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# Project MIGAPE: Work Package 2:

## Results of the Standard Simulations for Portugal

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## Contents

1.	Introduction .....	4
2.	The Portuguese Pension System .....	5
2.1.	The Social Security Old Age Pension .....	8
3.	Methodology .....	11
3.1.	Selection of relevant policy scenarios .....	11
3.2.	Modelling of Wage Profiles for Portugal .....	13
4.	Key Findings .....	16
4.1.	Pensions and the Interaction between Gender and Education .....	16
4.2.	Assessing the Impact of Unemployment on Women’s Pensions .....	17
4.3.	Assessing the Impact of Childbirth on Women’s Pensions .....	20
4.4.	Assessing the Impact of Care Provision on Women’s Pensions .....	23
4.5.	Assessing the Impact of Early Retirement on Women’s Pensions .....	25
5.	Conclusion .....	32
	References .....	33

Table 1. Pensions in the Portuguese Social Security .....	6
Table 2. Contributions Credits .....	7
Table 3. Pension Accrual Rates .....	9
Table 4. OAP Update Rules .....	10
Table 5. OAP Monthly Bonus Rates .....	11
Table 6. OAP and Replacement Rates, by level of education .....	16
Table 7. OAP after Unemployment, by Educational Level .....	19
Table 8. OAP following Childbirth, by Labour Market Participation Decision and Educational Level .....	22
Table 9. OAP following Care Provision, by Labour Market Participation Decision and Educational Level .....	24
Table 10. OAP following Early Retirement, by Educational Level .....	25
Table 11. OAP following Early Retirement if Unemployed at 26, by Educational Level .....	28
Table 12. OAP following Early Retirement if Unemployed at 49, by Educational Level .....	28
Table 13. OAP following Early Retirement in the event of Childbirth at 30, by Labour Market Participation Decision and Educational Level .....	29
Table 14. OAP following Early Retirement in the event of Care Provision at 54, by Labour Market Participation Decision and Educational Level .....	30
Figure 1. Observed vs. Predicted Cross-Sectional Wage Profiles, by Gender and Educational Level .....	14
Figure 2. Wage Profiles, by Educational Level .....	14
Figure 3. OAP Gross Replacement Rate, by level of education .....	17
Figure 4. Wage Profile if Unemployed at 26, by Educational Level .....	18
Figure 5. Wage Profiles if Unemployed at 49, by Educational Level .....	18
Figure 6. Impact of Unemployment Episode on the value of OAP .....	19
Figure 7. Wage Profiles in the Event of Childbirth at 30, by Education Level .....	21
Figure 8. Impact of Childbirth on the Value of OAP .....	22
Figure 9. Wage Profiles in the Event of Care Provision at 54, by Education Level .....	23
Figure 10. Impact of Providing Care to Dependent Adult on the Value of OAP .....	24
Figure 11. Impact of Early-Retirement (SARS -2 Years) on the Value of OAP .....	26
Figure 12. Impact of Early-Retirement (SARS -2 Years) on the Value of OAP, if Previously Unemployed .....	27
Figure 13. Impact of Early-Retirement (SARS -2 Years) on the Value of OAP, following childbirth .....	29
Figure 14. Impact of Early-Retirement (SARS -2 Years) on the Value of OAP, following care provision .....	30

## 1. Introduction

MIGAPE (“Mind the GAP in Europe”) was designed with the view to map, and uncover the mechanisms behind, gender differences in pension income - and to find better ways to communicate these findings to policy makers and the audience at large. In this report, we use the power of standard simulations<sup>1</sup> to illustrate how events, and choices, that women make over their lifetime might impact on the pension benefit that they later receive.

As we describe in more detail below, this technique consists in creating a set of hypothetical individuals with well-defined characteristics, for which we can compute the value of their pensions using the rules currently in place. Such approach has been used to look at the generosity of welfare benefits (OECD, 2019a), the existence of (dis)incentives to work (OECD, 2019b), distributive effects of welfare policies across social groups (Philips and Toohey, 2013), the effects of the interaction between welfare and tax policies (Bradshaw, et al, 1993), or the ex-ante evaluation of policy-reforms (Creedy and Scutella, 2004) – see Marlier et al (2007); Burlacu et al (2014).

While it has become more popular in the analysis of the redistribute effects of tax policies (O’Donoghue, 2002) and welfare benefits (Bradshaw and Finch, 2002; Cantillon et al, 2004), the standard simulations approach is particularly useful in the field of pensions (see Draxler and Mortensen, 2009; Gál et al, 2009)<sup>2</sup> – if anything because they can help to overcome the absence of quality (administrative) data on this issue, which is not an uncommon thing (see Burlacu and O’Donoghue, 2014).

First and foremost, as they are focused on the outcomes for a restricted (and well-defined) 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. This particularly so when compared with other approaches (static or dynamic microsimulation) where the outcomes of pension policy reflects both the complexity of pension rules and of the inherent complexity of the population that is being examined (see Burlacu et al, 2014).<sup>3</sup> By fixing the characteristics of hypothetical individuals, standard simulations are also very useful to inform cross-national comparisons – as differences across countries will inevitably result from differences in pension rules (see OECD, 2019c; European Commission, 2018). Finally, given their ability to reduce the complexity in pension rules, and populations, standard simulations offer a valuable way of communicating relevant research outcomes to policy-makers and to the society in general (Burlacu et al, 2014).

Acknowledging the advantages of the standard simulation approach for the purpose of this endeavor, we have structured this report as follows. First, we describe the fundamental features of the Portuguese Pension system, and depict the rules used to determine the eligibility to an Old Age Pension (OAP), and how the pension benefit is computed (and updated). Second, we describe in more detail the methodological procedures used for producing the standard simulations, namely the computation of age-

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<sup>1</sup> This particular approach has been identified elsewhere as the ‘typical agent model’ approach (Gál et al, 2014), the ‘hypothetical (or synthetic) data’ approach (Berger, 2001); or, when the focus is on differences across hypothetical family aggregates the ‘model family’ approach (Bradshaw and Finch, 2002) or ‘stylized households’ approach (Immervoll and O’Donoghue, 2002).

<sup>2</sup> For a more in-depth discussion of the limitations of this type of approach see Marlier (2007).

<sup>3</sup> In this sense, standard simulation models can be seen as an effective option to reduce the impact of social complexity.

earning profiles of hypothetical individuals; and the selection of scenarios for analysis. Subsequently, we show how a number of relatively common set of events (unemployment, childbirth, care provision, and early retirement) - and how women respond to some of these events - impact on the pensions of women. We conclude by summarizing our key findings, their relevance for future research and policy-making in the field of pensions.

## 2. The Portuguese Pension System

The Portuguese pension system<sup>4</sup> is organised into three pillars (see GPEARL, 2018):

- The 'Public Pensions' pillar, which includes a set of schemes run within Social Security;
- The 'Occupational Pensions' pillar, which includes an (increasingly marginal) set of voluntary pension schemes run by companies and social/professional groups;

The 'Individual Private Pensions' pillar, which comprises funded individual retirement plans, provided through the market.

As can be seen in Table 1, Social Security is organised into three key regimes:

- The 'Contributory Regime', which includes set of contributory, defined-benefit, pension schemes, which are funded – on a Pay-As-You-Go basis - by workers and employers contributions, which includes:
  - The 'Employees' Scheme', which provides protection to private employees and public employees (enrolled since 2006)<sup>5</sup>;
  - The 'Self-Employed Workers Scheme';
  - And a set of 'Special Schemes', which provides protection to specific groups of workers;
  - The 'Convergent Social Protection Scheme', which covers Public sector workers who entered public service before 2005;
- The 'Non-Contributory Regime', which includes a set of pensions/benefits financed by transfers from the State Budget;
- And, the 'Funded Regime', which comprises a voluntary Public Capitalization Scheme;

For the remainder of this section, we will not consider the pensions provided through the Convergent Social Protection Scheme.

Looking at Table 1 we can see that Social Security provides protection against a variety of (age-related) social risks. For those who have made the necessary contributions to Social Security (see Section 2.1.), the risk of a drop in income after retirement is covered by a defined-benefit contributory scheme: the Old-Age Pension. If they do not comply with eligibility requirements, they are entitled to a non-contributory pension (Social Old-Age Pension). In the event of death, survivors are entitled to a Survivors' Pension that is based on contributions made by the deceased. If someone is hit by an incapacitating condition that inhibits him/her from working, he/she is entitled to an Absolute Disability Pension. If the incapacitating condition does not prevent that person from working, she is entitled to a Partial Disability Pension. If she

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<sup>4</sup> This section builds extensively on Moreira et al (2019).

<sup>5</sup> Public sector workers who entered public service before 2005 were covered by an autonomous pension scheme - the Civil Servants Scheme, or CGA as it was commonly known - which was administered by the Ministry of Finance. This scheme was closed to new entrants since December 31st 2005 (see Section 1.2). Later on, in 2009, it was integrated into the Social Security edifice – as the Convergent Social Protection Scheme.

does not comply with eligibility requirements, she will be entitled to a Social Disability Pension. As can be seen in Table 1.1., CGA covers these risks in a very similar way to Social Security.

**Table 1. Pensions in the Portuguese Social Security**

	<b>SOCIAL RISKS</b>				
	<b>Old Age</b>	<b>Death</b>	<b>Disability</b>	<b>Dependency</b>	<b>Insufficient Income</b>
<b>Social Security: Contributory Regime <sup>a</sup></b>					
<b>Employees Scheme</b>	Old Age Pension	Survivors' Pension	Absolute Disability Pension		
<b>Self-Employed Scheme</b>			Partial Disability Pension		
<b>Convergent Social Protection Scheme' <sup>d</sup></b>	CGA Old-Age Pension	CGA Survivors' Pension	CGA Disability' Pension <sup>h</sup>		
<b>Social Security: Non-Contributory Regime <sup>b</sup></b>	Social Old Age Pension		Social Disability Pension <sup>h</sup>	Dependency Supplements <sup>e, g</sup>	Social Supplements (old age and disability) <sup>f</sup>  Solidarity Supplement for Seniors (CSI)  Extraordinary Solidarity Supplement (old age and disability)
<b>Social Security: Funded Regime <sup>c</sup></b>	Public Funded- Pension Scheme				

*Notes:*

<sup>a</sup> Sistema Previdencial - Regime de Repartição.

<sup>b</sup> Sistema de Proteção Social De Cidadania - Subsistema de Solidariedade.

<sup>c</sup> Sistema Previdencial - Regime de Capitalização.

<sup>d</sup> Regime Geral de Proteção Social Convergente

<sup>e</sup> Dependency Supplements are paid to beneficiaries of Old Age Pension and Absolute and Partial Disability Pension.

<sup>f</sup> Social Supplements are paid to beneficiaries of Old Age Pension, Survivors and Absolute and Partial Disability Pension.

<sup>g</sup> Not Simulated in DYNAPOR.

Other risks are covered by non-contributory benefits (see Table 1.). Thus, the risk of insufficient income in old age is covered by a combination three non-contributory benefits:

- Social Supplements, which secure a minimum pension for old age, survivors and disability pensioners;
- The Solidarity Supplement for Seniors (CSI), which provides a means-tested safety-net for all individuals above the statutory age of retirement (SAR);
- The Extraordinary Solidarity Supplement (CES), which is automatically paid to recipients of the Social Old-Age Pension and Social Disability Pension.

