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Gender inequalities in pensions: Are determinants the same in the private and public sectors?¹

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Abstract

While the average gender gap in pensions is quite well documented, gender differences in the distribution of pensions have rarely been explored. We show in this paper that pension dispersion is very similar for men and women within the French pension system of a given sector (public or private). However, the determinants of these gender inequalities are not the same. Using a regression-based decomposition of the Gini coefficient, we find that pension dispersion is mainly due to dispersion of the reference wage. Gender differences are less marked among civil servants. For women, pension dispersion is also due to dispersion in contribution periods. We also decompose the Gini coefficient by source of income to measure the impact of institutional rules on the extent of pension inequality. Unexpectedly, we find that the impact of pension minima is limited, although slightly larger for civil servants than for private sector employees.

Keywords: Pension, Private and Public sector, Gender gap, Gini coefficient, Decomposition

JEL: J14, J16, H55

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1. Introduction

Only quite recently have gender inequalities in retirement pensions become a topic of research (Ginn (2001), Jefferson (2009)) and political debate (OECD, 2013, Bettio *et al.*, 2013). This growing interest is largely due to changes in family patterns, in particular to the growing number of separations and of non-married couples, which are gradually modifying the characteristics of the retired population. Currently, most retirees are either widowed or in couple, but in the future an increasing proportion of retirees will be single (separated or never-married) or divorced, especially among women. Women will thus have to rely more and more on their own pension entitlements rather than sharing their husband's income or receiving a survivor's pension when widowed.

Gender inequalities in retirement pensions and the risk of poverty have thus emerged as a serious issue. Differences between men's and women's average pensions are quite well documented. In most countries women's pensions are roughly half that of men on average (Bettio *et al.*, 2013 for a comparative study, Marin and Zólyomi, 2010). This is not surprising. Although women's participation rate has risen a great deal since the 1970s, it is not yet as high as men's, more women work part time and they interrupt their careers more often. Their average earnings are also lower (Ponthieux and Meurs, 2015). The gender pension gap thus reflects both women's persistently lower labor force participation and their lower average earnings (Bonnet and Hourriez, 2012; Vara, 2013; Stahlberg, 2006). Some few studies have been undertaken to precisely the sources of this gap. Johnson (1999), Levine *et al.* (1999) and Even and McPherson (1994), on US data, highlight that differences in labor market histories explain the major part of the gender pension gap. More recently, on UK data, Bardasi and Jenkins (2010) reached some different conclusions. They explain that the "gender gap arise mainly because women's characteristics are less well rewarded than men's, rather than because women have less advantageous personal characteristics than men". The authors mentioned that one reason for this difference in findings is the differences in the information used. In the American case, information on earnings histories was available, so that the differences in returns on personal characteristics observed in the British case correspond in part to differences in earnings in the case of the United States. Most of these studies analyze the mean difference between the private pension income of men and women in terms of pension coverage rates and average pension amount.

The average pension gap may not be very informative due to the shape of the pension distributions, which differ between men and women. Yet the gender differences in pension distribution have rarely been examined. The exception is Hänisch and Klos (2014), using unconditional quantile regressions to decompose the gender pension gap. The analysis of pension distributions is useful for informing public policy. Indeed, if more female than male retirees receive small pensions, the minimum pensions benefit women more than men and a reform of this policy will affect women more than men. So looking beyond the average is important.

This article contributes to the knowledge of pension dispersion between men and women and its determinants in the French case. Contrary to the UK or the US, private pension incomes in France are still limited, so the question of whether or not to join a scheme does not apply for the vast majority of employees. French pension schemes are still largely public bodies. All employees are covered, in principle, by public pension schemes, and the rules for calculating pensions depend on the sector (mainly private sector employees or civil servants). Moreover, both private and public schemes have

rules that aim explicitly at reducing dispersion by increasing the lowest pensions, for example, by means of a minimum pension. Other rules (which differ from one scheme to another) affect the dispersion by taking beneficiaries' family situations into account, that is, their status as spouse or parent, and not only their employment history. For this reason, pensions are not strictly proportional to total contributions paid over the whole career. It is also observed that the link between work history and the pension level is stronger in the private sector than in the public sector.

In this article, we try to identify the determinants of the pension dispersion for men and for women and to quantify the impact of each determinant. Our analysis is based on a very rich data set which gives us information on income for men and women over the work lifecycle. We also consider the type of employer (public or private). This dimension is important to get a more accurate view of the gender differences in pensions, as the proportion of women in the public sector is higher than in the private sector. Our statistical analysis is based on the Gini coefficient as the most popular and appropriate measure of inequalities. Following Lerman and Yitzakhi (1985), we first decompose the Gini coefficient by income sources (that is by components of pensions) in particular to measure the impact of institutional rules intended to reduce inequalities (in particular, minimum pensions). We then use a regression-based decomposition of the Gini coefficient (Fields, 2003; Cowell, Frank and Fiorio, 2011) to measure the impact on pension dispersion of the different elements used to calculate pensions, mainly length of contribution period and wage level.

This article contributes to the literature in two ways. We show that pension dispersion is quite similar for men and for women within the pension system of a given sector, which is quite surprising. However the causes of these inequalities are not the same for both sexes. For both men and women, and for retirees from both the public and the private sectors, pension dispersion is mainly due to the dispersion of the reference wage, that is, the wage used to calculate the pension. Among women, pension dispersion is also largely due to dispersion in contribution periods, even for the youngest generations who tend to have higher labor force participation rates. Furthermore, while pension minima are explicitly designed to reduce inequalities, their impact is in fact small for private sector employees. Minima have a larger impact for civil servants. Finally, the rules linking pensions to family status increase the inequalities, but to a limited extent.

The next section describes briefly the institutional framework of the French pension system. Section 3 presents our data set and the methodology used to decompose the Gini coefficient. The results of our decompositions by pension components and by the elements used to calculate pensions are shown in section 4. Concluding remarks are given in the last section.

2. Institutional background

2.1. The retirement schemes

In France, there are separate retirement schemes for different occupational groups. The pensions of private sector employees come from several schemes: the "General Scheme" (*régime général* or RG), often referred to as the "basic scheme," and one or more complementary schemes (ARRCO,

AGIRC and IRCANTEC). Civil servants receive pensions from a single scheme.⁵ There are a number of other retirement systems, in particular, for the self-employed. These systems are not included in our study because of the difficulty of evaluating members' lifetime earnings.

Retirees who have spent their whole careers in either the private or the public sector are referred to as "single-sector retirees" (*monopensionnés*). Those who have worked in both the private and public sectors and are receiving pensions from more than one system are referred to as "multi-sector retirees" (*polypensionnés*). The various schemes that make up the national retirement system have undergone many reforms since the beginning of the 1990s (see appendix A). However, the rules for calculating pensions are still quite different in the private and public sectors. Hence, pension levels are different if a similar career is spent in a single-sector or in different sector covered by different retirement schemes.

Generally, the pension is mainly a function of the length of the contribution period (D), that is, the number of quarters of contributions, and the reference wage (w_{ref}). The contribution period is used to calculate the pension rate ($Taux_{global}$), which is applied to the reference wage. The reforms enacted since the beginning of the 1990s gradually increased the contribution period required for a full pension, modified the calculation of the reference wage and created a pension bonus for people who start getting a pension after they have satisfied the age and contribution period requirements for a full pension. These changes have generally gone into effect gradually, by "generation," i.e. parameters have changed incrementally for successive birth cohorts.

Recent reforms have moved towards convergence between public and private sector retirement systems, but differences persist (see Appendix A for a detailed description of the system and its reforms). In the private sector, the reference wage for the basic scheme is the average of the highest 25 years of wages (since 1993), up to the contributions ceiling (the complementary schemes are added to the basic scheme). Past years of wages are adjusted using a price index. For civil servants, the reference wage is the wage of the last 6 months of career, bonuses excluded.⁶

The retirees studied here were concerned by two main reforms: the first in 1993, only for private sector employees, and the second in 2003 for both sectors. The 2003 reform is important because it gradually harmonized some elements of pension calculation in the two sectors but did not affect retirees in our sample much since many of them had retired before.

2.2. Minimum pensions and pension entitlements linked to family situation

These schemes are completed by two main public policies: minimum pensions and pension entitlements linked to family situation (bonus for children, survivor's pension). These policies affect the level of pensions and are expected to reduce pension's inequalities.

⁵ The public scheme is divided in two schemes according to the former employer: the scheme for those employed by the central state (*Service des Retraites de l'Etat* or SRE) and the scheme for civil servants employed by local authorities (CNRACL). The appellation is different but the calculation principles are the same.

⁶ Bonuses may constitute a large part of the wage for civil servants, so the reference wage may be half the total remuneration for some categories. The average rate of bonuses for civil servants (teachers excluded) aged 55-59 years was 29 % in 2006, for teachers 12% and for some harsh or at-risk occupations (policemen, nurses, firemen,...) 45% (COR/DGAFP, 2009).

The General Scheme for private sector employees guarantees a minimum pension to retirees who are entitled to a full pension, that is, to those who retire at age 65 or whose contribution period, counting all the sectors they have worked in, exceeds the requirement for a full pension. If an individual's pension rights fall below this minimum, their pension is brought up to the minimum, which is called the "contributory minimum" (*minimum contributif*). The full contributory minimum is paid to retirees who fulfill the contribution period requirement for a full pension. The contributory minimum is reduced for retirees with a shorter contribution period on a pro rata basis.

A similar mechanism, called the "guaranteed minimum" (*minimum garanti*) exists in civil servants schemes. Until the 2003 reform, the guaranteed minimum was granted in full to retirees with 25 years or more of service, and a partial minimum was paid to retirees with between 15 and 25 years of service. With 15 years of service, civil servants were entitled to 60% of the full guaranteed minimum. This contrasts with the private sector contributory minimum, which is proportional to the individual contribution period. In order to move towards harmonisation of private and public sector rules, the 2003 reform increased the contribution period required for a full public sector minimum pension from 25 to 40 years. As of January 1, 2013 civil servants with 15 years of contributions in the civil service get 57.5% of the full guaranteed minimum. For each additional year up to 30, the minimum increases by 2.5 percentage points per year and by 0.5 percentage points for each year beyond 30, reaching 100% of the minimum for 40 years of service.

