Pensions and heterogeneity in an Overlapping Generation Model (OLG).

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Abstract

Over the last few decades, we have been witnessing the development of pension systems in Europe. People are now offered a better social protection, however demographic evolutions can impact the inequality level between generations or different social categories of Retirees. Using an overlapping generation model, we investigate consequences of demographic constraints on income distribution. Inequalities issues among retired people have not been addressed by many scholars. In our model, we introduce heterogeneity with four professional categories crossed by gender to put into perspective inequalities. We put forward the hypothesis that the Pay-As-You-Go (PAYG) pension system always has a balanced budget. As a result, the deterioration of the dependency ratio involves a pension decrease. We observe that the gap income between active people and Retirees, and between Men and Women, is growing with demographic constraints. In spite of a lower pension level, inequalities between social categories remain stable. But our results support the idea that people living longer benefit from a regressive redistribution : because of the architecture of the PAYG system, French white collars and women seem to receive more benefits than they contribute.

Keywords : Inter- Intragenerational inequalities, Intergenerational Income Distribution, Pay-as-you-go Pension System, Computable General Equilibrium Model.

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Résumé

Si le développement des systèmes de retraite après guerre a permis de lutter contre les inégalités et d'offrir une protection sociale au plus grand nombre, les contraintes démographiques pourraient entraîner des modifications non négligeables en termes de disparités des revenus à la retraite, mais également entre générations. A l'aide d'un modèle d'équilibre général calculable à générations imbriquées, nous étudions les inégalités monétaires intra et inter cohortes sur la base d'une hétérogénéité de genre, mais aussi entre catégories socioprofessionnelles, dans un contexte de baisse de croissance démographique. Si le système de retraite par répartition est défini de manière à ce que la caisse de retraite soit toujours à l'équilibre, le niveau de pension s'ajuste, entraînant un accroissement des différences de revenus entre actifs et inactifs, entre hommes et femmes. Par contre, les inégalités entre retraités de catégories socioprofessionnelles différentes ne se modifient pas. Par ailleurs, sur un plan macro-économique, la baisse de la démographie entraîne une diminution des inégalités au sein de la population globale. Ce travail permet également de mettre en lumière un phénomène de redistribution régressive dans le système par répartition, au profit des catégories favorisées en termes de revenus et d'espérance de vie.

Mots clés : Inégalités Inter-,Intracohortes, Distribution Intergénérationnelle de Revenu, Systèmes de Retraites par Répartition, Modèle d'Equilibre Général Calculable.

JEL Classification : D63, E64, H55, C68.

Current pension systems in Europe emerged after the second world war. European countries are faced today with population ageing : longevity is increasing and in the same time, economic growth is slowing. According to the Institut National de Statistiques et d'Etudes Economiques (INSEE), a French woman, born in 2008, is expected to live 84.3 years, and a man is expected to live 77.5 years. In 1980, the life expectancy was 76.4 years for women and 70.2 for men. Meanwhile, the fecundity decreased : in 1980, the fecundity indicator was 2.47, and in 2006, it declined to 1.98. Consequently, France and most of European countries are involved in a reform process : many public pension schemes are no longer sustainable. In the same time, a number of economists studied the consequences of pension system development on poverty and inequalities among Retirees. Cohen Solal and Lelièvre (2002) pointed out in Europe the fact that retired households seems to have the same level of standard of life than active households. But recognising that the pension system involvement allows people to benefit from a better protection in the post war period, recent demographic and economical constraints could impact the inequality level between generations or different social categories of Retirees. The inequality issues have been addressed by many literatures, but inequality problems among retired people have not been analysed by many scholars. Well, government cannot conduct fair reforms without having an accurate sight over people standards of life. It is useful to consider inequalities between active and retired generations, between social categories of Retirees, or between men and women.

In this paper, we carried out a research on pension inequalities. Using an overlapping generation model, we investigate consequences of demographic constraints on income distribution. We introduced heterogeneity with eight different social groups. Four professional categories crosses by gender are used. Overlapping generation models allows us to represent demographic constraints, breaking down the population in different age groups. It provides us with a piece of information on different incomes evolution. This allows us to study exactly income inequalities in an ageing population context.

Our model is determinist. It contains seven generations, certain but different life times, perfect foresight, bequests and exogenous labour supply. A Pay-As-You-Go (PAYG) pension system allows the redistribution between population categories, and pension funds provide an individual mandatory pension.

This paper is divided in three sections. In the first, we present some previous studies

that use OLG models or that pointed out the inequalities issues in an ageing context, the second part details the model, and the last one provides the results of the study.

A brief Literature Review

How can we determine whether a pension scheme is fair or not ? In this paper, we carried out research on France ; however the question remains in every type of pension systems. Some articles point towards this critical issue as we cannot find a unique approach to define a fair pension scheme. Some authors (D.Blanchet) distinguish two ways to study this topic.

The first approach, also called the cross approach, sheds lights on the standard of life of people living during the same period. As a result, if we consider that people living during the same period should have an equivalent standard of life, we cannot take into account the economic growth, or pension systems financing issues. In this case, if a fair system provides the same resources to people alive, we have to focus on intergenerational inequalities in the model.

