Derived rights pensions and implicit debt of pension plans: an assessment on French data

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** draft version*

Summary

The purpose of this article is to measure the magnitude of the commitments of the French public PAYG pension system towards derived rights retirees. This is done by assessing the amount of savings that each deceased insured should have bestowed to his surviving spouse as an annuity equivalent to the derived rights pension paid by the pension system. This new component of the heritage is called patrimonial equivalent of pension rights (PEPR). For our assessment, we used the method of "acquired rights", which consists of actualizing future acquired pensions depending on each individual situation. In this study only the derived rights pensions are taken into account for pensioners alive at the 31 December of 2008. The data source used for this purpose is the *Echantillon Interrégime des Retraités (EIR 2008)*. Thus, our assessment indicates an implicit debt of € 292.85 billion of pension system with a 2% discount rate corresponding to 10.21 years of pensions of 2008. We also find that, when compared to other assets such as financial products and real estate investment, the distribution of PEPR is less unequal across the retirees population. Furthermore, we estimate a linear econometric model for measuring the sensitivity of the PEPR to the retirement characteristics of individuals or of their deceased spouses. We find that the individual's age has a dual effect on the PEPR; the PEPR grows with liquidation's age in men but the opposite effect happens among women; and there is a high sensitivity of the PEPR to the amount of the pension received by the deceased spouse or that he would have received before his death.

Keywords: derived rights pension, patrimonial equivalent of pension rights, acquired rights, heritage, *Echantillon Interrégime des Retraités*.

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1. Introduction

In recent years, the legislation on derived rights[2] in France has changed significantly. The beneficiary population of derived rights is significantly different from the recipients of direct rights, due to special conditions of openness and service of pensions. At the individual level, the survivor's pension is half of the overall pension of beneficiaries[3]. At the macroeconomic level, derived rights are nevertheless important.

The survivor's pension is a pension benefit paid in cash, after the death of the insured person in activity or retired to his surviving spouse and/or his or her former spouses if divorced. This is a derived right whose amount depends on the direct rights pension of the deceased spouse. Thus, the survivor's pension is a legal right that can be requested at any time after the death of spouse. If the survivor's pension exists in all pension schemes, its characteristics however depend on various criteria.

Since 1993, France has undergone several pension reforms, with the overall objective to ensure the sustainability of the PAYG pension system by controlling its financial balance in the long term. These reforms have generally reduced the generosity of basic schemes by making more stringent requirements for a full pension. Direct rights pensions are thereby primarily concerned, but the rules for calculating derived rights pensions or survivor's pensions were also substantially altered. These derived rights pensions, which in fact represent an annual expenditure of more than € 30 billion, or about 13%[4] of the mass of pensions of all schemes, have diverse rules between schemes (basic schemes, special schemes and supplementary schemes) so that there are income disparities and hence living standards between the beneficiaries.

Although the surviving spouse may be a man or a woman, survivor's pension benefits mainly to women, given the age difference at marriage and the difference in life expectancy. Also, during the creation of the first pension schemes for civil servants, it was considered that women had no professional activity because they dedicated themselves to the education of their children, which were more numerous than today. Therefore, as they could not acquire direct rights pension, it appeared logical that they could benefit from generous survivor's pensions at the time of their husband's death. However, the tendency to the generalization of female work, which lead to the acquisition of increased direct rights for women and the

[2] The derived rights include survivor's pensions, but also other devices such as widower's pensions or the life rescue. Given the importance of the survivor's pensions as derived rights (over 90% of the masses paid), we will speak of survivor's pension as derived rights in this paper.

[3] 12th Report of the Pensions Policy Board, 2013.

[4] Social Security Branch, 2012.

opening of the right of survivor's pension for men have slightly changed the logic of the original scheme.

Thus, any individual receiving a pension has potentially a "fictitious heritage" that will run out as he moves forward to his age of death. This "fictitious heritage" is then called patrimonial equivalent of pension rights (PEPR) and constitutes an implicit debt of a pension plans towards its beneficiaries.

The purpose of this article is to evaluate the implicit debt of the French pension plans towards the pensioners living in 2008 and who perceive the survivor's pensions. The reasoning consists on considering that pension schemes have a debt towards their current pensioners, which is the counterpart of the contributions made by their deceased insured spouses to finance pensions of previous generations. Our study aims to calculate this implicit debt at the macroeconomic level but also at the microeconomic level called patrimonial equivalent of pension rights (PEPR). The PEPR hence constitutes a component of the heritage of each retiree and is not transferable immediately (fictitious heritage) unlike other components of heritage that are for example financial and housing wealth. The methodology used for this purpose will consist on an actuarial calculation of the probable value of future pension benefits of retirees by an "acquired rights approach".

The scarcity of studies on derived rights pensions in France and the importance of the growth of these rights as a percentage of the pension benefits paid by the pension system are all elements that question the characterization of this particular population of retirees receiving derived rights. Thus, this paper contributes to enlarging the scope of the field of retirement pensions in France by providing a wider view on this matter.

The rest of the paper is organized as follows: the second section is devoted to a brief overview of the French pension system and of various current reversion devices depending on the pension schemes and on the evolution of the legislation on survivor's pensions since 2003; in the third section, we present different methods of implicit debt evaluation with emphasis on the method of "acquired rights" used here for our assessment; the fourth section will mobilize the data of the *Echantillon Interrégime des retraités (EIR)* for a descriptive characterization of the population of beneficiaries of derived rights and for the evaluation and analysis of the implicit debt of retirees in 2008 ; finally, the last section concludes the paper.

2. The French pension system and its reversion devices

The aim of this section is to introduce the reader to the functioning of the French pension schemes in general, and in particular of reversion devices. It is also for us the opportunity to

make a brief overview of cessation activity schemes in France and conjugal rights mechanisms in France's different pension schemes.

2.1. Evolution and current structure of the pension system

In France, after the Second World War, the creation of social security and the gradual but widespread extension of pension insurance to all the active population (private sector employees, non-employees, servants) allowed the society to provide to individuals whose advanced age no longer permits the intellectual or physical exercise of a professional activity, an alternative income for the rest of their lives. Originally, replacement revenues consisted primarily on basic pensions and were gradually enriched with supplementary pensions with the creation of the AGIRC for executives of the private sector and the ARRCO in 1961 for all employees of the private sector. Act No. 72-1223 of 29 December 1972 formally establishes the generalization to all employees and former employees of the private sector the compulsory affiliation to a supplementary pension scheme.

The post-war economic boom sees the rise of the Welfare State and all its social protection systems (health, family, unemployment, invalidity, old age). This period of sustained economic growth (close to 5% per year on average) and social progress resulted in a significant improvement in the living conditions of pensioners: on the one hand, there was an increase in pensions stronger than wages; on the other hand, life expectancy at retirement and in good health increased (life expectancy increased from 67 years in 1950 to 81 in 2010).

After the first oil crisis however, the gradual entry of the French economy in a relatively more modest growth cycle (of the order of 2% on average) does not stop these improvements. Additionally, rising unemployment led to the promotion of youth employment at the expense of senior employment (over 55 years). This logic favored the emergence of early retirement devices and the adoption of one of the most emblematic pension reforms of the 20th century in France: the "Retirement at 60". Driven by Law No. 83-430 of 31 May 1983, it gives an opportunity for all employees to leave at full rate from the age of 60 years on the condition of having validated 150 quarters of contribution. During the same year, an agreement of February 4, 1983 harmonized the conditions for the payment of a pension in the basic and supplementary schemes (AGIRC-ARRCO) by reducing from 65 to 60 the age at which rights to a supplementary pension are open, provided they had contributed the required number of quarters (150).

The 1993 reform, implemented starting from January 1st, 1994 is the first significant break in the evolution of liquidation conditions of retirement and the calculation rules of a basic pension in the pension schemes of the employees in the private sector. There were various elements that were jeopardizing the financial equilibrium of France's different pensions schemes: the deformation of the age pyramid, generated both by unfavorable changes in the birth rate and increasing life expectancy, but also an insufficient employment rate of older workers. Because of this, this reform is the first to toughen the conditions of access and the pensions calculation method. Those that followed (2003, 2008, 2010, 2014) had the main aim of balancing revenue and expenditure for France's various pension schemes, without reduction in pensions paid. They rely heavily on extending the period of activity, in a compulsory or voluntary way, in order for contributions to offset benefits paid.

Among these reforms, the law No. 2003-775 of 21 August 2003 is distinguished by a willingness to go beyond the safeguarding of the PAYG pension system. It therefore forms "the ability for anyone to access individually or in connection with his professional activity, to one or more financial products reserved to planning retirement, in conditions of financial security and of equality of taxation, in addition to the mandatory PAYG pension schemes". Thus, one gives to the financial intermediaries the management of an optional supplementary pension system. Two channels are then offered: the individual channel and available to all (the popular retirement savings plan - PERP), the collective channel for those which access to savings in companies (collective retirement savings plan - PERCO).

