0.3 percentage point difference to 0.7 percentage points between 2020 and 2035, after which it contracts slightly. While the labour productivity (and wage) growth rate is assumed to increase from the current lower levels to 1.7-1.8 over the period 2010-2050, the average pensions do not seem to fully follow this development.

In the EU10, the overall picture is quite different from that in the EU15. The average annual real growth rates are higher: 1.8% per year for public pensions and 2.3% for total pensions (including the statutory private pension), compared with a 2.7% increase in labour productivity. Moreover, the growth rates are significantly higher at the beginning of the projection period, starting from a level of around 3% per year, though they decrease towards the end of the projection period. This shape of the evolution holds for both public and total pensions and reflects the assumed labour productivity development which affects the average

level of pensions through the accrual of pension rights from higher wages, resulting in higher new pensions, and through the indexation of old pensions in countries where pensions are at least partially indexed to wages. The only point at which the relatively close interrelation between the growth rates of pensions and wages breaks down is the period 2010-2015 when pensions seem to increase significantly less than wages. This development is mainly driven Poland where the development of pension levels slows down due to the start of pensions being paid out from the reformed NDC scheme.

An examination of the developments in individual countries reveals that the growth rates of pensions differ more than those of wages. Over the whole projection period, the average increase in pensions exceeds that of wages in Ireland, Luxembourg, Cyprus and Hungary. Despite a close indexation of pensions to wages, these also reflect discretionary increases in pension levels (in Hungary also an increase in gross pensions to compensate the introduction of taxation on pensions). In contrast, in many countries, the increase in average pensions will be at a pace that is 0.6-0.8 percentage points lower than average wage growth. These include countries such as Germany, France, Italy, Austria, Sweden and Estonia. Moreover, in Malta and Poland, the gap between the average growth rates is over 1 percentage point per year. These developments are driven by recent reforms to switch to price indexation in France and Austria, the indexation of pension ceilings to prices in Malta, the introduction of sustainability factor in Germany and the introduction of notionally defined contribution systems in Italy, Sweden and Poland.

**Graph 3-6 Projected annual real increases in average public pensions and labour productivity (wages) in the EU15 and EU10, calculated over 5-year periods from 2005 to 2050**

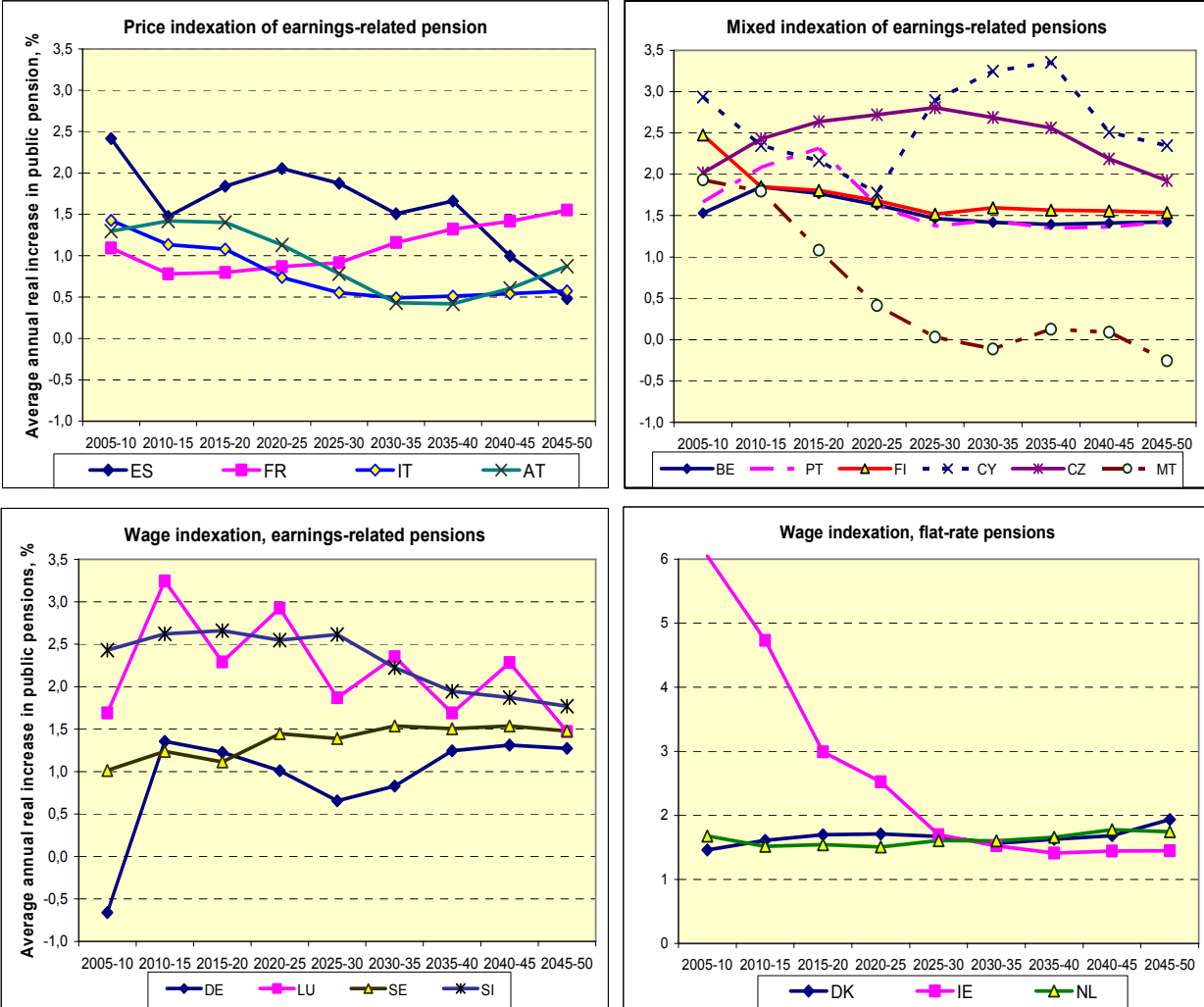


Graph 3-7 and Graph 3-8 below analyse annual real increases in average public pensions across countries. Countries have been grouped mainly by the type of their indexation regimes. However, it must be borne in mind that even the indexation regimes are hardly ever fully identical in two countries. Moreover, the average pension development is affected also by factors other than merely the indexation rule, including life expectancy adjustments,

sustainability factor corrections, the timing of the effect of past reforms and transitional periods as reforms are implemented. Also, the accrual of pension rights and the valorisation of past earnings are important determinants for the start level of new pensions which may differ from the average level of pensions in payment. And lastly, the composition of the pensioner population (those with flat-rate vs. earnings-related pensions, the difference between new and expiring pensions) may have important effects on the development of the average.

The lowest increases in average public pensions are projected in Italy (0.8% per year) and in Austria and Germany (0.9% per year), while the highest increases will occur in Ireland (2.4% per year) and in Luxembourg (2.2% per year). Measured over the 5-year periods, the average annual increases for the EU15 as a whole are relatively stable, with the exception of the first period, 2004-2010, when the growth rate is projected to be 0.9% (in comparison with the 1.2% average increase over the whole projection period). This figure is dominated by the German projections, which project a fall of 0.9% per year over the period 2005-2010 due to the sustainability factor correction. In later 5-year periods, the German indexation rule appears to produce somewhat similar increases to the French system.

**Graph 3-7 Annual real increases in average public pensions, countries (EU15 and some EU10 countries) grouped according to the type of the indexation of pensions**



**In the first group** of the EU15 countries (ES, FR, IT and AT), pensions are indexed to prices (or close to prices); the Italian pension scheme is a defined-contribution scheme and others are defined-benefit schemes. Despite the fact that the formal indexation of pensions is similar, relatively large differences in annual real increases of average pensions are projected, growth rates varying mainly between 0.5 and 2 percent per year. Moreover, the evolution of real increases shows different patterns for different countries: while the growth rate increases over time for France, it is on a declining trend in Italy, Austria and particularly in Spain.

The declining trend in Italy and Austria can be explained by the latest reforms, which will result in lower initial pensions than hitherto due to the new rules. In Italy, new pensions will be based on the defined-contribution principle and the level of new pensions takes account of the life expectancy of the retiree. Also in Austria, the link between contributions and benefits has been tightened through the calculation of the pensionable wage over the whole work career and through the introduction of stronger actuarial reductions for early pensions.

In Spain, the high increase at the beginning of the projection period is explained partly by the fact that the Government has committed to increase the level of minimum pensions substantially during its term of office. The rise in minimum pensions pushes average pensions up still further during the first years of the projections. Also, the level of new pensions has been rising at a higher pace than wages in recent years and this development is projected to continue until 2010. The subsequent decrease in average growth rates represents a return to more 'normal' growth rates but may also be affected by an increasing number of lower pensions due to the higher participation of women with partial careers. At the end of the projection period, the substantially lower increase in average pensions than in wages is mainly due to demographic dynamics. In particular, the end of the baby-boom effect results in a smaller number of new pensioners, which pushes the average level of pensions down. Also, the increase in life expectancy increases the number of pensioners with low pensions.

**The second group** (BE, PT, FI, CZ, CY and MT) consists of countries where pensions are indexed by a mixed index with greater weight given to prices than wages (or where the greater part of pensions is linked to a price index and the smaller part to a wage index, as is the case in BE (private sector pensions linked to a price index plus 0.5 percentage points and public sector pensions to a wage index) and CY (minimum pensions linked to wages and earnings-related pensions to prices)).

In this group of countries, annual real increases of average public pensions are very similar in Belgium, Finland and Portugal at about 1.5 percent per year over most of the projection period. In contrast, annual real increases of pensions are projected to be higher in the Czech Republic and Cyprus.

In the Czech Republic, the annual increase is between 2 and 2.8 percent per year, reflecting partly the assumption of higher labour productivity (and wage) growth rate than in other countries in this group, in particular up to 2030. This results in a more generous indexation of pensions (prices plus a third of the average real wage growth). Moreover, the changes in the composition of the pensioner population lead to an increasing average pension. New pensions are higher than pensions in payment due to the fact that their replacement rate (relative to wage) is projected to be relatively constant and that the trend is moving towards old-age pensions and away from the lower disability and survivors' pensions.

In Malta, an indexation close to prices dominates because the ceiling of the pensionable income is adjusted by a price index (cost-of-living adjustment), the minimum and maximum of the earnings-related pensions by only 2/3 of the price indexation despite the fact that the earnings-related pensions between the minimum and maximum are adjusted by 2/3 of wage increases in the respective occupation of the pensioner. Over time, these rules lead to earnings-related pensions approaching the maximum pension, thus producing virtually flat-rate pensions only<sup>9</sup>. This also explains why annual real increases of pensions approach zero in the middle of the projection period.

**The third group** (DE, LU, SE and SI) includes countries where public earnings-related pensions are indexed to wages. The projected real increases in public pensions are very similar in Luxembourg and Slovenia: slightly over 2.5 percent per year at the beginning of the projection period and decreasing to a below 2 percent increase towards the end. In LU, the

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<sup>9</sup> A reform proposal, including a change in this indexation rule, has been proposed in March 2006 but has not yet been concluded.

recurring increases and decreases of the growth rates are due to the rule which requires pensions to be adjusted to real wage increases every two years and which therefore means that the calculation of average increases over 5-year periods includes an unequal number of adjustments in consequent periods.