Beneficiaries of ‘Contributory Regime’ pensions are also entitled to a non-contributory benefit to cover the additional costs of caring for a dependent adult - the Dependency Supplement.

As a principle, contributions to Social Security depend on whether a person has earnings from work. Thus, an employee is required to pay 11% of his/her gross wage to Social Security. This is to be matched by a contribution paid by the employer worth 23.75% of the employees’ gross salary. A self-employed person is also required to pay a contribution, at a general rate of 21.4% relevant self-employment earnings (Rodrigues et al, 2019).

**Table 2. Contributions Credits**

<b>Situation</b>	<b>Eligibility to Pension Credits</b>	<b>Basis for Computation of Reference Remuneration</b>
<b>Unemployment</b>	If entitled to Unemployment Insurance and Assistance (except if the amount is paid in one go), and only for the duration of the entitlement period. <sup>c</sup>	Reference Remuneration considered for the computation of Unemployment Insurance (or value of the Unemployment Insurance benefit if entitled to Assistance-Based Unemployment Benefit)
<b>Sickness</b>	If entitled to Sickness Benefit, and only for the duration of the entitlement period.	Reference Remuneration considered for the computation of Sickness Benefit.
<b>Childbirth</b>	If entitled to Parental Leave, and only for the duration of the entitlement period.	Reference Remuneration considered for the calculation of Parental Leave.
<b>Incapacity (Absolute)</b>	If entitled to Absolute Incapacity Benefit, and only for the duration of the entitlement period.	Reference Remuneration considered for the calculation of Absolute Incapacity Benefit.
<b>Incapacity (Partial)</b>	If entitled to Partial Incapacity Benefits, and only for the duration of the entitlement period.	Difference between last salary and equivalent to Absolute Incapacity Benefit if incapacity were to be absolute.

Source: Decree 1-A/2011, articles 71 to 74.

Notes:

<sup>a</sup> The Portuguese legislation also assigns pension credits if the person has to perform military service, juror service or in the event of a reduction of activity or suspension of the employment contract in a business crisis situation under the terms of the in the Labor Code.

<sup>b</sup> There is also a special regime for that grants pension credits to artists and performers in the event of childbirth.

<sup>c</sup> With the exception of situations expressly provided for in the legal regime for unemployment benefits and cessation of activity.

There are nonetheless a number of instances where individuals who are not working that are credited with contributions (pension credits) to Social Security (see Table 2). For instance, an unemployed person will be credited with contributions during the period she is entitled to Unemployment Insurance. The same applies to a person who cannot work due to a temporary or a permanent condition, provided that she is entitled to Social Security contributory benefits that cover those risks. People who have to stop working following childbirth will also be entitled to pension credits for the duration of the Parental Leave.

## 2.1. The Social Security Old Age Pension

As can be seen in Table 1, for most categories of workers, the risk of a drop in income after retirement is covered by the Old-Age Pension (OAP). The eligibility to Old-Age Pension (OAP) is conditional on two conditions. First, and foremost, the applicant must have paid in at least 15 years of contributions (qualifying period). Second, she must be at, or over, the statutory age of retirement (SAR). Following the legislation introduced in 2013 (Law 83-A/2013), the statutory age of retirement is defined by reference to the pensionable age in 2015, which was 66, and indexed to changes in life expectancy at the age of 65, according to the following formula (GPEARL, 2018):

$$m_n = \sum_{i=2015}^n (LE_{i-2} - LE_{i-3}) \times 12 \times \frac{2}{3}$$

Where:

- $m$  is the number of months to be added to the pensionable age in the reference year;
- $n$  identifies the year of pension entitlement;
- $i$  is the pensionable age in the reference year (2015).
- $LE$  stands for the life expectancy at age 65.

The value of the OAP is computed according to the following formula (GPAERI, 2018):

$$OAP_m = RE \times PAr \times n$$

Where:

- $OAP_m$  is the (Monthly) Old Age Pension;
- $n$  number of years contributing to the system;
- $RE$  is the Reference Earnings (total remunerations divided by  $n * 14$ );
- $PAr$  is the Pension Accrual Rate.

Reference Earnings (RE) are the earnings that individuals earn over the years and that will constitute the basis for computing the OAP. For individuals registered in the Social Security from 2002 onward, the RE are computed by averaging the annual earnings of the best 40 years in the individual's contributory career. For individuals that entered the labour force before 2002, the RE is a weighted mean computed by reference to the number of years contributing to Social Security before and after 2002:

- For earnings received before 2002, RE are computed by averaging the annual earnings of the best 10 years in the last 15;
- For earnings received after 2002, RE are computed by averaging the annual earnings of the best 40 years in the individual's contributory career (GPEARI, 2018).

Table 3. Pension Accrual Rates

Number of Years contributing to Social Security (n)		
n ≤ 20 years		n > 20 years
	Reference Earnings (RE)	Calculation Formula
PAr =	≤ 1,1 x IAS	PAr = RE x 2,3 % x n
RE	> 1,1 x IAS and ≤ 2 x IAS	PAr = ( 1,1 x IAS x 2,3% x n)
x 2%		+ [(RE - 1,1 x IAS) x 2,25% x n]
x n (up to 40)	> 2 x IAS and ≤ 4 x IAS	PAr = (1,1 x IAS x 2,3% x n)
		+ (0,9 x IAS x 2,25% x n)
		+ [(RE - 2 x IAS) x 2,2% x n]
	> 4 x IAS and ≤ 8 x IAS	PAr = (1,1 x IAS x 2,3% x n)
		+ (0,9 x IAS x 2,25% x n)
		+ (2 x IAS x 2,2% x n)
		+ [(RE - 4 x IAS) x 2,1% x n]
	> 8 x IAS	PAr = (1,1 x IAS x 2,3% x n)
		+ (0,9 x IAS x 2,25% x n)
		+ (2 x IAS x 2,2% x n)
		+ (4 x IAS x 2,1% x n)
		+ [(RE - 8 x IAS) x 2% x n]

Source: Decree 187/2007

Notes:

IAS – Social Support Index

RE – Reference Earnings

n – Number of years contributing to Social Security

Once the individual's RE are established, these are multiplied by a Pension Accrual Rate (PAr), which determines the percentage of the person's RE that will be considered for computing the final pension. As can be seen in Table 3, the PAr depends on a) the length of the contributory career, and b) the individual's position in the distribution of income. Bearing in mind that the higher the PAr the more generous the final pension will be, we can conclude that the current OAP rules are designed to favor individuals with longer careers or with lower earnings.

Table 4. OAP Update Rules

OAP	GDP real variation rate < 2%	GDP real variation rate ≥ 2% and < 3%	GDP real variation rate ≥ 3%
< 1.5 IAS	CPI change rate	CPI change rate + 20% GDP real variation rate (minimum: CPI change rate + 0.5 percentage points)	CPI change rate + 20% GDP real variation rate
≥ 1.5 IAS & < 6 IAS	CPI change rate – 0.5 percentage points	CPI change rate	CPI change rate + 12.5% GDP real variation rate
≥ 6 IAS	CPI change rate – 0.75 percentage points	CPI change rate – 0.25 percentage points	CPI change rate

Source: Decree 187/2007

The OAP is updated every year according to an indexation rule that considers two factors:

- the growth of the economy, as measured by the GDP real growth rate;
- the value of the pension, by reference to the Social Support Index (IAS)

As can be seen in Table 4, depending on how these conditions apply, the value of the OAP will be updated by reference to the rate of change in the Consumer Price Index (CPI), excluding housing costs, in the previous year (GPEARL, 2018).

Under current rules, there are three options for claiming an OAP before the statutory age of retirement:

- The “flexibility scheme”, for individuals aged 60 or over and at the least 40 years of contributions. Under this scheme applicants will receive a 0.5% cut to the value of the pension per every month of anticipation to the SAR, or the Personal Age of Retirement (PAR)<sup>6</sup> - which ever the smallest; plus a penalty associated with the Sustainability Factor for that year. Since 2018, applicants that have (at the least) 40 years of contributions at 60 are exempted from the application of the Sustainability Factor;
- The ‘long careers scheme’, for individuals age 60 and 48 years or more of contributions or, alternatively, 60 with 46 years of contributions and started working (and paying contributions), before the age of 15;
- The “long-term unemployment scheme”, available to individuals aged 57 or more that have been unemployed since at least 52, and have exhausted all unemployment benefits (GPEARL, 2018).

In what can be seen as an incentive for individuals to extend their stay in the labour market, those who postpone the take-up of the OAP beyond the statutory age of retirement (up to the age of 70), are entitled to a pension bonus which will increase the final value of their pension. The pension bonus is calculated by reference to the following formula:

$$OAP\ Bonus = (PAR_m - SAR_m) \times Br$$

<sup>6</sup> The Personal Age of Retirement (PAR) is computed by reducing in 4 months by each year that exceeds the 40 years of contributory career at the age of 65, and up to the minimum of 65 years old (GPEARL, 2018).

Where:

$PAR_m$  is the Personal Age of Retirement, in months;  
 $SAR_m$  is the Statutory Age of Retirement, in months;  
 $Br$  is the Monthly Bonus Rate.

Table 5. OAP Monthly Bonus Rates

<b>Contributory Career</b>	<b>Monthly Bonus Rate (%)</b>
15-24	0.33
25-34	0.5
35-39	0.65
≥ 40	1

Source: Decree 187/2007

As can be seen in Table 5, the size of the bonus increases with the length of the contributory career.

### 3. Methodology

As mentioned above (see Introduction), this report will use as heuristic the power of standard simulations to illustrate how events, and choices, that women make over their lifetime might impact on the pension benefit that they later receive. In this section we describe the methodology that was designed to achieve this aim. First, we discuss the criteria used to select the scenarios that are best suited to illuminate how, under existing rules, life-events and individual choices impact on the women's pensions. Then, we depict the set of methodological choices that presided to the construction of age-earnings profiles of the hypothetical individuals that will be used in our simulations.

#### 3.1. Selection of relevant policy scenarios

In this section we discuss the criteria adopted for selecting the policy-scenarios that will be the object of our analysis. Each scenario will depict a set of hypothetical female individuals, who differ in terms of a) a number of fixed-characteristics, or circumstances (education, age of entry in the labour market and age-earnings profile) and b) are faced with a set of socio-demographic events (unemployment, childbirth, provision of care to a dependent adult, and retiring early from the labour market) which, in some cases requires them to make c) choices about how they participate in the labour market (remain in full-time employment, reduce the number of hours of work, move into inactivity). Whenever relevant, we expand our scenarios to assess the importance of pension credits as a mechanism for improving the protecting the pensions outcomes of women.

##### 3.1.1. Circumstances

Acknowledging that this is key in determining the age of entry in the labour market (and consequently the length of the contributory career) as well as the level and shape of the age-earnings profile (see Figure

1, below), we will simulate the pension outcomes of women, born in 2000, with three differentiated educational levels:

- Less than upper secondary education (ISCED 0-2);
- Upper secondary education or Post-secondary non-tertiary education (ISCED 3-4);
- Higher education (ISCED 5+)

Depending on the level of education, women are assumed to join the labour market at different ages:

- 19, if completed less than upper secondary education (ISCED 0-2);
- 21, if completed upper secondary education or Post-secondary non-tertiary education (ISCED 3-4);
- 24, if completed Higher education (ISCED 5+)

Below, we discuss in more detail how these individuals' earnings over their life course were computed (see Section 3.2.).