The current French pension system (Figure 1) is a complex set of schemes enabling to insured persons access to basic pensions and supplementary pensions (mainly following PAYG schemes) that coexist with supplementary pensions financed by individual or collective capitalization. The system is characterized by segmentation of schemes following the professional category of participants (active, retired), which leads to three major sets of schemes pension:

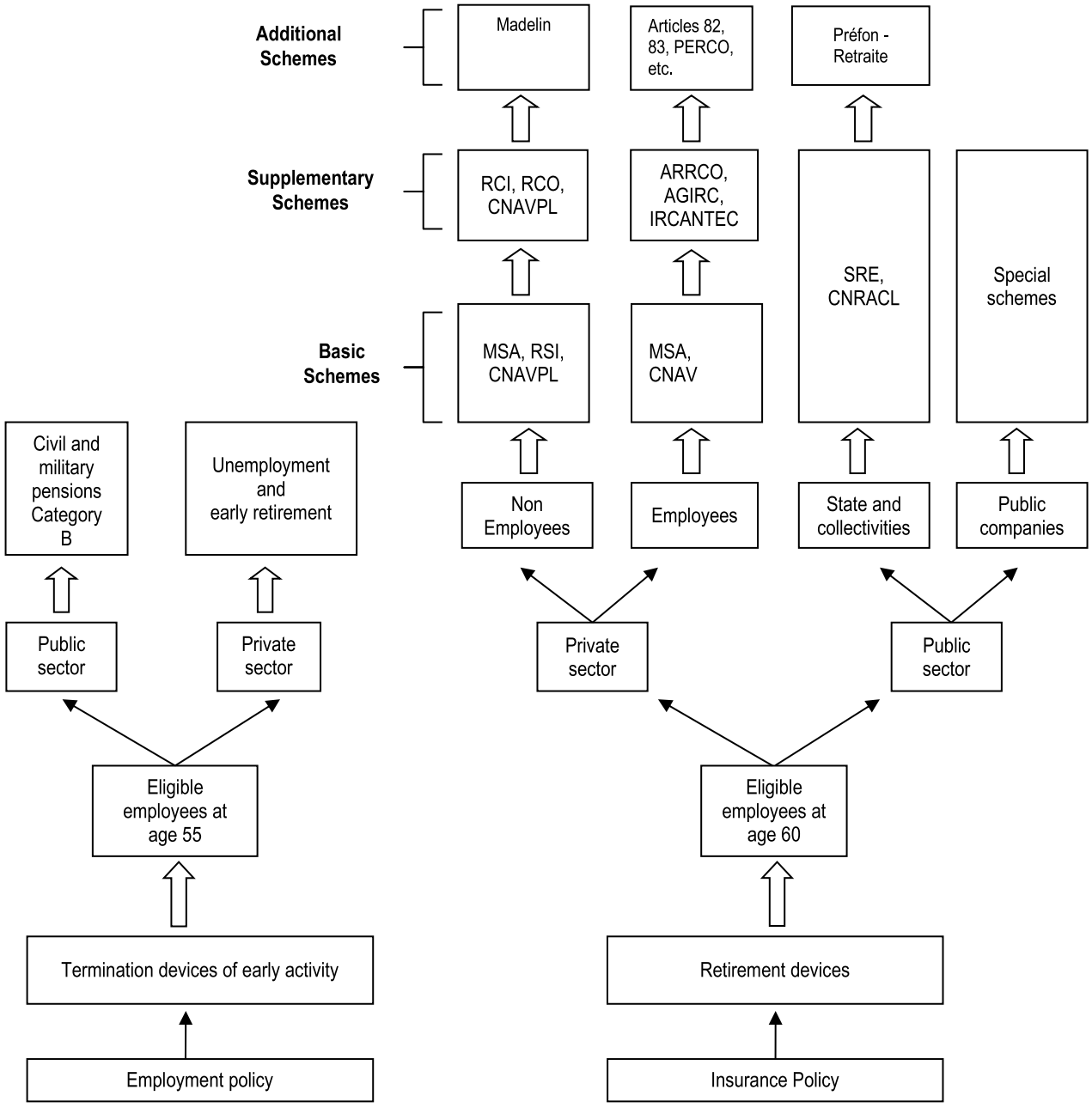
- The first set includes the basic and supplementary plans of employees of the industry and trade managed respectively by CNAVTS, AGIRC and ARRCO, and agricultural workers managed by the MSA. The non-permanent staffs of the Public sector depend for their basic pensions on the CNAVTS and for their supplementary pensions on the IRCANTEC.

- The second brings together the independent workers schemes, namely those craftsmen managed originally by CANCAVA, those of industrialists and traders managed originally by ORGANIC, the agricultural non-employees managed by the MSA, the liberal

professions unified and managed by CNAVPL since 1st January 2004, lawyers managed by the CNBF, and clergymen managed by CAVIMAC. The pension schemes of craftsmen and traders came under the management of a single agency in 2006, RSI, before their actual merger on 1 January 2013.

- The third set includes the pension schemes of civil servants and military personnel as well as pension schemes for employees of public companies and some private companies, referred to as special schemes. The pension benefits of civil servants, judges and military are managed by the SRE while those officials of local authorities and hospital workers depend of the CNRACL. The seven main special schemes are: regimes of SNCF (CPRSNCF), RATP (CRPRATP), the electricity and gas industries (CNIEG), the Bank of France, sailors (ENIM), Mines (CANSSM), clerks and notary's employees (CRPCEN). They are managed by autonomous social security institutions or by the *Caisse des Dépôts et Consignations* (CDC). These pension schemes were designed, in their creation, to reward certain personal subjected to high stresses in the exercise of a profession of vital importance to the nation.

Figure 1 : Termination and Retirement devices in France



Source : Final Report Risque Epargne Salariale Retraite (RESAR), 2014.

Like the Public Sector regimes and special schemes, the schemes of the non-employees of the private sector are "integrated", i.e. a single pension fund manages both the basic pensions and the supplementary pensions. The compulsory membership of all non-employees to a supplementary scheme is relatively recent, especially for agricultural non-employees (in 2003) and traders (in 2004). Since 1st January 2009, the ten professional sections that insure the steering and the management of supplementary schemes for liberal professions are

grouped within the CNAVPL. In addition, five groups of liberal professions with conventions with social security have established an obligation to join an additional scheme that allows them to perceive "old age social benefits" in retirement. These are doctors, dentists, physician assistants, midwives and directors of private laboratory of medical analysis.

Overall, the French pension system has as many basic schemes (a little over thirty main pension schemes) as supplementary schemes structured according to the professional category of the insured persons. At these two old hedging levels, we can add a third level which includes all additional pension schemes subscribed according to the personal or professional context of the individuals. This third pillar, like the first two, is characterized by a more nuanced differentiation by the socio-professional category of membership of the insured persons. Indeed, the popular retirement savings plan (PERP) subscribed in a personal context is available to all employees while the *Préfon-Retraite* is for servants and *Madelin* contracts are for the independent workers.

2.2. The reversion devices in France

Marital rights in the French pension system are called "derived rights", and consist mainly on survivor's pensions. If the reversion system currently maintains an average standard of living of widows and widowers after the death of their spouse, this average hides many disparities with overcompensation effects and, therefore, net losses in standards of living. These disparities are reinforced by differences difficult to justify in design and rules of survivor benefits between schemes.

Due to the sensitivity of the subject represented by widowhood and to a very heterogeneous support of the surviving spouses according the schemes, changes in reversion regulation were most often the result of punctual reforms and favorable to the surviving spouses.

The management of widowhood differs greatly depending on the pension schemes. Three groups of schemes can be identified: the first group consists on the general scheme and aligned schemes (RSI, MSA employees and non-employees, CNAVPL), the second group consists on the pension schemes of the public sector and special schemes, and the third group includes compulsory supplementary schemes. The table below summarizes the different conditions of opening of the survivor's pension in these regimes groups.

Table 1: Summary of the reversion devices depending on the pension schemes

	General scheme and aligned schemes	**Supplementary schemess**	**Public sector and special schemes**
Beneficiaries	Surviving spouses, divorced and even remarried	Surviving spouses, divorced not remarried	Surviving spouses and divorced spouses (in case of remarriage, civil union or cohabitation, the survivor pension is suspended)
Reversion rate	54% (conditionally ported to 60% with survivor pension increase)	60%	50%
Income's condition	Yes	No	No
Age Requirements	Yes, 55 years (51 years if death before 1 January 2009)	Yes, 55 years (Arrco), 60 years (Agirc) no condition if invalid or if two dependent children	No
Marriage duration's condition	No	No	Yes, minimum of 4 years of marriage

Source: COR (2012), "Recent regulatory developments relating to the reversion" Document 2, Plenary Session of June 27, 2012.

In the general scheme and aligned schemes, survivor's pension shall be granted to the surviving spouse who is at least 55 years old when his income is below a certain threshold. Survivor's pension is attributed to married spouses at the time of widowhood but also to divorced spouses even remarried; no minimum duration of marriage is required for entitlement to a survivor's pension. In the case of several survivors spouses, survivor's pension is distributed depending on the duration of the respective marriages. At the death of a surviving spouse, its share of survivor's pension comes to increase that of the other or others surviving spouses. The theoretical reversion rate is 54%.

If the insured person was died or disappeared without receiving a retirement pension, a preliminary step is necessary: the pension scheme calculates fictitiously the pension that deceased person would have had. At the general scheme and aligned schemes, the pension is

automatically calculated at the full rate of 50% regardless of the insurance period validated. However, the pension is prorated and calculated taking into account the best 25 years of wages following the same conditions existing for the calculation of a direct right's pension.

Finally, if the deceased was receiving pensions of several aligned schemes, the surviving spouse is entitled to a survivor's pension of each of these schemes. To make things easier for the widowed spouse, a coordination between the aligned schemes has been in place since 2006: the surviving spouse fill in one pension application form for all schemes and will have only one pension scheme as the unique interlocutor, who is in charge of coordinating pensions instruction, of calculating the distribution of capping between schemes as appropriate and of ensuring information near the surviving spouse.

In schemes of the public sector and special schemes, survivor's pension is attributed without conditions of age or resources. It is suspended as long as the surviving spouse remarries, is on a civil union (PACS) or cohabiting. It aims to support all widowhood situations, regardless of the age of the surviving spouse. In cases of multiple surviving spouses, survivor's pension is distributed depending on the duration of the respective marriages. The reversion rate is 50%.