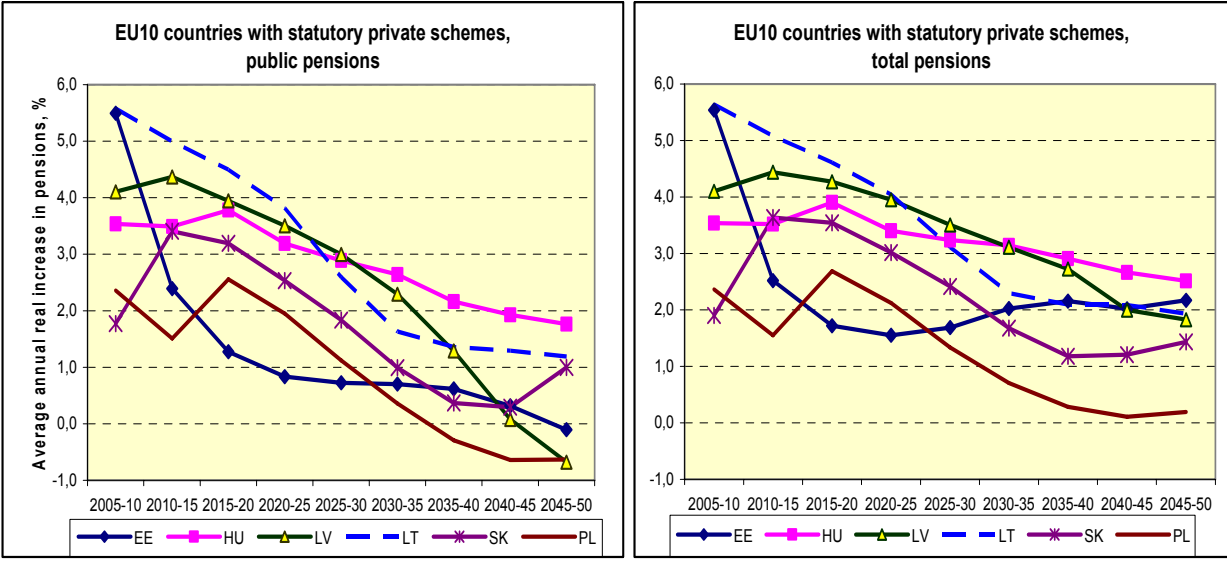
In Germany, according to the basic rule, pensions are indexed to gross wages minus contributions to pension schemes (this reduction is called the Riester factor). However, an additional rule stipulates that the index be modified with a sustainability factor which takes account of the changes in the ratio between the number of pensioners and employees. This modification plays a particularly important role at the beginning of the projection period when the old-age dependency ratio rises fastest in Germany (see Graph 3-12). The Riester factor also holds down the index adjustments of pensions because contributions to private pension schemes increase over the coming years. In fact, the index adjustments of pensions are expected to remain low even in nominal terms up to 2010.

In Sweden, in the reformed pension system, at the aggregate level pensions are indexed to wages but, at the individual level, when a pension is granted the adjustments are front-loaded. This means that an additional increase of 1.6% is granted on the new pension at the time of retirement, offset by a respective reduction in the index increase in the subsequent years. In the transition phase, this rule results in pensions increasing on average less than wages, but in a steady state the increases will be equal to a wage indexation. Additionally, the level of new pensions is modified to take account of the life expectancy of the retiree.

**The fourth group** (DK, NL and IE) consists of countries with flat-rate public pensions, which are indexed to wages in DK and NL and raised by discretionary decision in IE (in the projections, wage indexation is applied). The annual increases are around 1.5 percent per year, except at the beginning of the projection period in IE, where it is 4-4.5% per year. The average 1.5 % increases in Denmark and the Netherlands are lower than for earnings-related pensions with a wage indexation (as in, for example, LU and SI) due to the fact that the average of the flat-rate pensions is affected only by the indexation, while the average of earnings-related pensions is also affected by higher new pensions that have accrued in line with earnings increases. For Ireland, the average of public pensions is affected by factors other than mere indexation such as government commitments to raise the level of pensions in the short run and the maturation of the contributory pension scheme, which provides higher pensions than the non-contributory scheme, over the longer term.



**Graph 3-8 Annual real increases in average public and total pensions, EU10 countries with a switch from the public scheme into statutory private schemes**



In the group of 6 of the EU10 countries (EE, HU, LV, LT, SK and PL) which have switched a part of the social security pension scheme into private schemes, the indexation varies. Only in Poland are pensions indexed to prices. In Estonia and Latvia, pensions are indexed 50:50 to prices and to the growth of the social security contribution revenues, the latter taking account of changes in wages and employment. In Hungary and Slovakia, pensions are indexed 50:50 to prices and wages. In Lithuania, pensions are adjusted by discretionary decision but the projections adjust them in line with wage increases.

For these countries, the left-hand picture shows the projected increases in public pensions and the right-hand picture that in total pensions. The latter is more important because it includes the whole statutory pension provision, while the public pensions picture is biased in that public pensions constitute a decreasing part of total pensions in the future. A general feature of the projected annual increases is that there is a declining trend for all countries. This holds also when total pensions are considered and thus confirms that the declining trend of public pensions is not only due to the switch into private funded schemes. In particular, it is influenced by the assumptions on labour productivity growth rates, and hence wage increases, which were assumed to be particularly high in the first part of the projection period. However, the pace of the decrease in average pensions varies considerably across countries and it might not be fully explained by the impact of the assumed wage increases.

In particular, in Poland, annual real increases of total pensions are projected to approach zero towards the end of the projection period. This overall development is heavily influenced by the introduction of the notional defined-contribution scheme, and more precisely by the timing of the reform's impact on payment of pensions from the NDC scheme. The first new pensions from the NDC scheme will be paid out in 2009. Over time, these pensions will be become notably lower than pensions from the old defined-benefit scheme. Moreover, the take-up of early pensions is assumed to be restricted from 2007 onwards. These factors weigh on the increase in average pensions during the period 2010-2015. From 2015 onwards, the partial switch of pensions into private funded schemes will further reduce the level of public pensions paid out because people will increasingly start to receive a part of their pensions

from the private scheme. At the end of the projection period, the increase in average (public and total) pensions slows down, first, due to the assumed slowdown in wage growth rates, and second, due to the increase in life expectancy; both of these factors will directly reduce the level of new pensions. Thus, over a long part of the projection period, expiring pensions will be higher than new pensions, which will hold down the evolution of average pensions.

In Latvia, the annual real increases in public pensions are projected to become negative in the period 2045-2050. This is explained by the phasing-in of the switch into private schemes, the completion of which may still have some effect in this period. The stronger decreasing trend in public pensions over the whole projection period than in other countries that are also switching can be explained by the fact that the part that will be switched into private funds will gradually increase.

In Estonia, a sharp decrease in the growth rate of both public and average pensions in Estonia after the first 5-year period 2004-2010 is striking. This seems to be explained by exceptional increases in pension levels during the first 5-year period, based on discretionary decisions taken in recent years. However, the low and flat profile of growth rates from 2015 onwards also differs significantly from other countries. Changes in labour productivity growth rates over the projection period are slower and would suggest a slower downward trend for average pension increases.

For Hungary, the projected decrease in the growth rates of public pensions is significantly lower than for other countries that have also switched a part of social security pension scheme into private funded schemes. The Hungarian country fiche explains this feature by the dynamic evolution of the average pension level, which will be raised by new pensions that will be higher than the pensions in payment due to the assumed high labour productivity – and hence also wage – growth rates.

Summing up, while it can be concluded that in countries with a price indexation of pensions the projected annual increases of pensions are projected to be lower than in countries with a mixed or full indexation to wages, it appears that the indexation of pensions alone is not a very powerful explanatory factor for the evolution of average pensions. The projected evolution of average pensions can differ quite significantly even across countries which have basically relatively similar indexation rules. There are a great number of factors which also affect the evolution of average pensions. For instance, the additional rules which modify the basic indexation rule can have significant effects. These include factors such as life expectancy and sustainability adjustments, minimum and maximum rules, etc. And pension reforms can also change the picture substantially, e.g. through altered accrual and eligibility rules, and discretionary decisions to raise pension levels.

### 3.3. Timing of the effect of the driving factors

Above we have analysed the effect of the different driving factors on the increase in public pension expenditure. In order to have a clearer picture of the timing of the various driving factors it is useful to look at the 5-year growth rates of the driving factors instead of the cumulative changes over the whole projection period.

In the EU15 (Graph 3-9), while the old-age dependency ratios continue to increase over the whole projection period, the pace of the increases is the fastest during the period 2010-2015 and 2020-2035 (measured as an increase over a 5-year period). In the EU15 Member States, the timing of ageing varies quite considerably. This is seen in Graph 3-12 which shows the annual growth rates of old-age dependency ratios for the largest Member States. The pressure for increases in public pension expenditure follows, by and large, the pressure coming from the ageing of the population, though it shows a lower convex curve than the increases in the old-age dependency ratio. The difference between these curves also shows the impact of the offsetting factors on pension expenditure. These factors are projected to be the most effective during the periods of the highest pressure coming from ageing, i.e. in the periods 2005-2015 and 2025-2035.

Looking at the first decade of the projections and the impact of the offsetting factors, it is seen that the impact of the increasing employment rates is projected to materialise almost fully during this period. Its impact is also the strongest of the driving factors during this period. Taking into account the assumptions of "no policy change" and the fact that only the impact of enacted reforms was incorporated in the employment projections, it is a plausible result that its impact materialises over the first decade.

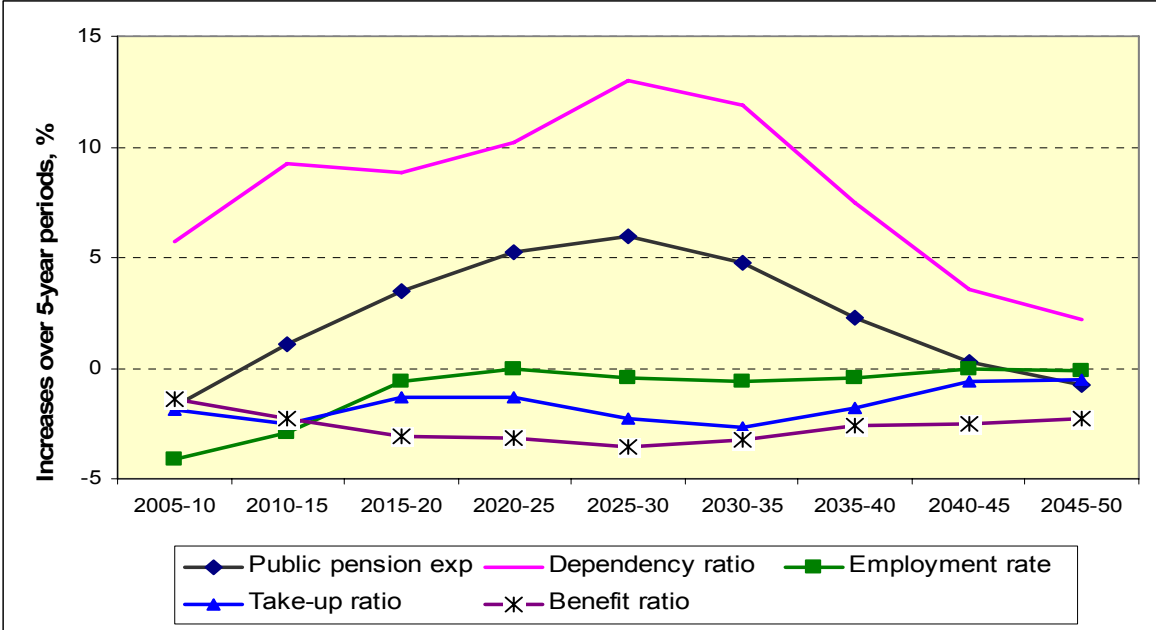
The decrease in the pension take-up ratios takes place over a longer period than the employment impact. Moreover, it seems to react to the increase in the old-age dependency ratio so that its impact on the increase in public pension expenditure is dampened. This is seen in Graph 3-9, which shows its effect strengthening during the periods 2010-2015 and 2025-2035.

The impact of benefit ratios is projected to be spread relatively evenly over the whole projection period in the EU15. However, it also seems to become somewhat stronger in periods when the pressure of ageing is strongest, notably 2015-2035.

Annex 1 presents the timing of the effect of the driving factors for each country. Not surprisingly, the timing and strength of the driving and offsetting factors varies considerably across countries. It appears that, in a great number of countries, considerable pressures coming from the peaks in the dependency ratios are flattened by the offsetting factors, notably by take-up ratios and benefit ratios to relatively smooth changes in pension expenditure.

Annex 2 presents a further decomposition of the take-up ratio for those countries which provided necessary data on the number of pensioners by age group. This data provides additional insight into the question of the degree to which the changes in the take-up ratio are due to changes in the take-up within age groups and changes in the age composition of the population. It appears that, in general, the population composition effect, measured by the ratio of persons aged 55-64 relative to persons aged 65+, has a strong impact on changes in the take-up ratio. However, it also reveals that a number of countries project considerable decreases in the take-up of pensions in the age groups below 65 and in some countries (AT, PL) even in the age group over 65.

**Graph 3-9 Timing of the effect of the driving factors on the 5-year growth rates of public pension expenditure in the EU15**



In the EU10 (Graph 3-10, Graph 3-12), the pace of ageing is stronger and earlier than in the EU15. The highest growth rates in the old-age dependency ratios will take place already in 2010-2020, while in the EU15 the ageing is fastest in 2025-2035. Moreover, in the EU10, there is a second acceleration in the old-age dependency ratios in the 2040s. As far as different Member States are concerned, the timing of ageing will take place at about the same time (Graph 3-12). Concerning the pressure on public pensions, the growth rates of public pension expenditure follow the ageing pressure to a significantly lesser degree than in the EU15. In particular, at the beginning of the projection period, the offsetting factors are projected to play a very strong role. Also during the 2040s, the take-up ratios of pensions are projected to offset the effect of the old-age dependency ratio. This seems to be, however, mostly due to the effect of population dynamics, i.e. the changing sizes of the age group 55-64 and those aged 65+. The graphs in Annex show for individual countries that the pension take-up ratios within the age groups remain relatively unchanged at the end of the projection period. Unfortunately, a great number of countries did not provide data on the number of pensioners by age group and, consequently, summaries at EU15 and EU10 level were not possible.