### **3.1.2. Life events**

Acknowledging that it is not possible to capture the full range of possibilities in this domain, we decided to look at a set of events that (arguably) represent the most typical events that might shape women's contributory careers. With the view to examine how the timing of these events might impact on pension outcomes, we chose to look at the impact of these events at the start and termination of the women's labour market careers. The duration of these events was designed with the view to be a) as representative as possible of the nature of these events in real life, and b) that help to highlight the importance of pension credits in protecting women when moving into retirement.

With this in mind, our policy-scenarios cover this set of events:

- Unemployed at 26, for 3 years;
- Unemployed at 49, for 3 years;
- Need to provide care for 6 years, following childbirth at 30;
- Need to provide care to dependent adult at 54, for 6 years;
- Retire two years ahead of the statutory age of retirement

### **3.1.3. Choices**

Acknowledging that, when faced with the need to provide care to a depend child or dependent adult, women (might) have to reconsider if they should remain in full-time employment, we decided to look at what would mean for women's pensions if they respond to these events by either reducing the number of hours of work, or by abandoning the labour market altogether. In line with this, our policy-scenarios will also consider the following choices for women who are required to provide care to a child or dependent adult:

- Remain in full-time employment (40 hours/pw)
- Move to part-time work at 80% of full-time employment, for 6 years;
- Move to part-time work at 50% of full-time employment, for 6 years;
- Move to part-time work at 20% of full-time employment, for 6 years;
- Move into inactivity, for 6 years

### 3.2. Modelling of Wage Profiles for Portugal

As mentioned above, depending on their level of education, the hypothetical individuals being considered here will have a specific wage-profile. These 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 because they have a different pension system). In the paragraphs bellow we describe in detail the methodology adopted for boiling these wage profiles<sup>7</sup>, but also to model the penalty that will follow an absence from the labour market.

The wage profiles were produced as follows. First, we used data from the 2018 wave of the EU-SILC Portugal (Instituto Nacional de Estatística, 2016) to estimate a cross-sectional wage profile by age. Yearly earnings were recalculated to a base of 2080 hours (40 hours per week times 52 weeks; so assuming paid holidays)<sup>8</sup>, to account for workers who did not work all year (full year equivalent). This had the effect of increasing substantially the average wage, and reducing somewhat the variance of wages. The top and bottom percentiles were excluded, to neutralize the impact of outliers.

The cross-sectional wage profile was estimated from a sample of individuals aged between 19 and 70, working as employees both in the private and public sector. Self-employed persons were excluded. Persons working part-time or less than 500 hours per year were also excluded. Admittedly, this has significantly increased the average wage estimates.

Separate regressions (OLS) were performed for each educational group, using (centered) age and (centered) age-squared as independent variables. This specification allows that the age profile differs by education, not just in level but also as regards the form of the curve. The resulting curves revealed a good fit to the average earnings by age.<sup>9</sup>

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<sup>7</sup> The derivation of the wage profiles as described bellow can be criticized on several grounds. Estimation on cross-sectional data implies that the different ages refer to different birth cohorts, while our simulation is about a single birth cohort, born in 2000. Also, the concavity of the curves (i.e. the fact that earnings growth declines as the age increases) could be due to people at higher ages having gone through work interruptions earlier in their career, due to unemployment, disability, or care responsibilities, and suffering wage penalties as a result.

<sup>8</sup> Where information on the number of hours worked in the primary job (PL060) was missing, we imputed the legal number of working hours per week (40).

<sup>9</sup> Adding the third power of age had the unfortunate effect that for some gender-education groups, the wage profile became convex at higher ages (i.e. wage growth increased with age). This seemed an artefact of that specification, as it is intrinsically implausible in the Belgian context, and is not visible in the graphs of average earnings by age.

Figure 1. Observed vs. Predicted Cross-Sectional Wage Profiles, by Gender and Educational Level

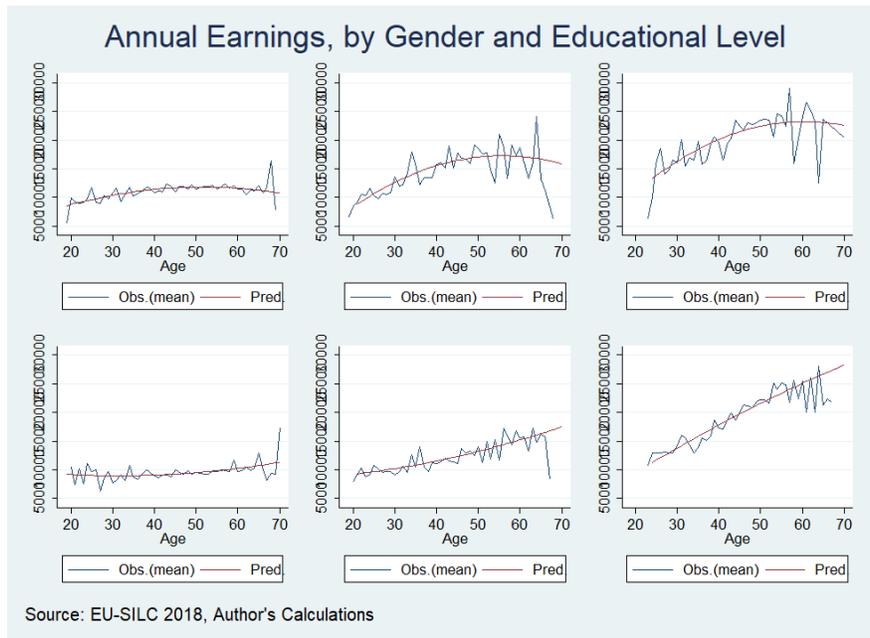
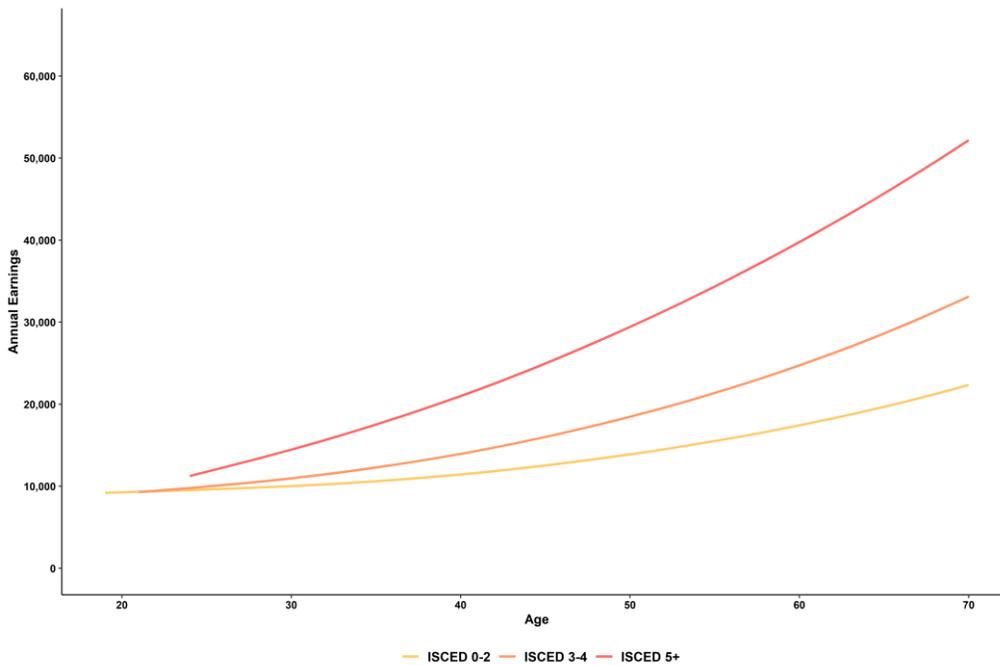


Figure 2. Wage Profiles, by Educational Level



The estimates from those regressions were used to simulate the 'longitudinalises' wage profiles over all ages from 19 to 70 (so extrapolating beyond the current statutory retirement age as this expected to reach

69.5 by 2070 in Portugal) for the three educational groups<sup>10</sup>. The wages were updated by reference to changes in productivity as projected by Ageing Working Group of the Economic Policy Committee of the European Council (European Commission, 2017).

As is evident in Figure 2, the resulting wage profiles confirm our expectation that differences in education significantly shape women's entry wages and how these evolve over the lifecycle.

### 3.2.1. Modelling of the wage penalty

As is evident from above, some of the policy-scenarios that we propose to study imply periods of joblessness, be it in the form of unemployment (for 3 years), be it in the form of inactivity - for 6 years, as a response to the need to provide care to a child or depend adult (see Section 3.1.). As referenced in the literature these periods of joblessness can imply that the person when returning to work does not earn the same wage as an otherwise similar individual who worked continuously – a phenomena otherwise known as the 'earnings penalty' or 'wage scar' (Nielsen and Reiso, 2011; Gregg and Tominey, 2004).<sup>11</sup>

Acknowledging this, we assume that – in the policy-scenarios under consideration - whenever women are forced out of the labour market they will face a wage penalty when returning to full-time employment. For the purpose of the standard simulations, the wage penalty was modeled as follows:

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

Where:

$w_{it}$  represents the wage of individual  $i$  at age  $t$ ;

$a_{it}$  represents the age-related individual increase in the wage;

$g_t$  represents the overall increase in wages, due to productivity gains in the national economy;

$a_{it}$  and  $g_t$  are represented as growth rates

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 an interruption, the wage increases resume at the level that a person of the same age with an uninterrupted career would experience.<sup>12</sup> The impact of the this methodological decision in how the wage profiles is visible in Figure 3

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<sup>10</sup> One of the problems with the option of using cross-sectional estimates of wage profiles is that this might produce negative estimates for later ages, which is a statistical artifact that results that people with higher wages tend to abandon the labour market earlier. When this was the case, we assumed that the wages would not grow with age.

<sup>11</sup> There can be a number of reasons for this. During an interruption, human capital is likely to stagnate, and can even decay because of technical and organizational progress or due to the fact that 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.

<sup>12</sup> Another possible option 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 reflects in a more adequate fashion the effect of seniority in a job affects the

## 4. Key Findings

Having described in detail the methodology adopted for the purpose of this report, in this section we will examine how events and choices that women make impact on the value of their pensions. We start by showing how, even in the absence of career interruptions, the value of the women's pensions, and its ability to replace income from work is significantly affected by their level of education. Then we describe how the experience, and timing, of unemployment might also affect the value of women's pensions. Subsequently, we describe how childbirth, and the decisions that women take concerning their participation in the labour market impact on their pension. Next, we conduct a similar analysis to assess the impact of care provision on women's pensions. In the final part of this section, we focus on how retiring two years before the statutory age of retirement would impact on women's pensions.