The original rationale for minimum pensions was quite different in the public and private sectors. The private sector contributory minimum was originally designed to enhance pensions for workers with long careers and low wages. The public sector guaranteed minimum was designed to increase pensions for civil servants with short careers. Indeed, with a long career, a civil servant's pension, calculated as a proportion of the career-end wage, is rarely below the guaranteed minimum.

Pension rights linked to retirees' work history can be supplemented by rights linked to their family situation. A pension bonus is granted to parents who have brought up three or more children. The increase depends on the scheme and may vary with the number of children. In the General Scheme, the increase is 10%. The private sector complementary scheme ARRCO gives a 5% bonus for three or more children; the private sector complementary scheme AGIRC gives 8% for three children, plus 4% for each additional child, with a maximum of 24% for 7 or more children.⁷ In the public sector, the bonus is 10% for three children, plus 5% for each additional child; however, the total pension, including the bonus for parents, cannot exceed the career-end gross wage (premiums excluded) used to calculate the pension.

Widows and widowers may get a survivor's pension. The survivor's pension is equal to a percentage of the pension rights of the deceased spouse.

⁷ These rules apply to rights accrued before 2011. For rights accrued in 2012 or later, the increase is 10% for three or more children in both AGIRC and ARRCO.

3. Data and methodology

3.1. Data

Individuals may receive pensions from more than one retirement system if they worked in more than one sector over the course of their careers (for example, someone who started as a private sector employee and then became self-employed, or someone who worked in more than one type of employment at the same time). An administrative database enables us to calculate total pensions for an anonymous population sample, by collecting individual data on pensions from the different obligatory retirement schemes. This database is called the EIR, which stands for *Echantillon interrégime de retraités* or “Interscheme sample of retirees.” The EIR also collects information on how pensions are calculated, contribution periods, pension rates, circumstances of individuals at retirement, decreases or increases in pension rates due to early or delayed retirement, etc.

The EIR collects information directly from retirement schemes and then matches the information by retiree. There is no system for centralizing information on all pensions paid out to retirees. The 2008 wave of the EIR was designed to represent the population aged 35 or more as of December 31, 2008. It includes all individuals in the sample who are receiving a retirement pension, either through direct entitlement or through indirect entitlement to a deceased spouse’s pension, i.e. a survivor’s pension. Virtually all obligatory retirement schemes participate in the EIR. For the 2008 EIR, 74 schemes gave information: the General Scheme and other basic schemes, schemes for public sector employees, mandatory complementary schemes.

All told, the 2008 EIR includes 233,165 individuals who are receiving at least a direct entitlement pension, and, possibly, a survivor’s pension.

We have chosen to concentrate on schemes for private sector employees and civil servants. Thus we deal with three groups of retirees:

- private sector employees, who are covered by the General Scheme (RG)
- civil servants employed by the central state, who are covered by the *Service des Retraites de l’État* (SRE)
- civil servants employed by local authorities, who are covered by a separate scheme (called CNRACL).

Retirees from these schemes may be getting pensions from a single system (*monopensionnés* or single-sector retirees) or from more than one (*polypensionnés* or multi-sector retirees). All told, retirees from these schemes make up 83.6% of male and 91.1% of female retirees in 2008. In the rest of this article, we present our results for the different sectors without differentiating between single sector and multi-sector retirees; annex B presents results separately for the two groups.

Pension distributions are quite different between men and women (Figure 1). Women’s one is more shifted to the left to lower pension levels.

Place figure 1 here

The distribution of contribution periods reflects the different labor market histories of men and women (Figure 2). These trajectories are more heterogeneous among women. More women than men have short contribution periods, resulting in a thicker left tail of the distribution. A bit more surprising is the observation of more women than men having very long distributions periods (at the end of the right tail of the distribution). This is explained by the existence of caregiver credits (contribution years for mothers). This benefit increases the contribution period, up to a limit of eight quarters per child and not conditional on any career break.

Place figure 2 here

“Reference” wages distribution of women is shifted to the left compared to men’s ones, reflecting lower wages (figure 3).

Place figure 3 here

3.2. Decomposition of the Gini coefficient

In order to study the roles played by different income sources and by different elements that enter into the calculation of pensions, we have chosen to use the Gini coefficient, one of the most widely used measures of inequality. This coefficient can be decomposed into different elements, following the method proposed by Lerman and Yitzakhi (1985).

Let us suppose that the amount of income (Y) whose dispersion we want to study is the sum of k elements or income sources (Y^k): $Y = \sum_{k=1}^K Y^k$. The Gini coefficient of the income variable Y can be decomposed as follows:

$$G(Y) = \sum_{k=1}^K \frac{\mu_k}{\mu} \bar{G}(Y^k) = \sum_{k=1}^K \frac{\mu_k}{\mu} R_k G(Y^k) = \sum_{k=1}^K S_k R_k G(Y^k)$$

Where $\mu_k = \bar{Y}^k$, $\mu = \bar{Y}$, the averages of the different income sources and of total income.

As well known, the Gini is not exactly decomposable in the sum of the Gini coefficients for different income sources. It is possible nonetheless to link the different elements.

The ratio S_k stands for the share of income from source k in total income.

$\bar{G}(Y^k)$ is the pseudo-Gini for income source k . In fact, it is the Gini coefficient for income source k , but it is calculated by ranking individuals by their total income Y instead of ranking them by their income from source k . We can show that $\bar{G}(Y^k) = R_k G_k$.

$G_k = G(Y^k)$ is the Gini coefficient for income source k (i. e. it is calculated by ranking individuals by their income from source k .)

R_k measures correlation between individuals’ rank according to their total income Y and their rank according to their income from source Y^k .

$$R_k = \frac{\text{Cov}(Y^k, \text{rang}(Y))}{\text{Cov}(Y^k, \text{rang}(Y^k))}$$

The decomposition of the Gini coefficient enables us to calculate the contribution of each element Y^k to total dispersion of income Y . This contribution is equal to $S_k R_k G(Y^k)$.

It is also possible to use this decomposition in a regression framework (Fields, 2003; Cowell, Frank and Fiorio, 2011). In order to do so, we suppose that the variable Y whose dispersion is under study can be written in the following form:

$$Y = \beta_0 + \sum_{k=1}^K \beta_k X^k + U$$

This specification can then be estimated and the method of decomposing the Gini coefficient described above can be applied to variable Y .

$$Y = \sum_{k=0}^K Y^k \quad \text{avec } Y^k = \hat{\beta}_k X^k \text{ et } Y^0 = \hat{\beta}_0 + \hat{U}$$

The elements of $\hat{\beta}_k$ are the coefficients estimated in the first step; \hat{U} is the estimated residual.

4. Results

4.1. Dispersion of pensions is similar between men and women but differs from one sector to another

The Gini coefficient is 0.34 for all retirees in our sample, counting both men and women, and taking into account survivor's pension. It is 0.37 for all retirees, that is, including retirees from schemes other than those in our sample. The dispersion is lower than the dispersion of earnings (0.4 according to Coudin, Marc, Pora, Wilner, 2014). In any given scheme, there is little inequality between men and women (Figure 4). However, the Gini coefficient is higher for women than for men affiliated to CNRACL. This is probably linked to the fact that women, who make up the majority of local authority employees, are a very heterogeneous group: many women hold service jobs requiring few qualifications, but many have high ranking positions.

Although Gini coefficients are similar for men and women, there are marked differences between schemes. Dispersion is much higher in the General Scheme, with a Gini coefficient of about 0.35, whereas in schemes for public sector employees – SRE for civil servants of the central state and CNRACL for those employed by local authorities – the coefficient is around 0.2 (Figure 4).

Place figure 4 here

This may be due in part to the fact that retirees with less than 15 years of career in the public sector get their pensions from the General Scheme. It also reflects the fact that careers are more erratic in the private sector and differences in the composition of the two populations of workers. Indeed, compared to private sector workers, public sector workers have fewer differences in qualifications, with those employed by the central state having particularly high levels of qualifications, and differences in wages are less marked in the public sector (Ponthieux and Meurs, 2015).

If we remove survivors' pensions from the analysis and consider only direct entitlement pensions, patterns are similar (Figure 5). Survivors' pensions reduce dispersion among women (especially in the General Scheme), since men rarely receive survivors' pensions, so taking survivors' pensions into account accentuates differences in dispersion between men and women.

Place figure 5 here

4.2. Decomposition of the Gini coefficient by income source

The total retirement pension is a sum of several elements. It may comprise both survivors' pensions and direct entitlements. The direct entitlement pension for a private sector retiree may include the General Scheme pension, complementary pensions, bonuses for parents and supplements that bring the pension up to a minimum. A given component contributes more to total dispersion of pensions, the larger its share in total pensions, the more dispersed the component itself and the stronger the correlation between individuals' ranks in the distribution of the component and individuals' ranks in the distribution of total pensions.

Our decomposition of the Gini coefficient is carried out for men and for women and for groups of retirees covered by the three retirement systems. For example, if we consider single-sector women retirees who are receiving a pension only from the system for private sector employees, the Gini coefficient is 0.355 (Table 1). Direct entitlements account for 37.8% of dispersion (0.135/0.355), complementary pensions for 30.2% and survivors' pensions for 34.0%. Two components of the total pension reduce dispersion: the contributory minimum reduces the Gini coefficient by 1.3 points; allowances for old people with low incomes reduce the Gini by 0.4 points. The positive contribution of survivor's pension is close to the basic direct entitlement's one but results from different elements. Survivors' pensions are highly dispersed since only some women receive them (the Gini coefficient of this source equals 0.754 compared to 0.432 for basic direct pensions). R_k is relatively high (0.64), due to the strong homogeneity in the French society. Direct pension entitlements of women who have worked are correlated with their husbands' because spouses tend to have similar levels of education and hence couple's wage levels are correlated.⁸ However, the R_k for survivor's pension remains lower than the direct entitlements' one. In the retired population, many women combine low direct pension entitlements (resulting from short careers and low participation) with relatively high survivor's pensions.

Place table 1 here

Figure 6 sums up the contributions of each component of pension income for different groups of retirees and for men and women.

The contribution of survivors' pensions to the Gini coefficient is stronger for women than for men. For men, the contribution of survivors' pensions reaches 5% for the local authorities scheme, CNRACL; for other schemes, it is close to 1 or 2%. For women, the contribution of survivors' pensions is 21% for the central state scheme (SRE) and 28% for CNRACL; it is 35% for General Scheme pensioners (RG).

⁸ Note that in the French pension system, survivor's pensions are means-tested only in the private sector basic scheme and neither in the complementary schemes, nor in the public sector.

