SOCIAL SECURITY, IMPLICIT DEBT AND INEQUALITY: LEARNING FROM THE BELGIAN EXPERIENCE

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1. INTRODUCTION

In Belgium, three main public pension schemes coexist. Two of them, administrated by Social Security, cover the private sector workers that are wage-earners and self-employed. The civil servants' pensions are administrated separately and paid directly from the general budget. The three schemes are based upon the pay-as-you-go principle and are unfunded. Moreover, they are defined-benefit, as pension benefits are computed using predefined rules that take into account professional career length and earnings during working life, without establishing any direct relation with pension payroll taxes contributed to the system.

The expected net value of pension rights accumulated by the Belgian population under these schemes is part of each individual's wealth in spite of its intangible nature. Also called Social Security Wealth (SSW)[2] once aggregated at the country level, these pension entitlements correspond exactly to liabilities accumulated by public pension schemes. However, in spite of the legal and binding nature of pension liabilities, the burden of this implicit debt is neither reported in national accounts, nor is part of the public debt, to which in fact they belong.[3] To fill this lack of information, some studies have already estimated the aggregated value of SSW for Belgium, but so far computations were done solely on the basis of average pension benefits (Perelman, 1981, and Bouillot and Perelman, 1995). In this paper we estimate the SSW for Belgium once again, but using a representative sample of approximately 3% of the whole Belgian population on 1 January 2002. The dataset was obtained

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(2) Denomination introduced by Martin Feldstein (1974).
(3) Regularly, the Belgian Study Committee on Ageing (2012) publishes updated long-term projections of Social Security accounts, including the cost of pension schemes. In these projections, the annual flow of future pension liabilities relies on average individual pension benefits by scheme.

from individuals' pension record files and contains detailed information on personal characteristics and earnings histories. In some way, this paper is an extension of Jousten et al. (2012), in which the authors reported the expected impact of pension reforms using the same dataset and pension calculator. However, in this study we emphasize the distribution of pension rights and its main drivers across successive age cohorts and pension schemes, placing a particular interest on gender differences.

For this purpose, we developed a computer code, PENSCALC, which computes accrued-to-date pension benefits for future pensioners at the individual level, applying the computational and eligibility rules fixed by each pension scheme.[4] This code also computes benefits for individuals with mixed careers, i.e. those cumulating rights in several pension schemes. Assuming a fixed retirement age at 65 for men and 62 for women,[5] and using the pension rights derived from PENSCALC, we estimate the actuarial expected value of pension entitlements for future pensioners. For current ones, we proceed in the same way and compute the actuarial value of future entitlements based on the observed amount of current benefits.

As mentioned above, we focus not only on the estimation of the global amount of pension entitlements but also on the way this SSW is distributed. We analyze differences in SSW between men and women across age cohorts, pension schemes and income deciles. Also, we are interested in estimating its distribution between the three Belgian regions, i.e. Brussels, Flanders and Wallonia. These amounts can be viewed as the implicit debt that each region would receive in the hypothetical case of a decentralization of the pension schemes management.

It is important to note that we are only interested in the public part of the pension entitlements. Therefore, we leave aside private, occupational and individual capitalized pension entitlements in our computations, as well as the expected value of early retirement benefits paid by other social security branches. These branches are mainly composed of unemployment and disability insurance schemes, complemented by conventional early retirement introduced by Belgian government in the early seventies. The latter allows workers from private sector to leave labor market well before reaching normal retirement age.[6] Note that our computations include those beneficiaries, as they are automatically transferred to the pension system when they reach the legal retirement age.

(4) See Jousten et al. (2012).
(5) The normal retirement age for women has been gradually increased from 60 years old in 1997 to 65 in 2009. It was set at 62 in 2002.
(6) It is also possible for workers from both private and public sectors to claim pension benefits from the age of 60 given that certain eligibility conditions, specific to each pension scheme, have been satisfied.

The paper is structured as follows. In Section 2 we present briefly the three Belgian public pension schemes, mainly their differences in terms of benefits computation and eligibility rules. In Section 3 we explain the methodology behind the computation of the social security wealth, as well as the data and the assumptions involved. The fourth section analyses the distribution of SSW among the Belgian population, paying a particular attention to the gap between men and women within each public pension scheme. Finally, in Section 5 we present an estimation of the aggregate amount of pension liabilities by scheme and region.

2. PENSION SCHEMES, ELIGIBILITY RULES AND BENEFITS COMPUTATION

As indicated before, three main public pension schemes coexist in Belgium. Social Security administrates two of them, for the wage-earners and self-employed. It also provides mean tested guaranteed replacement income for elderly (IGO/GRAPA).[7] As for the civil servants' pension, it is considered as a "differed wage" and is therefore included in the general budget and administrated by a dedicated administration called PDOS-SdPSP.[8] Here, we present schematically the eligibility rules and the benefit computation formulas applied within each of these three schemes.

The three pension schemes are characterized by several common parameters that play a key role in the benefit computation formulas. First of all, the career length is taken into account up to a threshold: 45 years for men and 42 for women. Second, earnings are averaged over the last five years of professional career for civil servants and over the best 45 years (42 for women) for others. Third, periods spent on replacement income are assimilated to working days. Fourth, a series of thresholds, like minima and maxima of pensionable earnings and annual benefits, are taken into account. Finally, pensioners are allowed to cumulate pension benefits with earnings up to a threshold.[9]

2.1. THE WAGE EARNERS SCHEME

A few conditions have to be met by wage earners to be granted a full pension benefit from Social Security. First of all, they should have previously worked for an employer in the private sector (or in the public sector under an employment contract) and should be affiliated to Social Security (i.e. have paid due pension contributions on annual earnings). Then, this individual should prove 45 years of career as wage earner (42 for women).

(7) http://www.onprvp.fgov.be/nl/profes/benefits/igo/paginas/default.aspx.
(8) http://www.pdos.fgov.be/pdos/about/index.htm.
(9) For instance, annual gross income cannot exceed 7,276.05 EUR for single pensioners in the wage earner and civil servant schemes (2002 amounts). Single self-employed can cumulate their pension in the same fashion with an annual gross income of 5,820.79 EUR (2002 amounts). Those amounts are increased in case the individual has family charge.

Anticipated retirement is allowed, from 60 years old onwards without actuarial adjustment, but a minimum of 30 career years with at least one-third of equivalent full-time job days is required. Days spent on replacement income (e.g. sickness, disability, unemployment) are assimilated to working days in pension records and are thus taken into account in pension computation.[10] In the case where full career requirement is not met, pension benefits are reduced proportionally to the career length of the individual.

Equations 1 and 2 illustrate the computation of annual pension benefits, at 1 January 2002, P_i^{we}, for a wage earner *i*:

$$p_i^{we} = \left(p_{\min}^{we} \cdot \frac{\mu_i}{\bar{\mu}} \right) \leq \left(\frac{W_i^{we}}{\bar{\mu}} . \rho \right) \leq \left(p_{\max}^{we} \cdot \frac{\mu_i}{\bar{\mu}} \right) \quad (1)$$

where μ_i is the individual's career length in years up to 2002, while $\bar{\mu}$ is the full career length (45 years for men and 42 for women in 2002); p_{min}^{we} and p_{max}^{we} the full career minimum and maximum benefits threshold; p is the replacement rate, 0.60 or 0.75 depending on household status;[11] w_i^{we} and the total pensionable earnings:

$$W_i^{we} = \sum_{t=b}^{2001} \left[w_{\min,t}^{we} \leq \left(w_{i,t}^{we} / \pi_t \right) \leq w_{\max,t}^{we} \right] \quad (2)$$

where *b* is the first year in the professional career, $w_{i,t}^{we}/\pi_t$ is the current gross wage in period *t*, updated to 2002 applying the index π_t. The index is fixed by the Social Security administration and takes into account inflation (consumption price index) and, partially, productivity growth.[12] $w_{\min,t}^{we}$ and $w_{\max,t}^{we}$ are minimum and maximum thresholds for year *t*, also fixed by Social Security, which play a redistributive role in the computation of pensionable earnings.