Supplementary schemes concern private sector employees. Thus, the beneficiaries of the survivor's pension in the general scheme and/or aligned schemes may receive a pension of supplementary schemes at the rate of 60% and without income condition.

2.3. Evolution of the legislation on survivors' pensions in the aligned schemes

The 2003 reform has made substantial changes to the legislation for the new beneficiaries of derived rights. The objectives of this reform were to simplify the rules for attribution and open the field of reversion to a wider population. The three major conditions inherent to the survivor's pension were notably changed.

The extended marriage requirement:

Since 1st July 2004, the divorced former spouses, even remarried (to the general scheme and aligned schemes) can benefit from the survivor's pension. This is not the case for other forms of union (PACS, cohabitation, etc.). Moreover, the marriage duration requirement was repealed by the 2003 reform. However, if the deceased insured was married several times, survivor's pension is shared between the former spouses and surviving spouses in proportion of the duration of each marriage.

Income's condition modified in depth:

From July 2004, changes in resource condition and the inclusion of personal rights have been operated. Indeed, if the 2003 reform abolished the rules of non-cumulation between survivor's pension and personal pension, it has also expanded the resource base. The new resource condition based on a broad base occurs both at the opening of the rights and when calculating the pension.

The age requirement put into question:

The 2003 reform included the elimination of the age requirement after a gradual lowering of the minimum age for access to survivor's pension. On 1st July 2005, the minimum age went from 55 to 52 years and then to 51 years on 1st July 2007. The reduction to 50 years, scheduled for 1st July 2009 and the total abolition of the age requirement scheduled for 1st July 2011 were put into question on 1st January 2009, with a return to an age requirement of 55 years for surviving spouses. However, insured persons whose spouse died before 1st January 2009 may still be entitled to the reversion since age 51. The widow allowance was made permanent with the return of the age requirement for reversion. This allocation of a single amount is indeed paid on a means-tested condition for two years maximum to the surviving spouses who do not have the required age to benefit from the reversion.

A survivor's pension increase*:*

A survivor's pension increase was implemented on 1st January 2010. The aim is to raise the rate of the survivor's pension to 60% (from 54% to 60% for the aligned schemes), but only for the most modest insured persons. The increase is applied under three conditions: the insured must have reached the full rate age (65 years at the time of the creation of the increase, which will reach 67 years in 2022 under the effect of the 2010 reform); have liquidated all his pension rights (subsidiarity) and have resources not exceeding 852.40 euros a month from 1st January 2015. This increase can be reduced and possibly revised in the event of change in resources.

In summary, the Evolution of the legislation on survivors' pensions has mainly affected the general scheme and the aligned regimes and legal elements giving the various changes in legislation relating to reversion are reported in table A6 (in annex)

3. Implicit debt of pension plans: definition and methodology[5]

Numerous studies have been devoted over the past fifteen years to the future of pensions and measures to cope with the demographic evolutions. The reforms implemented in 1993 and 2003 aimed at reducing the need for financing resulting from the aging of the population. But these needs are likely to remain on the upside (COR, 2006) and also be combined with the increasing needs in other areas, such as health. Moreover, these difficulties will intervene in a budgetary context that is not favorable. The public debt of France rose almost continuously over the past 35 years, reaching over two thirds of GDP against 20% in 1980. The need to identify new resources coincides with a high current debt and it is natural to try to measure these phenomena in terms that are directly comparable. It is this logic that pushes to express the commitments of pension schemes as an "implicit" debt.

Indeed, the "implicit" debt generally includes all the commitments that are not contractual or who are not registered irreversibly in law but which result from the extension of current policies or which correspond to expectations that citizens have about future policies (Heller, 2003).

Thus, these implicit commitments are obviously very diverse, and an element of the debate is precisely to discuss their perimeter. For example, should we and can we evaluate the implicit commitment of governments to finance the education of future generations, to protect the environment, to continue to ensure its state functions, to shoulder to a certain level the burden of health spending or addiction? These issues will not be addressed in this paper, which will be limited to discussing the interest of this approach for retirement pensions and in particular those of derived rights pensions. In this more restricted framework, the definition of implicit commitments also called PEPR is conceptually easier: these are all the pensions of derived right to honor in the future by the pension schemes on the basis of existing rules or already planned as part of the reforms adopted. For the assessment of these implicit commitments, several methods exist, but the three methods mainly found in the literature are:

The "closed system" approach: this approach assumes that the pension scheme continues to exist until the death of the last contributor and does not account for new entrants to the scheme. The PEPR is therefore equal to the sum of two masses: the present value of the pensions that will be paid to contributors when they will have finished their careers, net of the remaining pension contributions that will be collected until the retirement of the last

[5] Unless otherwise stated, this part refers to the writings of Blanchet and Ouvrard (2006) and those of Buffard-Girardot (2010)

contributor; plus the present value of the stream of pensions that will be paid to already retired individuals. This method allowed Blanchet et al. (2006) to assess the amount of implicit debt of pension systems in a macroeconomic approach through the DESTINIE microsimulation model. Thus, for individuals in activity and retired in 2005, they found an amount of the implicit commitment of €7429 billion with a 2% discount rate, which is equivalent to 34.5 years of 2005 pension benefits and 4.5 years of 2005 GDP. Vernière (1992) had already made assessments for the 1970-1985 period and found an average level of about 2.8 years of GDP with a discount rate equal to the growth rate plus 2%.

The "open system" approach: the open system approach complements the previous method by adding the present value of pensions minus the contributions of future generations, new entrants into the pension scheme. But this method is useful mainly to assess the reserves that pension system should have, without increasing contributions, to cope or running its deficits in the future. It synthesizes future imbalances of the pension system but it is not suitable for the calculation of a patrimonial equivalent of pension rights.

The "acquired rights" approach: this approach supposes that the pension system is a company which grants retirement pensions. At a given time, the population of people affiliated to a system is comprised of two groups: those already retired and those in mid-career who have not finished accumulating their rights in the pension system. If we imagine that such a system is forced to close, for example following the demise of the insurance company, then two kinds of commitments would need to be honored towards the affiliates: to serve the pensions of current retirees until their death (or until the death of the spouse if reversions are taken into account), and to pay current contributors, during all the period of their future retirement, the retirement rights that they have already accumulated to the current date. Moreover, even if the risk of closure was excluded, it seems natural to subtract the mass of these "acquired rights" to the carrying value of the company: a buyer of the company indeed takes not only into account its explicit assets and liabilities, but he also incorporates these pension commitments towards employees or former employees of the firm and the actuarial equivalent of such commitments must be taken into account in the company's purchase price. This is required by international accounting standard called "IAS 19" recommended by the International Accounting Standards Board (IASB) and adopted by the European Commission since 2003. The idea is to extend this methodology to all or part of the mandatory pension systems. The goal is not to propose a rigorous evaluation, but simply to give a numerical illustration of the properties of this indicator. In France, this assessment has

been done for some time for the civil and military pensions regime (Pellé, 2006), based on the ARIANE simulation model of the Budget Directorate. Since 2003, this assessment is presented in the General Account of the Finance Administration. These calculations lead to a high assessment of the Government's pension commitments in "acquired rights" from 790 to 1,000 billion euros, representing between 17 and 22 years of civil and military pensions, or 0.5 to 0.6 years of GDP. Blanchet and al. (2006) estimate for individuals in activity and retired in 2005 an amount of implicit debt between 5419 billion euros (4% discount rate) and 7847 billion euros (2% discount rate) using the microsimulation model DESTINIE. This represents between 25.2 and 36.4 years of pension benefits in 2005, and between 3.2 and 4.7 years from 2005 GDP.

Following Vernière (2002), one can summarize the three methods of "acquired rights", "closed system" and "open system" as follows: one begins at t_0 date and we look the flow of pension benefits and contributions for dates $t > t_0$, isolating the following flow categories (in actuarial sum):

- DAR : "acquired rights" of individuals already in retirement;
- DAC : "acquired rights" by current contributors (based on their past contributions);
- DFC : future rights of current contributors, i.e. the rights that they will acquire, net of contributions they will pay for the rest of their working lives;
- DNE: the rights of new entrants, i.e. the future rights of the individuals of current and future generations who have not yet started to contribute in pension system, net of contributions that they will have to pay on throughout their working lives.

All these quantities are according to current legislation, summed and discounted at a given rate *r*. On this basis, the three indicators of commitments can be characterized as follows:

- DAR + DAC summarizes gross commitments in "acquired rights";
- DAR + DAC + DFC summarizes the net commitments towards all the individuals who are in the pension system;
- DAR + DAC + DFC + DNE summarizes all the net long-term commitments, including towards future generations who have not yet entered the pension system.

Debt, savings and intergenerational transfers

The measure of implicit debt overlaps concepts encountered in the economic literature on

savings or intergenerational transfers. The concept of acquired rights is the exact counterpart of the concept of patrimonial equivalent of pension rights (PEPR) of individuals or households. The principle of PEPR is to assimilate the pension rights of individuals to a form of capital, i.e. the amount of capital that they should have to their current age to ensure them during retirement a rent equivalent to the amount of pension rights already acquired at this age. This concept has two main uses. For example, it was used to test the hypothesis of a crowding out effect between the pension system and private savings, following the seminal paper by Feldstein (1974). It is also interesting in the microeconomic analysis of heritage inequalities: for example, we know that independent workers usually have more wealth than employees but this partly compensates for the relative weakness of their pension rights. A fairer comparison of levels of wealth may therefore try to take into account these substitution effects between the real capital and the virtual capital formed by these pension rights.

4. Assessment of the implicit debt of pension plans towards the derived rights retirees

4.1. Database and descriptive statistics

4.1.1. Database

The source of information used in this study is the *Echatillon interrégime des retraités (EIR)*. This administrative database, carried out by the Directorate of Research, Studies, Evaluation and Statistics (Drees) of the Ministry of Labor, Employment and Health, was the first attempt to overcome the administrative complexity of the French pension system.