Place figure 6 here

When survivors' pensions are excluded, bonuses for parents of three or more children increase pension dispersion, more so for men than for women (Figure 7). For all the retirees in our sample, these bonuses increase inequalities among men by 4% and among women by 3%. Indeed, bonuses for parents are proportional to pensions.⁹ They contribute more to inequalities among civil servants and therefore augment dispersion more for retirees of public sector schemes (SRE, CNRACL), which give increased bonuses for each child over the number of three. Bonuses for parents contribute 7% to inequalities among men civil servants of the central state and 11% among men retired from local authorities. For women, the contribution of bonuses for parents to inequalities is similar across schemes, at between 2% and 4%.

As we would expect, pension minima reduce dispersion (Figure 7). The impact of minima on inequality is two to three times greater for women than for men. The effect of minima is slightly larger for women than for men in the General Scheme, but it is small compared to the public sector. Many private sector retirees, especially women, receive the contributory minimum, but women are usually entitled to it because they start getting a pension after reaching age 65. Most of them only get a fraction of the full contributory minimum, a fraction equal to the ratio between their own contribution period and the contribution period required for a full pension. In the public sector, minima have a larger impact on inequalities: 7% for SRE and 14% for CNRACL. Minima have a greater impact on multi-sector than on single-sector retirees (cf. appendix B).

Place figure 7 here

We observe lastly that pensions from complementary schemes increase inequality among retirees in the private sector, and that more for men than for women.

4.3. Decomposition of the Gini coefficient by the elements used to calculate pensions

4.3.1. Elements used to calculate direct entitlements

The preceding decomposition of the Gini coefficient highlights the importance of the roles played by direct entitlements and complementary pensions. In order to study the impact on pension dispersion of the elements used to calculate pensions (reference wage, contribution period, etc.), we adopt a somewhat different approach. We consider the total pension to be a weighted sum of these elements, each taken separately. The general idea is to express the pension as a regression on all the relevant factors. If pensions were exact multiples of the reference wage and contribution period, the sum of the components would be exactly equal to the total. In reality, the pension is not a linear function of the elements of individual careers: for example, the contributory minimum is flat-rate, the amount being the same whatever the reference wage. Thus there will always be a gap between the pension as calculated on the basis of the reference wage and the contribution period and the observed pension, called the "residual." This gap corresponds to non-linearities in calculation formulas, and also to errors in measurement. We have tried to deal with these non-linearities by

⁹ Moreover, some mothers of three or more children have extremely short contribution periods.

using specifications that are more flexible than linear functions for the different elements considered.

More precisely, we use the decomposition of the Gini coefficient presented in section 3.2. First, we estimate a linear regression, where Y is the direct entitlement pension.

$$Y = \beta_0 + \sum_{k=1}^K \beta_k X^k + U = \beta_0 + \beta_{RefWage} RefWage + \beta_{Contributions} Contributions + \dots + U$$

Secondly, we decompose the retirement pension as above :

$$Y = \sum_{k=0}^K Y^k \text{ where } Y^k = \hat{\beta}_k X^k \text{ and } Y^0 = \hat{\beta}_0 + \hat{U}$$

$\hat{\beta}_k$ represents the coefficients estimated in the first step and \hat{U} represents the estimated residual.

We can now use the same method as above to decompose the Gini coefficient.

Our decomposition is based on the main elements of individual careers used to calculate the pension, that is:

- The contribution period of the individual for all retirement systems, which is a proxy for career length
- The reference wage (see below)
- A variable indicating if the retiree had three or more children
- A variable for individuals' pensions received from systems other than those covered here (we cover the systems of the following 3 groups: private sector employees, civil servants employed by the central state, civil servants employed by local authorities.)
- The year of birth (using a dummy variable for each cohort) in order to allow for differences in the age and sex composition of occupational groups¹⁰ and to allow for changes in pension calculation and revaluation rules over time.

The way we determine reference wages differs from scheme to scheme. For the General Scheme, we calculate the reference wage on the basis of number of points acquired in complementary schemes. The General Scheme reference wage is the average of the highest n years of wages under a ceiling, with past years' wages increased following an index. This reference wage does not take wages above the ceiling into account. This reference wage can be used to calculate General Scheme pensions, but it cannot be used to calculate complementary pensions, especially for workers with high wages. Since men make up a higher proportion of high wage workers than women, our comparative analysis must allow for this difference. To do this, we calculate an approximate average amount of wages above the ceiling on the basis of points from complementary schemes and contribution periods.

For public sector retirees, both from SRE and CNRACL, only the career-end wage comes into play. Finally, for multi-sector retirees, the reference wage is calculated in proportion to their contribution periods in each sector they worked in.

Hence, the notion of reference wage differs from scheme to scheme as it does in the formulas used to calculate pensions (career-end wage or average wage).

¹⁰ The year of birth may also play a role on gender differences through two mechanisms: the change in the female labor market participation across generations; the gender differences in mortality rate.

4.3.2. The main factors of pension dispersion: contribution period and wages

As expected, the main sources of pension dispersion are length of contribution period and wages, but their influence is very different regarding men's and women's pensions inequalities (Figure 8).

Inequalities in contribution periods have little effect on the dispersion of men's pensions (between 5% and 8%) whereas inequalities in wages play a predominant role. Their weight in pension dispersion is 60% for the CNRACL, 69% for the General Scheme and 82% for the SRE. Career length plays a lesser role for multi-sector retirees than for single-sector retirees (cf. appendix B). Indeed, since they have worked in two or more sectors, multi-sector retirees generally have had longer careers and the length of those careers varies little.

The situation is different for women, for whom career length plays a much greater role in pension dispersion: 3 to 4 times more than for men. In the General Scheme or in the CNRACL, for example, between a quarter and a third of pension inequality among women is due to length of contribution period. The influence of contribution period on inequalities among women retirees from the SRE is slightly less important, but still significant at 20%.¹¹ For women, the contribution period plays a larger role in pension inequalities among single-sector retirees than among multi-sector retirees, but inequalities between these two groups are smaller among women than among men. Men have fairly similar contribution periods but their wage profiles differ, whereas the amount of time women spent in employment is more heterogeneous. This is the case in both the private and the public sectors.

Wages play an important role for women, but their impact is smaller than for men. In general, wage levels explain about half of pension dispersion among women, except for female civil servants employed by the central state, for whom 75% or more of pension inequality is due to differences in wages.

Other factors, such as year of birth or bonuses for children, have little impact. We might have expected the year of birth to have an effect due to differences in life expectancy according to social status (differential mortality).

The variable "other pensions" takes account of pensions paid out by schemes other than those considered here. They play an important role, especially for General Scheme retirees, for whom these pensions can be large (see appendix B on multi-sector retirees). For public sector retirees, "other pensions" represent small amounts, with little effect on pension dispersion. Public sector retirees who receive pensions from more than one system (multi-sector) are generally getting a pension directly from the General Scheme. This latter is taken into account in our computations.

Place figure 8 here

¹¹ The impact of contribution period length on women retirees from the central state civil service is somewhat attenuated because few SRE retirees have very short contribution periods (since pensions for civil servants with careers under 15 years in length are paid out by the General Scheme). One might expect the same situation for the CNRACL but length of contribution periods among employees of local authorities is more heterogeneous.

Finally, as we have indicated, the adjustment is not perfect: even though we use flexible non-linear functions, it is not possible to take all the non-linearities into account in a simple way. Furthermore, there are errors in the measurements of some variables. The residual explains about 8% of dispersion for SRE retirees, about 15% of dispersion for General Scheme retirees and more than 20% of dispersion for CNRACL retirees. Some of the residual is due to non-linearities in the retirement system. In addition, the method used to compute reference wages of private sector retirees is imprecise by its very nature. It is difficult to explain the strong impact of the residual on CNRACL retirees, particularly on women. The main reason is undoubtedly the complexity of the careers of the many multi-sector female retirees who are getting pensions from the CNRACL, especially nurses and local authorities employees. These categories of retirees would merit a separate study focusing just on them.

Because of the great increase in women's labour force participation, our results do not necessarily reflect recent developments or future changes. For this reason, we examine the specific situation of young retirees. We carried out a similar decomposition on retirees born between 1930 and 1942 (Figure 9), a subgroup that is more homogeneous than the population of all retirees. The results are similar, except that the effect of contribution period on pension dispersion is less strong for women. This probably reflects the diversity of behaviours in this transition generation which entered the labour market between 1950 and 1962, and went from a norm of absence from the labour market for married women to a norm of couples with both members on the labour market. The results for men are practically identical.

Place figure 9 here

Conclusion

This paper examines the gender dispersion in pension entitlements. We use a very rich French data set for 2008, which gives a comprehensive view of the whole retired population and we are able to distinguish situations by former employment sector (public or private, one scheme or multi-schemes). We found that the inequalities within a given sector (State, local authorities, private) are quite similar for men and women and are far less pronounced in the State sector than in the two others. This is largely because civil servants' careers are more continuous than those of private employees, for both women and men. Pension dispersion is mainly due to dispersion of the reference wage for both sexes. Among women, inequality is also explained by the dispersion in contribution periods.

We also decompose the Gini coefficient by source of income to measure the impact of institutional rules on the extent of pension inequality. As expected, the role of pension minima in reducing dispersion is greater for women than for men. We find that the minima policy has a larger impact for civil servants than for private sector employees. Surprisingly, however, it has a limited effect on pension inequality, so it cannot be the source of the gap in the level of pension inequalities between the public and private sectors.

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Appendix A – The French pension system and its reforms

1. The situation before the 1993 reform

This section describes the calculation of pensions before the 1993 reform.

For private sector employees, the General Scheme pension, that is, the basic pension without obligatory complementary scheme pensions, was calculated as follows:

$$P = 50\% \times w_{ref} \times \text{Min} \left[\frac{D_{scheme}}{150}, 1 \right] \times (1 - d)$$

where $d = \text{reduc_rate} \times \text{Max} \left(0, \text{Min} \left(D_{required} - D_{total}, 4 \times (65 - \text{age}) \right) \right)$

If an individual retires at age 65, the pension is not reduced, whatever the individual's contribution period. This age is often referred to as the "full rate age."

For public sector employees, the total pension was calculated as follows:

$$P = 75\% \times w_{ref} \times \text{Min} \left[\frac{D_{scheme}}{150}, 1 \right]$$

Parameters concerning individuals:

D_{scheme} : individual's period of contributions to a given sector

D_{total} : individual's total contribution period, including all sectors of activity

age : individual's retirement age

w_{ref} : individual's reference wage.

