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Impact on pension outcomes of life events: standard simulations from five European countries

Gijs Dekkers[a)], Karel Van den Bosch[a)], Mikkel Barslund[b)], Tanja Kirn[c)], Nataša Kump[d)], Philippe Liégeois[e)], Amílcar Moreira[f)], Nada Stropnik[d)], Kara Thierbach[c)], Vincent Vergnat[e)]

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[a)] Federal Planning Bureau, Belgium; [b)] CEPS – Centre for European Policy Studies; [c)] University of Liechtenstein; [d)] IER – Institute for Economic Research, Slovenia; [e)] LISER – Luxembourg Institute of Socio-Economic Research; [f)] University of Lisbon.

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Executive summary

This study reports results from the use of standard pension simulations to demonstrate the impact of stylized labour market choices, that women may make, on the pension benefit that they later receive. It covers five countries, Belgium, Portugal, Slovenia, Luxembourg and Liechtenstein, and focuses on complete or part-time career interruptions in response to care responsibilities for a child or an older relative.

Standard simulations, or hypothetical or model person simulations, calculate pension income packages (or other outcomes) for a hypothetical individual, based on a work-life earnings profile, the detailed applicable tax and benefit rules and the characteristics of the individual. Modelled individuals are not meant to represent realistic career trajectories, but the results illustrate the functioning of the complex rules that determine the eligibility to pension benefits, and individuals' entitlements.

The hypothetical model individuals are defined by a combination of circumstances and options. Circumstances include age (30 or 54 years), education level and a full working career or a period of unemployment. The options are: continuing to work full time; part time work at 80% for 6 years; part time work at 50% for 6 years; or ceasing to work for 6 years. We consider scenarios where the reason for the reduction or interruption of work is care for a young child (at age 30), or caring for a dependent older relative (at age 54), as that may imply that the person is eligible (directly or indirectly through care-related benefits) for pension credits. The alternative is work interruption without cumulating such pension credits. It is assumed that people retire at the standard retirement age. Finally, the model persons are assumed to have been born in 2000, and to enter the labor market in 2020 or later, so that the simulations refer to the future.

In order to simulate the pension amount at the moment of retirement, we derived separate country specific wage profiles (i.e. earnings at any given future age) by gender and three levels of education. This is done in two steps: first, current cross-sectional wage profiles by age were estimated from national data sources. In the second step these wage profiles are then updated to future years using projections of future real average wage growth made by the Ageing Working Group of the Economic Policy Committee of the European Commission. (For Liechtenstein, the average Swiss wage index over the last twenty years was used.) Periods of complete interruption of work due to unemployment or another reason are assumed to involve an earnings penalty relative to an individual with an uninterrupted career. Only first-pillar pensions are simulated, except for Liechtenstein, where the simulations also cover the second-pillar pensions.

Key findings

For the comparative analysis, we first consider the case of a person at age 30 who reduces or interrupts her work for six years, and who is eligible for childcare-related pension credits. The impact of working part time in that situation is quite small (less than 3%) in Belgium, Portugal and Liechtenstein, larger in Slovenia (3 - 5%) and largest in Luxembourg (6 - 8%). The impact of completely interrupting work is much larger, particularly so for persons with high education. The main reason is that complete interruption, in contrast to part-time work, leads to an earnings penalty which reduces earnings during the entire rest of the career, up to the standard retirement age. Differences between countries are due to

the way pension credits for reduction of work due to child care are calculated. In some countries, these pension credits are accumulated (almost) throughout the six years (Belgium and Liechtenstein), while this period is much more limited in time in Luxembourg, Slovenia and Portugal.

A second comparative case considers unemployment for three years before age 30 followed by an uninterrupted career until the standard retirement age. Compared to a career without unemployment, the reduction in the pension is stronger in Luxembourg than in other countries for all education levels (10 – 17%). In the other countries, the impact varies between 1% and 5% for the low education level, between 4% and 8% for the medium education level, and between 8% and 11% for the high education level, thus showing a clear gradient by education The main reason is that the unemployment spell entails an earnings penalty for the rest of the career, which is not compensated by pension credits. The large impact in Luxembourg is because pension credits during unemployment are based on the level of unemployment benefit which is limited to one year.

The impact of 6-year career interruptions at age 54 in order to care for an older relative is covered in the third comparative case. The impact of part-time work is very small in Belgium, and also quite limited in Liechtenstein. For the other countries they vary between 3% and 7% for those with low education, 5% and 10% for those with medium education, and 6% and 9% in the high education scenarios. Full career interruption entails a reduction in pensions from 5% (Belgium) to more than 20% (Slovenia). These country differences are due to differences in the regulations of pension credits related to care for older relatives. In Portugal and Slovenia, no such pension credits exist. In Belgium, Liechtenstein and Luxembourg, these pension credits can be obtained during the whole period of six years. The large reduction in pensions in the case of Slovenia is due to loss of generous bonus accrual rates available after more than 40 years of contributions.

Finally, we made a comparison between the impact of caring at age 30 and age 54. This is informative of whether pension credits related to care for older persons are more or less more compensatory than those related to childcare. In Liechtenstein and Portugal there is no impact of care-related pension credits on the pension, neither for childcare, nor for care for older persons. In Slovenia there are no pension credits related to care for older relatives, while maternal and parental leave do entail pension credits. In Belgium and Luxembourg, by contrast, pension credits for care to older persons at age 54 appear to have a greater impact than childcare-related pension credits at age 30. For Luxembourg, the main reason for this is that childcare-related pension credits can cover only part of the six-year period, while pension credits for care to older relatives can be granted for the whole period. In Belgium, both kinds of pension credits are based on the last full-time wage, which is considerably higher at 54 than at 30.

1. Introduction[1]

1.1. The goal of project MIGAPE

The goal of the project "MInd the GAP in Europe" (MIGAPE) is to analyse gender differences in pension income, and to do this from various perspectives and communicate the lessons learned to policy makers and the audience at large. This project is a collaboration between researchers from CEPS, the Federal Planning Bureau and the KU Leuven in Belgium, the University of Lisbon, Portugal, the IER in Slovenia, LISER in Luxembourg and the University of Liechtenstein, Liechtenstein.

A summary of the project can be found on the MIGAPE website (2020) and more specifically in the project description (Dekkers, Hoorens and Van den Bosch, 2019). The objectives of this project can be grouped along three related axes. The first axis aims at providing the public at large with relevant information on the consequences that their choices may have on their future pension. The goal of the second axis is to provide policy makers of various EU countries with information on the possible future developments of Gender Pension Gaps. A third, and complementary axis will study how to raise people's awareness of the consequences of employment decisions. This report is part of the first axis, comparing results from the participant countries.

This report draws heavily on the five national reports: Dekkers and Van den Bosch (2020); Kirn and Thierbach (2020); Liégeois and Vergnat (2020); Moreira and Craveiro (2020); Kump and Stropnik (2020).

1.2. Goal and approach of this report

As discussed in the project description (Dekkers, Hoorens and Van den Bosch, 2019), the pension that one can expect to receive after retirement is a function of previous labour market circumstances and decisions, together with the – possibly compensating – elements of the existing pension system. This report is based on standard simulations to demonstrate the impact of choices that women commonly make on the pension benefit that they later receive. The decisions on which we focus concern complete or part-time career interruptions in response to care responsibilities for a child or an older parent.

Standard simulations, also known as hypothetical or model person simulations, are calculations of income packages (or other outcomes) for a hypothetical individual, solely based on the applicable tax and benefit rules and the characteristics of the individual. In the project reported on here the focus is on the effects of labour market decisions, mediated by the rules of the pension system, on the future pension. A pension model is used to calculate the resulting public pension at the statutory retirement age (or at the moment of early retirement). The key advantage of standard simulation is that, by fixing the definitions of the hypothetical individuals and varying only particular labour market decisions, the resulting difference in outcome (pension) can be unambiguously attributed to the decision, given her circumstances and the pension regulations. E.g., the effect of working half-time for six years at a certain point in the career is calculated for a woman with a particular employment contract, a particular age and a given wage profile. So, as they are focused on the outcomes for a restricted (and well-defined)

[1] This chapter is largely copied from the Belgian national report (Dekkers and Van den Bosch, 2020).

number of hypothetical cases, standard simulations can help to illustrate the functioning of the (sometimes) highly complex rules that determine the eligibility to pension benefits, and individuals' entitlements.[2] A well-known example of standard simulation in the context of pensions are the prospective theoretical replacement rates (TRRs) published by the OECD in "Pensions at a Glance" (2017 and 2019). See also Burlacu et al (2014), European Commission (2018).

Standard simulations therefore have important advantages compared with other simulation approaches (static or dynamic microsimulation) where the outcomes of pension policy reflects not only the complexity of pension rules but also the inherent complexity of the – possibly simulated – population, where individuals are never completely comparable (see Burlacu et al, 2014). A third approach would be to use observations on a sample of retired persons that included data on their pensions and their past career. Apart from the basic problem that such data do not exist for all MIGAPE countries, results from such observations would reflect regulations and behaviour in the past, which might differ in important ways from current rules and behaviour.

The impact of particular career decisions on the later pension is likely to vary by characteristics of individuals, e.g. the impact of a career interruption will differ for a high-wage person compared to a low-wage person. For this reason, it is important that the modelled persons in the standard simulations cover a range of relevant characteristics. We vary model persons by gender, education, unemployment experiences and whether they retire at the standard retirement age or two years earlier (if eligible); in total we simulated hundreds of scenarios.

Standard simulations are not fit for distributive analysis and for drawing conclusions about the population as a whole (Hufkens et al., 2019). Due to their stylized form, they cannot show what the impact of policies or policy reforms are on the actual future gender pension gap. This can only be done on the basis of data for a whole population or a representative sample. In work package three of the MIGAPE project, dynamic microsimulation will be used to project the future gender pension gap.

We emphasize that the modelled individuals, as presented below, do not always represent realistic career patterns (e.g., a woman is assumed to return to work at age 60, after an interruption of 6 years). However, it is important to make the modelled individuals comparable in every respect but the choice made, in order to show the implications of the pension regulations. The impact on their later pension of certain choices within realistic careers and lives of men and women will be the subject of work package three of this project, which focuses on axis 2, and which uses dynamic microsimulation and a large sample of real individuals.

We acknowledge that the terms 'decisions' and 'choices', at least as they are normally used in everyday language, may be not seem appropriate to describe women's (and men's) career transitions. Societal expectations that derive from traditional gender roles may permeate women's professional and personal life through the expectations of partners, relatives, or employers. These expectations impose constraints that may severely limit their options. We therefore emphasize that by using the terms 'decisions' and 'choices', we do not mean fully free choices or fully discretionary decisions, but refer to those degrees of freedom (however limited those in some circumstances may be), that women do have.