The sample is representative of the population of retirees and covers all mandatory pension schemes in France. It allows observing the evolution of the number and composition of retirees, describing the starting conditions for retirement (number of quarters, rates and circumstances of liquidation, discount and/or premium of pension, etc.) and reconstructing the amount of the overall retirement for an anonymous sample of individuals. Six waves of the EIR are available today: 1988, 1993, 1997, 2001, 2004 and 2008, the last wave being the one used in this study. Thus, the EIR is a panel: the individuals and generations belonging to the sample of a wave are re-selected in the next wave, except in case of death, suspension by a pension scheme or over-sampling. Thus, one can finely observe the evolution of pensions between two waves; and distinguish the effect of different factors (revaluations of pension, acquisition of new rights, liquidation of new retirees' pensions, disappearance of the deceased, etc.). The EIR 2008 provides information on pensioners alive the 31st December 2008. One generation in two is included in the sample (one in three for older generations and

two out of three for the younger generations in the EIR 2008) in varying sizes: only individuals born the first week of October, the first two weeks of October or in some rare cases the first three weeks of October.

4.1.2. Descriptive statistics

Derived rights are a determinant pension benefit for the standard of living of many retirees. The survivor's pension is an essentially feminine benefit, attributed over 90% of the time to women who most often have little or no work. The table below shows the evolution between 2001 and 2008 of the average amount of derived rights (for all schemes) and the share of women in the population of beneficiaries.

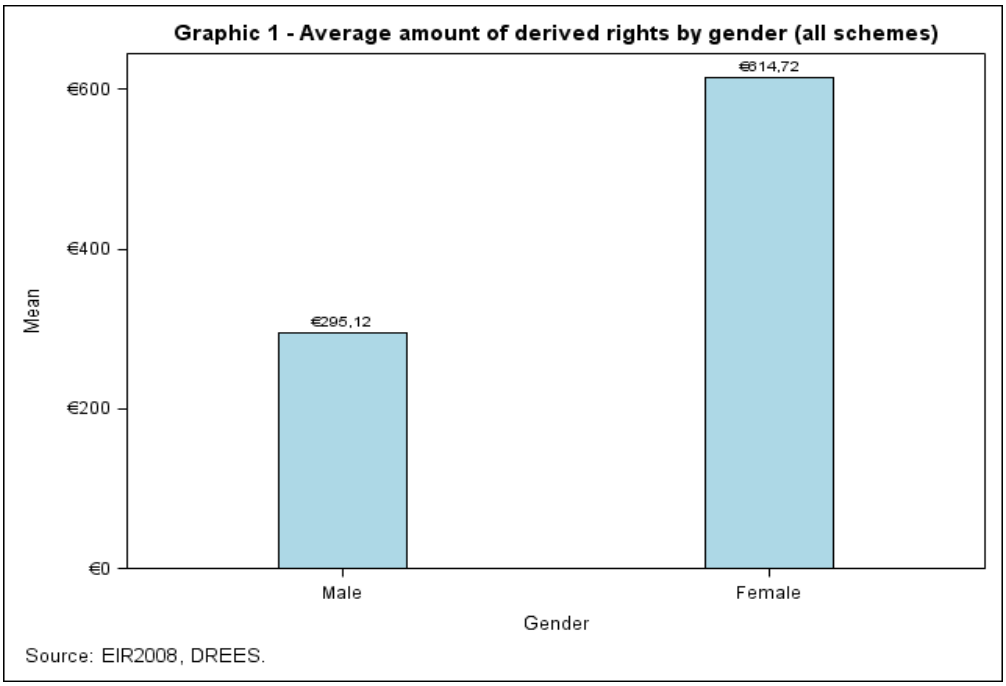
Table 2: Evolution of the average pension (for all schemes) in euros and of the proportion of women in the population of beneficiaries of derived rights

Year of EIR **Schemes**	**2001**	**2004**	**2008**
Mean for all schemes	444.37	522.92	588.43
% of women in the population	93.65%	91.91%	91.77%

Source: EIR 2001, 2004 and 2008, Drees.

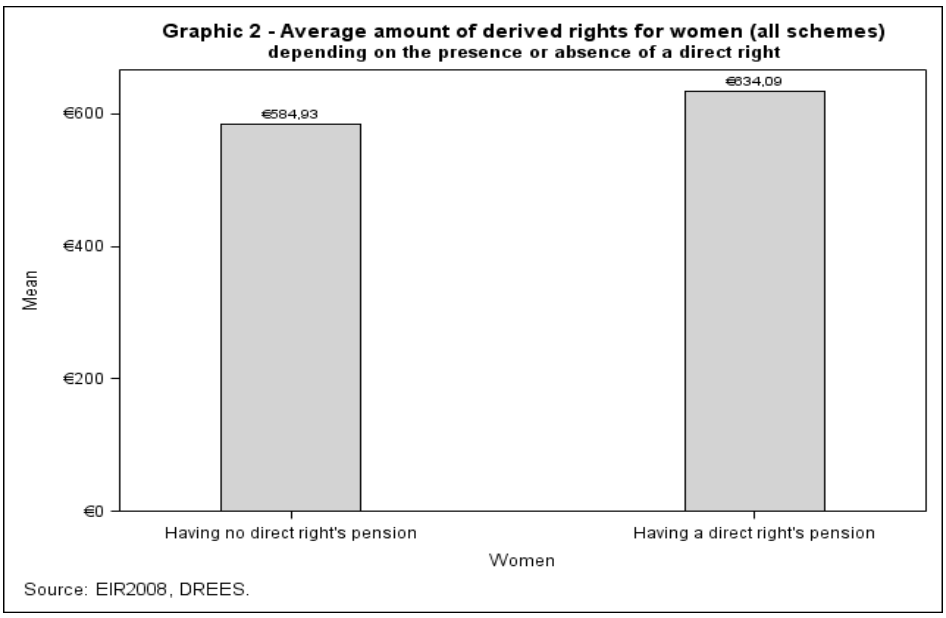
Thus, the average pension has increased slightly over the 2001-2008 period, probably due to the presence of new beneficiaries with higher derived rights pensions ("noria effect": indeed, pensions for new recipients are higher because of the specific rights over their deceased spouses' more important pensions, having benefited from more favorable wage careers) and also due to the revaluation of pensions that takes into account the level of inflation in order to maintain the purchasing power of pensioners.

It also appears from the graphic below that the average of "derived rights all schemes" observed among women in 2008 is more than twice that observed in men.



Thus, a woman received an average of € 615 of derived rights in 2008, while among men, the average was € 295 in 2008. This difference is due to the weakness of the female direct rights, deceased spouses of men, who have often less favorable wage careers than their male counterparts.

Among women who are beneficiaries of a derived right, 55.6% (Appendix Table A3) also have a direct right (main advantage of direct right) and the "average pension all schemes" in these is slightly higher than in those who do not have direct right, as well as shown it the graph below.



Indeed, this difference in average pensions between women who have a direct right and women who do not have a direct right is due to differences in social classes between beneficiaries that come from a homogamy of the professional category in France. Generally, women with an occupation (holders of a full right to retirement) are in a couple with men having higher rights to retirement, which also results in a higher survivor's pension on the death of their spouses.

The table A1 in appendix on changes in ages of pension's liquidation illustrates the evolution of the legislation on reversion due to the 2003 reform in the general scheme with the opening of the age requirement for individuals under 55 years from 1st July 2005, which resulted in an increase in the number of beneficiaries at young ages in this scheme. Furthermore, the average pension is always higher in the Public sector schemes (Graphic A1) because those schemes do not have a resource condition causing the capping of the survivor's pension. Indeed, the rules of openness and service of derived rights are more stringent in the private schemes than in the public schemes.

4.2. Practical calculation of the PEPR and Analysis of Results

The assumptions made for the assessment of the patrimonial equivalent of pension rights of derived rights beneficiaries are:

- The derived Rights beneficiaries live up to 100 years maximum;
- The personal situation of each retiree of derived rights is unchanged throughout his retirement (no marital status change for civil servants, no change of resource level for private sector employees, etc.);
- Given that the pensions are revaluated following inflation and that we do not have revaluation coefficients after 2013, we make the assumption of a long-period inflation of about 1.5% (that is i.e. pensions are adjusted annually from 2014 by 1.5% and the discount rate reflects this revaluation).

Based on these assumptions, the PEPR of an individual i is noted $EPDR_i$, having an age a_i in 2008, an annual pension of derived rights $P_{i2}(t)$ in year t (t=0 for the year 2008), and conditional survival probabilities $L(a_i + t|a_i)\ t = 0,2, \dots, (100 - a_i)$, is given by the following formula:

$$EPDR_i = \sum_{t=1}^{100-a_i} \frac{L(a_i + t|a_i) \times P_{i2}(t)}{(1+r)^t}$$

Thus, the total implicit debt of the pension plans towards the derived rights beneficiaries living in 2008 is given by the formula:

$$EPDR = \sum_{i=1}^{N} Pond(i) \times EPDR_i = \sum_{i=1}^{N} Pond(i) \times \sum_{t=1}^{100-a_i} \frac{L(a_i + t|a_i) \times P_{i2}(t)}{(1+r)^t}$$

Where r is the discount rate, N is the number of individuals in the EIR and *Pond(i)* is the weight of the individual in the sample (weight variable that allows the individual to be considered representative of a group of individuals in the population). The monthly pension, available in the EIR, is multiplied by 12 to get the annual pension in 2008. But the implicit debt is valued starting from 2009 upon the death of individuals in the EIR. Conditional survival probabilities are derived from the tables of average mortality of INSEE over the 2000-2008 period. Individual PEPR is perceived here as the sum of the benefits derived rights updated in 2008 that the pension system will have to pay to each individual from 2009 until his death knowing the individual's age in 2008, a_i.