### 4.1. Pensions and the Interaction between Gender and Education

Table 6 depicts the contributory careers, and respective pension entitlements, of the three (ideal-typical) cases under analysis. The first thing to notice, is that under the assumptions made above concerning the age of entry in the labour market (see Section 3.1) and the evolution of the statutory age of retirement (see Section 2.1), all the base scenarios under analysis here will have very long contributory careers - ranging from 46 years for a woman with higher qualifications, to 51 for a woman with less than secondary education. This significantly contrasts with the current average contributory period, which stands at around 30 years (GPEARL, 2018). This has two implications. First, it signifies that the final value of the OAP will depend less on these woman contributory record, and more on differences in how salaries have evolved over their careers. Second, this means that the lower salaries at the start of the career will not be taken in consideration when compiling the 40 best years of contributions - which will lead to higher pension benefits.

Table 6. OAP and Replacement Rates, by level of education

Educ.	Career Start	Contrib. (Years)	PAR	Bonus (%)	OAP (Monthly)	Starting Salary (Monthly)	Final Salary (Monthly)	GRR
Low	19	51	66	0.1	952	657	1,556	61
Medium	21	49	67	0.6	1,273	664	2,299	55
High	24	46	68	1.6	1,987	803	3,631	55

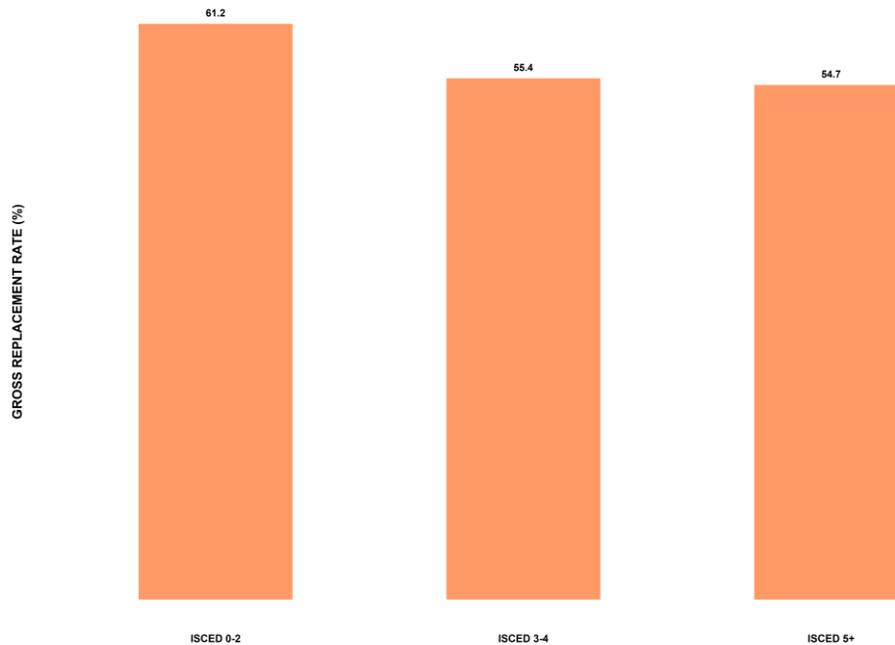
In line with the previous paragraph, we find that differences in OAP reflect, above all, differences in wage profiles across educational levels (see Table 6). Thus, a woman with low qualifications is projected to receive an OAP worth €952, per month. On the other hand, a woman with higher qualifications is expected to receive a pension worth €1987, per month.

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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 also implies that overtime individuals will recover much of the wage lost during their absence from the labour market – which 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).

As expected, given the progressive nature of the accrual formula currently in use (see Section 2.1), the OAP Replacement Rate - which measures the value OPA by reference to final salary - is higher for women with lower qualifications (61.2%) than for those with medium (55.4%) or higher qualifications (54.7%) (see Figure 3).

Figure 3. OAP Gross Replacement Rate, by level of education



The evidence in Table 6 also suggests that the formula used to assign a Pension Bonus for individuals with more than 40 years of contributions (see Section 2.1) might have a regressive effect – which, in a way, can be seen as counteracting the re-distributive intent that underpins the OAP accrual formula currently in use. Thus, a women with higher qualifications will be entitled to a higher pension bonus (1.6%), than a woman with lower qualifications (0.1%) - even if the latter has a larger contributory career. This is explained by the fact that the pension bonus cannot raise the value of the pension beyond 92% of the Reference Remuneration (see Section 2.1). Given that, as result of the progressive accrual rate formula currently in use, women with higher qualifications will receive a smaller percentage of their Reference Remuneration, but they will (proportionally) benefit more from the pension bonus feature.

#### 4.2. Assessing the Impact of Unemployment on Women’s Pensions

The impact of unemployment on the value of the OAP can occur through two (complementary) mechanisms. Assuming that dropping out of the labour market carries with it a wage penalty (see Section 3.2), unemployment will reduce a person’s wages over her life-cycle (see Figures 3 and 4), which will in turn lower the Reference Remuneration used to compute the value of the OAP, and the value of the Pension Bonus (see Section 2.1). We can call this the ‘earnings’ mechanism.