[2] See Hufkens et al., 2019, for a more general discussion of standard simulation.

Yet, one prerequisite for women to optimally use these degrees of freedom is that they are fully and clearly informed about the consequences of such choices. The extent to which women can exercise agency (i.e. the ability to make effective choices and to transform those choices into desired outcomes) is not a given, but can be enhanced in various ways. Providing information can be one of those, as this can reduce the bind of social norms by affecting the costs and benefits of compliance (World Bank, 2012, p. 151). If women have access to adequate information on the pension consequences of various options, this can strengthen their bargaining position vis-à-vis other persons.

The structure of the report is as follows. In the next chapter we introduce our methodology, including the characteristics of the model persons. Given their importance for the resulting pensions, much attention is given to the wage profiles by age of these model persons. In chapter 3 we describe the first-pillar pension system in the participating countries, as well as other aspects of social protection systems that are relevant for understanding the results of the simulations. Chapter 4 presents and discusses the results, and Chapter 5 concludes.

2. Methodology[3]

2.1. Definition of the scenarios

Before we start, let us describe some notions that are important in order to understand what follows. We use the term *scenario* to denote a single combination of circumstances and options. We distinguish between *circumstances* (which are assumed given), and *options* (what individuals may choose from). Any scenario is therefore a combination of circumstances and options. All scenarios refer to women. The national reports also report on scenarios for men; we do not present and discuss them here for reasons of space

In the scenarios discussed in this report, circumstances are defined by three variables, which together form twelve combinations.

- Age: these are the ages at which a choice is made (or not). The motivation for selecting these ages is that 30 is a typical age at which women and men are confronted with the care of young children, and 54 is a typical age at which some women and men are confronted by care for older relatives.

  The women and men are supposed to have been born in 2000.

  a. Age 30
  b. Age 54
- Education: this variable (together with gender) determines the earnings profiles (see below)
  a. Less than Upper secondary education (ISCED 0-2)
  b. Upper secondary education or Post-secondary non-tertiary education (ISCED 3-4)
  c. Higher education (ISCED 5+)
- Full working career or a period of unemployment:

[3] This chapter draws heavily – at times ad verbatim - on the national report for Belgium (Dekkers and Van den Bosch, 2020)

a. Full working career (see below for starting age by education)
b. A 3-year period of unemployment. It is assumed the cases are entitled to an unemployment benefit, at least until the – possible - exhaustion of this benefit. The spell of unemployment happens at ages 26, 27, 28 for the case aged 30, and at ages 49, 50, 51 for the case aged 54.

The assumed age of entrance to the labour market differs by level of education. Based on labour force survey data for the five countries, we have chosen the following ages:

– ISCED 0-2: 19;
– ISCED 3-4: 21
– ISCED 5+: 24.

Besides circumstances, there are options that an individual can choose from. For each age at which the choice is made (30 or 54), there are three options, the first of which is the base set of continuing to work full time[4]. The other options are:

– part time work at 50% for 6 years,
– ceasing to work for 6 years.

Furthermore, we distinguish between situations where the period out of work or the time spent not working when in part time work gives rise to pension credits, and situations where it does not. In some countries, this depends, directly or indirectly[5], on the reason for the move to part or full time work interruption. We assume that for the individual that considers his or her options at the age of 30, the reason is "caring for a young child", while for the individual that considers the options at 54 it is "caring for a dependent parent or another older relative". The alternative (not specified) is a reason that does not make persons eligible for these or similar schemes[6,7].

Finally, periods of unemployment and of full work interruption imply mostly that the person when returning to work does not earn the same wage as an otherwise similar individual who worked continuously. In the literature this effect is referred to as an "earnings penalty" or wage scar (Nielsen and Reiso, 2011; Gregg and Tominey, 2004).[8] There can be a number of reasons for this: the first person has less seniority and experience then the second one; she may be regarded as less motivated by employers. In order to show the effect of the resulting loss of earnings on the later pensions, we assume

[4] In addition to these options, we also simulated scenarios with part-time work at 80 %. As expected, the results of those scenarios are quite close to those of continuous full-time work, and therefore not presented in this report, though they are discussed in most of the national reports. Some countries also simulated an option of working part-time at 20% for six years. This is also not included in this comparative report; the results were, as could be expected, between those of part-time work at 50% and ceasing to work without wage penalty.

[5] An indirect link exists when pension credits depend on receiving a certain benefit, which itself depens on the reason for the reduction or interruption of work. E.g. in Belgium, people caring for children or for disabled persons can enter the schemes of time credit and/or thematic leave.

[6] From this it follows that the notion "relevant reason" in no way has a normative meaning.

[7] In addition to these, the national reports also include scenarios where people retire two years earlier than the standard retirement age (SRA), if they are eligible for this, in addition to the scenarios where they retire at the SRA. These scenarios were difficult to compare across countries, mainly because many scenarios implied no eligibility for early retirement due to an insufficient number of contribution years. Also, early retirement is not the focus of this project and this report.

[8] Below we use the terms "wage penalty" and "earnings penalty" interchangeably. We use the word "wage" in its general sense to refers to all forms of pecuniary employee compensations that are relevant for the pension system.

that a period of unemployment or a full career interruption entails a wage penalty.[9] Details about the way the wage penalty is modelled are explained in the next section.

All combinations of the above circumstances and choices result in hundreds of scenarios. Hence, we have a dataset that consists of many "individuals", which represent the career of a constructed individual, each with his or her unique combination of circumstances and choices. With the exception of the Portuguese team, which has developed a static simulation model for this task, all partners have used existing microsimulation models to run these individuals and simulate the pension benefits that result from their careers. These are:

- Belgium: MIDAS (Dekkers *et al.*, 2010; Dekkers *et al.*, 2015)
- Liechtenstein: MiLiPE (Kirn and Thierbach, 2020)
- Luxembourg: MIDAS_LU (Liégeois and Genevois, 2015)
- Slovenia: DYPENSI (Kump *et al*., 2017)

Finally, a basic grasp of the first pillar pension systems for employees is necessary in order to understand and interpret the simulation results. This will be the subject of the next chapter.

2.2. Earnings profiles and the wage penalty

In order to simulate the pension amount at the moment of retirement, we need to make assumptions about the earnings in each year, or, equivalently at each age, of the career. The set of yearly amounts of earnings by age is called a wage profile. We estimate separate country specific wage profiles by gender and three levels of education (low: ISCED 0-2, medium: ISCED 3-4, high: ISCED 5+). The profiles are intended to represent, as closely as possible, the average yearly wage of a full-time employee by age (civil servants and the self-employed are excluded in countries where they have a different pension system). The persons are supposed to be born in 2000, to enter the labour market around 2020 (depending on level of education), and to retire in the 2060s. The wage profiles were determined in two steps:

- the cross-sectional wage profiles by age were estimated by regression from national data sources (see Table 2.1 below).
- future wages were then derived from these amounts using projections of future real wage increases published by the European Commission.

Step 1: estimating the cross-sectional wage profile by age

Separate regressions (OLS) were performed for each country and gender-education group, using a polynomial function of age as the independent variable. This specification allows that the age profile differs by gender and by education, not just in level but also as regards the form of the curve. The samples include only people who are subject to the pension system that is simulated in the standard simulations. E.g., the simulations for Belgium refer to the pension system for employees, and therefore civil servants and self-employed persons were excluded. Where necessary, wages were recalculated to

[9] The national reports also include scenarios with these interruptions without a wage penalty.

a yearly basis; outliers and observations with only few hours worked (e.g. less than 500 hours) were removed. For further details about the estimation procedures we refer to the national reports.

Given important differences in the availability of data across partners, it was agreed that each partner should use the best data available to them. This implies that wage curves are not harmonized across countries. Table 2.1 lists some characteristics of the data bases used.

Table 2.1: Characteristics of the data bases used for the estimation of the wage curves

	Source of data	Year	Sample selection	Size of sample
Belgium	Administrative data from social security administrations (Datawarehouse on Labour Market and Social Protection)	2011	Employees (not civil servants)	115,800
Liechtenstein	Census 2015 + Wage statistics 2016	2016	Inhabitants of Liechtenstein working in private and public sector	9,978
Luxembourg	EU-SILC	2015	Employees in private and public sector	3,842
Portugal	EU-SILC	2018	Employees in private and public sector	11,787
Slovenia	Administrative data (Structure of Earnings Statistics)	2016	All persons in paid employment who worked full time	Approx. 538,000

The estimates from those regressions were used to simulate the wage profiles over all ages from 19 up to the standard retirement age in the 2060's (so extrapolating beyond the current statutory retirement age if this will be increased) for the six gender-education groups.

Step 2: adjusting to future years

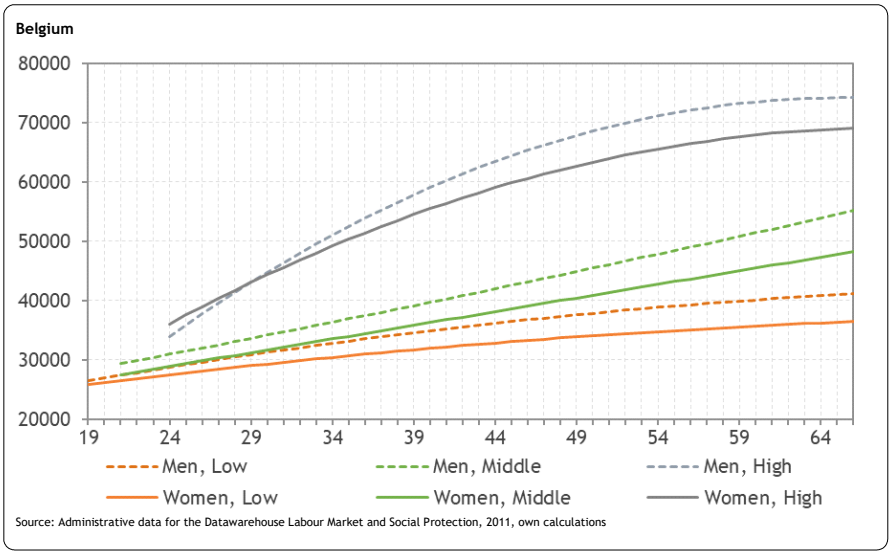
The wage amounts were adjusted to future years using the projections of average wages by the Ageing Working Group of the Economic Policy Committee of the European Council (European Commission, 2017). So, e.g., the wage for a person aged 45 was uprated from 2011 to the year 2045. Since no wage growth projections are made for Liechtenstein, the wage profile is updated by the Swiss wage index (BFS, 2019b). According to this index, the wages in Switzerland increased in the last twenty years (1998-2018) by an average of 1.1% in nominal terms.

