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Pension Reforms in the EU since the Early 2000's: Achievements and Challenges Ahead

Giuseppe Carone, Per Eckefeldt, Luigi Giamboni, Veli Laine and Stéphanie Pamies Sumner

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Pension Reforms in the EU since the Early 2000's:

Achievements and Challenges Ahead

Giuseppe Carone, Per Eckefeldt, Luigi Giamboni, Veli Laine, Stéphanie Pamies Sumner

Abstract

Most EU Member States have carried out substantial pension reforms over the last decades in order to enhance fiscal sustainability, while maintaining adequate pension income. The intensity of pension reforms has been particularly strong since 2000. These reforms have been implemented through a wide range of measures that have substantially modified the pension system rules and parameters. One of the most important elements of pension reforms, aside of whether countries engaged or not in a systemic change, has been the introduction of mechanisms aimed at automatically adjusting (indexing) the key pension parameters (pension age, benefits, financing resources) to demographic pressure (e.g. changes in life expectancy, increase in the dependency ratio). Indeed, since the mid-1990's, half of the EU Member States have adopted either automatic balancing mechanisms, sustainability factors and / or automatic links between retirement age and life expectancy. All these pension reforms are projected to have a substantial impact on containing future pension expenditure trends. According to the latest long-term projections in the 2015 Ageing Report, public pension expenditure is projected to be close to 11% of GDP over the long run in the EU, almost the same as in 2013.

However, the fiscal impact of ageing is still projected to be substantial in many EU countries, becoming apparent already over the course of the next two decades. This is also due to the very gradual phasing in of already legislated reforms, an issue that raises questions about the intergenerational fairness of the reforms and poses some doubt on the time-consistency of their implementation. Indeed, the sustainability-enhancing pension reforms legislated in a majority of EU countries will lead to a reduction of generosity of public pension schemes for future generations of retirees. But to make sure that these reforms will not have to face political and social resistance and risk of reversal in the moment they start to be implemented in full, other "flanking" policy measures are likely to be necessary: for example, reforms that boost retirement incomes by effectively extending working lives and employability of older workers (also through flexible working arrangements that allow people to keep working beyond current formal retirement age and to step down gradually from full-time to part-time to very part-time work) and provide other means of retirement incomes (e.g. private pensions) and appropriate social safety nets to avoid that people fall into poverty in old age.

JEL Classification: H55, J26, J1.

Keywords: Pensions, ageing population, public expenditure, debt, deficit, potential growth, structural reforms, retirement age, older workers, longevity risk.

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1. INTRODUCTION

Most EU Member States have carried out gradual and in some cases substantial pension reforms over the last decades in order to enhance fiscal sustainability, while maintaining adequate pension income. The intensity of pension reforms has been particularly strong since 2000. These reforms have been implemented through a wide-range of measures that have modified substantially the pension system rules and parameters (e. g. pension age, retirement incentives, pension calculation, indexation, social contributions). Pension reforms have generally been implemented only gradually and over long time periods. Several Member States have additionally adopted more systemic reforms, by strongly supporting the introduction of new pillars and / or radically changing the nature of their public pension schemes. Moreover, more than half of the EU Member States have now introduced automatic mechanisms, linking key pension system parameters to life expectancy.

The great recession that hit the European Union in 2008-09 prompted in many countries an acceleration of sustainability-enhancing pension reforms, through the adoption of additional measures with sometimes short-term impacts. In some cases, partial or full reversals of past systemic reforms were observed.

The projected low birth rates and expected continued increases in life expectancy will result in an almost unchanged, but much older, population by 2060. The EU is expected to move from having about four working-age people (aged 15-64) for every person aged over 65 to a ratio of only two to one. On account of the expected reduction of the working population in Europe, potential growth is likely to be much lower than experienced in previous decades, and the need for public provision of age-related transfers and services will at the same time increase.

On the one hand, it should be acknowledged that there has been considerable progress with pension reforms. The improvements are already visible, for instance with regard to employment rates that have risen on account of pension reforms, especially among older workers. Moreover, pension reforms display a substantial impact on containing future pension expenditure trends. According to the latest long-term projections in the 2015 Ageing Report, public pension expenditure is projected to be close to 11% of GDP over the long run in the EU, almost the same as in 2013.

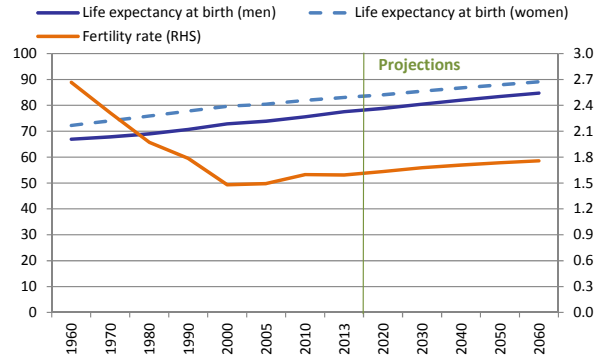
On the other hand, the fiscal impact of ageing is still projected to be substantial in many EU countries, becoming apparent already over the course of the next decade, also because of the very gradual phasing in of already legislated reforms, an issue that raises questions about the intergenerational fairness of the reforms and poses some doubt on the time-consistency of their implementation. Indeed, the sustainability-enhancing pension reforms legislated in a majority of EU countries will lead to a reduction of generosity of public pension schemes for future generation of retirees. This has reduced the expenditure-increasing effects of demographic change in the long-term. But to make sure that these reforms will not have to face political and social resistance in the moment they start to be implemented in full, other reforms are likely to be necessary: for example, reforms that boost retirement incomes by effectively extending working lives and provide other means of retirement incomes (e.g. private pensions). Hence, more needs to be done in this respect.

This paper draws heavily on the wealth of information contained in the five vintages of the joint EC (ECFIN) and EPC (AWG) Ageing Reports (published in 2001, 2006, 2009, 2012 and 2015). The paper is organised as follows. Chapter 2 analyses the features of the pension reforms over the last decade. Chapter 3 assesses the budgetary savings resulting from the estimated impact of pension reforms, making use of the 5 vintages of long-term budgetary projections (released in 2001, 2006, 2009, 2012 and 2015), carried out jointly by the Commission services (DG ECFIN) and the group of Member States' experts on ageing (the AWG, attached to the Economic Policy Committee). Chapter four describes the impact of the reforms on the actuarial fairness, the financial sustainability and the adequacy of EU pension systems. The paper concludes by describing remaining challenges and policy options.

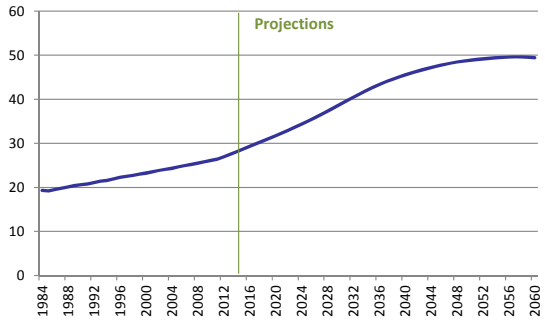
2. TRENDS IN PENSION REFORMS: AN AREA OF DECISIVE POLICY ACTION CHALLENGED BY THE 2008-09 FINANCIAL CRISIS

The age structure of the EU population is projected to dramatically change in the coming decades, due in particular to an increasing longevity and low fertility (see Graph 1). The demographic old-age dependency ratio (people aged 65 or above relative to those aged 15-64) is projected to increase from less than 25% in 2001 to around 50% in 2060 (according to the Ageing Report 2015 - see Graph 2). This long-term increase was even projected to be higher in the previous vintages of the Ageing Report (for example, + 25 pp. in 2001 - see Table 1). This population ageing trend poses important fiscal sustainability challenges in the medium and long term, as (all else being equal) larger cohorts of pensioners put pressures on public pension expenditures (the additional EU average spending - without taking into account other effects[1] - due to the "ageing" effect has been estimated at around + 7½ pp. of GDP in the long term in the different vintages of the Ageing Reports).

Graph 1. **Actual and projected life expectancy and fertility rate in the EU (2015 AR)**



Graph 2. **Actual and projected old-age dependency ratio in the EU (65+/ 15-64 –2015 AR)**



Source: Ageing Report (2015)

Table 1. **Main demographic assumptions through the different AR vintages (EU average)**

	2001 AR*	2006 AR**	2009 AR***	2012 AR***	2015 AR
Fertility rate (convergence value)	1.7	1.6	1.7	1.7	1.8
Increase in LE (Men)	5.0	6.3	8.9	7.9	7.1
Increase in LE (Women)	4.2	5.1	7.2	6.5	6.0
Migration (start period) - as % of total pop	0.2	0.3	0.4	0.2	0.0
Migration (end period) - as % of total pop	0.2	0.2	0.2	0.2	0.2
Old-age dependency ratio (overall change)	**25.0**	**26.9**	**27.0**	**29.0**	**22.0**

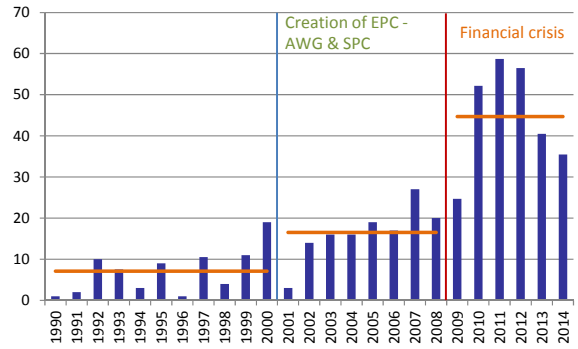
* BE, DK, DE, EL, ES, FI, IE, IT, LU, NL, AT, PT, FI, SE, UK
** All MSs except EL, BG, RO & HR
*** All MSs except HR

Source: Ageing Report (2001 to 2015), Eurostat

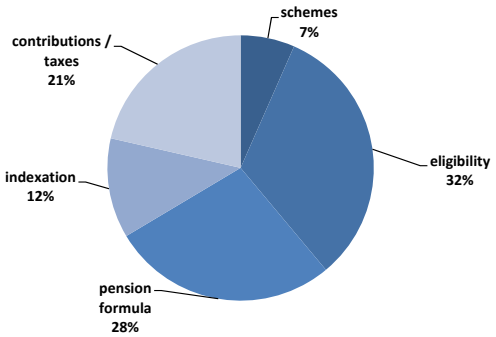
[1] This estimation corresponds to the change in public pension expenditure due to the dependency ratio component (holding constant other factors such as the coverage ratio, the benefit ratio or the labour market ratio i. e. not taking into account the impact of pension reforms, see section 3 of the paper).

In order to enhance fiscal sustainability, while maintaining adequate pension income, most EU Member States have carried gradual and substantial pension reforms over the last decades. [2] The intensity of pension reforms has been particularly strong since 2000 (see Graph 3). These reforms generally comprised a wide-range of measures (see Graph 4). Most European countries modified substantially their pension system rules and parameters (e. g. pension ages, retirement incentives, pension calculation, indexation, social contributions). Pension reforms are often implemented gradually over long time periods. Several Member States additionally adopted more systemic reforms, by strongly supporting the introduction of new pillars and / or radically changing the nature of their public pension schemes (see section 2.1.2). Moreover, the great recession that hit the European Union in 2008-09 prompted in many countries an acceleration of sustainability-enhancing pension reforms, through the adoption of additional measures, with sometimes short-term impacts. In some cases, partial or full reversals of past systemic reforms were also observed (see section 2.2).

Graph 3. **Number of (main) pension measures in the EU since the 1990's**



Graph 4. **Decomposition of (main) pension measures in the EU since the mid-2000's**



Source: Authors calculation based on the Ageing Report (2009, 2012, 2015), European Economy (2007), SPC 2015 Report, OECD (2012, 2014, 2015).

Notes: i) These figures are based on the main pension measures adopted by EU countries as reported in the different papers quoted (both for public and private pensions). They are not necessarily comprehensive and involve to some extent a subjective analysis. ii) Pensions measures have been decomposed in 5 broad categories: eligibility measures (e. g. pension ages, required contributory period), pension formula (e. g. definition of pensionable earnings, accrual rates, valorisation), indexation (for pensions in payment), resources (e. g. social contributions, taxes) and schemes (merge or closure of pension schemes).

Based on the rich set of information contained in the five Ageing Reports published jointly by the European Commission (DG ECFIN) and the Economic Policy Committee, this chapter describes the main reforms in the EU over the last decade. Section 2.1.1 highlights the main overall trends in terms of parametric pension reforms, while section 2.1.2 focuses on a subset of countries, which additionally adopted more systemic reforms. While these first two sections put the emphasis on sustainability-enhancing measures (that has been the main objective of pension reforms over the last decades[3]), section 2.1.3 provides a brief discussion of accompanying pension measures aimed at improving adequacy or further harmonising public pension schemes [4].

[2] Projected increases in pension expenditure can pose significant challenges to fiscal sustainability. See Carone et al. (2014) for a coherent framework for assessing fiscal sustainability challenges.

[3] This is also the focus of this paper.

[4] See Table A.1 in the Annex for an overview of the main type of reforms adopted by country according to their intensity.

2.1. (PUBLIC) PENSION REFORMS: MAIN OVERALL TRENDS

2.1.1. European countries substantially reformed their (public) pension system through a succession of parametric reform

Increasing retirement ages

Over the last decade(s), the most common measure adopted to address pension sustainability challenges in the EU has consisted of raising pension ages. Indeed, nearly all European countries have increased the level of early and statutory **retirement ages** (the only exception being Luxembourg). In some cases (e.g. Greece, Sweden, France and Finland), particularly large increases have been legislated between 2008 and 2013 (see below). Looking forward, according to the Ageing Report 2015, only Luxembourg and Sweden have not legislated (further) rises of pension ages. Austria and Slovenia also project increases limited to women (in order to harmonise pension age between genders). The largest progression of statutory retirement age over the period 2008 – 2060 is projected in Denmark, the Czech Republic, Greece, Italy and Slovakia (see Table 2). However, despite this common upward trend, an important dispersion of pension ages should remain in the long run: for example, in 2060, the statutory retirement age should be as high as 72.5 in Denmark (for both men and women) against 63 for women in Bulgaria (see Graphs 5 and 6).[5] At this date, the norm in terms of statutory retirement age should be around 67 against 65 for men and 63 for women currently (see Table 2). Comparing the last two vintages of the Ageing Report (2012 and 2015), a significant upward revision (by close to one year) of the projected increase of the statutory retirement age can be observed (see Table 3).

As the effective exit age from the labour market tends to be lower than the legal pension age, most Member States also introduced different measures in order to change the **incentives to retire** (with the effect of reducing relative pension benefits, see next sub-section):

- Pathways to early retirement, many of which were introduced in the 1970's in response to rising unemployment (e.g. specific early retirement schemes, use of unemployment or sickness insurance schemes for older workers), have been closed to new entrants or severely restricted (including disability pensions) in most of European countries (e.g. Spain, France, Netherlands, Austria, Romania, Finland, Sweden);

- Increases in the number of years of contributions required to receive a (full) pension have also been a frequent feature of pension reform packages (the average contributory period estimated at around 34 years on average at the EU level in 2014 is projected to increase by 4 years to around 38 years in 2060, according to the Ageing Report 2015);

- The introduction of bonuses / penalties paid / imposed on people retiring after / before the normal pension age is frequently observed (such incentives currently exist in 18 EU countries - see Ageing Report 2015);

- Easing of the conditions to cumulate pension and wage (e. g. Czech Republic, Spain, Romania). Some countries even abolished the notion of statutory retirement age (e.g. in Sweden, where the retirement age is flexible[6], and in the UK, where the State pension age corresponds to the age after which a public pension can be received, whether or not the individual has retired).

[5] The impact of the 2015 Bulgarian pension reform has not been taken into account in this paper.

[6] Although laws on employment protection stipulate that an individual is entitled to stay in employment until his / her 67th birthday, but not after that.

Table 2. **Statutory and early retirement ages (in bracket)**

	MEN					WOMEN				
	2008	2013	2020	2040	2060	2008	2013	2020	2040	2060
BE	65	65 (60.5)	65 (63)	67 (63)	67 (63)	64	65 (60.5)	65 (63)	67 (63)	67 (63)
BG	63	63.7 (63.7)	65 (65)	65 (65)	65 (65)	59.5	60.7 (60.7)	62.7 (62.7)	63 (63)	63 (63)
CZ*	61.8	62.7 (59.7)	63.7 (60)	66.5 (61.5)	69.3 (64.3)	56-60	59.7 (56.7)	61.7 (58.7)	66.5 (61.5)	69.3 (64.3)
DK*	65	65 (60)	66 (63)	70 (67)	72.5 (69.5)	65	65 (60)	66 (63)	70 (67)	72.5 (69.5)
DE	65	65.3 (63)	65.8 (63)	67 (63)	67 (63)	65	65.3 (63)	65.8 (63)	67 (63)	67 (63)
EE	63	63 (60)	63.8 (60.8)	65 (62)	65 (62)	60.5	62 (59)	63.8 (60.8)	65 (62)	65 (62)
IE	65	65 (65)	66 (66)	68 (68)	68 (68)	65	65 (65)	66 (66)	68 (68)	68 (68)
EL*	65	67 (62)	67 (62)	69.9 (64.9)	71.9 (66.9)	60	67 (62)	67 (62)	69.9 (64.9)	71.9 (66.9)
ES	65	65 (63)	65.8 (63)	67 (63)	67 (63)	65	65 (63)	65.8 (63)	67 (63)	67 (63)
FR	65	65.8 (60.8)	67 (62)	67 (62)	67 (62)	65	65.8 (60.8)	67 (62)	67 (62)	67 (62)
HR	-	65 (60)	65 (60)	67 (62)	67 (62)	-	60.8 (55.8)	62.5 (57.5)	67 (62)	67 (62)
IT*	65	66.3	66.8	68.4 (65.4)	70 (67)	60	62.3	66.8	68.4 (65.4)	70 (67)
CY*	65	65 (63)	65 (63)	67 (65)	69 (67)	65	65 (63)	65 (63)	67 (65)	69 (67)
LV	62	62 (60)	63.8 (61.8)	65 (63)	65 (63)	62	62 (60)	63.8 (61.8)	65 (63)	65 (63)
LT	62.5	62.8 (57.8)	64 (59)	65 (60)	65 (60)	60	60.7 (55.7)	63 (58)	65 (60)	65 (60)
LU	65	65 (57)	65 (57)	65 (57)	65 (57)	65	65 (57)	65 (57)	65 (57)	65 (57)
HU	62	62 (62)	64.5 (64.5)	65 (65)	65 (65)	62	62 (62)	64.5 (64.5)	65 (65)	65 (65)
MT	61	62 (61)	63 (61)	65 (61)	65 (61)	60	62 (61)	63 (61)	65 (61)	65 (61)
NL*	65	65.1 (65.1)	66.3 (66.3)	69.3 (69.3)	71.5 (71.5)	65	65.1 (65.1)	66.3 (66.3)	69.3 (69.3)	71.5 (71.5)
AT	65	65 (62)	65 (62)	65 (62)	65 (62)	60	60 (58.8)	60 (60)	65 (62)	65 (62)
PL	65	65.3 (65.3)	67 (67)	67 (67)	67 (67)	60	60.3 (60.3)	62 (62)	67 (67)	67 (67)
PT*	65	65 (55)	66.4 (55)	67.7 (55)	68.8 (55)	65	65 (55)	66.4 (55)	67.7 (55)	68.8 (55)
RO	63	64.7 (59.7)	65 (60)	65 (60)	65 (60)	58	59.7 (54.7)	61.4 (56.4)	63 (58)	63 (58)
SI	63	65 (58.3)	65 (60)	65 (60)	65 (60)	61	63.5 (58)	65 (60)	65 (60)	65 (60)
SK*	62	62 (60)	62.8 (60.8)	65.4 (63.4)	67.8 (65.8)	55-59	58.3 (56.3)	62.8 (60.8)	65.4 (63.4)	67.8 (65.8)
FI	62-68	68 (62)	68 (63)	68 (63)	68 (63)	62-68	68 (62)	68 (63)	68 (63)	68 (63)
SE	61-67	67 (61)	67 (61)	67 (61)	67 (61)	61-67	67 (61)	67 (61)	67 (61)	67 (61)
UK	65	65 (65)	66 (66)	66.7 (66.7)	68 (68)	60	61 (61)	66 (66)	66.7 (66.7)	68 (68)
EU	64	65 (61)	65 (62)	67 (63)	67 (64)	62	63 (60)	64 (61)	66 (63)	67 (64)
EA	64	65 (61)	66 (62)	67 (63)	67 (63)	63	64 (60)	66 (61)	67 (63)	67 (63)

Source: Ageing Report (2009, 2015), updated for Belgium (November 2015)

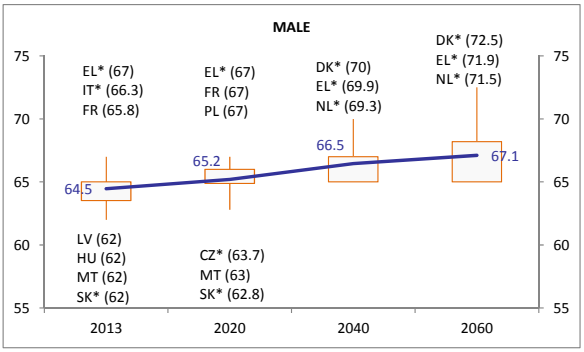
Notes: See the 2015 Ageing Report for additional information on these figures. Countries with a * have introduced an automatic link between the retirement age and life expectancy. The EU/EA figures are simple averages.

