New evidence on the social security incentives as drivers of retirement behavior [a]

Alain Jousten[*] and Ekaterina Tarantchenko[†]

October 30, 2014

Abstract: The paper uses a rich administrative dataset on Belgian older workers to provide new evidence on the impact of social security systems on retirement behavior. In addition to measures of financial incentives induced by the social security systems, we construct an eligibility status indicator. This indicator flags individuals who satisfy eligibility requirements for early retirement schemes. We find that financial incentives do not have a lot of explanatory power for the probability to retire. In contrast, being eligible for early retirement substantially increases the chances for an individual to exit the labor force. Using these findings, we evaluate the impact of changes in the early retirement eligibility rules. These changes are shown to have important effects on the median retirement age of older workers.

JEL classification: H55, J14, J21, J26, D91

Keywords: Social Security System, Financial Incentives, Eligibility, Retirement Behavior, Policy Simulations

[a] A previous draft was circulated in December 2013 under the title "Financial incentives to retirement in Belgium: what policy lessons?".

[*] University of Liège (HEC Management School, Tax Institute and CREPP), Institute for the Study of Labor (IZA) and Network for Studies on Pensions, Aging and Retirement (Netspar). *Address*: Boulevard du Rectorat 7, B31, 4000 Liège, Belgium. *E-mail*: ajousten@ulg.ac.be

[†] University of Liège (HEC Management School and CREPP). *Address*: Boulevard du Rectorat 7, B31, 4000 Liège, Belgium. *E-mail*: e.tarantchenko@ulg.ac.be

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, contributing to a worsening of the macro-fiscal balance.

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 pushes up the actual retirement age. However, these studies were carried out for 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 only means forgoing one year of pensionable earnings and no extra actuarial adjustment. Increasing the normal retirement age alone is thus 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 (2013) analyzed the effect of an increase in the earliest age of retirement from 60 to 62 for men and from 55 to 57.2 for women in Austria. They found that delaying the earliest age of retirement 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 eligibility and financial incentives on retirement in Belgium. We rely on a simulation model to derive financial incentive measures that we use as one of the determinants of retirement behavior. These measures are constructed using rich administrative data from 2001 on wage earners. The data contain 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. A further contribution of this paper is that our econometric model, in addition to financial incentives and other control variables, takes into account an eligibility status indicator for early retirement as predictor of the worker's choice. This eligibility indicator, constructed using detailed career and personal characteristics, allows quite precise identification of individual-level eligibility for early retirement. The results show weak if not inexistent effects of financial incentives on the timing of retirement. However, being eligible for early retirement significantly increases the probability to leave the labor force. Based on this evidence, we conduct a micro-simulation analysis of a hypothetical policy reform inspired by that progressively introduced in Belgium as of January 2012. The goal is to find out what could be the labor market behavior of elderly in Belgium if the rules within the social security system were changed. An evaluation of this simulated policy changes indicates an important positive impact on the median retirement age.

As compared to the previous literature on retirement incentives in Belgium (see Jousten and Lefebvre (2013), Dellis et al. (2004)), our model and data allow us to capture with a higher

precision the labor supply response to simulated policy reform. 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 the data and the construction of financial incentive measures used to estimate the labor force participation. Section 4 describes the estimation results for the early retirement model. Policy simulations are performed and reported 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 pure 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 make 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. In the years before 1997, the Normal Retirement Age (NRA) was set to 65 and 60 for men and women respectively. The Early Retirement Age (ERA) was set at 60, allowing men to claim pension benefits at 60 with actuarial adjustments but without stricter career requirements. 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 required number of full career years entering the pension formula (from 40 to 45). On the other hand, the possibility to retire at the ERA of 60 was

[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. Individuals with mixed careers are also excluded from our analysis. We further do not consider second or third-pillar arrangements.

maintained for both men and women with a sufficiently long career. This career condition was sequentially tightened over the transition period[2].

In 2001, our year of interest, benefits could be claimed at any age after the ERA provided that the individual accrued 28 career years. The NRA was set to 65 and 62 for men and women respectively. The amount of benefits depends on three factors: average lifetime earnings, family situation and career fraction. Average lifetime earnings include the income 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. In general, retirees with a full career receive a replacement rate of 60% of the average lifetime gross earnings. Married retirees with a dependent spouse benefit from a replacement rate of 75% of the average lifetime gross earnings. Similarly, married two-earner couples can benefit from a supplement (top-up) if the sum of the two individual pensions is smaller than 75% of average lifetime gross earnings of the highest earning spouse. All these amounts are subject to proportional adjustments for incomplete careers. In 2001, a complete career consisted of 45 and 42 years for men and women 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 career 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 the 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. In our period of study, the unemployed aged 50 or more are still exempted from the job search requirement. In addition, those who can prove 20 years of career as wage earners and who do not 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 decades. In 2001, our reference year, an unemployed who lived with dependent household members received 60% of his last gross wage independently of the duration of unemployment spell. A single and a cohabitant living with

[2] More precisely, in 1997 the government introduced a career 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 full career condition: from 40 to 45 over 1997-2009.