Parameters concerning scheme rules:

$D_{required}$: the contribution period required for a full pension (which depends on birth cohort). Before the 1993 reform, it was equal to 150 quarters.

$reduc_rate$: the rate of reduction of the pension for retirement with a contribution period shorter than that required for a full pension; the rate is 2.5% per missing quarter.

In the General Scheme, the reference wage is the average of the highest ten years of wages, up to the contributions ceiling. Past years of wages are adjusted using an index. For civil servants, the reference wage is the wage of the last 6 months of career, premiums excluded.

The full pension rate is lower in the General Scheme because private sector retirees get additional pensions from complementary schemes. In these schemes, the pension is equal to the number of "points" acquired by the worker, multiplied by the value of the point. The number of points acquired in a given year is equal to the product of the employee's wage and the contribution rate of the scheme divided by the reference wage defined by the scheme (this reference wage is often likened to the "price" of a point). Complementary pension schemes may provide a large share of the total pension for employees with high wages.

2. The 1993 retirement system reform (the “Balladur reform”)

This reform concerned only private sector employees, and a few schemes that are aligned with the General Scheme (one for shopkeepers and craftsmen, one for farm labourers).

The main changes enacted were the following.

- The contribution period required for a full pension was increased from 150 to 160 quarters. This increase went into effect gradually, by one quarter for each successive birth cohort, beginning with people born in 1933. People born in 1943 or later were subject to a required contribution period of 160 quarters. However, the denominator in the coefficient $\left[\frac{D_{scheme}}{150} \right]$ remained equal to 150 quarters.
- The calculation of the reference wage was changed. The years used to calculate the reference wage increased from the highest 10 years of wages to the highest 25 years. This change was applied gradually, by increasing the number by one year for successive birth cohort, beginning with people born in 1933. The reform was fully in effect for people born in 1948 or later.
- Pensions in payment and past annual wages used to calculate the reference wage were indexed to consumer prices instead of to wages. This policy had in fact been applied as of 1987, but it became law in 1993.

3. The 2003 reform (the “Fillon reform”) and the current retirement system

The 2003 reform concerned both private and public sector employees. It gradually harmonized some elements of pension calculation in the two sectors.

It required the same contribution period for a full pension for civil servants as for the General Scheme. As of 2009, the contribution period required for a full pension was scheduled to increase in parallel for all employees covered by either system. The 2003 reform created a rule for periodic increases in the required contribution period, based on splitting gains in average life expectancy at 60; one third of the gain is to be allocated to an increase in time spent in retirement and two thirds to an increase in time potentially spent in the workforce.

The reform also aimed at making the choice of retirement age more flexible, by changing the rate of reduction in the pension for retirement with a contribution period that is shorter than the requirement for a full pension and by creating a bonus for retirement with a longer contribution period.

More specifically,

- The denominator in the coefficient

$\left[\frac{D_{scheme}}{150} \right]$ was increased to 160, making it equal to the contribution period required for a full pension.

- The 2003 law introduced a reduction in the pension of civil servants who retire with less than the contribution period required for a full pension. It also cut the reduction rate in the General Scheme (from 10% per missing year for the 1944 cohort to 5% for cohorts born after 1952).
- The law introduced a bonus for people who delay retirement. For periods of work after January 1, 2004, the pension was increased by 0.75% for each quarter of contributions beyond age 60 and beyond the contribution period required for a full pension (counting contributions to all schemes). As of January 1, 2009, the pension bonus rate was increased to 1.25% per extra quarter.

The pension formula for private sectors basic scheme and civil servant is in 2008 the following one:

$$P = Rate \times w_{ref} \times \min \left[\frac{D_{scheme}}{D_{required}}, 1 \right] \times (1 - d) \times (1 + s)$$

$$d = reduc_rate \times \max \left[0, \min \left(D_{required} - D_{total}, 4 \times (65 - age) \right) \right]$$

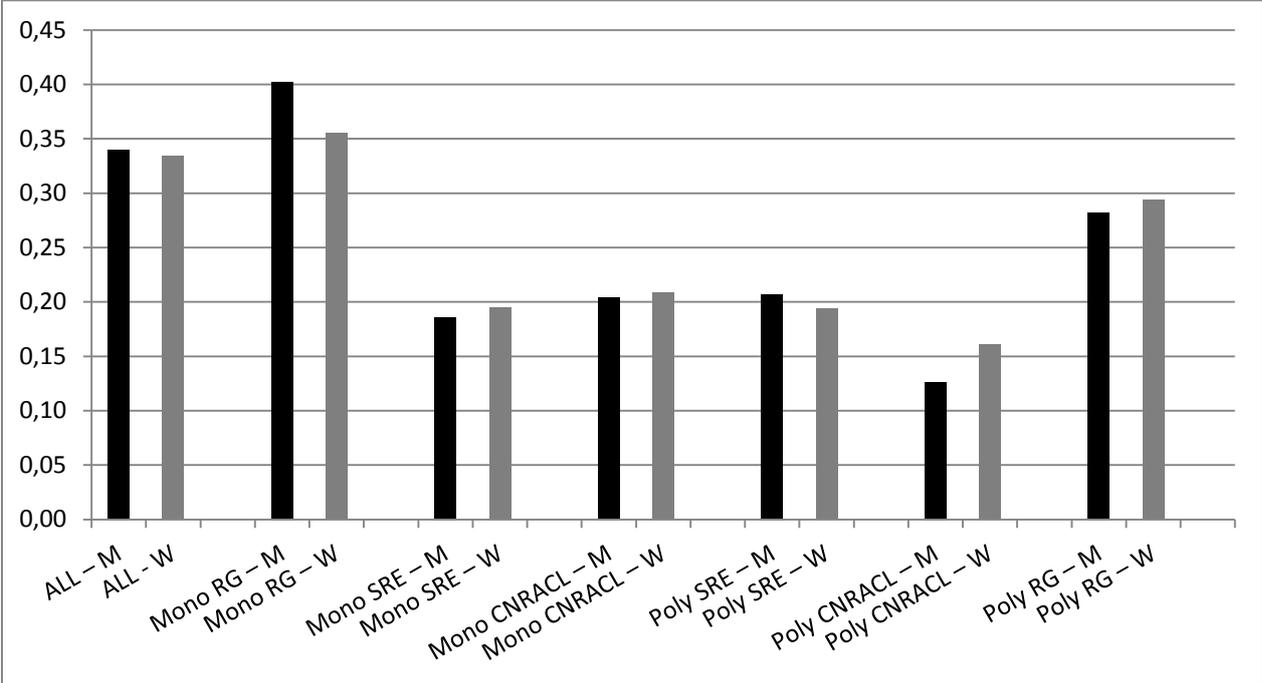
$$s = bonus_rate \times 1_{(age > min_age)} \times \max \left[0, \left(D_{total} - D_{required}, 4 \times (65 - age) \right) \right]$$

Compared to the pre 1993 formulas [1], two new parameters appear: the bonus rate and *min_age*, the minimum retirement age.

Reform has been pursued in recent years, particularly in 2010, when age limits were increased: the minimum retirement age is now gradually rising from 60 to 62; the full rate retirement age, after which reductions do not apply to retirees with insufficient contribution periods, is rising from 65 to 67. The 2010 retirement system reform also changed the rules for employees with relatively short careers in the public sector. Prior to that reform, civil servants with fewer than 15 years of contributions to the civil service retirement system received all of their pension from the private sector system. Since the 2010 reform, two years will be sufficient for civil servants to receive a pension from the civil service retirement system. This change in rules will increase the number of multi-sector retirees.

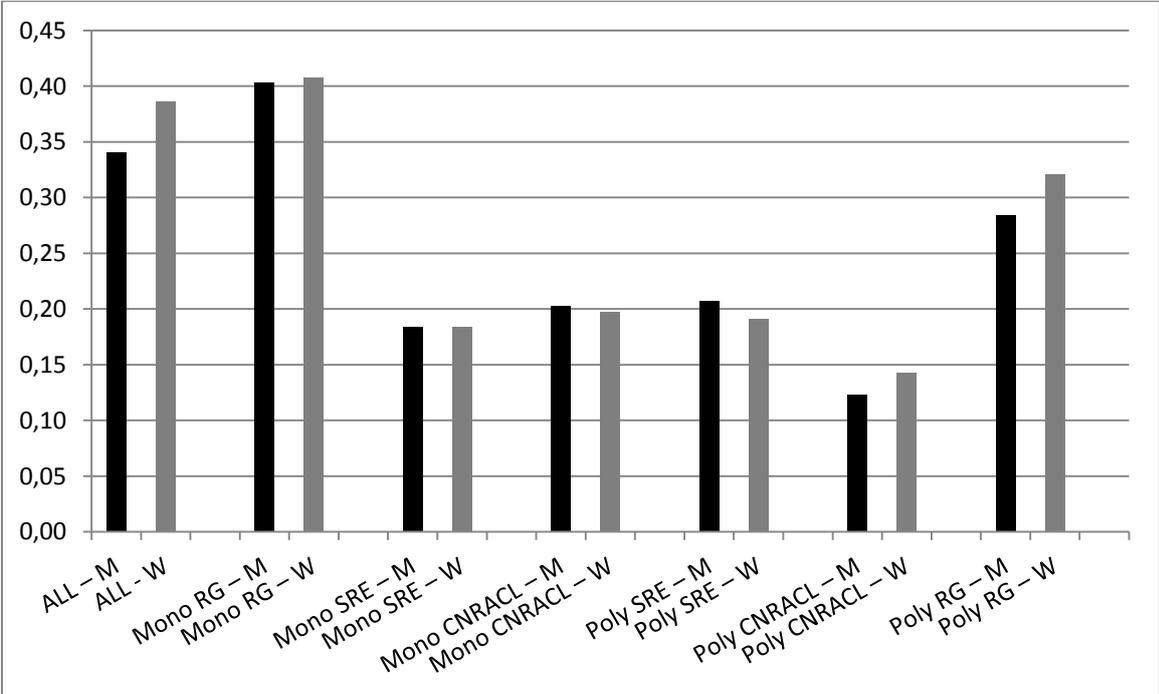
Appendix B – Results by retirement scheme, by gender, and for single-sector and multi-sector retirees

Figure B.1 – Inequalities in total pension for different schemes (Gini coefficient)