Table 3. **Projected change in the statutory retirement age in the EU: 2012 AR versus 2015 AR**

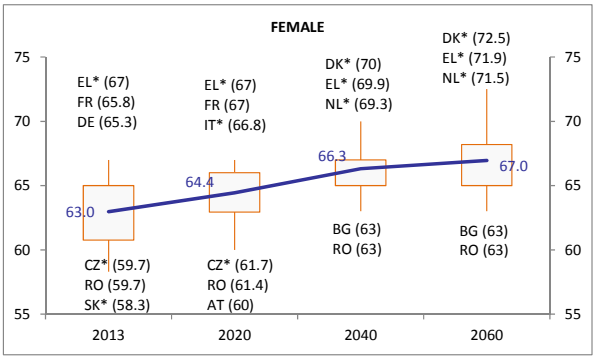
	Male		Female	
	2012 AR	2015 AR	2012 AR	2015 AR
Average absolute increase (2060 - base year)	1.8	2.6	3.2	4.0
Number of countries projecting an increase	15	23	17	25

Source: Ageing Report (2012, 2015), updated for Belgium (November 2015)

Graph 5. **Statutory retirement age, male**



Graph 6. **Statutory retirement age, female**

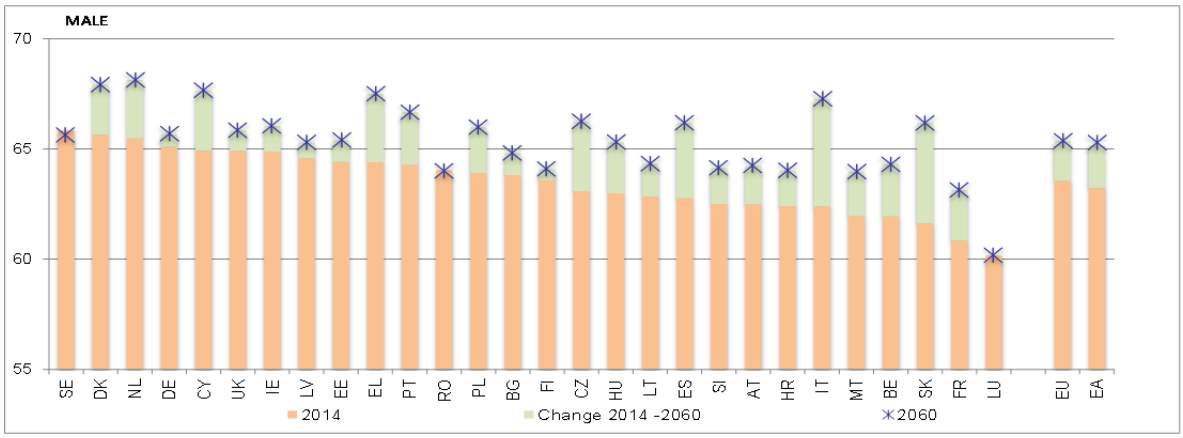


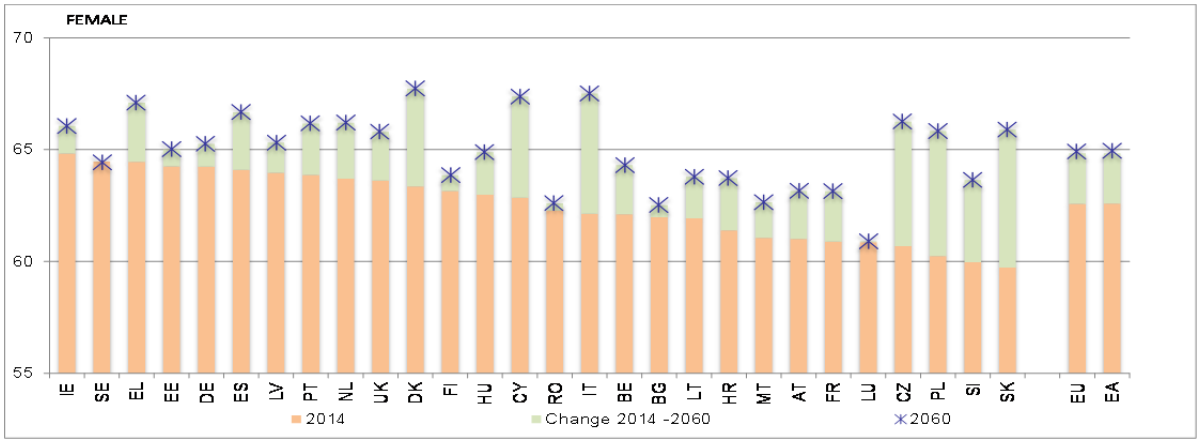
Source: Ageing Report (2015)

Notes: From 2040 onwards, the lowest statutory retirement age for males is 65 for most Member States, therefore countries are not reported below the average in Graph 5.

Because of the pension reforms that increase the statutory retirement age in a majority of Member States, longer working lives are projected, leading to an increase in the effective exit age from the labour market by about 2 years by 2060 in the EU (up by 1.8 years for men and by 2.3 years for women) (see Graph 7). Hence, the increase in the effective exit age is not projected to increase at the same pace as the statutory retirement age due to higher incidence of disability at higher ages and the prevalence of other pathways out of the labour force.

Graph 7. **Effective exit age from the labour market, males and females**

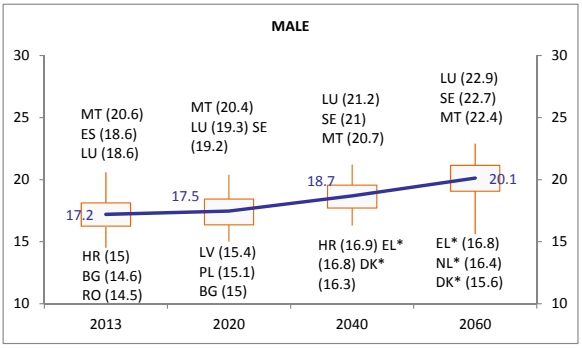




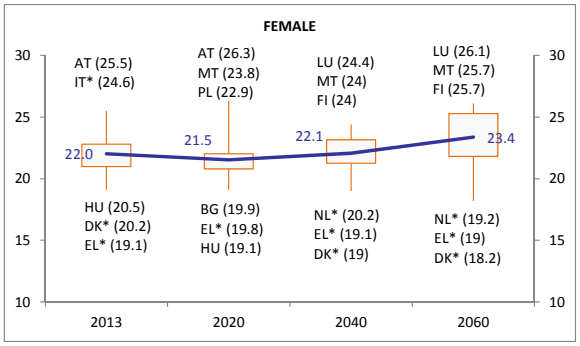
Source: Ageing Report (2015)

On average in the EU, despite the increase in both statutory retirement age and effective exit age from the labour market, the duration of retirement is expected to increase by about 3 years for men and by 1 ½ for women over the long term (see Graphs 8 and 9). The lower increase in the duration of retirement up to 2060 for females is due to the fact that some countries (Bulgaria, Czech Republic, Croatia, Italy, Lithuania, Malta, Austria, Poland, Slovakia, the United Kingdom) are equalising the statutory retirement age for men and women gradually through a more marked increase for females.

Graph 8. **Duration of retirement, male**



Graph 9. **Duration of retirement, female**



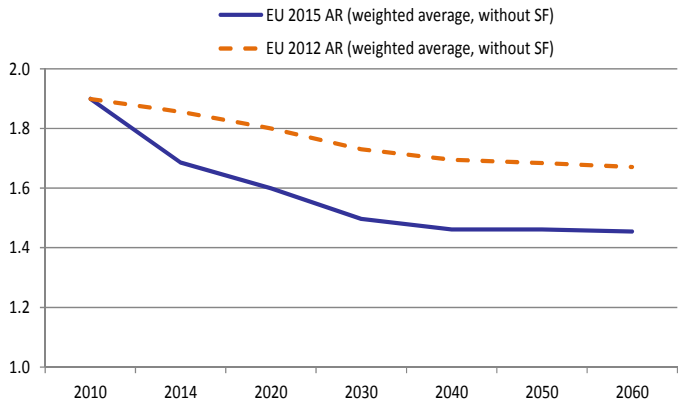
Source: Ageing Report (2015)

Reducing relative pension benefits

In addition to measures adopted to curtail eligibility trough increasing retirement age and closing alternative pathways to early retirement, another set of measures (on the number of years and valorisation of pensionable earnings, indexation of pensions in payment, calculation of accruals) aimed at reducing relative public pension generosity (in terms of **benefits**) has also been legislated by many EU countries (see Table 4). These parametric changes concern both the calculation of the first pension in payment, as well as the way it is valued over time (indexation of pensions in payment). First, several countries have extended the period over which earnings are taken into account for the calculation of the first pension, instead of restricting **pensionable earnings** to a limited number of final and / or best salaries. This measure has the effect of reducing pension benefits, given the normal upward slope to the age-earnings profile for most workers[7]. Indeed, pensionable earnings reference have moved to a (quasi-) lifetime average earnings measures in as many as 18 Member States. Only Spain, France, Lithuania, Malta, Austria and Slovenia still define, under current legislation, pensionable earnings over a restricted career period (see Table A3 in Annex for a comparison between the pensionable earnings reference in the 2015 AR compared to the 2006 AR). As an additional measure to curtail benefits, many countries have moved to a less generous **valorisation rule**, used to adjust past earnings to changes in living standards, between the time pension rights are accrued and when they are claimed (see Table A4 in Annex for a comparison between the valorisation rule used in the 2015 AR compared to the 2006 AR). Only a few countries adopted a strict pure price-valorisation rule (like in France, Belgium and Portugal). Several Members states adopted instead a mix of partial nominal wage - nominal price valorisation (e. g. Greece, Croatia, Romania, and Finland), while half of the EU countries kept the more generous wage-valorisation rule. Other countries chose to reduce annual **accrual rates** either directly (e. g. Greece, Italy, Luxembourg, Austria, Slovakia), or indirectly via, for example, an increase of the contributory period to receive a full pension (e. g. Belgium, France), the use of penalties for early retirement (see previous sub-section), or the introduction of a "sustainability factor" linked to changes in life expectancy (see Table 7).

[7] Of course, such measures do not concern countries, where public pension schemes mainly provide a flat-rate pension (e. g. Denmark, Ireland, Netherlands and the UK).

Graph 10. **Average accrual rates for new pensions over the period 2010-2060 (%):2012 AR versus 2015 AR**



Source: Ageing Report (2012, 2015)

Notes: See Graph A1 in the Annex for complementary data on accrual rates' projections.

Finally, another parametric reform used to reduce pension benefits progression has been the shift in several Member States towards less generous adjustment rules for pensions in payment. Indeed, many EU countries have moved from adjusting pension benefits to wages to a full or partial **indexation** to prices (see Graph 11 and table A.5 in the Annex). Full indexation to prices is again relatively rare however (it is the case in France, Italy, Hungary and Austria; see Table 4). A majority of Member States adopted instead a partial indexation rule to prices (for example, indexation mix of wages and prices – Swiss formula, or of wages and GDP). In addition, some countries introduced a "sustainability factor" or other "reduction coefficients" into the indexation calculation (see below). This is the case in particular in Spain with the introduction of an index for adjusting pensions in payment, projected to progress less quickly than inflation (for details see the Ageing Report 2015)[8].

Graph 11. **Evolution of pension indexation rules in EU Member States since the 2001 AR (% of total EU countries whose indexation rule is based on...)**

Source: Ageing Report (2001, 2015)

Notes: Indexation rules are spread between pure (or less) price-indexation rules ("prices-"), pure wage-valorisation rules ("wages+") and indexation rules based on a combination of variables (prices, wages, GDP, etc.). Moreover, in a few countries, there is no explicit indexation rule.

[8] The UK, on the other hand, moved in the opposite direction, returning to earnings indexation after having adopted price linking in the early 1980's. This is linked to the low level of public pension replacement rate and benefit ratio in this country. More generally, countries with less generous public pension systems have somehow adopted less restrictive measures (see below).

On top of pension measures affecting the expenditure side, many Member States relied on **revenue-enhancing measures** in order to balance public pension schemes. Several countries increased social contribution rates (e.g. Denmark, France), especially after the crisis (e. g. Bulgaria, Cyprus, Poland, Portugal, Finland, UK). Some EU Member States ear-marked tax revenue for the public pension system (e.g. 1 point of VAT in Germany). Other countries raised civil servants' contributions (e. g. Ireland, France, Cyprus, Portugal, UK) and / or reduced tax reliefs / allowances on pension benefits (e.g. Ireland, France, Cyprus, Latvia, Romania). Moreover, Germany introduced a balancing mechanism whereby contributions are quasi-automatically adjusted to ensure the financial equilibrium of the public pension system. Finally, a growing number of countries (15), while maintaining the unfunded nature of their public pension system, have introduced reserve funds to be used to finance the projected increase of spending (e.g. Ireland, France, see Tables 5 and 6 below).

Table 4. **Key parameters defining public pension benefits in the EU (old-age pensions)**

		General indexation variable(s)		
		Prices	Mixed, not fixed indexation rule or not applicable	Wages
General valorisation variable(s)	Prices	BE (Full career), FR (25 best years)	MT (10 best of last 40), PT (Full career)	
	Mixed, not fixed rule or not applicable		IE (Flat rate), EL (Full career), HR (Full career), LT* (25 best years), PL (Full career), RO (Full career), FI (Full career)	DK (Years of residence), NL (Years of residence)
	Wages	ES (Last 25), IT (Full career), HU (Full career), AT (40 best)	BG (Full career), CZ (Full career), EE (Full career), CY (Full career), LV (Full career), LU (Full career), SI (Best consecutive 24), SK (Full career)	DE (Full career), SE (Full career), UK (Years of insurance contributions), NO (Full career)

Source: Ageing Report (2015)

Notes: A more detailed and comprehensive description of the EU Member States pension systems is in The 2015 Ageing Report – Underlying assumptions and projections methodologies, European Economy 8 – 2014.

BG Pensionable earnings reference is full career starting from 1997. 3 Best years before 1997

CZ Pensionable earnings reference is full career back to 1986. Currently 30 years to be considered.

EL Pensionable earnings reference is full career starting from 2011. Best 10 years before 2011.

ES Pensionable earnings reference is last 25 years as of 2022. The maximum value of the valorisation rule is close to prices. The IPR is established annually at a level consistent with a balanced budget of the Social Security system over the medium run.

FR The pensionable earnings reference is full career in AGIRC and ARRCO. Valorisation rule and indexation rules are price - 1% in both AGIRC and ARRCO in 2014 and 2015. AGIRC: Association générale des institutions de retraite des cadres; ARRCO: Association pour le régime de retraite complémentaire des salariés; CNAVTS: Caisse nationale de l'assurance vieillesse des travailleurs salariés.

LT Pensionable earnings reference is 25 best years after 1994 and 5 best years for the period 1984-1993.

LU Indexation rule is wages if sufficient financial resources available, otherwise only cost of living indexation.

HU Pensionable earnings reference is full career back to 1988.

MT Pensionable earnings reference rule applies to people born as of 1962

AT Pensionable earnings reference is converging towards the best 40 years in 2028. Currently 25 best years

PT Pensionable earnings reference is full career as of 2002. 10 best years out of last 15 before 2002. Price and wage valorisation rule applies to earnings registered between 2002 and 2011.

RO Price valorisation and indexation after 2030.

SK Pensionable earnings reference is full career back to 1984.

2.1.2. Several European countries enacted systemic pension reforms

'Old' Member States

Next to parametric pension reforms, **five 'old' Member States have adopted additionally systemic reforms** (as pointed out by Hering (2006); see Box 1). This is the case of Sweden, Italy, Greece, and to some extent Germany and Austria. Sweden and Italy shifted at the end of the 1990's to an NDC (Notional Defined Contributions)[9] public pension system, while gradually moving from a dominant pillar model to a multi-pillar one. Greece in 2010 introduced a basic pension and reformed the Defined benefit (DB) first pillar. In 2012, it transformed its second pillar in an NDC system, and more recently (in May 2016), legislated a new systemic pension reform (the new system, while curtailing pension benefits further, reflects most of the structural features of the 2010 and 2012 reforms).

Germany also reformed its public pension point system (1992 and 2004 reforms),[10] which now presents features close to an NDC system, and encouraged private pensions. More recently, Austria introduced a new harmonised public pension scheme, more actuarially-oriented than previous schemes and based on individual pension accounts. A common feature of the ground-breaking reforms engaged by these countries is that, besides aiming at enhancing sustainability, they have tended to substitute relatively fragmented schemes with a more unified public scheme.

Table 5. **Main characteristics of pension systems in "old" EU Member States...**

	Public pension schemes						Private occupational schemes		Private individual schemes	
	Financing		Type of pensions				Status		Status	
	PAYG	pre-funded	Flat-rate	DB	PS	NDC	Mandatory	Voluntary	Mandatory	Voluntary
BE	x	x		x			x	x		x
DK	x		x	x			x			x
DE	x	x			x			x		x
IE	x	x	x	x			x	x		x
EL	x		x	x		x				x
ES	x	x		x				x		x
FR	x	x		x	x			x		x
IT	x					x		x		x
LU	x	x		x				x		x
NL	x		x	x			x			x
AT	x			x			x			x
PT	x	x		x			x	x		x
FI	x	x		x				x		x
SE	x	x				x	x		x	x
UK	x		x	x				x		x
Sub-total "old" MSs	**15**	**9**	**5**	**12**	**2**	**3**	**7**	**10**	**1**	**15**
% total	100%	60%	33%	80%	13%	20%	47%	67%	7%	100%

Source: Ageing Report (2006, 2009, 2012, 2015)

* Legal framework for occupational schemes; however, not implemented so far.

Notes: i) in red, countries where private schemes currently provide substantial income to retired people (at least 10% of GDP), in blue, countries where they are expected to provide high share in the future (maturing schemes). ii) Pre-funding of public pension schemes refers to the existence of reserve funds in some countries set up to secure public pension schemes.

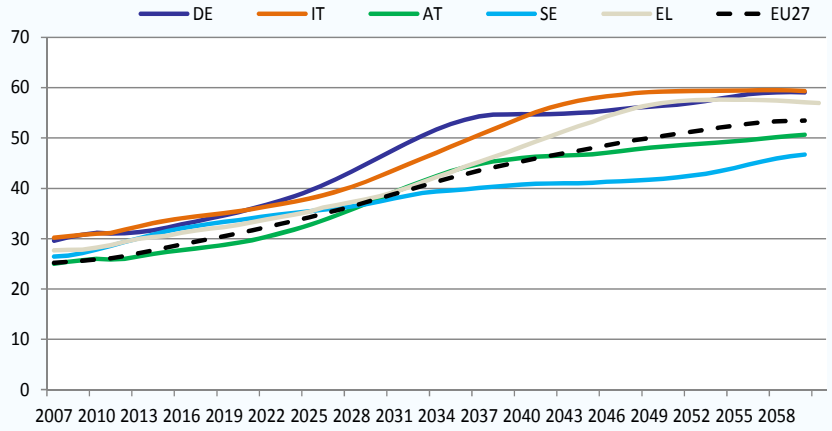
[9] These schemes are designed to mimic most of the features of DC schemes. The pension depends on contributions, which are tracked in accounts earning a notional rate of return, but unlike DC plans, the rate of return is set by the government and often linked to wage or GDP growth. These schemes remain PAYG financed: no assets are accumulated.

[10] In a point system, workers earn pension points based on their individual earnings for each year of contributions. At retirement, the sum of pension points is multiplied by a pension-point value to convert them into a regular pension payment.

Box 1. **SYSTEMIC PENSION REFORMS IN SELECTED "OLD" MEMBER STATES: THE CASE OF SWEDEN, ITALY, GREECE, GERMANY AND AUSTRIA**

Since the 1990's (more recently in Austria), Sweden, Italy, Germany and Austria initiated systemic reforms of their pension systems, in line (especially in Germany and Italy) with projected strong increases of their old-age dependency ratio (see Graph 12 for the levels projected in the Ageing Report 2009). Moreover, tax burdens were already relatively high at that time (especially in Sweden but also in Austria), making further increases in contribution rates untenable.

Graph 12. **Old-age dependency ratio (% of population of 15-64)**



Source: Ageing Report (2009)

- **Sweden**: in 1998, after a long process of consultation and research, Sweden enacted, with a large consensus, a radical pension reform, which was fully implemented in 2003 (Natalia and Stamati, 2013). This reform introduced new NDC rules for public pensions, as well as new (relatively small) supplementary DC pillars (the old system consisted mainly of a flat-rate pension and an earnings-related PAYG DB component). Private pensions, which represented around 20% of total pension expenditure in 2005 (according to Eurostat), should represent over a third of pension spending by 2060 (according to the Ageing Report 2015).

- **Italy**: with the 1992-93 and 1995 reforms, Italy adopted a NDC public pension system and moved towards a three-pillar structure. However, the phasing-in of the NDC system is very slow (as a comparison, while in Sweden the old DB system will be completely phased-out by 2020, in Italy it will be the case only by the mid-2030's, implying a full implementation of the reform over 35 years), and the coverage of supplementary pensions remains limited (thus additional measures were adopted before the crisis including higher fiscal incentives and "automatic" transfer to pension funds of severance pay for the private sector employees).

- **Germany**: since 1992, Germany, faced with the reunification costs as well as dramatic projected demographic changes, has substantially reformed its pension system. Through the 1992 and the 2004 reforms (introduction of contribution and sustainability factors), the German public pension point system has come close to an NDC system. Moreover, the 2001 Riester reform enacted the start of a progressive shift towards a multi-pillar system. In 2012, private pensions represented around 10% of total pension expenditure (according to Eurostat).

- **Austria**: in 2005, Austria introduced a new harmonised public pension system, more actuarially-oriented than prevailing schemes. Although based on individual pension accounts, the new system remains a PAYG DB system (closer to the German point system than to the Swedish NDC system, according to Knell et al, 2006). In parallel, two new private pension schemes have been introduced (the "new severance pay scheme" and the "premium-aided pension savings scheme") to encourage the expansion of second and third pillars. Even if the coverage of these schemes has increased during the last decade, private pensions remain limited in Austria.

- **Greece:** In the recent years the Parliament adopted two comprehensive reforms of the main pension scheme (2010) and of the supplementary public pension scheme (2012). The first reforms aimed at simplify the highly fragmented pension system, enhance transparency and fairness, postpone the retirement age and decrease the generosity of benefits. The new rules on entitlements, contributions, valorisation and indexation of pension rights apply to all main schemes and pro rata to all current and future workers. The supplementary pension scheme has been transformed into a NDC scheme. In 2016 a new systemic pension reform has been legislated. It further curtails pension benefits by creating a closer link between contribution and benefit (by, among other things, abolishing the pro rata application of the previous reforms), while maintaining most of the structural features of the 2010 and 2012 reforms.