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

financially independent members benefited from respectively 60% and 55% of their last gross 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 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 the age, the career length as a wage earner and the activity sector. The workers must also be eligible for unemployment benefits that represent 60% of their capped gross 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 the career requirement 25 years as wage earner (with assimilated periods taken into account), though it was possible to retire through this system at earlier ages in specific sectors given tighter career requirements. An exception is made for companies that are recognized to be 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%, are first benefiting from continued pay from their employer, before receiving sickness compensation for the remainder of their first year of inactivity. 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

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

with dependent household members receive 65% of their last capped gross 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 is effective as of 2012. This section describes some of the most important changes related to the PP and CER systems.

First, two main changes were introduced relative to the PP system. On the one hand, the 2012 reform made the pension systems 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 career condition for the early retirement, to respectively 62 and 40 years. An exception is provided for the workers with long career histories and is adapted through the period 2013-2016. As from 2016, workers with at least 42 or 41-year career could retire after they are respectively 60 or 61 years-old.

Second, the 2012 reform raised the CER eligibility age from 58 to 60 for both men and women[5]. At the same time, the career requirement was brought to 40 years for men and 35 for women. The career length 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.

Table 1 summarizes the timing of the changes described in this section. Clearly, this 2012 reform is intended to lead to a deferral of individual (early) retirement decisions. 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 a policy reform that partly reflects the changes introduced by the 2012 reform.

[5] However, within certain activity sectors workers with sufficient career length 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 (career length requirement, in years)	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 real wage	Starting 2012	Minimum guaranteed wage
Conventional early retirement			
Age (career length requirement, in years)	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 (career length requirement, in years)	50 (10 out of 15 last years within the same sector or 20 years)	2012	52 (unchanged)
		2013 - 2018	Increase by 6 months every year: 55 in 2018 (unchanged)
Age for companies in restructuring (career length requirement, in years)	50 (10 out of 15 last years within the same sector or 20 years)	2013	55 (unchanged)

3. Data and Methodology

3.1. Data

The dataset was extracted from the "Datawarehouse Labour Market and Social Protection", the central administrative data registry for labor market data in Belgium. A random sample of 100,000 individuals was drawn from the Belgian population on 01/01/2002.[6] 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 the 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 into retirement. 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

[6] Originally, the data were collected for the large-scale government funded research project MIMOSIS (Micro-simulation Model for Belgian Social Insurance Systems). The main goal of the project was to develop a tax-benefit micro-simulation model that would allow evaluation of budgetary and distributional impact of different policy reforms to social insurance and personal income taxes. For further details on the MIMOSIS project see Decoster et al (2008).

50-61 years old women). We further limit our analysis to those who were in the wage earners' 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.

Table 2. *Descriptive sample characteristics: by gender*

	Men	Women
Mean age (years)	54.06	53.74
	(3.13)	(3.00)
Family status (%)		
Single	17.94	32.47
In couple	82.06	67.53
Active partner (%)	35.69	45.31
Mean age difference with the partner (years)	2.09	-1.29
	(4.12)	(4.14)
Region (%)		
Brussels	5.52	13.89
Flanders	66.32	56.34
Wallonia	28.16	29.77
Occupation (%)		
White-collar	48.61	63.54
Blue-collar	51.39	36.46
Intensity of current job (%)		
Part-time	5.61	48.70
Full-time	93.52	49.91
Special	0.87	1.39
Mean current net earnings (€ in thousands)	16.54	11.16
	(9.55)	(6.37)
Mean lifetime net earnings (€ in thousands)	13.15	8.64
	(6.09)	(4.42)
Exit rate (%)	10.91	11.11
Observations	2191	1152

Note: standard deviations are presented in parentheses.

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 *l* can be approximated by

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

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

$$\mathrm{E}[B_h^l(s)] = \begin{cases} \rho(s) Bsg_h^l(s) & if\ not\ married \\ \rho(s)\tau(s) Bmar_h^l(s) + \rho(s)[1-\tau(s)] Bsg_h^l(s) & \\ +[1-\rho(s)]\tau(s) Bsur_h^l(s) & if\ married \end{cases}$$

where $Bsg_h^l(s)$ is the worker's benefit at age *s* if he is not married and retires at age *a*, $Bmar_h^l(s)$ is the worker's benefit at age *s* if he is married and retires at age *a*, $Bsur_h^l(s)$ 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*[7]. For the unemployment, sickness or disability and conventional early retirement exit routes, the amounts of $Bsg_h^l(s)$ and $Bmar_h^l(s)$ 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. 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,

[7] The survival probabilities are based on age and gender specific survival tables from the Human Mortality Database. For computational reasons, we assume that the husband is 3 years older than the wife in our computation of expected benefits.