Figure 4. Wage Profile if Unemployed at 26, by Educational Level

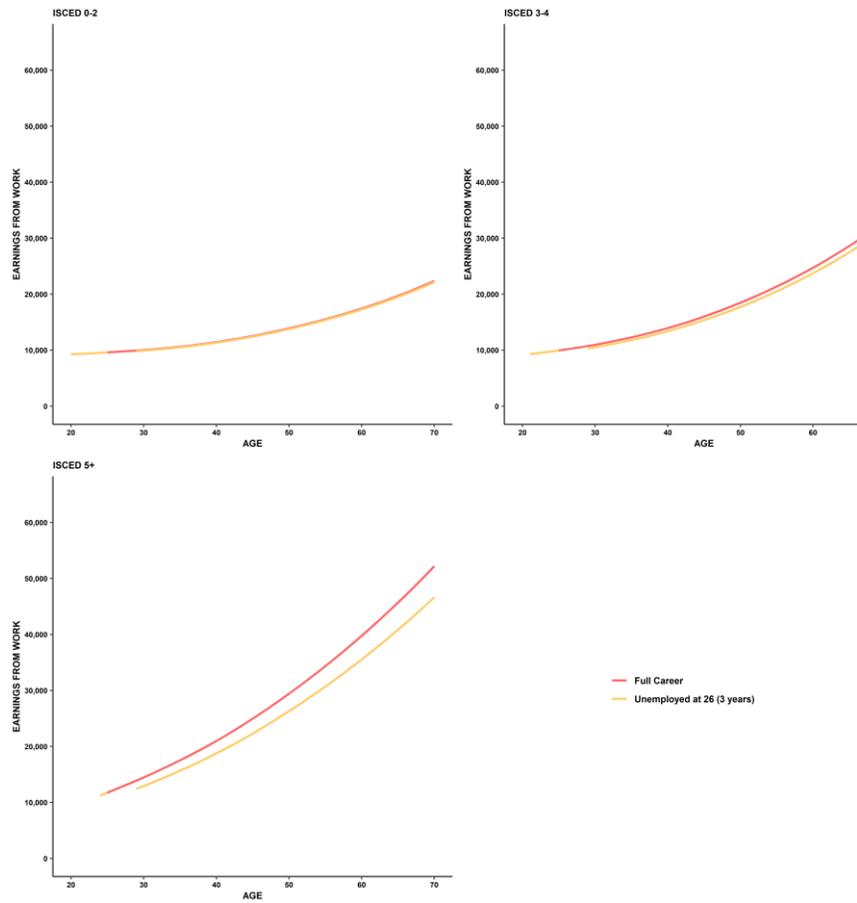


Figure 5. Wage Profiles if Unemployed at 49, by Educational Level

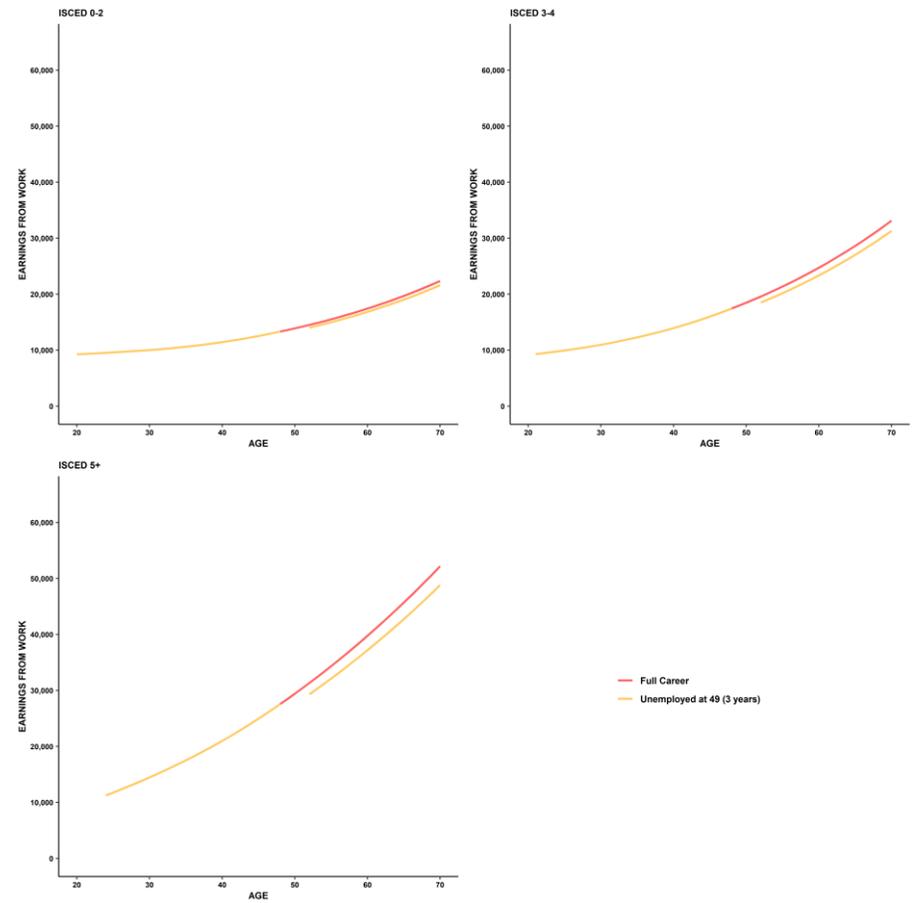


Figure 6. Impact of Unemployment Episode on the value of OAP

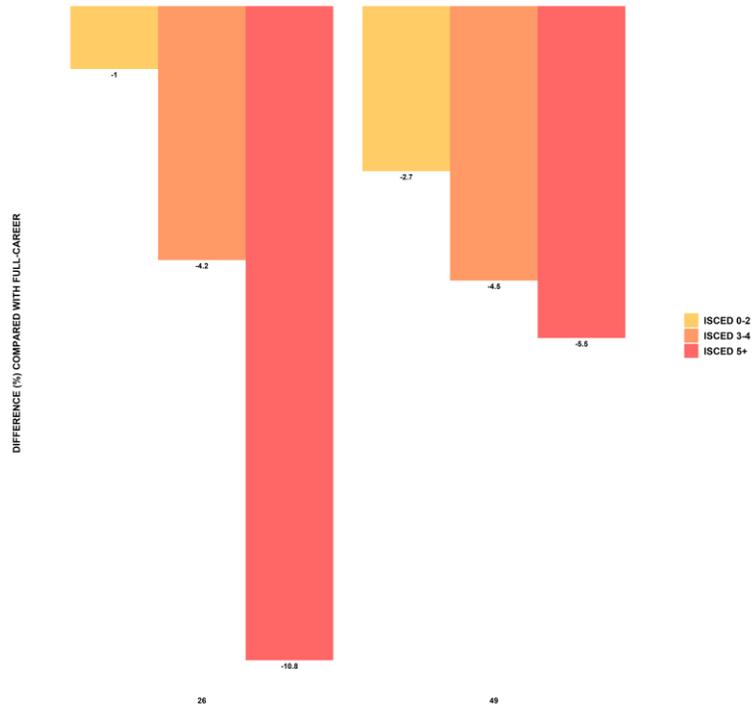


Table 7. OAP after Unemployment, by Educational Level

Age at Unemp.	Eleg. Pension Credits	Educ.	Contrib. (Years)	PAR	Bonus (%)	OAP (Monthly)	OAP (as % FTE)
26	YES	Low	51	66	0	952	100
		Medium	49	67	1	1,273	100
		High	46	68	2	1,987	100
	YES	Low	50	67	0	942	99
		Medium	48	67	1	1,220	96
		High	44	69	1	1,772	89
	NO	Low	48	67	0	943	99
		Medium	46	68	1	1,222	96
		High	43	69	1	1,776	89
49	YES	Low	50	67	0	926	97
		Medium	48	67	1	1,215	95
		High	45	68	1	1,878	95
	NO	Low	48	67	0	914	96
		Medium	46	68	0	1,192	94
		High	43	69	1	1,831	92

Alternatively, unemployment will reduce the number of contribution years upon which the OAP (and the Pension Bonus) is computed - the 'contributory career' mechanism. As it is natural to presume, the longer the duration of the unemployment episode, the stronger the reduction of the contributory career. However, this effect can be mitigated if the woman is entitled to Unemployment Insurance benefit - which credit her with replacement earnings, i.e. Pension Credits (see Section 2.1).

In line with the previous paragraphs, we find that a 3 year unemployment episode has a detrimental impact on the value of the OAP (see Figure 6). It is also worth noticing that the penalty associated with unemployment is stronger for women with higher qualifications.<sup>13</sup> For instance, for a female graduate, a (3 year) unemployment episode at 26 would signify cut of 10.8% to her OAP – which compares to the 1% cut a woman with low qualifications would receive.

As can be seen in Table 7, the impact of unemployment across educational levels depends on its timing. For women with higher qualifications, the adverse impact of unemployment is stronger if this takes place at the start of their careers (-10.8% vs. -5.5%). In contrast, for women with low qualifications unemployment has a stronger detrimental impact if this takes place at later stages in their careers – even if the differences are relatively marginal (-1% vs. -2.7%).

### **4.3. Assessing the Impact of Childbirth on Women's Pensions**

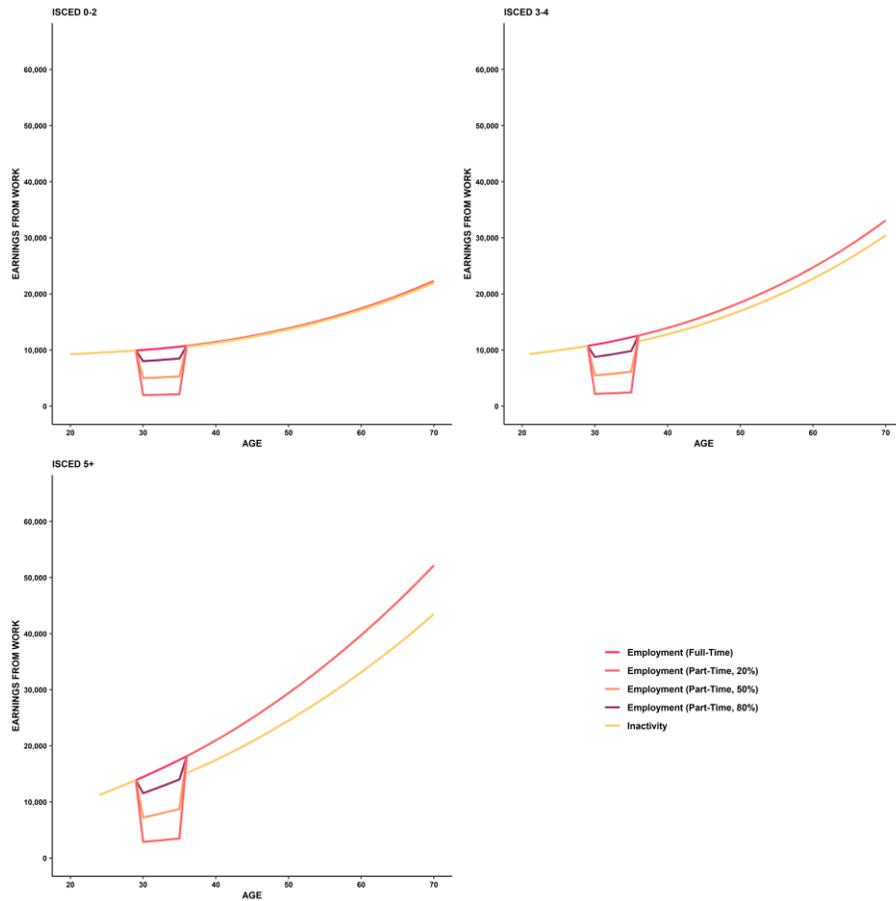
As mentioned above (see Section 3.1), we expect that the impact of childbirth on a women's pensions will depend on the decisions they make concerning their participation in the labour market. If childbirth leads to a period of inactivity, its impact on the OAP can be explained by the same type mechanisms that shape the influence of unemployment on a woman's pension (see Section 4.2). If, on the other hand, childbirth leads to a reduction of the number of working hours, then its impact will depend on a) whether part-time earnings will be considered in the computation of the Reference Remuneration, and b) the size of the reduction in the number of hours worked (see Figures 5 and 6).

In line with our predictions, we find that reducing the number of hours, or dropping the labour market for 6 year period following childbirth will have detrimental effect on a women's pensions (see Figure 8). As to be expected, dropping out of the labour market will have a more severe impact. Thus, for a woman with medium qualifications, a 6 year period of inactivity following childbirth would result in cut of 8.4% to the value of her pension - compared to if she had remained in full-time employment throughout that period. In contrast, reducing the number of hours of work during the same period, would result in a loss of just 1%.

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<sup>13</sup> In fact, the difference in the effect of unemployment is more pronounced between women with low and intermediate education, than the difference between middle and highly educated women (see Table 7).

Figure 7. Wage Profiles in the Event of Childbirth at 30, by Education Level



In what can be seen as further testament of the re-distributive nature of the OAP Accrual Rate formula (see Section 2.1), we find that the pension penalty for dropping out of the labour market following childbirth increases with education. For a women with higher qualifications, a 6 year inactivity episode following childbirth is likely to reduce the OAP by almost 18% - well above the 2% cut a woman with low qualifications would get if she were to make the same choice.

As can be seen in Table 8, pension credits associated with Parental Leave do not really protect women in the event that they are forced into inactivity following childbirth. This reflects the fact that this form of pension credit is dependent not on the duration of the childcare needs, but on the entitlement to Parental Leave – which can be extended to a maximum of 6 months (see Section 2).

As mentioned above, reducing the number of hours worked following childbirth only has a marginal effect on the cases being considered here - irrespective of the size of the reduction in working-hours (80%, 50%, 20%) or the level of qualification (see Table 8). This can be explained by two reasons: First, childbirth happens in the early stages of women’s careers, where wages are lower, and the loss of earnings, in absolute terms, is smaller. Second, in cases where the reduction in the number of hours is smaller (see Figure 5), the Reference Remuneration is computed using wages that are higher than pay for part-time work, but that would not be considered in the case of an uninterrupted career.

Figure 8. Impact of Childbirth on the Value of OAP

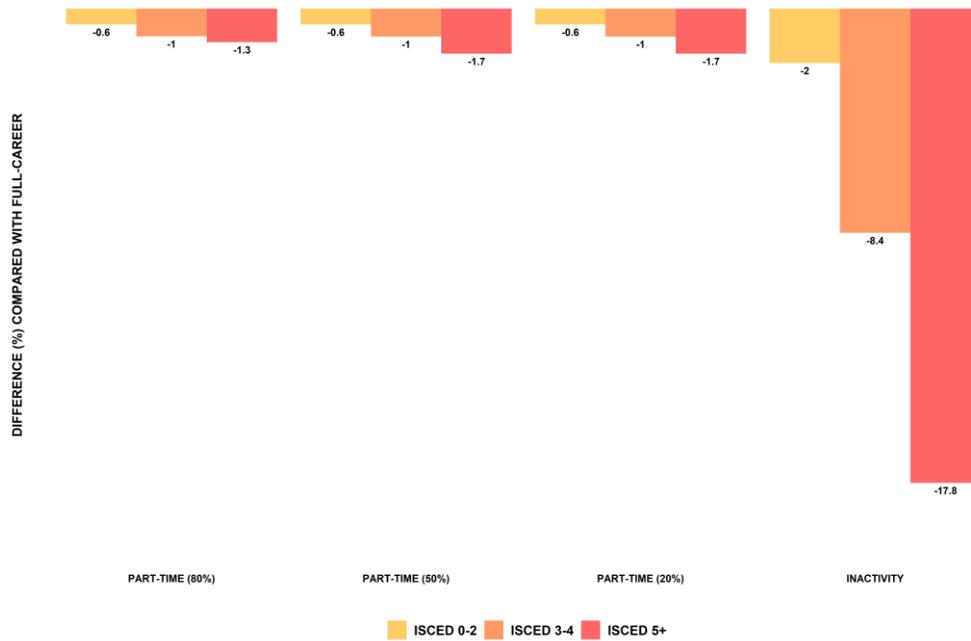


Table 8. OAP following Childbirth, by Labour Market Participation Decision and Educational Level

Option	Eleg. Pension Credits	Educ.	Contrib. (Years)	PAR	Bonus (%)	OAP (Monthly)	OAP (as % FTE)
FTE	YES	Low	51	66	0.1	952	100
		Medium	49	67	0.6	1,273	100
		High	46	68	1.6	1,987	100
PT80	YES	Low	51	66	0.1	946	99
		Medium	49	67	0.6	1,260	99
		High	46	68	1.5	1,962	99
PT50	YES	Low	51	66	0.1	946	99
		Medium	49	67	0.6	1,260	99
		High	46	68	1.5	1,954	98
PT20	YES	Low	51	66	0.1	946	99
		Medium	49	67	0.6	1,260	99
		High	46	68	1.5	1,954	98
INACT	YES	Low	46	68	0.1	932	98
		Medium	44	69	0.5	1,166	92
		High	41	70	0.0	1,634	82
	NO	Low	45	68	0.1	932	98
		Medium	43	69	0.5	1,166	92
		High	40	70	0.0	1,633	82

#### 4.4. Assessing the Impact of Care Provision on Women's Pensions

As the paragraphs bellow will demonstrate, other than issues related with the timing of this type of event, the impact of care provision is shaped by the same type of mechanisms that explain the impact of childbirth on women's pension outcomes.

