Preliminary draft. Please do not cite or circulate without authors' permission.

Financial incentives to retirement in Belgium: what policy lessons?

Alain Jousten
Université de Liège
Center of Research in Public Economics and Population Economics (CREPP) and Tax Institute
Institute for the Study of Labor (IZA)
Network for Studies on Pensions, Aging and Retirement (Netspar)
Boulevard du Rectorat 7, B31, 4000 Liège, Belgium
email: ajousten@ulg.ac.be

Ekaterina Tarantchenko
Université de Liège
Center of Research in Public Economics and Population Economics (CREPP)
Boulevard du Rectorat 7, B31, 4000 Liège, Belgium
email: e.tarantchenko@ulg.ac.be

Abstract:

The paper analyzes the role of the Belgian social security system in retirement behavior of elderly. To address this issue, we rely on a rich administrative dataset. The data contain personal, family and labor market characteristics on 50-64 years-old wage earners and their spouses on the income year of 2001. It enables us to construct accurate measures of financial incentives generated by the social security system. Using these incentive measures as predictors of retirement choice, we investigate the impact of various reform scenarios that change these derived measures. The results show that financial incentives do affect retirement probability of old-age male and female workers but in a different way. We also found that there would be a significant impact on retirement behavior from changing the financial incentives.

Keywords: social security system, financial incentives, retirement behavior, policy simulations

1. Introduction

During the last several decades, increasing the labor market participation of older population has become one of the major challenges for industrialized countries. Many policy measures have already been implemented to boost the labor supply of older workers and reduce the incentives to retire early. However, as the old-age dependency ratio continues to grow due to the population aging, keeping the employment rate of elderly at the current level will lead to an unsustainable pension burden on younger generations.

Several studies examined the effects of policy measures that changed eligibility rules for (early) retirement. Hanel and Riphan (2012), Mastrobuoni (2009) and Behaghel and Blau (2010) found that increasing the normal retirement age (NRA) pushes up the actual retirement age. However, these studies were carried out for the countries (United States and Switzerland) where the early retirement is accompanied by a permanent benefit discount. In contrast with those countries, there is no cut in pension benefits in Belgium in case of early retirement. Indeed, claiming pension benefits one year early means forgo one year of pensionable earnings. Increasing the NRA alone is likely to have a very limited effect on the actual retirement age. A more significant result could be obtained from the policy measures that would tighten the accessibility conditions to early retirement and/or introduce an actuarial adjustment. Staubli and Zweimüller (2011) analyzed the effect of an increase in the earliest age of retirement (ERA) from 60 to 62.2 for men and from 55 to 57.2 for women in Austria. They found that delaying the ERA resulted in a significant increase in employment among older workers.

The present paper goes beyond pure changes in eligibility rules. Its objective is to identify the role of financial incentives on retirement in Belgium. We rely on a simulation model to derive incentive measures that we use as one of the determinants of retirement behavior. Through a micro-simulation analysis, we are then able to evaluate the effects of several hypothetical policy reforms inspired by those progressively introduced in Belgium as of January 2012. The goal is to find out what would be the labor market behavior of elderly in Belgium if the rules within the social security system were changed. To answer this question we use administrative data from 2001 on wage earners. The data contains rich individual information on career and earnings histories that allow us to obtain a rather accurate approximation of social security benefits that would effectively be paid in case of (early) retirement. Moreover, we make use of individual-level information to project future earnings and the intensity of work, both inputs to the financial incentive measures.

As compared to the previous literature on retirement incentives in Belgium (see Jousten and Lefebvre (2013), Dellis et al. (2004)), our model allows us to capture with a high precision the labor supply response to simulated policy reforms. However, a drawback of our dataset is that it lacks information on the health status, which is likely to affect the probability of retirement. Jousten and Lefebvre (2013) and Kalwij and Vermeulen (2008) studied the impact of health indicators on the labor force participation of elderly in Belgium and found a positive effect of poor health on the timing of retirement. Kalwij and Vermeulen (2008) showed that excluding health indicators from their analysis had a very limited impact on the marginal effects of the other socio-demographic regressors, indicating a very low dependency between the two types of variables.

The paper is structured as follows. In section 2, we present a brief review of the institutional framework within which wage earners retire in Belgium. Section 3 is devoted to data and construction of financial incentive measures that we use to estimate the labor force participation. Section 4 describes the estimation results for the early retirement model. We then use these results to investigate the effects of some policy simulations, which are presented in section 5. Finally, section 6 concludes.

2. A Brief Review of the Belgian Social Security System for Wage Earners

We focus our attention on wage earners for whom we have high quality administrative data including complete earnings histories necessary to compute pension benefits at individual level[1]. This scheme covers the largest part of the population and represents a substantial proportion of overall public pension expenditures. Beyond public pensions, other social transfers – with their own eligibility and benefit rules also play an important role for early retirement. We follow Jousten and Lefebvre (2013) and take into account the four possible pathways to retirement once workers exit employment: unemployment, sickness or disability, conventional early retirement and retirement. Our description focuses on the rules applicable in 2001, as this is the year we can study with our data.

2.1. Public Pension System

Individuals qualify for the public pension (PP) benefits as long as they made social security contributions to the wage earners scheme. Our focal year of 2001 falls in the 1997-2009 transition period during which the PP system was substantially revised. Prior to 1997, the NRA was set to 60 and 65 for women and men respectively. Male workers could also claim pension benefits at 60 without any seniority requirement. The 1997 reform introduced two particularly important changes along with several other modifications in the law. On the one hand, the NRA of women was sequentially increased from 60 to 65 to align it with the NRA of men and establish gender equality. This delaying of the NRA was accompanied by an increase in the number of years of complete seniority condition serving to calculate pension entitlements. On the other hand, the possibility to retire at age 60 was maintained for both men and women who had accrued a sufficient number of years of seniority. This seniority eligibility condition was sequentially tightened over the transition period[2]. Past the NRA, the eligibility for benefits is no longer subject to the seniority requirement.

In 2001, benefits could be claimed at any age after the ERA of 60 provided that the individual accrued 28 years of seniority. The NRA was set to 62 and 65 for women and men respectively. The amount of benefits depends on three factors: average total lifetime earnings, family situation and seniority fraction. Average total lifetime earnings include the income

[1] There are two other schemes, one for civil servants and one for self-employed. We leave them aside as the administrative dataset lacks information essential in the computation of retirement benefits. We further do not consider second or third-pillar arrangements.