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

These two forward looking measures rely on the expected earnings as well as working and assimilated periods[8] 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[9]. Table 3 provides mean and standard deviation of financial incentive indicators for men and women according to their retirement status. The differences between the two genders are considerable. On average, women have an 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 the household supplement. The retired individuals in the sample have on average lower SSW, regardless of gender. Additional descriptive statistics show that they also have lower current and lifetime earnings as well as shorter careers, which could explain the finding. The amount of SSA is on average negative for men and positive for women. However, the standard deviations are very high, revealing strong variability within the sample. As for PV, its average amount is positive for both genders and in absolute value much higher than that of SSA. This indicates the importance of looking beyond instantaneous effects. Table 3 also displays the percentage of individuals eligible for early retirement. The same argument, in terms of career and lifetime earnings, developed above can equally well apply to explain a higher percentage of eligible men as compared to women. As expected, the eligibility percentage is higher among the retired.

Table 3. *Social security incentives: by retirement status and gender*

Retirement status	SSW		SSA		PV		Eligible (%)
	Mean	S.D.	Mean	S.D.	Mean	S.D.	
Men							
Not retired	167.61	(47.79)	-0.33	(9.30)	10.66	(13.44)	13.88
Retired	160.34	(57.32)	-1.56	(9.90)	6.51	(15.22)	30.54
All	166.82	(48.95)	-0.46	(9.38)	10.21	(13.71)	15.70
Women							
Not retired	107.61	(46.71)	1.06	(9.91)	16.18	(15.46)	11.04
Retired	95.07	(55.71)	1.71	(8.85)	10.62	(13.98)	18.75
All	106.22	(47.93)	1.13	(9.79)	15.56	(15.40)	11.89

Note: monetary values are in € thousands.

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

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

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

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. In contrast, greater accruals of that retirement wealth from additional work should encourage individuals to postpone their withdrawal from the labor force. Table 3 reports the average estimated marginal effects of two different specifications, each including SSW and either SSA (Accrual) or PV (Peak value), for male and female workers separately. The dependent variable takes the value of 1 if individual leaves employment during the year of 2001. Current earnings, average lifetime earnings and spouse's earnings are in €1,000, and SSW, SSA and PV are expressed in €10,000.

We further construct and include an eligibility indicator for conventional or standard early retirement (*Eligible*) as an independent variable. To our knowledge, only one study used this indicator as predictor of timing of retirement. Pienta (2003) in her study of couples' retirement behavior in the United States found that pension eligibility increases the likelihood of being retired among men. Numerous other studies attempted to capture the effect of eligibility through inclusion into regression of age dummies. Jousten and Lefebvre (2013) and Dellis et al. (2004) found significantly higher exit rates from employment at the key social insurance eligibility ages. Although age is likely to be correlated with the eligibility variable, it is also the case for other variables of interest, such as the financial incentives of social insurance. Omitting eligibility may therefore result in misleading conclusions. This study exploits rich information available in the dataset which allows a rather accurate identification of the individual's true eligibility for early retirement. The intuition is that older workers who meet the eligibility conditions are more likely to exit employment.

The results reported in Table 4 indicate that financial incentives have an unexpected sign, but are mostly not statistically significant. On the one hand, the coefficient of SSW is negative for both men and women regardless of the model specification and is significant for men. This is somewhat surprising as it suggests that male workers with higher SSW have greater taste for work and thus retire later. Note that similar findings have already been reported in previous studies for Belgium, France and Italy (see Gruber and Wise (2004)). The negative effect of the SSW observed in our data can be explained by unobservable factors that could be correlated with both exit rates and SSW. Omitting them may bias the estimation results. Consider for example health and education indicators, if they are not controlled for, the effect of the SSW is likely to be underestimated. 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 the 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. We also examined the presence of outliers. Figure 1 shows the histogram of the SSW by gender. For men, the distribution tails off toward 0 indicating that few male workers have very low SSW. Further analysis indicates that these observations are characterized by low average lifetime earnings and short careers with few assimilated periods. For example, these cases might correspond to cross-border workers for

whom we lack information on foreign professional experience[10]. In contrast, the distribution of the SSW for female workers is more symmetric with much larger share of observations near 0, principally a tribute to shorter and more incomplete careers. Beyond the arguments already cited for men, additional factors apply more specifically to women. Women are more likely to experience extended career breaks during their professional life (e.g. maternity). When we remove 1% or 5% of observations with lowest values of the SSW, represented by two vertical lines in Figure 1, the coefficient of SSW for men is still negative but no longer significant. For women, the effect of the SSW becomes positive but is still not significant. The estimated effects of other covariates are robust to changes in the sample.

