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CENTRE POUR LA RECHERCHE ECONOMIQUE ET SES APPLICATIONS

Competition between Unfunded Systems: A European Union challenge

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Titre : Compétition entre les différents systèmes de retraite : un défi pour l'Union européenne

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Résumé : La plupart des pays européens ont mis en place un régime de retraite par répartition, souvent appelé « premier pilier », financé par des cotisations obligatoires assises pour l'essentiel sur les salaires. Malgré cette caractéristique commune fondamentale, les régimes diffèrent de façon significative en deux dimensions au moins. Tout d'abord, même s'ils ont évolué, les systèmes portent la marque du passé et peuvent être encore classés suivant le critère « Beveridge » versus « Birsmarck ». D'autre part, le niveau général des contributions obligatoires - donc des pensions associées - varie fortement d'un pays à l'autre. Pour exemple, ce niveau représentait en 1995 9% du PIB en Grande Bretagne, 16,5% en France et plus de 20% en Suède. Ainsi la redistribution effectuée au sein d'une génération et le niveau des contributions sont deux caractéristiques majeures qui différencient les régimes européens entre eux. A l'heure actuelle la durée de cotisations donnant l'ouverture à des droits est longue si bien que la « portabilité » des systèmes est très réduite. Ceci constitue un frein à la libre « circulation » des travailleurs, frein qui pour certains devrait être éliminé. Dans une perspective européenne, le libre choix par tout citoyen de l'EU de n'importe quel système pourra être envisagé. Les régimes de base pourront-ils coexister ? Comment se répartiront les adhérents ? Quel sera l'impact sur la redistribution intra générationnelle ? Nous tentons ici d'apporter quelques éléments de réponse à ces questions.

Mots-clés : RETRAITE, REDISTRIBUTION DU REVENU, SALAIRE, EUROPE

Classification JEL : H5, J3

Title : Competition between Unfunded Systems: A European Union challenge

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Abstract : Most European countries have set up a mandatory unfunded pension scheme, often called *first pillar*, financed through contributions levied on wages. Although this common characteristic is crucial, the systems significantly differ in many aspects. Most importantly they differ in the level of the contribution rate and in the benefit rule that determines the redistribution performed by the system, ranging from "Bismarckian" system to "Beveridgean" one. Currently the minimal contributing period necessary to give pension rights is long, thereby limiting the "portability" of the systems. This limitation constitutes a barrier to workers'mobility, which may slow down labor integration, a major objective of the European Union.

There are various ways to diminish the impact of such barriers. One is harmonization. Given the current differences in the systems and the problems of transition, agreement on a common system or even on steps toward convergence can only be slow. Another somewhat indirect but potentially powerful way to influence social security systems is "free choice". By free choice, I mean to let any EU citizen to choose the system of any EU country *without* moving. Owing to the differences in the social security taxes and the benefit rules, free choice could trigger a drastic change in the allocation of individuals between the various systems.Would all systems survive ? What would be the impact on efficiency, redistribution, and ultimately on citizens welfare ? This paper aims to discuss these questions.

Keywords : PENSION SCHEME, REDISTRIBUTION, WAGE, EUROPE

JEL classification : H5, J3

Introduction

Most European countries have set up a mandatory unfunded pension scheme, often called *first pillar*, financed through contributions levied on wages. Although this common characteristic is crucial, the systems significantly differ in many aspects. Most importantly they differ in the level of the contribution rate and in the benefit rule that determines the redistribution performed by the system, ranging from "Bismarckian" system to "Beveridgean" one. Currently the minimal contributing period necessary to give pension rights is long, thereby limiting the "portability" of the systems. This limitation constitutes a barrier to workers' mobility, which may slow down labor integration, a major objective of the European Union.

There are various ways to diminish the impact of such barriers. One is harmonization. Due the current differences in the systems and the problems of transition, agreement on a common system or even on steps toward convergence can only be slow. Another somewhat indirect but potentially powerful way to influence social security systems is "free choice". By *free choice*, I mean to let any EU citizen to choose the system of any EU country *without* moving.[2] Owing to the diversity in the levels of social security taxes and in the benefit rules, free choice could trigger a drastic change in the allocation of individuals between the various systems. Would all systems survive ? What would be the impact on efficiency, redistribution, and ultimately on citizens welfare ? Our aim is to discuss these questions.