[2] More precisely, in 1997 the government introduced a seniority requirement of 20 years for early retirement and by 2005, sequentially increased it to 35 years. As for the NRA of women, it was first increased from 60 to 61 in 1997 and then by one year increments every three years to attain 65 in 2009. There was a similar change in the complete seniority condition: from 40 to 45 over 1997-2009.

from work as well as the income imputed for the periods spent in replacement income (called assimilated periods). This latter imputed income depends on the wage that workers earned before they started receiving replacement income. Married couples with one dependent spouse benefit from 75% of the average total lifetime earnings multiplied by a seniority fraction, while all the others receive a replacement rate of 60%. The 75% replacement rate is also granted for two-earner married couples provided that the household supplement doesn't exceed the lowest PP benefit calculated for the two spouses. Seniority fraction represents the individual's accrued years of seniority, including regular contribution years and assimilated periods, over the complete seniority requirement. In 2001, the latter was equal to 42 and 45 years for women and men respectively. In addition, pension benefits are adjusted to the cost of living through variation of the consumer price index. Since 1991, there is no actuarial adjustment for early retirement other than that directly implied by the pension computation formula by means of incomplete seniority adjustments.[3]

2.2. (Old-Age) Unemployment Insurance

The unemployment insurance (UI) provides a replacement income for wage earners who lost their job involuntary. There are numerous conditions a worker has to satisfy to be eligible for the benefits. For example, the claimant has to prove that before becoming unemployed he has received earnings or replacement income for a certain amount of days. This latter period, as well as the reference period before the loss of job, depends on age of the claimant. In addition, during the unemployment spell, beneficiaries must be actively seeking for and accept any job which is considered suitable. An exception is made for old-age unemployed. Since 1986, the unemployed aged 50 or more are exempted from the job search requirement and those of them who can prove 20 years of career as wage earners and don't receive a company supplement from their former employer, benefit from a seniority supplement. The amount of the latter varies with age and family status of the beneficiary.

Unemployment benefits are not generally limited in time, except when the unemployed reaches the NRA and automatically switches to public pension benefits. Their amount depends on the family status and the last wage which is limited to a ceiling. The system has been frequently revised during the last couple of decades. In 2001, our reference year, an unemployed who lived with dependent household members received 60% of his last wage independently of the duration of unemployment spell. While a single and a cohabitant living with financially independent members benefited from respectively 60% and 55% of their last wage during the first year. Their replacement rates for the period following the first year of unemployment decline with duration of the spell, the digression depending on the time elapsed since they started claiming benefits.

2.3. Conventional early retirement

The conventional early retirement system (CER)[4] was created during the middle 70' when many companies in Belgium encountered financial difficulties due to the first oil crisis. In

[3] Until 1992, an additional 5% reduction in pension benefits was applied per year of early retirement.

[4] Since 1st January 2012, the name of conventional early retirement has been replaced by "unemployment with a company supplement".

order to protect younger workers from unemployment, the program was aimed to insure dismissed older workers a decent income under certain conditions. In addition to unemployment benefits, workers who are forced to retire early, receive from their employer a company supplement until they reach the NRA. The conditions one has to satisfy to qualify for CER are mostly related to age, seniority under the wage earners scheme and activity sector. The workers must also be eligible for unemployment benefits that represent 60% of their capped wage regardless of the family situation until they are rolled over into the PP system. The amount of employer's supplement corresponds to at least one half of the difference between the last net (capped) wage and unemployment entitlements. Unlike most of the beneficiaries of unemployment benefits, those under the CER are not required to be available for the labour market and actively seeking for a job.

However, soon after the introduction of CER, employers used the system to lay off costly older workers who in turn were willing to retire early. As a consequence, the number of beneficiaries has substantially grown and the system has become very costly in budgetary terms. Also, the effect on the labour market of younger population has appeared to be rather weak. To discourage earlier exit from the labour force, the eligibility conditions have been frequently revised. In 2001, the minimum age was 58 and seniority requirement 25 years as wage earner (with assimilated periods taken into account), though it was possible to retire through this system at earlier ages given tighter seniority requirement and the activity sector. An exception is made for companies in economic difficulty or in restructuring, where old workers can benefit from CER as of the age of 50. However, these workers have to prove either 20-year earnings or assimilated periods history or 10 out of 15 years within the same sector prior to lay-off.

2.4. Sickness and Disability Insurance

Wage earners, who cease their professional activity because of work incapacity of at least 66%, receive sickness compensation during the first year. Apart from the 66% incapacity, claimants have to prove they have contributed to social security for a sufficient period of time. Following the 12th month of sickness compensation, the beneficiaries can claim disability benefits (DI) if their invalidity is certified by medical council of the National Institute for Health and Disability Insurance. Disability benefits are not limited in time except when individual is considered able to work by the medical officer or reaches the NRA. The amount of compensation is determined according to the beneficiary's family situation. Those with dependent household members receive 65% of their last capped earnings. Others benefit from 55% or 40% replacement rate depending respectively on whether they live alone or within a household with financially independent members.

2.5. Recent social security reform

To increase the employment rate among elderly and reduce the incentives to retire early, the Belgian government enacted a major reform of the social security system at the end of 2011. The majority of the changes introduced by this reform was approved and is effective as of 2012. This section describes some of the most important amongst them.

First, two main changes were introduced relative to the PP system. On the one hand, the 2012 reform made pension system less generous. The imputed income for certain assimilated periods as of 2012 is limited to a minimum guaranteed wage instead of the last personal real wage. On the other hand, a transition period 2013-2015 was introduced to sequentially increase the ERA, as well as the minimum seniority condition for the early retirement, to respectively 62 and 40 years. An exception is provided for the workers with longer seniority and is adapted through the period 2013-2016. As from 2016, workers with at least 42 or 41-year seniority could retire after they are respectively 60 or 61 years-old.

Second, the 2012 reform rose the CER eligibility age from 58 to 60 for both men and women[5]. In the same time, the seniority requirement was brought to 40 years for men and 35 for women. The seniority for women is planned to increase further in two steps to reach 40 in 2015. The 2012 reform also changed the conditions for companies in economic difficulty or in restructuring. For the companies in restructuring, the eligibility age was increased from 50 to 55 in 2013. For the companies in economic difficulty, the same age is also expected to increase to 55 by 2018.

Finally, the UI was also substantially revised. Since 2012, the decline in unemployment benefits is sharper over unemployment duration for all the unemployed, regardless the family situation. Along with this change, the government raised the minimum age at which older unemployed can benefit from the seniority supplement from 50 to 55.

Table 1 summarizes the timing of the modifications presented in this section. Based on the 2012 reform, we expect a delaying in early retirement. Evaluating the impact of such policy measures becomes of a particular interest. In this paper, we use micro-simulation analysis to investigate the effect of several policy reforms that partly reflect the changes introduced by the 2012 reform.

[5] However, within certain activity sectors workers with sufficient seniority may still retire at earlier ages.