The evaluation was made under a fairly wide range of discount rates from 2% to 4%, the first rate being slightly higher than the overall long-term economic growth rate that is envisaged. The structure of the weights by age does not allow us to represent the rights profiles acquired by age. Indeed, the weights in the database were calculated by the designers for the representativeness of average levels and total levels of retirement pension by sex and by pension schemes and not by age. However, PEPR profile age should be very low at young ages, both because individuals in this age group have acquired very little derived rights of the death early on their spouses (generally before completing their career), and because the payment of the corresponding derived rights will intervene on a distant horizon and is therefore reduced by the play of the discount factor. Then he should grow with age as the acquired rights increase, and beyond a certain age, PEPR profile should finally diminish with the decrease in the number of individuals concerned and the shortening of their remaining life.

An actualization at a higher discount rate gives a lower PEPR at all ages as translates the evaluation formula: the reserves that would have the equivalent capitalization system are indeed lower the higher the interest rate on its reserves. The total implicit debt of pension

system towards the derived rights retirees is the weight of future pension commitments in the GDP, and therefore allows to evaluate the long-term sustainability of pension plans or the sustainability of public debt integrating this implicit debt. The resulting values are given in table 3, both in billions of euros 2008, in benefit years of 2008 and as a percentage of GDP 2008. The resulting amount varies between 8.63 and 10.21 years of mass current benefits (derived rights in 2008: € 28.69 billion), or between 12.81% and 15.15% of GDP in 2008 (GDP 2008: € 1,933.2 billion). That is, table 3 shows that the result is sensitive to the choice of the discount rate. A change of only one point in the discount rate brings down the amount of PEPR about 9% on average.

Table 3: Assessment of the patrimonial equivalent of pension rights from all French pension schemes, according to "acquired rights" method

	Discount rate		
	2%	**3%**	**4%**
PEPR in 2008 (in billions of euros)	292.85	268.58	247.67
As years of pension benefits 2008	10.21	9.36	8.63
As percentage of GDP 2008	15.15	13.89	12.81

Source: EIR 2008, Drees, Author.

At the individual level, the average PEPR of all schemes is shown in the table below:

Table 4: Average PEPR, all schemes by gender (in euros)

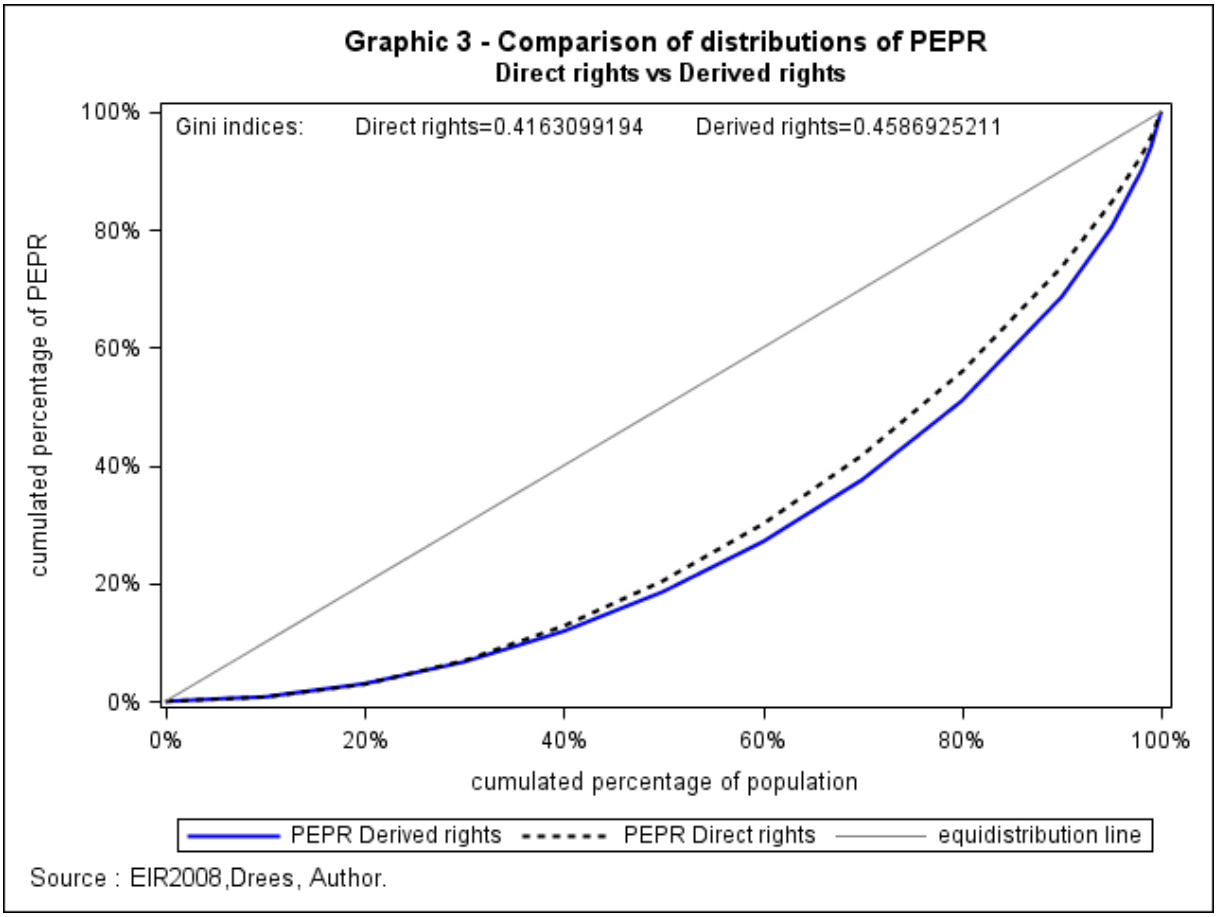
	Discount rate		
	2%	**3%**	**4%**
Men	34,463.81	31,629.3	29,187.31
Women	74,968.9	68,771.4	63,430.86
All	71,637.13	65,716.25	60,614.14

Source: EIR 2008, Drees, Author.

Thus, even at the individual level, the PEPR strongly depends on the present value of the derived rights pension received and therefore on the discount rate. Indeed, the amount of PEPR varies from an average of 71,637 euros for a discount rate to 2%, to 60,614 euros for a rate of 4%. The gender difference is also important since not only at a given level of derived rights pensions women had on average more than twice the average pension in men, but also the average differences of PEPR between the two sexes are still widening because of the differential mortality/survival favorable to women.

PEPR and inequality

For the analysis of the concentration of virtual heritage of derived rights retirees, we retain the discount rate of 2% because this rate is near the overall economic growth rate which was envisaged in the long term and in addition it corresponds to the actuarial return rate of the French pension system in 2008 (i.e. the rate at which contributions should be placed, in permanent regime, in an equivalent capitalization system used to achieve the same pension). Thus, the distribution of PEPR between the derived rights pensioners is represented by the graph below (solid curve). This graph, through the Lorenz curves, comparing the concentration of virtual heritage of beneficiaries of derived rights and of direct rights beneficiaries, with a diagonal called "equipartition line" or "equidistribution line" which represents an equal distribution of PEPR. The more the curve deviates from the diagonal and the more the distribution of PEPR is unequal.



Thus, 20% of the derived rights beneficiaries (the poorest pensioners in terms of PEPR) receive a maximum of 3.0% of total virtual heritage. Indeed, the first decile of derived rights retirees (10% of the poorest pensioners) has at most 0.77% of the overall virtual heritage while the last decile of derived rights retirees (10% of retirees richest in terms of PEPR)

captures 31 42% of this heritage and 1% of the wealthiest retirees keeps 5.89% of it. While an egalitarian distribution of available PEPR corresponds to a situation in which 50% of retirees would receive 50% of virtual heritage, we see that in France, 50% of the poorest pensioners of derived rights will reap only 18.62% of the overall virtual heritage. Comparatively to the PEPR of direct rights retirees, the distribution of PEPR of derived rights pensioners is slightly more unequal. Indeed, among retirees of direct rights, 50% of individuals, in the bottom of the distribution, capture 20.48% of the virtual heritage and the richest decile captures 26.36% of virtual heritage. Moreover, the Gini indices calculated (see Box appended on the calculation method) clearly confirm these differences in concentration between the PEPR of direct rights retirees and that of derived rights pensioners.

However, both situations above are less unequal than the distribution of financial heritage (wealth held in the form of financial assets such as cash flows, investment securities, etc.) of French households in 2008. Indeed, among the poorest households, 20% of these have 0% of total financial heritage and 50% only 5% of total financial heritage. This means that half of the households monopolize 95% of total financial heritage. Among the 50% wealthiest households, heritage is far from being evenly distributed, since 62% of total financial heritage is held by 10% of the richest households[6].

Thus, the PEPR (derived rights or direct rights) is less concentrated than the usual heritage (financial and real estate): the Gini indices (indicator of inequality) are lower for PEPR: 0.458 for derived rights and 0.416 for direct rights against 0.63 for the usual heritage of households in 2008. This lower concentration of PEPR is explained by the fact that it is based on a regulated pension system with capped contribution bases which themselves are based on regulated activity incomes or regulated activity incomes of the deceased insurant. Also, the existence of social minima and minimum and maximum pensions contribute to a more equal distribution of PEPR during the retirement period.