As indicated in equation 1, minimum and maximum pension thresholds apply on p_i^{we} taking into account career length. In 2002, their values were, respectively, 11,562.32 EUR and 16,512.01 EUR, for a single male new pensioner with a full career as wage earner (45 years).

(10) Early retirement, vocational training and paternity holidays, among others, are also assimilated to working spells and registered in pension records. In all cases, assimilated days give right to earnings imputations. Imputed earnings correspond to average per day earnings prior to the period just before the interruption.

(11) The 0.60 "single rate" is of application for single individuals but also for married individuals whose spouse has its own income, either earnings or replacement income, including pension benefits. In the other cases, couples with only one regular income have a right to the "household rate" of 0.75.

(12) Other than inflation, this index was built to take into account the evolution of well-being in the economy. Up to 2004, the pensionable wages corresponding to the years 1954 to 1973 were updated assuming an annual growth rate of 3.6%. However, for pensioners retiring after 2004, this well-being adaptation was abandoned (http://www.onprvp.fgov.be/FR/profes/calculation/career/wages/revaluation/Pages/default.aspx).

2.2. THE SELF-EMPLOYED SCHEME

Other than wage earners, Social Security also provides pensions to self-employed applying similar benefit computation rules. There are, however, some differences. First, up to 1983, only a lump-sum amount was registered in self-employed pension records (from 1984 on, real annual earnings are reported). Second, anticipated pensions are submitted to an increasing actuarial adjustment, depending on age of retirement (3.0% if retirement at 64, 3.5% per year if retirement at 63, 4.0% at 62, 4.5% at 61 and 5% at 60). Finally, an adjustment coefficient is applied to real earnings that reflects lower pension contributions paid by self-employed as compared to wage earners (workers and employers contributions together). The value of this "harmonization" coefficient in 2002 was 0.567851 for earnings below 33,371.67 EUR and 0.463605 above.

Equations 3 and 4 present the computation of pension benefits, $p_{i,}^{se}$, for a self-employed (i):

$$p_i^{se} = \left(p_{\min}^{se} . \frac{\mu_i}{\bar{\mu}} \right) \leq \left(\frac{W_i^{se}}{\bar{\mu}} . \rho . \tau \right) \tag{3}$$

where $\bar{\mu}$ is the full career length, ρ, the replacement rate, p_{min}^{se} the minimum pension threshold (6,912.83 EUR in 2002), defined as before; τ is the harmonization index introduced above, and W_i^{se} the total pensionable self-employed career earnings, computed as follows:

$$W_i^{se} = \sum_{t=b}^{2001} \left[\left(w_{i,t}^{se} / \pi_t \right) \leq w_{\max,t}^{se} \right] \tag{4}$$

Given that self-employed earnings registers were created in 1984, before this year $w_{i,t}^{se}$ corresponds to a lump sum. For the years after, computations follow the same rules as for wage earners: once earnings are updated using index π_t they are submitted to minimum and maximum thresholds.

2.3. THE CIVIL SERVANT SCHEME

Employees with a permanent position in the public sector are affiliated to the civil servant pension scheme administrated by the state. The rules are basically the same as for the wage earners and self-employed, but there are also substantial differences. First, age of retirement is mandatory (65 years old for men and 62 for women in 2002). Second, anticipation, up to 60 years old, is allowed with only five years of affiliation as civil servant and pension entitlements are increased for each extra year of work (cumulative yearly increase of 1.5% from 60 to 62 and 2% from 63 to 65). Third, only earnings over the last five years are taken into account for the

computation of pension benefits, as compared to the whole career history in wage earners and self-employed schemes. Fourth, the gap between minimum and maximum thresholds of pension benefits is considerably bigger. Indeed, the minimum threshold for a complete career is equivalent to the wage earners (9,228 EUR yearly for a single pensioner), but the absolute maximum is more than three times higher (59,456.70 EUR). Finally, the (implicit) replacement rate is 0.75, independently of the household status.

Equation 5 sketches the computation formula for pension benefits, $p_{i,}^{cs}$, for a civil servant (i):

$$p_i^{cs} = \left(p_{\min}^{cs} . \frac{\mu_i}{\bar{\mu}_k} \right) \leq \left(W_i^{cs} . \mu_i . \delta_k \right) \leq \min \left[\left(p_{\max}^{cs} . \frac{\mu_i}{\bar{\mu}_k} ; 0.75 W_i^{cs} \right) \right] \qquad (5)$$

where μ_i is the individual career length, and p_{min}^{cs} and p_{max}^{cs} the minimum and maximum pension thresholds, respectively. In addition, pension benefits are capped to 75% of the average income over the last 5 career years, W_i^{cs}. Another feature of the civil servant's scheme is that the career length corresponding to a full pension, $\bar{\mu}_k$, varies with the hierarchical rank k, which can differ across career periods.[13]

Finally, factor δ_k, known as the "tantième" (in French) and the "jaarlijks" (in Dutch), takes simultaneously into account the full pension career length, $\bar{\mu}_k$ and the replacement rate ρ. In the case of civil servants the replacement rate is fixed to 0.75 independently of individuals' household status.
Therefore, in the more general case and for men ($\bar{\mu}_k = 45$), the tantieme/jaarlijks value corresponds to $\delta_k = 1/(\bar{\mu}_k / \rho) = 1/(45/0.75) = 1/60$.

2.4. MIXED CAREERS, MEAN TESTED ALLOWANCES AND SURVIVAL PENSIONS

Some specific rules are applied to compute pensions of individuals with mixed career histories, i.e. those who have worked under several schemes during their professional life. We do not report these rules in our paper but they are taken into account in the PENSCALC program we developed to compute accrued-to-date pension benefits.

Other than the three main public pension schemes, there exists a means tested scheme for people aged 65 or more. This complementary scheme, known as GRAPA (in French) or IGO (in Dutch), guarantees income up to a certain amount (7,022.70 EUR per year for a single, in 2002) for elderly people with too low pension benefits. Pensioners, but also non-pensioners, can apply for the GRAPA-IGO, conditional on age and their income, including all kinds of pension benefits.[14] Unfortunately, we

(13) We don't have access to individual retrospective information for civil servants, therefore we assume in our computations that all of them belong to the more general case, that is $\bar{\mu}_k = 45$ for men and $\bar{\mu}_k = 42$ for women.
(14) There are however some exceptions for some social incomes, based on specific criteria.

were not able to simulate these complementary benefits for future pensioners due to data limitations and difficulty to anticipate the real career evolution of individuals up to retirement. It is however included when computing current pensioners' SSW.