Table 1. *Social security system before and after 2012 reform*

	before	after	
		Timing	Changes
Public pension			
Early retirement age (years career requirement)	60 (35)	2013	60.5 (38) or 60 (40)
		2014	61 (39) or 60 (40)
		2015	61.5 (40) or 60 (41)
		Starting 2016	62 (40) or 61 (41) or 60 (42)
Imputed income for assimilated periods	Last personal wage	Starting 2012	Minimum guaranteed wage
Conventional early retirement			
Age (years career requirement)	58 (37 men, 33 women)	2012	60 (40 men, 35 women)
		2014	60 (40 men, 38 women)
		2015	60 (40 men, 40 women)
Age for companies in economic difficulty (years career requirement)	50 (10 out of 15 within the same sector or 20)	2012 2013 - 2018	52 (unchanged) Increase by 6 months every year: 55 in 2018 (unchanged)
Age for companies in restructuring (years career requirement)	50 (10 out of 15 within the same sector or 20)	2013	55 (unchanged)
Old-age unemployment			
Benefits	-	2012	sharper decline in benefits over unemployment spell regardless family situation
Age for seniority supplement (years career requirement)	50 (20)	2012	55 (unchanged)

3. Data and Methodology

3.1. Data

The dataset was extracted from the "Datawarehouse Labour Market and Social Protection". A random sample of 100,000 individuals was drawn from the Belgian population on 01/01/2002. The data contain personal and family characteristics on the income year of 2001, as well as detailed career and earnings histories for each year of affiliation to wage earners scheme, at individual level. We also have yearly information on periods spent on replacement income for the whole professional career, which are accounted for in state pension computation formula. In addition, administrative data provide labor market information on a quarterly basis which we use to select the sample of interest and determine transitions. Finally, the same details are available for the spouses of sampled individuals. As a result, we are able to compute the potential pension and other social transfers today and in the future and determine whether an individual is eligible for either of these social security benefits at a given age.

In order to analyze the role of social security system on retirement behavior, we restrict our attention to individuals above the age of 50 and below the NRA (i.e. 50-64 years old men and 50-61 years old women). We further limit our analysis to those who were in the wage earners'

insurance scheme and were still employed at the end of the first quarter of 2001. The final sample includes 2,247 men and 1,175 women that we analyze separately.

We follow the literature (Jousten and Lefebvre (2013), Dellis et al. (2004), Hanel and Riphan (2012)) and consider the exit from employment as an absorbing state. This means that workers who leave employment during the year of 2001 are defined as permanently retired. This assumption rules out the possibility of returning to work. Table 2 summarizes the main sample characteristics for men and women.

3.2. Financial Incentive Measures

We compute the social security benefits for each individual, at all present and future possible retirement dates up to the NRA. We assume that the exit from employment is only possible through the four pathways described in section 2. The computation of benefits takes into account the eligibility conditions specific to each of the four programs. We next compute the net present discounted value of all future benefits associated with a given retirement path, that we define as social security wealth (SSW). SSW for a worker of age a if he retires at age $h \geq a$ through an exit route E can be approximated by

$$SSW_h^E = \sum_{s=h}^{T} \delta^{s-a} \, \mathrm{E}[B_h^E(s)]$$

where δ represents the discount factor with the interest rate set to 3%, T the life span, $\mathrm{E}[B_h^E(s)]$ the expected benefits at age s associated with a pathway E if the worker retires at age h. The expected benefits are calculated as

$$\mathrm{E}[B_h^E(s)] = \begin{cases} \rho(s) BS_h^E(s) & if\ not\ married \\ \rho(s)\tau(s) BM_h^E(s) + \rho(s)[1-\tau(s)] BS_h^E(s) & \\ \quad +[1-\rho(s)]\tau(s) S_h^E(s) & if\ married \end{cases}$$

where $BS_h^E(s)$ is the worker's benefit at age s if he is not married and retires at age a, $BM_h^E(s)$ is the worker's benefit at age s if he is married and retires at age a, $S_h^E(s)$ is the worker's survival benefit when he would have been aged s and retired at age a, $\rho(s)$ is the worker's survival probability at age s conditional on being alive at age a and $\tau(s)$ is the spouse's survival probability at age s conditional on being alive at age a[6]. For the unemployment, sickness or disability and conventional early retirement exit routes, the amounts of $BS_h^E(s)$ and $BM_h^E(s)$ correspond respectively to UI, DI and CER benefits (hereafter referred to as preretirement benefits) up to the NRA. We assume that after an old worker retires through one of these three routes and provided that he satisfies the eligibility conditions, he receives the same level of preretirement benefits until he reaches the NRA. After the NRA, the preretirement benefits are replaced by PP benefits. As for the pension exit route, a worker is assumed to receive 0 until he becomes eligible for the early retirement or reaches the NRA.

[6] The survival probabilities are based on age and gender specific survival tables from the Human Mortality Database. In our computations, we assume that the husband is 3 years older than the wife.

After that, he can start claiming PP benefits that remain at the same level through the rest of his life.

In our empirical analysis we use the weighted average of the SSW indicator of the previously derived incentives for the various exit paths (UI, DI, CER and PP). The weights are taken equal to the empirical instantaneous exit rates differentiated by age and gender. Based on this weighted SSW, we compute two dynamic incentive measures: social security accrual (SSA) and peak value (PV). These two indicators capture the incentive of staying in employment compared to withdraw from the labor force in the current period. Namely, SSA represents the difference in SSW if retirement is postponed by one year and is defined as

$$SSA_a = SSW_{a+1} - SSW_a$$

While PV equals the difference between SSW at future age where its maximum is reached and SSW today, that is,

$$PV_a = \max_h \{SSW_h - SSW_a\}, \quad h = a+1, \dots, NRA$$

These two forward looking measures rely on the expected earnings as well as working and assimilated periods[7] for all individuals at each future age up to the NRA. For simplicity, we assume that individuals', when making their retirement decision, evaluate their future earnings prospects as being constant in real terms[8]. Table 2 provides mean and standard deviation of financial incentive indicators for men and women. The differences between the two genders are considerable. Women have in average almost 40% lower SSW than men. This comes as no surprise as women generally have shorter careers and lower lifetime earnings. Another factor that contributes to a larger amount of SSW of men is that they are more likely to benefit from a higher replacement rate for their PP benefits. This is due to the fact that in married couples, men are more often single earners or have much higher PP benefits than their spouses. They are therefore those who receive household supplement. The value of SSA is in average negative for both genders and is quite modest, €-20 for men and €-350 for women. As for PV, its average amount is positive and equals to €8160 and €13630 for men and women respectively indicating the importance of looking beyond instantaneous effects.

[7] Other characteristics such as spouse's earnings are also taken into account.

[8] We also considered a 1.5% real growth rate. The results go in the same direction.