Finally, pensioners who receive the derived rights pensions from independent schemes hold the lowest virtual heritage (Table 5). This is because their deceased spouses had acquired little direct rights in these schemes, due to compensation of these direct rights by their real estate and financial heritage. Indeed, the independents have generally a greater housing and financial wealth than employees in France. So a fairer comparison of levels of wealth may

[6] la prise en compte des revenus du patrimoine dans la mesure des inégalités », Alexandre Baclet and Emilie Raynaud, *Economie et Statistique*, 2008

therefore try to take account these substitution effects between the real heritage and the virtual heritage that constitutes the PEPR.

Table 5: Distribution of virtual heritage of derived rights pensioners by sector of activity of the deceased spouse

Sector of activity of the deceased spouse	PEPR derived rights (in billions of euros)	In percentage of total	Average PEPR (all schemes)
Private sector	190.25	64.96%	57503.79
Public sector and special schemes	76.76	26.21%	79883.54
Indépendents	25.84	8.82%	25263.43
Total	292.85	100.00%	71637.13

Source: EIR 2008, Drees, Author.

Determinants of PEPR

By construction, the patrimonial equivalent of pension rights of beneficiaries of derived rights depends on the socio-professional category of the deceased, the deceased's activity sector, the amount of the pension received by the deceased at the time of death, the age of the beneficiary or his age of liquidation. However, we propose in this part to measure the sensitivity on PEPR of each of these characteristics through a log-linear model. Derived rights retirees are treated separately by gender because the population receiving the derived rights is composed mainly of women (over 90% in 2008), and therefore careers characteristics of their deceased spouses differ of those of men’s deceased spouses. The table below shows the results of log-linear models estimated.

Table 5: Results of log-linear models estimated

Variables	Men		Women	
	Model1	Model2	Model1	Model2
Constant	-0.473799 (0.4770773)	0.2617454 (0.4779444)	1.025915*** (0.2445244)	1.243698*** (0.2610202)
Age of liquidation	0.010545*** (0.0023478)	0.008118*** (0.0023845)	-0.006941*** (0.0006571)	-0.0088678*** (0.0007268)
Age in 2008	0.1655774*** (0.0139998)	0.156944*** (0.0135096)	0.1541533*** (0.0065572)	0.1515041*** (0.0065518)
Age squared in 2008	-0.001491*** (0.0000938)	-0.0014272*** (0.0000909)	-0.0013272*** (0.0000436)	-0.0012996*** (0.0000438)
Logariyhme of the deceased's pension	0.9536469*** (0.0078296)	0.9631487*** (0.0172654)	0.92755*** (0.0040256)	0.9252554*** (0.0138304)
Basis scheme (indicator)		-0.8043072*** (0.1062653)		-0.0087662 (0.0260238)
Born in France+DOM (indicator)		-0.0173029 (0.0530439)		0.025578* (0.0143354)
Presence of a direct right (indicator)		0.0414345 (0.0379232)		0.0277626** (0.0126923)
Normal deceased's pension (indicator)		0.1664093*** (0.0452995)		0.0430638** (0.0188132)
Deceased's sector of activity (ref: Public Sector + Special schemes)				
Independent		-0.3344256*** (0.0877622)		-0.102909*** (0.036179)
Private sector		-0.313026*** (0.0847271)		-0.099261** (0.0400008)
R^2	0.9591	0.9631	0.9630	0.9635
N	724	724	7078	7078
S^2	0.157831	0.143734	0.139959	0.138178

Note: *** significativity at 1%; ** significativity at 5%; * significativity at 10%. ( ): standard deviation
Estimates on women are performed in a robust manner to correct the standard deviations to take into account heteroscedasticity

Source: EIR 2008, Drees, Author.

Both "Model 1" estimates are performed on quantitative variables such as the age of the retiree liquidation of derived rights, age of pensioner in 2008, its squared age to take into account the linearity effects; and the deceased's pension (or that would have had the deceased) that has generated the derived right. This model is globally significant and already accounts for over 95% of the variability of the patrimonial equivalent of pension rights of derived rights retirees. Moreover "Model 2" estimates embed the indicator variables (the fact that the derived right whether or not paid by a basic plan, the fact that having or not a direct right, born in France or not and the fact that the deceased's pension is normal or not) and a multinomial variable (the sector of activity of deceased). The explanatory power of the model improves slightly.

Thus, all things being equal, age has a dual effect on the level of PEPR for derived rights

retirees regardless of sex: the higher age, the more the individual will have accumulated a virtual heritage; but from a certain age threshold, the level of PEPR decreases with increasing age due to the reduced duration of retirement and to the interaction with the discount factor already mentioned above.

Furthermore, the age of liquidation has a negative impact on the level of women's PEPR. Indeed, the age difference at marriage between man and woman (women are on average younger than men at marriage) and the differential mortality between the sexes (men die in average earlier than women) leads to a slightly earlier liquidation of derived rights for women. Women's earlier liquidation gives them a longer duration of perception of derived rights (long retirement period) and has virtually no impact on the level of their derived rights because their deceased spouses had generally favorable wage careers which allowed them to liquidate an adequate level of survivor's pension. Thus, the decrease in PEPR with age of liquidation in women will be only the effect of the reduced retirement period and of the discount factor. Conversely, men who liquidate later are more likely to receive an adequate survivor's pension resulting from a full career of their deceased spouses, which will lead to an increase in the level of their PEPR. Indeed, given that women have more often incomplete careers (because of maternity and children's education also called "career penalty for child") and less favorable in terms of wage compared to men, an early liquidation of the derived rights by their surviving spouses (men) will also result in a lower level of pension and ultimately in a lower level of PEPR.

Not surprisingly, the amount of the pension of the deceased spouse or that the deceased spouse would have perceived at the time of death has a positive influence on the level of PEPR. Indeed, as the survivor's pension is a share of this amount, the elasticity obtained for this variable is very close to unity; which means that an increasing of 1% of this amount leads, all things being equal, to an increase of more than 0.95% of the PEPR in men and more than 0.92% in women.

Also, among retired women born in France, the PEPR is higher than in women born abroad. Indeed, assuming in most cases the homogeneity of the country of birth in a couple, most retired women born abroad have a deceased spouse who started his career abroad before acquiring retirement rights in the French pension system, which explains the weakness of their rights and therefore the low level of derived rights arising therefrom. The relation of birthplace and level of PEPR is not significant in men.

Moreover, the fact to have a direct right is linked to a higher level of PEPR in women. Indeed, the difference of PEPR between women holding a direct right and those not holding could be

due to differences in social classes among the beneficiaries. In general, women with an occupation (holders of a direct right to retirement) are in a couple with men with comparable pension rights if not higher, which also results in a higher survivor's pension at the death of their spouses and ultimately by a higher level of PEPR. Whereas women who do not hold direct rights are often in a couple with spouses with lower rights to retirement, and therefore have lower derived rights and ultimately by a lower level of PEPR.

Also, the fact that the deceased received (or should receive) a normal pension is linked to a high level of PEPR in men as well as in women; which is quite in line with our expectations because the other types of pension (disability pensions, incapacity pensions, etc.) are often of a lower level, and therefore the derived rights which come from these other types of pension are also of a lower level and reduce the PEPR.

Finally, considering the public sector and special scheme as the sector of activity of the deceased as a reference, it appears that in both men and women, individuals who perceive derived rights of independent schemes and of the private sector have lower PEPR than the reference, all things being equal. This relationship had already been established in the analysis of inequality in the distribution of PEPR.

5. CONCLUSION

Ultimately, the patrimonial equivalent of pension rights (PEPR) of derived rights beneficiaries can be seen as a component of their heritage. Our work consisted in assessing this indicator and to analyze its characteristics. Thus, as the heritage, PEPR increases with income or the amount of the pension that the deceased spouse perceived or would have perceived at the time of death, but helps to reduce heritage inequality. Indeed, The PEPR is based on a PAYG pension system that insures a pension to each individual independently of a propensity to save to cope with the loss of income during the transition to retirement or widowhood. However, to carry out this calculation, several choices had to be made which may have some limitations. First, the assumptions underlying the evaluation are rather simplistic. Indeed, from one year to another, the personal situations of individuals vary with recoupling / marriage or with changes of their income that may make them ineligible in the future to a survivor's pension. Hence the choice of the discount rate and the maximum age of death would lead either to underestimate the true implicit debt of the pension plans or to overestimate it.