On the other hand, the estimates suggest that the dynamic incentive measures have no explanatory power in the likelihood of retiring, except the SSA for women. Surprisingly, the retirement probability of female workers seems to increase with one year accrual of the retirement wealth. 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 a wife's retirement decision is closely related to her husband's characteristics such as occupational status and work intensity. These two factors, among others, influence an individual's pension wealth.

In sum, the financial incentives of social insurance don't seem to have a lot of explanatory power in the retirement decision. On the contrary, the estimated coefficient of the eligibility status indicator is significantly positive for both samples of men and women regardless of the model specification. In the Peak value estimation for female workers, *eligible* and *age* variables appear individually not statistically significant but the test for their joint significance rejects the null hypothesis (at the 10% level). Being eligible for conventional or standard early retirement increases chances to leave employment by about 11% for men and from 5.6% to 8.6% for women depending on the model specification. Although for women the average marginal effect of the eligibility status might be estimated less precisely due to a strong correlation with age, additional tests confirm the positive influence of the variable on the retirement probability.[11]

[10] In 2001 the share of cross border workers in the labor force was about 2.2% (source: Eurostat, LFS). Another factor that could contribute to an underestimation of the SSW is years of work in social insurance schemes other than the wage–earner scheme. However, given that workers with mixed employment statuses in 2001 were excluded from our sample, this problem should only be of limited importance.

[11] We tried the same specification as in Table 4 run on a sub-sample of female workers aged 54 or more. This is the age at which the fraction of women eligible for early retirement turns positive. For this sub-sample, the marginal effect of the eligibility dummy reaches 11% and is statistically significant at the 10% level. We obtain similar effect when the linear age is replaced with age-specific dummies.

Table 4 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 are some slight differences. For example, being in a part-time job has no effect on women while men with reduced hours of work are more likely to retire later. There are also no significant differences between regions for men, while women living in Flanders are likely to retire earlier than their Walloon counterpart. The marginal effect of the average lifetime earnings is positive and statistically significant for both genders but is slightly higher for women. Interestingly, being in a temporary job strongly increases the probability of retirement for both men and women as compared to a full-time job. The estimated marginal effect is around 53% and 35% for respectively male and female workers.

Table 4. *Probit estimates of labor force exit, by gender (average marginal effects)*[12]

	Men		Women	
	Accrual	Peak value	Accrual	Peak value
Social security incentives				
Eligible	0.1126***	0.1086***	0.0855*	0.0558
	(0.0338)	(0.0330)	(0.0476)	(0.0435)
SSW	-0.0035**	-0.0035*	-0.0017	-0.0027
	(0.0017)	(0.0018)	(0.0027)	(0.0028)
SSA, PV	0.0036	0.0007	0.0222**	-0.0035
	(0.0070)	(0.0062)	(0.0096)	(0.0078)
Income variables				
Earnings	-0.0123***	-0.0122***	-0.0132***	-0.0127***
	(0.0017)	(0.0017)	(0.0029)	(0.0029)
Average lifetime earnings	0.0069***	0.0068***	0.0075*	0.0094**
	(0.0020)	(0.0020)	(0.0042)	(0.0043)
Socio-economic variables				
Age	0.0066**	0.0069**	0.0031	0.0035
	(0.0026)	(0.0028)	(0.0038)	(0.0039)
Family status (ref.: Single)				
In couple	0.0136	0.0132	0.0015	0.0019
	(0.0197)	(0.0200)	(0.0252)	(0.0253)
Active partner	-0.0149	-0.0147	-0.0382	-0.0376
	(0.0180)	(0.0181)	(0.0274)	(0.0276)
Age difference	0.0008	0.0008	-0.0011	-0.0010
	(0.0015)	(0.0015)	(0.0022)	(0.0022)
Partner's earnings	0.0006	0.0006	-0.0007	-0.0006
	(0.0016)	(0.0016)	(0.0015)	(0.0015)
Region (ref.: Wallonia)				
Flanders	-0.0041	-0.0043	0.0388*	0.0401**
	(0.0140)	(0.0140)	(0.0201)	(0.0201)
Brussels	-0.0319	-0.0321	0.0393	0.0356
	(0.0246)	(0.0245)	(0.0348)	(0.0345)
Blue collar	-0.0202	-0.0199	0.0214	0.0230
	(0.0175)	(0.0175)	(0.0237)	(0.0238)
Intensity of current job (ref.: Full-time)				
Part-time	-0.0385*	-0.0386*	-0.0191	-0.0199
	(0.0197)	(0.0197)	(0.0213)	(0.0214)
Temporary job	0.5269***	0.5292***	0.3558***	0.3503***
	(0.1241)	(0.1239)	(0.1274)	(0.1283)
Observations	2191	2191	1152	1152
Log-Likelihood	-650.4	-650.6	-343.4	-345.9