Table 2. *Descriptive sample characteristics, by gender*

	Men	Women
Age (years)	54.12	53.75
	(3.17)	(3.00)
Marital status (%)		
Not married	22.47	37.28
Married	77.53	62.72
Active spouse (%)	33.73	42.89
Age difference (years)	1.85	-1.30
	(3.66)	(3.47)
Region (%)		
Brussels	5.70	13.70
Flanders	66.00	56.17
Wallonia	28.30	30.13
Occupation (%)		
White-collar	48.33	64.26
Blue-collar	51.67	35.74
Intensity of current job (%)		
Part-time	5.07	39.66
Full-time	94.93	60.34
Seniority (years)	33.13	29.02
	(7.14)	(8.73)
Current net earnings (€ in thousands)	17.88	11.37
	(12.18)	(6.66)
Lifetime net earnings (€ in thousands)	13.06	8.60
	(6.07)	(4.42)
SSW (€ in thousands)	155.21	98.08
	(46.23)	(45.22)
SSA (€ in thousands)	-0.35	-0.16
	(12.35)	(9.81)
PV (€ in thousands)	7.47	12.72
	(13.81)	(14.98)
Exit rate (%)	10.15	10.55
Observations	2247	1175

4. Empirical strategy and estimation results

In order to analyze the retirement behavior of elderly, we estimate probit models that relate the retirement decision of workers to various independent variables including the constructed financial incentive indicators. We expect a positive effect of SSW on the retirement probability and a negative effect of both dynamic incentive measures. Indeed, individuals with higher levels of retirement wealth are more likely to retire earlier, holding all other variables constant. While greater accruals of that retirement wealth from additional work should cause individuals to postpone their withdrawal from the labor force. Table 3 reports the results of two different specifications, each including SSW and either SSA or PV, for male and female workers separately. The dependent variable takes the value of 1 if individual

left employment during the year of 2001. The variable *seniority* represents the number of years of seniority under the wage earners scheme as they are accounted for in the pension computation formula. In order to capture potential nonlinear relationships between the retirement dummy and independent covariates, we included in each specification a polynomial in age, current earnings and incentive measures. We also centered age by 50 and some of the other variables (income variables, career and incentive measures) by their sample means. Current earnings, average life time earnings and spouse's earnings are in €1,000, and SSW, SSA and PV are expressed in €10,000.

Table 3 shows that financial incentives seem to influence differently the retirement behavior of women as compared to men. To better illustrate the dependence of the likelihood of retiring on the incentive measures, we also plotted the average predicted probability of exit from the labor force estimated at different levels of the incentive variables (see Figures 1a and 1b). The levels chosen correspond to the different sample percentiles of the incentive measures.

As expected, the retirement probability for women is positively dependent on the SSW variable for the model estimated with the SSA as well as the PV measures. Although the coefficients on the SSW and it's square appear insignificant in the model run with the PV, the test for their joint significance rejects the null hypothesis (at the 5% level). This finding is confirmed by Figure 1a which shows that the estimated probability curve is positively sloped at every percentile of the SSW. Table 3 and Figure 1a also show that the dynamic incentive measures have a positive impact on the likelihood of retiring, which is unexpected. One possible explanation is that women' retirement decision might strongly depend on that of their husbands'. Consider, for example, wives with low value of the retirement wealth accrual whereas their husbands' accrual is large. If the couple's behavior is jointly determined and large values of husbands' accrual push them to delay their retirement, wives are likely to postpone their retirement to match it with their husbands'. An inverse situation where women have large values of SSA but not their husbands would encourage both spouses to retire early. Several studies have found evidence in favor of strong preferences for a couple to retire jointly (see Gustman and Steinmeier (2000), Coile (2004), Pienta (2003)). Pienta (2003) analyzed retirement behavior of married couples and showed that wife's retirement decision is closely related to her husband's characteristics such as occupational status and work intensity. These two factors influence an individual's pension wealth.

Table 3. *Probit estimates of labor force exit, by gender (parameter estimates)*

	Men		Women	
	Accrual	Peak value	Accrual	Peak value
Financial incentives				
SSW	-0.03201	-0.02885	0.06844**	0.05382
	(0.02032)	(0.02086)	(0.03478)	(0.03493)
SSW²	0.00421***	0.00370***	0.00242	0.00375
	(0.00140)	(0.00138)	(0.00244)	(0.00244)
SSA/PV	-0.06521*	-0.10259**	0.17653**	0.11024
	(0.03836)	(0.04473)	(0.06856)	(0.09796)
SSA²/PV²	0.04002***	0.04197***	-0.03907	-0.01163
	(0.01536)	(0.01347)	(0.03531)	(0.02212)
Income variables				
Earnings	-0.06364***	-0.06317***	-0.09438***	-0.09482***
	(0.01014)	(0.01010)	(0.01846)	(0.01853)
Earnings²	0.00067***	0.00068***	0.00204***	0.00199***
	(0.00013)	(0.00013)	(0.00055)	(0.00056)
Average life time earnings	0.06011***	0.05751***	0.02243	0.02697
	(0.01575)	(0.01556)	(0.03095)	(0.03117)
Socio-economic variables				
Age	-0.10215	-0.09721	-0.00030	-0.14056
	(0.07674)	(0.07427)	(0.13207)	(0.13546)
Age²	0.03451**	0.03152**	-0.00809	0.03109
	(0.01470)	(0.01446)	(0.03348)	(0.03304)
Age³	-0.00182**	-0.00165**	0.00097	-0.00153
	(0.00077)	(0.00076)	(0.00220)	(0.00213)
Marital status (ref.: Living alone)				
Married	0.03630	0.02662	-0.07069	-0.07295
	(0.14084)	(0.14450)	(0.16876)	(0.16860)
Active spouse	-0.14866	-0.15349	-0.14809	-0.14705
	(0.14244)	(0.14259)	(0.20995)	(0.20909)
Age difference	-0.00275	-0.00344	0.00581	0.00639
	(0.01120)	(0.01123)	(0.01733)	(0.01723)
Spouse earnings	0.00969	0.01067	-0.00133	-0.00205
	(0.01127)	(0.01134)	(0.00909)	(0.00899)
Region (ref.: Wallonia)				
Flanders	-0.04098	-0.04274	0.32194**	0.32295**
	(0.08668)	(0.08679)	(0.13001)	(0.12930)
Brussels	-0.03711	-0.03658	0.25475	0.26380
	(0.17310)	(0.17309)	(0.18450)	(0.18302)
Blue collar	-0.00070	-0.01081	0.23845*	0.24934*
	(0.10518)	(0.10532)	(0.13756)	(0.13743)
Part-time	-0.18133	-0.17435	-0.29878**	-0.27999**
	(0.16855)	(0.16843)	(0.13240)	(0.13315)
Seniority	0.02754***	0.02437**	-0.02108	-0.01631
	(0.01048)	(0.01017)	(0.01320)	(0.01307)
Intercept	-1.73821***	-1.65570***	-1.55885***	-1.66779***
	(0.19406)	(0.18948)	(0.19255)	(0.20850)
Observations	2247	2247	1175	1175
Log-Likelihood	-650.7	-649.5	-342.9	-345.7

Notes: ***, ** and * indicate significance at the 1, 5 and 10% level. Standard errors of parameter estimates are presented in parentheses. Other control variables are activity sector dummies.