'New' Member States

In response to population ageing pressures, and typically in the context of their transition to market economies, many 'new' **European countries also enacted systemic pension reforms in the late 1990's – early 2000's**. These reforms were largely influenced by the multi-pillar approach promoted by the World Bank (1994), with a large role given to private individual pensions (Grech, 2010). Indeed, most of the "new" EU Member States introduced mandatory private individual schemes (e.g. Bulgaria, Estonia, Croatia, Latvia, Lithuania, Hungary[11], Poland[12], Romania and Slovakia[13]), while a smaller group of countries adopted mandatory private occupational schemes (e.g. Cyprus and Slovenia[14]). At the same time, some countries converted their old DB public pillar to a point system (e. g. Croatia, Cyprus, Romania and Slovakia) or an NDC system (e. g. Latvia and Poland). An important element is that the pre-funding of the new private pension schemes was often financed through the reallocation of part of the social contributions – taxes raised for the statutory PAYG public scheme.

[11] These schemes were partially brought into the general government sector in 2011; the remaining schemes are now voluntary (see below).

[12] In 2013, the part of assets of these schemes (OFE) held in government bonds has been shifted to the public NDC account. In 2014, the membership to these schemes became voluntary.

[13] During their existence, the participation to these private individual schemes has changed several times from mandatory to voluntary for new comers.

[14] In Cyprus and Slovenia, mandatory occupational schemes concern mainly public sector employees. In Lithuania, a legal framework for occupational private pensions has been adopted in 2006, but there are no occupational pensions so far. The same situation (as in Lithuania) prevails in Malta.

Table 6. **Main characteristics of pension systems in "new" EU Member States**

	Public pension schemes						Private occupational schemes		Private individual schemes	
	Financing		Type of pensions				Status		Status	
	PAYG	pre-funded	Flat-rate	DB	PS	NDC	Mandatory	Voluntary	Mandatory	Voluntary
BG	x			x				x	x	x
CZ	x	x		x						x
EE	x	x		x			x		x	x
HR	x				x			x	x	x
CY	x	x			x		x	x		
LV	x	x				x			x	x
LT	x			x			x*		x	x
HU	x			x				x		x
MT	x		x	x			x*			x
PL	x	x				x		x		x
RO	x				x				x	x
SI	x	x		x			x	x		x
SK	x				x				x	x
Sub-total "new" MSs	**13**	**6**	**1**	**7**	**4**	**2**	**5**	**6**	**7**	**12**
% total	100%	46%	8%	54%	31%	15%	38%	46%	54%	92%

Source: Ageing Report (2006, 2009, 2012, 2015)

* Legal framework for occupational schemes; however, not implemented so far.

Notes: i) in red, countries where private schemes currently provide substantial income to retired people (at least 10% of GDP), in blue, countries where they are expected to provide high share in the future (maturing schemes). ii) Pre-funding of public pension schemes refers to the existence of reserve funds in some countries set up to secure public pension schemes

Addressing longevity risk through automatic mechanisms

One of the most important features of pension reforms over the last two decades, whether countries engaged or not in a systemic change, has been the introduction of **mechanisms aimed at automatically** adjusting the key pension parameters (pension age, benefits, financing resources) to changes in life expectancy. Indeed, since the mid-1990's, half of the EU Member States have adopted either automatic balancing mechanisms, sustainability factors (i.e. a direct link between pension benefits and life expectancy) and / or automatic links between retirement age and life expectancy (see Tables 7 and 8).

At the time of the completion of the first Ageing Report (2001 AR), only four Member States (14% of EU countries) had introduced such mechanisms. **Automatic balancing mechanisms** ensure that the pension system will be able to remain financially sustainable by adjusting benefits' indexation and / or by social contributions when needed. Such balancing mechanisms exist only in three countries: in Sweden since 1998 (reduced indexation in case the pension system would show a deficit in the medium-term[15]), in Germany since 2004 (the contribution rate is automatically adjusted so that the statutory pension scheme is in balance, and pension indexation is reduced through a contribution rate factor and the sustainability factor) and in Spain since 2013 (reduced indexation when the pension system is in financial disequilibrium). The introduction of **sustainability factors** (i.e. of a factor that changes the size of the pension benefit depending on expected demographic changes, such as life expectancy at the time of retirement) has been more widespread (8 countries – although not fully automatic in France and in Denmark). Finally, several countries (8) have introduced an **automatic link between retirement ages and life expectancy**, as early as in 1995 in Italy, and more recently in

[15] This may be due to e.g. low returns on the pension fund assets or low wage (GDP) growth.

Greece, Slovakia and Finland. These countries are, not surprisingly, the ones projecting the highest increases in retirement age over the long run (especially for men; for women, harmonisation trends imply sometimes steep increases even in countries without such an automatic link). Few countries have introduced simultaneously two automatic adjustment mechanisms (e. g. Italy, Sweden, Portugal, Spain and Finland).

All in all, by 2015 half of the EU Member States (14 MSs) had introduced automatic mechanisms that enhance the sustainability of pension systems, and some of them had introduced more than one mechanism (see Table 8).

Table 7. **Automatic mechanisms in public pension system in the EU**

Country	Automatic balancing mechanism	Sustainability factor (benefit link to life expectancy)	Retirement age linked to life expectancy	Legislated
Italy		X	X	1995 & 2010
Latvia		X		1996
Poland		X		1999
Sweden	X	X		2001 & 1998
France*		X		2003
Germany	X			2004
Finland		X	X	2005 & 2015
Portugal		X	X	2007 & 2013
Greece			X	2010
Denmark**			X	2011
Netherlands			X	2012
Cyprus			X	2012
Slovak Republic			X	2012
Spain	X	X		2013 & 2011

Source: Ageing Report (2015), updated for Finland

Notes: in red, after 2009.

Table 8. **Total number of automatic mechanisms in public pension system in the EU**

	Total number of automatic mechanisms	% EU28 with automatic mechanisms
2001 AR	4	14%
2006 AR	8	25%
2012 AR	13	39%
2015 AR	19	50%

Source: Ageing Report (2015), updated for Finland

2.1.3. Accompanying measures to ensure lasting success of implemented reforms, preserve adequacy and further harmonise pension rules

A key objective of (public) pension reforms enacted over the last decade(s) has been to enhance fiscal sustainability. In addition, different accompanying measures have been taken in order to preserve pension adequacy and / or increase the fairness of the pension system (and thus support the social acceptability of pension reforms), as follows:

- Attempts to **harmonise** different pension schemes (especially between the private and the generally more favourable public sector) have been made. Several Member States have carried reforms aimed at further aligning rules applying to the public sector (civil servants) and / or special pension schemes with the ones prevailing in the general regime (e. g. Austria, Italy,

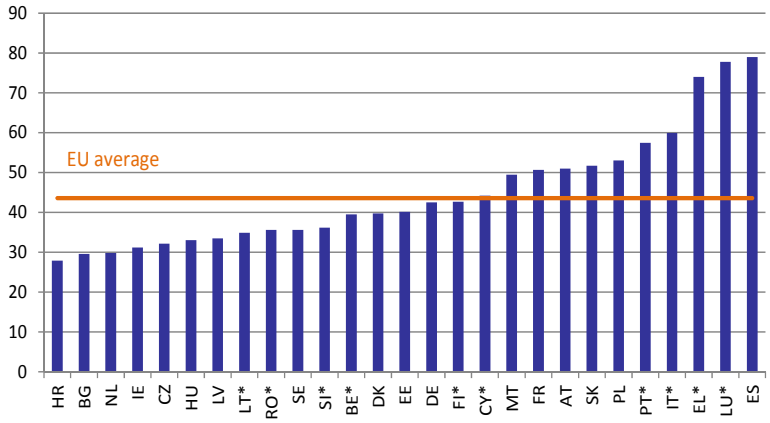
France, Ireland, Greece, Romania). In some cases, civil servants and special pension schemes have been closed to new entrants (e. g. Cyprus, Greece, Portugal). In Greece, several reforms have tried to tackle the problem of the pension system fragmentation (2002 and 2008 reforms, which allowed merging different pension schemes; 2010 reform and, more recently, the 2016 reform, which set more unified rules across the different schemes);

- To compensate for the increase of early / statutory retirement ages, some flexibilities have often been introduced (or maintained) to take into account **long careers** (e.g. France, Germany) and in some cases, **hazardous jobs** (e.g. Greece);

- While pension ages were generally lower for women than for men in the past (average difference of 2 years in 2008 in the EU, with 5 years gaps in France, Italy, Austria, Poland, Romania and the UK for example), most countries have legislated a gradual **equalisation of pension ages between gender** (by 2060, those ages should be equal in all EU countries but Bulgaria and Romania);

- In countries characterised by low benefit and replacement ratios, especially some Eastern European countries and / or countries with flat-rate public pensions (see Graph 13), some measures have been adopted to increase **public pension system adequacy** (e.g. Bulgaria, which increased its accrual rate in 2014; UK, which adopted a more favourable indexation rule in 2007).

Graph 13. **Gross average replacement ratio in 2013 (%, public pensions)**



Source: Ageing Report (2015)

* Earnings-related public pensions (information not available on public pensions). EL figure includes the public mandatory supplementary pension. When only the main scheme is considered the RR is 64% (still the third highest value in the EU).

Notes: The gross average replacement ratio is defined as the average first public pension paid in 2013as a share of the average wage at retirement. Information not available for the UK.

2.2. (PUBLIC) PENSION REFORMS IN THE WAKE OF THE 2008-2009 FINANCIAL CRISIS

The financial and economic crisis of 2009 has had a profound impact on retirement-income systems of all different designs: private funded pension schemes first saw a strong reduction in the value of their assets (-23% during 2008); then, their financial equilibrium was challenged by very low rates of return, while the deterioration of public finances led to reducing public support (through reduced tax-incentives or direct subsidies, and – often temporary – reduction of contributions). But public pension PAYG schemes were also affected. Falling employment along with lower growth or even declines in wages hit the revenue side. Moreover, in some countries, the expenditure side was also affected, as

older-workers losing their jobs were more willing to choose to retire early (Whitehouse, 2012). On top of this, the rapid rise of public debt in some European countries (due to banking bailouts and the economic crisis) called for acute fiscal consolidation.

In this context, **the pace of pension system reforms has accelerated since 2008-09 in the EU** Member States, often adopting a mix of temporary / short-term effects measures (see Table 9) and additional structural measures:

- In many cases, temporary measures were adopted to reduce the financial burden of public pension expenditures (e.g. freeze of indexation and even cuts in pensions in payment) and / or increase resources (e.g. increase in contribution rates, taxes or tax bases). Moreover, because of the huge impact of the crisis on public budgets, in several countries, some pension measures adopted took effect almost immediately, or very shortly after the legislation had been adopted (e.g. increase of the retirement age for women in Italy; see also Box 2). This contrasts with past pension reforms that were generally allowing for considerable transition periods;

- Moreover, additional structural measures to enhance the sustainability of public schemes were also taken, as seen above (e.g. the adoption of automatic adjustment mechanisms in 8 countries over 4 years after the crisis, while the same number of countries adopted such mechanisms over a prolonged period of 14 years before the crisis; see Table 7 above).

Table 9. **Selected short-term / rapid & systemic pension measures adopted since the financial crisis**

	Temporary measures on pension benefits			Short effects measures on eligibility		Measures affecting pension system architecture		
	Direct cuts in pensions in payment	Frozen / reduced indexation	Increased taxes (rate, base) / contributions	Rapid rise in retirement age	Immediate closure of early retirement acess	Reduction in tax incentives / subsidies to private pensions	Reduction of contributions to mandatory private schemes	Roll-back of private pension schemes
BE						x		
BG		x		x				x*
CZ		x	x*					
DK			x			x		
EE		x					x**	
IE			x (civil servants)	x		x		
EL	x	x	x	x	x	x		
ES						x		
FR		x						
HR	x	x						
IT		x	x*	x			x	
CY	x	x	x					
LV	x*	x	x				x	
LT	x*						x	
HU	x	x		x	x	x		x
NL						x		
AT		x	x			x		
PL		x					x	x
PT	x*	x	x*					
RO	x*	x	x				x**	
SI	x*	x						
SK						x**	x**	x***
FI		x	x			x		
SE						x		
UK						x		

* Reduction contested through Constitutional Court decisions and / or later on reverted.
** Temporary.
*** Participation in DC private schemes changed from mandatory to voluntary.

Source: Ageing Report (2015), SPC report (2015)

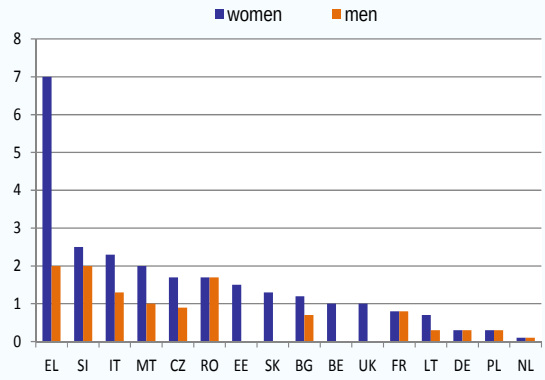
Notes: i) In the Czech Republic, the voluntary fully funded pillar introduced in 2013 should be abolished (possibly by the end of 2015). Ii) Countries, which benefited from financial assistance during the crisis, are in red.

Box 2. **STATUTORY RETIREMENT AGES: AN ACCELERATION OF THE INCREASE SINCE THE CRISIS?**

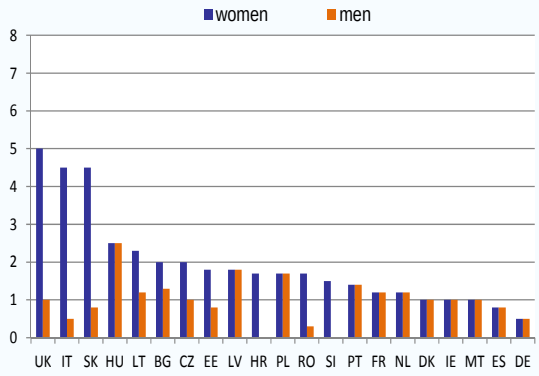
Over the period 2008-2013, important increases of statutory pension ages have been observed in some countries, in particular in Greece, Slovenia and Italy (see Graph 14). In some cases, these increases have been particularly fast (for example, Bulgaria brought forward in 2011 the planned increase of statutory retirement age; Italy legislated a rapid rise of women pension age in the public sector – from 61 to 65 between 2010 and 2012). Significant increases have also been legislated for the period 2013-2020, especially in the UK, Italy and Slovakia (mainly for women; see Graph 15).

Graphs 14 and 15. **Legislated increases in statutory retirement age between 2008 and 2020**

Statutory retirement age change between 2008 and 2013



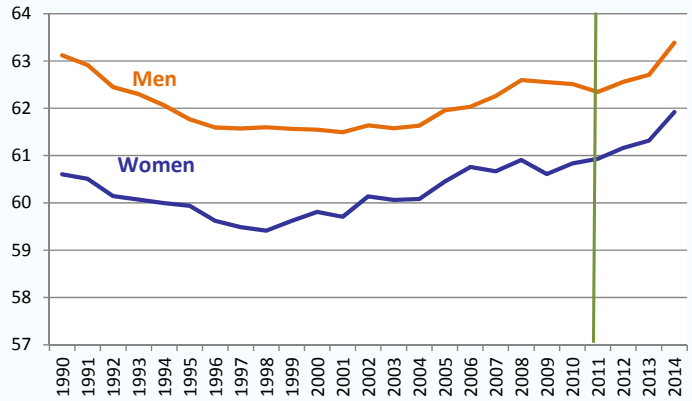
Statutory retirement age change between 2013 and 2020



Source: Ageing Report (2009, 2015)

This trend seems to have translated into a sharper rise of the effective exit age from the labour market in 2014, contrasting with more progressive increases observed since the beginning of the 2000's. This evolution is particularly outstanding in the post-crisis context of high unemployment rate.

Graphs 16. **Average effective exit age from the labour market**



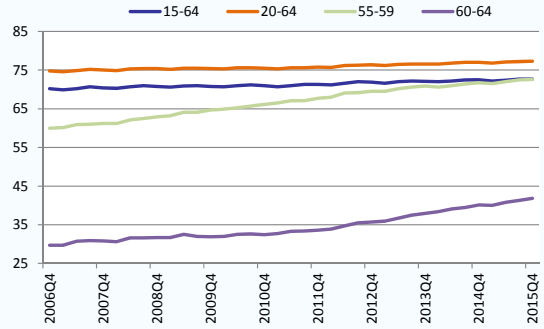
Source: Ageing Report (2012, 2015)

Notes: from 1990 to 2011, data come from OECD; after 2011, the series have been extrapolated using the 2015 Ageing Report relative changes.

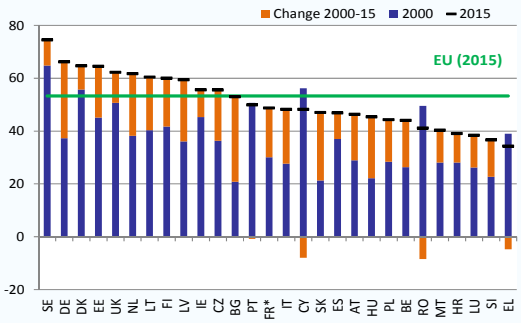
Despite the progress made with increasing effective exit age and thus older workers' participation and employment rates in EU countries over the last decade, a number of countries (Greece, Slovenia, Luxembourg, Croatia, Malta, Romania) remained 10 pp. or more behind the EU average in 2015 (see Graph 17). Moreover, men still have higher participation rates than women (see Graphs A.3 and A.4 in the Annex). Furthermore, there is ample scope for improvement for most EU counties in terms of catching up with the front runners in the EU by putting the right policies in place. Increasing the employment rate of older people would significantly decrease the public pension expenditure ratio in a number of countries.

Graphs 17. **Participation and employment rate in the EU**

Participation rate in the EU, by age group (%)



Employment rate, age group 55-64, by country (% and pp. change)



Source: Eurostat

Reversal of previous reforms: the case of private funded pension schemes

In other cases, mainly in Eastern European countries, the difficulties of private funded pension schemes, and budgetary strategies to reduce public deficit and debt[16] resulted in **important reversals of past trends** (as pointed by Bielawska et al (2015) - however, these reversals are linked to many factors, of which fiscal rules only contributed to a limited extent[17]). Indeed, in Hungary and Poland, a roll back of private pre-funded pension arrangements was observed[18]. In Slovakia, the participation to private pension schemes was changed from mandatory to voluntary in 2013. Therefore, if in the 2009

[16] Indeed, the pre-funding of private pension schemes is to some extent financed in CEECs through public debt issuance (as seen, contributions into these new schemes are most of the times financed by reallocating part of the social contributions raised to finance public pensions in payment; with no additional fiscal revenue raised, this has been compensated by issuing public debt). Thus, this pre-funding of future pension liabilities adds to the current deficit and debt, while in contrast in countries with no pre-funded pension liabilities, such anticipation of costs do not exist (moreover, future PAYG liabilities are treated as implicit liabilities and not official debt). While both types of liabilities have an impact on fiscal positions over the long-term, it is important to recognize that there is a difference between explicit liabilities (servicing government debt and honouring principal repayment), and implicit liabilities (future expenditure commitments). This issue was recognized in the context of the SGP in the early 2000's and led to allowing some flexibility (to take into account systemic pension reform costs in the application of the SGP). However, in the wake of the crisis, growing pressure to comply with SGP rules contributed to a reduced public support or even reversal of earlier systemic pension reforms in a number of CEECs. This issue, among others, was addressed with the 2011 reform of the SGP (the 'Six-pack'): indeed, account is taken of systemic pension reform costs both in the preventive and the corrective arms of the Pact.

[17] Outside of the crisis and short-term budgetary constraints, other reasons invoked for downsizing private pension schemes in CEECs include high management fees, low real returns, ineffective/insufficient risk-diversification strategies and the problem of regulating annuities needed for pension pay-outs (see also Egert, 2012).

[18] Note that in Bulgaria, government's attempt to shift mandatory funds' assets to the PAYG public schemes has been blocked by the Constitutional Court.

AR private pension expenditures were projected to strongly increase in the long run, in more recent vintages this trend has substantially been revised downwards (see Table 10). Several countries (e.g. Latvia, Lithuania, Estonia, Romania and Slovakia) also significantly reduced contributions to private pension schemes (either on a temporary or a permanent basis, see Graph 18). By contrast, the contribution rate to the mandatory individual DC pillar has remained unchanged in Sweden since it was introduced in 1998 (the contribution rate is rather small at 2.5 pp. out of a total of 18.5%). More generally, the crisis seems to have put (at least temporarily) a halt to the expansion of the role of pre-funded schemes in pension provision in the EU (SPC, 2015)[19]. Several countries also used resources accumulated in reserve funds, aimed at supporting public PAYG pensions systems, to finance their public deficit (e. g. France, Poland). In the case of Ireland, the National Pensions Reserve Fund (NRPF) was (partially) used for bank recapitalisation and as a guarantee for the EU / IMF loan.

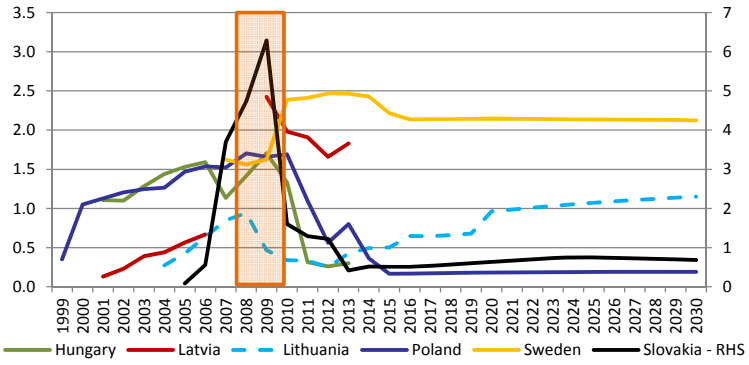
Table 10. **Private pension expenditures projections in Poland, Hungary and Slovakia across different Ageing Report vintages (% of total public pension expenditures)**

	Projected increase (2060 - base year)		
	AR 2009	AR 2012	AR 2015
PL	19.6	12.0	na
SK	17.7	na	na
HU	14.0	0.6	na

Source: Ageing Report (2009, 2012, 2015)

Notes: In the Ageing Report 2015, none of these three countries projected private pension expenditures (while the current level is estimated close to 0% of GDP according to Eurostat). Thus, those schemes are not expected anymore to represent a significant share of total pension expenditures in the long-run.

Graph 18. **Contributions to private pension schemes in selected countries (% of GDP)**



Source: Ageing Report (2015), OECD.

Countries that required **macro-financial assistance** are generally the ones that adopted the most comprehensive packages of (short-term / rapid) measures following the financial crisis (e.g. Greece, Hungary, Romania, Ireland, Cyprus, Latvia and Portugal; see Graph A2 in the Annex). Spain also adopted a substantial structural pension reform in 2013.