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Annex

List of Abbreviations

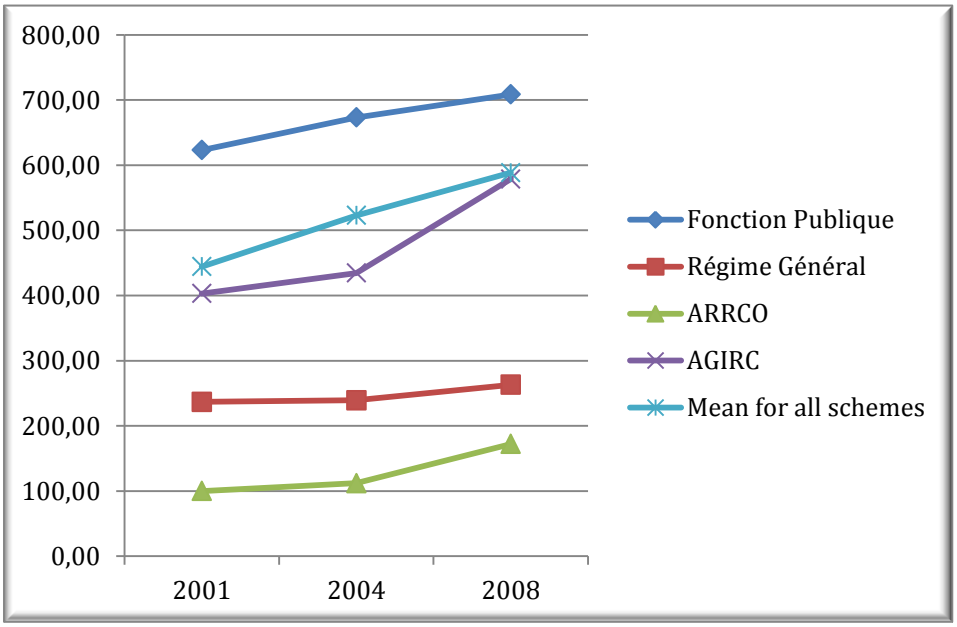
AGIRC : Association Générale des Institutions de Retraite des Cadres
ARRCO : Association des Régimes de Retraite Complémentaire
CAMIEG : Caisse d'Assurance Maladie des Industries Electriques et Gazières
CANCAVA : Caisse Autonome Nationale de Compensation de l'Assurance Vieillesse Artisanale
CANSSM : Caisse Autonome Nationale de Sécurité Sociale dans les Mines
CAVIMAC : Caisse d'Assurance Vieillesse Invalidité et Maladie des Cultes
CIPAV : Caisse Interprofessionnelle de Prévoyance et d'Assurance Vieillesse (professions libérales spécifiques)
CNAF : Caisse Nationale des Allocations Familiales
CNAVPL : Caisse Nationale d'Assurance Vieillesse des Professions Libérales
CNAVTS : Caisse Nationale d'Assurance Vieillesse des Travailleurs Salariés
CNBF : Caisse Nationale des Barreaux Français
CNIEG : Caisse Nationale des Industries Electriques et Gazières
CNRACL : Caisse Nationale de Retraite des Agents des Collectivités Locales
COR : Conseil d'Orientation des Retraites
CPRPSNCF : Caisse de Prévoyance et de Retraite des Personnels de la Société Nationale des Chemins de Fer
CRM : Caisse de Retraite des Marins
CRPCEN : Caisse de Retraite et de Prévoyance des Clercs et Employés de Notaires
CRPRATP : Caisse de Retraite et de Prévoyance de la Régie Autonome des Transports Parisiens
CSG : Contribution Sociale Généralisée
EIR : Echantillon Inter régime de Retraités
EPDR : Equivalent Patrimonial des Droits à la Retraite
ENIM : Etablissement National des Invalides de la Marine
FSV : Fonds de Solidarité Vieillesse
IRCANTEC : Institution de Retraite Complémentaire des Agents Non Titulaires de l'Etat et de Collectivités publiques
MSA : Mutualité Sociale Agricole
NRCO : Nouveau Régime Complémentaire Obligatoire des commerçants
OPCVM : Organisme de Placement et de Collecte de Valeurs Mobilières
ORGANIC : Organisation Autonome Nationale de l'Industrie et du Commerce
PERP : Plan d'Epargne Retraite Populaire
PERCO : Plan d'Epargne Retraite Collectif
PPESV : Plan Partenarial d'Epargne Salariale Volontaire
RAFP : Retraite Additionnelle de la Fonction Publique
RETREP : Régime temporaire de retraite des enseignants d'établissements privés sous contrat
RCO : Régime Complémentaire Obligatoire des artisans
RCI : Régime Complémentaire obligatoire des Indépendants
RSI : Régime Social des Indépendants
SRE : Service des Retraites de l'Etat
UNEDIC : Union Interprofessionnelle pour l'Emploi dans l'Industrie et le Commerce

Table A2: Evolution of the ages of liquidation depending on the schemes between 2001 and 2008

Year / Schemes	2001			2004			2008		
	Minimum	Mean	Maximum	Minimum	Mean	Maximum	Minimum	Mean	Maximum
Fonction Publique	29,00	61,41	91,00	27,00	62,13	91,00	20,25	58,52	98,50
Régime Général	55,00	62,35	94,00	55,00	62,38	95,00	51,00	62,62	98,50
ARRCO	41,00	64,32	91,00	23,00	62,60	98,00	20,00	61,06	98,50
AGIRC	29,00	61,41	91,00	27,00	62,13	91,00	26,25	61,89	95,50

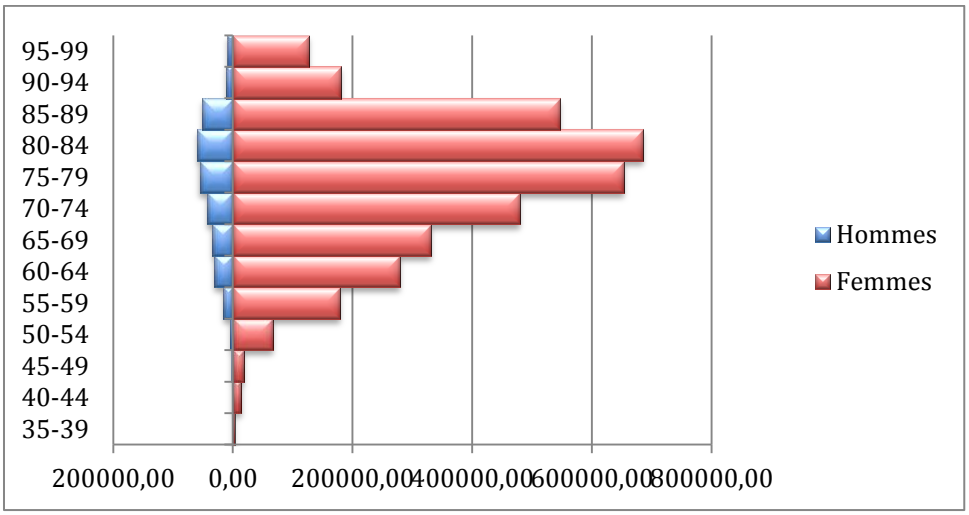
Source: EIR 2008, Drees.

Graphic A1: Evolution of the average pension of derived rights depending on the schemes between 2001 and 2008



Source: EIR 2008, Drees.

Graphic A2: Pyramid of ages of derived rights pensioners at 31/12/2008



Source: EIR 2008, Drees.

Table A2: Average monthly pension by scheme of liquidation in 2008

Schemes of liquidation	**Mean**	**Std**	**minimum**	**maximum**
CNAV/CNAVTS	263.20	1438.54	0.02	1061.24
Fonctionnaires d'Etat	708.67	3105.55	0.01	2523.49
Salariés agricoles (MSA)	120.99	996.65	1	748
Exploitants agricoles (MSA)	216.09	1414.54	1	758
Complémentaire-MSA Exploitants agricoles	21.37	142.85	1	55
Régimes spéciaux (SNCF,RATP,ENIM,CRPCEN,Banque de France,IEG,FSPOEIE,Altadis,RAVGDT,CANSSM)	567.68	3811.95	3.58	3625.05
Commerçants (RSI)	171.29	1366.42	0.21	1478.56
Complémentaire-RSI commerçants	65.59	717.09	0.01	634.41
Artisans (RSI)	154.04	1081.15	0.23	778.79
Complémentaire-RSI Artisans	46.16	462.46	3.72	502.32
Autres régimes (CAVIMAC,RETREP)	82.84	319.41	57.01	136
CDC IRCANTEC (Complémentaire)	43.66	1100.31	0.77	1828.54
Professions libérales (CNAVPL)	186.72	947.68	0.22	376.37
Complémentaire-CNAVPL	467.05	2965.59	4.03	2218.08
Supplémentaire-CNAVPL	344.75	1817.69	6.5	777.35
Avocats (CNBF)	384.51	1871.39	38.86	681.37
Complémentaire-CNBF	328.28	2939.83	3.82	1228.89
Supplémentaire-CNBF	321.47	1142.81	72.87	446.01
Complémentaire-CRPNPAC (professionnel navigant de l'aéronautique civile)	1893.16	13043.93	14.4	4607.47
AGIRC régime général	578.62	5080.41	0.1	5555.65
Complémentaire-CGRCPE (caisses d'épargne)	252.34	1483.84	5.62	848.25
ARRCO	172.33	1496.07	0.01	4030.45

Source: EIR 2008, Drees.

Table A3: Presence of a direct rights pension or not in 2008

	Presence of a direct right's pension	
Gender	Having no direct right's pension	Having a direct right's pension
Female	44.4%	55.6%
Male	37.14%	62.86%

Source: EIR 2008, Drees.

Table A4: Distribution of PEPR in the population of derived rights retirees in 2008

Groups	Percentage of population	Percentage of PEPR	Cumulated percentage of PEPR	Cumulated percentage of population
0-10 %ile	10	0.77	0.77	10
10-20 %ile	10	2.23	3	20
20-30 %ile	10	3.69	6.69	30
30-40 %ile	10	5.19	11.88	40
40-50 %ile	10	6.74	18.62	50
50-60 %ile	10	8.45	27.07	60
60-70 %ile	10	10.55	37.62	70
70-80 %ile	10	13.37	50.99	80
80-90 %ile	10	17.59	68.58	90
90-95 %ile	5	11.80	80.38	95
95-98 %ile	3	9.57	89.95	98
98-99 %ile	1	4.16	94.11	99
99-100 %ile	1	5.89	100	100

Source: EIR 2008, Drees, Author.

Table A5: Distribution of PEPR in the population of direct rights retirees in 2008

Groups	Percentage of population	Percentage of PEPR	Cumulated percentage of PEPR	Cumulated percentage of population
0-10 %ile	10	0.72	0.72	10
10-20 %ile	10	2.18	2.9	20
20-30 %ile	10	3.99	6.89	30
30-40 %ile	10	5.89	12.78	40
40-50 %ile	10	7.7	20.48	50
50-60 %ile	10	9.6	30.08	60
60-70 %ile	10	11.69	41.77	70
70-80 %ile	10	14.17	55.94	80
80-90 %ile	10	17.71	73.65	90
90-95 %ile	5	10.94	84.59	95
95-98 %ile	3	7.91	92.5	98
98-99 %ile	1	3.18	95.68	99
99-100 %ile	1	4.32	100	100

Source: EIR 2008, Drees, Author.