Figure 1a. *Predicted probability of labor force exit for selected percentiles of incentive measures, women (sample means and conf. intervals)*

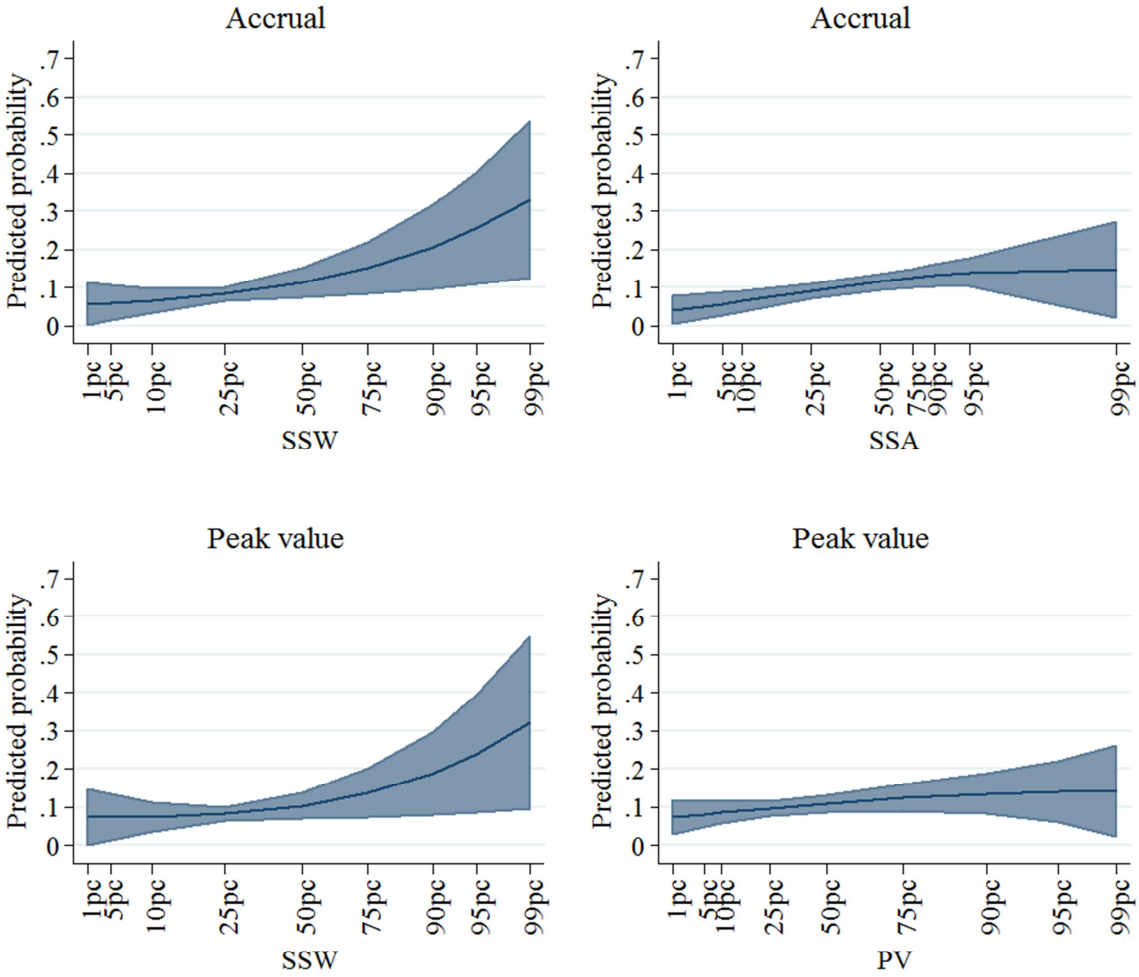
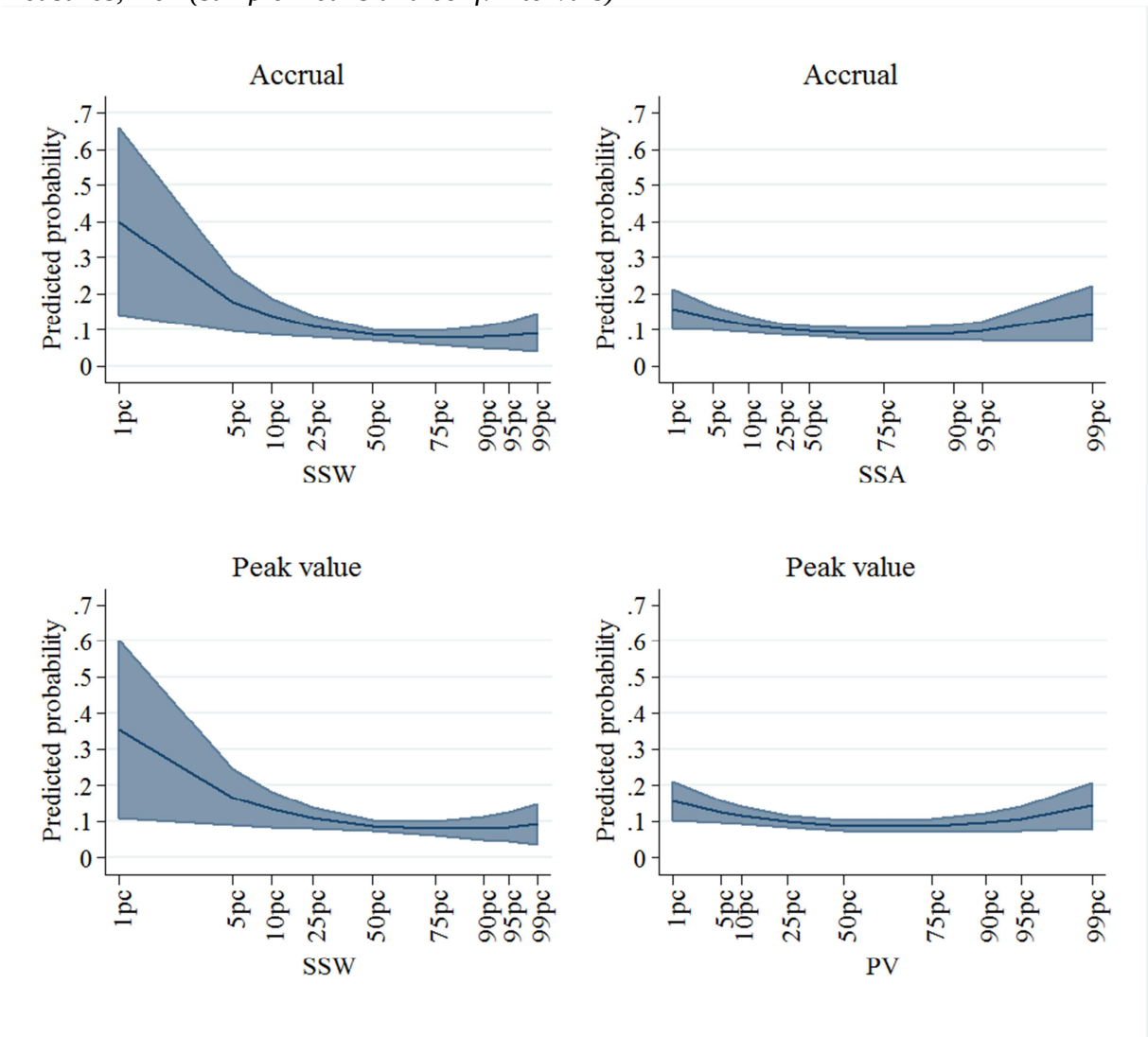