As can be seen in Figure 10, dropping out of the labour market will have a significant impact on women's pensions. As can be seen in Table 9, the detrimental effect of inactivity increases with education. Thus, for a woman with low qualifications, leaving the labour market for 6 years would result in cut of 8.3% in the value of the OAP - compared to if she had remained in full-time employment. For a woman with higher qualifications, a similar decision/situation would result in a cut worth 16.2% in the value of the pension.

Compared to childbirth, the cost of reducing the number of hours is stronger. A woman with low qualifications who reduces the hours of work by 50% following childcare would have her pension cut by 1% - compared to if she had remained in full-time employment (see Figure 8). A similar decision in the event of having to provide care to a dependent adult signify a cut of 8.6% (see Figure 10).

Figure 9. Wage Profiles in the Event of Care Provision at 54, by Education Level

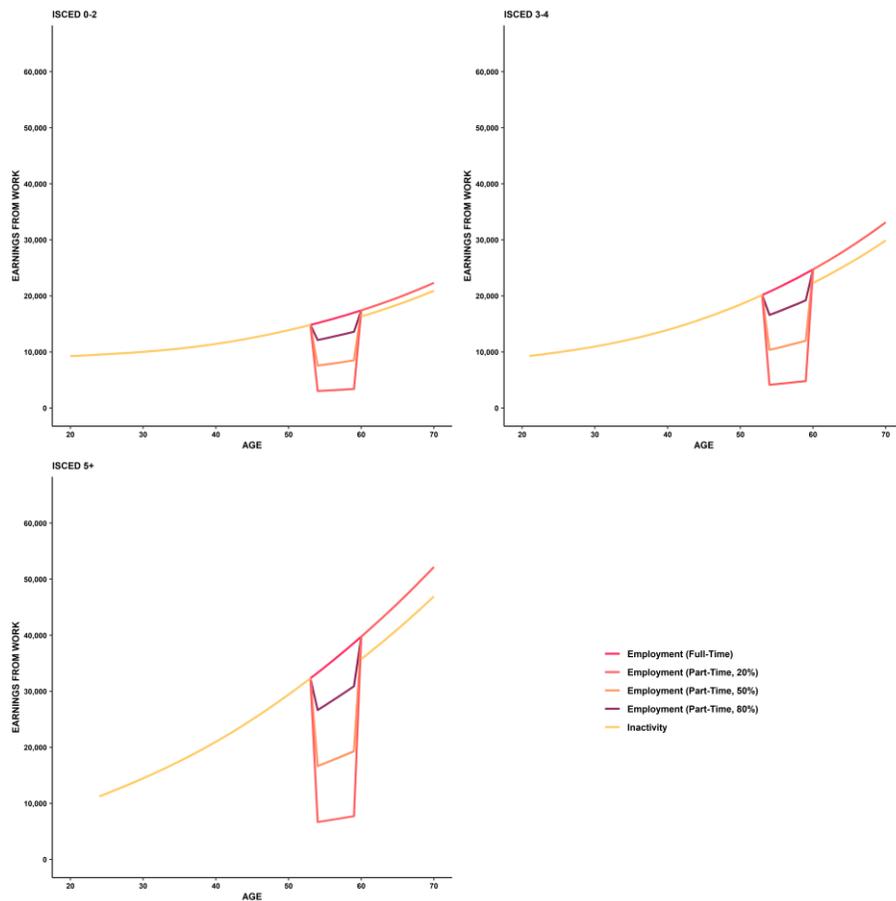


Figure 10. Impact of Providing Care to Dependent Adult on the Value of OAP

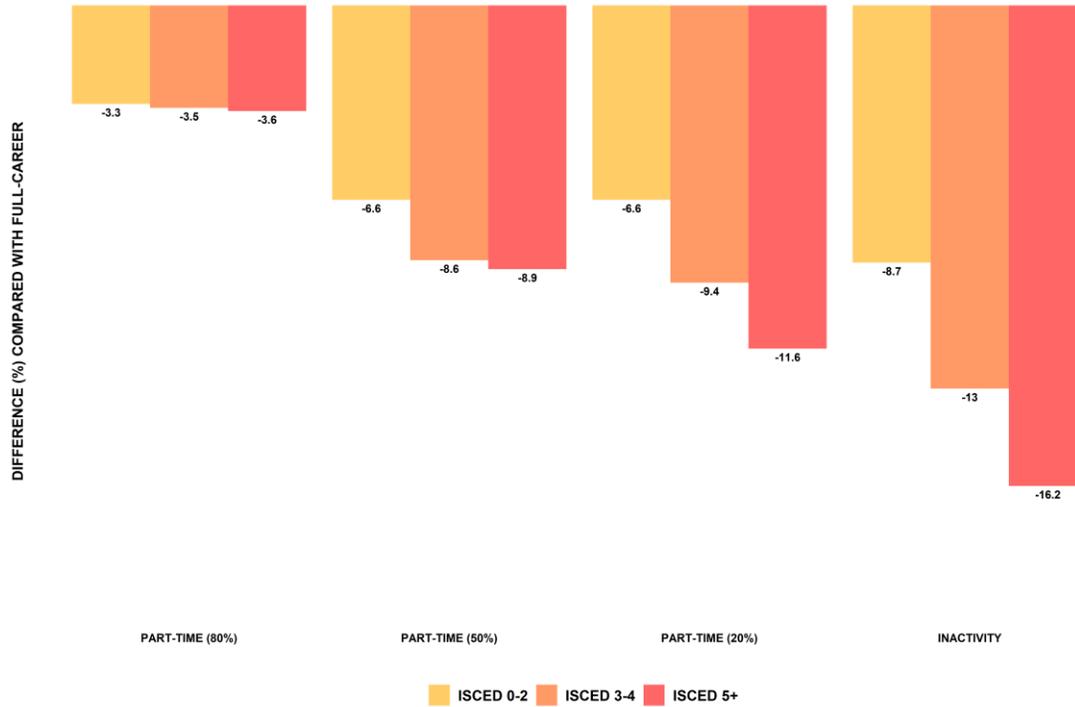


Table 9. OAP following Care Provision, by Labour Market Participation Decision and Educational Level

Option	Eleg. Pension Credits	Educ.	Contrib. (Years)	PAR	Bonus (%)	OAP (Monthly)	OAP (as % FTE)
FTE	YES	Low	51	66	0.1	952	100
		Medium	49	67	0.6	1,273	100
		High	46	68	1.6	1,987	100
PT80	YES	Low	51	66	0.0	920	97
		Medium	49	67	0.6	1,229	97
		High	46	68	1.5	1,917	96
PT50	YES	Low	51	66	0.0	889	93
		Medium	49	67	0.5	1,163	91
		High	46	68	1.3	1,810	91
PT20	YES	Low	51	66	0.0	889	93
		Medium	49	67	0.5	1,154	91
		High	46	68	1.2	1,757	88
INACT	YES	Low	45	68	0.0	869	91
		Medium	43	69	0.4	1,108	87
		High	40	70	0.0	1,665	84
	NO	Low	45	68	0.0	869	91
		Medium	43	69	0.4	1,108	87
		High	40	70	0.0	1,665	84

Not only that, and unlike what happens if a woman has to provide childcare (see Section 4.3), the penalty associated with part-time work increases the more the number of hours is reduced (see Figure 8 and 10). As an example: for a woman with middle education, the decision to reduce work-hours by 20% (PT80) to provide care will lead to a 3.5% cut in the value of her pension - compared to if she had remained in full-time employment. If she were to reduce the number of hours worked by 80% (PT20), the cut would amount to 9.4%.

Differences in the impact of part-time work reflect the fact that care provision episodes tend to take place at a later stage in women’s careers, where wages are higher (from a life course perspective) and thus, the loss of earnings due to part-time work is (in absolute terms) greater. Moreover, unlike in the event of childcare (see Section 4.3), in this type of event, it is not possible to replace salaries for part-time work by higher salaries in full-time employment in the computation of the Reference Remuneration. This will in turn impact negatively in the value of the OAP and on the size of the Pension Bonus (see Table 9).

As expected, given that the current legislation does not foresee any type of protection for this type of situations, we do not find any influence of pension credits in protection women if they have to drop-out of the labour market to care for a dependent adult (see Table 9).

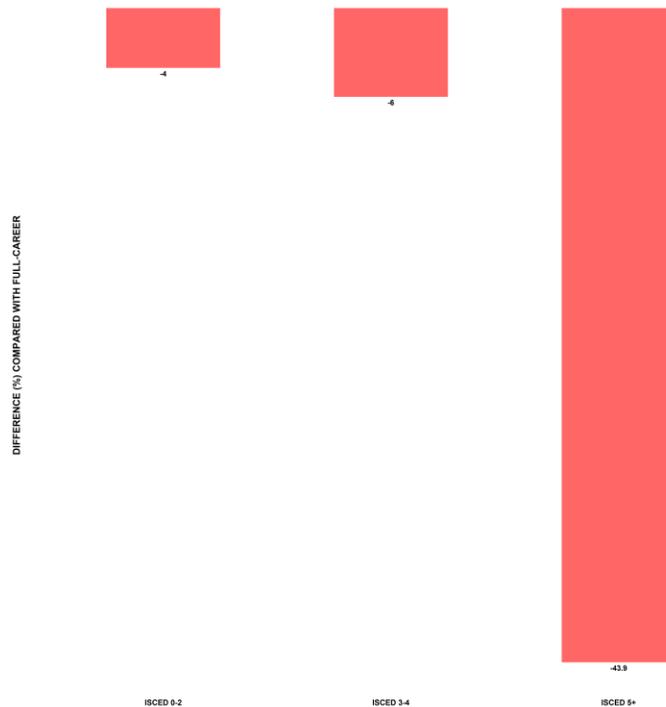
#### 4.5. Assessing the Impact of Early Retirement on Women’s Pensions

Having looked at the impact of childbirth and care provision on women’s pension outcomes, we now turn to how the decision to take-up pension benefits two years ahead of the statutory retirement age (SAR) might impact on a women’s pension outcomes. With the view to map the full range of effects of this type of event, we will examine the impact of early retirement if the woman has previously experienced unemployment, if she had a child or if she had to provide care to a dependent adult.