Under all the Belgian pension schemes, a survival pension is granted to the survival spouse under certain conditions. The latter are mainly earnings and age, which should be greater or equal to 45, except for people with dependent children or having a proven disability. Professional activity is allowed but earnings are limited to a certain amount. It is important to note that a general rule for the computation of survival pensions under the Social Security schemes is that in the case the couple beneficiated of only one pension computed at the 0.75 replacement rate, the surviving spouse would keep the same pension but computed at the 0.60 single replacement rate. In the case both spouses had a pension, the survival spouse could cumulate her/his own pension and survival benefits but the sum of both could not exceed 110% of survival pension computed on a basis of a full career. We include these rules for the computation of expected survival pensions in our computation of SSW, but only for current pensioners that already benefit from a survival pension. The computation of expected survival pensions for future pensioners requires several complex assumptions concerning lifecycle behavior and sources of income.

Last but not least, there is an important difference between the ways pension benefits are adjusted to the general evolution of productivity in the economy. For wage earners and self-employed the adjustment is not systematic and its percentage depends on a general agreement between unions (workers and firms) and the government. On the contrary, civil servants benefit from a systematic adjustment, reflecting the evolution of gross wages paid for current employees in the same job position as that occupied by a pensioner before she/he retired.

3. COMPUTING SSW

3.1. METHODOLOGICAL ISSUES

As previously stated, the aim of this paper is to present the patrimonial wealth of the Belgian population in terms of pension rights. In doing so, we compute an indicator of the present discounted value (PDV) of future pension rights for the whole population in 2002 using a representative sample. Blanchet and Ouvrard (2006a) highlighted three main, though divergent ways to do that:

- The accrued-to-date pension rights method, the one used in this paper, computes the PDV of future rights that have already been contracted to the federal government by current retirees and active individuals in year *t*. It is thus composed of the pensions paid to the already retired population, and of the accumulated rights the active population have

earned through the payment of contributions, excluding future years of work. Such a definition has been widely used in the literature. Bouillot and Perelman (1995) used it for Belgium, Vernière (1992, 1997a, 1997b) for France, Van den Noord and Herd (1993) for seven OECD countries and Holzmann and al. (2001) for some low and middle income countries. Franco and al. (2004) also used this methodology in their work to analyze the long run fiscal sustainability of the European Union zone.

- The closed-group method adds the rights active individuals would earn through the achievement of a complete career.[15] The closing of the system is thus progressive and ends when the last worker alive in *t* gets to retirement. Various studies that apply this method have been written by Blanchet and Ouvrard (2006a, 2006b) and Blanchet and Le Minez (2008) for the French pension liabilities. Van den Noord and Herd (1993) and Chand and Jaeger (1996) used it to analyze the impact of aging on the fiscal sustainability of some selected OECD countries.
- The last well-known method is the "open-group". Unlike the closed-group method which expands its computation only to future rights of existent workers, this methodology enables outsiders to enter the labor market. This means that new workers appear in the computation that were previously underage or even not yet born. The European Commission used this approach to compute the impact of aging on public expenditures (European Commission, 2006). Under this computation lies another similar concept introduced by Auerbach, Gokhale and Kotlikoff (1991, 1994): generational accounting. This method, instead of being limited to the pension system, looks at the entire budget of the federal state and computes, for one representative individual within an age cohort, what this individual would pay or receive from the state. Furthermore, it enables us to estimate the overall sustainability of the public finances, given fiscal policies of the studied year. This method was applied by Dellis and Lüth (1999), Stijns (2000) and Decoster and al. (2013) for Belgium, and by Raffelhüschen and al. (1999) for European countries, among other authors.

The authors' intentions will guide them to the adequate methodology. If one wants to assess the overall fiscal sustainability of the public finances in the long run, the open-group method will be chosen. If the goal is budgetary, i.e. to estimate the stock value of the overall pension system that is already due or, in other words, the net PDV of pension entitlements of the population affiliated to public pension schemes at time *t*, one of the other two methodologies will be chosen.

(15) The most common assumption would be to impose the accumulation of pension rights through one retirement age. A more plausible assumption would be to take individual preferences towards the end of their career history.

The main advantage of the first methodology is that it provides the information needed to project the evolution of public pension budgets, an exercise done yearly by the Belgian Study Committee on Ageing (2012). Some of their main assumptions are however difficult to justify for the case of Belgium. An example of such assumptions is a perfect expectation in terms of evolution of labor market participation rates, own earnings, even the knowledge of the amount of social contributions paid, both by the employee and by the employer.

The accrued-to-date method appears to be a better candidate to estimate the PDV of anticipated pension rights. In this defined-benefits framework, future pensioners are aware that they accumulate a certain amount of pension that evolves with the number of years of affiliation and the level of past earnings. Furthermore the global SSW, measured using the accrued-to-date methodology, can be seen as an estimation at time t of the liabilities from the pay-as-you-go system or, more figuratively, as the transfer that the federal government would have to make to other entities, private or public, in the hypothetical scenario in which it decides to delegate, or sell, the administration of the whole pension system to them.

One of the added-values of this paper in comparison to previous publications in the field, is the in-depth detail made possible by the use of an updated individual data from administrative sources. Indeed, the last study made by Bouillot and Perelman (1995) lacked a micro perspective as they were compelled to use aggregated data and average pension benefits by scheme. The second added-value is the use of computer code PENSCALC which permits a much more accurate computation of individual pension entitlements.

The same data and code were previously used in Jousten et al. (2012) to simulate the distributive effects of potential reforms in the computation of pension benefits rules. We take a different angle in this paper as we are interested in the observed distribution of the present discounted value of future pension benefits and SSW at the aggregated level, making the distinction between age cohorts, gender, career length, region, and working scheme, among others.

Under the accrued-to-date methodology, the present discounted value of the expected pension benefits accumulated by a currently retired individual i at time t, $SSW^R_{i,t}$, is computed as follows:

$$SSW^R_{i,t} = p^R_{i,t} \sum_{s=a+1}^{S} \upsilon_{s/a} \left(\frac{1+g}{1+r} \right)^{s-a} \tag{6}$$

where $p^R_{i,t}$ is the actual pension benefit at time t; a is the actual age and S the maximum lifespan, set to 105 in our computations; and $\upsilon_{s/a}$ the survival probability at

age *s* conditional on being alive at age *a*. Finally, *g* and *r* are the expected growth rate of pension benefits and the discount rate, respectively. The total implicit debt of public pension scheme at time *t* regarding the already retired population is $\sum_{i=1}^{n} SSW_{i,t}^{R}$.

The computation for future pensioners is fairly similar. The only difference is that pension benefits are assumed to be paid as an annuity starting at the normal age of retirement, 65 years old in this illustration:[16]

$$SSW_{i,t}^{F} = f\left(p_{i,t}^{we}; p_{i,t}^{se}; p_{i,t}^{cs}\right)\sum_{s=65}^{S} v_{s/a}\left(\frac{1+g}{1+r}\right)^{s-a} \tag{7}$$

where $f\left(p_i^{we}; p_i^{se}; p_i^{cs}\right)$ indicates that for future pensioners accrued-to-date pension benefits are a function of benefits cumulated under different public pension schemes. That is, either exclusively under one of the three, wage earner, self-employed or civil servant schemes ("pure career"), or under several ("mixed career"). The total implicit debt of public pensions at time *t* regarding the not yet retired population is $\sum_{i=1}^{n} SSW_{i,t}^{R}$

3.2. DATA AND MAIN COMPUTATIONAL ASSUMPTIONS

We rely on a dataset pooled from several Belgian social insurance agencies in the framework of the MIMOSIS project, which uses 2001 as the reference year[17]. This dataset consists of 305.019 representative individuals from whom we draw two groups: a first one that owns pension rights but are not yet retired, i.e. the "*future pensioners*", and a second one that do not accumulate pension rights anymore but are already benefiting from a retirement income, i.e. the "*retired*". The "*future pensioners"* sub-group consists of 162,622 individuals representing 5.6 million persons from the Belgian population. The "*retired"* sub-group consists of 31,709 individuals, representing 1.8 million persons that receive pension income, including survival pension.