Figure 1b. *Predicted probability of labor force exit for selected percentiles of incentive measures, men (sample means and conf. intervals)*



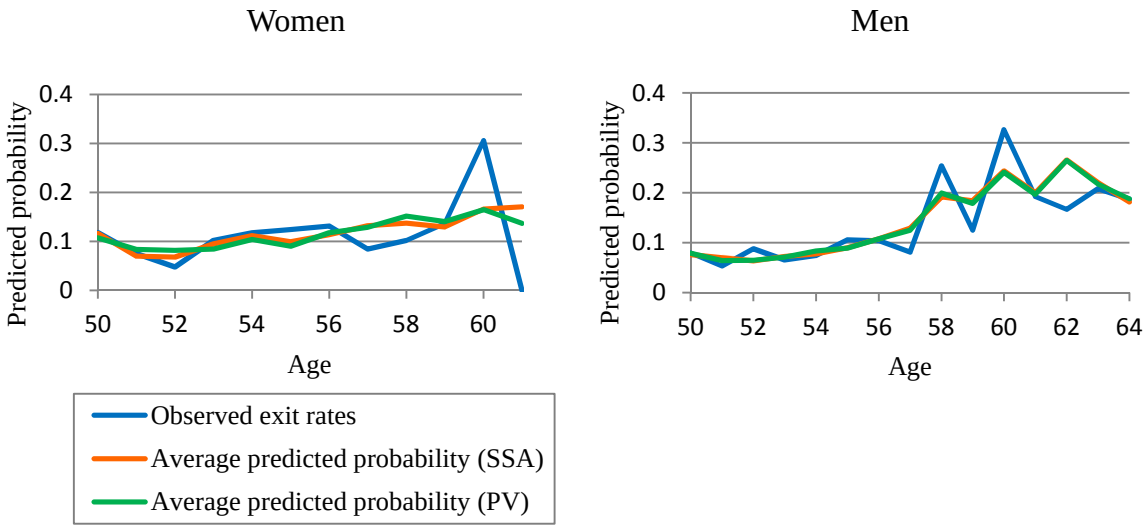
Unlike women, men have a quite different pattern. The SSA and PV have a significantly negative impact on their probability of labor force exit. This impact dies out as the level of these two dynamic incentive indicators increases. The SSW variable for men has unexpected negative (although not significant) estimated coefficient in level while its square is significantly positive. As in case of the dynamic incentives, the retirement probability seems to be U-shaped in function of the SSW. That is, the retirement probability is negatively sloped with respect to the SSW and concave. Figure 1b shows that the slope slows as the level of SSW increases and even turns positive for the highest values of the SSW. Though maybe surprising at first sight, these findings can rather easily be rationalized. The negative effect of SSW has already been found in previous literature (see Gruber and Wise (2004)). However, unlike these studies, that considered a linear function of the SSW, our model allows a more flexible polynomial structure of this variable. One possible explanation of a U-shaped pattern of the SSW is that the individuals' decision to retire may depend on their net replacement rate. Indeed, those of them who have too little SSW are more likely to also have low earnings. In that case, retiring will lead to high net replacement rates. Therefore, their probability to retire is high as they have little reason to stay in the labor force. This phenomenon is reinforced by the fact that periods spent on social benefit receipt are considered in a fully

equivalent way to work periods in the pension computation formula. In contrast, the individuals with higher SSW are likely to have higher earnings and lower net replacement rates. They would thus prefer to delay their retirement to support their future consumption. However, when SSW is sufficiently high, net replacement rates are no longer a constraint and the variable has the expected positive effect on the probability to retire. Another factor that could explain the negative effect of the SSW on the retirement probability is that the husband's behavior could be influenced by his wife's SSW. Indeed, as it already was mentioned, married men are more likely to benefit from household supplement to pension benefits than married women. As a consequence, a male worker who loses household supplement because of a rise in his spouse's pension benefits, may leave the labor force sooner. This is due to the fact that the loss of household supplement is more than compensated by an increase in spouse's income, resulting in a rise in the total SSW of the couple.

Table 3 also shows that the estimated effects of the other explanatory variables are very similar between the models run with SSA or PV measures for a given sample. However, when these effects are compared between the two samples, there seem to be some significant differences. For example, being in a part-time job has no effect on men while women with reduced hours of work are more likely to retire later. This finding is not surprising as women at the end of their working career are more likely to have a part-time job as compared to men. Average life time earnings and contribution years are both significant and positive for men, which might have been expected. The conclusions are different for women as their retirement preferences don't seem to be affected by neither of the two variables.

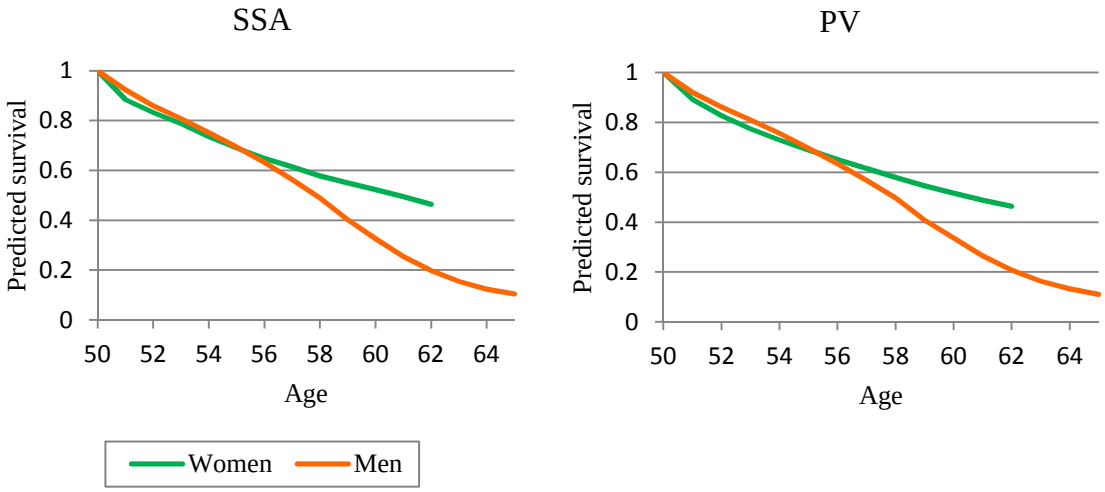
Figure 2 displays actual instantaneous exit rates out of the labor force and probabilities predicted by the fitted model, both averaged by age. The spikes observed for men at ages 58 and 60 match the eligibility conditions for respectively CER and early retirement within PP systems. For women, there is no spike at 58 but one at 60. The differences between the observed exit rates and predicted probabilities are partly due to a failure of the model to fully capture the impact of the social security system. That is, the eligibility criteria of different social security programs play an important role in addition to individual-level financial incentives.