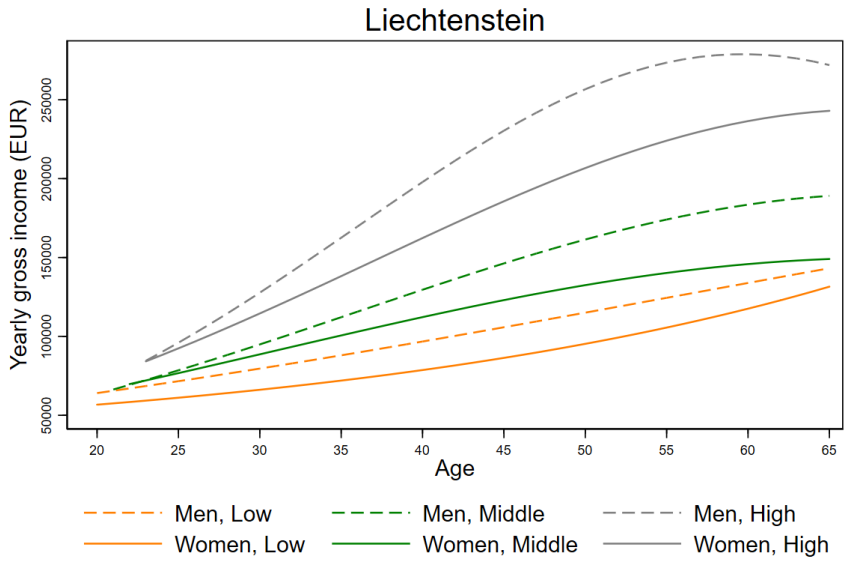
The resulting wage curves

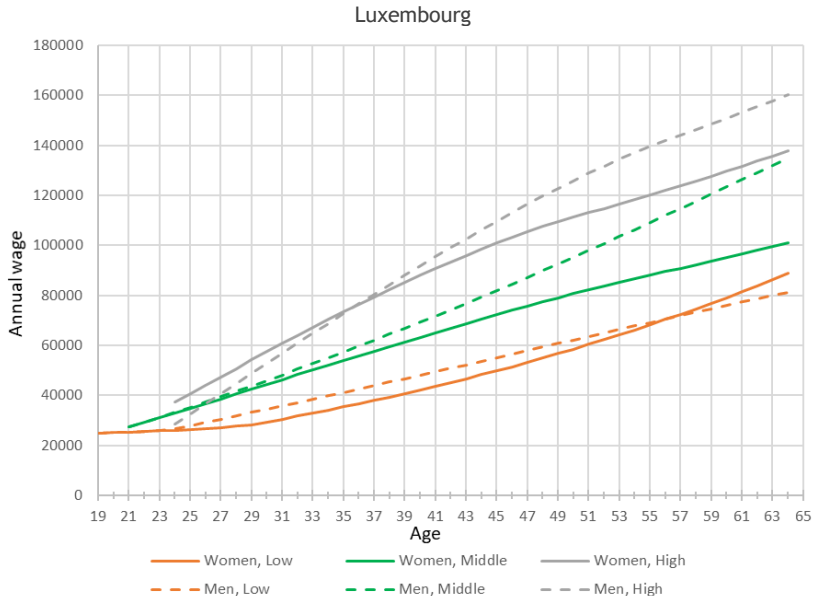
Figure 2.1 shows the estimated and projected wage curves for each country. Typically, the earnings of men and women with higher educational attainment levels increase faster at younger ages. However, in most cases, earnings growth phases out in the highest age group for persons. Furthermore, and not unexpected, the earnings of women are generally lower than those of men. This is especially so for the highest educational attainment level. Possibly, the finding for some countries that women's earnings lag behind those of men reflects the impact of the earnings penalty, resulting from previous disruptions of the career. For further comments on the wage curves, we refer to the national reports.

Figure 2.1 Projected wage curves by gender and level of education for each country

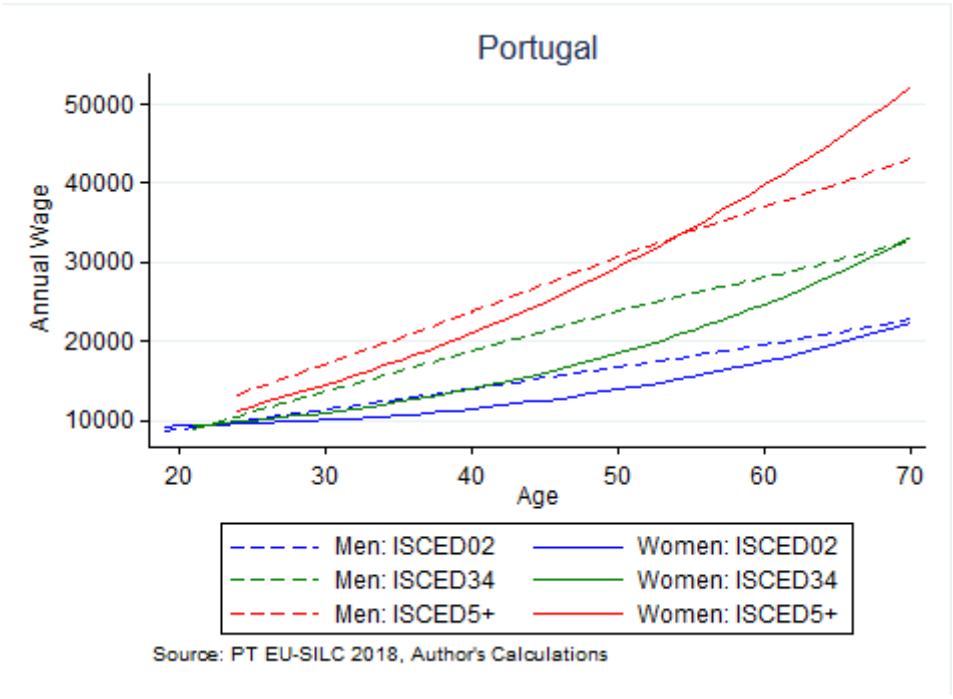
Belgium

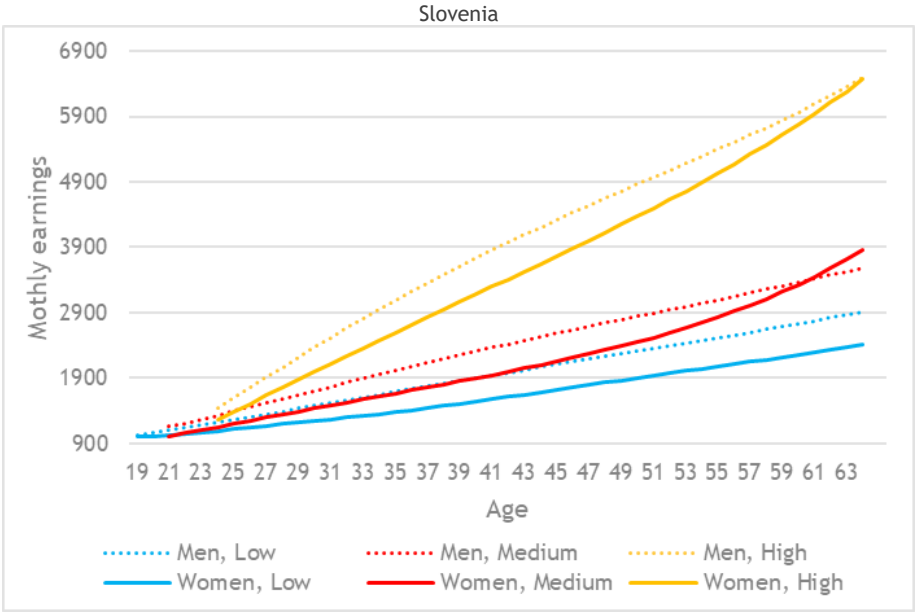






(Figure 2.1 continued)





Modelling of the wage penalty

The wage penalty refers to the phenomenon that after an interruption, people returning to work generally earn a lower wage than otherwise similar persons who did not interrupt their career. During an interruption, human capital is likely to stagnate, and can even decay because of technical and organizational progress or because the employee's knowledge is not maintained and brushed up during absence (Beblo and Wolf, 2002). Perceptions by employers that persons interrupting their job for family-

related reasons are less committed to their work, may also play a role. In the context of these standard simulations, which are intended to show the consequences on the later pensions of partial or complete interruptions of work due to care responsibilities, it is important to take this phenomenon into account. In the economic literature, especially in the context of the effects of unemployment, this phenomenon is often referred to as "scarring". Below we use these terms interchangeably.

For the purpose of the standard simulations, we model the wage penalty in a rather stylized way. Given the way the wage profiles have been estimated, the wage of a simulated case *i* at age *t* (can be represented by the following equation:

$$w_{it} = w_{it-1} * a_{it} * g_t$$

where a_{it} represents the age-related individual increase in the wage, and g_t the overall increase in wages, due to productivity gains in the national economy. Both factors are represented as growth rates in a multiplicative equation. We assume that after an interruption, the person returns to work at the wage she earned during her last year in work, increased by the general wage growth during the period of interruption. During the interruption, there is no age-related individual wage increase, as the person does not gain in experience or seniority. After the interruption, these increases resume.[10]

Figure 2.2 Illustration of the wage penalty

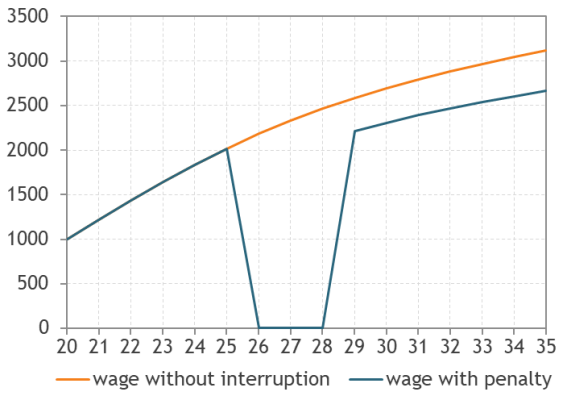


Figure 2.2 illustrates the wage penalty for a person who is unemployed between ages 26 and 28. During this period, her wage is zero, and when resuming work at 29, her earnings fall short of those of someone with continuous employment. Yet, her wage at 29 is higher than at 25, because she profits from the general wage growth during her spell of unemployment.

For the scenarios specified, the wage penalty applies to periods of unemployment and of full interruption, but not to part-time work.