While the computation of accrued pension rights for the already *retired* individuals is straightforward, for *future pensioners* we need detailed information on their working career history to compute their accumulated entitlements. We use admi-

(16) Computations take into account the fact that normal age of retirement for women was expected to follow a path from 62 in 2002 to 65 in 2009.

(17) The original dataset was collected in the MIcro simulation MOdel for Belgian Social Insurance Systems (MIMOSIS) project of the Federal Public Service Social Security financed by the Belgian Science Policy Administration (BELSPO Agora Program AG/01/086 and AG/01/116). The sample was randomly selected from the National Register at 1 January 2002 but corresponds to year 2001. For a detailed presentation of the MIMOSIS project, see Decoster et al. (2008).

nistrative data from various social insurance institutions which allows us to model these entitlements rather accurately.[18] Working status of those on the labor market is determined by data coming from the "Datawarehouse Labor Market and Social Protection", which gathers information on each working scheme[19]. Information includes wages earned during each career-year worked as a wage earner, enriched by relevant complements regarding the full or part-time nature of the job, as well as any period with replacement income provided by a social insurance scheme.[20] Data for the self-employed is limited to the last registered earnings and the first year of affiliation. Finally, information for civil servants is thin and limited to the last year of observation. This can obviously bias the results as we are forced to extrapolate career information from a single annual observation in 2001.

Finally, in order to compute the present discounted value of accrued pension rights, we assume a real constant annual rate of growth and a constant annual discounting rate. Pension benefits are assumed to grow at an annual rate of 0.9%. This was the real growth rate of pension thresholds (minima and maxima), over the period 1980 to 2002. We choose these parameters given the key role they play in the computation of pension benefits.[21] The annual discount rate is set to 3.0%. We report the results of a sensitivity analysis in the following sections. Finally, we use mortality tables by region (Brussels, Flanders and Wallonia) and gender (Statistics Belgium, 2013).

Figure 1 presents the socio-economic structure of the population for men and women, respectively. The absolute number of individuals divided by categories is based on the administrative data available in MIMOSIS on the 1st January 2002. Other than *retired* and *children* (including students up to 25 years old), we distinguish several other categories on behalf of their labor market position: wage earners, self-employed, civil servants, sick (and disabled), unemployed (including pre-retired) and others. The latter category includes all the individuals not reported in the other categories, mainly those inactive and not benefiting from replacement income.

(18) Historical administrative information is incomplete for self-employed and civil servant schemes, but complete for wage-earners. Nevertheless, future pensioners are invited to bring complementary information for the computation of pension benefits at the date of retirement. Unfortunately, this information was not available for this study.

(19) Complementary information comes from RVA/ONEM for the unemployed, from FAO/FAT, FBZ/FMP and RIZIV/INAMI for occupational disease, industrial accident, disablement and other illnesses.

(20) For wage earners, we use data from CIMIRe (Comptes Individuels Multisectioriels / Multisectoriele Individuele Rekening). For self-employed, we rely on data from RSVZ-INASTI ("Rijksinstituut voor de Sociale Verzekeringen der Zelfstandigen / Institut national d'assurances sociales pour travailleurs indépendants").

(21) The Belgian Study Committee on Ageing (2012), retains the rate of 1.0% as the central hypothesis for the evolution of pension minimum thresholds and lump-sum social allowances in its long-term projections of Social Security expenditure.

First of all, we observe the importance of men and women born between approximately 1945 and 1975, thus aged from 25 to 55 years old in 2002, representing the coming "baby-boomers" generation. The second observation is the high proportion of women in the category *other*, as compared to men, particularly among the 60+, while old men are either *retired* or still working as *self-employed*. This shows that most elderly men had a professional career and benefit from public pensions, while a big proportion of women never have been affiliated with a public pension scheme.

FIGURE 1: SOCIO-ECONOMIC STRUCTURE BY AGE (NB)

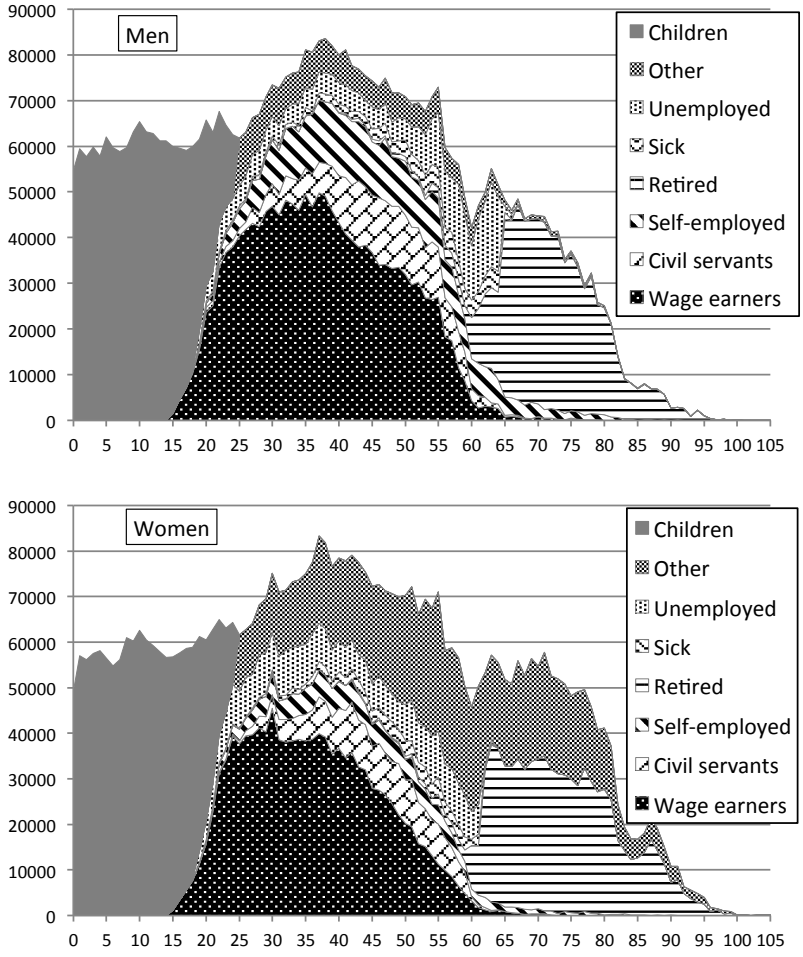


Figure 2 presents similar information in percentages but focuses on the 40 to 65 year-old cohorts. We can observe many differences between men and women. A first difference is a high proportion of women in the *other* category that diminishes for the youngest cohorts, compared to a lower proportion that seems to increase for younger males. This would account for a significant increase in the labor force participation of women over the second part of the last century, while men' levels remained overall stable.

A second difference to note is the increased proportion of unemployed men aged from 50 to 65 years old. This is explained by the popularity of the pre-retirement schemes[22] whose beneficiaries receive unemployment allowances and are labeled in administrative files as "unemployed" up to the normal age of retirement (65 and 62 for men and women respectively in 2002) when they switch to the *retired* category automatically as they are taken over by the pension schemes.

Third, the proportion of men and women in the *retired* category increases dramatically from 60 years old. It is at that age that workers affiliated to the public pension schemes become eligible to retirement, even if the normal age to do so is at 65 (62 for women). As stated above, the difference relies in the observation that men seem to benefit more generally from a public pension scheme, while this is less often the case for women as the *other* category remains quite large.