Figure 2. *Predicted probability of exit from the labor force, by gender and age (Baseline)*



For cohorts of the same age, women seem to have higher probability to retire, with an exception for the 52-year old cohort. The trend shows an opposite pattern for people of 57 and more. This difference between the two genders is illustrated in Figure 3, where the survival probability function estimated for a sample of 50 year old is plotted. The drop of the survival functions of women and men is quite similar until age 56, though slightly more important for women. After 56, the difference widens and women seem to have much higher probability to remain in the labor force.

Figure 3. *Predicted survival probability in the labor force at 50, by model specification and age (Baseline)*



5. Policy simulations

In light of our findings in the previous section, we analyse the effect on retirement probability of five different reforms to the Belgian social security system. The effect is captured through the incentive measures that are modified along with the introduced changes. We then contrast the results of these simulated scenarios with the base situation where the social security

system is left unchanged, i.e. with the rules that prevailed in our reference year of 2001 (hereafter referred to as Baseline).

Policy reform 1 is partly inspired by the 2012 reform enacted by Belgian government that we described in section 2.5. It consists in an increase of two years in the standard and conventional early retirement ages as well as in a tightening of the seniority length required to be eligible for these two programs. That is, an individual can start claiming PP benefits at the ERA of 62 (instead of 60 for the Baseline) given he proves 40-year seniority (28 years for the Baseline). The CER benefits are available from the age of 60 (compared to 58 for the Baseline) with at least 40 years of seniority (25 years for the Baseline). These modifications to the ERA and minimum age for the CER benefits clearly follow the 2012 reform, without considering the exceptions allowed by the new law (e.g. more flexible ERA for the individuals with longer seniority or different CER conditions depending on the activity sector). In addition, we still consider the possibility to retire earlier through the CER system in case of companies in economic difficulty or in restructuring. However, this possibility is limited to the workers aged 52 and more (compared to 50 for the Baseline). This condition is less restrictive than the one implemented by the 2012 reform. Finally, we also restrained the access to old-age unemployment to the individuals of at least 52 years old. (Policy 1: 2-year shift)

Policy 2 introduces a 5% actuarial reduction in pension benefits for each year of retirement before the NRA, as was the case until 1992. This reform modifies individuals' SSW of the pension exit path only, leaving the SSW of the three remaining retirement routes unchanged. That is, by assumption, the retirement through UI, CER or DI implies that pension benefits are collected after the individuals reach the NRA, where the actuarial adjustment no longer applies. (Policy 2: Actuarial adjustment)

Policy 3 decreases the actual system's generosity by reducing the imputed income for assimilated periods to zero, while still counting these periods towards the seniority in eligibility and benefit generosity. This means that the average total lifetime earnings that determine the amount of pension benefits no longer include the imputed income for periods spent on replacement income. (Policy 3: Assimilated periods)

Policies 4 and 5 are combinations of Policy 1 with respectively Policies 2 and 3 (Policy 4: 2-year shift plus actuarial adjustment; Policy 5: 2-year shift plus assimilated periods). For these two policies as well as for Policy 1, the incentive measures were recalculated using age-specific weights shifted up by two years. In order to evaluate the effect of these five policy reforms, we first compare the amount of the retirement wealth simulated before and after the changes applied to the social security system. We then use the estimation results presented in the previous section to predict the median retirement age for each policy alternative and each specification.

Figure 4 presents the percentage change in the SSW averaged by age and gender, under the five policy alternatives as compared to the Baseline. For both genders, there is substantial difference between the Baseline and Policies 1, 4 and 5. This is mostly due to the 2-year shift reform that restricts the access to the early retirement benefits (namely UI, CER and PP). The difference in the SSW is negative and ranges from 26% to 33% for women (from 30% to 40%

for men) aged 50 depending on the policy alternative. The spike at age 53 for both men and women is due to the 2-year shift in weights used to compute the SSW. The actuarial adjustment and assimilated periods policies applied on their own have more reduced impact. For Policy 2, this finding can be explained by the fact that the 5% actuarial reduction affects a limited fraction of individuals and through PP pathway only. That is, only those who have sufficiently long seniority to be eligible for standard early retirement will have their pension benefits cut. As for Policy 3, the elimination of imputed income is compensated by other provisions of the pension system (e.g. minimum pension benefits). These other ways of protecting people against poverty result in a limited effect of the policy. It can also be seen from Figure 3 that there is no significant difference between Policies 4 and 1. This can be explained by the even smaller fraction of individuals affected by the 5% actuarial adjustment due to the increase in the ERA and tightening in seniority requirement for the standard early retirement. Figure 4 also reveals substantial differences in the impact between gender and age groups. It is not surprising that the actuarial adjustment proposed by Policy 2 has greater effect on men than on women given the difference in their NRA. A 60 year old man eligible for standard early retirement if retires will have his pension benefits cut by 25% as compared to 10% reduction for a woman of the same age. In contrast, the change generated by Policy 3 is slightly stronger for female workers, indicating greater dependence of their pension benefits on the imputed income. Policy 3 also has larger effect on lower age groups for both men and women, which is consistent with its nature. The impact of Policies 1, 4 and 5 is strongly heterogeneous in terms of both ages and genders. However, it is buffered when a 2-year shift in weights for the SSW is no longer applied, except for ages 50 to 52.

Figure 4. *Relative change in SSW as compared to Baseline, by gender and age (€ in thousands)*