Note: ***, ** and * indicate significance at the 1, 5 and 10% level. Standard errors of marginal effects are presented in parentheses. Current earnings are included as a quadratic polynomial. Other control variables are activity sector dummies.

[12] We also tried a more parsimonious specification where we added cross-products of financial incentive variables with eligibility dummy. The results are comparable to those displayed in Table 4.

Figure 1. *Distribution of the SSW: by gender*

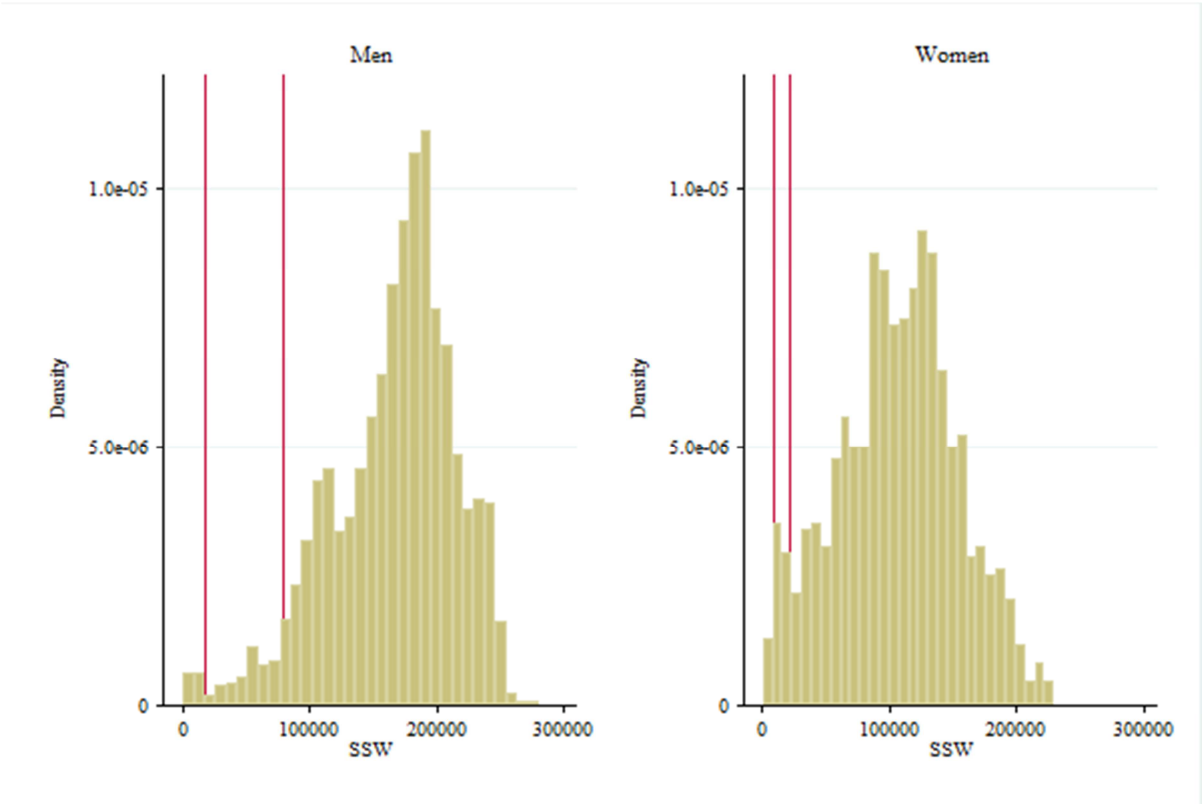
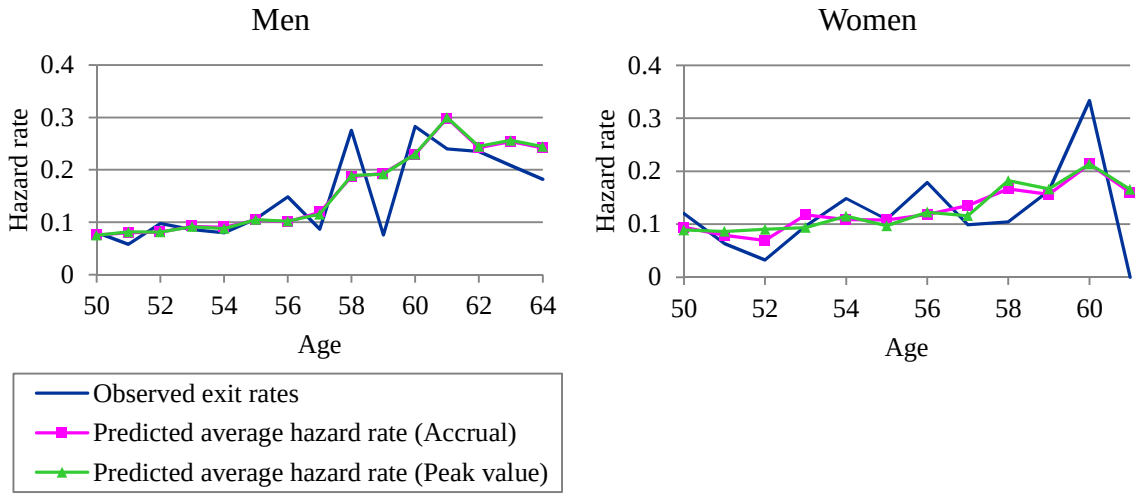