[10] Another possibility would be to assume that after an interruption, the wage increases resume the path that they would have taken if there had been no interruption, at the level when the career was interrupted, though with a delay. One might argue that this option more accurately reflects the effect of seniority in a job affects the wage, if this is supposed to stop when people interrupt their job, and resumes accumulating from the previous level when they return to work. However, this option implies that individuals will recover much of the wage lost during their absence from the labour market. This implication runs counter to the literature on the scarring effects of unemployment, which suggests that individuals suffer important wage losses after unemployment and that these remain significant over time (e.g. Arulampalam, 2001). See the Belgian report (pp. 11-12) for more explanation of the difference between these two options to model the earnings penalty.

3. Public pension systems: a brief overview

This section gives a brief partial overview of the pension system in each of the five countries covered. The focus is on the elements in the pension system which are relevant for understanding the simulation results.[11]

The statutory retirement age for someone entering the pension system today is currently 65 years in Slovenia, Liechtenstein and Luxembourg; will be 67 years in Belgium from 2030 on and expected to be 69.5 years in Portugal, where the statutory retirement age is linked to the development in life expectancy.

The results cover first pillar defined benefit pensions in all five countries and, in the case of Liechtenstein, also second pillar (funded) occupational pensions. The second pillar is quantitatively the most important pillar in Liechtenstein. Third pillar private pensions are not covered. In terms of occupational sectorial coverage of the simulated results Table 3.1 provides an overview.

Table 3.1. Sectoral coverage of results

	Belgium	Portugal	Slovenia	Liechtenstein	Luxembourg
Sectoral coverage	Employees in the private sector, and employees in the public sector who are not civil servants.	Private and public sector employees; self-employed	Private and public sector employees; self-employed	First Pillar: employees, self-employed civil servants, inactive persons, Second Pillar: employees.	Employees, both from private and public sector (civil servants)

Source: National reports

In some countries there are different pension schemes for different sectors. If a choice had to be made, the partners agreed to simulate the most prevalent scheme. In Portugal, Slovenia, Luxembourg and Liechtenstein, the general pension scheme covers both employees and the self-employed. In Belgium and Luxembourg, civil servants have their own scheme, while in Belgium there is also a separate system for the self-employed. The pension system for new civil servants in Luxembourg is very similar to the general system for employees. Therefore, results for Luxembourg also apply to civil servants.

Elements in the pension systems compensating for periods of full- or part-time inactivity or unemployment

The simulated scenarios have various combinations of full-and part-time inactivity and different reasons for periods of not working: childcare, unemployment and caring for parents or older relatives later in the working life (see chapter 2). These events are set at ages 30 and 54; and three years prior to these ages for the duration of unemployment.

How and to what extent the different pension systems compensate for reduced working time is important for the impact on the final pension amount at retirement. Table 3.2 gives an overview of the different compensating rules for each country.

[11] See the national reports for more details on each country's pension system.

Table 3.2. Compensation of inactivity (full or part-time) in the pension system

Country	Measures to compensate for inactive periods (full or part) in the pension system
Belgium	Systems of time credit and thematic leave for childcare or elderly care.
	Unemployment, disability and sickness leave count towards pension rights.
Portugal	Earnings equivalent to full time during parental leave (maximum 6 months).
	Unemployment, disability and sickness leave count towards pension rights.
	No credit available to care for sick or disabled adult late in the working life.
Slovenia	Maternity and parental leave (maximum of 12 months).
	Part-time (>50% full time) work for parents of young children until age 3 (7 if more than one child).
	Credited social contributions for parents of four or more children who exit the labour market.
	Additional accrual rate of 1.36% for taking care of each child in its first year.
	Partial compensation for lost income due to care of a child with a severe disability or illness until age 18.
	Unemployment, disability and sickness leave (also to care for an ill immediate co-resident family member) count towards pension rights.
	No credit available to care for sick or disabled adult late in the working life.
Liechtenstein	1st Pillar:
	Childcare credits (16 years per child)
	Unemployment: 80% of wage for 260 days, thereafter minimum contributions during non-working periods.
	Period of care giving for sick or disabled adult count towards pension rights.
	2nd Pillar: Entirely earnings related (no compensation for labour market absence).
Luxembourg	Parental leave (up to 6 months full time, 1 year at 50% or 20 months at 80%). An additional "baby years" compensation can complement the parental leave up to 2 years (parental leave included) if the parent stops working.
	Periods of unemployment count towards pension rights.
	Periods of care giving can count towards pension rights (and are assumed to do so in the simulations).

Source: National reports

Note: This is a stylized table of different rules in place to compensate for (full or part-time) labour market inactivity or unemployment with a focus on in-activity related to child care and caring for sick or disabled adult late in the working life.

All five countries have policies in place to continue the building-up of pension rights in connection with childbirth and subsequent childcare. However, there are large differences when it comes to the duration of childcare policies. In Portugal, compensation is available for a maximum of 6 months, and for a maximum of 12 months in Slovenia. In Luxembourg, compensation will run until two years after maternity leave in case of fulltime caring. For Slovenia and Belgium, part-time work (with number of hours corresponding to more than 50% of full-time working hours) can be compensated in the pension system up until the age of at least 3 (Slovenia, with one child) or 4 (Belgium). Liechtenstein has the most generous system (in terms of duration) of the five countries with child credits available for up to 16 years. In Slovenia, pension credits for care activities are based on the minimum wage (rather than previous wage), implying that caring is less compensated in percentage terms the higher your initial earnings.

For care giving to a sick or disabled older relative late in the working life there is no pension compensation mechanism in place in Slovenia and Portugal, whereas in Luxembourg such a period may count towards acquisition of pension rights (See Luxembourg national report for details). Liechtenstein and Belgium have programmes in place for compensating pension contributions for a longer period. In Liechtenstein for the duration of the care period, and for Belgium more than 4 years.

All five countries have some compensating mechanism such that pension rights are (at least partly) accumulating during periods of unemployment, but they vary in generosity. In Luxembourg pension

rights accrual is compensated only for up to one year (a second year if more than 50-years-old) and at the level of unemployment benefit. The same mechanism is in place in Liechtenstein and Slovenia, while in Belgium the pension accrual during unemployment is based on past earnings and not limited in time. The basis for calculating pension rights during unemployment in Portugal is the level of unemployment benefit.

Other relevant aspects of pension systems

All five countries have minimum pensions in place, which in some countries will apply to some scenarios. Maximum pension amounts (or assessment bases) are in place in most countries. The exception is Portugal where instead the pension accrual rate decreases for higher wages.

There are several specificities in the pension systems which have particularly important implications for our model results. The pension system in Liechtenstein is a two-pillar system, where the quantitatively most important second pillar is entirely earnings based. Hence, there is no compensation for caring periods whether for children or dependent adults. This contrasts with the first pillar which is relatively generous when it comes to compensating for caring periods. However, the first pillar has a maximum pension which applies for most of our scenarios due to a combination of the long careers implied by the specification of the model scenarios and the way contributions are accumulated over the career and mapped to the pension outcome (the so-called revaluation factor).[12] As a consequence, the pension credits accredited due to absence – either part or full time – from the labour market in order to care for children or older parents does not affect the pension level in our simulations. Since with a long career, one will reach the maximum pension level from the first pillar even without the credits from periods of caring (as defined in our scenarios).

Two further aspects of pension systems are worth mentioning. In Slovenia, only the best 24 years of earnings (valorised annually by the average nominal wage growth) serves as the basis for the final pension assessment, and in Portugal the best 40 years are taken into account. Therefore, years of caring may 'fall out' of the pension base calculation. Second, in some pension system, the accrual rate per year is increased if people continue to work after a certain age and/or after they have exceeded a given number of years of contribution. In Slovenia, an additional bonus accrual is available after 40 years of contribution with an additional 1.5% accrual per six months for a maximum of three years. The implication is that shortening the contributory period (as is done in some of the scenarios presented) can be relatively more expensive in terms of pension rights as high accrual marginal years are no longer part of the basis on which pensions are assessed. The pension system in Luxembourg also provides some bonus accrual to encourage extending the working life, and these can also imply that reductions or interruptions of work early in the career have an effect on the later pension that is disproportional to the loss in total earnings.

[12] Se the Liechtenstein national report for a detailed description.

4. Results of the standard simulations

4.1. Introduction

In this chapter we present a comparative analysis of the results of the standard simulations that we judge to be the most relevant and interesting (the national reports report on many additional scenarios). The results are structured mainly on the same lines as in the national reports. First, we discuss simulations for the case of making a choice at age 30, and afterwards those for scenarios making a choice at age 54. For both cases, we first present the reference scenario as a benchmark against what follows. Secondly, we show the impact of eligibility for compensating elements in the pension system that are related to taking up a care task on the pension benefit at SRA. We also look at the consequences of having been unemployed earlier, as this is a common career interruption. Finally, we make a comparison between some scenarios making a choice at age 30 and at age 54. This comparison reveals differences in the protection provided by pension credits when people reduce or interrupt work, either because of childcare responsibilities or because they have to care for ageing relatives.

We express all results as percentages, mostly of the pension for a particular option relative to the pension in the corresponding base scenario, i.e. when continuing the work full-time; for some comparisons, when relevant, other ratios (or percentage-point differences) are shown as indicated in the table headings. The projected pensions amounts in Euro or Swiss francs are not very meaningful, as they refer to a year in the 2060s, nor comparable, given the important differences in average wage levels between the countries participating in MIGAPE.