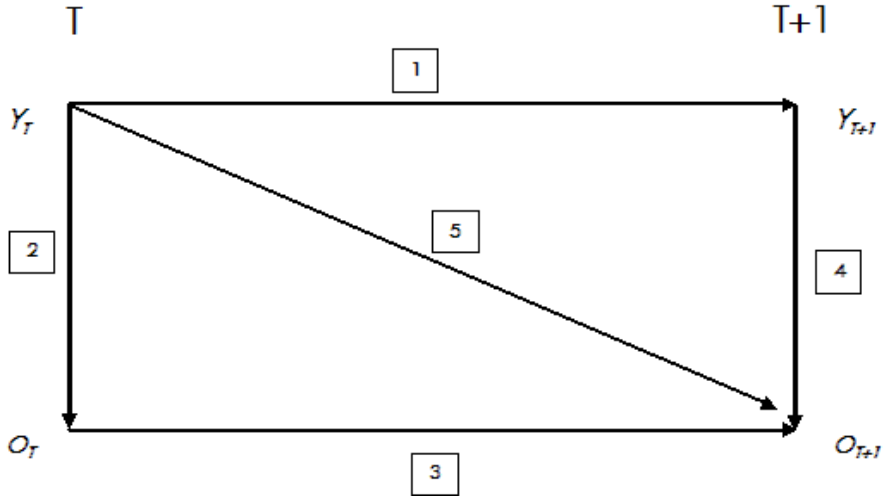
The second approach, also called "longitudinal approach", allows us to compare contributions during the active life and the benefits perceived during the retirement period. A normative idea can be derived from this approach : people should always receive from the public pension system what they paid as contributions. However there is no theoretical foundation supporting this approach. Furthermore, it gives no piece of information on the size of the system : a pension system can be defined as fair without allowing people to reach a decent standard of life.

Many literatures tried to define equity and social justice ; for instance Rawls mentioned resources equality criteria. We can draw a parallel between the cross approach and this principle of "equality of resources". But it does not make sense to consider an economy without economic growth. Rawls also introduced the "maximin" criteria. It suggests being attentive forwards the poorest people. However, Rawls (1993) put also into perspective a criteria of equity between generations : in a PAYG pension system, current generations save for their descendants. Using this reference, Masson (1999) talks about retrospective and downward solidarity between generations. Implications for this principle is the role of the State, which has to guarantee the enrolment of each generation in this system. The public pension system takes over from the private

altruism.

It is important to distinguish which generations are compared to define equity criteria. Two axes of comparison can be used : the time and the age.

FIG. 1 – Equity and generations



Lecture :

- Y_T *Young generation at time* T,
- O_T *Old Generation at time* $T+1$,
- T *Time,*
- *The relation number 1 compares the young generation at time* T *and the Old generation at time* $T+1$.

Sources : Author, inspired from Masson (1999).

The cross and intergenerational equity can be defined comparing Young and Old People at a given date (relations 2 and 4, FIG.1). The relation 5 on the Figure 1 shed lights on the longitudinal situation of people born at time t, which refers at the longitudinal approach. However at the end, we should take into consideration relations 1 and 3 : is it better to be young at time T or $T+1$?

As reflected here, many definitions of "equity" can be given. Furthermore, we can assume that inequalities harm to equity principles. Consequently, in this article we try to put into perspective inequalities and to quantify them.

The issue of expectancy life inequalities has been addressed by few literatures too. For this reason, it is necessary to examine the impact on monetary inequalities. Using

a theoretical model, Drouhin (2001) and Hachon (2008) advance the thesis that PAYG pension system could involve a regressive distribution between social classes. People having a shorter life would subsidise the pension of people living longer. Well people living longer are often white collars, while the others, living shorter, are often blue collars. These French economists demonstrated how capitalisation involvement could reduce these inequalities. In this case, using a computable overlapping generation model allows us to quantify this impact and to confirm or not, the regressive redistribution phenomenon. We can draw a parallel between the cross approach and these papers analysis, as a comparison between contributions and benefits is made.

Computable models are often used to analyse financing issues. Fodha and Le Maître (2007) modelled a general equilibrium framework to determine if a specific pension system could resolve the financing problem and, in the same time the job market disequilibrium. However, introducing human capital effects, they analyse welfare inequalities between social classes. Contrary to Hachon and Drouhin they conclude that capitalisation involvement could increase welfare inequalities. Furthermore, this solution impacts more negatively the Poor's situation.

1 Theoretical model

Distinguishing men and women, the model introduces seven generations from different social categories. Consequently, this article focuses on inequalities arising from social or professional belongings or gender.

1.1 Demographic specifications

We introduce four social and professional categories, corresponding to a French classification :

- The first category is the upper class, including executives. In the British socio-economic classification (SEC), made by the Office for National Statistics, they are called "higher managerial occupations".

- The second category is the upper middel class, known in the SEC as "lower managerial occupations". We can also call them "white collars".

- In the third category, we find intermediate occupations, such as "intermediate sales and service occupations" in the SEC. In France, they are called "employees".

- The last category includes factory workers, also know as "blue collars". In the SEC they represents the semi routine, and routine technical occupation.

The working life begins at the age of 20 (period 0 of the life cycle in the model), and after 4 periods of 10 years, people retire at the age of 60 [1] (period 40 of the life cycle). The lifetime is certain and exogenous : men having a higher managerial occupation and women live seven periods while the other groups live 6 periods. In other words, the former group dies at the age of 90 while the latter dies at the age of 80. At each date t in the model, seven generations are living side by side.

The life cycle is described with the index "A" ranging from 0 to A_d equal to 50 or 60 depending on the gender and the social category.

The population ($Pop_{csp,t}$) contains seven generations at period t :

$$Pop_{csp,t} = \sum_{A} \frac{n_{csp,t}}{(1+\gamma_t)^A} \tag{1}$$

[1] The French legal retirement age

$n_{csp,t}$ is the number of births at time t and γ_t the demographic growth rate. In our model, labour supply ($LS_{csp,t}$) is exogenous. There is no unemployment : between the age of 20 and the age of 60, people are working.

$$LS_{csp,t} = \sum_{A=0}^{30} \frac{n_{csp,t}}{(1+\gamma_t)^A} \tag{2}$$

We can calculate the retired population ($PENS_{csp,t}$) at time t :

$$PENS_{csp,t} = \sum_{A=40}^{A_d} \frac{n_{csp,t}}{(1+\gamma_t)^A} \tag{3}$$

1.2 Household sector

The household sector is represented by the life utility function. According to the literature, we use a Constant Elasticity Substitution (CES) function. At each time t, people in their last life cycle period die and bequests are distributed to children. Each agent maximises the utility function subject to a budget constraint. Following Hviding and Merette (1998), the utility function can be written as follows :

$$U_{csp,\,t} = \frac{1}{1-\theta} \sum_{A} \frac{1}{1+\rho} \left(c^{1-\theta}_{csp,\,A,t} + \beta^{\theta}_{csp,\,A}\, Tran^{1-\theta}_{csp,\,A,t} \right) \tag{4}$$

$$0 < \theta < 1$$

$$\beta_{csp,Ad} > 0,\ \beta_{csp,\,A \neq A_d} = 0$$

The utility function has two arguments : $c_{csp,A,t}$, the consumption of an agent of age group A, and the intergenerational transfers, $Tran_{csp,A,T}$.