Free access to the first pillar of any EU pension system may seem unrealistic. Similar measures however have been imposed recently in other domains. In the domain of Higher Education for instance, there are important variations in the financial regimes (combinations of a taxes and fees) and the quality of higher education across the EU-25 countries. Instead of trying to harmonize these policies, the Bologna Process, which was launched in 1999, aims at removing the obstacles to mobility for students by establishing the so-called European Higher Education Area by the year 2010. In particular, students will have access to the education system of a foreign country at the same conditions as natives, a measure which is likely to have a dramatic impact on students choices.

We proceed as follows. Next section presents some empirical evidence of the diversity of pay-as-you-go systems across some european countries. The influence of the design of the system on the welfare of the citizens according to their earnings are discussed. We then explore the impact of free choice between two pay-as-you-go systems. Since the exercise is highly prospective, it is useful to formulate a simple theoretical framework that allows us to analyzes citizens behaviors. The analysis is based on Demange (2008).

An appraisal of the diversity of pension systems across EU

The Whitehouse report (2003) shows how different and complex the pension systems are in nine OECD countries. Even for countries with roughly identical characteristics, pension systems may differ significantly. Due to these differences, pension systems have a different impact on citizens welfare. The simplest way to evaluate this impact is through lifetime wealth. Public pensions modify lifetime wealth by requiring contributions during the working period and by providing benefits during retirement. The net public pension wealth (NPPW) is the sum value of all these flows discounted by some interest rate. It can be positive or

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[2]Thus our analysis differs from studies that examine the impact of national unfunded systems on the individuals' decisions to migrate (e.g. Hombourg and Richter [1993], Breyer and Kolmar [2002]).

negative. Such a measure only gives an approximation of the impact of the system on welfare.[3] The NPPW depends on the chosen interest rate, neglects uncertainty, and assumes away the equilibrium effects of a pension system due to the distortionary effect of taxes on labor. Despite of this, the differences between the NPPW across seven European countries such as provided by Wildasin (1999) are large enough to indicate how important the differences across systems are. Table 1 gives the NPPW as percentage of lifetime wealth for France, Germany and Netherlands. It shows that the NPPW values vary not only across countries, but also across individuals according to their marital status and generations. To evaluate the incentives to migrate, the change in the NPPW when a worker migrates to another country is computed. Table 2 gives these changes for migrants from Netherlands to France, from Germany to France, and from Germany to Italy. The computations are performed by assuming that a migrant keeps the earnings of the home country. (For workers moving from a low-wage to a high-wage country, keeping the earnings of the home country or retaining the earnings of the destination country can make a substantial difference.)

Country	Single aged 20	Married aged 20	Single aged 40	Married aged 40
France	-6%	-4%	8%	12%
Germany	-16%	-16%	-11%	-11%
Netherlands	-31%	-30%	-28%	-25%

TAB. 1 – Net public pension wealth as percentage of lifetime wealth

Source : Wildasin (1999)

Migrant from	Single aged 20	Married aged 20	Single aged 40	Married aged 40
Germany to France	10%	11%	15%	17%
Netherlands to France	25%	25%	30%	31%
Germany to Italy	4%	4%	12%	12%

TAB. 2 – Changes in net public pension wealth for migrants as % of lifetime wealth

Source : Wildasin (1999)

Another look at the diversity of systems is to look at their design. The *level* of the contributions and the *redistribution* carried out within a generation are the two major characteristics that differentiate European systems.

The level of the mandatory contributions, hence the level of the pension benefits, varies significantly across countries. For example, this level represented in 2003 roughly 9% of the GDP in the United Kingdom, $16,5\%$ in France, $19,5\%$ in Germany, and 32.7% in Italy.[4]

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[3]The net public pension wealth varies as welfare only in the absence of liquidity constraints or uncertainty.

[4]Cross countries comparisons are however rather hazardous, and vary according to the definition of social security. In line with the objectives of the paper, I have tried to consider only the first pillars the systems. Data for France, Germany, and Italy are taken

As for redistribution, although benefit rules have evolved, systems can still be classified roughly as they were at their set up. Some are mostly "Bismarckian" with individuals' pensions that are earnings-related, while others are mostly "Beveridgean" with flat pensions.

The level and the redistribution translate into replacement rates. Table 3 illustrates the variation both across countries and within countries. Observe that systems with rather flat benefits (i.e. sharply decreasing replacement rates) tend to be associated with low contribution rates (i.e. low replacement rates).