4.2. Scenarios at age 30: impact of childcare responsibilities

4.2.1. Comparative impact of working part time at 50%, relative to full-time, with pension credits related to child care

Table 4.1 shows the pension amount when working part time at 50% for 6 years at the age of 30, relative to the pension for the base scenario of working full time. Put differently, it shows the impact on the pension benefit at SRA of working part time at the age of 30 to care for a child. It is assumed that all pension credits related directly or indirectly to child care, for which the person is eligible, are obtained. For example, compared to when the woman continues to work full time, working part time for 6 years to care for a child brings the pension benefit at SRA to around 93.7% (i.e. reduces it by 6.3%) if the woman is low educated in Luxembourg, and to 92.2% (a reduction of 7.8%) if she has a high level of education. The relative size of the reductions is illustrated in Figure 4.1.[13]

Table 4.1: Pension when working part-time 50% for six years after age 30, as a percentage of the pension when continuing to work full-time (assuming pension credits related to child care are obtained)[14]
%

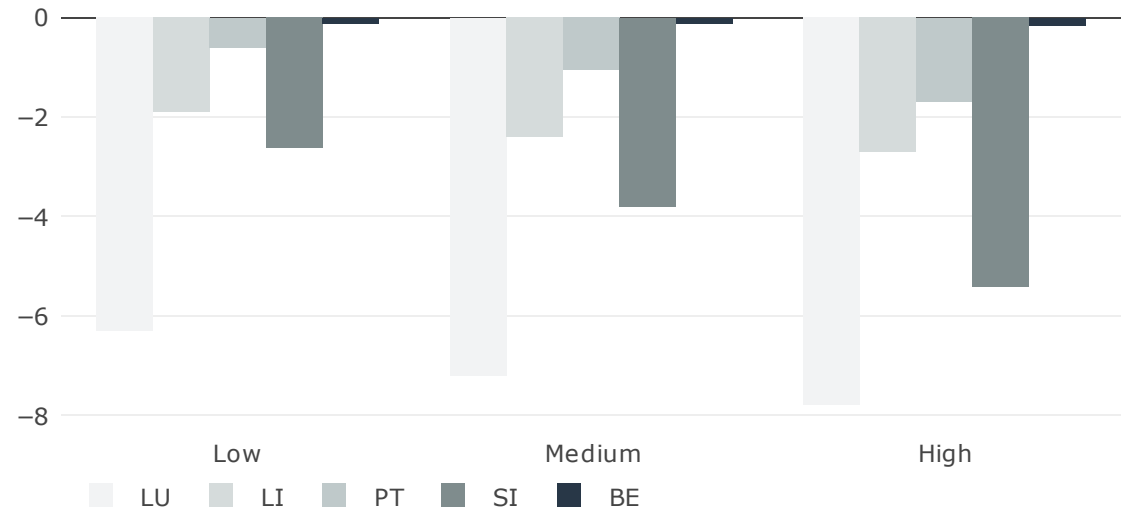
[13] In the tables and figures in this chapter, the education levels are defined as follows:
Low: Less than Upper secondary education (ISCED 0-2)
Medium: Upper secondary education or Post-secondary non-tertiary education (ISCED 3-4)
High: Higher education (ISCED 5+)

[14] The same order of countries is used in all tables but is otherwise arbitrary.

	Low education	Medium education	High education
LU	93.7	92.8	92.2
LI	98.1	97.6	97.3
PT	99.4	99.0	98.3
SI	97.4	96.2	94.6
BE	99.1	99.1	98.9

The impact of working part time is quite small (less than 3%) in Belgium, Portugal and Liechtenstein. It is larger in Slovenia (3-5%), largest in Luxembourg (6-8%). Within countries, there is little difference in the effect by educational level, except in Slovenia.

Figure 4.1 Reduction of pension when working part-time 50% for six years after age 30, relative to continuing to work full-time (assuming pension credits related to child care are obtained)
%



The differences between countries are due to the way pension credits for reduction of work due to child care are calculated. These pension credits are often tied to particular care-related benefits, which do not necessarily cover the whole six-year period assumed in the simulations. In Belgium, the impact this choice is very small, because time credit and/or thematic leave can be granted for a maximum of 59 months (in the case of half-time work; after maternity leave of 15 weeks), and the pension credits are calculated on the basis of the last full-time wage (indexed for inflation). In Luxembourg, by contrast, parental leave and "baby years" jointly cover a much smaller period. Moreover, the reduction in the number of contributory years has a disproportionally large impact on the later pension, due to the loss of additional accrual (see chapter 3). In Portugal parental leave can be taken for a maximum of 6 months. The pension losses are quite limited, because the Portuguese old age pension is calculated on the 40 career years with the highest wages. Therefore, the half-time wages are replaced by full-time wages in earlier years. In Slovenia, in addition to maternity leave and parental leave, a mother is entitled to a decrease in the statutory retirement age without incurring negative accruals, or an additional accrual rate for taking care of the child in its first year. The first advantage is irrelevant here, as working up to the SRA is assumed, and the second one is also applicable in the situation of continuous full-time employment, so it does not affect the ratio of the pensions. In Liechtenstein, the mechanisms of the first

pillar pension scheme, in particular the revaluation factor, ensure that part-time work because of child care does not produce any reduction in the first pillar pension, while the impact on the funded, defined-contribution second-pillar pensions is proportional to the lost earnings.

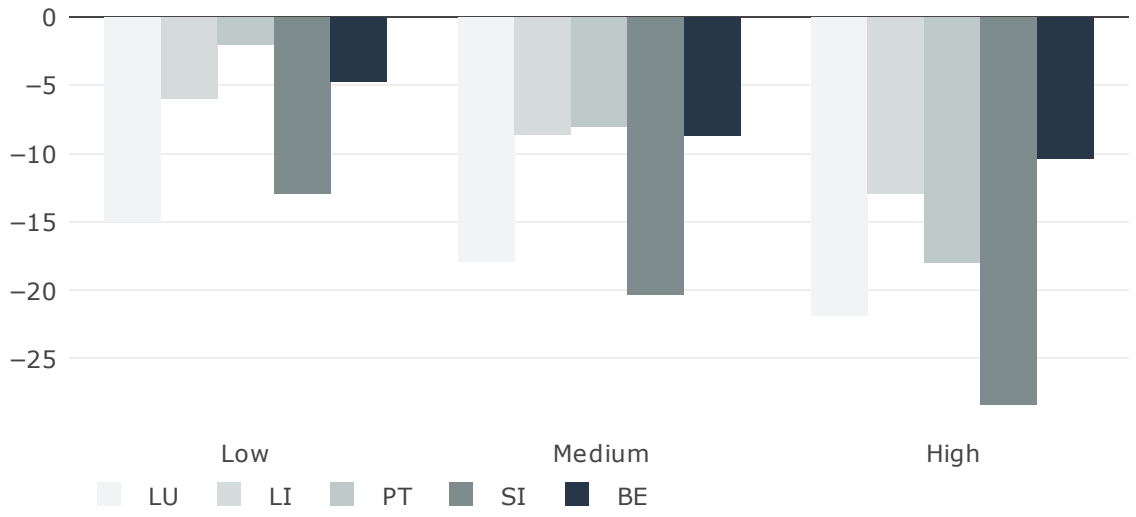
4.2.2. Comparative impact of full interruption of the career, relative to full-time, with pension credits related to child care

Table 4.2 shows the pension amount when interrupting the career for 6 years at the age of 30, relative to the base scenario of continuing to work full time. Put differently, it shows the impact of a full interruption at the age of 30 to care for a child on the pension benefit at SRA. It is assumed that the interruption leads to an earnings penalty during the rest of the career; see section 2.2. For example, compared to when the woman continues to work full time, interrupting the career for 6 years to care for a child brings the pension benefit at SRA to 95.3% (i.e. reduces it by 4.7% if the woman is low educated in Belgium, and 89.6% (a reduction of 10.5%) if she has a high level of education. Figure 4.2 shows the corresponding reduction of pension.

Table 4.2: Pension when completely interrupting work for six years after age 30, as a percentage of the pension when continuing to work full-time (assuming pension credits related to child care are obtained, and assuming an earnings penalty applies)
%

	Low education	Medium education	High education
LU	85.0	82.1	78.1
LI	94.0	91.4	87.1
PT	98	92	82
SI	87.1	79.7	71.6
BE	95.3	91.3	89.6

Figure 4.2 Reduction of pension when completely interrupting work for six years after age 30, relative to continuing to work full-time (assuming pension credits related to child care are obtained)
%



The impact of completely interrupting work (when there is a wage penalty) is for the medium education level about 8-9% in Belgium, Portugal and Liechtenstein, and considerably larger in Luxembourg (18%) and Slovenia (20%). The losses are smaller for those with low education, strikingly so in Portugal, and higher for persons with high education, especially in Portugal and Slovenia. For the cases with high education, the loss is relatively limited to 10.4% in Belgium but gets as high as 28.4% in Slovenia.

It may be remarked that the impact of completely interrupting the career for 6 years is much larger than twice the impact of part-time work at 50% for six years, as shown in table 4.1. For some countries (e.g. Belgium) this is partly due to fact that eligibility for some care-related benefits is proportionally extended over time in case of part-time employment, and so the period covered is shorter when work is completely interrupted. The main reason, though, is that complete interruption, in contrast to part-time work, leads to an earnings penalty which reduces earnings during the entire rest of the career, up to the SRA. Differences between countries are partly due to the way pension credits related to child care are granted, as discussed above. Another factor is that the size of the earnings penalty varies across countries, and also across educational levels. As can be gathered from the wage curves in Figure 2.1, earnings for those with high education generally rise rather fast during the ages 30-36, so implying a large earnings penalty in later years. On the other hand, for those with low education, minimum pension regulations have a mitigating effect on the pension loss. In Slovenia, the impact for women with high education is very large, much larger than the proportional reduction in the total number of years worked during the career. In addition to the impact of the wage penalty in the early years of career and five years less of pension contributions, this is because the interruption implies that these women do not profit from the additional accrual rate of 3% for a year of work after the fulfilment of 60 years of age and completion of 40 years of pension contribution period. In Luxembourg, a similar mechanism in the pension system is partly responsible for the relatively high reductions in pensions.

4.3. Comparative impact of being eligible for childcare-related pension credits

4.3.1. Comparative impact of being eligible for childcare-related pension credits when working part time at 50%

Tables 4.3 and 4.4 show the impact of being eligible to childcare-related compensation mechanisms in the pension system in force, given that one works part time for 50%. The table are constructed as follows. Table 4.1 above shows the impact on the pension amount when working part time at 50% for 6 years at the age of 30, relative to the base scenario of working full time, assuming the person obtains pension credits related to child care responsibilities. In a similar way, table 4.3 shows the impact of working part time at 50%, assuming that person is *not* eligible for pension credits related to child care responsibilities. Table 4.4 contains the differences between those two tables. For example, for a woman with a low level of education, living in Belgium, who takes the option of part-time work at 50% and obtains the pension credits related to time credit and/or thematic leave, the pension benefit at SRA would end up at 99.1% of what she would receive if she had continued to work full-time (see table 4.1). If she would not be eligible for time credit and thematic leave, her pension would be only 95.4% of the latter amount (table

4.3). The difference of 3.7% is shown in table 4.4.[15] The figures can be interpreted as a measure of the degree of social protection conferred by childcare related pension credits against pension losses due to interruption or reduction of work because of childcare responsibilities.

Table 4.3: Pension when working part-time 50% for six years after age 30, as a percentage of the pension when continuing to work full-time (assuming *no* eligibility for pension credits related to child care)
%

	Low education	Medium education	High education
LU	92.6	91.5	91.0
LI	98.1	97.6	97.3
PT	99.4	99.0	98.3
SI	94.8	90.2	91.6
BE	95.4	95.3	94.7

Table 4.4: Impact of being eligible for childcare related pension credits when working part-time 50% for six years after age 30: difference (in percentage points) between the pension when being eligible and when not eligible (1)
percentage-point

	Low education	Medium education	High education
LU	1.1	1.3	1.2
LI	0.0	0.0	0.0
PT	0.0	0.0	0.0
SI	2.6	6.0	3.0
BE	3.7	3.8	4.2

(1) Both expressed as a percentage-point of the pension in the reference base case: when continuing to work full-time. So the figures in the table represent the difference between the corresponding entry in table 4.1 and table 4.3a.