θ is the inverse of the intertemporal elasticity of substitution, ρ, the rate of time preference, and $\beta_{csp,A}$ represents the propensity for intergenerational transfers.
Introducing bequests, this utility function allows us to capture an additional inequality

source : the property inequalities. This study does not attempt to focus on this inequality source, but it is necessary to take into account the reality of French inequalities. Using the French Survey, the "Enquête Patrimoine", we show that 38% of executives' children have a managerial occupation. 68% of children whose father had a technical occupation belong to the Working Class too. Consequently, we put forward the assumption of social reproduction : bequests from the oldest executive generations are distributed as inheritance to younger executives at the age of 50. The same assumption is made for each category.

Assuming they have no borrowing constraint, agents maximise their utility subject to their life time income : during their working period, they earn salaries($\omega_{csp,t}$), and when they retire, they receive a public pension from the Pay-As-You-Go system ($Rpub_{csp,t}$) and another from a pension fund ($Rpr_{csp,A,t}$). Working people pay a social contribution to the PAYG system, and a mandatory contribution to an individual private pension system, the pension fund) ; in addition, public benefits ($pp_{csp,t}$) are distributed to the intermediate class and blue collars by the government. Finally, they receive, at the age of 50, a transfer from their parents. Their lifetime income ($Rev_{csp,t}$) can be written :

$$\begin{aligned} Rev_{csp,t} &= \sum_{A} \frac{1}{(1+r(1-\tau_t^k))^A} \left(\omega_{csp,t}\left(1-\tau^r_{csp,t}-\tau^c_{csp,t}-\tau^s_{csp,t}\right)\right. \\ &\quad \left. + Her_{csp,A,t} + pp_{csp,t} + Rpr_{csp,A,t} + Rpub_{csp,t}\right) \end{aligned} \tag{5}$$

where r is the interest rate, $\tau^r_{csp,t}$ and τ^k_t represent the income and capital tax rate. $\tau^s_{csp,t}$ and $\tau^c_{csp,t}$ are contribution rates to PAYG pension system, and to the private pension system.

Maximising the utility function subject to the lifetime income constraint, we found the optimal consumption ($c_{csp,A,t}$) :

$$c_{csp,A,t} = \frac{c_{csp,A-1,t}}{(1+\gamma)^{A-1}} \left(\frac{1+r(1-\tau_t^k)}{(1+\rho)}\right)^{\frac{1}{\theta}} \tag{6}$$

$$Tran_{csp,A,t} = \beta_{csp,A}\, c_{csp,A,t} \tag{7}$$

The inheritance ($Her_{csp,A,t}$) distributed to 50 years old people is subject to a tax (τ_{csp,t^h}) :

$$\frac{Her_{\,cspc,\,A=30,\,t}}{(1+\gamma_t)^{A=30}} = \frac{Tran_{\,csp,\,A_d,\,t}\,(1-\tau^h_{csp,t})}{(1+\gamma_t)^{Ad}} \tag{8}$$

1.3 The production sector

The firm is represented by a Cobb Douglas production function. The production depends on 9 arguments : 8 labour demand types ($LD_{csp,t}$) and the capital demand (K_t). We put forward the hypothesis that there are 2 different labour demands for men and women. This assumption is unusual as gender discrimination is forbidden. However, it allows us to shed lights on wages inequalities between men and women. Therefore the capital depreciation rate (δ) is exogenous and constant. Y_t is the Gross Domestic Product (GDP) at time t :

$$Y_t = A\,K_t^{\alpha_k} \prod_{csp} LD^{\alpha_{csp}}_{csp,\,t} \tag{9}$$

$$\text{where } 1-\alpha_k = \sum_{csp} \alpha_{csp}$$

Optimal labour and capital demands are :

$$LD_{\,csp,\,t} = \frac{Y_t\,\alpha_{csp}}{\omega_{\,csp,t}(1+\tau^e_{csp,t})} \tag{10}$$

$$K_t = \frac{\alpha_k\,Y_t}{r+\delta} \tag{11}$$

Where $\omega_{csp,t}$ is the individual wage.

Using ratios between workers category wages, we can solve the producer's program. This piece of information is provided by the French INSEE : we found the average salary for each category of working people.

1.4 The PAYG pension system

The agents retire at the age of 60. In Hviding and Merette (1998), the assumption that a unique public sector involving at the same time public expenditures and public pensions is made. These authors focus on a larger issue of public debt. In contrast in our paper, we introduce an independent PAYG pension system. Although the PAYG pension system is a public system, separated from the government accounts. It is financed by employees and employers' contributions ($\tau^s_{csp,t}$ and $\tau^e_{csp,t}$). We assume this system has always a balanced budget. Being able to levy social contributions on working generations, the government allows the system to be sustainable. Consequently, the pension amount ($Rpub_{csp,t}$) and the replacement rate are endogenous. However, we need a supplementary piece of information to solve the equilibrium of the system as we have eight categories of agents. By taking into account the French Survey "Patrimoine", we calculate the ratio between pensions perceived by different social categories. We put forward the hypothesis these ratios remain stable.