Finally, in some cases, and after the peak of the financial crisis, short-term pension-related measures were adopted, not to foster sustainability, but with the aim of **coping with the negative socio-impact of the crisis** (e.g. Italy, which allowed employees from 2015 to 2018 to receive severance pay in their payroll rather than transferring it to private pension schemes, to support consumption; Bulgaria, which

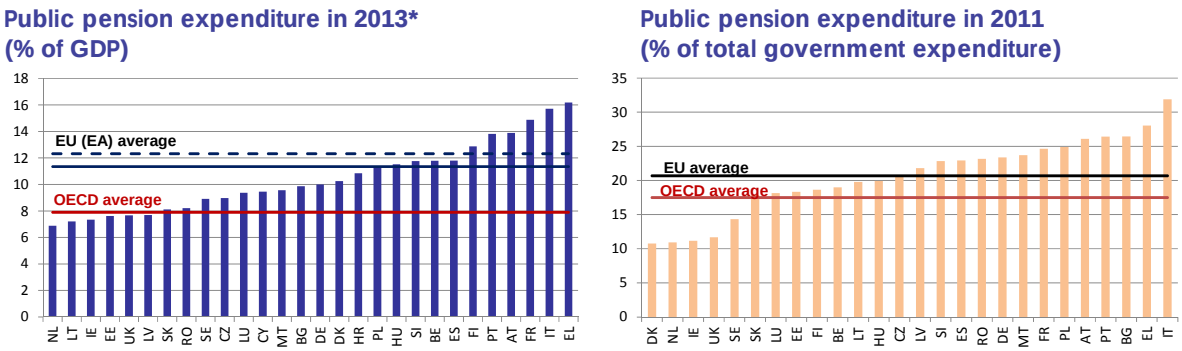
[19] Even in countries where private schemes are widespread and benefit from a large coverage, different measures had to be taken to restore solvency (indexation suspension, direct benefits cuts, increase of contributions, etc.), contributing to slow down the coverage of these schemes.

temporarily froze the planned increase in the retirement age in 2014 and Romania, which decreased social contributions paid by employers in 2014, in both cases with the objective to support short-term employment). More generally, several temporary measures with immediate effect that were taken in the wake of the financial and sovereign debt crisis were later on revisited (by Constitutional Courts and / or through general elections) and gave rise in some cases to (partial) reversals (e. g. Czech Republic, Portugal, Latvia, Lithuania, Slovenia, Greece, see Table A6 in the Annex). In several countries (e.g. Germany, Italy and Poland), recent debates and measures adopted, which could partially revert past enacted reforms, illustrate the necessity to appropriately calibrate pension reforms to ensure both fiscal sustainability and social acceptability.

2.3. EU PENSION REFORMS IN INTERNATIONAL PERSPECTIVE

After over two decades of reforms, and even though pension systems still vary significantly across Member States, a strong public sector involvement remains a common feature for all EU Member States. Indeed, according to the Ageing Report 2015, public pension expenditure in 2013 was above 11% of GDP in the EU (and above 12% in the EA), compared to an OECD average of less than 8% of GDP in 2011. Despite a relatively large range (going from 6.9% of GDP in the Netherlands to 16.2% of GDP in Greece[20]), public pension expenditure ratio was close or higher than the OECD average in 24 EU countries. Public pension benefits also still represent a substantial share of European governments' expenditures: this share reached a third of total government expenditure in Italy in 2011, and was above the OECD average (at 17.5%) in more than 20 EU countries (see Graph 19).

Graph 19. **Public pension expenditure EU versus OECD average**



* Last available year for OECD average.

Source: Ageing Report (2015), Eurostat, OECD (SOCX)

Moreover, despite diverse arrangements and attempts to develop second and third pillars[21] in most Member States, the bulk of pension benefits currently remains contribution-based and earnings-related (Bismarckian type system), with a relatively limited role played by private pensions. Exceptions exist though (for example, Denmark and the Netherlands rely to a relatively much larger extent on private pension funds).

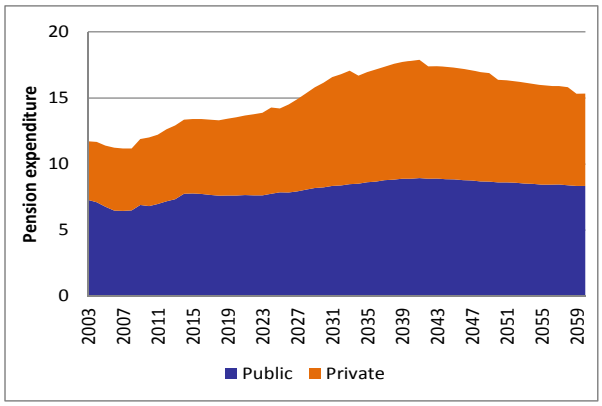
The importance of the private pillars depends on how long they have been in place, and on the contributions paid to them. For instance, private pillars have already been built up for a long time in the Netherlands, and total pensions can therefore expand despite the public pillar being more or less

[20] Note that this high level in Greece is partially the result of the severity of the crisis in the country: if the nominal GDP level had remained constant at its 2007 level, public pension expenditure in 2013 would represent around 13% of GDP, though this would still be above EU and EA average.

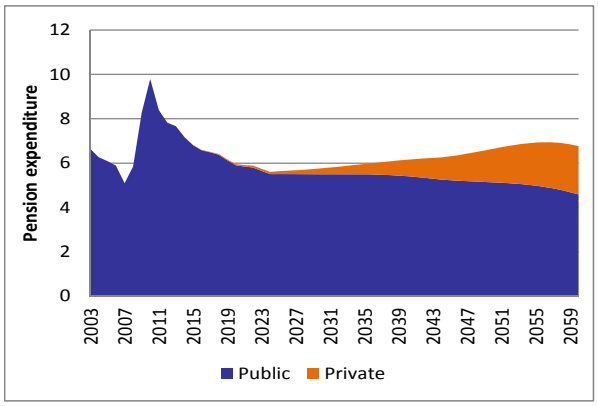
[21] As we have seen in section 2.2, these attempts have been partially / temporarily halted in some countries since the financial crisis.

unchanged as a share of GDP over the next few decades (Graph 20). In Latvia, the introduction of private pillars is more recent (in the 1990s), but because of the private pillar, total pension (as a share of GDP) can expand in the long term despite the public pillar being projected to fall slightly (Graph 21).

Graph 20. **Netherlands - Pension/GDP**



Graph 21. **Latvia - Pension/GDP**



Source: Ageing Report (2015)

However, **past reforms should in the long-run result in a reshaping of pension systems in some European countries, with private pillars increasingly supporting retirement incomes over time** (Table 11 summarises the main trends in pension system design since 1995). According to the Ageing Report 2015, public pension spending should remain stable over the long run at the EU aggregate level, with 6 countries experiencing substantial decreases (close or above -2 pp of GDP in Croatia, Denmark, Latvia, France, Italy and Greece; at least by -0.5 pp of GDP in Sweden, Estonia, Spain, Portugal and Poland). In some of these countries, this downward trend will coincide with a significant increase in pension benefits provided by private schemes (e.g. Croatia, Denmark, Latvia, Sweden and Estonia).

Table 11. **Characteristics and main trends in pension system design in EU countries**

	Preserved overall pension system architecture	Attempt to change pension system nature / architecture*	Partial reverse back to old model
one dominant pillar	Belgium France Luxembourg Malta Slovenia Czech Republic Finland Portugal Cyprus Spain	*Greece* Italy Austria	Poland Hungary Slovakia
multi-pillar	Ireland Denmark UK Netherlands	*Bulgaria* *Romania* *Lithuania* *Croatia* *Latvia* *Estonia* Germany Sweden	

* This group includes countries that strongly reformed their 1st pillar (like in Greece, Italy and Austria) and / or countries that introduced additional pillars (representing already a significant share of total pension expenditures, or projected to do so in the long-run.

Source: Presentation inspired by Grech (2010)

Notes: i) Pension reforms since 1995 is included ii) Most of countries, attempting to develop a multi-pillar pension system, introduced temporary / permanent measures following the financial crisis likely to have weakened the expansion of private pension schemes (see Table 9). Despite such measures, some countries reporting private pension projections for the 2015 AR, still project a substantial increase of such schemes (e. g. Estonia, Latvia and Lithuania). Countries in italic are those where the intended reforms are still subject to uncertainties. iii) The Annex contains a Table A7 providing more details on this classification.

3. THE BUDGETARY IMPACT OF PENSION REFORMS: AN OVERALL REDUCTION OF PROJECTED SPENDING TRENDS

3.1. INTRODUCTION

As a result of the past reforms described in the previous chapter, the projected changes in the pension expenditure as a share of GDP over the following half century have decreased since 2001 for the EU as a whole. Over the last 15 years and the 5 rounds of EC-EPC budgetary projections in the Ageing Reports, many countries have reported large decreases in projected pension expenditure due to major policy reforms. This chapter will examine more in details the main drivers behind such declining trends and to what extent such projected decrease in future pension expenditure can be considered sound and reliable, at least over the short-run horizon.

One important feature of the consecutive EC-EPC budgetary projections exercises has been the assessment of the underlying reasons of changes in the evolution of pension expenditure. By comparing the main outcomes of the different vintages of pension expenditure projections, we can assess the main reasons for the changes occurred between the 5 rounds of projections. This analysis is facilitated by the fact that the projection methodology has been relatively consistent over time, since the first round of projections and up to now:

- The demographic deterministic projections carried out by Eurostat were generally based on a very long-term "convergence" approach for each key demographic determinant, i.e. fertility rates, mortality rates and net level of migration, while taking due account of recent trends and developments at the beginning of the period.[22]

- The participation rates have been projected by gender and single age using the cohort methodology approach[23], taking particularly into account the significant rise in the labour force participation of women over recent decades (as younger women, with a much stronger attachment to the labour force, gradually replace older women with relatively low participation rates). The framework for projecting labour force into employment, total hours worked and unemployment has also remained unchanged.

- The methodology to simulate the impact of pension reforms on the participation rates of older workers (through its estimated effects on the retirement decision by shifting and adjusting distribution probabilities of labour market exit) has been also consistent across projections exercises. Furthermore, in case of unchanged legislation, it was systematically agreed to use the changes in the exit rates as estimated in the previous wave of projections, including peer reviewed reforms by the AWG/EPC.

- The structural unemployment rate estimates (NAWRU) have been also systematically used as a proxy for unemployment rates in the baseline scenario. The minimum country-specific or average anchors towards which the NAWRU rates are assumed to converge have nevertheless been slightly reviewed in each round of projections.

- Potential GDP growth and its components, including TFP, have been calculated using a Cobb-Douglas production function with constant returns to scale, which is consistent with the

[22] In order to ensure comparability and consistency across countries, demographic projections by Eurostat has been used since the 2006 projection exercise was prepared.

[23] See Carone (2005) for a detailed description. The methodology was initially developed by the ILO (see D. Latulippe 1996) and the OECD (see J-M. Burniaux, R. Duval and F.Jaumotte 2003).

methodology for estimating potential growth and output gaps developed by the OGWG. The capital stock in efficiency terms is assumed to remain constant in the long term (i.e. following the 'capital rule'). In the projections, convergence in TFP growth rates over the long run is assumed. Consequently, in the long run, TFP becomes the single driver of labour productivity.

Although the methodological approach has remained relatively unchanged, key demographic drivers and macroeconomic assumptions have however been revised in between the projection exercises, according to the changing economic and demographic context.

As shown in Table 12, which compares the main demographic and macroeconomic assumptions at EU level, there were sizeable differences in some key assumptions in between the different vintages of the Ageing Reports. Overall in the EU, the main demographic assumptions have been the most favourable over the long run in both the first (2001) and the latest (2015) Ageing Reports, as highlighted by the overall projected change in the old-age dependency ratio peaking at +29 pp. in the 2012 round of projections, contrasted with +22 pp. in the last (2015) round. This large difference is due to more favourable fertility rate assumptions, together with a slightly lower increase in life expectancy on average in the 2015 Ageing Report compared to the 2009 and 2012 Ageing Reports.

Table 12. **Main underlying assumptions over consecutive budgetary projection exercises, EU**

	2001 AR*	2006 AR**	2009 AR***	2012 AR***	2015 AR
Demographic assumptions					
Fertility rate (last year)	1.7	1.6	1.7	1.7	1.8
Fertility rate (overall change)	0.2	0.1	0.1	0.1	0.2
Increase in LE (Men)	5 (75)	6.3 (75.4)	8.5 (76)	7.9 (76.7)	7.1 (77.6)
Increase in LE (Women)	4.2 (81.3)	5.1 (81.5)	6.9 (82.1)	6.5 (82.5)	6 (83.1)
Net migration (start period) - as % of total pop	0.2	0.3	0.4	0.2	0.0
Net migration (end period) - as % of total pop	0.2	0.2	0.2	0.2	0.2
Old-age dependency ratio (overall change)	25.0	26.9	27.0	29.0	22.0
Labour force assumptions					
Unemployment rates (last year)	5.8	6.1	5.7	6.3	6.4
Unemployment rates (overall change)	-2.8	-3.1	-1.6	-3.3	-4.4
Participation rates 55-64 MEN (overall change)	3.3 (52.6)	13.2 (53.5)	9.7 (57.3)	11.2 (58.8)	10.2 (62.8)
Participation rates 55-64 WOMEN (overall change)	16.8 (29.9)	21.6 (32.6)	19.9 (38.2)	21.7 (41.1)	20.9 (46.5)
Participation rates 65+ MEN (overall change)	-1.1 (5)	2.9 (11.3)	8.3 (11.8)	7.3 (10.3)	8.9 (11.6)
Participation rates 65+ WOMEN (overall change)	-0.2 (1.9)	2.9 (5.3)	11.2 (6.1)	8.7 (5.7)	11.2 (6.3)
Macroeconomic assumptions					
Labour productivity growth (annual average)	1.8	1.8	1.8	1.5	1.4
Labour input growth (annual average)	-0.2	-0.1	-0.1	-0.1	-0.1
Potential GDP growth (annual average)	1.6	1.7	1.7	1.4	1.4

*BE, DK, DE, EL, ES, FI, IE, IT, LU, NL, AT, PT, FI, SE and UK.
** All Member States except BG, RO and HR.
*** All Member States except HR.
Source: Ageing Report (2001, 2006, 2009, 2012 and 2015).
Notes: Projection horizon: 2001 and 2006 AR: 2050; 2009, 2012 and 2015 AR: 2060. The upper age limit for the participation rates for 65+ was 71 years for the 2001, 2006 and 2009 AR and 74 years for the 2012 and 2015 AR. Figures in brackets indicate the value in the base year. For detailed macroeconomic and demographic assumptions, see Eurostat (National accounts, POP, MIGR and LFS databases) and previous Ageing Reports.

Looking at the main elements determining the labour input component of GDP growth, it appears that the two last projection exercises have generated the largest increases in participation rates, highlighting the positive expected impact of major structural pension reforms, mainly undertaken after the onset of the economic and financial crisis. Indeed, the financial crisis that hit the European Union in 2008-09 prompted in many countries a strong acceleration of sustainability-enhancing pension reforms, through the adoption of additional measures with sometimes short-term impacts. In several cases (e. g. Greece, Sweden, France and Finland), reforms with particularly large impacts have been legislated between 2008 and 2013 (see Chapter 2). Moreover, while the long-term NAWRU anchors were slightly higher in the last two rounds of projections, the much higher initial level of unemployment rates entails a stronger reduction of unemployment – corresponding to higher employment growth – over the projection horizon compared with the past.

Considering the macroeconomic assumptions and more specifically the expected labour productivity growth, the crucial assumption on productivity growth has been revised downward in consecutive

projection rounds, emphasising the risk of lower TFP growth in the future, in light of the trend decline over the last decades.

The heat-map in Table 13 summarises, for each projection exercise and for the main assumptions, at aggregated level[24], which one has been more favourable (green) or less favourable (orange) when compared to the average of all rounds of projections.

Table 13. **Overall classification of main assumptions by comparing budgetary projection exercises**

	2001 AR*	2006 AR**	2009 AR***	2012 AR***	2015 AR
Demographic assumptions					
Labour force assumptions					
Macroeconomic assumptions					

*BE, DK, DE, EL, ES, FI, IE, IT, LU, NL, AT, PT, FI, SE and UK.
** All Member States except BG, RO and HR.
*** All Member States except HR.

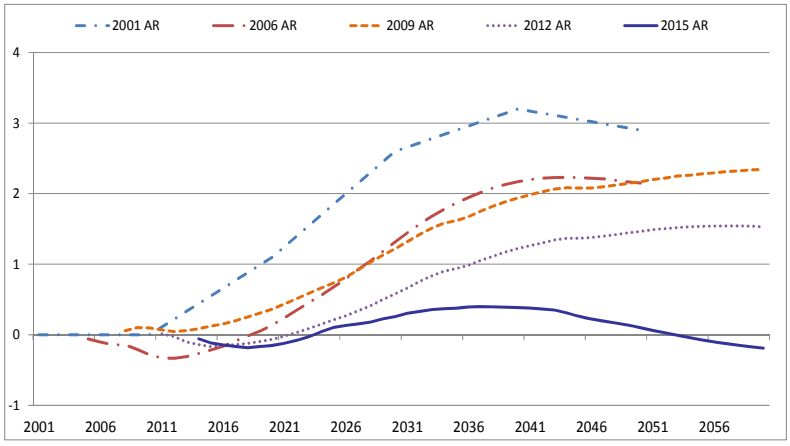
Source: Commission services.

3.2. COMPARING THE PROJECTIONS

An overall reduction of the projected increase in the public pension expenditure ratio

The projected change in pension expenditure as a share of GDP for each projection exercise is depicted in Graph 22 for the EU as a whole (Pension spending as a share of GDP is provided in Graph A.5 in the Annex). Each consecutive projection shows a smaller increase by 2040 (i.e. when demographic ageing reaches its peak), with increases of 3.2 pp. of GDP in 2001, going progressively down in successive vintages till a low of 0.4 pp. of GDP in the 2015 projection exercise (2015 Ageing Report). After 2040, pension expenditure was projected to decline in the 2001, 2006 and 2015 projections, while in 2009 and 2012 projection exercises it was projected to keep on increasing until the end of the projection period. The 2001 and 2006 projections had a timespan until 2050, showing overall increases in pension expenditure of 2.9 pp. of GDP and 2.2 pp. of GDP respectively. The more recent 2009, 2012 and 2015 projection exercises extended coverage to 2060, with lower overall increases between each consecutive projection (2.3 pp. of GDP, 1.5 pp. of GDP and -0.2 p.p of GDP respectively) (see Table 14).

Graph 22. **Changes in public pension expenditure as a share of GDP in the 2001, 2009, 2012 and 2015 vintages, European Union.**



Source: Ageing Report (2001, 2006, 2009, 2012 and 2015).

Notes: Graph A.5 contains public pension expenditure as a share of GDP in levels.

[24] Using simple averages of the relevant assumptions shown in Table 12.

There are, however, large differences between countries, as can be seen in Table 3. The largest downward revision in pension expenditure between projection periods (over 10 pp. of GDP between the 2006 AR and the 2015 AR) can be seen in Greece, Cyprus and Portugal, all countries that have introduced significant reforms to their pension systems since 2001. Consistently, low or negative expenditure changes are reported in countries that had already reformed their pension system before 2001 (e.g. EE, IT, LV, PL and SE). In many countries the projected change in pension expenditure does not vary significantly between projection exercises, implying that no major policy changes have taken place in this time period. However, in some cases the underlying assumptions alone can have a strong impact on the dynamics of pension expenditure. This is the case, for example, for Finland, where pension expenditure was expected to increase by 3.2 pp. of GDP in the 2012 projections, and only by 0.1 pp. of GDP in the 2015 projections with no other changes, except for underlying assumptions. This is also the case for Luxembourg, where pension expenditure was projected to increase by 9.4 pp. of GDP in the 2012 projections, and by a reduced 4.1 pp. of GDP in the 2015 projections, driven by improved demographic projections and very limited impact from policy changes.

Table 14. **Overall projected change in public pension expenditure as % of GDP by budgetary projection exercise**

Public pensions expenditure as % of GDP - Overall p.p. change over the entire projection period (starting level in brackets)					
	2001 AR	2006 AR	2009 AR	2012 AR	2015 AR
BE	3.3 (10)	5.1 (10.4)	4.8 (10)	5.6 (11)	1.3 (11.8)
BG	:	:	3 (8.3)	1.1 (9.9)	-0.4 (9.9)
CZ	:	5.6 (8.5)	3.3 (7.8)	2.7 (9.1)	0.7 (9)
DK	2.8 (10.5)	3.3 (9.5)	0.1 (9.1)	-0.6 (10.1)	-3.1 (10.3)
DE	5.1 (11.8)	1.7 (11.4)	2.3 (10.4)	2.6 (10.8)	2.7 (10)
EE	:	-2.5 (6.7)	-0.7 (5.6)	-1.1 (8.9)	-1.3 (7.6)
IE	4.4 (4.6)	6.4 (4.7)	4.6 (4)	4.1 (7.5)	1.1 (7.4)
EL	12.2 (12.6)	:	12.4 (11.7)	1 (13.6)	-1.9 (16.2)
ES	7.9 (9.4)	7.1 (8.6)	6.7 (8.4)	3.6 (10.1)	-0.8 (11.8)
FR	3.7 (12.1)	2 (12.8)	1 (13)	0.5 (14.6)	-2.8 (14.9)
HR	:	:	:	:	-3.9 (10.8)
IT	0.3 (13.8)	0.4 (14.2)	-0.4 (14)	-0.9 (15.3)	-1.9 (15.7)
CY	:	12.9 (6.9)	11.4 (6.3)	8.7 (7.6)	-0.1 (9.5)
LV	:	-1.2 (6.8)	-0.4 (5.4)	-3.8 (9.7)	-3.1 (7.7)
LT	:	1.8 (6.7)	4.6 (6.8)	3.5 (8.6)	0.3 (7.2)
LU	1.9 (7.4)	7.4 (10)	15.2 (8.7)	9.4 (9.2)	4.1 (9.4)
HU	:	6.7 (10.4)	3 (10.9)	2.8 (11.9)	-0.1 (11.5)
MT	:	-0.4 (7.4)	6.2 (7.2)	5.5 (10.4)	3.2 (9.6)
NL	5.7 (7.9)	3.5 (7.7)	4 (6.6)	3.6 (6.8)	0.9 (6.9)
AT	2.5 (14.5)	-1.2 (13.4)	0.9 (12.8)	2 (14.1)	0.5 (13.9)
PL	:	-5.9 (13.9)	-3.5 (11.6)	-2.2 (11.8)	-0.7 (11.3)
PT	3.4 (9.8)	9.7 (11.1)	2.1 (11.4)	0.2 (12.5)	-0.7 (13.8)
RO	:	:	7.9 (6.6)	3.7 (9.8)	-0.1 (8.2)
SI	:	7.3 (11)	8.8 (9.9)	7.1 (11.2)	3.5 (11.8)
SK	:	1.8 (7.2)	3.4 (6.8)	5.2 (8)	2.2 (8.5)
FI	4.6 (11.3)	3.1 (10.7)	3.3 (10)	3.2 (12)	0.1 (12.9)
SE	1.7 (9)	0.6 (10.6)	-0.1 (9.5)	0.6 (9.6)	-1.4 (8.9)
UK	-1.1 (5.5)	2 (6.6)	2.7 (6.6)	1.5 (7.7)	0.7 (7.7)
NO	:	:	4.7 (8.9)	4.9 (9.3)	2.5 (9.9)
EU	2.9 (10.4)	2.2 (10.6)	2.3 (10.1)	1.5 (11.3)	-0.3 (11.3)

Source: Ageing Report (2001, 2006, 2009, 2012 and 2015).