Finally, it is interesting to note that the proportion of self-employed among men is higher compared to women, particularly among the 60 to 64 years old.

These differences in socio-economic status between men and women and across age cohorts are directly connected to career characteristics and, at the end of the day, with pension benefits. In Figure 3, we take advantage of the detailed individual professional career data available in MIMOSIS, which we complete with PENSCALC results. We illustrate some key features of working careers among wage earners in 2002. It is important to note that the observation period is different for each age cohort and that while we take into account a quasi-complete career history for the 55-59 and 60-64 year-old cohorts, younger generations are de facto at the start of their professional lives and thus have shorter working careers. Moreover, note that in the following sections, inactive individuals with accumulated pension rights, either unemployed, sick, disabled, retired or in the "other" category, are taken into account in computations on behalf of the pension scheme to which they are subject, presently or in the past. For instance, all individuals presently unemployed are by definition subject to the wage-earners scheme, even if in the past they cumulated pension rights under the self-employed or the civil servants schemes.

(22) Old age unemployment and conventional early retirement.

FIGURE 2: SOCIO-ECONOMIC STRUCTURE BY AGE (%)

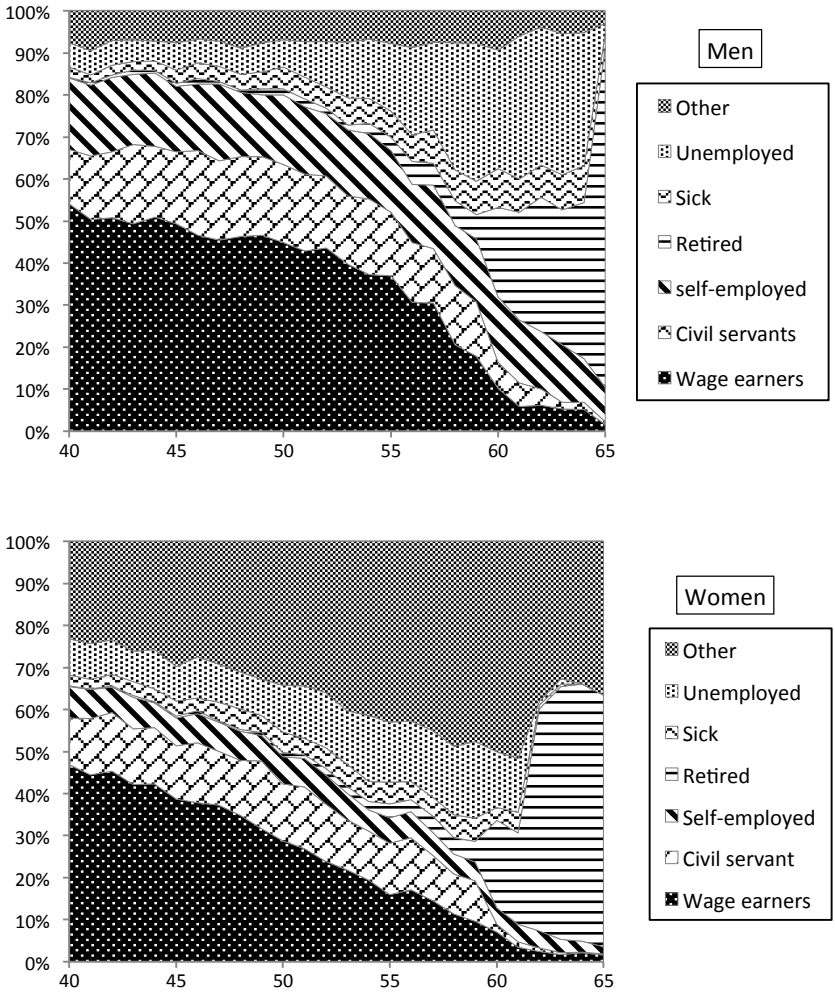
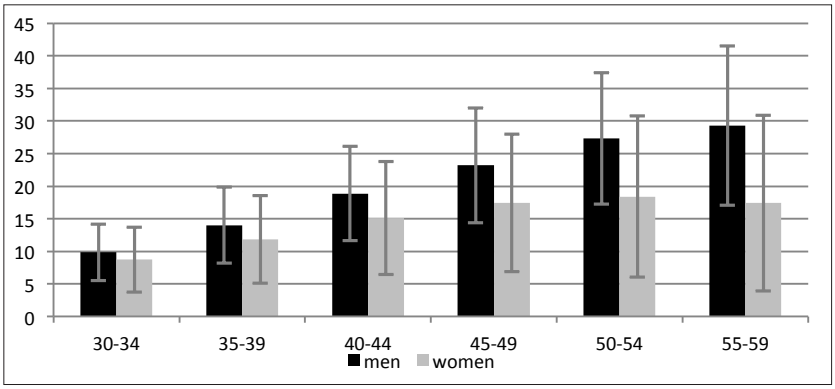


Figure 3.A reports the average career length, up to 2001. As expected, the gap between men and women is higher (from simple to double) within the older than within the younger cohorts. Part of this gap could be explained by the fact that women in the older cohorts often left the labor market after a short professional career to take care of children. In other words, they belong in the *other* category, illustrated in Figures 1 and 2. As they own pension rights, they are taken into account in SSW computations.

Figure 3.B illustrates another key feature of the Belgian public pension schemes, i.e. the average proportion of assimilated days in pension registers, up to 2001. Assimilated days are taken into account in pension computations as working days giving right to wage imputations. More precisely, each assimilated day is equivalent to an average daily wage (real and imputed) from the previous period of work. It is interesting to see that for both extremes in age cohorts, the share of assimilated days of men is close to 20%, while it declines to near 15% for the cohorts between 45 and 59 years old. This feature is certainly explained by the high proportion of youth unemployment, on the one side, and by the popularity of preretirement schemes, on the other side. Among women, the share of assimilated days rises dramatically for the younger cohorts (up to 35%), but fall down relatively faster among the older cohorts. This figure also confirms our previous observations on the differences between men and women, as women tend to spend more time in replacement income during their life (maternity leave, mainly).

Figure 3.C presents the average share of career years, at the individual level, for which the minimum pensionable wage is applied for the computation of pension benefits. As indicated in Section 2, this happens if, for a particular year and under certain conditions, earnings are below a minimum threshold (cf. equation 2). This rate is higher than 20% among women aged from 60 to 64, compared with less than 10% among men in the same age cohort. This gap is even larger among the younger cohorts. Two main drivers can be linked to those observations: First, a higher proportion of part-time work among women and, second, an important wage gap between men and women.[23]

FIGURE 3.A: CAREER LENGTH IN YEARS (BY AGE-GROUP AND GENDER)



(23) Meulders et al. (2011) documented the persistence of a significant gender wage gap in several European countries, particularly in Belgium, using recent EU survey data.