$$\sum_{csp} PENS_{csp,t}\, Rpub_{csp,t} = \sum_{csp} (\tau^e_{csp,t} + \tau^s_{csp,t})\, \omega_{csp,t}\, LS_{csp,t} \tag{12}$$

1.5 Individual Pension Fund

A fully funded system allows agents to capitalise in order to perceive a supplementary pension when they retire. A mandatory contribution is levied to wages during their working life. After retiring, agents receive a private pension at each period. Using the life expectancy, the amount of annuities is calculated. As the model is deterministic, people know their life length. Longer the life is, smaller the pension is. If people live during 3 retirement periods, the capital accumulated is divided by a factor 3. Then, the capital which is not distributed for the first retirement period continues to be capitalised. It explains the growing profile of the private pension. Consequently, people living a 3 period retirement perceive a pension calculated as follows :

$$Rpr_{csp,40,t} = \frac{1}{3} \sum_{i=10}^{40} \tau^{c}_{csp,t-i}\, \omega_{csp,t-i}\, (1+r)^{(i-10)} \tag{13}$$

$$Rpr_{csp,50,t} = Rpr_{csp,40,t}\, (1+r)^{10} \tag{14}$$

$$Rpr_{csp,60,t} = Rpr_{csp,40,t}\, (1+r)^{20} \tag{15}$$

In order to simplify the model, pension benefits are not taxable. However contributions can not be deducted from the taxable income. The capital income is taxable, while the private pension return is exempt from tax.

1.6 Macroeconomic Equilibriums

Aggregate conditions allow the model to be consistent. We assume that the model represents a closed economy. Macroeconomic equilibriums ensure there are no wasted resources. The Gross Domestic Product (GDP) and resources redistributed by the public sector (P_t) are equal to macroeconomic spending : the aggregated consumption (CT_t), the public expenditure (G_t) and the investment.

$$Y_t = CT_t + G_t - P_t + I_t \tag{16}$$

The labour supply ($LS_{csp,t}$) is exogenous. The equilibrium between supply and demand ($LD_{csp,t}$) on the labour market can be written :

$$LS_{csp,t} = LD_{csp,t} \tag{17}$$

Using data from the French Statistical Institute, we calibrate the French economy state in 2007. However, we adjusted the weight of the population as we integrated only 52% of the working population. Indeed we used only four professional categories.

Consequently, in order to construct a consistent model, we adjusted the data proportionally to the population integrated in the model.

2 Calibration step

The model has to be calibrated. As we already said, we use French data. Few parameters are calculated and other are fixed. Then, we calculate the baseline scenario[2]. In this article, we assume the economic growth is exogenous.

TABLE 1 : Calibrated parameters

Calibrated Parameters	Values
ϕ Capital intensity	0.4
A Cobb Douglas parameter	3.9
α_k Cobb Douglas parameter	0.35
α_{csp}Cobb Douglas parameter :	
Men Executives	0.114
Men White collars	0.098
Men Intermediate Occupations	0.121
Men Factory Workers	0.066
Women Executives	0.077
Women White Collars	0.068
Women Intermediate Occupation	0.062
Women Factory Workers	0.044

Sources : Author's calculations, GAMS.

As we mentioned it, we had to determine income ratios between professional categories in order to solve the producer's program. They are exposed in the Appendix A. However, parameters in the second table had been chosen as they allowed us having consistent results. For instance, the inverse of the intertemporal elasticity is the same as in Rasmussen and Rutherford (2001). Contrary to Hviding and Merette, we chose a higher rate of time preference as we intend to apply later this model to other economies

[2]Simulations have been realised using the GAMS software

with similar parameters. It is fixed at 0.5% in this study.

TABLE 2 : Fixed parameters

Chosen Parameters	Values
δ Capital depreciation rate	7%
θ Inverse of the intertemporal substitution elasticity	4
ρ Time preference rate	0.5%

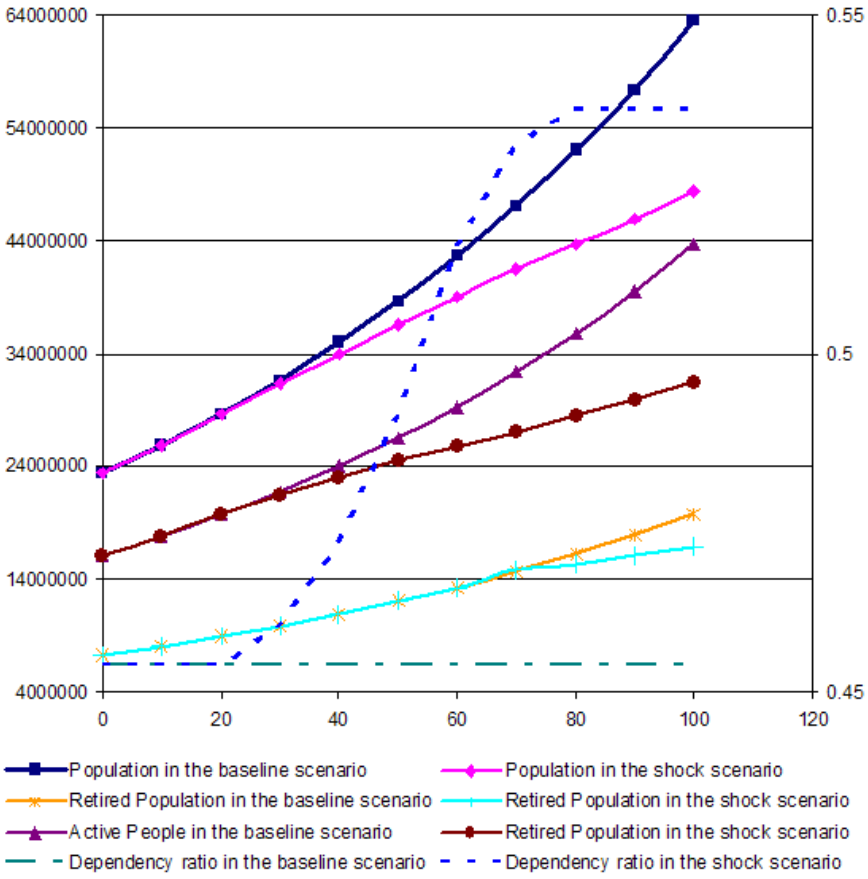
These parameters allowed us to establish the baseline scenario, and to solve equilibriums on different markets. Then, the next step consists in introducing a demographic shock to compare 2 situations. However, we note that the baseline scenario provides us already with an interesting piece of information on inequalities.