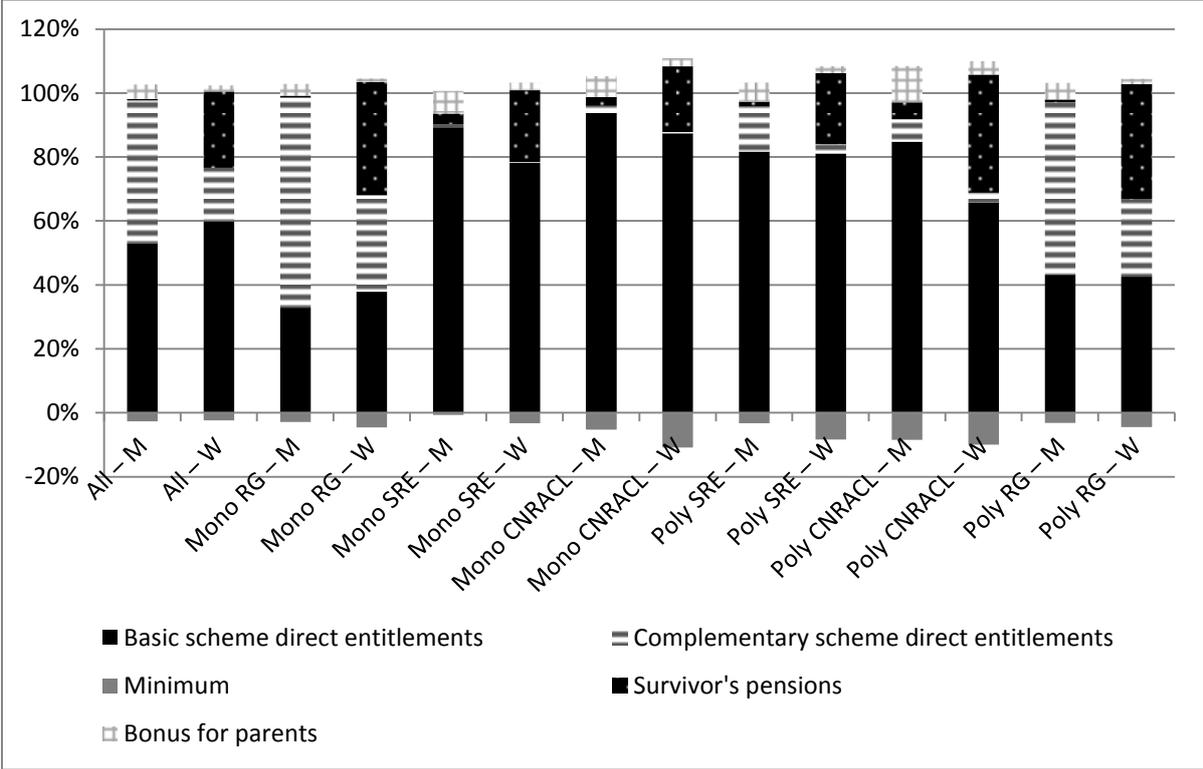
Population : Retirees with direct entitlements, as of December 31, 2008
 Mono(pensionnés) means “single-sector retirees” and poly(pensionnés) multi-sector retirees”.
 Data source: EIR 2008

Figure B.2 – Inequalities in direct entitlement pensions for different sectors (Gini coefficient)



Population: Retirees with direct entitlements, as of December 31, 2008
 Mono(pensionnés) means “single-sector retirees” and poly(pensionnés) multi-sector retirees”.
 Data source: EIR 2008

Figure B.3. – Contribution of each pension source to dispersion of total pensions, by group



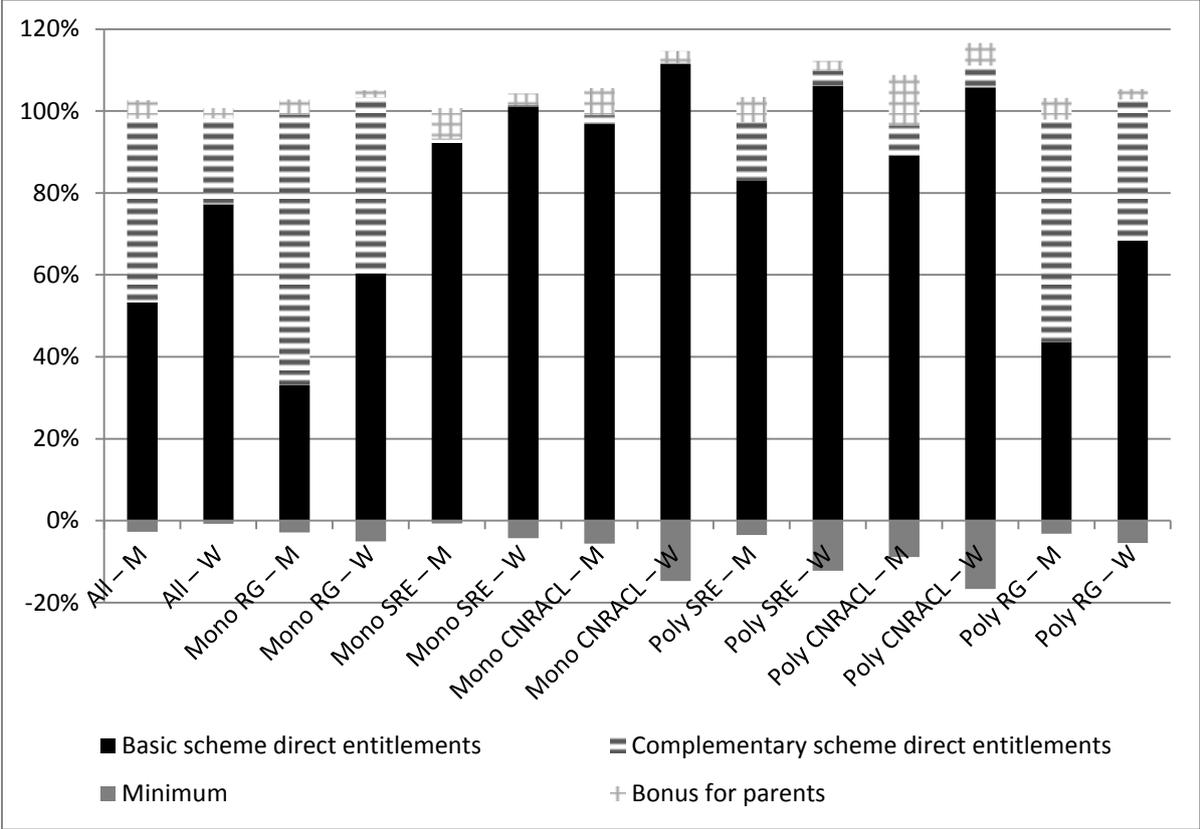
Population: Retirees with direct entitlements, as of December 31, 2008

Mono(pensionnés) means “single-sector retirees” and poly(pensionnés) multi-sector retirees”.

Data source: EIR 2008

Interpretation: For women only covered by the private sector retirement system, 38% of total pension dispersion, as measured by the Gini coefficient, is due to General Scheme direct entitlements (not counting the contributory minimum), 30% to complementary scheme direct entitlements, 35% to survivors’ pensions, and 1% to bonuses for having 3 or more children. The contributory minimum reduces dispersion of total pensions by about 5%.

Figure B.4 – Contribution of each pension source to dispersion of direct entitlements, by scheme



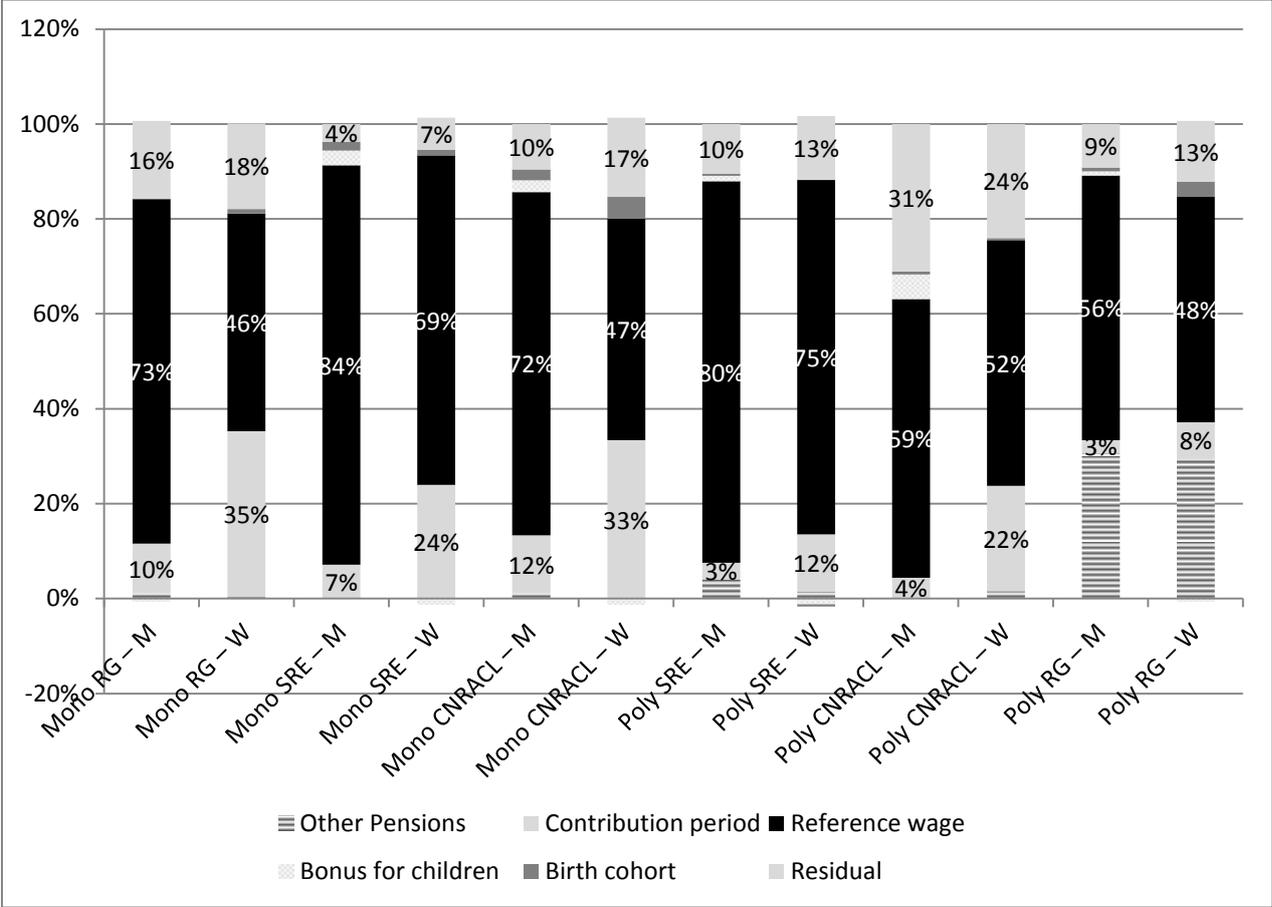
Population: Retirees with direct entitlements, as of December 31, 2008

Mono(pensionnés) means “single-sector retirees” and poly(pensionnés) multi-sector retirees”.