Note: For BE, the effect of the 2015 pension reform has been incorporated. Original 2015 AR projection indicated an increase of 3.3% of GDP.

Main factors behind the changes in pension expenditure between the 2009 and 2012 and the 2012 and 2015 projections

Table 15 shows the breakdown of the main reasons for the differences in the change in public pension expenditure as a percentage of GDP between the 2009 and 2012 projections and between the 2012 and 2015 projections for the countries that reported these figures in their country fiches (15 Member States

reported the breakdown in the 2012 pension country fiches, 25 Member States did so in the 2015 country fiches[25]).

Policy-related changes are consistently reducing pension expenditure, with the largest cumulated impact on pension expenditure between 2009 and 2015. The change in the underlying assumptions had an expenditure-increasing impact between 2009 and 2012, and an expenditure-decreasing impact between 2012 and 2015. The improvements in modelling have first produced an expenditure-increasing impact, which then turned to a decreasing impact between the 2012 and 2015 projections. Finally, the interpretation of 'constant policy' had an impact on pension expenditure only between the 2009 and 2012 rounds, showing that many countries decided to change assumptions to better reflect historical evidence[26].

Table 15. **Breakdown of the main differences in public pension projections as % of GDP at EU level between different projection vintages**

European Union - difference between 2012 AR and 2009 AR						
	2010	2020	2030	2040	2050	2060
Change in assumptions	0.5	0.4	0.3	0.2	0.2	0.3
Improvement in the coverage or in the modelling	0.5	0.0	0.2	0.3	0.3	0.5
Change in the interpretation of constant policy	0.0	0.5	0.4	0.3	0.3	0.0
Policy related changes	0.0	-0.3	-0.5	-0.5	-0.4	-0.5
Others	0.0	0.0	0.0	0.0	0.0	0.1
TOTAL CHANGE (2012 AR - 2009 AR)	0.9	0.7	0.4	0.4	0.4	0.4

European Union - difference between 2015 AR and 2012 AR						
	2013	2020	2030	2040	2050	2060
Change in assumptions	0.5	0.3	0.5	0.1	-0.3	-0.7
Improvement in the coverage or in the modelling	0.0	-0.1	-0.2	-0.3	-0.3	-0.3
Change in the interpretation of constant policy	0.0	0.0	0.0	0.0	0.0	0.0
Policy related changes	0.0	0.0	-0.2	-0.3	-0.4	-0.3
Others	0.1	0.0	0.0	0.0	0.0	0.0
TOTAL CHANGE (2015 AR - 2012 AR)	0.6	0.3	0.1	-0.5	-1.1	-1.4

Source: Ageing Report (2009, 2012 and 2015).

To provide a more detailed look at the underlying drivers of changes in the pension spending-to-GDP ratio over time, the following decomposition formula is applied for all projection vintages:

$$\frac{Pension\ Exp}{GDP} = \frac{\overbrace{Population\ 65+}^{Dependency\ Ratio}}{Population\ 20-64} \cdot \frac{\overbrace{Number\ of\ Pensioners\ (Pensions)}^{Coverage\ Ratio}}{Population\ 65+} \cdot$$

$$\cdot \frac{\overbrace{\frac{Average\ income\ from\ pensions\ (Average\ Pension)}{GDP}}^{Benefit\ Ratio}}{Hours\ Worked\ 20-74} \cdot \frac{\overbrace{Population\ 20-64}^{Labour\ Market-Labour\ intensity}}{Hours\ Worked\ 20-74}$$

The equation shows the main drivers that affect the dynamics of pension expenditure. The overall change in the public pension expenditure-to-GDP ratio can be expressed as the sum of the contribution of the following four main elements:

[25] The pension country fiches are available athttp://europa.eu/epc/pdf/country_fiche_en.zip

[26] Changes to no-policy-change assumption have occurred to reflect e.g. that ad hoc changes have been made in the past regularly so that pensions have risen faster than the legislated pension indexing would imply.

- **The dependency ratio**, which quantifies the impact of demography (the change in the composition of the population, old age versus working age) on the pension-to-GDP ratio. An increase in this ratio indicates a higher proportion of older individuals with respect to working-age population. As the dependency ratio increases, the pension-to GDP ratio moves in the same direction.
- **The coverage ratio**, which is defined as the number of pensioners of all ages to the population over 65 years. The analysis of the coverage ratio provides information about how changes in the effective exit age and the share of the population covered by the pension system influence pension spending. As the coverage ratio increases, the pension expenditure-to-GDP ratio increases as well.
- **The benefit ratio**, which indicates the development of the relative value of the average pension (public pension spending / number of pensioners) with respect to the average wage. This ratio reflects the features of the legal framework of pension systems as far as the calculation and indexation rules are concerned.
- **Labour market/ labour intensity**, which refers to the impact of labour market behaviour on pension expenditure. It captures the impact of measures aiming at increasing the participation rate, including of older people, reflecting projected developments in the labour market.

Table 16 shows the decomposition for all projection vintages. The dependency ratio effect has been consistently, by far, the most important driver of the pension expenditure-to-GDP ratio, being moreover the only driver that pushes up the latter. The dependency ratio effect was smaller in the 2001 and 2015 projections compared to other vintages (see also Tables 12 and 13).

As observed in Chapter 2, several reform steps have been taken in recent years by a number of Member States in order to limit the increasing impact of ageing on public pension expenditure. In many cases, these reforms were related to the abolishment or restriction of early retirement schemes, the increase in statutory retirement ages or the incentive to stay longer in the labour market on a voluntary basis, beyond the legal retirement age. All these measures are reflected in the reduction of the coverage ratio (pensioners / population 65+) that reduces the pension expenditure-to-GDP ratio. The latter has assumed an increasing importance in pushing down the increasing trend in pension expenditure since the 2001 projection vintage[27].

Many countries have also implemented measures that reduce the generosity of pension benefits to improve the sustainability of their pension systems. For example, the indexation of pensions in payment, the valorisation of past pensionable earnings, the way accrual rates are determined and the way age limits are set for a full pension are design features that impact the generosity of current and future pensions. In the EU as a whole, changes in the benefit ratio have shown a larger reducing effect on the pension expenditure-to-GDP ratio since the 2009 projections[28], reflecting a decreasing relative generosity of pension benefits.

Labour market reforms leading to longer and active working lives improve the sustainability of pension systems through higher labour supply and thus faster potential GDP growth. Higher employment rates also increase the amount of pension contributions and if the increase occurs also in older age groups, it is associated with higher effective exit ages and thus shortens the time spent on retirement. The labour market effect has reduced the pension expenditure-to-GDP ratio in all projection vintages, with the most pronounced impact for countries with the highest initial unemployment rates to be absorbed over time before reaching the assumed long-term "equilibrium" rate.

[27] The coverage ratio effect for the EU as a whole is less pronounced in 2015 compared with 2012 due the fact that the high coverage ratio effect in 2012 was partly due to eligibility restricting reforms with an immediate impact (e.g. in Greece and Italy), which are not captured in the 2015 coverage ratio effect anymore.

[28] The gradual decrease in the benefit ratio effect between the 2001 and 2009 projections can also be attributed to the fact that part of the effects materialised in between the projections.

Table 16. **Breakdown of the main differences in public pension projection as % of GDP at EU level**

Decomposition of gross public pension expenditure overall change - European Union						
	Overall change	Dependency ratio contribution	Eligibility/Coverage ratio contribution	Benefit ratio contribution	Employment/Labour market contribution	Residual/Interaction effect
2001 AR	2.9	6.4	0.6	-2.8	-1.1	-0.2
2006 AR	2.2	8.5	-2.2	-2.6	-1.1	-0.4
2009 AR	2.3	8.7	-2.6	-2.5	-0.7	-0.6
2012 AR	1.5	8.5	-2.9	-2.7	-0.7	-0.6
2015 AR	-0.2	7.2	-2.6	-3.0	-1.4	-0.4

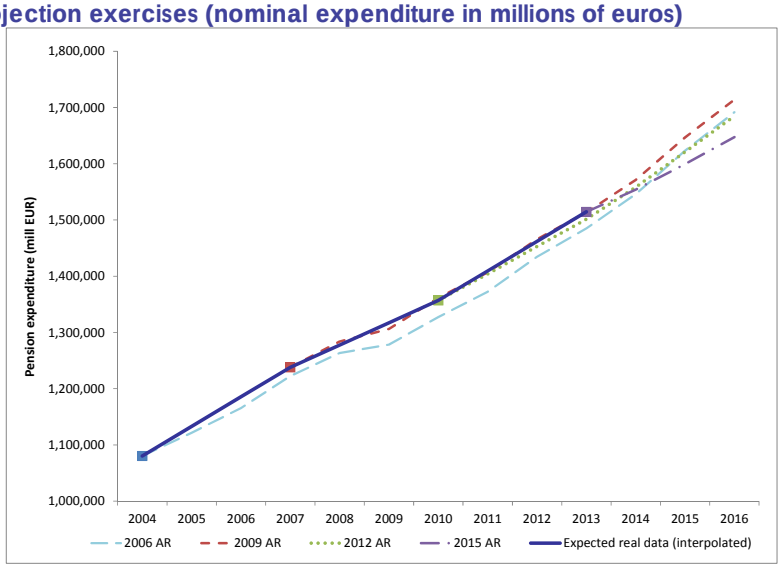
Source: Ageing Report (2001, 2006, 2009, 2012 and 2015).

3.3. SHORT-TERM ACCURACY OF PENSION PROJECTIONS

The first years of projected nominal public pension expenditure should not be prone to major forecast errors at least in "normal" times and in absence of any major policy changes, given that the number of pensioners and the amount of pension benefits should be well predictable.

At the aggregate EU level, the projected nominal pension expenditure projections until 2016 are very close to each other, as can be seen in Graph 23. In each projection round, the observed starting expenditure is also close to the projected one both in the next projection round and in subsequent projections. This indicates no systemic bias in the projections over the short run[29].

Graph 23. **Projected public pension expenditure for the EU as whole in 2004-2016 from the 2006, 2009, 2012 and 2015 projection exercises (nominal expenditure in millions of euros)**



Source: Ageing Report (2006, 2009, 2012 and 2015).

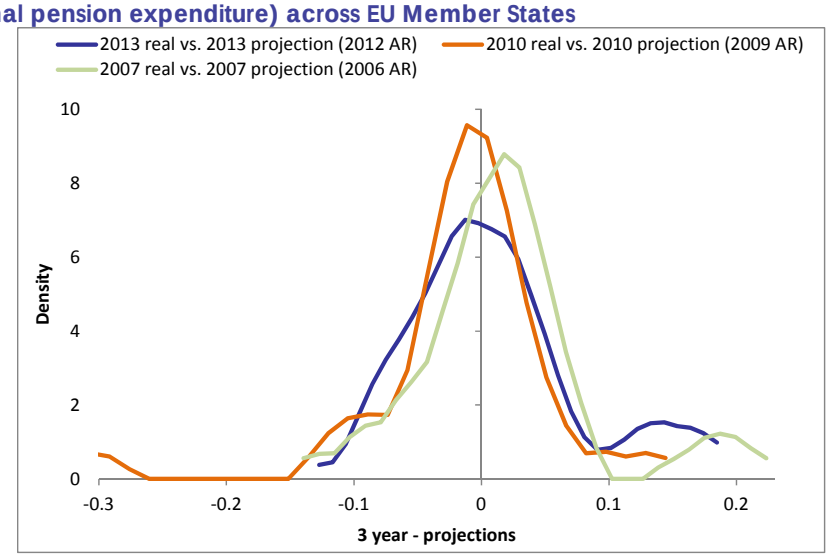
Notes: Countries which participated in all projection rounds since 2006 are included: BE, CZ, DK, DE, EE, IE, ES, FR, IT, CY, LV, LT, LU, HU, MT, NL, AT, PL, PT, SI, SK, FI, SE, UK

To measure the accuracy of the projections in the short term between consecutive projection exercises, the difference between the nominal pension expenditure in the base year (actual observed data) in each projection exercise and the nominal pension expenditure as projected in the corresponding previous round of projections for this year is calculated. For example, for the year 2010, the outturn value from the AR2012 is compared with the projected value from the AR2009 exercise. Graph 24 shows the

[29] The 2001 projection round is excluded from this analysis as the underlying projection assumptions lead to no increase in the pension expenditure to GDP ratio before the year 2011.

distributions[30] of forecast errors for pension expenditure over the whole sample of EU countries. The distributions are peaking at close to zero and the majority of observed biases are within a 10% bandwidth for all projection years, confirming that no systemic bias over the short run can be found when looking at the full sample of observations across EU countries.

Graph 24. **Distribution of projected biases of projected public pension expenditure (outturn – projected values of nominal pension expenditure) across EU Member States**



* Bandwidth = 0.0199

Source: Commission services.

The macroeconomic situation can, however, affect the accuracy of pension expenditure projections for individual countries even in the short term, if a large divergence between the underlying economic assumptions and the realised outcome occurs, especially in terms of the variables that are used to index pension benefits (usually inflation and wage growth). The macroeconomic context might also lead to pension policy measures, like temporary freezes in indexation, which can have a direct impact on the short-term accuracy of pension projections. Finally, the economic situation might have repercussions on retirement behaviour, for example when the worsening labour market situation leads to increased retirement in older age cohorts, leading to higher pension expenditure than originally projected.

Also other pension policy measures (not necessarily related to the economic cycle) can affect pension expenditure outcomes. For instance, some countries have shifted private pensions to the public pillar, leading to some abrupt increases in public expenditure being observed (e.g. for Hungary in 2013). On the other hand, policy measures that increase retirement age or curb early retirement might lead to "a run for retirement" in the short term for the persons that are currently eligible to retire, leading to an underestimation of pension expenditure in the short term.

Other factors that might lead to apparent "forecast errors" are changes in the coverage of the national pension models. A continuous strive to improve the modelling of pension expenditure has in many cases lead to a broader definition of public pension expenditure, which leads to an apparent underestimation of pension expenditure.

As shown in Table 17, differences are present across countries, with some of them exhibiting large deviations between pension expenditure outcomes and the projected values in the short term. Large negative deviations (i.e. lower expenditure outcomes than projected) are recorded in 2007 for EE and CY, in 2010 for EL and in 2013 for LU, HU and RO.

[30] To depict the distributions in the three projection exercises, an Epanechnikov kernel density estimation with the bandwidth reported in the graph is used.

Major short-term positive deviations have been also recorded for some Member States mostly before the beginning of the economic crisis (SK in 2007) or during the crisis (CZ, IE and LV in 2010). Only MT shows a very large positive deviation in 2013.

Table 17. **Forecast errors for the three first years (comparing outcome (base year) expenditure with the projected expenditure from the previous projection round, % of outcome expenditure)**

	2007 outcome (reported in 2009 AR) vs. 2006 AR projection for 2007	2010 outcome (reported in 2012 AR) vs. 2009 AR projection for 2010	2013 outcome (reported in 2015 AR) vs. 2012 AR projection for 2013
	outcome - projected	outcome - projected	outcome - projected
BE	-1.8%	1.9%	0.9%
BG	:	1.6%	6.1%
CZ	3.7%	10.6%	-3.2%
DK	-5.5%	-3.8%	-2.3%
DE	-0.1%	0.0%	-2.6%
EE	-17.2%	-2.7%	2.6%
IE	6.6%	10.8%	-0.2%
EL	:	-12.7%	-1.2%
ES	-2.6%	1.8%	5.0%
FR	3.5%	-4.5%	4.8%
IT	-0.4%	0.7%	-1.9%
CY	-20.3%	4.2%	4.6%
LV	-4.8%	30.6%	6.0%
LT	7.0%	-0.1%	1.1%
LU	-3.1%	-1.0%	-14.8%
HU	-1.8%	-0.1%	-15.3%
MT	-2.3%	7.4%	10.2%
NL	-5.7%	1.1%	-1.8%
AT	-0.2%	3.6%	-1.5%
PL	-5.3%	3.0%	-5.5%
PT	1.7%	2.3%	1.4%
RO	:	-2.4%	-16.0%
SI	-3.9%	-1.4%	-9.7%
SK	12.0%	5.3%	-3.7%
FI	-0.6%	-1.9%	-0.4%
SE	0.1%	-7.5%	4.2%
UK	0.9%	2.7%	6.1%
NO	:	-0.6%	-0.3%
EU	1.3%	-0.3%	0.9%
EA	1.7%	-0.7%	0.6%

Source: Commission services.

Table A.10 in the Annex expands the above analysis by comparing the latest outcome (2013) with the projected values for 2013 in the three previous projection exercises (2006, 2009 and 2012 AR). This analysis confirms that at the aggregate EU level there is no systemic bias in the projections in the 3 to 9 year horizon (see also Graph 23 above), albeit large deviations are reported in several countries.

To conclude, the methodology used in the pension projections run for the different vintages of the Ageing Report is consistent over time, thus facilitating a meaningful comparison of the projection results.

The change in the projected pension expenditure as a share of GDP over the next half century has decreased since 2001 for the EU as a whole. Many countries have reported large decreases in projected pension expenditure due to major policy reforms. Overall, reforms have primarily led to a decrease in the projected coverage (e.g. through curbs in early retirement schemes and increased retirement ages) and to a reduction in the generosity of pension benefits (e.g. through a larger reliance on price indexation).

Although the number of pensioners and the amount of pensions should be well known for the first years of the projections, the short-term accuracy of the pension projections can be affected by many factors. This can be seen in large recorded deviations for several countries when comparing the realised outcome with the projected nominal pension expenditure from the previous projection round. However, at the aggregate EU and EA level, the deviations are on average small and indicate no systematic bias over the first years of projections.

4. THE IMPACT OF PENSION REFORMS ON THE FINANCIAL BALANCE OF PENSION SYSTEMS AND THE ADEQUACY OF PENSIONS

4.1. THE FINANCIAL BALANCE OF PENSION SYSTEMS AFTER A DECADE OF REFORMS

This chapter investigates whether recent pension reforms have improved the financial stability of pension schemes around the EU. The analysis makes use of a financial gap indicator (FGI) calculated with the pension projections contained in the Ageing Reports.

For all PAYG schemes, even when the formula for calculating pension rights is not a DB but a DC one as in the case of a NDC pension scheme, the basic financial equilibrium condition can be expressed as follows[31]:

$$\bar{C}_t * \text{Cont}_t = \bar{P}_t * \text{Pens}_t \quad (1)$$

Where, $\bar{C}_t$ is the average contribution in any given period t, Cont_t is the number of contributors in any given period t, $\bar{P}_t$ is the average pension in any given period t and Pens_t is the number of pensioners in any given period t.

Starting from the condition above a Financial Gap Indicator (FGI) can be easily calculated as follow:

$$\text{FGI} = \frac{\bar{C}_t}{\bar{P}_t} * \frac{\text{Cont}_t}{\text{Pens}_t} - 1 = \overline{\text{FR}}_t * \overline{\text{DR}}_t - 1 \quad (2)$$

where FR is the Financial Ratio (FR: the average contribution to the average pension at time t) and DR is the Demographic Ratio (DR: the ratio of the number of contributors to the number of pensioners in a given period t).

According to the FGI indicator, a pension system is in financial equilibrium when the FGI is equal to 0; an emerging financial dis-equilibrium or deficit would be signalled by a value smaller than 0 and, vice versa, a surplus would be present whenever the FGI is larger than 0. Equation (2) makes evident that the financial stability of a pension scheme is the result of the evolution of the two main components: the Financial Ratio (FR), and the Demographic Ratio (DR). [32] In order to improve the financial stability of the pension scheme, policymakers can adjust one of the following channels: increase revenue by changing the contribution (rates or base), decrease expenditure by reforming the rules to determine the pension level and change the requirements to retire, e.g. retirement age, and the contribution requirement to increase the effective retirement age.

In order to get a better view of the financial situation of a PAYG pension scheme, it would be better to separate earnings-related pensions from social assistance. Due to data availability, this has been possible only for the FGI from the 2012 AR and 2015 AR. The analysis below covers pension figures on public pension schemes. The aggregate of public pension expenditure may include benefits that are not necessarily earnings-related. Disability pension, minimum pension or flat component of an earnings-related old-age pension may, according to national legislation, be tax financed. Therefore,

[31] For the sake of simplicity we are not considering here the possibility of buffer funds as in the case of the Swedish system.

[32] By adopting the terminology of Drouin A. and M. Cichon (2009).

DK and NL public pension schemes, based on years of residency, have been excluded from the analysis. [33]

Revenues from contribution and the number of contributors to the public pension scheme are part of the AWG exercise since the 2006 round of projections.[34] Hence, the analysis proposed in this section will rely on data from the 2006, 2009, 2012 and 2015 AR.

Each group of columns in the table below shows the evolution of the FGI between 2015 and the final year of the interval covered by the projection exercise of each AR (2050 in the 2006 AR and 2060 for all sub-sequent reports).