3 Demographic decrease and inequalities

The French demographic ratio was equal to 3.14 in 1975 [3] ; it decreased to 1.51 in 2006. These data illustrates the ageing issue in France[4]. The solvency problems encountered by our economies can be explained by this external shock. Two phenomena cause the demographic constraints : the growing life expectancy and the declining fecundity. Consequently, we chose to simulate a scenario of decreasing population growth rate. Whereas the population grows at the annual rate of 1% in the baseline scenario, the growth rate plunges to 0.5% during the second period in the shock scenario. It leads logically to a dependency ratio increase : it attains 45% before the demographic shock and rise gradually to 54% at the eightieth simulation period. (FIG.2)

[3] Demographic ratios are calculated as follow : $\frac{ActivePopulation}{RetiredPopulation}$;
[4] However, this issue is less pregnant in France than in other European countries.

FIG. 2 – Population



Sources : Author's calculations, GAMS.

The replacement rate is negatively impacted. We have to remind that the contribution rates are exogenous and fixed, so the pension amounts fall to ensure the balance of the PAYG pension system. Considering our assumptions and the income ratio between categories, we note a proportional decline of pension amounts for the 8 categories. For instance, the replacement rate of men having a intermediate occupation goes down from 64% to 56%(Appendix B).

White Collars benefit from the highest replacement rates before (78%) and after (69%) the shock. We note a weak difference between men and women from this category. Contrary to them, executive women and women having an intermediate occupation benefit from an important difference with men's incomes : they have higher replacement rate. Eventually, women blue collar receive lower replacement rates than men from the same category.

Although intermediate occupations do not receive the lowest wages when they are working, they obtain a low replacement rate during the retirement. It is quite surprising ; however we have to remind that we did not use the same survey to calculate the income ratios between categories. In the Survey Patrimoine, they are supposed to perceive the lowest pension among the other professional categories, whereas they have a wage higher than people having a technical occupation during the working life. Overall, pensions paid by the public PAYG system decrease by 13%.

Considering eight categories in our model, we have the possibility to calculate concentration index. Gini coefficients provide us with details on inequalities among categories. We focus on working people and Retired. Thereby, we show that the dispersion between incomes among Retired remains stable as we defined in a first step fixed ratios between them. Nevertheless, the individual private pension varies and the Gini coefficient decreases from 0.281 to 0.280 (Appendix C).

However the inequalities level among the entire population seems to decline : the Gini index decreases from 0.321 to 0.246. Incomes used to calculate this coefficient include income from work, inheritance and income from capital. This phenomenon can be explained by the significant executives' macroeconomic income decrease. After the transition period, their income is equal to 63% of their initial income in the baseline scenario. They suffer from the most spectacular drop. Like Brown (2003), we show in a first step that pensions are more equally distributed than wages and income capital. However, in our demographic scenario, the Gini index among the whole population becomes lower than among Retired.

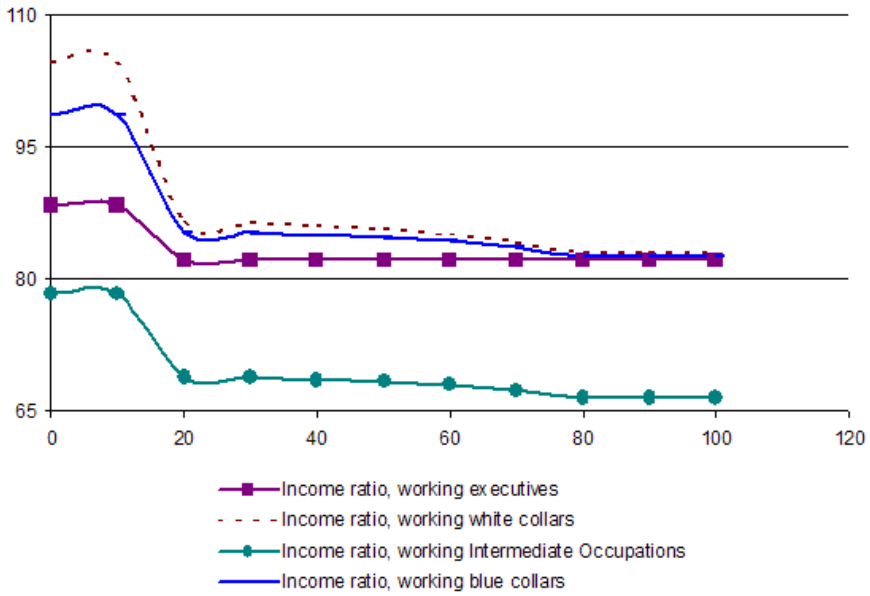
We also take into consideration gender inequalities. We compared men's and women's incomes among the retired population and then among the population, including working people and Retired. Ratios [5] were calculated, allowing us to answer this question : are gender inequalities stronger during the working life or during the retirement ? Then we shed lights on consequences of a demographic shock. Using our calculations, we conclude that inequalities[6] are higher among Retired. This finding confirms the precarious situation of some women when they retire. Many studies show this pheno-

[5] Ratios are calculated using this operation : $\frac{womenincome}{menincome}$.