Concerning the benefit ratio effect on public pension expenditure, it will evidently have a stronger effect in the EU10 Member States than the EU15 because in many countries the public pension provision will decrease as statutory private pension provision increases. This policy change will take place mainly between 2015 and 2040, during which period the benefit ratios of total pensions will grow faster than those of public pensions, pushing total pension expenditure up (Graph 3-11). Thereafter, the growth rates for the benefit ratio (and total expenditure) of all pensions will be about 3% higher for each 5-year period. However, even taking into account the increasing private pension provision, at the end of the projection period the growth rates of total pension expenditure reflect the ageing pressure only slightly better than the growth rates of public pensions alone. In contrast, at the beginning of the

projection period, the increasing statutory private pension provision does not yet have any effect on the benefit ratio of public pensions because the pensions in payment are still based on the pension system before the switch into private statutory schemes.

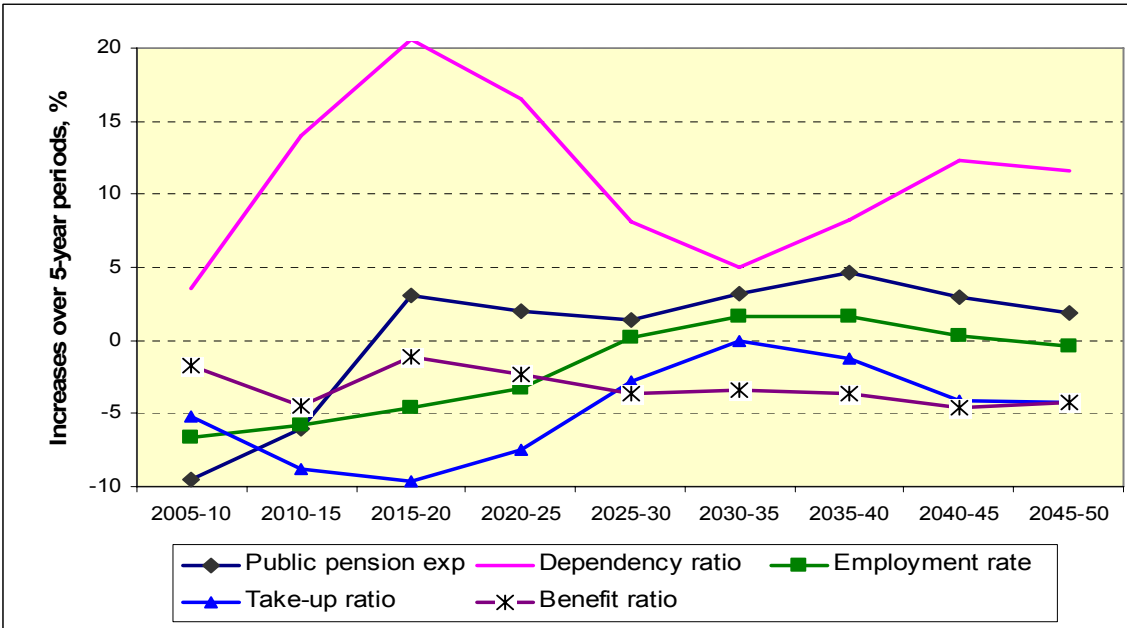
The projected decreasing benefit ratio of total pensions is plausible to the extent that it is due to the assumed high wage growth rates during the first part of the projection period. However, it might be asked whether there are other elements which unduly reduce the benefit ratio to significant degrees during the period 2005-2015. Also, it is difficult to explain why the offsetting effect of the benefit ratio should become stronger at the very end of the projection period, as appears to be the case for some Member States (EE, LV, PL; see Annex).

The projected increase in the employment rates has an essentially stronger offsetting effect in the EU10 than in the EU15, and is projected to last until 2025. Thereafter, employment rates are projected to decrease, which will have an adverse effect on pension expenditure relative to GDP.

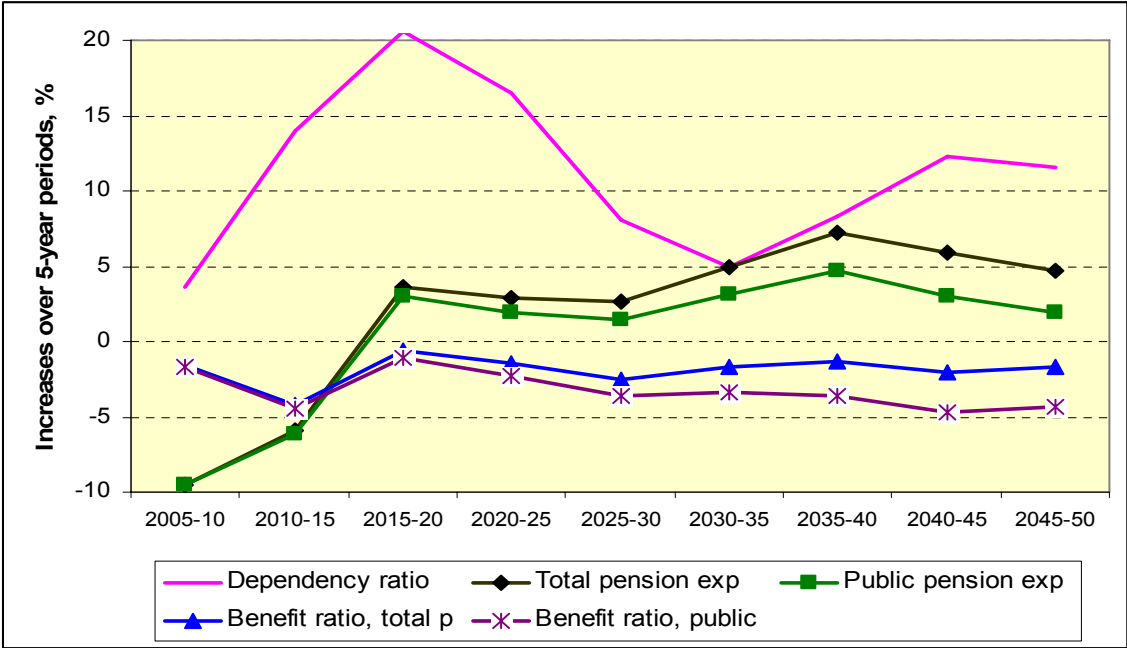
The effect of decreasing pension take-up ratios is projected to last virtually over the whole projection period in the EU10; only during the period 2030-2035, when the pressure from ageing is increasing at its slowest pace, will it be neutral regarding the increase in pension expenditure. The relative offsetting effect of pension take-up ratios is projected to be strongest during the periods of rapid ageing (2010-2020 and 2040-2050). However, this seems to be more the effect of the composition of population age groups than a 'real' decrease in the take-up ratios within the age groups. This feature also comes out clearly in country-specific decompositions (Annex).

Nevertheless, Annex also shows that many of the EU10 countries project a significant decrease in the pension take-up ratio in the 55-64 age group. This trend is plausible given that the current take-up of pensions in this age group is significantly higher than in the EU15 countries. Many of the EU10 countries also have policies in place which will gradually raise the statutory retirement age, which is currently below 65 in most EU10 countries.

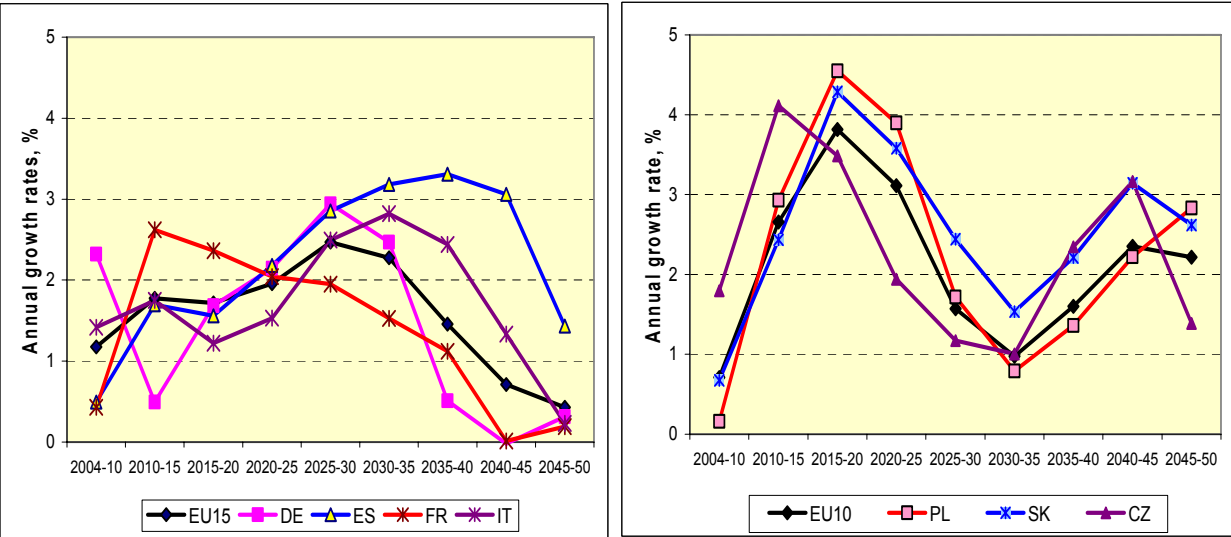
**Graph 3-10 Timing of the effect of the driving factors on the 5-year growth rates of public pension expenditure in the EU10**



**Graph 3-11 Timing of the effect of statutory private pensions on 5-year growth rates of public and total pension expenditure in the EU10**



**Graph 3-12 Annual growth rates of old-age dependency ratios over 5-year periods, selected countries**



## 4. SENSITIVITY ANALYSES

### 4.1. Overall look at the sensitivity analyses

The sensitivity scenarios were all run in relation to the baseline scenario, and only one parameter was changed in each sensitivity scenario from that in the baseline scenario. The following sensitivity tests were run:

- ***The higher life expectancy scenario*** assumed an increase in life expectancy, which corresponds roughly to an increase in life expectancy at birth of 1-1.5 years by 2050. Specifically, it was introduced by decreasing the age-specific mortality rates by 15% linearly over the period 2004-2050.
- ***The higher employment rate scenario*** assumed that the employment rate would increase by 1 p.p. over the period 2005-2015 and would thereafter remain at a 1 p.p. higher level in the period 2015-2050 compared with the baseline projection. The higher employment rate was assumed to be achieved by lowering the rate of structural unemployment (i.e. the NAIRU).
- ***The higher employment rate of older workers scenario*** assumed that the employment rate of older workers would increase by 5 p.p. over 2005-2015 and thereafter remain at a 5 p.p. higher level over the period 2015-2050 compared with the baseline projection. The higher employment rate of older workers is assumed to be achieved through a reduction in the inactive population. In terms of total employment rates, this scenario results in an increase of about 1 p.p., thus coming very close to the higher employment rate scenario.
- ***The higher and lower labour productivity scenarios*** assumed an increase/decrease in the labour productivity growth rate by 0.25 p.p. over 2005-2015, thereafter remaining at the 0.25 p.p. higher/lower level in comparison with the labour productivity growth rate in the baseline projection.
- ***The higher and lower interest rate scenarios*** assumed interest rates of 4 and 2% vs. 3% in the baseline scenario.

The size of the introduced shocks explained above and modelled in the sensitivity scenarios is not easily comparable and caution should be exercised when interpreting whether the results are more sensitive to one factor than another. However, one way of comparing the introduced shocks in the higher life expectancy and higher employment rate scenarios is to compare the change in the economic dependency ratio that they cause. It appears that the increase in the number of pensioners in the higher life expectancy scenario increases the economic dependency ratio (inactive persons relative to the employed) by around 5% while the increase in the number of employed persons in higher employment rate scenarios (one percentage point increase in the overall employment rate or 5 percentage point increase in the employment rate of older workers) decreases the economic dependency ratio by around 1.5%.

Table 4-1 provides an indication of the sensitivity of the pension expenditure projections to various assumptions. Overall, it shows that the public pension expenditure projections are most sensitive to the assumption of life expectancy and the assumption of labour productivity growth rate, while the assumptions of higher employment rates have a more limited impact on the results and the assumption of interest rate does not affect the results on public pension

spending (with the exception of SE and FI). The magnitude of the impact of different assumptions on pension spending depends critically on the pension system design: how responsive the system is to changes in economic and demographic developments. Thus, the magnitude of the impact varies across countries.