Table A6: Average PEPR by pension schemes in 2008

Schemes of liquidation	Average PEPR (derived rights)	Std	Minimum	Maximum
All schemes	**71637.13**	**637652.44**	**1.85**	**1202622.9**
CNAV/CNAVTS	33815.75	249926.26	1.85	193449.75
SRE-Fonction publique d'Etat civile	96298.07	573373.11	0.56	513489.72
SRE-Fonction publique d'Etat militaire	81899.19	584155.5	229.67	549622.67
MSA Salariés agricoles	13368.65	134666.79	98.92	158369.74
MSA Non salariés agricoles	20401.76	166264.91	56.34	150198.63
Complémentaire-MSA Non salariés agricoles	4240.42	28929.69	114.77	12632.1
CDC CNRACL	76025.03	396185.14	752.13	422921.02
CDC FSPOEIE (Fonds Spécial de Pensions des Ouvriers des Etablissement Industrielsd'Etat)	77837.49	491467.39	2401.26	335051.93
RSI Commerçants	18515.33	182865.93	45.74	292047.82
Complémentaire-RSI commerçants	7954.02	103567.26	1.43	116567.49
RSI Artisans	18474.31	164412.64	46.53	145809.74
Complémentaire-RSI Artisans	6305.25	85874.45	89.16	125082.22
CPR SNCF	65590.32	531518.09	394.38	539218.19
ENIM (Etablissement National des Invalides de la Marine)	68733.85	638744.24	524.53	743090.72
CDC CANSSM	34598.8	272233.01	512.3	159143.18
CAVIMAC (Caisse d'Assurance Vieillesse Invalidité et Maladie des Cultes	14487.07	73771.77	7540.87	25119.27
IEG (Industries Electriques et Gazières)	113200.44	758723.83	968.6	681575.1
CRP RATP	107360.03	677439.28	1879.91	398207.77
CRP RATP pensions en coordination régimes de base	9139.23	156035.53	749.42	63438.4
Complémentaire-CRP RATP pensions en coordination	3434.07	17077.85	1357.68	8915.35
CRPCEN (retraites et prévoyance des clercs et employés de notaires)	59915.66	750533.61	186.72	439103.13
Caisse de réserve des employés de la Banque de France	125249.45	752624.08	7964.47	387128.89
CDC IRCANTEC	5222.76	155523.28	76.46	386418.26
CNAVPL	19309.4	141442.76	14.66	89108.56
Complémentaire-CNAVPL	53947.37	469632.31	752.13	503986.76
Supplémentaire-CNAVPL	44824.95	302481.5	505.86	135113.31
CNBF-Caisse Nationale des Barreaux Français	42576.77	291839.23	3495.35	132871.3
Complémentaire-CNBF	37412.39	375295.35	618.5	205503.61
Supplémentaire-CNBF	40886.61	172054.79	12309.32	90736.35
Complémentaire-CRPNPAC (professionnel navigant de l'aéronautique civile)	216861.86	1344512.87	4086.71	601406.82
AGIRC régime général	68461.01	697328.46	18.97	985127.06
Complémentaire-CGRCPE (caisses d'épargne)	52636.01	412020.16	1330.57	221329.35
ARRCO	22168.67	224054.7	0.8	585930.41

Source: EIR 2008, Drees, Author.

Table A7: Average pension by sex and by pension schemes in 2008

Schemes	Sex		Total mean
	male	female	
	Average pension	Average pension	Average pension
CNAV/CNAVTS	163.85	268.56	263.2
Fonctionnaires d'Etat	613.06	720.3	708.67
Salariés agricoles (MSA)	81.18	122.34	120.99
Exploitants agricoles (MSA)	145.62	223.4	216.09
Complémentaire-MSA Exploitants agricoles	2.98	24.63	21.37
Régimes spéciaux (SNCF,RATP,ENIM,CRPCEN ,Banque de France,IEG,FSPOEIE,Altadis, RAVGDT,CANSSM)	521.37	568.55	567.68
Commerçants (RSI)	110.39	175.06	171.29
Complémentaire-RSI commerçants	118.58	61.07	65.59
Artisans (RSI)	130.17	154.44	154.04
Complémentaire-RSI Artisans	25.64	46.7	46.16
Autres régimes (CAVIMAC,RETREP)	.	82.84	82.84
CDC IRCANTEC (Complémentaire)	38.27	44.32	43.66
Professions libérales (CNAVPL)	188.16	186.68	186.72
Complémentaire-CNAVPL	359.01	473.34	467.05
Supplémentaire-CNAVPL	266.22	348.56	344.75
Avocats (CNBF)	477.39	369.83	384.51
Complémentaire-CNBF	163.73	358.09	328.29
Supplémentaire-CNBF	321.38	321.49	321.47
Complémentaire-CRPNPAC (professionnel navigant de l'aéronautique civile)	198.04	1970.56	1893.16
AGIRC régime général	269.46	586	578.62
Complémentaire-CGRCPE (caisses d'épargne)	254.04	251.99	252.34
ARRCO	121.37	175.37	172.33

Source: EIR 2008, Drees.

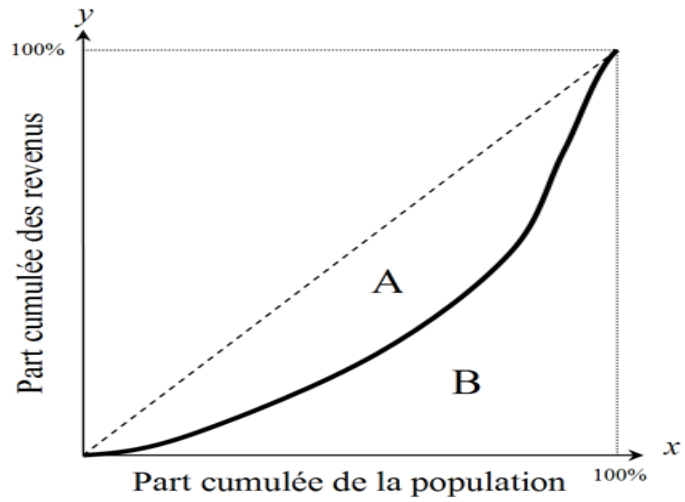
Table A8: Recent developments of reversion rules in the general scheme and the aligned schemes

Reforms	Legal texts	Object
2003	Law No. 2003-775 of 21 August 2003 on pension reform Decree No 2004-857 of 24 August 2004 and No. 2004-1447 of 23 December 2004	-phasing out the condition of reversion age -suppression of widowhood allowance -reform of the resource condition of reversion
2008	Law No. 2008-1330 of social security financing for 2009 of 17 December 2008	-restoration of the age requirement to 55 years from 1 January 2009 -creation of a survivor's pension increase as of January 1, 2010
2010	Law No. 2010-1330 of 9 November 2010 on pension reform Decree No. 2010-1778 of December 31, 2010	-Sustainability of the widow's allowance under the same conditions as those in effect before its repeal in 2003

Source: COR (2012), "Recent regulatory developments relating to the reversion" Document 2, Plenary Session of June 27, 2012.

Framed: Calculating the Gini index

The Gini index is an indicator associated to the descriptive approach of the measurement of inequality. Lambert (1993) summarized the analytical basis for establishing the relationship between the Gini index and functions of social welfare and thus to bring it into the scope of the analysis of well-being. However, the Gini index which is presented here concerns the descriptive approach of inequality. This is a complex and synthetic indicator of the inequality, like many others of the same nature. Therefore, it provides brief information on the distribution of income, but not on its characteristics, such as their location and their shape. The Gini index was developed by the Italian statistician Corrado Gini in 1912 and maintains a strict link with the representation of income inequality using the Lorenz curve. In particular, it measures the ratio of the area between the Lorenz curve and the straight equidistribution (called concentration area) and the maximum concentration area.



Lorenz curve associates at each part of the population ordered by growing income, the share that represents his revenues. Thus, the Gini index estimates the inequality by the difference at the Lorenz curve of equal distribution (dashed): it is the ratio of the area (A) which separates the Lorenz curve of the studied situation (in bold) and the triangle of surface (A) + (B).Thus:

$$G = \frac{Concentration\ area}{Maximum\ concentration\ area} = \frac{A}{(A+B)} = \frac{A}{(\frac{1}{2})} = 2A = 2(A+B-B) = 2(A+B) - 2B = 1 - 2B$$

The Gini index is equal to the difference between 1 and the double of integral of the function represented by the Lorenz curve. In practice, this function is not available, but the income by "slices" of the population is available. For n slices, the index is obtained by the Brown's formula (having previously cut the area under the Lorenz curve in a series of n polygons):

$$G = 1 - \sum_{k=0}^{n-1}(X_{k+1} - X_k)(Y_{k+1} - Y_k).$$

Where X is the cumulative share of the population, and Y the cumulative share of the income. For n persons with incomey_i, for i from 1 to n, indexed in ascending order($y_i \leq y_{i+1}$):

$$G = \frac{2\sum_{i=1}^{n} i y_i}{n\sum_{i=1}^{n} y_i} - \frac{n+1}{n}$$

Thus, in the practical case of the patrimonial equivalent of pension rights (PEPR), individuals are ranked in ascending order of the PEPR and the last above formula is applied to calculate the Gini index. Regarding the representation of the Lorenz curve, the population of individuals is grouped into thirteen (13) classes whose the first nine classes are the first nine deciles of the distribution of the PEPR. The following classes are made up as follows: the tenth class contains 5% of individuals whose the PEPR is after the ninth decile, the eleventh class includes the 3% of following individuals, and the last two classes each have 1% of individuals corresponding to the classes of individuals with the highest PEPR.