Data source: EIR 2008

Interpretation: For female retirees getting a pension only from the General Scheme, 60% of the dispersion of direct entitlements, measured by the Gini coefficient, is explained by General Scheme pension (without the contributory minimum), 43% is due to complementary schemes, 2% by pension supplements. Dispersion of direct entitlements is reduced by the contributory minimum, which reduces dispersion by 5%.

Figure B.5 – Decomposition of the Gini coefficient for direct entitlements, by component



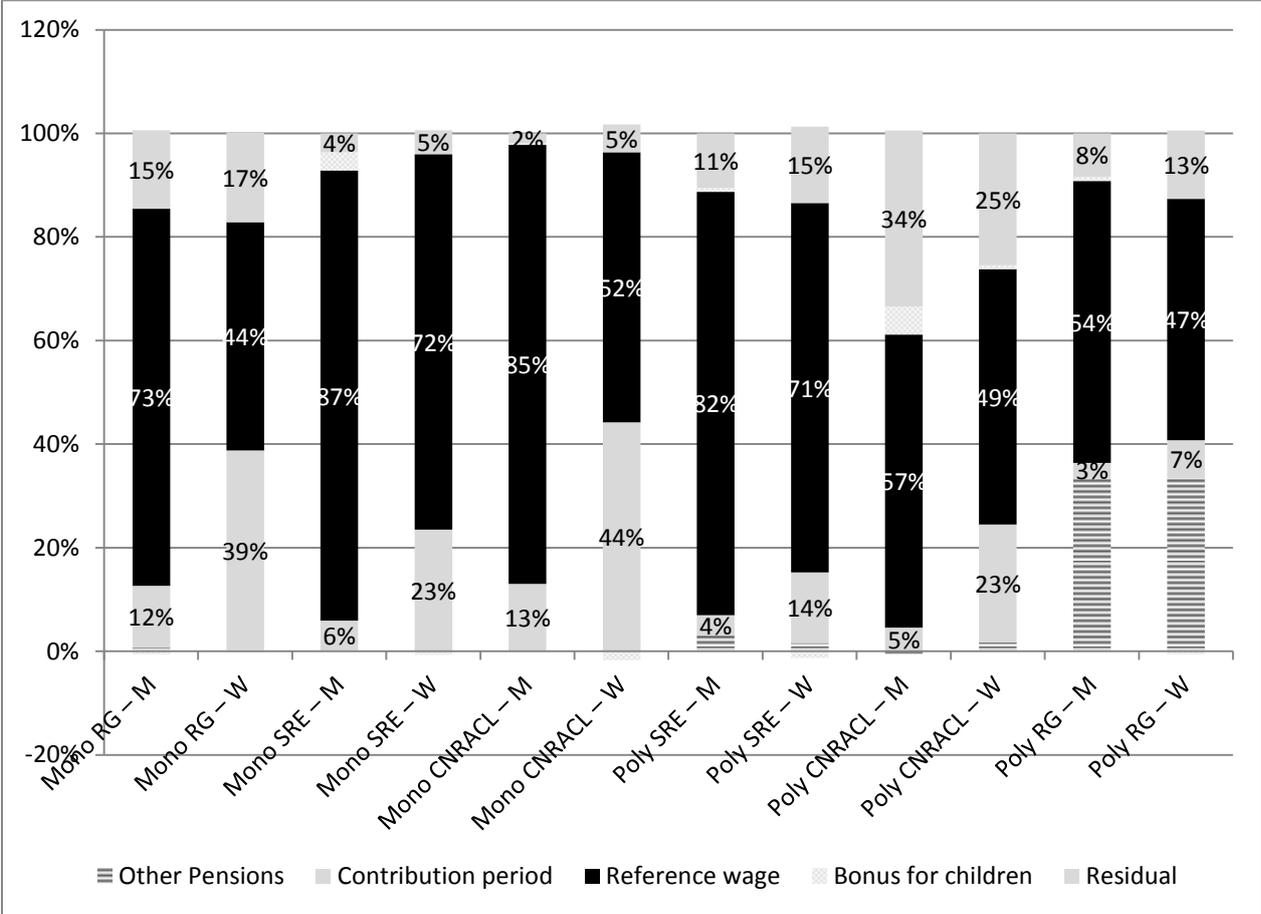
Population: Retirees with direct entitlements, as of December 31, 2008

Mono(pensionnés) means “single-sector retirees” and poly(pensionnés) multi-sector retirees”.

Data source: EIR 2008

Legend: For female retirees getting a General Scheme pension for private sector employees, 35% of the dispersion of direct pension entitlements, measured by the Gini coefficient, is due to contribution periods, 46% to reference wages. Bonuses for parents and birth cohort have little impact on dispersion. The residual accounts for 18% of total dispersion.

Figure B.6 – Decomposition of the Gini coefficient for direct entitlements, by component (1930 to 1942 birth cohorts)

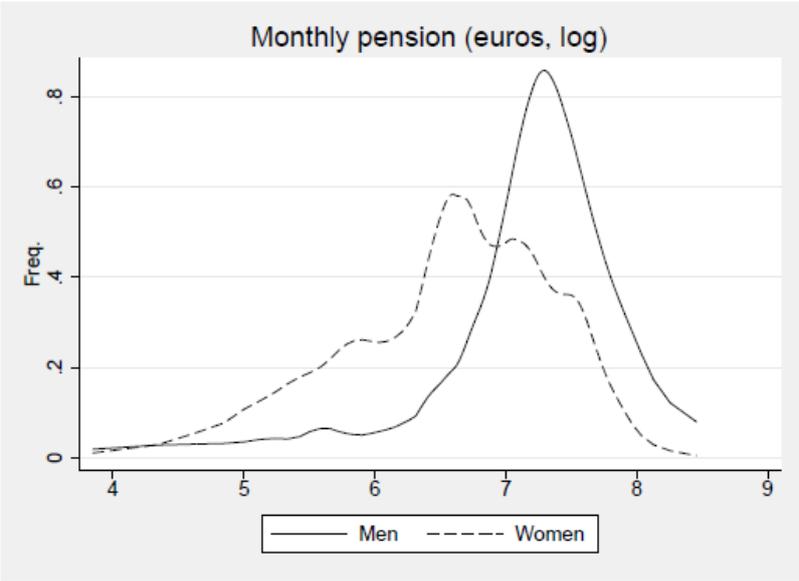


Population: Retirees with direct entitlements, as of December 31, 2008
 Mono(pensionnés) means “single-sector retirees” and poly(pensionnés) multi-sector retirees”.
 Data source: EIR 2008

Interpretation: For women single-scheme private sector retirees born between 1930 and 1942, 39% of the dispersion of their direct entitlement pensions, measured by the Gini coefficient, is due to contribution periods, 44% to reference wages. Bonuses for parents and birth cohort have little impact on dispersion. The residual accounts for 17% of total dispersion.

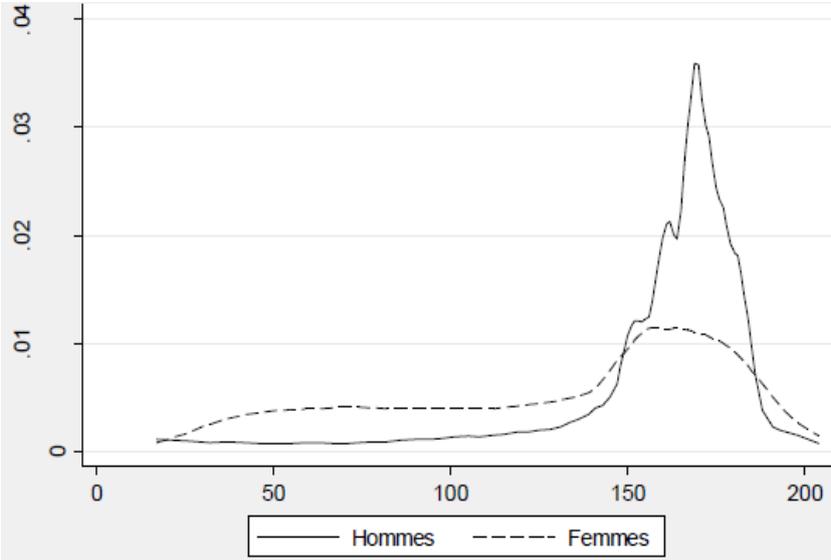
Figures and tables

Figure 1 – Distribution of monthly pensions, men and women



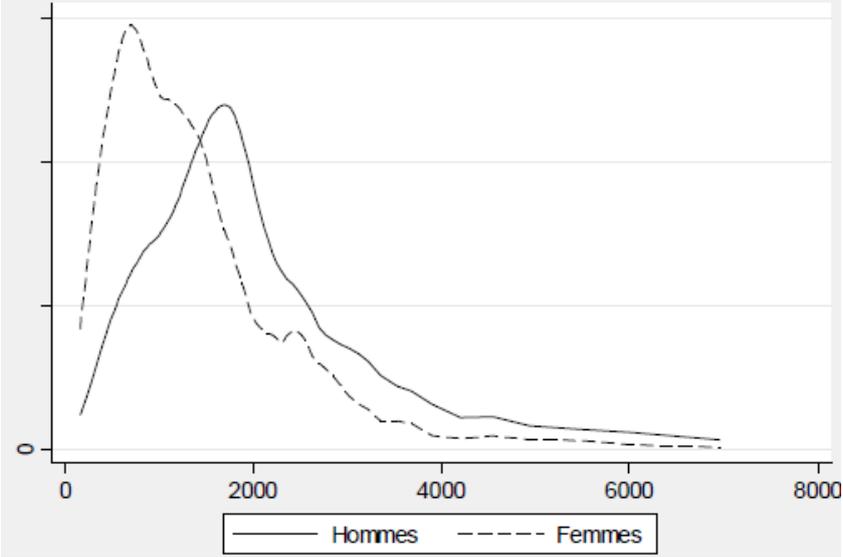
Source: EIR 2008, Retirees born between 1930 and 1942 with direct entitlements, as of December 31, 2008