When working part-time at 50% for six years, obtaining pension credits related to childcare responsibility leads to a pension that is about 4 percentage-points higher in Belgium, compared to a similar situation where there is no eligibility for those pension credits. In the absence of pension credits, the loss of pension is nearly proportional to the loss in total earnings over the career (though mitigated a bit by minimum regulations); about 5% for all education levels (see table 4.3). Pension credits succeed in closing a large part of this gap. In Slovenia, the impact of pension credits is also relatively large, though rather variable across education levels. The impact is highest for medium-educated women because, without pension credits for working part-time, she loses both the regular and additional accrual rates for working more than 40 years. The impact of childcare-related pension credits is much smaller in Luxembourg, partly because child-care related benefit schemes are of limited duration. In Liechtenstein and Portugal, they make no difference. In Liechtenstein, with respect to the first-pillar pension, the losses in earnings due to part-time work (for whatever reason) are completely compensated by the high current revaluation factor, while in the second pillar, there are no child-care related pension credits. In Portugal, parental leave of six months makes no difference, because the old age pension is calculated on the 40 career years with the highest wages, and so the half-time wages are replaced by full-time wages in earlier years.

[15] It would also be possible to show the ratio instead of the difference, i.e. the effect of the pension credits as a proportion of the loss in pension without those credits. The problem with those is that such a proportion of not very informative, if the base (the loss in pension without those credits) varies a great deal, and is very small in some scenarios in some countries, as can be seen in table 4.3. (It is not a great achievement to reduce a loss of 1 % by 90 %).

4.3.2. Comparative impact of being eligible for childcare-related pension credits when completely interrupting work for six years

Similar to tables 4.3 and 4.4, tables 4.5 and 4.6 show the impact of being eligible to care-related compensation mechanisms in the pension system in force, given that one completely interrupts work for six years.

Table 4.5: Pension when completely interrupting work for six years after age 30, as a percentage of the pension when continuing to work full-time (assuming *no* eligibility for pension credits related to child care, and assuming an earnings penalty applies)
%

	Low education	Medium education	High education
LU	78.7	76.0	71.3
LI	94.0	91.4	87.1
PT	98.0	92.0	81.9
SI	83.2	78.0	70.0
BE	91.1	84.1	81.9

Table 4.6: Impact of being eligible for childcare related pension credits when completely interrupting work for six years after age 30: difference (in percentage points) between the pension when being eligible and when not eligible (1)
percentage-point

	Low education	Medium education	High education
LU	6.3	6.2	6.8
LI	0.0	0.0	0.0
PT	0.0	0.0	0.1
SI	3.8	1.7	1.6
BE	4.2	7.2	7.7

(1) Both expressed as a percentage-point of the pension in the reference base case: when continuing to work full-time. So the figures in the table represent the difference between the corresponding entry in table 4.2 and table 4.4a

These tables show the impact of being eligible to childcare-related compensation mechanisms in the pension system in force, given that one interrupts the career for 6 years. In Belgium and particularly in Luxemburg, the compensating effect in percentage points is higher than for the case of part-time work at 50%. The loss in earnings is of course higher in the former than in the latter situation. The main reason for the larger impact (in percentage-points) is that in the case of complete interruption, pension credits can replace the full earnings, instead of 50% in the case of part-time work. In Belgium, this difference is small for the woman with the lowest level of education, due to the minimum pension and the minimum right per career year. In both countries, though, the remaining loss in pension, even when obtaining pension credits, remains high when interrupting work completely. This is due to the earnings penalty during the rest of the career, which is nowhere compensated by pension credits. In Slovenia, somewhat surprisingly, the impact, even in percentage-points, for those with medium or high education, is less for the full-interruption case than for the part-time work case. This is related to the fact that the time spent out of work due to childcare responsibilities results in shorter careers and consequently lower accrual rates, with very strong effects for careers longer than 40 years (because of regular and additional accrual rates). In the case of part-time work, the absence of pension credits for the period exceeding 40 years reduces additional accrual rates significantly. By contrast, in the option of full career interruption, the careers of low- and medium-educated women are shorter than 40 years, and the interruption thus results in much smaller decreases in the accrual rates. In Luxembourg, the pension credits have the double effect of increasing the base from which pensions are calculated, and extending the contributory

period so that bonus accrual is granted. For Liechtenstein a full interruption leads to a stronger decline in pension income than working part time. Due to the wage penalty, the decline is stronger, the higher the educational attainment level and hence the wage increase over the lifetime. Under the assumptions made, the crediting of child-care periods has no effect on pension income, since the minimum contribution to the first pillar in the event of career interruption and the comparatively high revaluation factor compensate for the lower contribution payments. In Portugal we find (virtually) no effect for the reasons discussed above with reference to tables 4.4.

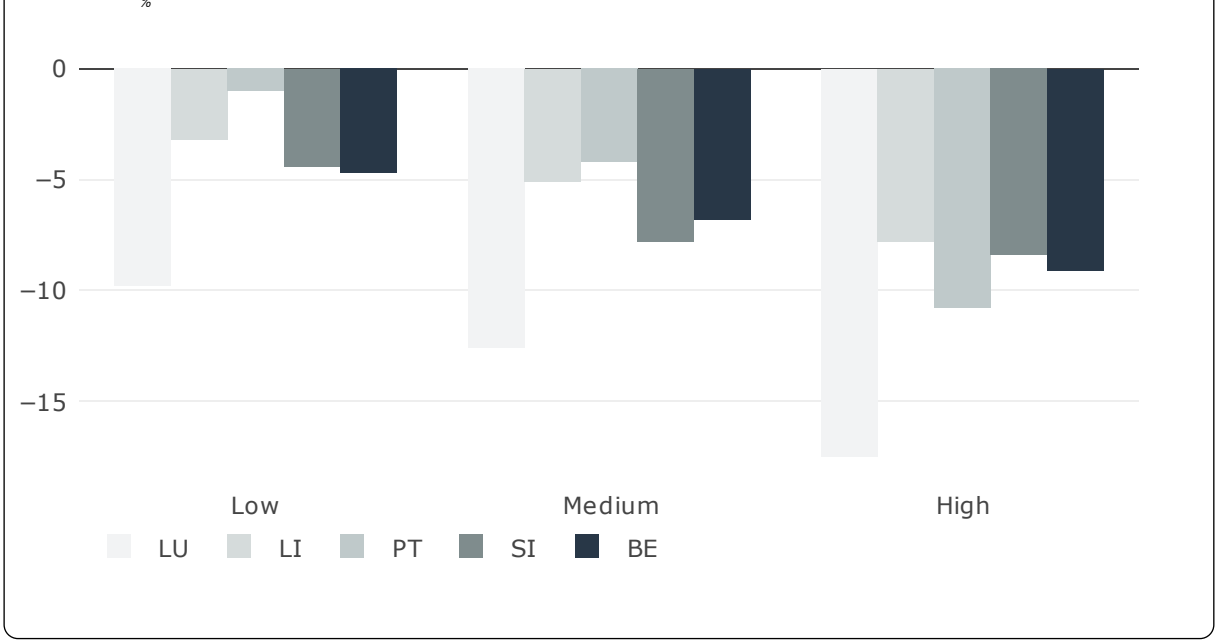
4.4. Comparative impact of an unemployment spell of three years

Table 4.7 shows the impact of a three-year period of unemployment at ages 26-28 on the later pension. It is assumed that the person concerned receives an unemployment benefit, at least as long as she is eligible, and also the related pension credits. Since this constitutes a complete interruption of work, the unemployment spell involves a wage penalty during the rest of the career. Apart from the period of unemployment, the person works full-time until the SRA. We compare the later pension with that of an otherwise similar pension who never experienced unemployment. So, in Belgium, the pension benefit ends up at 95%, 93% or 91%, depending on the education level, if one has had a 3-year unemployment spell in an otherwise full (and full-time) career. Figure 4.3 presents the corresponding reductions of pension.

Table 4.7: Impact of being unemployed for three years at ages 26-28, with wage penalty; otherwise full-time work throughout the career
%

	Low education	Medium education	High education
LU	90.2	87.4	82.5
LI	96.8	94.9	92.2
PT	99.0	95.8	89.2
SI	95.6	92.2	91.6
BE	95.3	93.2	90.9

Figure 4.3 Reduction of pension due to a spell of unemployment at ages 26-28, with wage penalty



The impact of unemployment is clearly stronger in Luxembourg than in other countries for all education levels (10 – 17%). In the other countries the impact varies between 1% and 5% for the low education level, between 4% and 8% for the medium education level, and between 8% and 11% for the high education level. The impact is quite high in Luxembourg because pension credits during unemployment are based on contributions from the unemployment benefit which is terminated after one year for people below age 50. As was the case for work interruption without pension credits, this leads to a loss of bonus accrual. In Liechtenstein also, pension credits during unemployment are based on the unemployment benefit, which expires fairly quickly. However, the negative effect of this on the first-pillar pension is largely compensated by the revaluation factor mentioned before. In Portugal, the loss in pension for the low-education woman is only 1%, as the unemployment benefit on which pension credits are based is close to the wage she would otherwise earn, and the earnings penalty is small. In Slovenia, pensions credits during unemployment are based on the level of unemployment benefit and the period during which this received. In Belgium they are calculated from the earnings during the last year of employment. The main impact of the unemployment spell is due to the earnings penalty, for which there are no compensating pension credits. This is also the reason why the pension loss is higher for those with more education.