**A higher life expectancy** should have a larger impact on pension spending in a defined-benefit scheme where the initial level of the pension does not depend on the time spent in retirement. In contrast, a defined-contribution scheme accommodates the time spent in retirement as the accumulated pension capital will be converted into annuities at the time of retirement and account is taken of the increased life expectancy.

The impact of **higher employment rates** (whether overall employment rates or employment rates of older workers) on pension spending depends critically on what is assumed of how the gain in higher employment rates is achieved and how the pension system design responds to such changes. If a gain in higher employment rates is achieved through decreased unemployment rates, the spending on unemployment benefits will actually be reduced but the person moving from unemployment to employment will (usually) accrue more pension rights, thereby increasing the level of his pension and the overall spending on pensions. However, the higher employment rate also results in higher GDP and, consequently, the ratio between pension spending and GDP is not affected much<sup>10</sup>. Similarly, when considering the change in the employment rate of older workers, the impact depends essentially on whether it increases the person's pension rights or not. Only in the case of a defined-benefit pension system and if the higher employment rate of older workers were gained through a reduction of non-actuarial early pensions, would the decrease in pension spending relative to GDP be notable. In contrast, in a defined-contribution scheme, a higher accumulation of pension rights should keep the level of pension spending virtually unchanged but can result even in a small increase of pension expenditure (IT, SK). Despite the limited impact on pension expenditure, higher employment rates result in welfare gains both at the individual level, allowing higher earnings when still employed and higher pensions when retired, and for society, resulting in higher GDP and higher income per capita.

**Higher and lower labour productivity** assumptions affect pension spending through their link to the increase in wages. In the projections it is assumed that real wages increase in line with labour productivity growth rates. The impact on pension spending depends directly on the extent to which pensions are indexed to wage increases. If pensions are indexed to wages, the share of pension spending relative to GDP should remain unchanged under different assumptions about the labour productivity growth rates, since the labour productivity growth rate determines both wage and pension growth. In contrast, if pensions are indexed to prices only (or to a hybrid index of wages and prices) and if the real wage growth rate increases, the share of pension spending relative to GDP will decrease and, conversely, in the event of lower wage growth rates, pension spending relative to GDP will increase.

**Higher and lower interest rates** have no impact on pension spending (relative to GDP) as far as fully pay-as-you-go pension systems are concerned. Only in funded schemes does the interest rate assumption matter. A higher interest rate (and thus also a higher return on pension assets) helps the financing of the pension scheme and results in a higher accumulation

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<sup>10</sup> A similar conclusion on the strong interdependence between higher participation, GDP growth and fiscal pressure caused by age-related expenditure is drawn by the Australian Productivity Commission (2005) in its report 'Economic Implications of an Ageing Australia'.



of pension funds if it concerns a defined-contribution scheme. In this case, the contribution rate remains unchanged but asset accumulation increases, also allowing higher pensions to be paid and thereby resulting in higher pension spending. In contrast, in a funded defined-benefit scheme (such as exists in the Netherlands in particular), pension expenditure is not affected but higher interest (return) rates allow lower contributions, which in turn result in a lower accumulation of pension assets.

The results of the sensitivity scenarios can be summarised as follows:

- **Higher life expectancy** is projected to increase public pension expenditure by 0.3 percentage points on average in the EU. The largest projected impacts on public pension expenditure are in DK, FR, PT and SI (by 0.6 p.p. of GDP) and in BE, MT, NL and SK by 0.5 p.p. The projected impact is smaller (0.2-0.3 p.p.) in countries with defined-contribution schemes (IT, LV, PL and SE) but not zero in any country. In DE, FI and UK, the impact is projected to be 0.2 p.p. and in EE and ES only 0.1 p.p.
- **A higher employment rate and higher employment rate of older workers** are projected to result in only small and rather similar changes in pension spending. In most countries, the level of public pension spending as a percentage of GDP will remain unchanged or only slightly changed (-0.1 p.p.). Only in Hungary and Slovenia are notable decreases (0.4-1.1 p.p.) projected, while somewhat smaller decreases (0.2-0.4 p.p.) are projected in BE, CZ, LT, AT, PT. Moreover, a higher employment rate of older workers appears to have a stronger impact in DK, EE and FR than that generated by a general increase in employment. In contrast, the German sustainability factor is designed in such a way that pension spending responds to changes in employment and to the change in ratio between the numbers of employed and pensioners, thus resulting in no (virtual) change in the pension spending ratio. Some countries (IT, SK) also project a small increase in pension spending, which is a feasible result in a defined-contribution scheme in particular because people in employment will accrue more pension rights.
- **Higher and lower labour productivity** result in relatively symmetric decreases/increases in the level of pension spending, of 0.3-0.4 percentage points of GDP on average. The changes are the greatest (0.7-1.6 p.p.) in CY, PT, ES, AT and MT, while in DK, DE, IE, LU, NL and SI pensions are projected to rise in line with earnings and (virtually) no change is projected.
- **Higher and lower interest rates** have no impact on the level of public pension expenditure in most countries. Only in Sweden do they have a noticeable impact: higher interest rates are projected to increase pension spending by 0.3 p.p. and lower interest rates to decrease spending by 0.3 p.p. This impact comes from the defined-contribution funded public scheme. However, the interest rate plays a more important role in countries with funded occupational and private statutory schemes. A more noticeable impact is seen for total pension expenditure. Due to the impact of interest rates on funded schemes, total pension spending could increase/decrease by 0.5-1.1 percentage points in EE, LV, LT, HU, SK and SE.

Below, a closer look is taken at how the sensitivity scenarios impact on public pension expenditure and the driving factors, with the exception of the scenarios of higher and lower interest rates, which affect public pension spending only in Sweden and to a very minor degree in Finland.

**Table 4-1 Summary of changes in gross public pension expenditure increases as a percentage points of GDP between 2004 and 2050**

	Baseline, change 2004-2050	Difference in public pension expenditure increases as percentage points of GDP relative to the baseline projection						
		Higher life expectancy	Higher employment	Higher empl of older workers	Higher labour productivity	Lower labour productivity	Higher interest rate	Lower interest rate
BE	5,1	0,5	-0,2	-0,3	-0,4	0,3	0,0	0,0
CZ	5,5	0,4	-0,2	-0,3	-0,3	0,2	0,0	0,0
DK	3,3	0,6	0,0	-0,3	0,0	0,0	0,0	0,0
DE	1,7	0,2	-0,1	0,0	0,0	0,0	0,0	0,0
EE	-2,5	0,1	0,0	-0,4	-0,2	0,2	0,0	0,0
GR								
ES	7,1	0,1	-0,1	-0,1	-0,9	1,0	0,0	0,0
FR	2,0	0,6	-0,1	-0,4	-0,4	0,5	0,0	0,0
IE	6,4	0,3	-0,1	-0,1	0,0	0,0	0,0	0,0
IT	0,4	0,3	0,0	0,2	-0,5	0,6	0,0	0,0
CY	12,9		-0,1		-1,4	1,6		
LV	-1,2	0,2	0,0	0,0	-0,1	0,2	0,0	0,0
LT <sup>2)</sup>	1,8	0,6	0,0	-0,1	-0,1	0,2	0,0	0,0
LU	7,4				-0,1	0,1	0,0	0,0
HU <sup>2)</sup>	6,7	0,2	-0,7	-1,1	-0,4	0,2	0,0	0,0
MT	-0,4	0,5	-0,1	0,0	-0,7	0,7	0,0	0,0
NL	3,5	0,5	-0,1	-0,1	-0,1	0,0	0,0	0,0
AT	-1,2	0,4	-0,2	-0,4	-0,8	1,0	0,0	0,0
PL	-5,9	0,2	-0,2	0,0	-0,4	0,2	0,0	0,0
PT	9,7	0,6	-0,2	-0,2	-1,2	1,3	0,0	0,0
SI	7,3	0,6	-0,4	-0,9	-0,1	-0,2	0,0	0,0
SK	1,8	0,5	0,0	0,1	-0,2	0,2	0,0	0,0
FI	3,1	0,2	0,0	-0,2	-0,4	0,5	0,1	-0,1
SE	0,6	0,3	-0,1		-0,2	0,3	0,3	-0,3
UK	2,0	0,2	-0,1	-0,1	-0,4	0,3	0,0	0,0
EU15 <sup>1)</sup>	2,3	0,3	-0,1	-0,1	-0,3	0,4	0,0	0,0
EU10 <sup>1)</sup>	0,3	0,4	-0,2	-0,2	-0,3	0,3	0,0	0,0
EU12 <sup>1)</sup>	2,6	0,3	-0,1	-0,2	-0,4	0,4	0,0	0,0
EU25 <sup>1)</sup>	2,2	0,3	-0,1	-0,1	-0,3	0,4	0,0	0,0

1) excluding countries which have not provided data

2) LT: revised sensitivity analyses; HU: revised High life expectancy scenario

#### **4.2. Higher and lower labour productivity scenarios relative to the baseline**

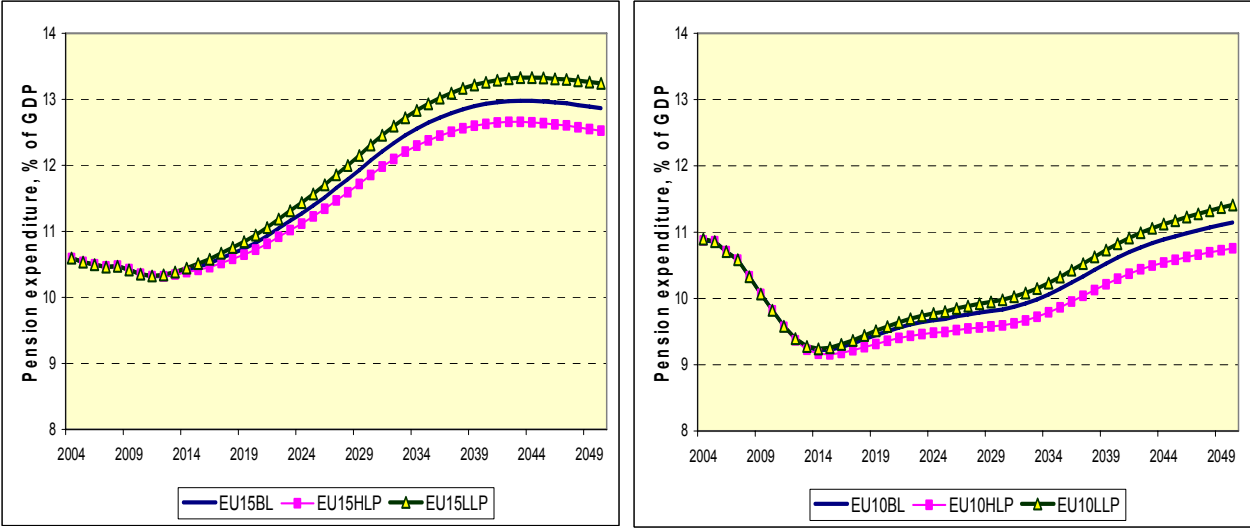
The impact of higher and lower labour productivity growth rates is relatively symmetric and steadily cumulates over the projection period while the change in the labour productivity was assumed to take place over 2005-2015 and thereafter to remain at the higher/lower level up to end of the projection period (Graph 4-1). Across countries, the range of the impact on public pension expenditure varies between 0 and 1.6 p.p. of GDP.

Graph 4-2 shows the variation between countries, focusing on those with the greatest impact.

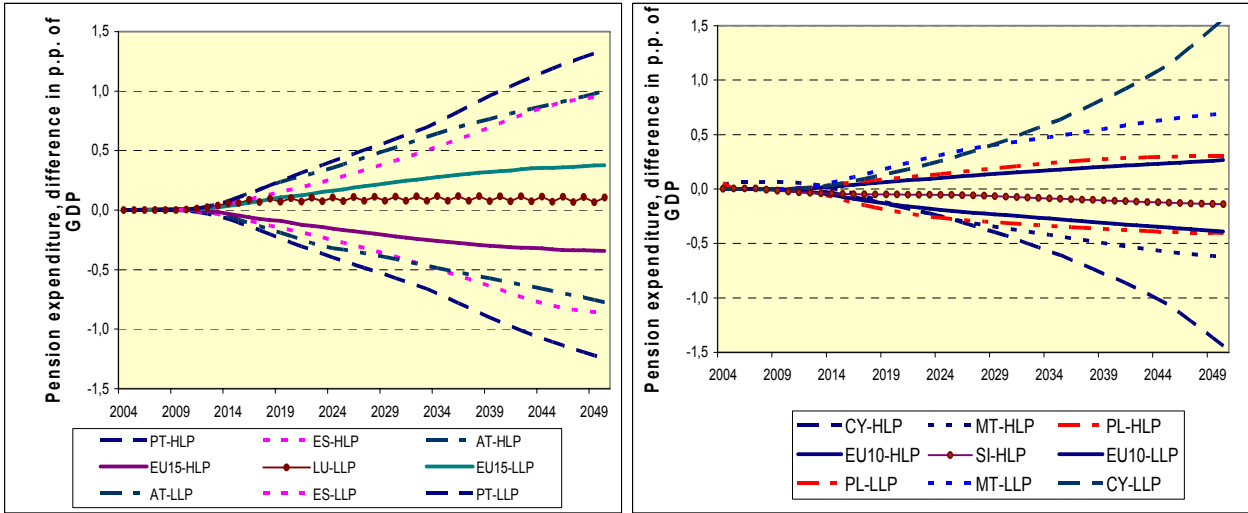
When looking at different countries, it was recognised that the assumed change in the labour productivity – and wage – growth rate does not affect pension spending as a percentage of GDP in countries where pensions are indexed to wages such as DE, LU and SI for earnings-related pensions and DK and NL for flat-rate pensions. In Ireland too, flat-rate pensions are assumed to develop in line with earnings although they are not formally linked to a wage index. In Germany, the indexation is basically linked to wages although it is further adapted to the changes in the ratio between the numbers of pensioners and employees. In this exercise, where only the labour productivity growth rate was changed, only the wage indexation was applied in Germany. In the above-mentioned countries, there is no (virtual) change in public pension spending according to the higher/lower labour productivity scenarios in comparison with the baseline.