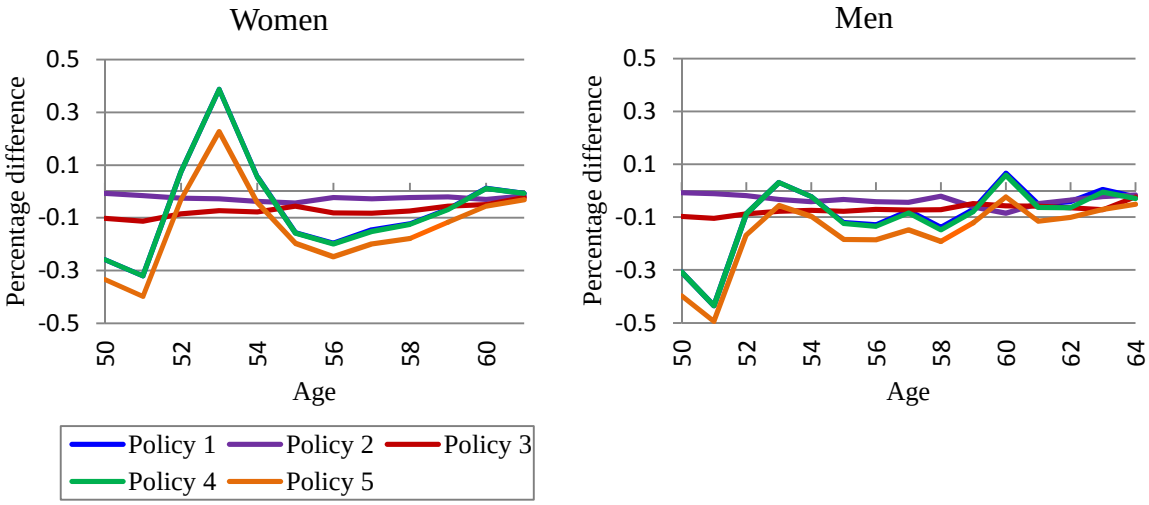


Table 4 illustrates the effects of simulation outcomes on the estimated median retirement age for 50 year old male and female workers. The results are reported for the two model specifications and under the different policy reforms. In accordance with our findings in section 4 (Figure 3), the estimated median retirement age of women appears to be higher. That is, for the Baseline case we would expect 50% of 50 years-old female workers to be still

in the labor market by age 61. The estimated median retirement age for male workers is nearly 3 years lower. The table also shows that the simulated policies have negative impact on men and positive on women. This finding can be explained by previously obtained results. First, let's consider the sample of male workers. We found a negative pattern in their retirement probability with respect to all of the incentive measures. From Figure 4 we also know that in general, policies have negative impact on the SSW. Provided that the dynamic incentive measures also decreased after the policies (or their changes were only marginal), it would explain the fall in the median retirement age. The same reasoning may be applied to women.

For the Baseline, the predicted median retirement age is very close for the two model specifications. However, the difference is greater after the policies, especially for men. Men also seem more sensitive to the simulated changes, except for Policies 2 and 3. Policy 5 has more sizeable impact on them, decreasing their retirement age by 3.7% or 9% for the model run with respectively SSA or PV. For women, the highest change in the retirement age is observed for Policy 4 and amounts to an increase by 2.4% for the accrual model and 2.1% for the peak value model. We also studied the impact of Policies 1, 4 and 5 without a 2-year shift in the SSW weights. We found slightly reduced effects but end up with similar conclusions.

Table 4. *Predicted median retirement age at 50, by gender (percentage change to Baseline in parentheses)*

	Men				Women			
	SSA		PV		SSA		PV	
Baseline	**57,86**		**57,96**		**60,81**		**60,57**	
Policy 1	56,21	*(-2,8%)*	53,63	*(-7,5%)*	61,81	*(+1,6%)*	61,29	*(+1,2%)*
Policy 2	57,74	*(-0,2%)*	57,93	*(-0,0%)*	61,90	*(+1,8%)*	61,77	*(+2,0%)*
Policy 3	57,52	*(-0,6%)*	57,58	*(-0,6%)*	61,36	*(+0,9%)*	61,02	*(+0,8%)*
Policy 4	56,21	*(-2,9%)*	53,73	*(-7,3%)*	62,24	*(+2,4%)*	61,86	*(+2,1%)*
Policy 5	55,73	*(-3,7%)*	52,74	*(-9,0%)*	62,23	*(+2,3%)*	61,61	*(+1,7%)*

From our analyses, we can see that the retirement behavior of male and female workers is very heterogeneous not only with respect to the financial incentives but also in terms of their reaction to different changes in these incentives. In any case, our simulations show that changing the financial incentives can considerably impact on the median retirement age of 50 year old workers. The policy reforms that impact the retirement age the most are those that modify the social security system more drastically, involving several simultaneous changes like the ones enacted by the 2012 reform.

6. Conclusions

In this paper we analyze the role of the Belgian social security system in the retirement behavior of elderly. We use a sample of 50-64 years-old workers under the wage earner scheme drown from administrative source. A rich dataset combined to accurately modeled simulations enable us to assign financial incentive measures to our sample. The results of the econometric analysis support that financial incentives play an important role in retirement decision. We find an expected positive impact of the net present discounted value of social security wealth on retirement probability of female workers. However, the results obtained for male workers go in the opposite direction suggesting a more sophisticated model that considers a joint retirement decision of couples. We also simulate changes in financial incentives and find that they have a non-negligible impact on the retirement choice.

References

Behaghel, L. and Blau, D.M. (2012), `Framing Social Security Reform: Behavioral Responses to Changes in the Full Retirement Age', American Economic Journal: Economic Policy, 4, 4, 41-67.

Coile, C. (2004), `Retirement Incentives and Couples' Retirement Decisions', Topics in Economic Analysis & Policy, 4, 1, Article 17.

Dellis, A., Desmet, R., Jousten, A., and Perelman, S. (2004), `Micro-Modeling of Retirement in Belgium', in `Social Security Programs and Retirement around the World: Micro-Estimation', NBER Chapters, 41-98, The University of Chicago Press, Chicago.

Gruber, J. and Wise, D. (2004), `Social Security Programs and Retirement Around the World: Micro-Estimation', NBER, The University of Chicago Press, Chicago.

Gustman, A. and Steinmeier, T. (2000), `Retirement in Dual-Career Families: A Structural Model', Journal of Labor Economics, 18, 503-545.

Hanel, B. and Riphan, R.T. (2012), `The Timing of Retirement – New Evidence from Swiss Female Workers', Labour Economics 19, 5, 718-728.

Jousten, A. and Lefebvre, M. (2013), `Retirement Incentives in Belgium: Estimations and Simulations Using SHARE Data', De Economist 161, 3, 253-276.

Jousten, A., Lefebvre, M., and Perelman, S. (2012), `Disability in Belgium: There Is More Than Meets the Eye', in `Social Security Programs and Retirement around the World: Historical Trends in Mortality and Health, Employment, and Disability Insurance Participatio', NBER Chapters, 251-276, The University of Chicago Press, Chicago.

Kalwij, A. and Vermeulen, F. (2008), `Health and labour force participation of older people in Europe: What do objective health indicators add to the analysis?', Health Economics 17, 5, 619-638.

Mastrobuoni, G. (2009), `Labor Supply Effects of the Recent Social Security Benefit Cuts: Empirical Estimates Using Cohort Discontinuities', Journal of Public Economics 93, 11-12, 1224-1233.

Pienta, A.M. (2003) `Partners in Marriage: An Analysis of Husbands' and Wives' Retirement Behavior', The Journal of Applied Gerontology, 22, 3, 340-358.

Staubli, S. and Zweimüller, J. (2011), `Does Raising the Retirement Age Increase Employment of Older Workers? ', NRN working papers 2011-13, The Austrian Center for Labor Economics and the Analysis of the Welfare State, Johannes Kepler University Linz, Austria.