Figure 2 displays actual instantaneous exit rates out of the labor force and probabilities predicted by the fitted model, both averaged by age. The differences between the observed exit rates and predicted probabilities are due to a failure of the model to fully capture the nonlinearities in the age pattern of retirement. That is, although the eligibility indicator is included, a linear age specification may be too restrictive to capture preferences and incentives at particular ages.

Figure 2. *Predicted average hazard rate of exit from the labor force: by gender and age (Baseline)*



5. Policy simulations

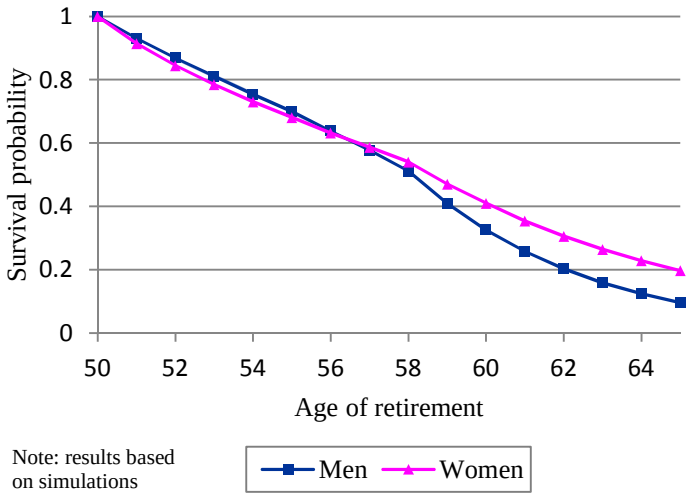
In light of our findings in the previous section, we analyse the effect on retirement probability of a policy reform that changes the eligibility rules for early retirement. We consider that the effect is captured exclusively through the eligibility measure which is adapted along with the introduced changes.[13] We then contrast the results of these simulated changes with the baseline 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*). For simplicity, we present the simulation results based on the Accrual model - this choice is based on the log-likelihood and does not substantially affect the outcome presented in this section.

The policy reform we propose (hereafter called *Delayed eligibility*) is inspired by the 2012 reform enacted by Belgian government that we described in section 2.5 (leaving aside grandfathering and preferential regimes). It consists in an increase of two years in the standard and conventional early retirement ages as well as in a tightening of the career 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 career history (28-year 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 career requirement (25 years for the Baseline). In order to evaluate the effect of these simulated changes, we first compare the survival probability functions generated before and after the revision of the social security system for the sub-sample of people aged 50 (i.e. 1951 birth cohort). Based on these functions, we then predict the change in the median retirement age for this 1951 cohort resulting from the policy reform. Similar results, available upon request, are obtained for older cohorts.

Figure 3 shows the simulated employment survival probability curve for the cohort born in 1951 (currently aged 50), derived from the estimates reported in Table 3. To obtain this predicted survival, we assume that, conditional on the observed characteristics of the individuals, the current transition probabilities remain constant in the future. We also hold the individuals' observed characteristics constant when predicting the hazard rate at each future age. Note that for women the estimation of the survival probability beyond the age of 62 is less precise as it is based on the out-of-sample predictions. The curve presents quite similar pattern for male and female workers until age 57, though the drop in survival probability is slightly more important for women. After 57, the difference widens and women have relatively higher probability to remain in the labor force.