FIGURE 3.B: SHARE OF ASSIMILATED DAYS (% BY AGE-GROUP AND GENDER)

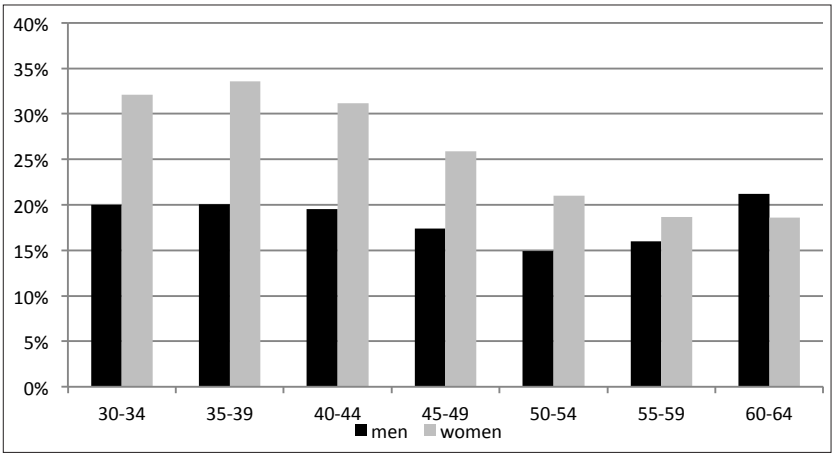
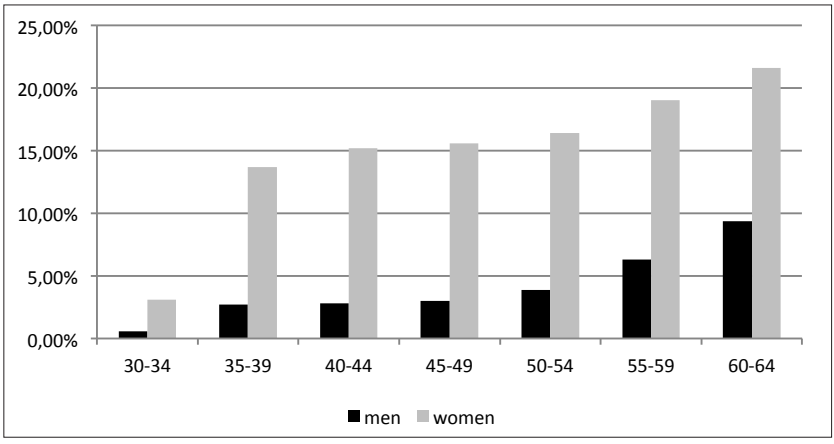


FIGURE 3.C: SHARE OF TOTAL YEARS OF CAREER WITH MINIMUM PENSION (% BY AGE-GROUP AND GENDER)



Finally, we present the average 2001 earnings available from administrative registers in Table 1, with the distinction made between the three different public pension schemes. As expected, huge differences are notable, whether between schemes or between men and women. The self-employed earnings average (5.320 EUR) is several times lower than the average in the two other schemes, but records a standard error

three times higher than the average value.[24] Differences in averages linked to gender are especially large, with the exception of civil servant scheme.

TABLE 1: MEAN ANNUAL EARNINGS BY PENSION SCHEME AFFILIATION AND GENDER (2001, EUR)

Scheme	Men	Women	All
Wage earners	24,616 (20,907)	15,346 (12,214)	20,463 (18,148)
Self-employed	5,871 (17,385)	3,549 (6,057)	5,320 (15,498)
Civil servants	32,690 (41,810	27,716 (12,891)	30,494 (32,488)

Note: Standard errors between brackets.

4. INEQUALITY ISSUES IN SSW DISTRIBUTION

In Section 2 and 3, we presented the main features of the Belgian public pension schemes and sketched the distribution of some key characteristics. Our expectation is that the amount of accrued-to-date pension rights (SSW), at the individual level, would be driven by some of these factors but, above all, by age. In fact, the accumulation of SSW over the life-cycle is expected to have the age inversed U-shape predicted by the Feldstein's (1974) extension of the life-cycle model (Ando and Modigliani, 1963), with a peak around the normal age of retirement. Another key factor is the pension scheme generosity or, in other words, the pension benefits computation rules.

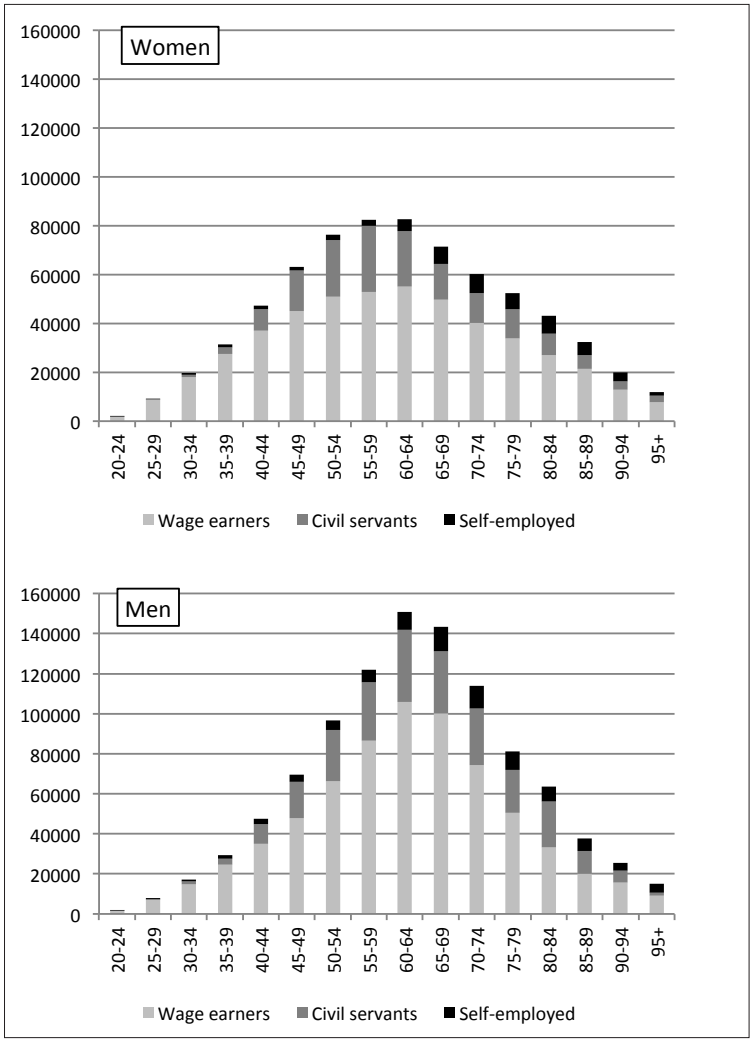
More specifically to Belgium, given the benefits computation for each scheme presented in Section 2, we expect the civil servants' scheme to represent a big share in total SSW compared to its number of affiliated individuals. On the contrary, SSW owned by self-employed is expected to be quite low, in light of the elements discussed in Section 3.

Figure 4 reports the average value of SSW by age cohort for men and women respectively, indicating the share in each scheme. SSW for both *future pensioners* and already *retired* individuals are taken together, and only individuals with positive SSW are taken in consideration.

(24) In pension records, self-employed earnings correspond to earnings three years before. In this case, for 2001, earnings in 1998 are reported.

As expected, the accumulation of pension rights reaches its maximum close to the normal age of retirement, in average near to 150,000 EUR at 60-64 years old for men and near 80,000 EUR at 55-59 years old for women. From this figure we also learn that, in terms of pension schemes' liabilities, the wage earner scheme represents the highest proportion, followed by the civil servant scheme.

FIGURE 4: AVERAGE SSW (EUR BY AGE-GROUP AND PENSION SCHEME)



In Table 2, we compare the proportion of pension schemes' liabilities to the proportion of beneficiaries (*retired* and *future pensioners*). It appears that the share of the civil servant scheme, 23.1% of total liabilities is more than twice the proportion of the beneficiaries, 12.3%. At the same time, self-employed scheme's liabilities represent 6.5% of the total, while the proportion of self-employed, *retired* and *future pensioners* together, represent 9.3% of the whole population with positive SSW.