Table 10. OAP following Early Retirement, by Educational Level

Ret. Choice	Early Ret. Reg.	Educ.	Contrib. (Years)	PAR	Penalty (%)	Sust. Factor (%)	Bonus (%)	OAP (Monthly)	OAP (% SAR)
SAR		Low	51	66	0	0.0	0.1	952	100
		Medium	49	67	0	0.0	0.6	1,273	100
		High	46	68	0	0.0	1.6	1,987	100
EARLY	-	Low	49	67	0	0.0	0.0	913	96
	-	Medium	47	68	0	0.0	0.0	1,197	94
	FLEX	High	44	69	-6	-33.5	0.0	1,115	56

Figure 11. Impact of Early-Retirement (SARS -2 Years) on the Value of OAP



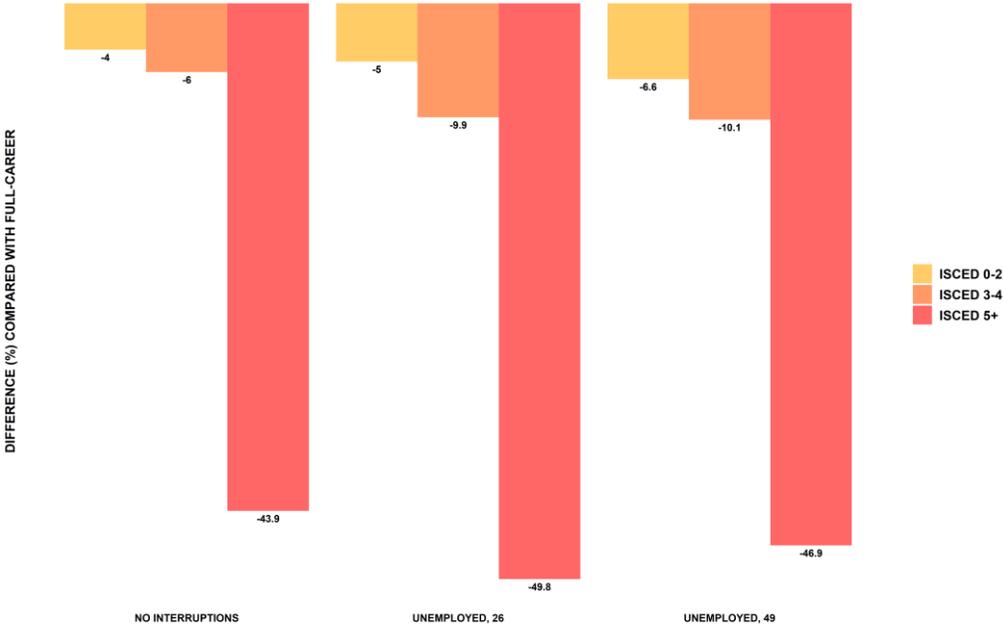
In general, taking-up a pension before the statutory age of retirement, means that women abdicate from adding more years to their contributory record and (given the upward shape of age-earnings profiles) from further increasing the Reference Remuneration. However, in the cases being considered here (which display exceedingly long careers), the impact of early-retirement on pension outcomes is fundamentally shaped by the rules that determine the individuals’ Personal Retirement Age (PAR), and how this determines the eligibility to existing early retirement regimes and the application of pension penalties (see Section 2.1),

Looking at Figure 11, we can’t but notice the sharp contrast in the impact of taking early retirement for women with higher qualifications – which would be expected to experience a 44% cut in the value of their pension - compared to those on lower or middle qualifications, which are expected to receive much smaller cuts (4% and 6%, respectively). As can be seen, in Table 10, this difference can be explained by how the duration of the contributory career will determine the personal age of retirement (PAR). A woman with lower qualifications who entered the labour market at 19 and has remained in full-time employment for the duration of her career, will be entitled to retire without any penalties at 67 - i.e. one year before the PAR. This means that, despite retiring early she will not be subject to any penalties (see Section 2.1)<sup>14</sup> – other than those related with the loss of two years of contributions.

<sup>14</sup> In principle as she is retirement past her PAR, this woman would be entitled to a pension bonus. However, as this cannot raise the value of the OAP beyond 92% of the Reference Remuneration (see Section 2.1.), she is not entitled to a Pension Bonus.

On the other hand, a woman with high qualifications who entered the labour market at 24 and has remained in full-time employment for the duration of her career, will be entitled to retire without any penalties at 69. This means that, by retiring at she will subject to the penalties that are inscribed in the early retirement (old) 'flexibility' scheme (see Section 2.1). Thus, in addition to a 6% cut (for retiring 12 months before the PAR) the woman in question will also receive a 33.5% cut from the application of the sustainability factor (see Table 10).

Figure 12. Impact of Early-Retirement (SARS -2 Years) on the Value of OAP, if Previously Unemployed



As to be expected, women that decide to retire early, having been unemployed at some stage in their careers, will receive even lower pensions than if they have had a professional career with no interruptions (see Figures 10 and 12). In line with previous evidence (see Section 4.2), the conjoint effect of unemployment and early retirement is particularly detrimental for women with higher education who have been unemployed in the earlier stage of their careers (26). This reflects, both the further shortening of the contributory career for women in this situation (see Tables 11 and 12), and the fact that the experience of unemployment in the start of the career is particularly harmful for women with higher education (see Figures 5 and 6).

Table 11. OAP following Early Retirement if Unemployed at 26, by Educational Level

UNEMP	Ret. Choice	Early Ret. Reg.	Educ.	Contrib. (Years)	PAR	Penalty (%)	Sust. Factor (%)	Bonus (%)	OAP (Monthly)	OAP (% SAR)	OAP (% FTE & SAR)
NO	SAR		Low	51	66	0	0.0	0.1	952	100	100
			Medium	49	67	0	0.0	0.6	1,273	100	100
			High	46	68	0	0.0	1.6	1,987	100	100
	EARLY	-	Low	49	67	0	0.0	0.0	913	96	96
			Medium	47	68	0	0.0	0.0	1,197	94	94
			FLEX High	44	69	-6	-33.5	0.0	1,115	56	56
YES	SAR		Low	50	67	0	0.0	0.1	942	100	99
			Medium	48	67	0	0.0	0.6	1,220	100	96
			High	44	69	0	0.0	1.2	1,772	100	89
	EARLY	-	Low	48	67	0	0.0	0.0	904	96	95
			Medium	46	68	0	0.0	0.0	1,148	94	90
			FLEX High	42	69	-6	-33.5	0.0	998	56	50

Table 12. OAP following Early Retirement if Unemployed at 49, by Educational Level

UNEMP	Ret. Choice	Early Ret. Reg.	Educ.	Contrib. (Years)	PAR	Penalty (%)	Sust. Factor (%)	Bonus (%)	OAP (Monthly)	OAP (% SAR)	OAP (% FTE & SAR)
NO	SAR		Low	51	66	0	0.0	0.1	952	100	100
			Medium	49	67	0	0.0	0.6	1,273	100	100
			High	46	68	0	0.0	1.6	1,987	100	100
	EARLY	-	Low	49	67	0	0.0	0.0	913	96	96
			Medium	47	68	0	0.0	0.0	1,197	94	94
			FLEX High	44	69	-6	-33.5	0.0	1,115	56	56
YES	SAR		Low	50	67	0	0.0	0.0	926	100	97
			Medium	48	67	0	0.0	0.6	1,215	100	95
			High	45	68	0	0.0	1.4	1,878	100	95
	EARLY	-	Low	48	67	0	0.0	0.0	889	96	93
			Medium	46	68	0	0.0	0.0	1,145	94	90
			FLEX High	43	69	-6	-33.5	0.0	1,056	56	53

Figure 13. Impact of Early-Retirement (SARS -2 Years) on the Value of OAP, following childbirth

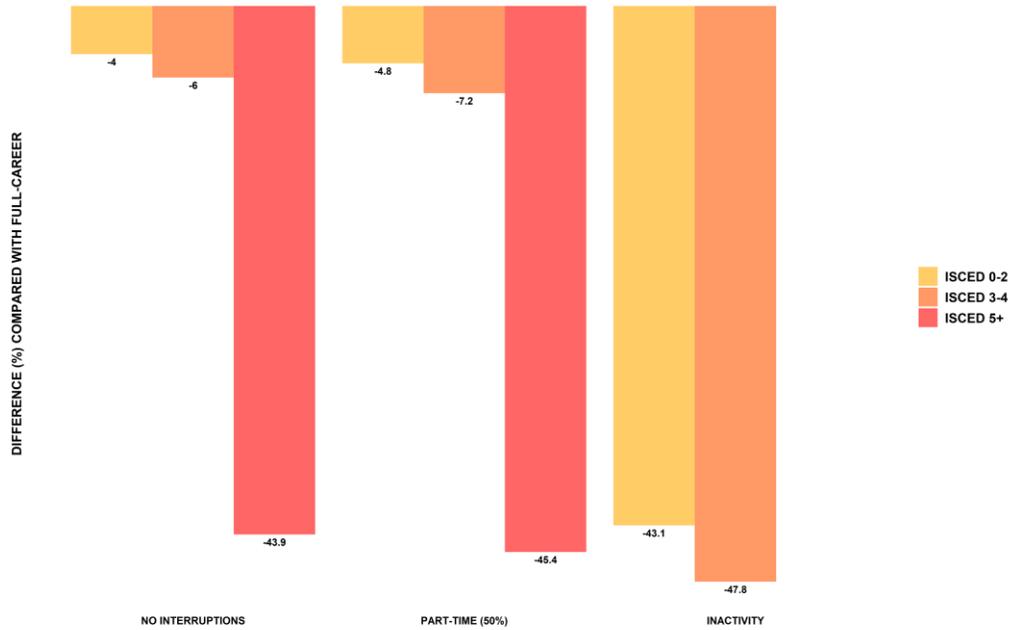


Table 13. OAP following Early Retirement in the event of Childbirth at 30, by Labour Market Participation Decision and Educational Level

Option	Ret. Choice	Early Ret. Reg.	Educ.	Contrib. (Years)	PAR	Penalty (%)	Sust. Factor (%)	Bonus (%)	OAP (Monthly)	OAP (% SAR)	OAP (% FTE & SAR)	
FTE	SAR		Low	51	66	0	0.0	0.1	952	100	100	
			Medium	49	67	0	0.0	0.6	1,273	100	100	
			High	46	68	0	0.0	1.6	1,987	100	100	
	EARLY	-		Low	49	67	0	0.0	0.0	913	96	96
				Medium	47	68	0	0.0	0.0	1,197	94	94
				High	44	69	-6	-33.5	0.0	1,115	56	56
PT50	SAR		Low	51	66	0	0.0	0.1	946	100	99	
			Medium	49	67	0	0.0	0.6	1,260	100	99	
			High	46	68	0	0.0	1.5	1,954	100	98	
	EARLY	-		Low	49	67	0	0.0	0.0	906	96	95
				Medium	47	68	0	0.0	0.0	1,181	94	93
				High	44	69	-6	-33.5	0.0	1,086	56	55
INACT	SAR		Low	46	68	0	0.0	0.1	932	100	98	
			Medium	44	69	0	0.0	0.5	1,166	100	92	
			High	41	70	0	0.0	0.0	1,634	100	82	
	EARLY	FLEX		Low	44	69	-6	-33.5	0.0	541	58	57
				Medium	42	69	-6	-33.5	0.0	664	57	52
				High	39	70	-	-	-	-	-	-

Figure 14. Impact of Early-Retirement (SARS -2 Years) on the Value of OAP, following care provision