Figure 2 – Distribution of contribution periods, men and women



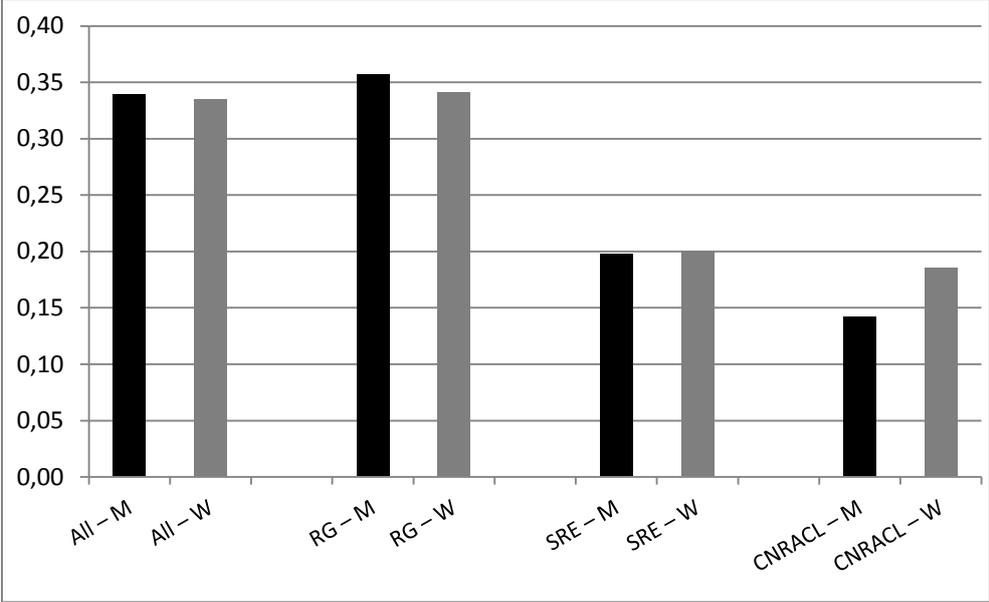
Source: EIR 2008, Retirees born between 1930 and 1942 with direct entitlements, as of December 31, 2008

Figure 3 – Distribution of “reference” wages, men and women (euros per year)



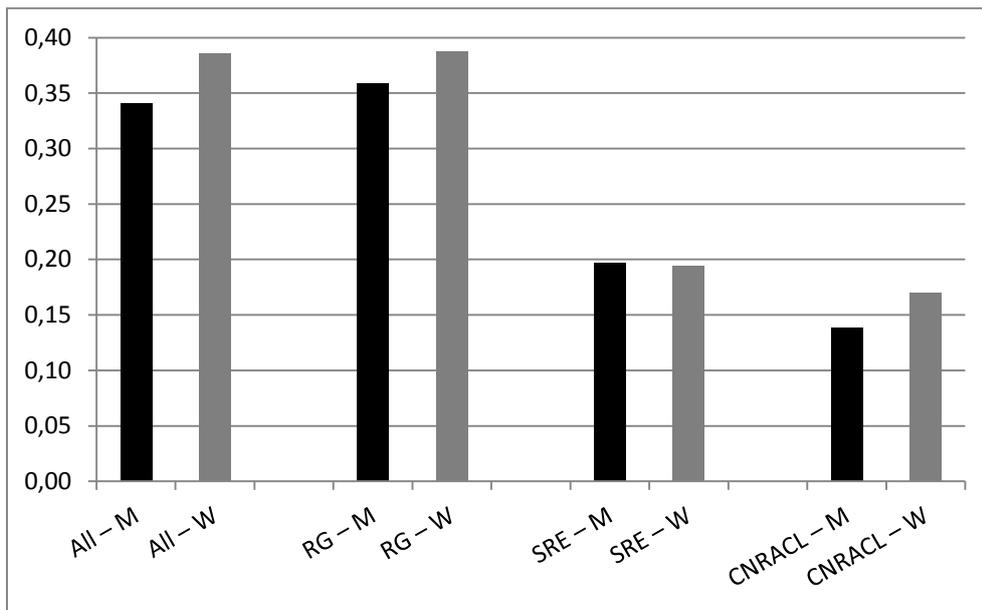
Source: EIR 2008, Retirees born between 1930 and 1942 with direct entitlements, as of December 31, 2008

Figure 4 – Inequalities in total pensions for different schemes (Gini coefficient)



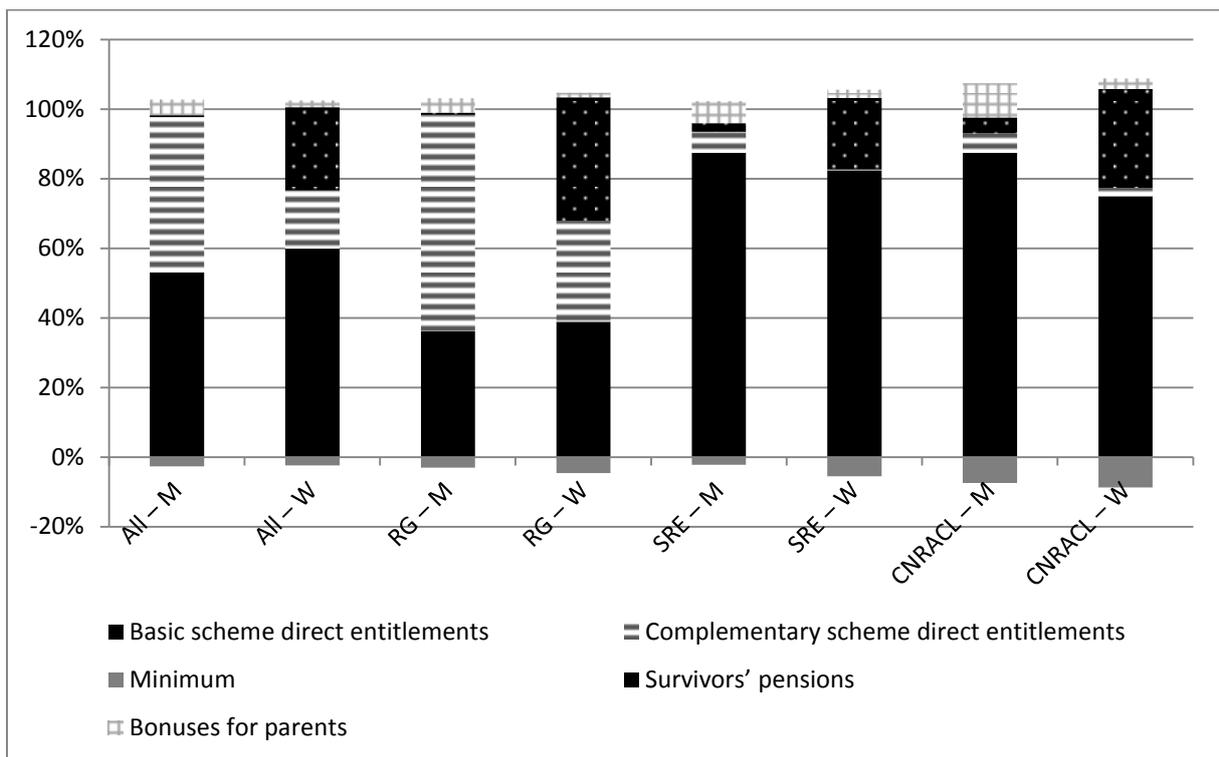
Source: EIR 2008, Retirees born between 1930 and 1942 with direct entitlements, as of December 31, 2008

Figure 5 – Inequalities in direct entitlements for different schemes (Gini coefficient)



Source: EIR 2008, Retirees born between 1930 and 1942 with direct entitlements, as of December 31, 2008

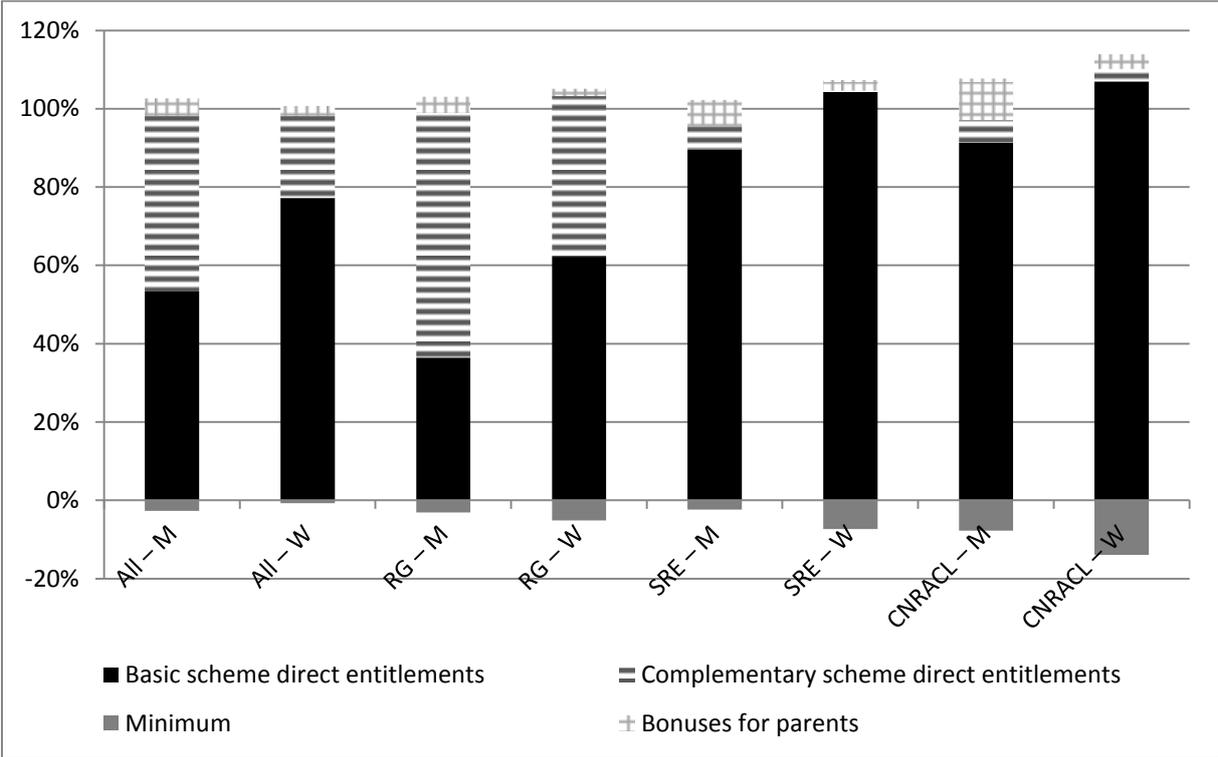
Figure 6 – Contribution of each pension source to dispersion of total pensions, by scheme