Basically, higher/lower labour productivity assumptions should have the strongest effect on pension spending in countries where the indexation of pensions is furthest removed from wage indexation. Pensions are indexed to prices only in ES, FR, IT, AT and PL, while in the remaining countries they are linked to hybrid indices. Thus, these countries should be the furthest from the baseline in Graph 4-2. This is indeed broadly the case for ES and AT, but not for all countries with a price indexation. As far as EU15 Member States are concerned, it is not clear why the impact should be greater in Portugal than in Spain and Austria. In Italy and France, the projected impacts are of the same size (0.4-0.6 p.p.), somewhat lower than in Spain and Austria. In the EU10, Cyprus comes out with the greatest impact and then Malta and Poland. This is not the expected result as public pensions are partially indexed to wages in Cyprus, while in Poland they are fully indexed to prices, and in Malta, they are virtually indexed to prices only. In the case of Poland (projected impact only 0.2-0.4 p.p.), it could be asked whether the impact should be greater.

**Graph 4-1 Pension expenditure in the higher (HLP) and lower (LLP) labour productivity scenarios in comparison with the baseline projection (BL)<sup>11</sup>**



**Graph 4-2 Differences in pension expenditure as percentage points of GDP in selected countries between higher/lower labour productivity scenario and the baseline**

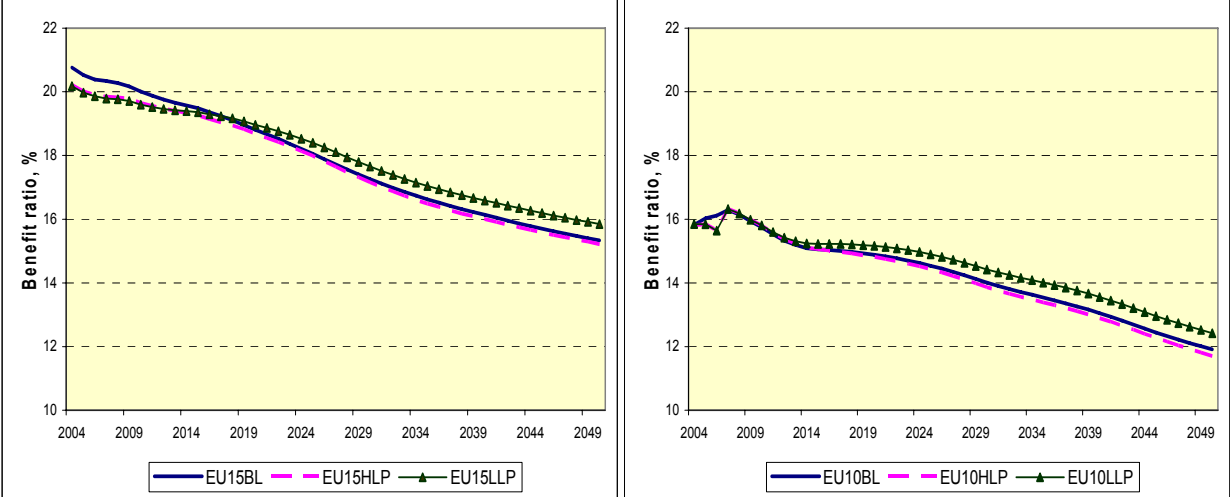


The assumption of the higher/lower labour productivity affects only the levels of pensions and wages while other assumptions and driving factors such as the old-age dependency ratio, employment rate or pension take-up rate remain unchanged. Thus, the benefit ratio becomes the only driving force regarding the change in the pension expenditure as a percentage of GDP (Graph 4-3). The interdependence between the wage and pension growth rates, albeit to varying degrees in different countries due to different indexation rules, leads to higher pensions in the higher productivity scenario and to lower pensions in the lower productivity scenario in comparison with the baseline scenario. However, the benefit ratios, which also take into account the changes in wages, are affected less than, but in opposite directions to, the changes in the average pension level (Graph 4-4). In other words, in the higher

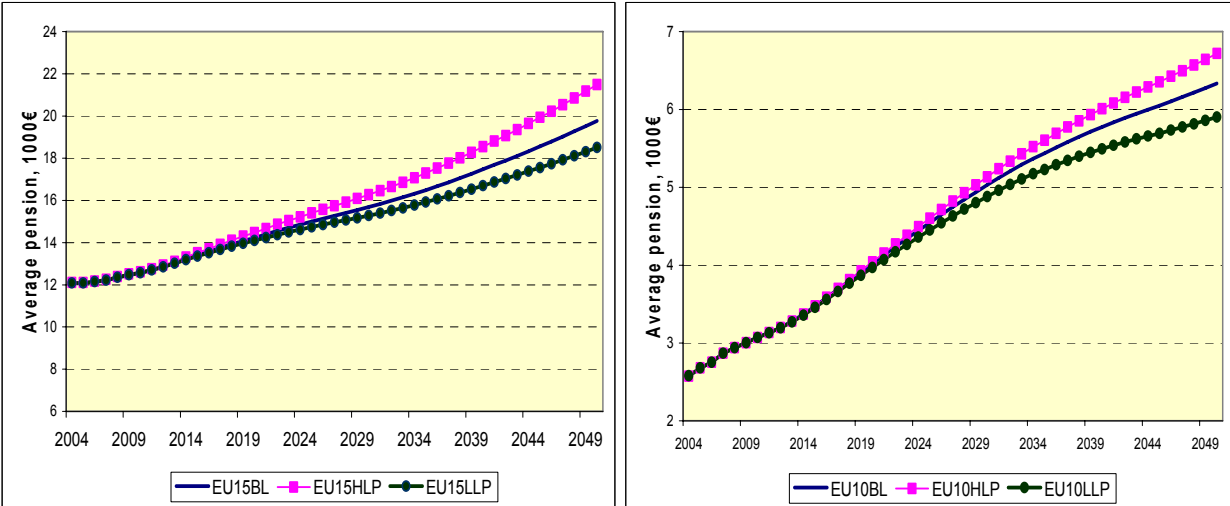
<sup>11</sup> GR, ES, LU and UK are excluded from the EU15 in this comparison because (all) data for the sensitivity scenarios were not provided.

productivity scenario, the benefit ratio decreases despite higher average pensions in comparison with the baseline scenario. Conversely, in the lower labour productivity scenario, the benefit ratio is higher but average pensions are lower than in the baseline scenario.

**Graph 4-3 Benefit ratios in higher (HLP) and lower (LLP) labour productivity scenarios in comparison with the baseline projection (BL)**



**Graph 4-4 Average pensions in higher (HLP) and lower (LLP) labour productivity scenarios in comparison with the baseline projection (BL)**



### 4.3. Higher employment and higher life expectancy scenarios relative to the baseline

**Higher life expectancy** will increase public pension expenditure in the EU as most public pension systems are defined-benefit schemes where the initial pension does not depend on the expected time in retirement. On average, both in the EU15 and EU10 in 2050, public pension spending is projected to be 0.3 p.p. of GDP higher than in the baseline projection (Graph 4-5). When the projections of different countries are looked at, the results are partially in line with the hypothesis that the increase in pension spending should be the highest in the countries with defined-benefit or flat-rate schemes. The projections of BE, DK, FR, MT, NL, PT, SI and SK – all of which have earnings-related defined-benefit or flat-rate public pension schemes – show the highest increases (0.5-0.6 p.p. of GDP) in pension spending when a higher life expectancy is assumed.

It is also in line with the hypothesis that the countries with notional defined-contribution schemes that include a life expectancy adaptation such as IT, SE, LV and PL project smaller increases (0.2-0.3 p.p. of GDP). It can be argued that the increase cannot be reduced to zero because there are also pensions such as minimum pensions that are not subject to defined-contribution rules. Also Finland and Germany project only a 0.2 p.p. increase. In the former, the introduction of a life-expectancy coefficient in the pension scheme and, in the latter, the practice of adapting pension indices with a sustainability factor can explain the relatively small increases. However, it is surprising that a number of countries with defined-benefit schemes project equally small or even smaller increases. Estonia, Hungary and Spain project only an increase of 0.1 p.p. and the United Kingdom 0.2 p.p.

These results might be translated into a rule of thumb that an increase in life expectancy by one year would increase public pension spending by 0.5 percentage point of GDP in countries with defined-benefit or flat-rate schemes (although there are outliers to this rule according to the projection results). In countries with defined-contribution schemes that include a life expectancy adaptation, the impact of increasing life expectancy appears to be about half of that in countries with defined-benefit schemes.

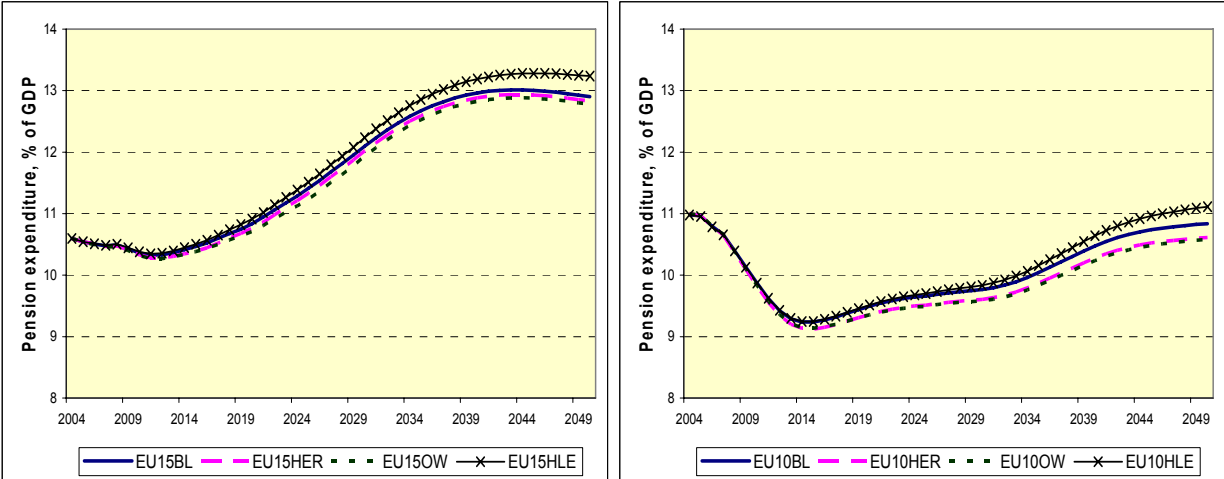
**A higher overall employment rate and a higher employment rate of older workers** have only a marginal impact on public pension spending relative to GDP. In the EU15, both scenarios – with about one percentage point increase in total employment – are projected to reduce public pension expenditure as a percentage of GDP by only 0.1 p.p. and in the EU10 by 0.2 p.p. (Graph 4-5). In other words, an employment increase of 10 percentage points would reduce public pension spending by 1-2 percentage points of GDP. This finding is also in line with the projected employment rate effect on pension spending in the baseline scenario.

The scenario of higher employment rate of older workers has a very similar impact on public pension spending. This is an expected result because the impact in overall employment rates is of the same magnitude. While, in general, these results can be explained by the high interdependence between pension expenditure, on one hand, and higher employment and a higher GDP, on the other hand, the differences in the results of different countries need some more explanation.