[13] The impact of the financial incentives is neutralized. When we allow the simulation outcome to depend on the eligibility and financial incentives both subject to the generated policy changes, the results are only marginally affected by the reform. This is due to the fact that the positive influence of eligibility variable is buffered by the counterintuitive effects found for the financial incentives.

Figure 3. *Simulated employment survival probability for 1951 cohort (currently aged 50): by gender and possible age of retirement (Baseline)*[14]



Note: results based on simulations

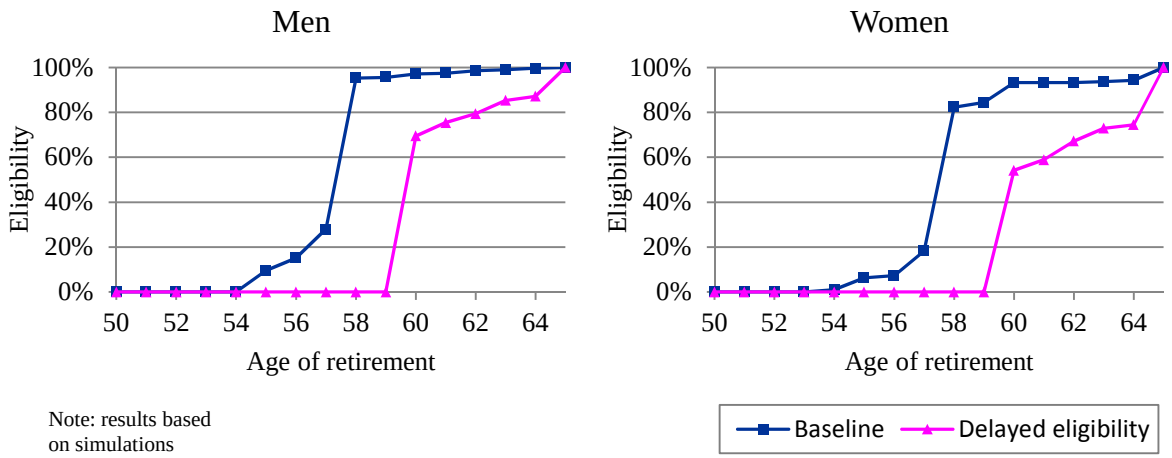
To get a more precise impression of how the path towards the NRA is affected by the early retirement eligibility criteria, Figure 4 displays the percentage of 1951 cohort eligible for conventional or standard early retirement benefits at each possible age of retirement. In our construction of the eligibility indicator we assume that access to CER benefits is granted automatically upon application if the eligibility conditions are satisfied.[15] Thus, the eligibility rates reflect the maximum percentage of individuals *potentially* eligible for conventional (or standard) early retirement. Two different curves are plotted for each gender: representing Baseline case and Delayed eligibility reform. First, as shown for the Baseline, although the eligibility rate of men at a given retirement age is higher as compared to women, their age pattern is quite similar. Until age of retirement 54 (53 for women), the percentage of workers eligible for early retirement benefits is 0%. It then grows slowly to reach almost 1/3 of the sub-sample (1/5 for women) at age of retirement 57. The positive fraction of workers eligible for early retirement before the minimum age of 58 is due to the possibility within specific activity sectors to retire through CER as of age 54. The large rise for both sexes at age of retirement 58 is explained by relaxed requirements for CER for all sectors. At that point, 95% of men (82% of women) potentially satisfy eligibility conditions. This sharp rise is followed by a more steady increase in eligibility rates towards the NRA. The differences in the eligibility rates between men and women for a given age of retirement are smaller than would have been expected. Indeed, Belgian women on average have substantially shorter careers than men. However, our simulations are focusing on women born in 1951 who are employed in 2001, and hence not the Belgian female population at large. The second observation from Figure 4 is that the impact of the Delayed eligibility reform is different for male and female workers as a result of differing baseline career lengths. For men, the effect is strongest below age 60, due to the increase in eligibility ages. For women, the effect is mostly driven by the

[14] In our analyses for women, we report results until the age of 65 as the NRA for 1951 birth cohort is equal to 65 for both genders.

[15] We ignore the possibility for a worker to benefit from CER because of company's economic difficulties or restructuring.

stricter career requirements, particularly after reaching age 60. Indeed, beyond that age the drop in eligibility rates due to policy changes is deeper for female workers.