Table 18. **FGI evolution throughout the different AR vintages**

	FGI - 2006 AR			FGI - 2009 AR			FGI - 2012 AR			FGI - 2015 AR		
Country	2015	2050	Difference 2050 - 2015	2015	2060	Difference 2060 - 2015	2015	2060	Difference 2060 - 2015	2015	2060	Difference 2060 - 2015
BG				-0.13	-0.35	-0.22	-0.09	-0.28	-0.18	-0.55	-0.56	-0.01
CZ	0.09	-0.37	-0.46	0.21	-0.25	-0.46	-0.03	-0.25	-0.22	-0.10	-0.19	-0.08
DE	-0.34	-0.32	0.02	-0.34	-0.33	0.01	-0.34	-0.35	-0.01	-0.33	-0.34	-0.01
EE	0.09	0.46	0.37	-0.03	0.13	0.16	-0.27	-0.12	0.16	-0.30	-0.23	0.07
IE	-0.43	-0.70	-0.27	0.05	-0.48	-0.53	-0.29	-0.48	-0.19	-0.29	-0.42	-0.14
EL	-0.42	-0.69	-0.27	-0.26	-0.65	-0.39	-0.49	-0.47	0.03	-0.49	-0.36	0.14
ES				0.16	-0.31	-0.47	0.06	-0.19	-0.26	-0.13	-0.06	0.07
FR	-0.02	-0.13	-0.11	-0.07	-0.10	-0.03	-0.21	-0.24	-0.03	-0.42	-0.30	0.12
HR										-0.45	-0.20	0.25
IT	-0.25	-0.28	-0.03	-0.24	-0.22	0.02	-0.30	-0.25	0.05	-0.31	-0.21	0.10
CY	-0.21	-0.64	-0.43	-0.44	-0.74	-0.30	-0.09	-0.36	-0.28	-0.34	-0.25	0.10
LV	0.25	-0.03	-0.27	0.25	0.14	-0.11	-0.05	0.20	0.24	0.01	0.35	0.35
LT	-0.06	-0.28	-0.23	0.00	-0.44	-0.44	-0.05	-0.42	-0.37	-0.01	-0.24	-0.23
LU	-0.07	-0.42	-0.35	0.08	-0.59	-0.67	-0.15	-0.53	-0.38	-0.29	-0.50	-0.21
HU	-0.43	-0.60	-0.18	-0.20	-0.38	-0.18	-0.15	-0.33	-0.17	-0.04	-0.11	-0.06
MT	-0.34	-0.53	-0.18	-0.34	-0.57	-0.23	-0.06	-0.47	-0.41	-0.45	-0.60	-0.15
AT	-0.29	-0.30	-0.01	-0.30	-0.33	-0.04	-0.41	-0.47	-0.06	-0.40	-0.42	-0.03
PL	-0.17	-0.01	0.17	-0.42	-0.42	-0.01	-0.28	-0.21	0.07	-0.30	-0.29	0.01
PT	-0.22	-0.56	-0.34	-0.17	-0.36	-0.20	-0.15	-0.32	-0.17	-0.19	-0.14	0.06
RO				-0.28	-0.55	-0.26	-0.19	0.01	0.20	-0.25	-0.19	0.07
SI	-0.10	-0.42	-0.32	-0.21	-0.54	-0.33	-0.19	-0.47	-0.28	-0.24	-0.43	-0.19
SK	-0.25	-0.51	-0.25	-0.25	-0.59	-0.33	-0.41	-0.67	-0.26	-0.29	-0.40	-0.12
FI	-0.19	-0.18	0.01	-0.14	-0.14	0.01	-0.15	-0.17	-0.02	-0.50	-0.44	0.06
SE	-0.28	-0.35	-0.07	-0.35	-0.36	0.00	-0.25	-0.27	-0.02	-0.30	-0.10	0.20
EU	-0.18	-0.34	-0.16	-0.15	-0.37	-0.22	-0.20	-0.31	-0.11	-0.29	-0.28	0.01

Notes: UK not included because of data availability. NL and DK not included as public pension system is based on year of residence instead of contribution. BE and NO not included because employees and employers contribution are not directly linked to financing of public pension expenditures, but – similar to other taxes - used to finance government expenditures in general. Data on contribution for BG related to the 2009 AR and 2012 AR include State contribution. Revenues from contribution in the case of SE do not include the buffer fund. Data for PL refer to the FUCS pension scheme. Data for IE include State pensions and the non-funded private occupational public service pension (POPS). It should be noted that in IE employer and employee contributions for state pensions are used to fund a wide range of social insurance benefits. Contribution figures for ES have not been reported in 2006 AR.

Source: Commission services.

[33] Since 2012 non-earnings-related minimum pension or income guarantee expenditure and recipients have been projected separately in the AR. Additionally, in 2015, expenditure and recipients of disability and other pension benefit that are not earnings related have been projected. Coherently with the effort to separate contribution from social assistance, these figures have been excluded when calculating the average pension and the number of pensioners using data from the 2012 AR and from the 2015 AR.

[34] The total revenue from employees and employers contribution has been collected in 2006, 2009 and 2012 projection exercises. In 2015 the module has been updated. Employees and Employers contributions are now projected separately as well as State contributions.

When looking at the difference in the value of the FGI between 2015 and the end point of the projection horizon (2050 or 2060), the results show on average (EU values) a deteriorating trend up to the 2009 AR projections, followed by a sharp improvement in the two more recent rounds of projections.

Indeed, while improvements in the value of the FGI are projected for only four countries in the 2006 AR (DE, EE, PL and FI) and five countries in the 2009 AR (DE, EE, IT, FI and SE), with only EE showing a positive value of the indicator in 2060 in both vintages of projections, in the 2015 AR there are as many as 13 countries projecting an improvement in the indicator over the long run. As a result of the financial crisis, financial stability has deteriorated in the short term throughout the projection exercises. Indeed, the gap projected for 2015 turns out to be worst in the 2012 AR and 2015 AR (-0.20 and -0.29 at EU level respectively) compared to the value projected in the 2009 AR, at the beginning of the crisis. When looking at the long term, many pension reforms during the last 5 years, supported by more favourable demographic projections (as from EUROPOP 2013 - as shown in Table 1 of section 1), result in better outcomes than in the past. Indeed, an FGI of -0.28 is projected for 2060 in the 2015 AR compared to a much higher value of -0.37 based on the 2009 AR for the same year (2060). However, it is to be stressed that a positive value of the indicator is projected only for LV (0.35) in 2060.

In order to further investigate the evolution of the FGI throughout the last four vintages of the projection exercises, an analysis of the evolution of the two sub-indicators in equation 2 (FR and DR) is presented in Table 19. For each AR, the indicators' evolution between 2015 and the end of the projection horizon is reported.[35]

Throughout the four last vintages of the AR, the demographic ratio (DR) behaves coherently with the evolution of the dependency ratio, as shown in Table 1, section 1. The reduction of the share of working-age population over the population aged more than 65 is reflected in the ratio between contributors and pensioners and impinges on the financial stability of the pension system. Coherently with the data on the evolution of the dependency ratio shown in Table 1, where a lower increase is projected in the 2015 AR, the projected DR is substantially increased in the latest report (-0.27 in the 2015 AR, compared to more than -0.54 in the 2009 AR) as a result of: i) more favourable population projections; and, ii) recent legislated reforms aimed at prolonging working careers and closing pathways to early retirement, e.g. by linking standard retirement age to life expectancy, increasing contribution requirements for retirement, revising eligibility criteria for disability pensions, etc.

The upward trend in pension expenditure brought about by adverse demographic developments is partially counterbalanced by pension reforms that have improved the financial ratio. At EU level, a positive contribution of the FR has been recorded in all AR exercises, reflecting the fact that many countries started reforming their pension schemes well in advance of 2006 (see table 7 section 1). The positive contribution of the FR to the reduction of the financial gap (FGI) has become larger in more recent projection exercises, as additional countries implemented pension reforms that, in most cases, included policy measures reducing benefits or increasing contributions (e.g. introduction of a sustainability factor, implementation of a less favourable indexation rule, penalties for early retirement). In the last round of projections, all MSs but LT, LU and SK[36] show a positive contribution coming from the FR.

[35] In order to have sub-indicator values that add up to the value of the FGI, a log-linearization is applied:

$$\log(\mathrm{FGI}+1)_{2060,\mathrm{AR2015}} - \log(\mathrm{FGI}+1)_{2015,\mathrm{AR2015}} = (\log \mathrm{FR}_{2060,\mathrm{AR2015}} - \log \mathrm{FR}_{2015,\mathrm{AR2015}}) + (\log \mathrm{DR}_{2060,\mathrm{AR2015}} - \log \mathrm{DR}_{2015,\mathrm{AR2015}}) \quad (3)$$

Where, for example, $\log \mathrm{FR}_{2060,\mathrm{AR2015}}$ is the logarithm of the financial ratio for 2060 as from the 2015 Ageing Report.

[36] Slovakia was slightly negative.

Table 19. **Decomposition of the FGI evolution throughout the different AR vintages - Log linearised values**

	2006 AR			2009 AR			2012 AR			2015 AR		
	Difference 2050 - 2015			Difference 2060 - 2015			Difference 2060 - 2015			Difference 2060 - 2015		
Country	FGI	FR	DR	FGI	FR	DR	FGI	FR	DR	FGI	FR	DR
BG				-0.29	0.21	-0.49	-0.23	0.03	-0.25	-0.02	0.14	-0.16
CZ	-0.54	-0.05	-0.49	-0.48	0.02	-0.50	-0.25	0.00	-0.25	-0.10	0.13	-0.23
DE	0.04	0.48	-0.44	0.01	0.39	-0.38	-0.01	0.40	-0.41	-0.02	0.41	-0.43
EE	0.29	0.58	-0.29	0.15	0.62	-0.46	0.19	0.51	-0.32	0.09	0.45	-0.36
IE	-0.63	0.01	-0.64	-0.70	-0.08	-0.62	-0.31	-0.07	-0.24	-0.21	0.33	-0.54
EL	-0.61	0.09	-0.70	-0.74	-0.16	-0.58	0.05	0.57	-0.52	0.24	0.35	-0.11
ES				-0.53	0.21	-0.74	-0.28	0.32	-0.60	0.08	0.45	-0.37
FR	-0.12	0.20	-0.31	-0.04	0.24	-0.28	-0.04	0.22	-0.26	0.18	0.32	-0.13
HR										0.37	0.49	-0.12
IT	-0.04	0.39	-0.42	0.03	0.42	-0.39	0.07	0.25	-0.17	0.14	0.16	-0.02
CY	-0.78	-0.07	-0.71	-0.76	0.13	-0.88	-0.36	0.60	-0.97	0.14	0.50	-0.37
LV	-0.25	0.19	-0.44	-0.09	0.66	-0.76	0.23	0.80	-0.57	0.29	0.60	-0.30
LT	-0.28	0.08	-0.35	-0.58	0.11	-0.69	-0.50	-0.10	-0.39	-0.26	-0.07	-0.19
LU	-0.48	-0.12	-0.35	-0.96	-0.14	-0.82	-0.60	0.16	-0.75	-0.35	-0.02	-0.33
HU	-0.37	-0.09	-0.29	-0.25	0.13	-0.39	-0.23	0.15	-0.38	-0.07	0.19	-0.26
MT	-0.32	-0.06	-0.27	-0.42	-0.04	-0.38	-0.58	-0.14	-0.44	-0.32	0.04	-0.36
AT	-0.02	0.26	-0.27	-0.05	0.32	-0.38	-0.10	0.23	-0.33	-0.05	0.26	-0.31
PL	0.19	0.60	-0.41	-0.01	0.68	-0.69	0.10	0.83	-0.73	0.02	0.57	-0.56
PT	-0.56	0.09	-0.65	-0.27	0.35	-0.62	-0.23	0.34	-0.57	0.07	0.36	-0.29
RO				-0.46	-0.05	-0.40	0.22	0.41	-0.19	0.08	0.40	-0.31
SI	-0.44	0.05	-0.49	-0.54	0.05	-0.59	-0.43	0.05	-0.47	-0.29	0.06	-0.35
SK	-0.41	0.23	-0.65	-0.59	0.19	-0.77	-0.59	-0.14	-0.45	-0.18	-0.01	-0.17
FI	0.01	0.20	-0.19	0.01	0.25	-0.24	-0.02	0.49	-0.52	0.11	0.38	-0.27
SE	-0.10	0.13	-0.23	-0.01	0.39	-0.40	-0.03	-0.42	0.39	0.26	0.07	0.18
EU	-0.27	0.16	-0.43	-0.33	0.21	-0.54	-0.17	0.24	-0.41	0.01	0.27	-0.27

Notes: see the note to Table 18. Values on FGI differ from those reported in Table 18 because of the log-linearisation. The difference 2050 – 2015 for each indicator is calculated according to eq.(3), e.g. in the last group of column the difference 2050 – 2015 in the FGI indicator is calculated as $\log(\mathrm{FGI}+1)_{2050,\mathrm{AR2015}} - \log(\mathrm{FGI}+1)_{2015,\mathrm{AR2015}}$.

Source: Commission services.

Looking more closely at pension arrangements prevailing in the Member States, we compare the average FGI performance by distinguishing those countries that have implemented at least an automatic stabiliser (namely the link between standard retirement age and life expectancy), a sustainability factor or an automatic balancing mechanism, against those that did not.[37] The last two stabilisers directly affect the FR by cutting the benefit in payment or by increasing the revenues into the system. The introduction of a link between the statutory retirement age and life expectancy affects the demographic ratio (DR).

The DR is of course strongly influenced by the demographic evolution as projected by EUROSTAT. To explicitly address this issue, a further decomposition of the indicator is carried out:

$$\overline{\mathrm{DR}}_t = \frac{\mathrm{Cont}_t}{\mathrm{Pens}_t} = \frac{\mathrm{Cont}_t}{Pop15{-}64_t} * \frac{Pop65{+}_t}{Pens_t} * \frac{Pop15{-}64_t}{Pop65{+}_t} \qquad (4)$$

Applying the log-linearisation:

$$\log_t \overline{\mathrm{DR}}_t = ConR_t + CovR_t + DepR_t \qquad (5)$$

[37] The classification is the one presented in Table 7 in Chapter 1. A sustainability factor is defined here as a rule that reduces pension benefit in line with increases in life expectancy. Coherently, all the NDC systems are classified as having embedded a sustainability factor. An automatic balancing mechanism is a rule that reduces the pension benefit or increases contribution to smooth the effect of the cycle on the financial sustainability of the system.

where $ConR_t$ is the logarithm of the ratio between the number of contributors and the working-age population, $CovR_t$ is the logarithm of the ratio between the population aged more than 65 and the number of pensioners and $DepR_t$ is logarithm of the dependency ratio. Table 20 reports log-linearised results for the described decomposition. Averages of the difference between the value of the indicators in 2015 and the end of the projection interval have been calculated by pooling together all the data of the different ARs. Averages have been calculated: i) for all the countries together (ALL); and ii) by grouping the countries according to whether their system is endowed with a link between retirement age and life expectancy (LE), whether a sustainability factor or an automatic balancing mechanism is legislated (SF or AM), in contrast with those that did not legislate any of them (No AAM). As expected, countries where at least one of the automatic stabilisers is in place show a better evolution of the FGI indicator, which is almost stable over the projection horizon (0 for countries with LE and 0.01 for countries with SF or AM).

Table 20. **Decomposition of the FGI and its sub-indicators (pooled data from different AR) –Log linearised values**

	FGI	FGI decomposition		DR decomposition		
		FR	DR	*ConR*	*CovR*	*DepR*
ALL	-0.18	0.23	-0.41	0.07	0.20	-0.68
LE	0.00	0.33	-0.33	0.12	0.24	-0.68
SF or AM	0.01	0.37	-0.36	0.05	0.18	-0.59
No AAM	-0.32	0.13	-0.45	0.07	0.21	-0.73

Notes: Values displayed are based on log linearisation as from eq. (5) and taking the difference between the last year of the projection interval (2050 for AR 2006 – 2060 for AR 2009, AR 2012 and AR 2015) and the year 2015.

LE group is made of 5 countries: CY, EL, IT, PT and SK. Countries where statutory retirement age is linked to increases in life expectances..

SF or AM group is made of 9 countries. AM: DE, ES and SE. SF: FI, ES, FR, LV, PL, PT and SE. Countries in which a sustainability factor or an automatic balancing mechanism is in place

No AAM is made of 11 countries: BG, CZ, EE, IE, HR, LT, HU, MT, AT, RO, SI. Countries where no automatic adjustment mechanism is in place.

See notes Table 18 explaining the rationale for excluding some countries (DK, NL, BE and UK).

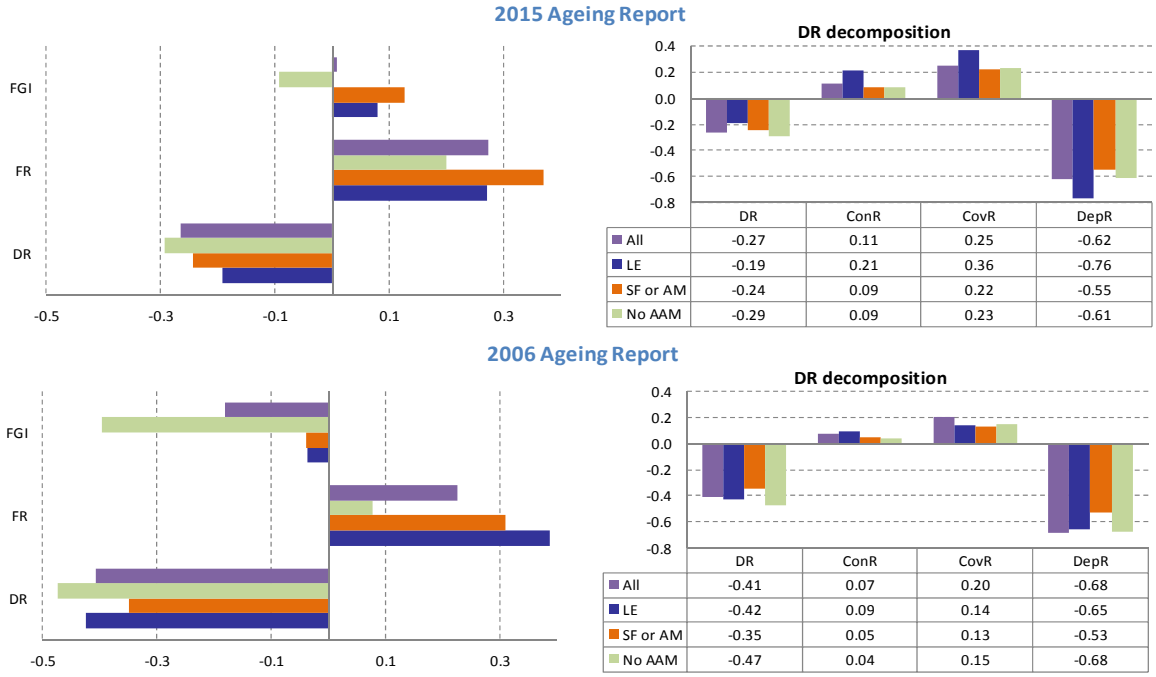
Source: Commission services.

While it is evident that for countries with SF or AM the result is driven, on average, by better outcomes in the FR (0.37 compared to 0.13), properly investigating the results for the countries with LE requires looking at the decomposition of the DR. When looking at the $ConR_t$ and at $CovR_t$ it is evident that LE is more effective (0.12 and 0.24 compared to 0.07 and 0.21) in contrasting the negative effect of the $DepR_t$ (-0.68).

The effect is more evident when comparing the decomposition results of the 2015 AR with those of the 2006 AR (see Graph 25). In the latter, the dependency ratio for the countries that adopted the LE was in line with the one for the countries without any automatic stabiliser. The same applies to the other two sub-components of the DR indicator. When looking at the 2015 AR, we see that the average dependency ratio for the countries with LE has deteriorated (-0.76 from -0.65), but it is also partially counter-balanced by better positive outcomes in the $ConR_t$ and the $CovR_t$ indicators.

This evidence can be explained by the fact that at the time of the 2006 AR fewer countries, especially among those suffering from severe demographic pressure and badly performing FGI, had their pension systems endowed with automatic stabilisers. As a results of the reforms of the last 10 years, in 2015 many countries are now included in the categories "LE" or "SF or AM". This explains the evolution of the $DepR_t$ between the two reports. The improvement in the FR and in the $ConR_t$ and $CovR_t$ sub-components of the DR shows that the automatic stabilisers are projected to be effective in improving the sustainability of pension systems over the coming decades.

Graph 25. **Decomposition of the FGI and its sub-indicators (2015 AR versus 2006 AR) - Log linearised values**



	DR	ConR	CovR	DepR
All	-0.27	0.11	0.25	-0.62
LE	-0.19	0.21	0.36	-0.76
SF or AM	-0.24	0.09	0.22	-0.55
No AAM	-0.29	0.09	0.23	-0.61

	DR	ConR	CovR	DepR
All	-0.41	0.07	0.20	-0.68
LE	-0.42	0.09	0.14	-0.65
SF or AM	-0.35	0.05	0.13	-0.53
No AAM	-0.47	0.04	0.15	-0.68

Notes: Values displayed are based on log linearisation as from eq. (5) and taking the difference between the last year of the projection interval (2060 for the AR 2015 and 2050 for the AR 2050) and the year 2015.

LE group is made of 5 countries: CY, EL, IT, PT and SK.

SF or AM group is made of 9 countries. AM: DE, ES and SE. SF: FI, ES, FR, LV, PL, PT and SE.

No AAM is made of 11 countries: BG, CZ, EE, IE, HR, LT, HU, MT, AT, RO, SI.

Source: Commission services.

4.2. ADEQUACY OF PENSION SYSTEMS AFTER A DECADE OF REFORMS

In recent years, as shown in the previous section, many countries have implemented pension reforms that have strengthened the financial sustainability of pension systems by tightening eligibility and decreasing benefits. This has led to sizable decreases in the projected pension generosity over the coming decades, which may also result in social or political sustainability challenges.