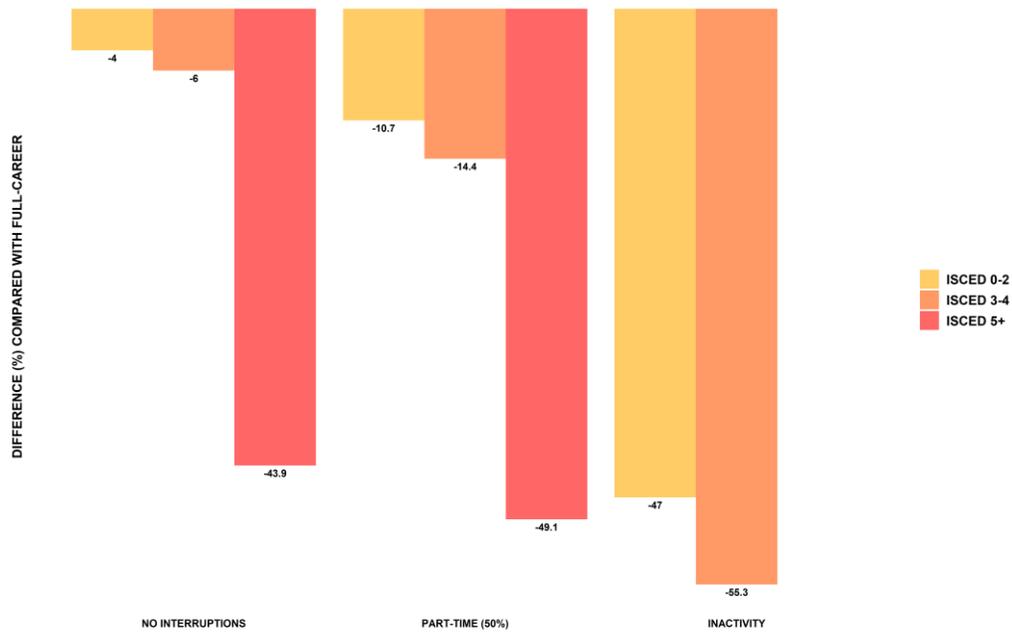


Table 14. OAP following Early Retirement in the event of Care Provision at 54, by Labour Market Participation Decision and Educational Level

Option	Ret. Choice	Early Ret. Reg.	Educ.	Contrib. (Years)	PAR	Penalty (%)	Sust. Factor (%)	Bonus (%)	OAP (Monthly)	OAP (% SAR)	OAP (% FTE & SAR)
FTE	SAR		Low	51	66	0	0.0	0.1	952	100	100
			Medium	49	67	0	0.0	0.6	1,273	100	100
			High	46	68	0	0.0	1.6	1,987	100	100
	EARLY		Low	49	67	0	0.0	0.0	913	96	96
			Medium	47	68	0	0.0	0.0	1,197	94	94
			FLEX High	44	69	-6	-33.5	0.0	1,115	56	56
PT50	SAR		Low	51	66	0	0.0	0.0	889	100	93
			Medium	49	67	0	0.0	0.5	1,163	100	91
			High	46	68	0	0.0	1.3	1,810	100	91
	EARLY		Low	49	67	0	0.0	0.0	849	96	89
			Medium	47	68	0	0.0	0.0	1,090	94	86
			FLEX High	44	69	-6	-33.5	0.0	1,012	56	51
INACT	SAR		Low	45	68	0	0.0	0.0	869	100	91
			Medium	43	69	0	0.0	0.4	1,108	100	87
			High	40	70	0	0.0	0.0	1,665	100	84
	EARLY	FLEX	Low	43	69	-6	-33.5	0.0	505	58	53
			Medium	41	70	-12	-33.5	0.0	569	51	45
			High	38	70	-	-	-	-	-	-

As can be seen in Figures 13 and 15, the impact of early retirement on women's pensions is particularly sensitive to the labour market decisions they make when they have a child or when they need to provide care to a dependent adult. For the sake of expediency, we restrict our analysis to two options: reducing by half the number of hours worked, for a period of 6 years (PT50), or dropping out of the labour market for the same period.

In line with previous evidence (see Section 4.3), we see that the detrimental effect of having to reduce the number of work hours by half (for 6 years) following childbirth for those retiring early is relatively small (see Figure 13). As mentioned above, this reflects the fact that – in the computation of the Reference Remuneration – the wages received during the period of part-time work are not considered. In contrast, the decision to retire 2 years earlier will have severe financial repercussions for women who have opted/been forced to drop the labour force (for 6 years) following the birth of a child. For women with lower and middle education, the reduction in the contributory career means that they are no longer able to retire early without penalties, and will be imposed severe cuts to what would otherwise be the value of their OAP – minus 43% and 48%, respectively (see Table 13). For women with higher qualifications, dropping the labour force for 6 years following the birth of a child will actually mean they do not have the number of contributions (see Table 13) to qualify for the early retirement 'flexibility scheme' (see Section 2.1)

In light of this, and of previous evidence that work hours reduction decisions have more detrimental effects if done in the context of adult care episodes than in the context of childcare episodes (see Figures 8 and 10), it should not come as a surprise that the decision to retire early will be particularly damaging for women to choose/have to reduce their labour market participation to provide care to a dependent adult. Again, the prejudicial effects of early retirement are particularly serious if women decide to drop out of the labour market altogether (for 6 years) (see Figure 14) – which, again, can be explained by the reduction in the contributory career that such decision/situation will produce. Looking at Table 14, we can also see that the absence of any pension credit for care related situations (see Section 4.4) means that the penalties imposed on women will be even harsher.

## 5. Conclusion

Making full use of the heuristic potential standard simulations, in this report we show how events, and choices, that women make over their lifetime might impact on the pension benefit that they later receive. Acknowledging that a) the scenarios covered in this report only cover a small portion of the full range of situations that women face during their contributory careers and b) that the cases under analysis display exceedingly long contributory careers (especially when compared with the current situation), this report has produced a number of findings that are of value to researchers, policy-makers and for women in general:

- Educational differences are a key factor to understand disparities in women's pension outcomes;
- However, women need to acknowledge how pension rules also impact on the value of their pensions. In this respect, we would like to highlight:
  - The OAP Accrual Rate, tends to favor women with lower qualifications/wages;
  - For women with long careers, part of this effect is counteracted by the rules that govern the Pension Bonus which tend to favour women with long careers and higher wages/salaries;
  - The existence of pension credits plays an important protective role against the detrimental impact of unemployment in women's contributory careers. In contrast, pension credits associated with Parental Leave play a very limited role in protecting women in the event that they are forced into inactivity following childbirth;
- Under current rules, women who work uninterruptedly until the Statutory Retirement Age (SAR) will be entitled to a Pension Bonus;
- Even considering the protective role of pension credits in this type of events, being unemployed (for 3 years) has a damaging effect in women's pension outcomes. The impact of unemployment on women's pensions is strongly moderated by women's qualifications and the timing of these events;
- When faced with the need to provide care to a family member, the decisions women make concerning the participation in the labour market matter. In general, reducing the number of hours of work is less detrimental than abandoning the labour market altogether. However, the impact of these decisions are heavily dependent on the nature and timing of these events. From a pension perspective, reducing the number of hours worked as a response to the need to provide care to a dependent adults (at 54) has more detrimental effects than moving to part-time in the event of childbirth;
- Under the premise that women will have longer careers, we find that the retiring two years ahead of the Statutory Retirement Age (SAR) will have a very severe negative impact in women's pensions. This detrimental effect of early retirement is further compounded by the experience of unemployment or by decisions to leaving the labour market to provide care to children or to dependent adults.

## References

- Berger, F., Borsenberger, M., Immervoll, H., Lumen, J., Scholtus, B., de Vos, K. (2001) "The Impact of Tax-Benefit Systems on Low-Income Households in the Benelux Countries. A Simulation Approach Using Synthetic Datasets," EUROMOD Working Papers EM3/01, EUROMOD at the Institute for Social and Economic Research.
- Bradshaw, J., Ditch, J., Holmes, H., Whiteford, P. (1993) "Support for children: A comparison of arrangements in fifteen countries", Department of Social Security Research Report No. 21, London: HMSO.
- Bradshaw, J., Finch, N. (2002) "A comparison of child benefit packages in 22 countries", Department for Work and Pensions Research Report No. 174. Leeds: Corporate Document Services
- Burlacu, I. and O'Donoghue, C. (2014) "The impact of differential social security systems and taxation on the welfare of frontier workers in the EU", *Journal on Free Movement of Workers*, 7, pp. 27-40.
- Burlacu, I., O'Donoghue, C., Sologon, D. (2014) "Hypothetical models", *Handbook of Microsimulation Modelling*, Bingley (UK): Emerald Publishing, pp. 23-46.
- Cantillon, B., Marx, I., Van den Bosch, K., Van Mechelen, N. (2004) *The Evolution of Minimum Income Protection in 15 European Countries 1992-2001*, Antwerp: Centrum voor Sociaal Beleid Herman Deleeck.
- Creedy, J., Scutella, R. (2004) "The Role of The Unit of Analysis in Tax Policy Reform Evaluations of Inequality and Social Welfare", *Australian Journal of Labour Economics*, 7(1), pp. 89 – 108.
- Mortensen, Jorgen. Towards sustainable but still adequate pensions in the EU: Theory, trends and simulations. Vol. 67. CEPS, 2009.
- European Commission (2017) "The 2018 Ageing Report: Underlying Assumptions and Projection Methodologies", Institutional Paper 065. Brussels: European Commission.
- European Commission (2018) *Pension Adequacy Report 2018. Current and Future Income Adequacy in Old Age in the EU, Vol. 1.*, Luxembourg: Publications Office of the European Union.
- Gál, R., Horváth, A., Orbán, G and Dekkers, G (2009) PENMICRO Monitoring pension developments through micro socioeconomic instruments based on individual data sources: feasibility study.
- GPEARI (2018) *2018 Ageing Working Group pension projection exercise. Portugal Country Fiche*, Lisbon: GPEARI.
- Immervoll, H., O'Donoghue, C. (2002) "Welfare benefits and work incentives: an analysis of the distribution of net replacement rates in Europe using EUROMOD, a multi-country microsimulation model," EUROMOD Working Papers EM4/01, EUROMOD at the Institute for Social and Economic Research.

Instituto Nacional de Estatística (2016) Inquérito às Condições de Vida e Rendimento. Documento Metodológico, Lisboa: INE.

Marlier, E., Atkinson, T., Atkinson, A. B., Cantillon, B., Nolan, B. (2007) *The EU and social inclusion: Facing the challenges*, Bristol: Policy Press.

O'Donoghue, C. (2002) "Redistribution over the Lifetime in the Irish Tax-Benefit System: An Application of a Prototype Dynamic Microsimulation Model for Ireland," Working Papers 0056, National University of Ireland Galway, Department of Economics.

OECD (2019a) *OECD Employment Outlook 2019: The Future of Work*, Paris: OECD

OECD (2019b) *Taxing Wages (2017-2018) - Special Feature: The Taxation Of Median Wage Earners*, Paris: OECD.

OECD (2017) *Pensions at a Glance 2017: OECD and G20 Indicators*, Paris: OECD.

Philips, B., Toohey, M. (2013) "Working Australia: What the Government Gives and Takes Away." NATSEM Research Note R13/1.

Rodrigues, C. F., Junqueira, V. Vicente, J. (2019) EUROMOD Country Report: Portugal (2016 – 2019). [https://www.euromod.ac.uk/sites/default/files/country-reports/year10/Y10\\_CR\\_PT\\_Final.pdf](https://www.euromod.ac.uk/sites/default/files/country-reports/year10/Y10_CR_PT_Final.pdf)