[6] It would be more precise to mention income gap between men and women as we do not calculate concentration index here.

menon. Up to now, we can affirm that retired women have a weaker standard of life than men. However, this is changing since they have integrated the job market. Nevertheless the gap remains significant. Bonnet, Buffeteau and Godefroy (2004) shed lights on the women weaker pension. They conclude that these inequalities reflect disparity on the job market. On average, women perceive a pension 44% lower than those of men. According to the authors, the trend since 1950 shows an inequalities decrease, but a slightly decrease. Inactivity during the working women life explains partly the lower pensions, but unfortunately we cannot represent this phenomenon in our model. Despite this limitation, our data might integer it as information collected by the Patrimoine Survey reflects partly it.

FIG. 3 – Income ratios, Women versus Men in the shock scenario



Sources : Author's calculations, GAMS.

Whereas the demographic shock causes an inequalities decrease among the population, inequalities gender seem to deteriorate. The highest difference increase between men and women can be noted among white collars. Nevertheless this result concerns the working population as inequalities between Retired remain stable. The decrease in the pension amounts does not cause any dispersion of the incomes. This is consistent with the stable Gini index.

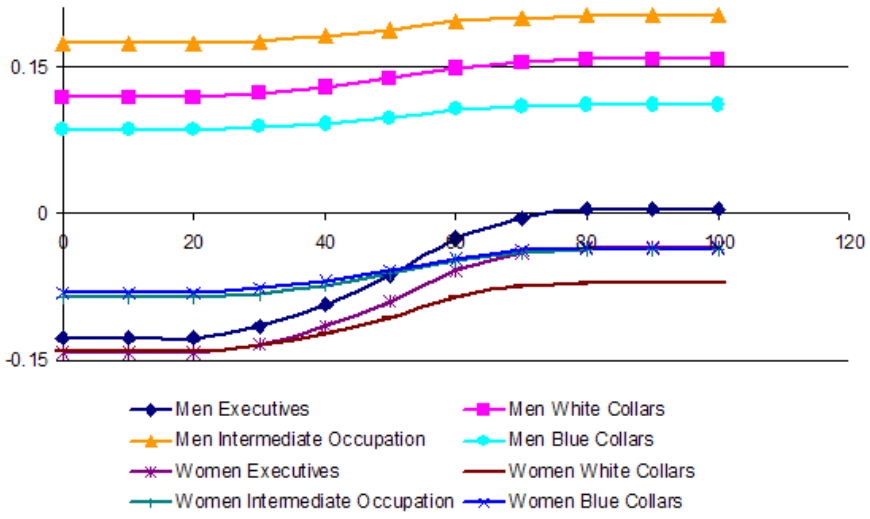
After introducing the demographic scenario, the gap between working people and Pensioners is enlarging among each professional category (Appendix D). In the baseline scenario, the retired executives earned 82% of their activity income. Finally, after the shock has happened, they perceive only 59% of it.

The most impressive gap concerns men blue collars. After the shock, their pension represents 56% of working people's income from the same category, whereas it was equal to 79% in the baseline scenario. We note the evolution between men and women : whereas the women situation was more balanced in the baseline scenario, the situation reverses. Eventually, women blue collars perceive only 52% from their activity income after the shock.

The second approach is called longitudinal or actuarial[7]. In our model, adopting this point of view means comparing the sum of capitalised contributions and the discounted sum of pensions to perceive. Using this methodology, we confirm some theoretical results [8] : category having the longest life expectancy and the highest income benefit from the PAYG system. In other words they perceive more then they pay, to the detriment of people living shorter. The Figure 4 shows the difference, for each category, between contributions paid and pension perceived. We do not focus on the value in the graphic, but only on the sign which shows us if people perceive more than they contributed. If the sign is negative, people profit from a net benefit, whereas a positive sign shows a net contribution. Before the demographic shock, men executives and women benefit from the PAYG pension system. After introducing the shock scenario, the benefit from these categories decreases ; men become even contributor to the system. Men white collars and from Intermediate Occupations suffer from what we can call a regressive redistribution, before and after introduction of the demographic scenario.

[7] See Blanchet
[8] Drouhin (2003), Hachon (2008)

FIG. 4 – Contributions to pension system



Sources : Author's calculations, GAMS.

Thus our overlapping generation model seems to confirm some important results found in the literature. However, our methodology is empirical, whereas existing models were theoretical. Furthermore we demonstrated that a demographic shock, more precisely a decline of the population growth, leads to a decrease in contribution inequalities. Indeed, the net benefit perceived by some categories of people drops.

Conclusion

The increase in the life expectancy and the long fecundity rates in Europe will lead to a plunge of pension amounts served by the PAYG public pension systems. We can even fear a bankrupt of these system. Consequently many countries are reforming their pension system architectures, and/or their parameters. In addition, the current economic situation causes low economic growth rates and decrease in the employment rates. In particular, working people, after the age of 50, suffer from unemployment. Thanks to the social security development,people are offered a better social protection, however demographic evolutions can impact the inequality level between generations or different categories of Retirees. We do not know if the current system will be able to adapt to such external shocks. Consequently, we chose in this paper, to carry out a research on pension inequalities. Using an overlapping generation model, we investigated consequences of demographic constraints on income distribution. We focused on different inequalities types : gender inequalities, inequalities between generations or social groups.
The decline of the demographic growth rate does not cause any important variation in the income distribution, but it increases the gap between working people and Retirees. Indeed, pension amounts logically drop because of the system architecture.

Gender inequalities among the population tend to rise, whereas differences between retired men and woman remain stable. It reflects the inequalities stagnation among the retired population.

Our research provides a confirmation of some results observed in the theoretical literature. We showed the regressive redistribution phenomenon in a PAYG pension system. People having a shorter life expectancy tend to contribute to the financing of people living longer's pension. In the same time, people living longer have the highest income, whereas people having a shorter life earn often a lower wage. Consequently, this phenomenon tends to reinforce inequalities in the population.

Nevertheless, we cannot affirm that a demographic shock will change the income distribution among Retirees. However, in a next step, we intend to focus on private solution to the financing pension system issue. Thus we can fear an increase in the inequalities if reforms only consider individual solutions to finance retirement.