Arriving at a precise definition of pension adequacy and operationalising it into an indicator has proven to be difficult. Besides the idea that that pension adequacy is determined by the degree of poverty alleviation and consumption smoothing a system provides to the current pensioner generation, intergenerational comparisons of adequacy also play a role, particularly in the wake of substantial reforms. In the following, the adequacy/generosity of the pension system is investigated using the benefit ratio indicator as projected by the Member States in the 2015 AR (see Graph 26 and table A.8 in the Annex).[38] Changes in benefit ratios over time capture the likely development of the relative value of the average pension (total public pension spending divided by number of pensioners) relative to the likely evolution of the average wage (economy-wide average wage). All other things constant, a decline in the benefit ratio over time points to a fall in the generosity of public pensions, relative to wages. The projected reduction in the Benefit Ratio is expected to contribute to improving public finances but it could also risk increasing poverty among older people in the future.

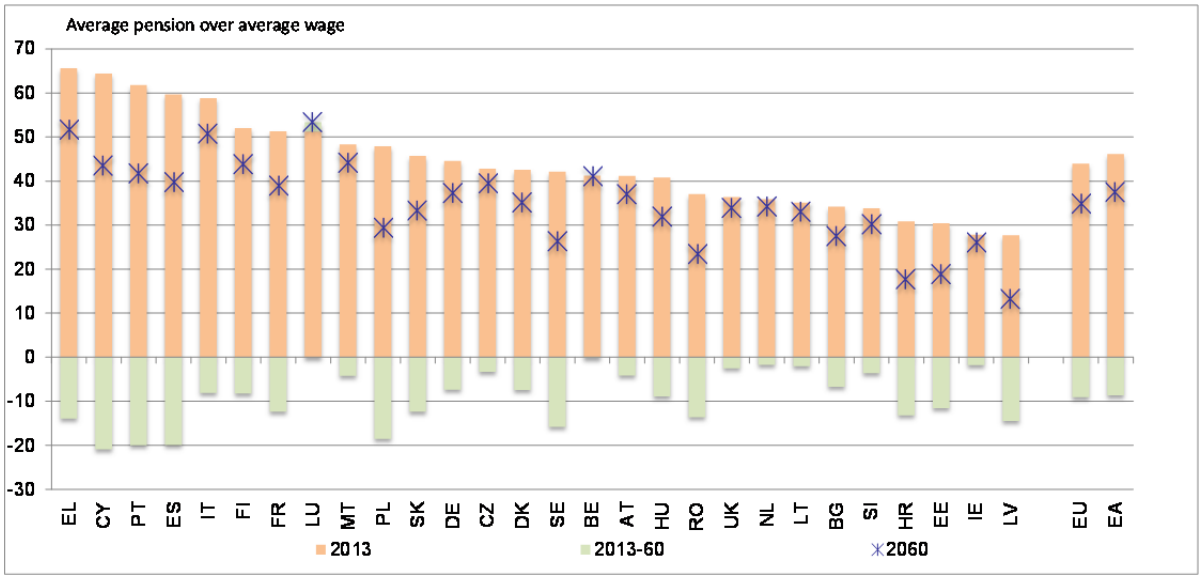
[38] Arriving at a precise definition of pension adequacy and operationalising it into an indicator has proven to be difficult. The most economically accurate measure would be one comparing someone's consumption pre-retirement with that post-retirement. The proposed indicators approximate the optimal one by measuring how pension benefits on average compare with previous average income. See the 2015 Pension Adequacy Report for a detailed discussion.

A rather substantial decline is projected in the public pension benefit ratio for most Member States over the period 2013 to 2060, amounting to around -20 pp or more in three Member States (Spain, Portugal and Cyprus). Only Luxembourg projects a slightly increasing public benefit ratio over the projection horizon (+2.1 pp). A benefit ratio decrease of around -9 pp is projected at the aggregate EU level.

It is nonetheless important to also consider that declines in the benefit ratio of public pensions may occur because the pension system has moved partly towards private schemes, and thus both revenues and expenditures related to public pension schemes would be lower in the future. The decline in the total pension benefit ratio becomes smaller in five Member States (Estonia, Latvia, Portugal, Romania and Sweden), when the influence of occupational and private individual schemes on pension entitlements is also taken into consideration. The total benefit ratio still declines by 10 pp or more in Poland, Portugal, Romania and Sweden. Only Denmark and Lithuania report a slight increase in the total benefit ratio (by +2.1 pp. and +2.8 pp. respectively), see Table A.8 in the Annex.

By 2060, the EU aggregate benefit ratio (for public pensions) would reach close to 38% (against 47% in 2013 – weighted average). The highest levels would be recorded in Luxembourg (53.4%), Greece (51.7%)[39] and Italy (50.7%), whilst the lowest levels would be observed in Latvia (13.2%), Croatia (17.6%) and Estonia (18.8%). In Latvia and Estonia, which also report data on occupational and private individual pensions, the total benefit ratio would however be slightly higher (at 19.5% and 25.4% respectively).

Graph 26. **Benefit ratio (average public pension/wage), 2013 and 2060**



Source: Commission services.

The benefit ratio is highly influenced by the indexation rules applied to the pension in payment. An indexation rule that is lower than wage indexation (i.e. price indexation rule) reduces the pension benefit of an individual relative to the average earning as the latter increases. This may pose a risk of pension inadequacy over time, especially when such a rule is applied to minimum pensions and when people are expecting to live on their pensions for an increasing number of years. Indeed, the projected average reduction in the benefit ratio in countries where pensions are indexed to wages is 6.5 pp, while less generous pension indexations, like those resulting in partial wage indexation or price indexation, lead to a much higher benefit ratio reduction in the considered time interval (10 pp and 11.2 pp respectively). Indexing minimum/social pension to prices instead of wages is extremely problematic in itself, as minimum pensions are a social tool to prevent absolute and relative poverty of people at old age and de-facto such indexation has proved to be "time-inconsistent" with this ultimate objective. Indeed, many countries have revised from time to time, on an ad-hoc basis, the level of their minimum pension when they are no longer able to provide a decent income support.

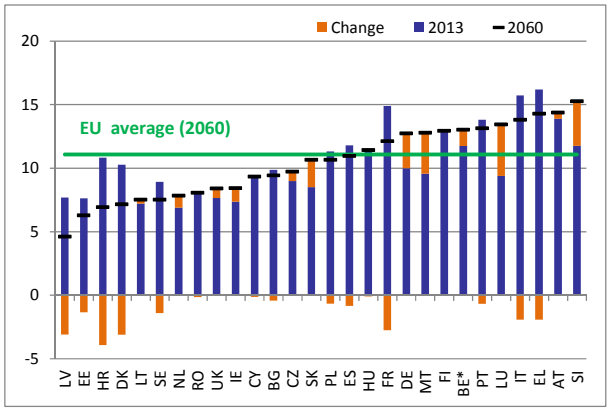
[39] Please note that data on Greece refer to the situation before the 2016 reform.

5. CONCLUSIONS: POLICY OPTIONS TO ADDRESS REMAINING CHALLENGES

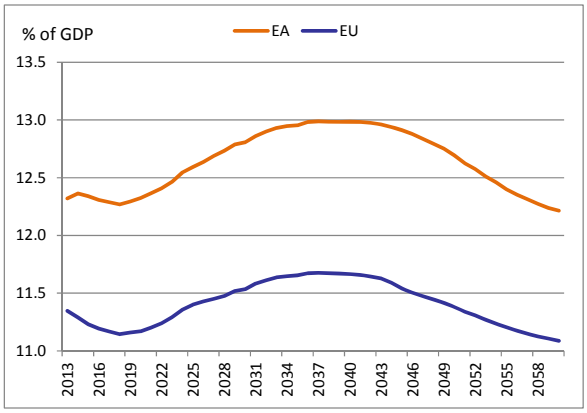
5.1. EVOLVING POLICY CHALLENGES

In the previous chapters, progress with pension reforms has been analysed. Public pension expenditure as a share of GDP reached 11 ¼ % in the EU in 2013 and is projected to fall to about 11% of GDP by 2060, i.e. no projected increase over the long term. Compared with previous long-term projection exercises, this is a significant improvement for future pension spending trends (see section 3). Nonetheless, the impact of ageing on pension spending is still projected to be substantial in some EU countries (see Graph 27). Large increases are projected for Luxembourg, Slovenia and Malta. Moreover, there are often long phasing-in periods of the pension reforms, an issue that raises questions about the intergenerational fairness of the reforms and poses some doubt on the time-consistency of their implementation. This is also leading to continued increase in pension expenditure over the next two decades in several countries (see Graph 28). This may call for future action to speed up the implementation of reforms, especially in countries with high fiscal sustainability risk in the short to medium term.

Graph 27. **Pension expenditure in EU countries, 2013 and 2060**



Graph 28: **Pension-to-GDP ratio**



Source: Ageing Report (2015)

Dynamic retirement ages are becoming the norm in EU countries. A tightening of the age eligibility to receiving a public pension (higher retirement age, reduced access to early retirement) is expected to act as a constraint on public pension expenditure in nearly every Member State. This reflects implemented pension reforms, often phased in over a long period, that lead to higher participation rates of older workers during the projection period. This is the main reason for the encouraging projections in the very long term. Many recent pension reforms include automatic mechanisms to address increases in life expectancy over time (see Tables 7 and 8).

With these sustainability-enhancing pension reforms in place in a majority of Member States, the challenge can take new forms. In addition to higher retirement ages, there has in general been a reduction of relative generosity of public pension schemes, often phased in over long time periods. This has reduced the expenditure-increasing effects of demographic change in the long term. But to make sure that these reforms will enjoy lasting support and success, other reforms are likely to be necessary. For example, reforms boosting retirement incomes by extending working lives and providing other means of retirement incomes. The relatively quick transition to an older population (in terms of the median age of voters) is still in its early phase in the EU. However, the window of opportunity is closing fast, and establishing a dynamic view on the age at which people retire needs to be seized without further delay.

Reforms have led to public pension benefits rising slower than wages, implying that on average pensioners will experience a relative deterioration in living standards vis-à-vis workers in the future. If pensions are being perceived as being 'too low' or the retirement age 'too high', this could eventually result in changes in pension policies, leading to upward pressure on pension spending, and the projections could thus underestimate future government expenditure. For example, as shown in section 4, the public pension benefit ratio (i.e. average pension in relation to average wage) is projected to fall in all Member States (except Luxembourg) in the period to 2060, on average by 9 pp. in the EU and in some countries (CY, PT and ES) by up to 20 pp. Consequently, the benefit ratio at the end of the projection period is generally low. Even including private pensions, the benefit ratio in 2060 would settle above 50 percent in only few countries (DK, EL, IT, LU, NL), while it falls below 30 percent in some other cases (BG, EE, HR, LV, PL, RO). This trend however differs widely across the EU (see Table A.8 in the Annex).

Pension policies have also been adapted to the changes in longevity in the EU, but adaptation is uneven across countries. Statutory retirement ages are increasing on average over time in EU counties. However, the increase is uneven, and the variability is increasing over time (see Graphs 5 and 62). This reflects the fact that in most countries, the statutory retirement age is constant after 2040, while in others it is increasing (e.g. Denmark, Greece, the Netherlands, where it is linked to life expectancy).

5.2. POLICIES TO ADDRESS FUTURE CHALLENGES TO PENSION SYSTEMS

Pension reforms should be complemented by flanking policies in order to render reformed pension systems more acceptable, socially viable and durable. Specifically, policies should aim at:

i. boosting retirement incomes by extending working lives;

ii. addressing longevity risks through automatic adjustment mechanisms;

iii. providing other complementary means of retirement incomes, e.g. through additional pension pillars;

iv. pursuing time-consistent measures and avoid risk of reform reversals when faced with ageing median voters.

i) extending working lives

Extending working lives may yield a double dividend:

- higher living standards through a longer career and a higher accumulation of pension rights, leading to higher permanent incomes; and,

- further progress towards sustainable public finances.

Extending working lives entails appropriate and comprehensive "flanking" labour market policies enabling older workers to continue working. These policies should combine:

- comprehensive lifelong learning strategies;

- flexible working arrangements that allow people to keep working beyond current formal “retirement ages” and to step down gradually from full-time to part-time to very part-time work[40];

- effective policies to help the unemployed re-enter the labour market;

[40] See "Interview with Lord Adair Turner", in The Journal of the Economics of Ageing Volume 6, December 2015, Pages 1–4.

- modern social safety net systems that support those in need and provide incentives for labour market integration;

- the improvement of wage-setting frameworks so that real wages and productivity developments are properly aligned over time;

- measures to reduce the gender gap in employment rates, particularly wide in several Member States (e.g. through care facilities).

ii) addressing longevity risk through automatic adjustment mechanisms

Designing key pension system parameters to adjust automatically to changes in demographic prospects is a powerful way of strengthening pension systems and reduces the political cost of revising the system from time to time to cope with longevity risk. Indexing the level of annual benefits or the duration of time spent in retirement to the demographic pressure will contribute to the long-term sustainability of pension systems, without the need to intervene with new reforms every time demographic conditions changes (which may become increasingly challenging given the expected relatively rapid ageing of the median voter in the EU over the coming 25 years).

For countries that have not yet done so, the introduction of automatic pension adjustment mechanisms should be favoured as a way to cater for the massive but slow-moving increases in life expectancy in the future and to enhance the resilience of pension systems to adverse shocks. Such a promising avenue has been already explored by several countries. It entails, for example, linking the retirement age to gains in life expectancy, or introducing a sustainability factor in DB systems, according to which the pension benefit is adjusted to reflect changes in life expectancy (something that is already automatically embedded in NDC systems).

iii) supporting complementary retirement savings

Though challenging in the present economic[41] and fiscal climate, encouraging complementary private pension pillars can yield a double dividend: i) supporting retirement incomes, through a higher accumulation of non-public pension rights, and ii) providing, to some extent, a buffer against adverse shocks, by diversifying pensioners' sources of income.[42] Such policies should be put into place sufficiently early as the build-up of supplementary savings takes time.

Additional pensions from private pillars, to compensate for the relatively lower pension income from public sources, are expected in a number of Member States. Indeed, a number of countries have implemented systemic pension reforms, shifting part of the previously public pillar to a mandatory funded private pillar (EE, LV, HU, PL, SK and SE). At present, these private pillars are making very small disbursements since they have been set up mainly during the previous decade, but their importance will increase in the future. Some countries (e.g. SE, DK and NL) also rely, to a certain extent, on 2nd pillar occupational pensions. Also, 3rd pillar non-mandatory pension schemes are increasingly being introduced, but their importance is generally small (see Table A.9 in the Annex).[43]

iv) pursuing time-consistent policies and avoiding risk of reform reversals when faced with ageing median voters

It is also important to bear in mind the political economy dimension of pension reforms. In the EU as a whole, the median age of male voters (aged 18 and over) rose by 5 years between 1960 and 2010, i.e.

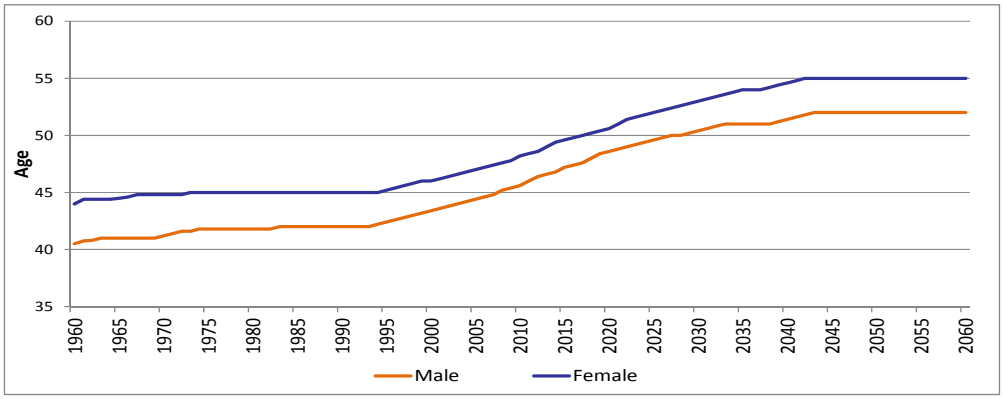
[41] Clearly, the current low interest rate environment encourages savings less than before. Still, from a life cycle point of view, and given in many cases lower publicly provided pensions in the future compared with today, there is a strong case for consumption smoothing through savings (delayed consumption) also on individual level.

[42] Specifically, individual pension pillars, often provided on a voluntary basis, can also best match individuals' specific preferences.

[43] Based on data provided by Member States. For the Ageing Report, the provision of data on private pension systems is made on a voluntary basis by Member States; therefore, the information is incomplete.

over a period of 50 years. Going forward, it is expected to rise by another 5 years by 2030. A similar development, but with a higher median age, is expected for females (see Graph 29). In twenty-five years' time, the median age is projected to have reached 52 years for men and 55 years for women (see Tables A.11 and A.12 for country-specific developments).

Graph 29. **Median age of persons aged 18 and over, EU**



Source: Eurostat

Several studies have documented that a political context characterised by ageing voters may hinder reforms, including those touching upon entitlement systems.[44] Older people are more likely to vote and increases in life expectancy entail an increase in their number, as shown above (see Graph 1 and 2 in Chapter 1). This implies a growing pressure on the government to provide improved state-funded services and benefits for older people, such as pensions. This in turn implies higher public expenditure. Moreover, the provision of such services might be financed through higher taxes on the young and working-age population, through less spending on investment, or both, thereby increasing the size of intergenerational transfers. The relatively quick transition to an older population (in terms of the median age of voters) is still in its early phase in the EU. However, the window of opportunity is closing fast.

Implementation risks, related to past pension reform reversals (e.g. as regards planned increases of the retirement age or tightening of rules on the calculation and indexation of pension benefits) would have a particularly strong impact in countries projecting high increases of the old-age dependency ratio (e.g. Slovakia, Portugal, Greece, Slovenia and Cyprus).[45] At the same time, the risk of reform reversal may be more pronounced in the Member States where, based on current legislation, future pensioners are projected to experience the strongest decreases of the benefit ratio and replacement rate (e.g. Cyprus, Portugal and Spain).[46] More in general, in countries with expected sharp decreases in public pensions (relative to pre-retirement incomes), an increasing role for private pensions may not be sufficient, especially for low-income workers, thus a strong safety-net system is also needed to avoid the resurgence of old-age poverty. To conclude, in several countries, recent debates and measures adopted that could partially revert past enacted reforms illustrate the necessity to appropriately calibrate pension reforms to ensure both fiscal sustainability and social acceptability.

[44] See e.g. Boeri et al. (2006), Bovenberg (2008), Galasso (2006), Galasso (2008) and Laine et al. (2009).

[45] See European Commission (2002), "Reform challenges facing public pension systems: the impact of certain parametric reforms on pension expenditure", EPC note (EPC/ECFIN/237/02). This note explores the impact of parametric reforms (regarding indexation, retirement age, and benefits linked to life expectancy) on pension expenditure. In particular, a change in the indexation of pensions by ½ pp. would have an impact on pension expenditure ratio change, over the long-run, of between 0.5 to 3 pp. of GDP (depending on the country-specific pension system characteristics).

[46] The benefit ratio is the ratio between average public pension benefits and the economy-wide average wage. The replacement rate is the ratio between the average first public pension (old-age earnings-related part) and the average wage at retirement. In Cyprus, Portugal and Spain, the benefit ratio is projected to decline by around 20 pp. over the period 2013-60 (against -9.5 pp. on average in the euro area). The replacement rate is projected to decrease by more than 30 pp. in Spain, and close to 27 pp. in Portugal over the same period (against around -9 pp. on average in the euro area). Other income than public pensions (e.g. private pensions and savings) also need to be taken into account when assessing risks related to declining benefit ratios.

ANNEX - Additional graphs and tables

Table A.1. **(Main) pension measures legislated by country and by type since the mid-2000's**

	parametric measures				schemes*
	eligibility	pension calculation	indexation	resources	
BE	+++	++	+		
BG	+	+	+++	++	++
CZ	++	++	+	+	++
DK	+++			+	++
DE	++	++		++	
EE	+	+	+++	+++	++
IE	++	++	+	+++	+
EL	++	++	+	++	++
ES	++	++	+	+	
FR	++	++	+	++	
HR	+	+++	+++		++
IT	++	++	+	++	
CY	++	+	+	+	+
LV	+	++	++	++	
LT	++	++		++	++
LU		+++	+++		
HU	++	++	+	++	++
MT	++	++	+		++
NL	+++	+		+	
AT	+++	+			
PL	+	+	+	++	+++
PT	+	++	+	++	++
RO	++	+	+	++	++
SI	+	+++	+++		
SK	++	++	+	++	+
FI	++	+	+	+	++
SE	+		+	+++	
UK	++	++	++	+	++

* Introduction, suppression or merging of schemes.

Notes: The cell is left blank if no measure has been legislated; + signals some measure(s) legislated (share in total pension measures for one country < EU average); ++ signals several measures legislated (share > EU average but lower than EU average + one standard deviation); +++ signals numerous measures legislated (share > EU average + one standard deviation).

Source: Commission services.

Table A.2. **Key parameters of pension systems in EU countries**

	Pensionable earnings reference	General valorisation variable(s)	General indexation variable(s)
BE	Full career	Prices	Prices and living standard
BG	Full career	Wages	Prices and wages
CZ	Full career	Wages	Prices and wages
DK	Years of residence	Not applicable	Wages
DE	Full career	Wages	Wages plus sustainability factor
EE	Full career	Social taxes	Prices and social taxes
IE	Flat rate	Not applicable	No fixed rule
EL	Full career	Price and wages	Prices and GDP (max 100% prices)
ES	Last 25 years	Wages	Index for pension revaluation
FR	25 best years (CNAVTS)	Prices	Prices
HR	Full career	Price and wages	Price and wages
IT	Full career	GDP	Prices
CY	Full career	Wages	Prices and wages
LV	Full career	Contribution wage sum index	Prices and wages
LT	25 best years	Yearly discretionary decision	Yearly discretionary decision
LU	Full career	Wages	Prices and wages
HU	Full career	Wages	Prices
MT	10 best of last 40 years	Cost of living	Prices and wages
NL	Years of residence	Not applicable	Wages
AT	40 best years	Wages	Prices
PL	Full career	NDC 1st: Wages, NDC 2nd: GDP	Prices and wages
PT	Full career up to a limit of 40 years	Prices	Prices and GDP
RO	Full career	Prices and wages until 2030	Prices and wages until 2030
SI	Best consecutive 24 years	Wages	Prices and wages
SK	Full career	Wages	Prices and wages
FI	Full career	Prices and wages	Prices and wages
SE	Full career	Wages	Wages
UK	Years of insurance contributions	Wages	Wages

Source: Commission services.