4.5. Scenarios at age 54: impact of care for an older relative

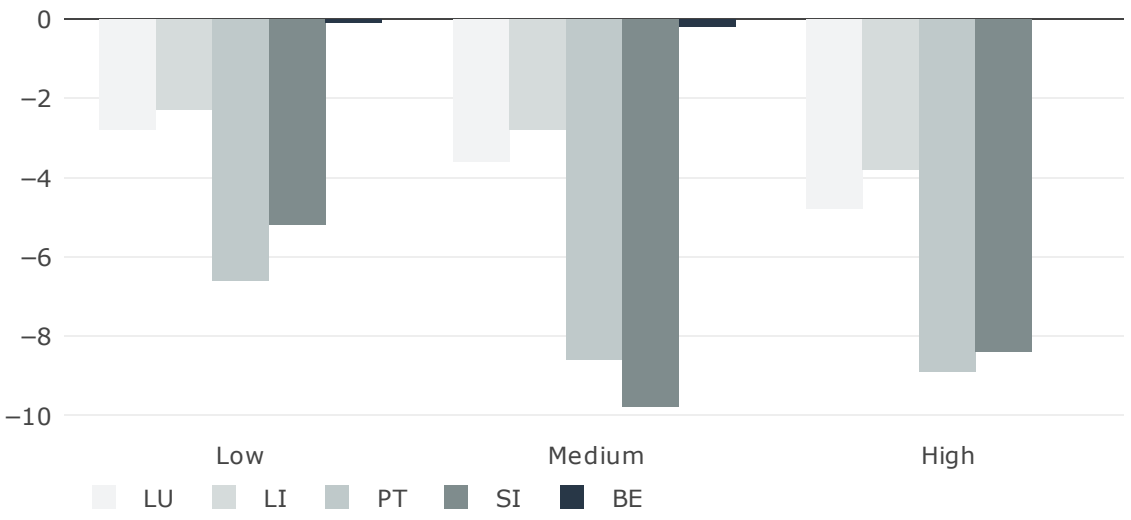
4.5.1. Comparative impact of working part time at 50%, relative to full-time, with pension credits related to care for older relatives

Table 4.8 shows the pension amount when working part time at 50% for 6 years at the age of 54, relative to the base scenario of working full time. Put differently, it shows the impact of working part time on the pension benefit at SRA to care for a dependent older relative at the age of 54. It is assumed any benefits related to care for older persons, and the associated pension credits, which may exist in the country, are taken up. The corresponding reductions in pension are shown in Figure 4.4.

Table 4.8: Pension when working part-time 50% for six years after age 54, as a percentage of the pension when continuing to work full-time (assuming pension credits related to care for older persons are obtained)
%

	Low education	Medium education	High education
LU	97.2	96.4	95.2
LI	97.7	97.2	96.2
PT	93.4	91.4	91.1
SI	94.8	90.2	91.6
BE	99.9	99.8	100

Figure 4.4 Reduction of pension when working part-time 50% for six years after age 54, relative to the pension when continuing to work full-time (assuming pension credits related to care for older persons are obtained)
%



It is striking that the impact is nihil or extremely small in Belgium. It is also limited in Liechtenstein and Luxembourg. For the other countries they vary between 3% and 7% for those with low education, 5% and 10% for those with medium education, and 6% and 9% in the high education scenarios. In Belgium, there is no impact, because the whole period of part-time work can be covered by time credit and/or thematic leave. During this period, pension credits are calculated using the last full-time wage. As the wage curve at this age is quite flat, this implies very small or no losses. In Liechtenstein, the low impact

results mainly from the high revaluation factor that ensures that the period of part-time work has no impact on the first-pillar pension. (Pension credits exist for care to older relatives, but given the assumptions of the simulations these are irrelevant for the eventual pension, as their effect is swamped by the revaluation factor.) There are only losses to the second-pillar pension, proportional to the reduction in earnings. In Luxembourg, the long-term care insurance may, after evaluation, cover the pension contributions of a non-retired person who has reduced his professional activity to provide assistance to a dependent person, but only a fictitious income up to the equivalent of the minimum social wage is taken into account. In Slovenia and Portugal, there are no measures supporting long-term care of older persons neither in the pension system nor in other branches of social policy.

4.5.2. Comparative impact of completely interrupting work, relative to full-time, with pension credits related to elderly care

Table 4.9 shows the pension amount when interrupting the career for 6 years at the age of 54 relative to the base scenario of working full time. Put differently, it shows the impact relative on the pension benefit at SRA of a full interruption at the age of 54 to take up a care task for an older relative. It is assumed any benefits related to such care, and the associated pension credits, which may exist in the country, are taken up.

Table 4.9: Pension when completely interrupting work for six years after age 54, as a percentage of the pension when continuing to work full-time (assuming pension credits related to elderly care are obtained)
%

	Low education	Medium education	High education
LU	93.5	92.8	90.5
LI	94.7	94.2	91.8
PT	91.3	87.1	83.8
SI	83.2	77.6	79.2
BE	96.5	95.0	96.5

In the case of full interruption, the loss in earnings during that period is of course double than when working half-time, and so the reduction of pensions is also larger. The wage penalty plays a small role, because wage increases at this age are limited, and also because the remaining career contains only a few more years. The loss of pension is smallest in Belgium, followed by Liechtenstein. The reductions in pension seem particularly high in Slovenia, from 17% for the low education case, to 22% for those with medium education (and, strikingly, a bit less, 21%, for the high education case). For Portugal and Luxembourg, they vary between 6% and 9% for those with low education, 7% and 13% for those with medium education, and 9% and 16% in the high education scenarios. The main reasons for these country differences have been explained above with reference to the part-time work option (section 4.5.1). The high losses in Slovenia (considerably higher than the proportional reduction of the career length) are related to the very high additional accrual rates in the pension system for working more than 40 years. The interruption implies that most or all of those additional years are lost, resulting in substantial pension losses. Because the woman with medium education starts her career at a younger age, she works during more additional years in the base scenario than the women with high education, and for this reason she loses more when her career is shortened.

4.6. Comparative impact of being eligible for pension credits related to care for older persons

Tables 4.10 and 4.11 show the impact of being eligible to compensation mechanisms in the pension system related to care for older persons, given that one works part time for 50% (table 4.10) or has completely interrupted work for six years (table 4.11). The interpretation of the tables is similar to that of tables 4.3 and 4.7 about childcare-related pension credits. For example, for a woman with a low level of education living in Belgium who takes the option of part-time work at 50% and obtains the pension credits related to time credit and/or thematic leave for care to an older relative, the pension benefit at SRA would end up at 99.9% of what she would receive if she had continued to work full-time (see table 4.8). If she would not be eligible for time credit and thematic leave, her pension would be only 95.5% of the latter amount (not shown in a table). The difference of 4.5 percentage points is shown in table 4.10. The numbers can be interpreted as a measure of the degree of social protection conferred by pension credits related to care for older persons against pension losses due to interruption or reduction of work because of responsibilities for such care.

Table 4.10: Impact of being eligible for pension credits related to care for older persons when working part-time at 50% for six years after age 54: difference (in percentage points) between the pension when being eligible and when not eligible (1)
percentage-point

	Low education	Medium education	High education
LU	6.9	6.4	5.9
LI	0.0	0.0	0.0
PT	0.0	0.0	0.0
SI	0.0	0.0	0.0
BE	4.5	8.4	8.2

Table 4.11: Impact of being eligible for pension credits related to care for older persons when completely interrupting work for six years after age 54: difference (in percentage points) between the pension when being eligible and when not eligible (1)
percentage-point

	Low education	Medium education	High education
LU	13.8	12.1	11.2
LI	0.0	0.0	0.0
PT	0.0	0.0	0.0
SI	0.0	0.0	0.0
BE	5.4	13.1	13.6

These results show how the pension benefit changes if pension credits exist to compensate for working part-time or interrupting the career, when caring for an older relative. In other words, it shows the impact of the mitigating pension rules concerning taking care of an older relative. In Slovenia and Portugal, the difference is zero because there is no benefit, or any other way to gain pension credits during the period of interruption: in other words, the Slovenian and Portuguese pension systems do not mitigate the loss in pension due to reducing working hours for this reason. In Liechtenstein, the results are the same as in Slovenia and Portugal. Here, though, pension credits for care to older relatives exist in the first-pillar scheme, but the effect of partially or reducing work for any reason is compensated by the revaluation factor, so the pension credits are irrelevant in the simulated circumstances. However, if a lower revaluation factor were to be applied, this would lead to a lower pension income under the first pillar and the compensatory effect of the care credits would become visible. For second pillar

pensions, there are no mitigating rules, and the reduction in earnings leads to a proportional reduction in the pension.

In Belgium, the pension benefit is much lower when the woman does not qualify for time credit and thematic leave, and the impact of qualifying for the pension credits related to care for older relatives is substantial. Also in Luxembourg, the pension is higher if the reason for reducing or interrupting work is to care for an elderly person. However, the patterns by education level differ: in Belgium the impact of the credits increases strongly with the level of education; in Luxembourg it is about the same for all education levels. In Belgium, pension credits are calculated on the basis of the last full-time wage, which is why, compared to women with low education, the impact is stronger for women with medium or high education. However, this is only so up to a ceiling, which is why the impact is about the same for women with medium and high education, even though the earnings of the latter are much than those of the former. In Luxembourg, pension credits to care for older persons are based upon a minimum social wage. So in the latter country, the pension credits related to care for older persons are more equalizing than in Belgium. Also, in Luxembourg, the impact of these pension credits is substantial, because they not only add to the base from which pensions are calculated, but also make sure that the number of contributory years is not reduced, so that bonus accrual is not lost.

4.7. Comparison between the scenarios at age 54 and at age 30

4.7.1. Comparative impact of part-time work and complete interruption, relative to full-time work, at ages 30 and 54.

It is interesting to compare the effects of making similar choices (i.e. reducing or interrupting work) for a related reason (i.e. care responsibilities, at age 30 and at age 54). Differences in effects reflect the balance of two mechanisms: on the one hand the earnings losses due to working less, and on the other hand the extent to which these are compensated by pension credits related to childcare or to care for older persons. First, we will describe the overall differences; in the next subsection we will have a closer look at the compensating effects of care-related pension credits.

Table 4.12 shows the comparative impact of working part time (50%) at 54 compared with the same scenario at the age of 30. Put differently, it compares the impact of working part time, when eligible for (possible) care related benefits, at 54 relative to the similar scenario at 30.

Table 4.12: Ratio of pension when working part-time for six years at age 30, and at age 54, assuming pension credits for childcare, and for care to older persons, respectively, are granted.
%

	Low education	Medium education	High education
LU	103.7	103.9	103.3
LI	99.8	99.9	99.2
PT	93.4	91.4	91.1
SI	97.3	93.8	96.8
BE	100.8	100.8	101.1

Table 4.9 shows important differences between countries. In Luxembourg, a person working part-time at age 54 (and obtaining pension credits related to care to older persons) will get a substantially higher pension than an otherwise similar person who had worked part-time at age 30 (and obtained child-care

related pension credits). In Portugal and Slovenia, the difference is reversed: the pension of the woman working part-time at age 30 exceeds that of the woman working part-time at age 54. In Belgium and Liechtenstein, the differences are negligible.