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Appendix

Appendix A : Imposed Constraints

Constraints	Values
$\frac{\omega_{executives-m,t}}{\omega_{bluecollar-w,t}}$	3.79
$\frac{\omega_{whitecollar-m,t}}{\omega_{bluecollar-w,t}}$	1.71
$\frac{\omega_{interocc-m,t}}{\omega_{bluecollar-w,t}}$	1.69
$\frac{\omega_{bluecollar-m,t}}{\omega_{bluecollar-w,t}}$	1.2
$\frac{\omega_{executives-w,t}}{\omega_{bluecollar-w,t}}$	2.61
$\frac{\omega_{whitecollar-w,t}}{\omega_{bluecollar-w,t}}$	1.5
$\frac{\omega_{interOcc-w,t}}{\omega_{bluecollar-w,t}}$	1.1
$\frac{\omega_{bluecollar-w,t}}{\omega_{bluecollar-w,t}}$	1

Sources : Author using the INSEE's data.

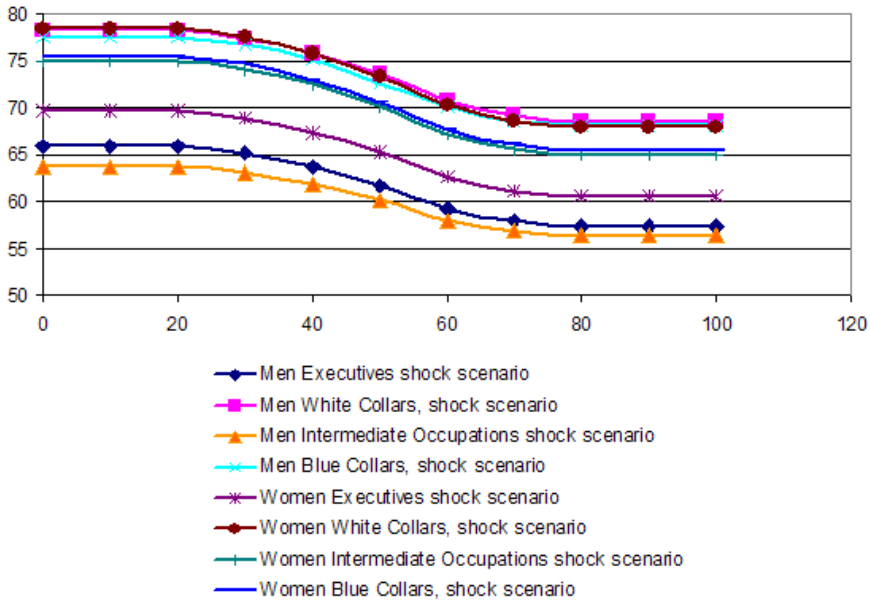
Stable ratios were used to ensure the equilibrium of the PAYG pension system.

Constraints	Values
$\frac{Rpub_{executives-m,t}}{Rpub_{bluecollar-m,t}}$	2.54
$\frac{Rpub_{whitecollar-m,t}}{Rpub_{bluecollar-m,t}}$	1.44
$\frac{Rpub_{InterOcc-m,t}}{Rpub_{bluecollar-m,t}}$	1.09
$\frac{Rpub_{bluecollar-m,t}}{Rpub_{bluecollar-m,t}}$	1
$\frac{Rpub_{executives-w,t}}{Rpub_{bluecollar-m,t}}$	2.09
$\frac{Rpub_{whitecollar-w,t}}{Rpub_{bluecollar-m,t}}$	1.38
$\frac{Rpub_{InterOcc-w,t}}{Rpub_{bluecollar-m,t}}$	0.96
$\frac{Rpub_{bluecollar-w,t}}{Rpub_{workingclass-m,t}}$	0.88

Sources : Author using the Enquête Patrimoine's data.