Source: EIR 2008, Retirees born between 1930 and 1942 with direct entitlements, as of December 31, 2008

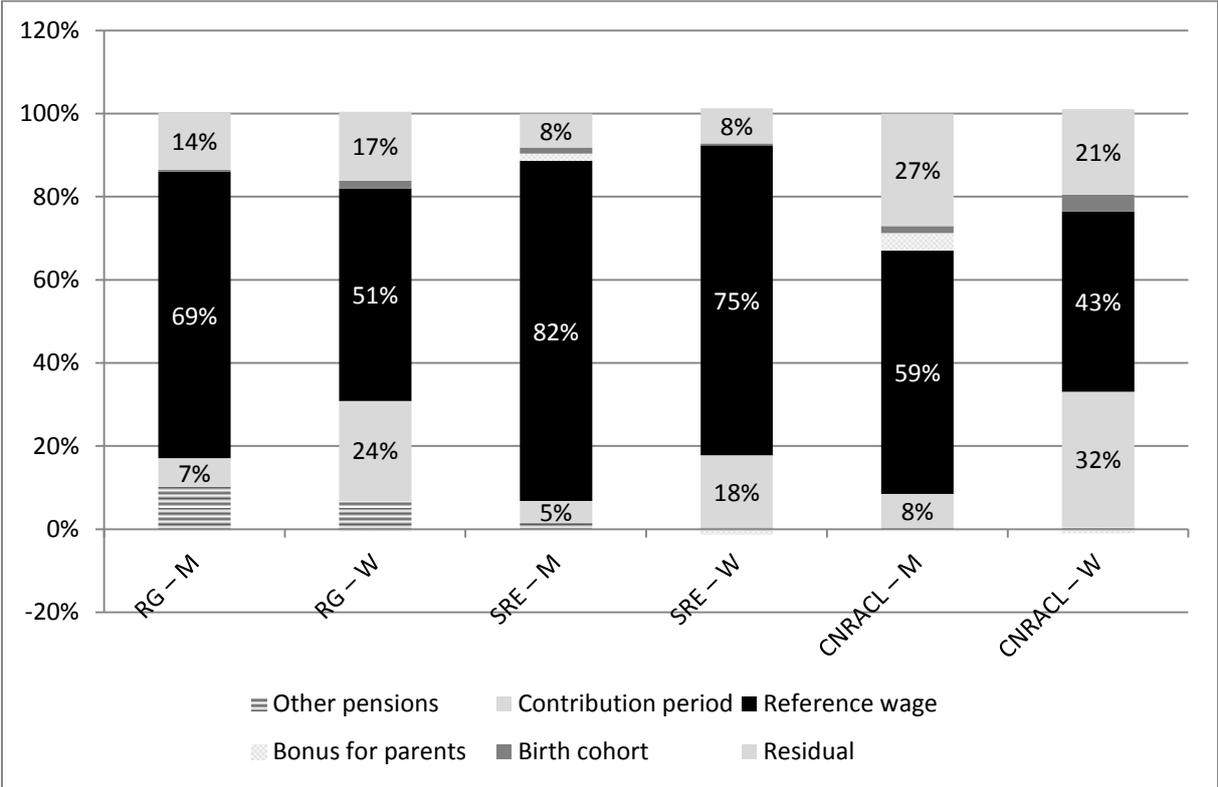
Note: For women retirees from the private sector, 39% of the dispersion of total pensions, measured by the Gini coefficient, is due to differences in the basic General Scheme (without the contributory minimum), 29% to differences in complementary pensions, 36% to differences in survivors' pensions and 1% to differences in pension bonuses for parents of 3 or more children. The contributory minimum reduces dispersion by 5%.

Figure 7 – Contribution of each pension source to dispersion of direct entitlements, by scheme



Source: EIR 2008, Retirees born between 1930 and 1942 with direct entitlements, as of December 31, 2008
 Note: For women retirees from the General Scheme, 62% of the dispersion of direct entitlements, measured by the Gini coefficient, is due to General Scheme pensions (without supplements for the contributory minimum), 41% to complementary pensions and 2% to bonuses for parents. The contributory minimum reduces dispersion of direct entitlements by 5%.

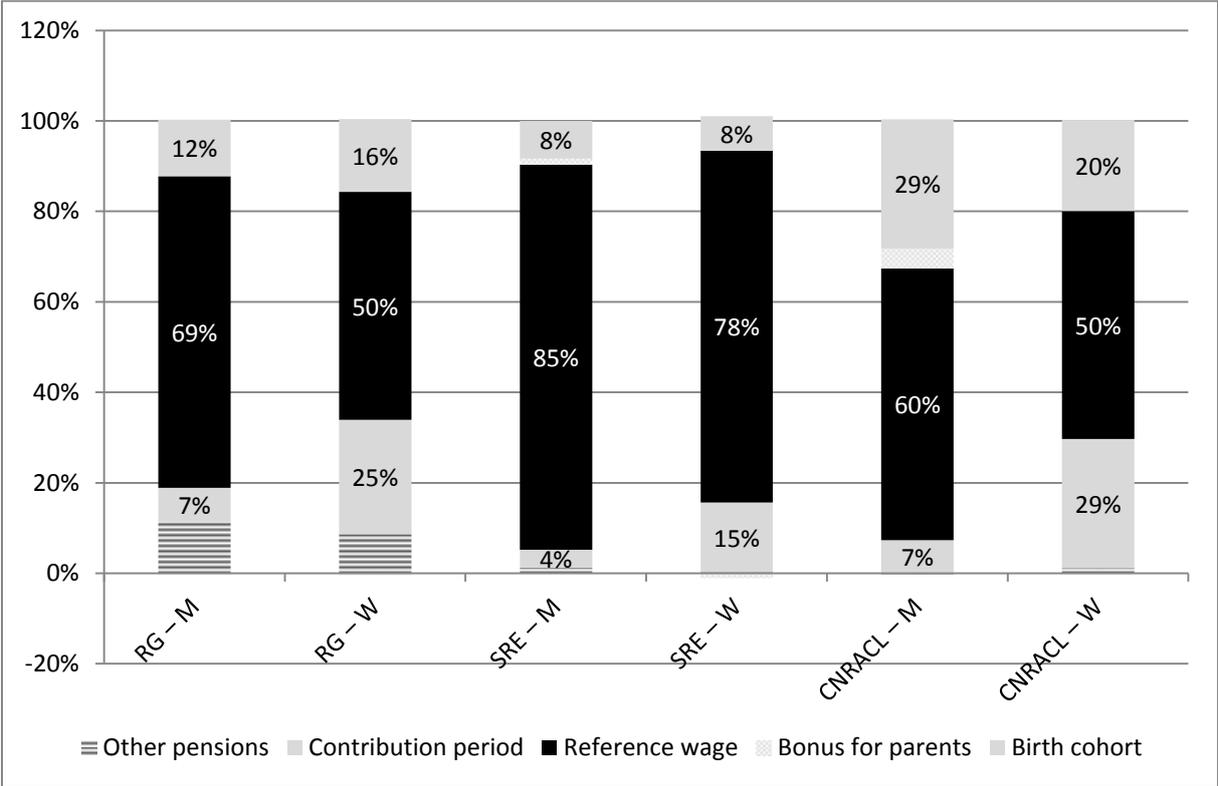
Figure 8 – Decomposition of the Gini coefficient of direct entitlements, by pension component



Source: EIR 2008, Retirees born between 1930 and 1942 with direct entitlements, as of December 31, 2008

Note: Among female retirees of the General Scheme, 24% of the dispersion of pensions, measured by the Gini coefficient, is due to differences in contribution periods; 51% is due to differences in reference wages. The impact of the two other components – bonuses for children and residual – is marginal. The residual accounts for 17% of total dispersion.

Figure 9 – Decomposition of the Gini coefficient for direct entitlements, by component (birth cohorts 1930 to 1942)



Source: EIR 2008, Retirees born between 1930 and 1942 with direct entitlements, as of December 31, 2008
 Note: Among single-sector women retirees from the General Scheme born between 1930 and 1942, 25% of the dispersion of their direct entitlement pensions, measured by the Gini Coefficient, is explained by contribution period and 50% by reference wage. The contribution of bonuses for retirees who have had three or more children is small. The residual explains 16% of total dispersion.

Table 1 – Contributions of different pension sources to total pensions dispersion for single-sector women from the private sector

Component of the total pension	Share of component S_k in total pension	Gini coefficient of income source k G_k	R_k	Contribution $S_k R_k G_k$	Contribution (%)
General scheme direct entitlements (without supplements to reach minimum)	0,437	0,432	0,713	0,135	0,378
Contributory minimum (added to General scheme direct entitlements)	0,058	0,673	-0,325	-0,013	-0,036
Complementary direct entitlements	0,208	0,646	0,797	0,107	0,302
Survivor's pension (without supplements to reach minimum)	0,251	0,754	0,640	0,121	0,340
Contributory minimum (added to survivor's pension)	0,005	0,955	0,143	0,001	0,002
Bonus for children added to direct entitlements	0,022	0,752	0,241	0,004	0,011
Bonus for children added to survivor's pension	0,010	0,897	0,496	0,004	0,013
Means-tested allowances for the elderly (ASPA, ASFSV)	0,010	0,975	-0,375	-0,004	-0,010
Total pension	1,000	0,355	1,000	0,355	1,000

Source: EIR 2008, Retirees with direct entitlement, as of December 31, 2008

Note: The contribution of each component of the total pension is the product of the component's share of the total pension S_k , of inequalities in the distribution of the component, measured by the Gini coefficient G_k , and of factor R_k which measures differences in ranking of individuals by their share of total income and ranking by their share of income source k .