In particular, Hungary and Slovenia project essentially higher impacts than other countries. In Hungary, the higher overall employment rate would reduce pension spending in 2050 by 0.7 p.p. and the higher employment rate of older workers by 1.1 p.p. In Slovenia, the respective reductions are projected to be 0.4 p.p. and 0.9 p.p. Excluding Hungary and Slovenia, the impact of the higher total employment rate would be in the range of 0 to -0.2 percentage points, which cumulates during the period when the employment rate increases; thereafter, it broadly appears to remain at the lower level that it has reached (Graph 4-10).

Concerning the scenario of older workers, its impact would also be within a narrow range between 0.2 and -0.4 p.p. (excluding HU and SI). However, its impact was projected to cumulate over a longer period, up to 2025, although the employment impact was assumed to take place by 2015.

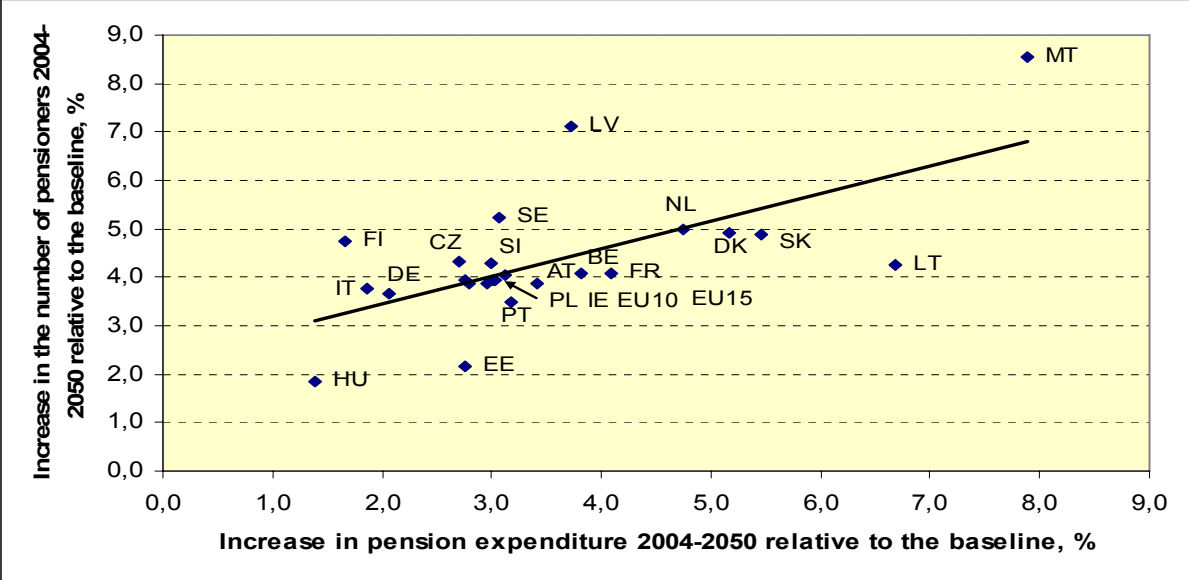
**Graph 4-5 Pension expenditure in the higher life expectancy (HLE), higher employment rate (HER) and higher employment rate of older workers (OW) scenarios in comparison with the baseline projection (BL)** <sup>12</sup>



When looking at the interdependence between the increases in the number of pensioners and in pension expenditure in the higher life expectancy scenario in comparison with the baseline scenario (Graph 4-6), a clear correlation emerges between these variables for the majority of countries. The main driver for the expenditure increase is the number of pensioners. The fact that the increase in pension expenditure is somewhat smaller than the increase in the number of pensioners was to be expected, given that the average level of the pensions of the oldest pensioners tends to be the lowest and the increased life expectancy increases the weight of these pensioners.

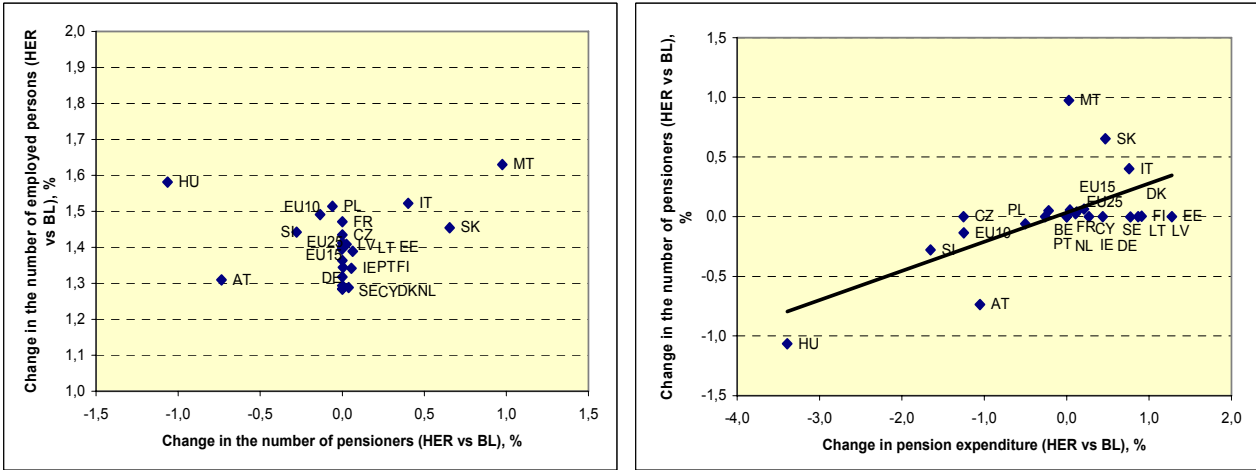
<sup>12</sup> GR, ES, LU, SE and UK are excluded from the EU15 and CY from the EU10 in this comparison because data for one or several sensitivity scenarios were not provided.

**Graph 4-6 Interdependence between the increases of the number of pensioners and pension expenditure when the higher life expectancy scenario (HLE) is compared with the baseline projection (BL)**



When comparing the scenarios of higher overall employment rate with the baseline scenario, the interdependencies are somewhat less clear-cut. The assumed increases in the employment rates, and thus in the number of employed persons, do not result in changes in the number of pensioners (the first pictures of Graph 4-7) in a great number of countries. This may be because the change reduces the number of the unemployed rather than pensioners. However, in some other countries, this is not the case: both the number of pensioners and pension expenditure are projected to decrease. This may point to some inconsistency between the modelling of the exits from the labour market in the labour force projections and the modelling of the entry into retirement in the national pension models.

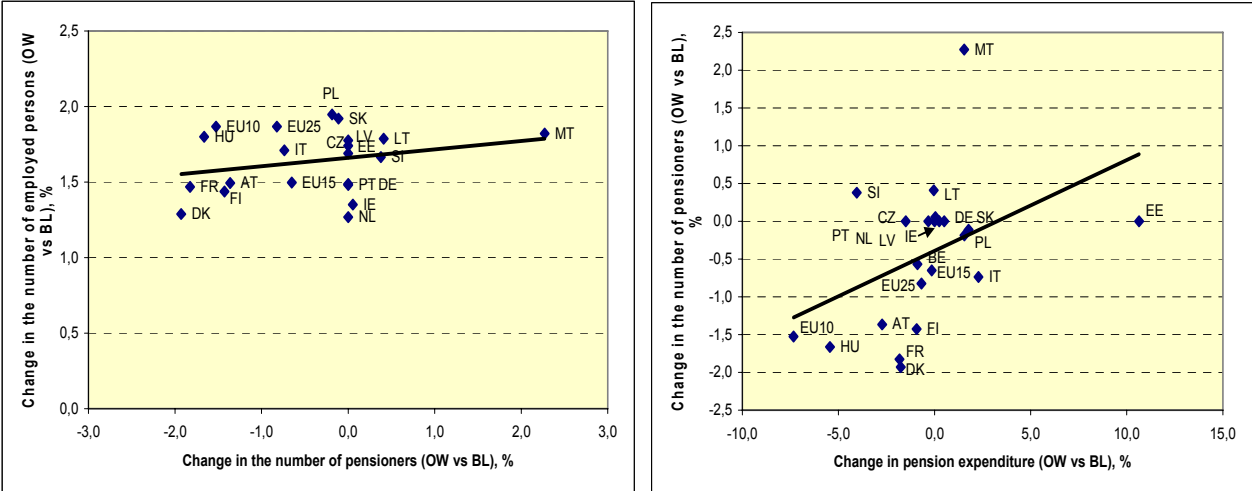
**Graph 4-7 Interdependencies between the changes in the number of employed persons, pensioners and the pension expenditure when the higher employment rate scenario (HER) is compared with the baseline (BL) scenario**





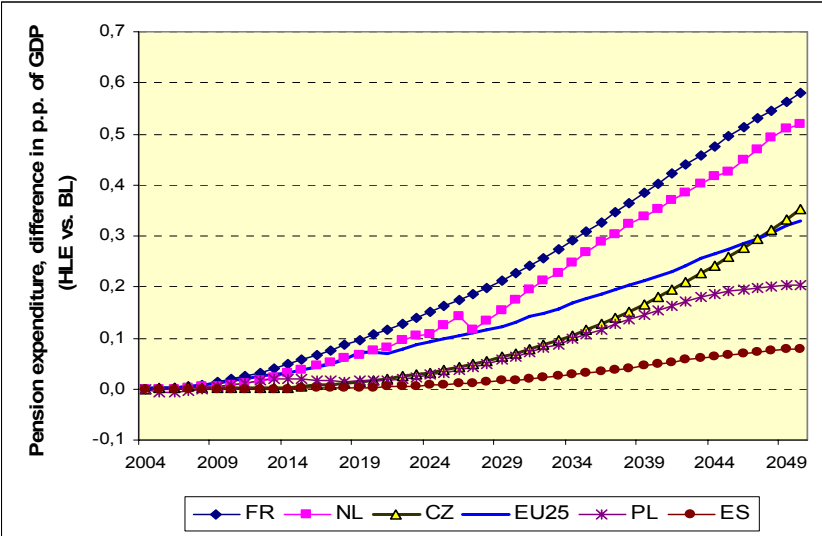
When the scenario of higher employment rates of older workers is compared with the baseline (Graph 4-8), the interdependencies are stronger: an increase in employment leads to a reduction in the number of pensioners, though a relatively smaller reduction and, in some countries, no reduction at all or even an increase. However, the impact seems to be stronger on pension expenditure than on the number of pensioners. This is surprising given that working longer should mean an accumulation of pension rights so that it would not have been expected that the change in pension expenditure would be stronger than in the number of pensioners.

**Graph 4-8 Interdependencies between the changes in the number of employed persons, pensioners and the pension expenditure when the higher employment rate of older workers scenario (OW) is compared with the baseline (BL) scenario**

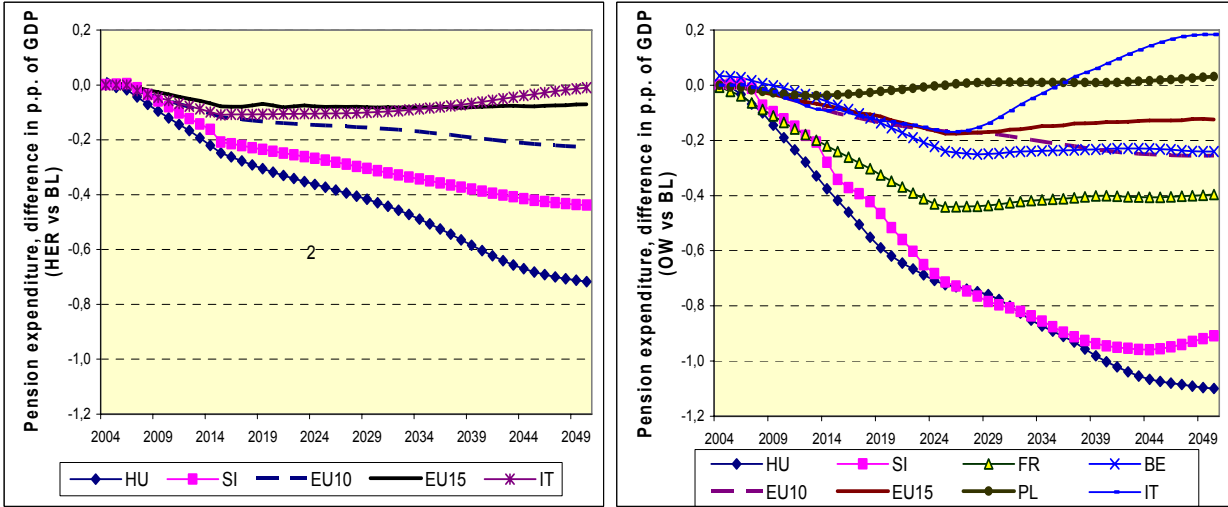


The following graphs (Graph 4-9, Graph 4-10) show the differences in pension expenditure projections between higher employment rate scenarios and the baseline projection for selected countries, covering the whole variation as they display the countries with the greatest and smallest differences. Table 4-1 shows the differences at the end of the projection period for all countries.