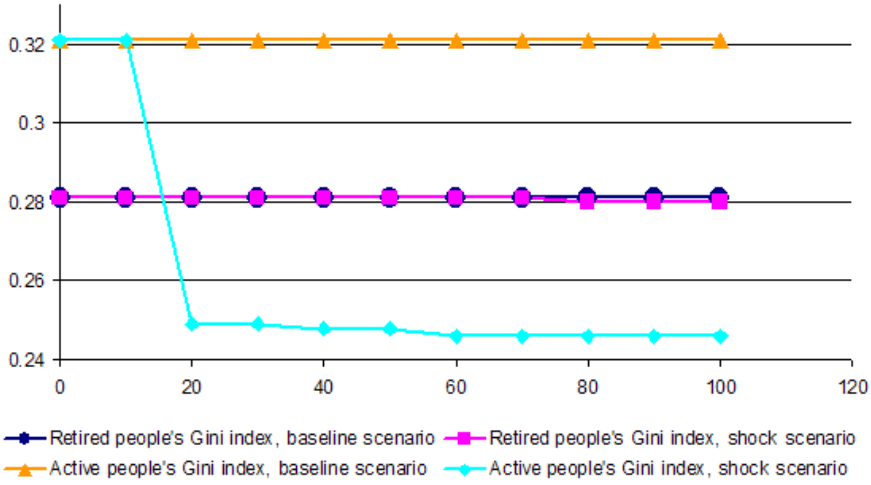
Appendix B : Replacement rates

FIG. 5 – Replacement rates



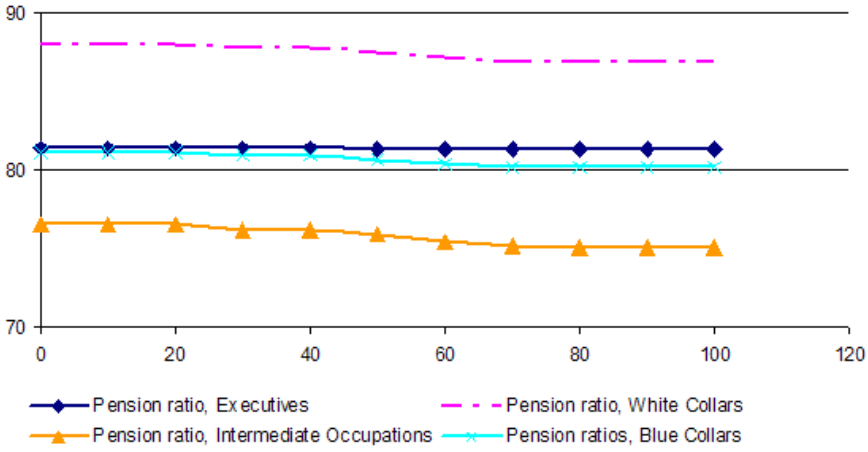
Appendix C : Gini Index

FIG. 6 – Gini Index



Appendix D : Income ratios, Retired People : Women/Men

FIG. 7 – Income ratios between women and men in the shock scenario



Appendix E : income ratios between Inactive and working People

FIG. 8 – Income Ratios between retired executives and Active executives

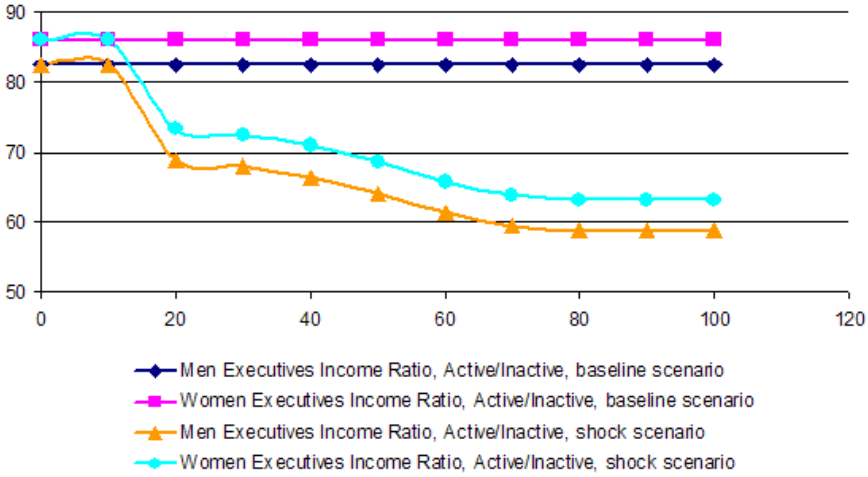


FIG. 9 – Income Ratios between retired white collars and working white collars

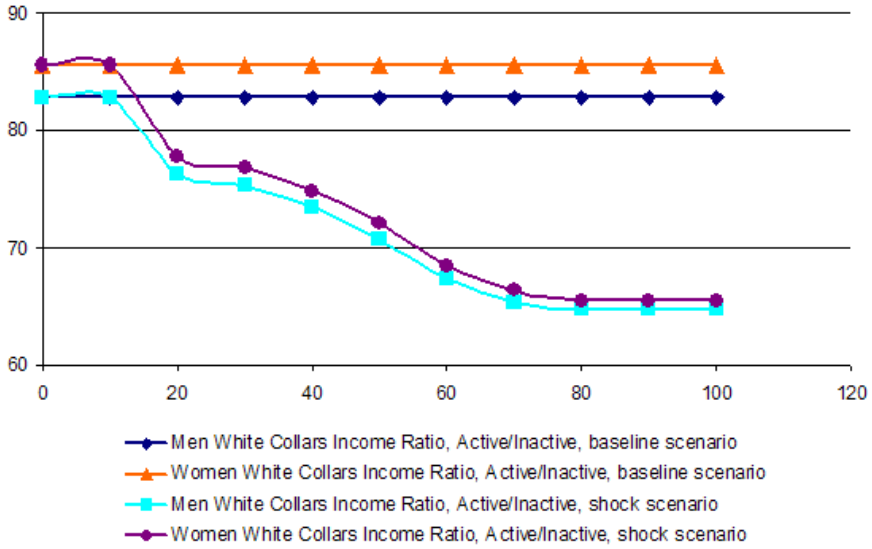


FIG. 10 – Income Ratios between retired intermediate occupations and Active intermediate occupations

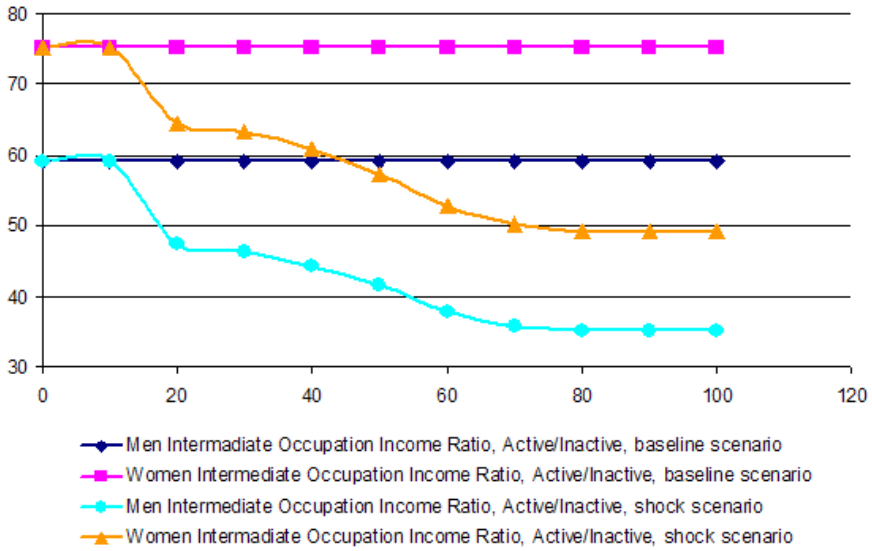


FIG. 11 – Income Ratios between retired blue collars and working blue collars