The ratios shown in table 4.12 indicate that the balance between the opposing mechanisms mentioned above can go in either direction. As wages increase with age (and since there is no earnings penalty for working part-time), earnings losses are in all countries higher at age 54 than at age 30. In Luxembourg, pension credits related to care for older persons compensate for these losses to a somewhat greater extent than pension credits related to child care do. The main reason is that benefits for child care (despite a compensation close to former wages) cover only a part of the six-year period, while eligibility for pension credits related to care for older persons (calculated at the level of the social minimum wage) runs throughout the period of six years. In Belgium, the maximum duration of time credit and/or thematic leave is 6 years in case of caring for a sick or disabled older person and 5 years when caring for a child. As we have seen, reducing working time in Liechtenstein for any reason (care or other) has no impact on the first-pillar pension, because of the revaluation factor. The slight difference between the two situations is due to the second pillar pension, which is proportional to earnings. In Slovenia and Portugal, there are no pension credits related to care for older persons.

Table 4.13, analogous to table 4.12, compares the impact of the full interruption with wage penalty, when eligible for (possible) care related benefits, at 54 relative to a similar scenario at 30.

Table 4.13: Ratio of pension when completely interrupting work for six years at age 30, and at age 54, assuming pension credits for childcare, and for care to older persons, respectively are granted.
%

	Low education	Medium education	High education
LU	109.9	113.0	115.8
LI	101.0	103.4	105.8
PT	91.3	87.1	83.8
SI	95.6	97.4	110.6
BE	101.3	104.0	107.8

The ratios in table 4.13 are mostly higher than in table 4.12, although they follow the same pattern across countries; exceptions are Portugal (all education levels) and Slovenia (low education). The main reason for this is that at age 30, the wage penalty following a complete interruption has a much stronger impact then at age 54, both because at the younger age wage increases are stronger, and because the remaining career is much longer. This is also the reason why in most countries, the ratios are higher for those with medium or high education. As earnings losses due to wage penalties are nowhere compensated by pension credits, this drives down the pension in the scenarios with work interruption at age 30, compared with work interruption at age 54. This effect is particularly pronounced in Slovenia, where the wage curve for women with high education is relatively steep. The impact of the pension credits itself is in line with what has been discussed with reference to the half-time work scenarios.

4.7.2. Comparison between the impact of pension credits related to childcare and those related to care for older persons

As explained above, the ratios shown in tables 4.12 and 4.13 are the net result of two opposing mechanisms: on the one hand the earnings losses and on the other hand compensating pension credits related to childcare or care to older relatives (if present). It is also interesting to make a comparison of the latter mechanism by itself: are pension credits related to care for older persons more, or less effective than those related to childcare in protecting people from pension losses consequent on a period of part-time work or complete interruption of work? For this purpose, we work from tables 4.4 and 4.10 and tables 4.6 and 4.11, for part-time work and complete interruption, respectively. To recall, table 4.4 shows the difference, in percentage points, between the pension of someone who works part-time for six years at age 30 and obtains pension credits related to childcare, and someone who is *not* eligible to such pension credits, but is otherwise in the same situation. These figures are repeated in table 4.14 in the rows for 'age of choice is 30'. Table 4.11, replicated in the rows for 'age of choice is 54', shows the corresponding difference about eligibility for pension credits related to care for older persons at age 54. The row marked "difference" shows the difference between these two. Table 4.15 presents the same kind of results for the case of complete interruption of work. So in both tables, a positive value indicates that pension credits related to care for older persons offer more effective protection against pension losses due to interruption or reduction of work because of care responsibilities, than pension credits related to childcare do.

Table 4.14: Impact (in percentage points) of eligibility for pension credits related to care for older persons when working part-time at age 54; the same for eligibility for pension credits related to childcare when working part-time at age 30; and the difference between these(1).
%

Education level	Age of choice	LU	LI	PT	SI	BE
Low education	54	6.9	0.0	0.0	0.0	4.5
	30	1.2	0.0	0.0	2.6	3.7
	Difference	5.7	0.0	0.0	-2.6	0.9
Medium education	54	6.4	0.0	0.0	0.0	8.4
	30	1.4	0.0	0.0	6.0	3.8
	Difference	5.0	0.0	0.0	-6.0	4.6
High education	54	5.9	0.0	0.0	0.0	8.2
	30	1.4	0.0	0.0	3.0	4.2
	Difference	4.5	0.0	0.0	-3.0	4.1

(1) See text for further explanation and interpretation. The table is transposed relative to other tables in this report (with countries by column), in order to be able to fit it comfortably on the page.

Table 4.15: Impact (in percentage points) of eligibility for pension credits related to care for older persons when completely interrupting work at age 54; the same for eligibility for pension credits related to childcare when working part-time at age 30; and the difference between these(1).
%

Education level	Age of choice	LU	LI	PT	SI	BE
Low education	54	13.8	0.0	0.0	0.0	5.4
	30	7.4	0.0	0.0	3.8	4.2
	Difference	6.4	0.0	0.0	-3.8	1.2
Medium education	54	12.1	0.0	0.0	0.0	13.1
	30	7.5	0.0	0.0	1.7	7.2
	Difference	4.6	0.0	0.0	-1.7	5.9
High education	54	11.2	0.0	0.0	0.0	13.6
	30	8.7	0.0	0.1	1.6	7.7
	Difference	2.5	0.0	-0.1	-1.6	5.9

(1) See text for further explanation and interpretation. The table is transposed relative to other tables in this report (with countries by column), in order to be able to fit it comfortably on the page.

Both in Liechtenstein and Portugal there is no impact of care-related pension credits on the pension, neither for childcare, nor for care for older persons. However, the reasons for this are quite different between these two countries. In Portugal, there are no pension credits associated with care responsibilities. In Liechtenstein, by contrast, such care credits exist and seem even rather generous. Childcare pension credits can be credited over a period of 16 years, and the pension credit for care to older persons is credited for the duration of care. As however the average lifetime income is multiplied by a rather high revaluation factor, and there is a relatively limited maximum pension, lower contributions to the first pillar for any reason, care-related or not, are fully compensated. However, if a lower revaluation factor were to be applied, this would lead to a lower pension income under the first pillar and the compensatory effect of the care credits would become visible.

In Slovenia, the differences are negative, for the simple reason that there are no pension credits related to care for older relatives, while maternal and parental leave do entail pension credits. In Belgium and Luxembourg, by contrast, pension credits for care to older persons at age 54 have a greater impact than childcare-related pension credits. For Luxembourg, the main reason for this is that the pension credits associated with parental leave and "baby years" can cover only part of the six-year period, while pension credits for care to older relatives can be granted for the whole period. The impact of less-than-complete coverage of the period is reinforced by the loss of bonus accrual due to the reduction of the contributory period. The credits for care to older persons are calculated on the basis of a fixed minimum wage, which is why the impact is about the same for all education levels. In Belgium, people can use the schemes of time credit and thematic leave for the entire period, or nearly so, both when caring for children and for older relatives. Pension credits are based on the last full-time wage (or half of that when working half-time), which is considerably higher at 54 than at 30. This is also the reason why the difference increases with the level of education: earnings increase more between the ages of 30 and 54 for those with medium and high education, compared to women (and men) with low education. For the women with high education, the ceiling on the earnings that can be taken into account comes into play.

5. Concluding remarks

This study reports results from simulations to demonstrate the impact of stylized labour market choices that women may make, on the pension benefit that they later receive. It covers five countries, Belgium, Portugal, Slovenia, Luxembourg and Liechtenstein, and focuses on complete or part-time career interruptions in response to care responsibilities for a child or an older relative. It uses standard simulations to calculate pension outcomes for hypothetical individuals, based on work-life earnings profiles, and current pension systems. These hypothetical model individuals are defined by a combination of given circumstances and options that might be subject to choice. Particular attention is given to regulations – or a lack thereof – that maintain the accumulation of pension rights when people reduce or interrupt their career because of care responsibilities for children or older relatives.

We do not repeat the findings here, but use this final chapter to make some tentative concluding remarks and to note the limitations of this study. The limitations imply that our findings are suggestions for further research and reflection, rather than definite conclusions.

Obviously, this study is limited by the number and definition of the scenarios that are simulated. The length of the periods of interruption or reduction of work has been – deliberately – set at the rather long time of six years. Results concerning childcare-related pension credits would have been different for a period of, e.g., three years. Also, the base scenarios always involve a career of at 41 years or more. Taking into consideration shorter careers might change some results substantially. Another limitation is that the outcome of the simulations is located far into the future. Although common practice in economic and social projections, the implicit assumption of the indefinite continuation of current policies might not always be realistic.

Finally, our simulations are limited to the individual first-pillar pensions (except for Liechtenstein). Second- and third-pillar pensions are not taken into consideration, nor are other sources of income. The household context is also ignored.

Keeping these limitations in mind, we propose the following concluding remarks, first on the compensating effect of pension credits, and secondly, given those, on what the results tell us about the impact of women's decisions on their pension. In the first place, pension credits related to childcare exist in four of the five countries in the project. These can have a significant impact on the later pension, though there is substantial variation in their generosity. In some countries, they are limited in time to a few years. Also, their assessment base can be some kind of minimum, or it can be the earnings during the last year before the interruption or reduction of work. In some countries, pension credits for childcare are also granted if there is no change in the hours of work.

Second, pension credits related to care for older relatives exist in three of the five countries in the project. In two of those three, their impact on the later pension seems to be larger than that of childcare related pension, mainly because they are not or less limited in time.

Third, the simulations reveal important, sometimes surprising, interactions between those pension credits and other aspects of pension systems. In some scenarios in some countries, the effects of pension credits are much reduced or even eliminated by minimum regulations, or, conversely, by maximum

pensions. The most extreme case of this is Liechtenstein, where seemingly generous care-related pension credits make no difference for the eventual pension in all scenarios. In Slovenia, a bonus accrual rate is granted for every year worked after age 60 and having contributed for 40 years; a similar system exists in Luxembourg. Presumably, the goal of this extra accrual rate is to encourage people to delay retirement, but it also implies that women and men lose a disproportionately large part of their pension when they have to interrupt their career for several years.

Fourth, the results show that working part-time at 50% for six years, whether at age 30 or at age 54, in order to care for children or older relatives, has in many countries a quite limited impact on the later pension. This is mainly due to the care-related pension credits, although minimum pension regulations also play a role for those with low wages.

Fifth, the impact of completely interrupting work for six years, for similar reasons, is often much larger than those pertaining to working part-time, even when the lost earnings during the interruption are partially compensated by care-related pension credits. Particularly at age 30, a large part of the reduction in pension when people interrupt their career is due to the earnings penalty suffered during the rest of the career. These earnings penalties are indirect and uncertain losses associated with the career interruption. They therefore fall outside the scope of pensions regulations, and cannot be compensated by pension credits.

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