**Graph 4-9 Differences in pension expenditure as percentage points of GDP in selected countries between the higher life expectancy (HLE) and the baseline (BL) scenarios**



**Graph 4-10 Differences in pension expenditure as percentage points of GDP in selected countries in the higher employment rate (HER) and older workers (OW) scenarios in comparison with the baseline (BL)**

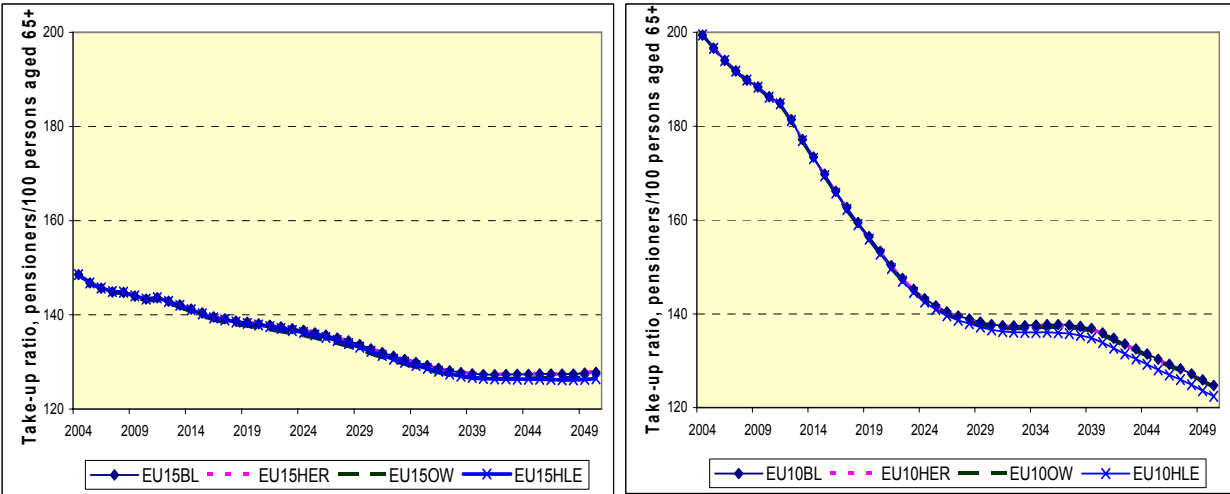


As far as the **driving forces** are concerned, in the scenario of higher life expectancy the impact on increasing pension expenditure comes principally from a higher old-age dependency ratio and a greater number of pensioners, while the take-up ratio remains relatively unchanged (in fact, marginally decreases), as does the average pension per pensioner. In countries where the pension level adjusts to life expectancy, such as IT, SE and FI, the average pension is somewhat lower. In some countries (LT and SI), the average pension is projected to slightly increase.

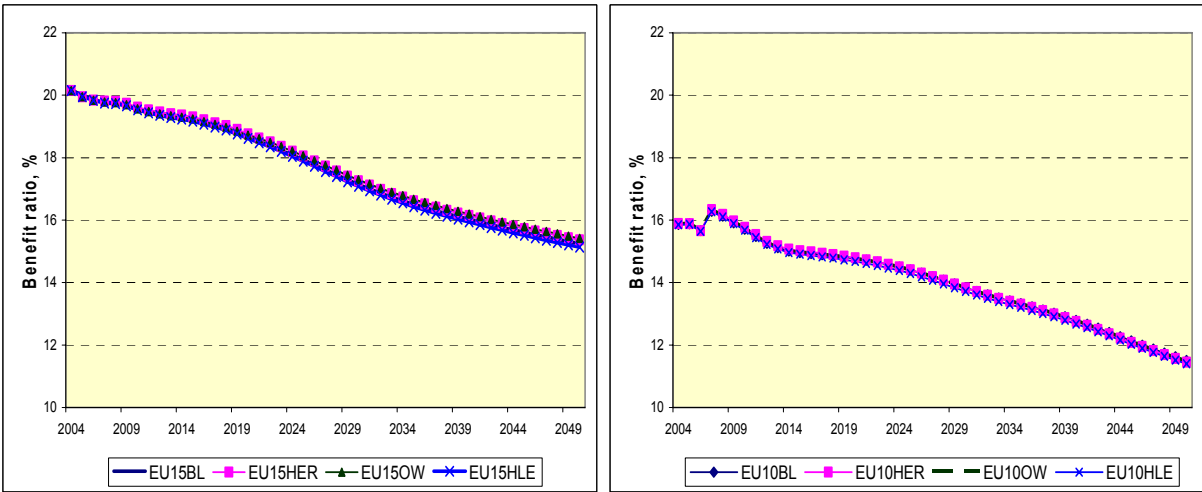
In the scenario of a higher total employment rate, the impact on pension expenditure is driven by the increased employment rate, while only very few countries project any impact on the take-up ratio or the average pension.

In the scenario of a higher employment rate of older workers, most countries have projected a slightly lower pension take-up ratio and a higher average pension. This suggests that Member States project that there will be few possibilities to retire on non-actuarial early pensions and that a longer working life will result in a higher accrual of pension rights and a later pension take-up.

**Graph 4-11 Pension take-up ratios in the scenarios of higher life expectancy (HLE), higher employment rate (HER) and the higher employment rate of older workers (OW) in comparison with the baseline projection (BL)**



**Graph 4-12 Benefit ratios in the scenarios of higher life expectancy (HLE), higher employment rate (HER) and the higher employment rate of older workers (OW) in comparison with the baseline projection (BL)**



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Carone, G. (2005), "*Long-term labour force projections in the EU-25 Member State: a set of data for assessing the impact of ageing*", European Economy, Economic Papers No. 235/2005, European Commission, Directorate-General for Economic and Financial Affairs.

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[http://ec.europa.eu/economy\\_finance/epc/epc\\_country\\_fiches\\_en.htm](http://ec.europa.eu/economy_finance/epc/epc_country_fiches_en.htm)

Australian Productivity Commission (2005), "*Economic Implications of an Ageing Australia*", Research Report, Canberra, Australia

## **ANNEX: Timing of the decomposed driving factors on public pension expenditure increases and the timing and decomposition of the pension take-up ratio by countries**

In the graph below, the first picture for each country shows the timing of the effect of the driving factors on public pension expenditure. The effect is measured as an average increase over a 5-year period. The respective EU15 and EU10 summary graphs were presented in section 3.3 (Graph 3-9 and Graph 3-10).

The second picture on the decomposition of the pension take-up ratio is presented only for those 15 countries which provided data on the number of pensioners by age group. In the graph, "take-up ratio 1" refers to the general take-up ratio of public pensions, i.e. all pensioners, including the age group of pension recipients below 55 years, relative to the old-age population, i.e., persons aged 65+. "Take-up ratio 2" refers to pensioners aged 55+ relative to persons aged 65+. The difference between take-up ratios 1 and 2 reflects the impact of pension recipients below 55 years, including those receiving survivors' pensions. The take-up ratio 2 is further decomposed to take-up ratios in respective age groups and the decomposition factor of elderly age groups as follows:

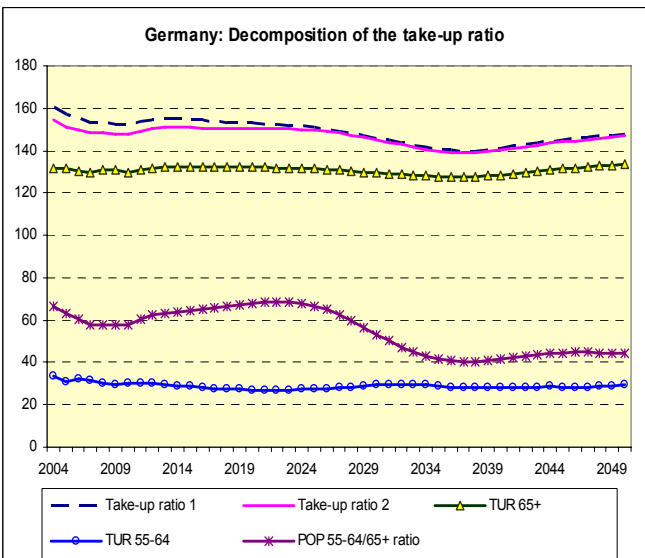
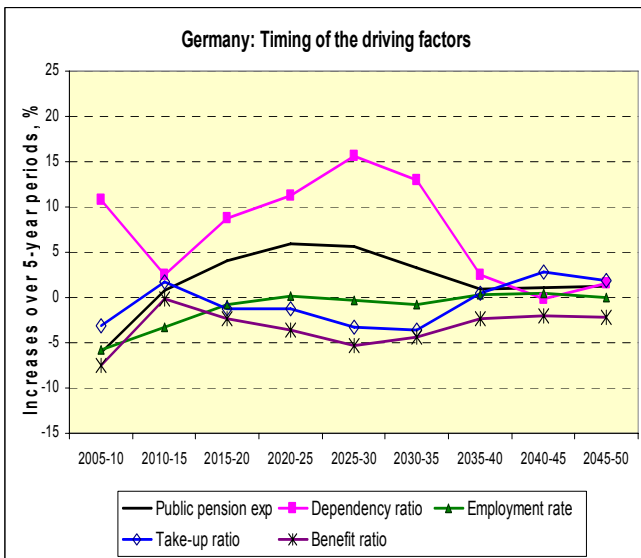
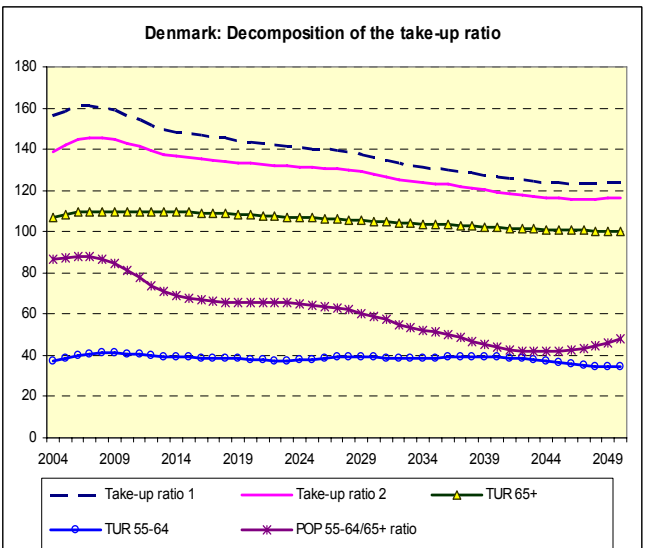
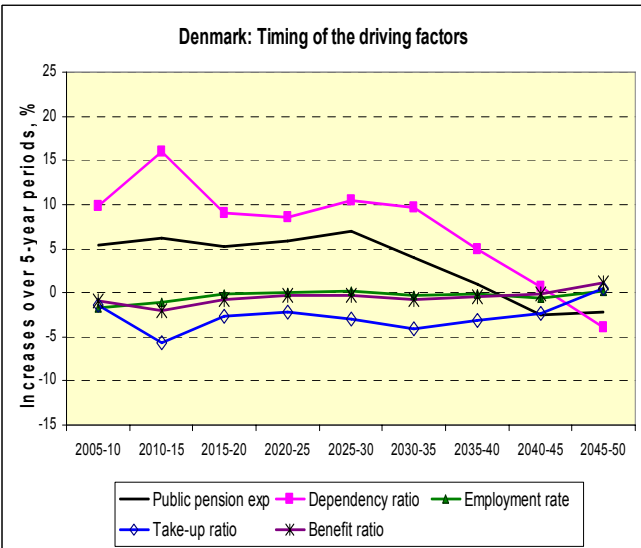
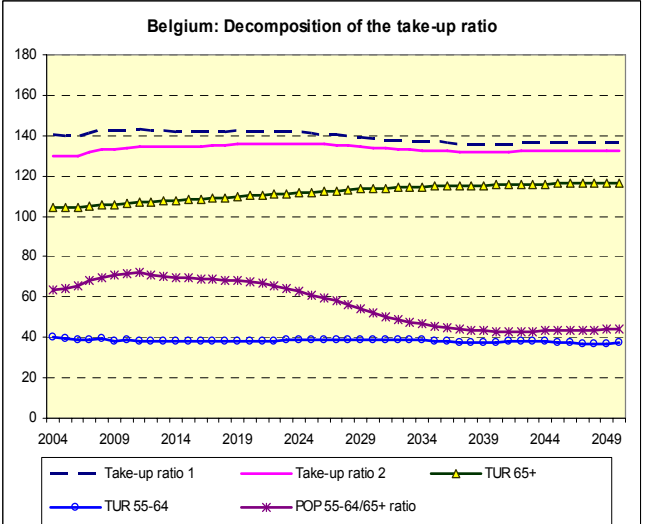
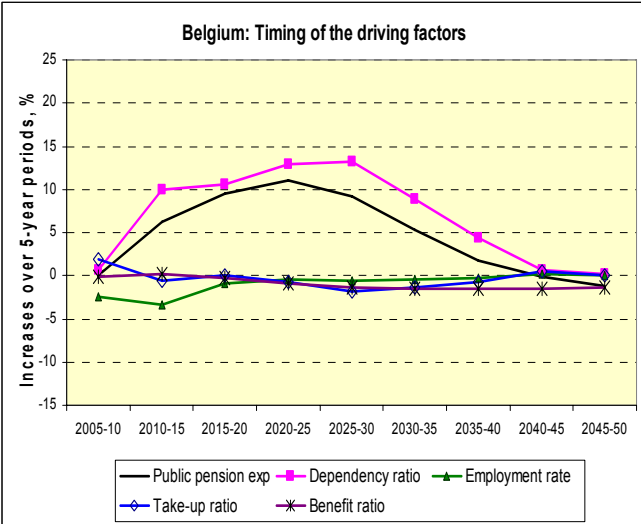
R = number of pensioners  
Pop = population (number of persons)