TABLE 2: PENSION SCHEMES AFFILIATION AND SSW (%)

	Wage-earners	Self-employed	Civil servants	All
Affiliates	78.3	9.3	12.3	100.0
SSW	70.5	6.5	23.1	100.0

Turning back to the average SSW by individual, Figure 5 reports the average pension rights corresponding to individuals, men and women together, distinguishing *retired* and *future pensioners*. In this case, we are only interested in the individuals that are either exclusively wage earners, self-employed or civil servants (*pure careers* instead of *mixed careers*). This figure confirms the effect of the more favorable computation rules applied for civil servants on the one side, and the effect of lower pensionable earnings among the self-employed on the other side. However, it is important to note that our computations are based on pension benefits before tax. The results would be different, particularly for civil servants, if progressive income taxation were taken into account.[25]

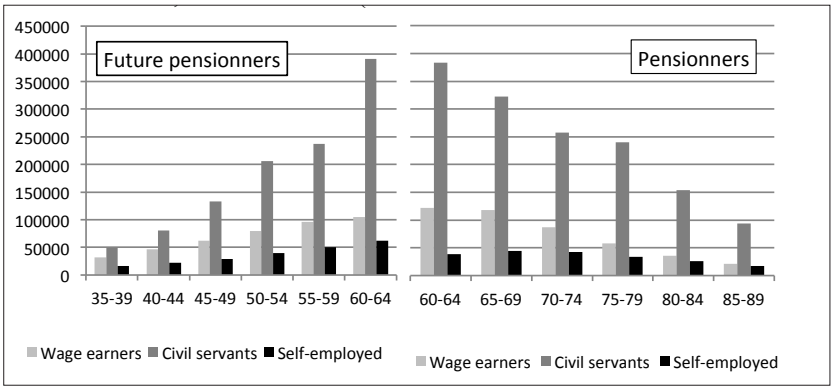
It is interesting to note that there are some differences between the *retired* and the *future pensioners* in terms of SSW, specifically for the 60-64 age cohort. The difference for civil servants is negligible, but it is particularly important for wage earners where the average is higher for the current retired. It is even more important for the self-employed, while in this case the average is higher on the future pensioners' side.

Other than minor differences that can be explained by the fact that the administrative records used in SSW computations was in some cases incomplete, the main source of difference relies on sample composition. In the case of wage earners, future pensioners in the 60 to 64 year-old cohort includes a high proportion of workers out of the labor market, pre-retired, sick, disabled, or in unemployment, benefiting

(25) As indicated in Section 3, we choose the accrued-to-date methodology for the computation of individuals SSW. It implies that for *future pensioners*, we estimate only a fraction of annual pension benefits, those accumulated up to 1 January 2002. Given the progressive nature of direct taxation, net pension values for future pensioners cannot be computed without making huge assumptions.

from a replacement income up to the normal age of retirement. These categories include a higher proportion of low skilled workers with lower SSW and/or workers with less complete professional career histories which may explain the observed gap. On the other side, among the self-employed, high skilled workers stay at work up to the normal age of retirement, or even later, which explains why the 60 to 64 years old that are already *retired* own in average lower SSW.

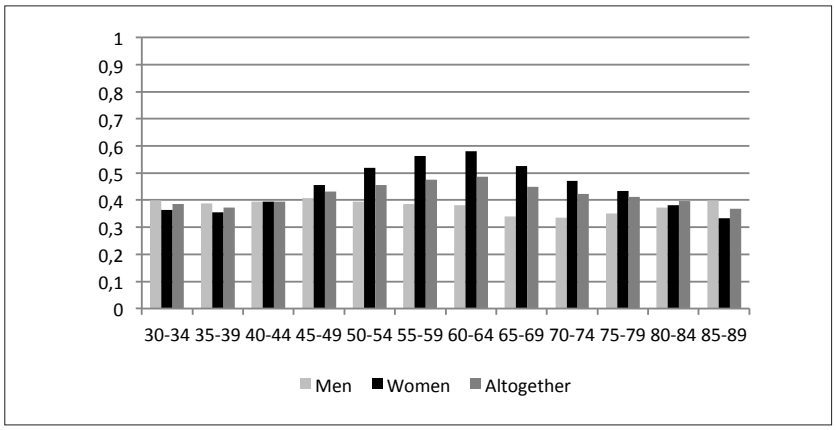
FIGURE 5: AVERAGE SSW, PURE CAREER (EUR BY AGE-GROUP AND PENSION SCHEME)



Furthermore, we are particularly interested in the way SSW is distributed. For this purpose, we computed Gini coefficients by age cohorts. Once again, we consider *retired* and *future pensioners* altogether. The results reported in Figure 6 correspond to SSW distribution among individuals with positive pension rights.

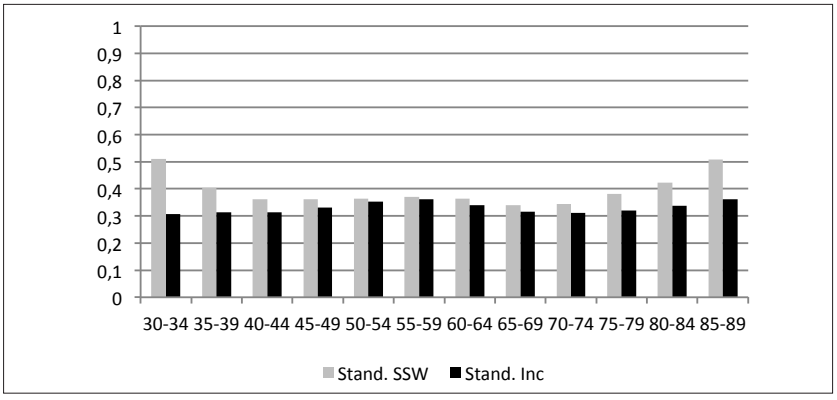
As expected, inequality is higher among women than among men in most age cohorts, with a few exceptions for the younger and the very old cohorts. Among men, the Gini coefficient reaches its lowest level at close to 0.30 within the 65 to 79 years old cohorts, while for women it reaches its highest level near 0.60 for the 60 to 64 years old.

FIGURE 6: SSW DISTRIBUTION BY AGE-GROUP AND GENDER (GINI COEFFICIENTS)



We compare in Figure 7 the distribution of SSW and net annual income, in 2001, from a household perspective. For this purpose, individual SSW and individual annual income are aggregated at the household level and standardized using the OECD equivalence scale.[26] We observe that the Gini coefficients are extremely close within the 50 to 54 and 55 to 59 year-old cohorts, while a gap appears for the other cohorts, indicating that SSW inequality is higher among the youngest and the oldest cohorts.