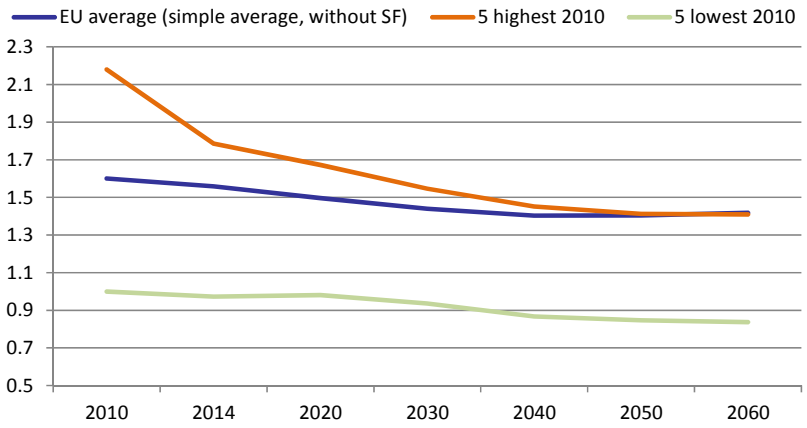
Table A.3. **Pensionable earnings reference: 2006 AR versus 2015 AR**

	2006 AR	2015 AR
BE	**Full career**	**Full career**
BG	na	**Full career**
CZ	30 years	**Full career**
DK	Years of residence	Years of residence
DE	**Full career**	**Full career**
EE	**Full career**	**Full career**
IE	Flat rate	Flat rate
EL	5 best years out of last 10 years (PR); last month (PU)	**Full career**
ES	Last 15 years	Last 25 years
FR	25 best years (CNAVTS)	25 best years (CNAVTS)
HR	na	**Full career**
IT	**Last 5 / 10 years (old DB); full career (new NDC)**	**Full career**
CY	**Full career**	**Full career**
LV	**Full career**	**Full career**
LT	25 best years	25 best years
LU	**Full career**	**Full career**
HU	**Full career**	**Full career**
MT	3 best of last 10 years	10 best of last 40 years
NL	Years of residence	Years of residence
AT	40 best years (as from 2028)	40 best years
PL	**Full career**	**Full career**
PT	**Full career up to a limit of 40 years**	**Full career up to a limit of 40 years**
RO	na	**Full career**
SI	Best consecutive 18 years	Best consecutive 24 years
SK	**Full career**	**Full career**
FI	**Full career**	**Full career**
SE	**Full career**	**Full career**
UK	Years of insurance contributions	Years of insurance contributions

Notes: In bold, when the pension reference is based on full career earnings; in green, when the reference is not based on full career wages, but has been extended compared to the 2006 AR.

Source: Commission services.

Graph A.1. **Average accrual rates for new pensions over the period 2010-2060 (%)**



Source: Ageing Report (2012, 2015).

Table A.4. **Valorisation rules: 2006 AR versus 2015 AR**

	2006 AR	2015 AR
BE	prices and welfare*	**prices**
BG	na	wages
CZ	wages	wages
DK	not applicable	not applicable
DE	wages	wages
EE	wages	social taxes
IE	not applicable	not applicable
EL	wages	prices and wages
ES	**prices**	wages
FR	**prices**	**prices**
HR	na	prices and wages
IT	DB: **prices;** NDC: GDP	DB: **prices;** NDC: GDP
CY	prices and wages	wages
LV	prices and wages	wage sum index
LT	yearly discretionary decision	yearly discretionary decision
LU	prices and wages	wages
HU	wages	wages
MT	**prices**	**cost of living**
NL	not applicable	not applicable
AT	wages	wages
PL	NDC: wages	NDC 1st: wages, NDC 2nd: GDP
PT	wages	**prices**
RO	na	prices and wages until 2030
SI	wages	wages
SK	wages	wages
FI	prices and wages	prices and wages
SE	wages	wages
UK	wages	wages

* Prices and wages in the public sector

Notes: In bold, when the valorisation rule is based on prices only; in green (resp. red), when the rule has become less (resp. more) generous compared to the 2006 AR.

Source: Commission services.

Table A.5. **Indexation rules compared**

	2001 AR	2006 AR	2015 AR
BE	prices and living standards	prices and living standards	prices and living standards
BG	na	na	prices and wages
CZ	na	yearly discretionary measure*	prices and wages
DK	wages	wages	wages
DE	wages (net)	wages + sustainability factor	wages + sustainability factor
EE	na	prices and social taxes	prices and social taxes
IE	no fixed rule	no fixed rule	no fixed rule
EL	wages + yearly discretionary measure	wages + yearly discretionary measure**	prices and GDP (max 100% prices)
ES	**prices**	**prices**	**index for pension revaluation**
FR	prices and wages	**prices**	**prices**
HR	na	na	prices and wages
IT	**prices**	**prices**	**prices**
CY	na	prices and wages	prices and wages
LV	na	prices and wages	prices and wages
LT	na	yearly discretionnary measure	yearly discretionnary measure
LU	prices and wages	prices and wages	prices and wages
HU	na	prices and wages	**prices**
MT	na	prices and wages	prices and wages
NL	wages	wages	wages
AT	*ad hoc* basis (reflecting wages (net))	**prices**	**prices**
PL	na	**prices**	prices and wages
PT	wages + yearly discretionary measure	prices and wages	prices and GDP
RO	na	na	prices and wages until 2030
SI	na	wages	prices and wages
SK	na	prices and wages	prices and wages
FI	prices and wages	prices and wages	prices and wages
SE	wages	wages***	wages
UK	**prices**	**prices**	wages

* Prices and for the minimum.

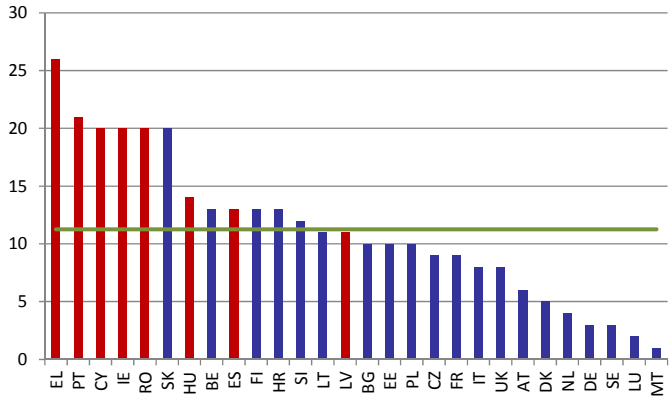
** Wages for the minimum

*** Prices for the minimum

Notes: In bold, when the indexation rule is based on prices only; in green (resp. red), when the rule has become less (resp. more) generous compared to the 2006 AR.

Source: Commission services.

Graph A.2. **Number of (main) pension reforms legislated since 2009 by country**



Notes: In red, countries that have required macro-financial assistance.

Source: Commission services.

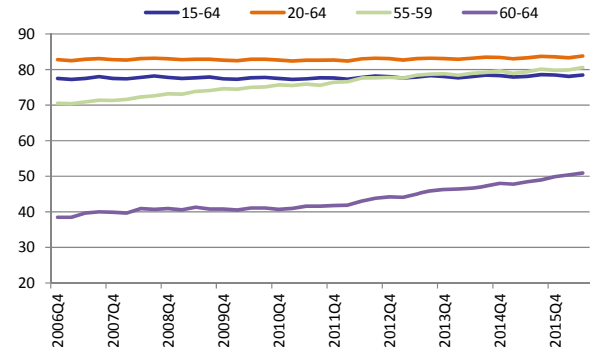
Table A.6. **Measures ruled out by Constitutional courts or corrective measures adopted after the peak of the 2008-09 crisis**

	Measures ruled out by Constitution courts			Corrective measures		
	Roll-back of private pension schemes	Increase of taxes on pensions	Pension cuts	Freeze in retirement age increase	Shift back to more generous indexation rule	Reduce incentives to contribute to private schemes / ease withdrawal of accumulated assets
BG	x			x		
CZ		x			x	
EL			x			
IT		x				x
LV			x			
LT			x			
PT		x*	x*			
RO			x			
SI			x			
UK						x

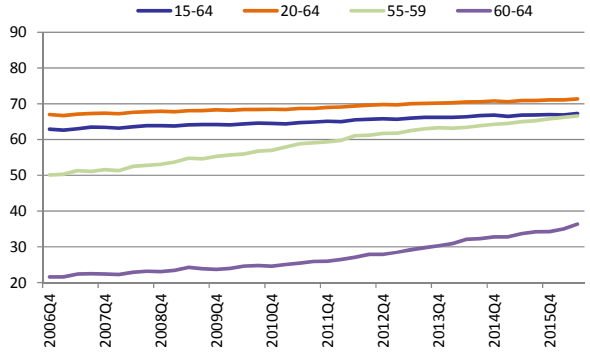
* Partially ruled-out.

Source: Commission services.

Graph A.3. **Participation rate in the EU, by age group (%), males**



Graph A.4. **Participation rate in the EU, by age group (%), females**



Source: Commission services, Labour Force Survey.

Table A.7. **Countries classification depending on pension reform trends**

	Private pension expenditures (% total)		category 1	category 2
	2013	2060		
BE	na	na	preserved model	one pillar
FR	na	na	preserved model	one pillar
LU*	0.0	na	preserved model	one pillar
MT*	0.0	na	preserved model	one pillar
SI**	0.0	1.6	preserved model	one pillar
CZ*	0.5	na	preserved model	one pillar
FI*	1.8	na	preserved model	one pillar
PT	2.0	1.5	preserved model	one pillar
CY*	3.6	na	preserved model	one pillar
ES	5.3	6.9	preserved model	one pillar
IE	na	na	preserved model	multi-pillar
DK	30.8	44.7	preserved model	multi-pillar
UK*	41.4	na	preserved model	multi-pillar
NL	43.2	45.5	preserved model	multi-pillar
EL*	0.0	na	changing model	nature public scheme
IT*	1.6	na	changing model	nature public scheme
AT*	4.5	na	changing model	nature public scheme
BG*	0.0	na	changing model	multi-pillar
RO	0.0	9.3	changing model	multi-pillar
LT	0.0	12.8	changing model	multi-pillar
HR	0.0	19.0	changing model	multi-pillar
LV	0.0	32.2	changing model	multi-pillar
EE	0.2	25.9	changing model	multi-pillar
DE*	10.3	na	changing model	multi-pillar
SE	21.7	34.2	changing model	multi-pillar
PL	na	na	reverting model	one pillar
HU**	0.0	0.6	reverting model	one pillar
SK	0.2	na	reverting model	one pillar

* Eurostat data (2012)

** Ageing report (2012)

Source: Commission services.

Table A.8. **Benefit ratio in 2013 and 2060 (in %) – 2015 AR**

	Public pensions			All pensions			
Country	2013	2060	% change	2013	2060	% change	General indexation variable(s)
BE	42.5	41.8	-0.7				Prices and living standard
BG	34.2	27.5	-6.7				Prices and wages
CZ	42.8	39.5	-3.3				Prices and wages
DK	42.5	35.1	-7.4	61.5	63.5	2.1	Wages
DE	44.6	37.3	-7.4				Wages plus sustainability factor
EE	30.4	18.8	-11.6	30.5	25.4	-5.1	Prices and social taxes
IE	27.9	26.1	-1.8				No fixed rule
EL	65.6	51.7	-14.0				Prices and GDP (max 100% prices)
ES	59.7	39.8	-19.9				Index for pension revaluation
FR	51.3	38.9	-12.4				Prices
HR	30.8	17.6	-13.2				Wages
IT	58.8	50.7	-8.1				Prices
CY	64.4	43.5	-20.9				Prices and wages
LV	27.7	13.2	-14.5	27.7	19.5	-8.2	Prices and wages
LT	35.1	33.0	-2.1	35.1	37.9	2.8	Yearly discretionary decision
LU	51.3	53.4	2.1				Wages
HU	40.8	31.9	-8.9				Prices
MT	48.3	44.1	-4.2				Prices and wages
NL	35.9	34.2	-1.7	63.2	62.8	-0.4	Wages
AT	41.2	37.0	-4.1				Prices
PL	47.9	29.4	-18.5	47.9	29.4	-18.5	Prices and wages
PT	61.8	41.7	-20.0	62.1	42.4	-19.6	Prices and GDP
RO	37.0	23.4	-13.6	37.0	25.8	-11.2	Prices and wages until 2030
SI	33.8	30.2	-3.6				Prices and wages
SK	45.7	33.3	-12.4				Prices and wages
FI	52.1	43.8	-8.3				Prices and wages
SE	42.1	26.3	-15.8	53.8	39.9	-13.8	Wages
UK	36.4	33.9	-2.5				Prices, wages and GDP
EU	46.9	37.8	-9.0				

Notes: Public pensions aggregate includes disability, survivor and non-earnings-related benefits. All pension aggregate includes private occupational and private individual benefit and it is only reported when private pensions have been provided.

The 'Benefit ratio' is the average benefit of public pensions and public and private pensions, respectively, as a share of the economy-wide average wage (gross wages and salaries in relation to employees), as calculated by the Commission services. EU figures are calculated as a weighted average.

IE A price and wage indexation rule has been assumed in the projections.

LU Indexation rule is wages if sufficient financial resources available, otherwise only cost of living indexation

UK Triple-lock indexation (highest of average earnings, CPI or 2.5%) is a commitment of the current government, but is not enshrined in law.

Source: Commission services.

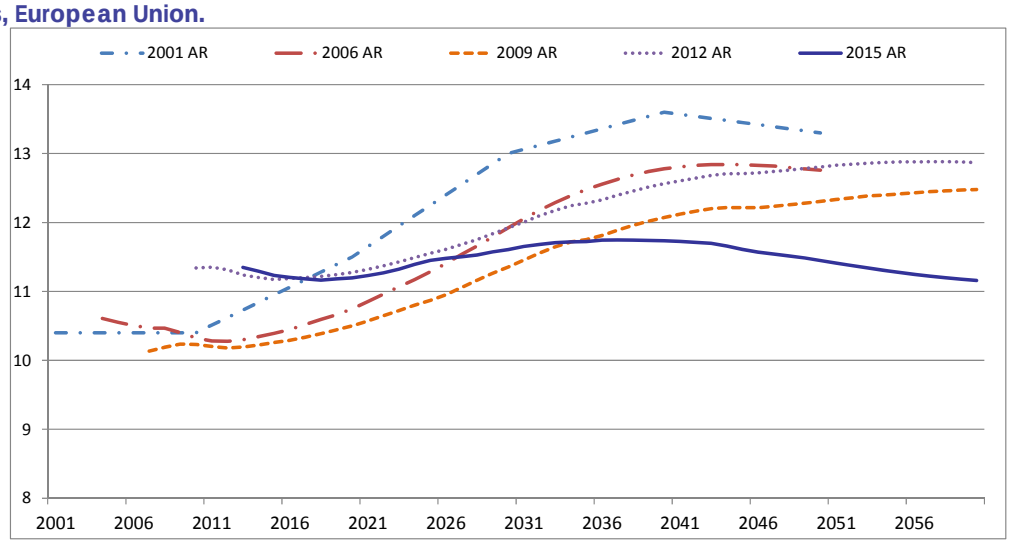
Table A.9. **Private (occupational and individual) pension schemes expenditure in 2013 and 2060**

	% GDP		% total pension expenditure	
Country	**2013**	**2060**	**2013**	**2060**
DK	4.6	5.8	30.8	44.7
EE	0.0	2.2	0.2	25.9
ES	0.7	0.8	5.3	6.9
HR	0.0	1.6	0.0	19.0
LV	0.0	2.2	0.0	32.2
LT	0.0	1.1	0.0	12.8
NL	5.2	6.5	43.2	45.5
PT	0.3	0.2	2.0	1.5
RO	0.0	0.8	0.0	9.3
SE	2.5	3.9	21.7	34.2

Notes: The table only presents the countries which provided data for private pension schemes.

Source: Ageing Report (2015), Commission services.

Graph A.5. **Public pension expenditure as a share of GDP in the 2001, 2009, 2012 and 2015 vintages, European Union.**



Source: Ageing Report (2001, 2006, 2009, 2012 and 2015)

Table A.10. **Forecast errors for three, six and nine years (comparing outcome (base year) expenditure in 2013 as reported in 2015 AR with the projected expenditure from the previous projection rounds (2006, 2009 and 2012 ARs) , % of outcome expenditure)**

	2013 outcome (reported in 2015 AR) vs. 2006 AR projection for 2013	2013 outcome (reported in 2015 AR) vs. 2009 AR projection for 2013	2013 outcome (reported in 2015 AR) vs. 2012 AR projection for 2013
	outcome - projected	outcome - projected	outcome - projected
BE	4.6%	4.1%	0.9%
BG	:	-0.6%	6.1%
CZ	7.6%	8.9%	-3.2%
DK	-15.1%	-9.2%	-2.3%
DE	-5.9%	-4.0%	-2.6%
EE	-0.1%	-14.9%	2.6%
IE	-0.4%	2.5%	-0.2%
EL	:	-17.3%	-1.2%
ES	10.2%	4.9%	5.0%
FR	6.7%	2.8%	4.8%
IT	-0.5%	-1.5%	-1.9%
CY	-8.6%	8.0%	4.6%
LV	15.7%	20.0%	6.0%
LT	-16.7%	-16.7%	1.1%
LU	-20.5%	-17.4%	-14.8%
HU	-21.5%	-6.2%	-15.3%
MT	10.5%	10.8%	10.2%
NL	-13.6%	-4.8%	-1.8%
AT	5.1%	2.7%	-1.5%
PL	9.8%	8.4%	-5.5%
PT	2.7%	2.8%	1.4%
RO	:	-28.0%	-16.0%
SI	-11.0%	-12.4%	-9.7%
SK	17.0%	3.6%	-3.7%
FI	0.0%	-4.5%	-0.4%
SE	-15.5%	-11.7%	4.2%
UK	5.5%	5.9%	6.1%
NO	:	7.3%	-0.3%
EU	1.9%	0.1%	0.9%
EA	2.3%	-0.5%	0.6%

Source: Commission services.

Table A.11. **Median age of persons aged 18 and over, males**

Males - Median age - Age 18 and over													
Country	1960	1970	1980	1990	2000	2010	2020	2030	2040	2050	2060	2070	2080
BE	44	43	42	42	44	46	48	48	48	49	49	50	51
BG	39	41	43	44	44	46	48	51	53	55	53	54	54
CZ	44	42	41	42	43	44	47	50	52	52	51	52	52
DK	44	43	42	42	44	46	48	49	49	50	50	51	52
DE	44	41	41	42	44	47	51	53	54	55	55	55	55
EE	37	38	40	40	42	43	46	49	51	52	51	52	52
IE	:	:	:	40	41	41	46	49	47	46	47	47	47
EL	:	42	44	44	44	45	49	52	55	55	54	54	54
ES	:	:	42	41	42	44	49	52	55	53	52	52	52
FR	:	:	:	:	44	46	48	49	49	49	50	50	51
HR	:	:	:	:	:	46	48	50	51	52	53	53	54
IT	39	41	42	43	44	47	50	52	52	53	54	54	55
CY	:	:	:	:	42	43	44	47	50	51	50	51	51
LV	:	39	40	41	42	43	47	49	51	49	48	49	48
LT	:	39	40	39	41	44	48	51	50	48	46	47	46
LU	:	:	42	41	43	44	45	45	46	47	49	50	51
HU	41	42	42	42	43	43	46	49	51	52	53	53	53
MT	:	:	36	40	43	46	47	49	51	52	52	52	52
NL	41	40	39	40	43	46	49	51	51	51	52	52	53
AT	45	42	41	41	42	46	49	50	51	52	53	53	54
PL	37	39	38	39	42	43	45	48	52	54	54	55	55
PT	39	41	42	42	43	45	49	52	54	55	56	56	57
RO	:	39	41	41	42	44	46	49	51	52	52	52	53
SI	:	:	:	40	42	45	48	51	53	53	52	52	52
SK	38	40	39	39	40	42	45	49	52	55	56	57	58
FI	39	39	39	41	45	47	49	49	50	50	51	52	52
SE	45	45	44	44	46	46	48	48	49	49	50	50	51
UK	:	:	43	42	44	45	48	48	49	50	50	50	51

Source: Commission services.

Table A.12. **Median age of persons aged 18 and over, females**

Females - Median age - Age 18 and over													
Country	1960	1970	1980	1990	2000	2010	2020	2030	2040	2050	2060	2070	2080
BE	47	46	46	45	47	48	50	50	50	51	51	52	53
BG	39	42	45	46	47	50	52	54	56	58	57	57	56
CZ	46	45	45	44	46	47	50	53	54	55	54	54	54
DK	45	45	45	45	46	48	50	51	51	52	52	53	53
DE	46	47	47	47	47	49	53	56	57	58	58	58	58
EE	44	44	45	46	48	49	53	55	56	58	56	56	56
IE	:	:	:	41	42	42	47	50	53	50	50	50	49
EL	:	43	45	46	46	48	51	55	58	59	58	57	56
ES	:	:	44	44	45	46	51	55	58	59	55	55	54
FR	:	:	:	:	46	48	51	52	53	53	53	53	53
HR	:	:	:	:	:	49	52	53	55	56	56	56	57
IT	41	43	44	46	47	49	52	55	56	56	56	56	57
CY	:	:	:	:	42	43	46	50	53	54	52	52	52
LV	:	44	46	47	48	49	53	56	57	58	54	53	52
LT	:	42	44	44	46	49	53	58	59	58	52	50	49
LU	:	45	45	44	45	45	46	46	47	49	50	51	52
HU	44	44	45	46	47	48	50	53	55	56	56	56	56
MT	:	:	39	42	45	48	50	52	53	55	55	54	55
NL	42	43	42	42	45	48	51	53	53	54	55	55	55
AT	47	47	47	46	46	48	51	52	53	55	55	56	56
PL	39	41	41	42	44	47	49	51	55	58	59	59	59
PT	40	43	44	44	45	47	52	55	59	60	60	61	60
RO	:	41	43	43	44	48	50	53	55	56	56	55	55
SI	:	:	:	43	45	48	52	54	56	57	55	55	55
SK	40	42	41	42	43	45	48	51	55	58	60	60	61
FI	43	43	43	44	47	50	52	52	52	53	53	54	55
SE	46	47	47	46	48	49	50	50	50	51	51	52	53
UK	:	:	46	44	45	46	49	50	51	52	52	52	53

Source: Commission services.

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