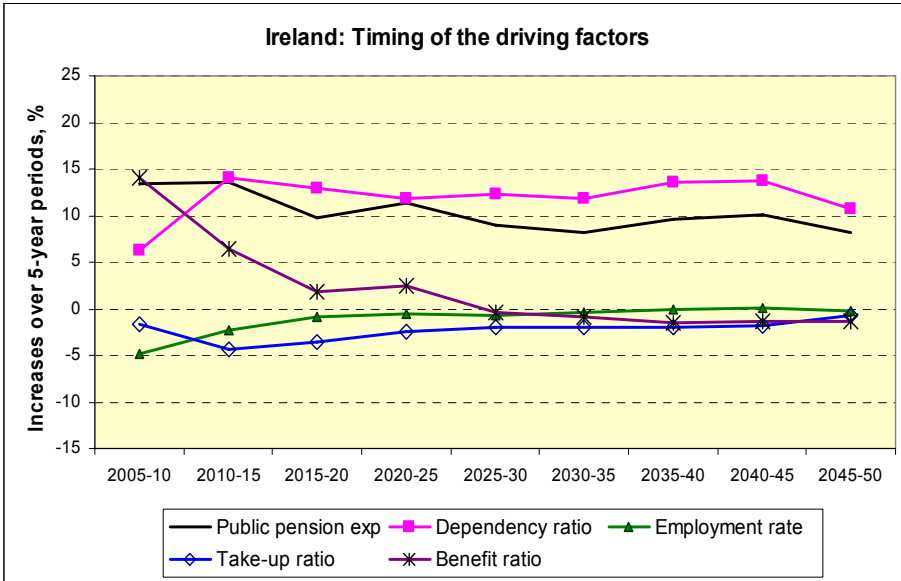
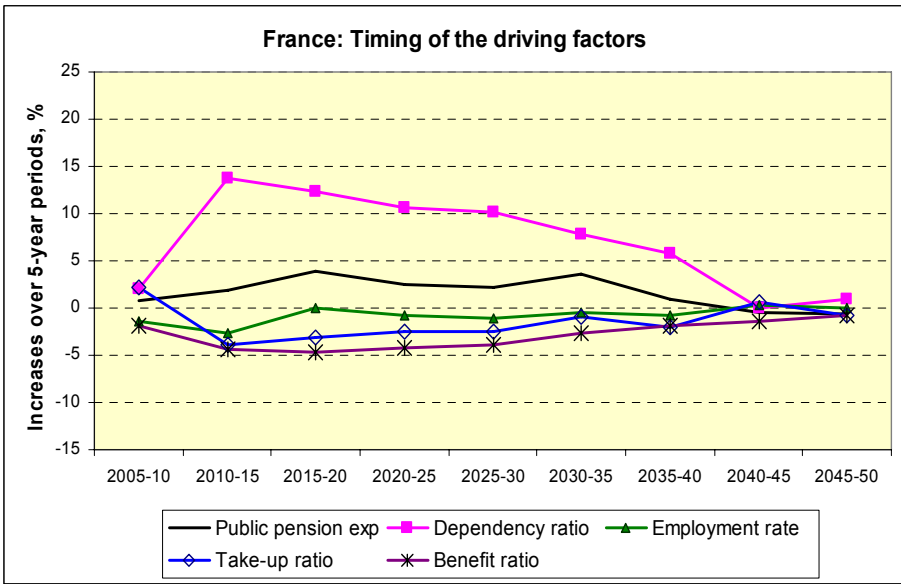
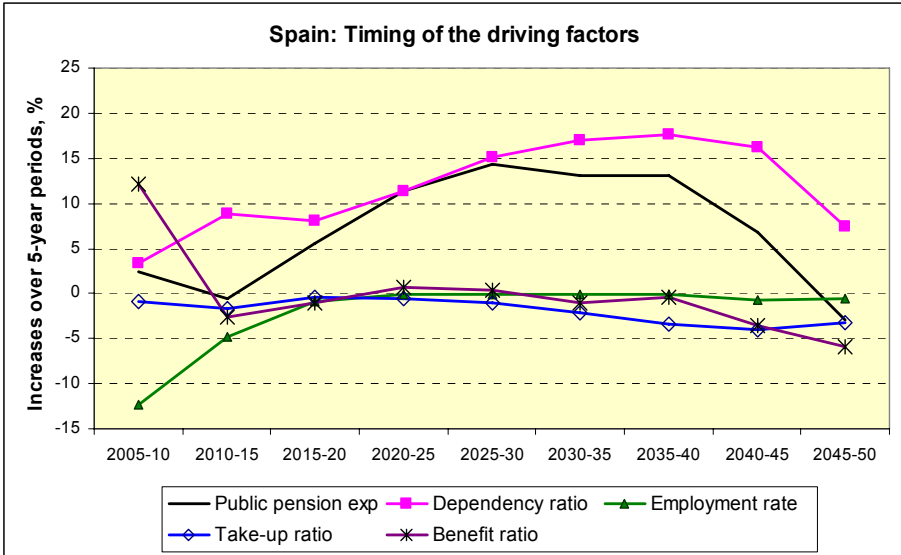
$$\text{Pension take-up ratio 2} = \frac{R_{55+}}{Pop_{65+}} = \frac{R_{65+}}{Pop_{65+}} + \frac{R_{55-64}}{Pop_{55-64}} \cdot \frac{Pop_{55-64}}{Pop_{65+}}$$

In this formula, the first term  $R_{65+}/Pop_{65+}$  (TUR<sub>65+</sub> in the graph legend) reflects the take-up of public pensions among the population aged 65+, i.e. in the age group above the standard retirement age in most countries. The second term  $R_{55-64}/Pop_{55-64}$  (TUR<sub>55-64</sub> in the graph legend) reflects the take-up of early pensions in the respective population age group. A decrease in the pension take-up in this group would imply a change in the eligibility rules and pension behaviour. The third term  $Pop_{55-64}/Pop_{65+}$  reflects the composition effect of age groups and is purely a demographic effect. It is worth noting that the pension take-up ratio in the oldest age groups exceeds 100% in many countries. This is acceptable to the degree that it reflects the pension take-up among non-resident population while the population figures refer to resident populations. Also, in some countries (DE, ES, LV, LT, AT), the starting level is above 100% due to the fact that the figure actually measures the number of pensions, not pensioners, meaning that different types of pensions, e.g. survivors' and old-age pensions, are counted separately.

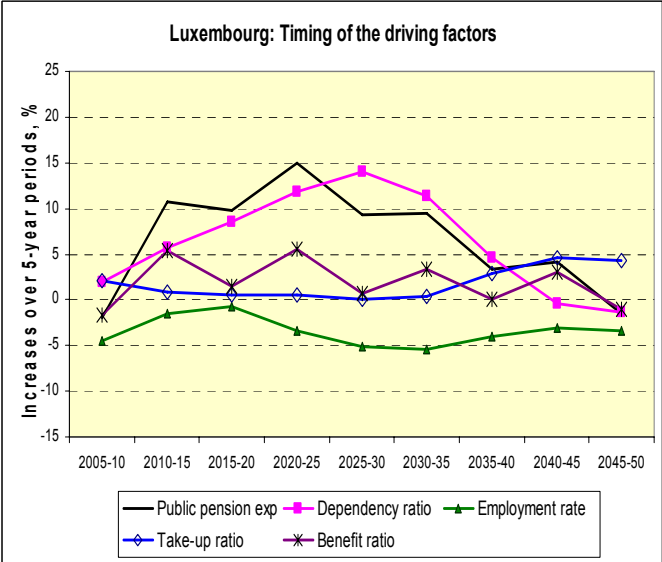
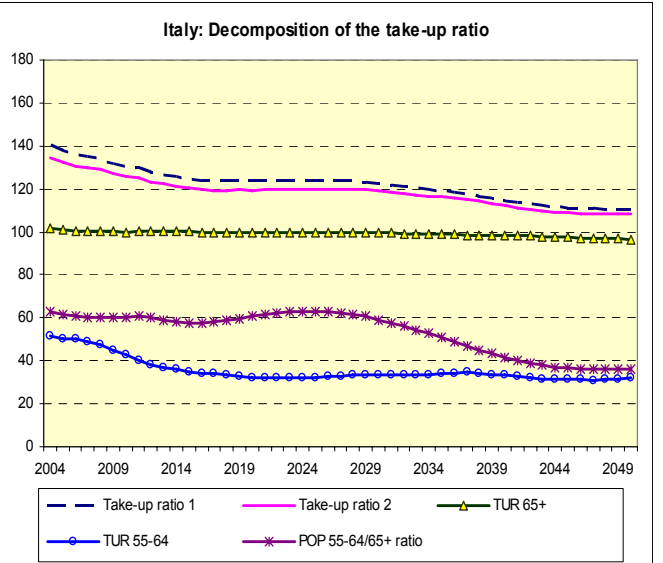
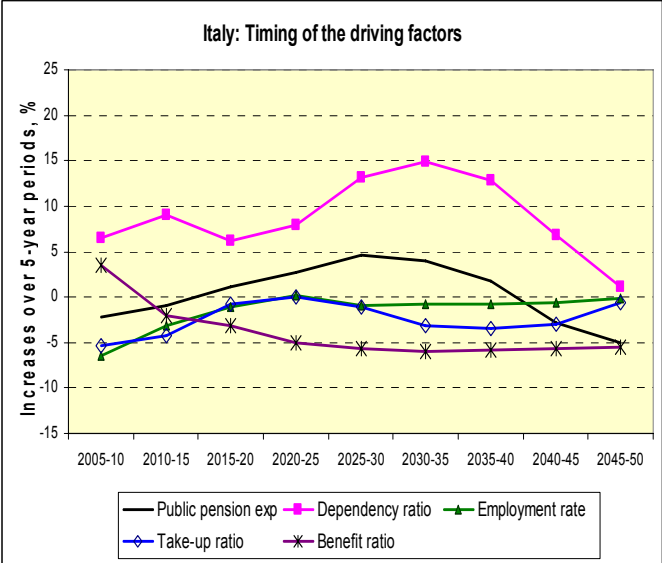
Concerning the results of individual Member States, it can be noted that the timing and the magnitude of different driving factors vary substantially across countries. The dependency ratio is the strongest push factor in all countries. It also appears that when the old-age dependency ratio increases fastest, the relative offsetting impact of the pension take-up ratio increases at the same time. However, in general, this does not seem to mean that the take-up of pensions in age-specific or younger age groups decreases, despite the fact that the overall take-up ratio does so. The evolution of the overall take-up ratio is strongly influenced by the composition effect of age groups, namely by a decreasing age group of persons aged 55-64. In fact, in most countries, the evolution of the overall take-up ratio follows quite closely the evolution of this demographic component.

Despite this general trend in country-specific results, a valid question might be how feasible it is that there could be a major decrease in the pension take-up ratio in the age group of persons aged 65+, as is projected in Austria, Poland and Estonia. In Austria and Poland, the take-up ratio is even expected to go clearly below 100%. In Malta, the pension take-up ratio among persons aged 65+ is expected to remain around 80%, which appears low in comparison with most Member States. Concerning the evolution of the pension take-up ratio among those aged 55-64 years, the projected decrease is substantially larger in EU10 Member States than in the EU15. Although these reductions appear in countries which recently have enacted pension reforms and thus the overall trend is plausible, it might be asked whether the projected decreases in some Member States are too optimistic.









Note that in the Luxembourg graph the dependency ratio refers to the resident population while the employment rate and the pension take-up rate include also cross-border workers and cross-border pensioners.