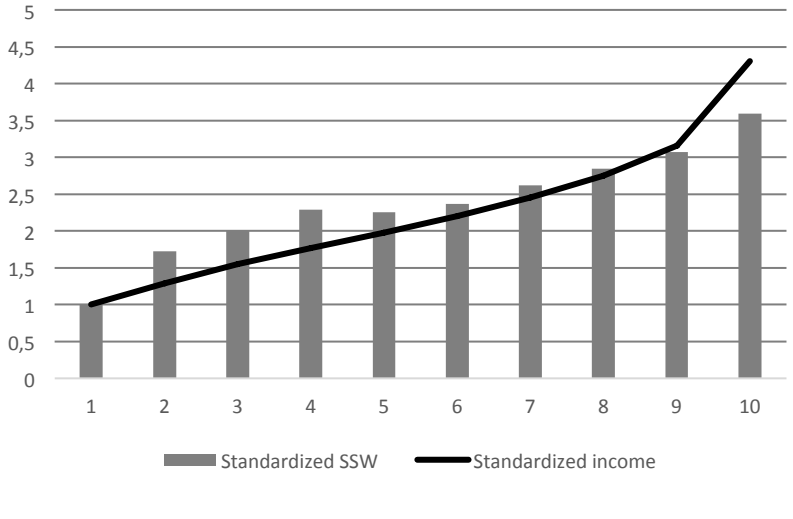
FIGURE 7: STANDARDIZED SSW AND INCOME DISTRIBUTION BY AGE-GROUP (GINI COEFFICIENTS)



(26) Household net income is computed in MIMOSIS as the sum of individual earnings and social transfers, less payroll and direct taxes. We use the OECD equivalence scale: 1.0 for the household head, 0.5 for the other persons aged 14 and over and 0.3 for children aged below 14.

Finally, Figure 8 also compares standardized income and SSW, but focusing on the 50 to 54 years old. For this purpose, the population in this cohort is classified using standardized income deciles. Clearly pension schemes play a redistributive, but moderate, role, on the one hand in favor of intermediate (second and fifth) income deciles, while, on the other hand, they play in disfavor of the highest income decile.

FIGURE 8: SSW AND INCOME BY INCOME DECILES (50 TO 54 YEARS OLD)



First decile standardized values = 1.0.

5. IMPLICIT DEBT

Once all individual SSW is aggregated at the national level, it corresponds to pension liabilities accumulated by the public pension schemes or, in other words, to the implicit debt of the Belgian pay-as-you-go system. In this Section, we analyze how this implicit debt is structured by looking to some particular features, mainly its decomposition between pension schemes and regions. As indicated before in Section 3, in the hypothetical scenario in which public pension schemes would be delegated (or sold) to other entities, private or public, these amounts represent the transfer that the federal government would have to make to these entities.

Our estimations rely on key assumptions relative to the expected growth rate of pension benefits and the discount rate, but also on other assumptions like the age of retirement, assumed to be exogenous and corresponding to the normal age of retirement. Furthermore, in our computations, mean-tested pensions and survival pensions are taken into account only in the case of the *retired* individuals. Finally, the estimations presented here correspond to gross pension rights, before direct taxation. Given these assumptions and applying the accrued-to-date methodology we estimate that SSW accumulated by the Belgian population corresponds to approximately 179.7% of GDP (466.8 billon EUR) in 2002. In other words, the implicit debt represented, in 2002, is close to twice the level of the explicit debt of all the public institutions of Belgium, estimated at 103.4% of GDP.

In Table 3 we present a sensitivity analysis, limited to the SSW of *future pensioners*. Starting from our central hypothesis, which corresponds to an annual growth rate of pension benefits equal to 0.9% and an annual discount rate of 0.3%, Table 3 illustrates the sensitivity of the results to changes in either one or both parameters simultaneously. As expected, SSW values are relatively volatile to changes in these parameters; its composition, however, is extremely stable by region and pension scheme. This is the reason why we decided to present the following results in percentages, rather than in amounts.

TABLE 3: SENSITIVITY ANALYSIS ON SSW

Growth rate (g)	**Discount rate (r)**		
	2.0%	3.0%	4.0%
0.65%	1.195	0.943	0.755
0.90%	1.272	1.000	0.798
1.15%	1.356	1.062	0.845

Baseline: g=0.90% and r=3.0%.
Note: Future pensioners SSW.

Table 4 reports the shares of the total population, the GDP and the SSW by region. It appears that the percentage of SSW corresponding to the Flanders population (60.2%) is proportionally higher, by 2 percentage points, than the share of population (58.0%), while the reverse can be noted for the case of Wallonia and especially for Brussels. Those results are in part due to a higher life expectancy among the population living in Flanders compared to the other regions. In 2001, the average life expectancy of men was 76, 73 and 75 respectively in Flanders, Wallonia and Brussels.

The comparison with GDP shows an unbalanced situation across regions. This is mainly due to the particularity of Brussels, which concentrates 19.2% of Belgian GDP but its population own only 8.3% of total SSW. The explanation is the high proportion of the labor force in Brussels, living in Flanders and Wallonia and commuting every day. But, as we observe in Table 4, while for Flanders the share of GDP (57.3%) is close to the share of SSW (60.2%), the situation is highly unbalanced in the Walloon case, with 31.5% of total SSW and only 23.4% of Belgian GDP.

TABLE 4: POPULATION, GDP AND SSW BY REGION (%)

	Population	GDP	SSW
Brussels	9.3	19.2	8.3
Flanders	58.0	57.3	60.2
Wallonia	32.6	23.4	31.5
Belgium	100.0	100.0	100.0

Finally, Table 5 reports the structure of SSW by pension scheme for each region making the distinction between *retired* and *future pensioners*. It appears that the civil servants scheme represents nearly one third (29.8%) of the total SSW among the *retired*, while less than one fifth (19.2%) among the *future pensioners*. The situation is however less contrasted in the case of Flanders with 17.8% of *future pensioners* SSW corresponding to the civil servants scheme and 13.6% of *retired* SSW.

TABLE 5: SSW BY PENSION SCHEME AND REGION (%)

	Wage earners	Self-employed	Civil Servants	All schemes
Future pensioners				
Brussels	78.4	5.4	16.2	100.0
Flanders	76.9	5.3	17.8	100.0
Wallonia	72.1	5.1	22.8	100.0
Belgium	75.6	5.3	19.2	100.0
Pensioners				
Brussels	60.0	4.0	36.0	100.0
Flanders	67.6	8.8	23.6	100.0
Wallonia	55.0	6.6	38.4	100.0
Belgium	62.6	7.6	29.8	100.0

6. CONCLUSIONS

In this paper we have estimated the present discounted value of pension rights owned by the Belgian population in 2002 under the three main public pension schemes: wage earners, self-employed and civil servants. It appears that SSW inequality is high among women, but also at ages close to retirement for both genders. We show how the individual career characteristics, as well as the rules fixed by each pension scheme for the computation of benefits, play a key role as inequality drivers. Nevertheless, when we compare the distribution of pension entitlements to the distribution of disposable income, it appears that they are very close to each other, even if SSW seems to play a clear redistributive role. Our interpretation is that if Belgian public pension schemes are redistributive in spite of their Bismarckian nature, this is mainly due to the role played by the minimum and maximum thresholds in the benefits computations.

Furthermore, we show that at the national level pension liabilities represent close to 180% of GDP (in 2002). This amount varies on behalf of key hypotheses made about expected growth rate of pension benefits or the discount rate applied in computations. Nevertheless, it is not a real surprise when it is compared with the projections made every year by the Belgian Study Committee on Ageing (2012). In the last projection, the burden of public pensions in GDP is expected to grow from 9.9% in 2011 to 14.7% in 2050.

Finally, we show how this implicit debt is distributed among pension schemes and regions. It appears that Brussels faces a relatively favorable situation with a low share of total pension liabilities compared with its contribution to national GDP. This is not the case in the other two regions, particularly in Wallonia which presents a high unbalanced situation, totaling 31.5% of total SSW while representing only 23.4% of Belgian GDP. Flanders, in spite of a life expectancy nearly three years higher than in Wallonia, faces a relatively favorable situation, 60.2% of total SSW and 57.3% of total Belgian GDP.

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