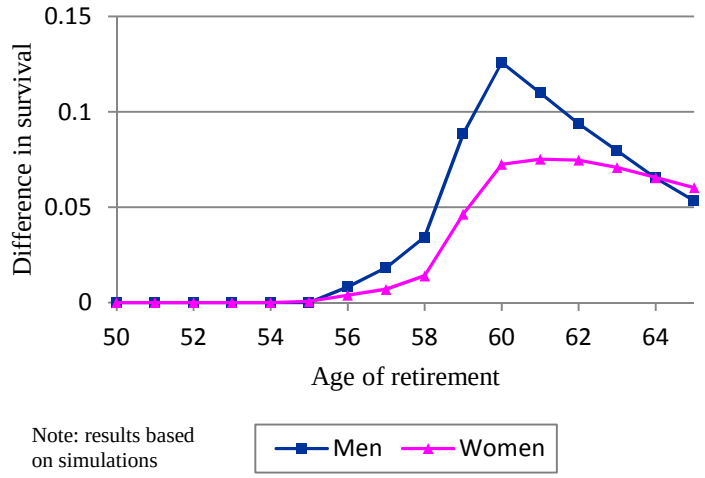
Figure 4. *Percentage of individuals eligible for conventional or standard early retirement among 1951 cohort (currently aged 50): by gender and possible age of retirement (Baseline and Delayed eligibility)*



Note: results based on simulations

Figure 5 presents the difference between the predicted employment survival for the cohort born in 1951 (currently aged 50) if the Delayed eligibility policy changes are applied and the same survival curve estimated in the Baseline case. For the initial 50-55 age range, the predicted survival remains unchanged which is consistent with the results obtained in the previous section and the eligibility rates depicted in Figure 4. The Delayed eligibility reform increases the probability of survival in the labor force over the 55-65 age range for both men and women. The maximum increase of 12.6 percentage points for men (7.5 percentage points for women) is reached at 60 years old (61 for women).

Figure 5. *Difference in predicted employment survival between Delayed eligibility and Baseline for 1951 cohort (currently aged 50): by gender and possible age of retirement*



Note: results based on simulations

Based on the predicted employment survival, we estimate the median retirement age for this 1951 cohort. The results are reported in Table 5. For the baseline, the estimated median retirement age of women is higher than that of men. That is, we would expect 50% of 50 years old female workers to be still employed by age 58.6. The estimated median retirement age for male workers is 6 months lower. If we change the eligibility rules for early retirement, the expected median retirement age increases by nearly 1 year for both genders, reaching 59 for men and 59.5 for women.

Table 5. *Predicted median retirement age for 1951 cohort (currently aged 50): by gender (percentage change to Baseline in parentheses)*

	Men		Women	
Baseline	**58.1**		**58.6**	
Delayed eligibility	59.0	(+1.4%)	59.5	(+1.6%)
Observations	272		192	

From our analyses, we conclude that a uniform change in eligibility requirements for early retirement affects men and women in a different way. That is, an increase in the minimum early retirement age has strongest impact on men as they are more likely to be eligible for early retirement compared to women. By contrast, tightening career requirement for early retirement affects women the most due to their generally shorter careers. As a result, the simulations predict an increase by approximately 1 year in the median retirement age for men and women born in 1951.

6. Conclusions

In this paper we analyzed the role of the Belgian social security system in the retirement behavior of the older workforce. We studied a sample of wage earners aged 50-64 drawn from Belgian administrative data. The richness of this individual-level data allowed us to compute rather accurate indicators of financial incentives and of benefit eligibility. More precisely, we derived a measure of the personal social security wealth, two forward-looking financial incentive indicators and an eligibility dummy for early retirement. Our two main findings can be summarized as follows. First, the results of the econometric analysis reveal that the financial incentives variables do not have the expected sign and are often not statistically significant. Second, there is strong evidence in favor of an eligibility effect. In particular, our models showed that being eligible for early retirement substantially increases the probability to withdraw from the labor force. Thus, our findings suggest that the timing of retirement is driven by the eligibility status, rather than the financial incentives.

The obtained estimates were used to simulate changes in the eligibility rules for the early retirement schemes. We studied the impact of a simultaneous 2-years increase in the conventional and standard early retirement minimum ages combined with a tightening in the career requirement for these schemes, in line with recent policy trends in Belgium. Our findings show that the simulated delay, as measured by the change in the median retirement age, is of approximately 1 year, and this independently of the sex of the worker. For men most

of this increase is due to the shift in the minimum early retirement age, while for women the tightening in career requirement also plays a non-negligible role.

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.

Decoster, A., De Swerdt, K., Orsini, K., Lefèbvre, M., Maréchal, C., Paszukiewicz, A. Perelman, S., Rombaut, K., Verbist, G. and Van Camp, G. (2008), `Valorisation of the Microsimulation Model for Social Security', Final Report Project AG/01/116.

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

Jousten, A., Lefèbvre, 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. (2013), `Does Raising the Early Retirement Age Increase Employment of Older Workers? ', Journal of Public Economics, 108(C), 17-32.