	50%	100%	150%
France	78.4	63.1	58.0
Germany	54.4	58.0	59.2
Ireland	65.8	38.5	29.3
Italy	81.8	77.9	78.1
Spain	82.0	84.5	85.2
Sweden	81.4	64.0	71.9
United Kingdom	66.1	41.1	30.6

TAB. 3 – Net replacement rate in 7 EU countries at 50%, 100% and 150% of average earnings
Source : OECD Pensions at a Glance

A crude description of current pension systems

Computations in Tables 2 and 3 give a one shot appraisal of the pension benefits in some countries. Our analysis instead is highly prospective and tries to understand the long run effects that would follow the opening of systems to EU citizens. In that purpose, we describe the current unfunded social security systems in as simple a model as possible while retaining their two major characteristics.

As can be seen in Table 3, in most countries, the system combines a Beveridgean system and a Bismarckian one in various proportions. This leads to a parsimonious description of a pension system with two parameters, the contribution rate on earnings and a parameter called in the sequel the Bismarckian factor, which determines the intra-generational redistribution operated by the system.[5] The pension benefits received by a worker are described as a weighted combination of those he would received in a Bismarckian system with those he would receive in a Beveridgean one with a weight determined by the Bismarckian factor.

The efficiency and the distributional effects. The impact of a pay-as-you-go system depends on the design of the system -here the contribution rate and the Bismarckian factor- but also on the economic environment. We shall consider a simple environment, a two-period generation model in which the growth

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in http ://www.ssa.gov/policy/docs/progdesc/ssptw/2004-2005/europe/guide.html. The same document gives $23, 8\%$ for UK, but it includes the second pillar, which is also mandatory but funded. For a description of the UK system see the European Commission and the Council Joint report Adequate and sustainable Pensions (2003).

[5]I use here the modeling of Casamatta, Cremer and Pestieau (2000).

rate of population, the real rate of return on investment, and the distribution of earnings are exogenous and constant over time. (Growth in productivity/wages can be handled with by interpreting the growth rate of population as the growth rate of the aggregate wage bill.) The impact of a pay-as-you-go system on a worker's lifetime wealth can be decomposed into an efficiency effect and a distributional effect.

Not surprisingly, the efficiency of inter-generational transfers is related to a comparison between the growth rate of the population and the rate of return on investment. While in place, the overall contributions offer a rate of return equal to the growth rate of the population. The *discounted growth rate* is the ratio of the growth rate of the population to the real rate. Whether the average wealth in the economy is increased or decreased by the system depends on the value of the discounted growth rate relative to 1. In the absence of redistribution, the discounted growth rate applies to the contribution of each individual as well. As a result, a Bismarckian system is either beneficial to each worker or detrimental to each one. The magnitude of the efficiency effect per unit of earning is proportional to the contribution rate and the discounted growth rate.

In contrast to efficiency, redistribution affects individuals in a differential way according to their earnings. The distributional effect determines the deviation with respect to the Bismarckian system. It is positive for those who earn less than the average and negative for others. Furthermore the *effective* redistribution within a system is influenced not only by the Bismarckian factor but also by the contribution rate (a beveridgean system with a low contribution rate can perform only limited redistribution) by the distribution of earnings of its contributors (even a beveridgean system operates no redistribution if earnings are all equal) and by the efficiency of the system since this partly determines how much to redistribute to retirees.

Not surprisingly, the discounted growth rate plays a crucial role. Which value for this ratio is reasonable ? This is a delicate question because it is not clear which investment return should be chosen. A period here represents roughly thirty years. If one takes for investment return the return on the stock market since the end of world war II, and for growth rate the projected growth rate of aggregate wage bill, the compounding effect will give a low value for the discounted growth rate. This is, however, related to the equity premium puzzle. If, indeed, individuals are risk averse and ready to pay a high risk premium, then one should take for the (sure-equivalent) investment return a much smaller value than the stock market return. Also, a pay-as-you-go system provides retirees with an annuity, thereby insuring them against some of the risks of living into old age. Making insurance compulsory avoids the usual problems encountered in markets with asymmetric information. As documented by various studies, the premium associated to the longevity risk is roughly 5% (see Brown, Mitchell, and Poterba 2001). To account for this premium, an extra return on a pay-as-you-go system could be introduced. Due to these difficulties and the uncertainty on future, I shall discuss widely differing values for the discounted growth rate.

Comparing systems in closed economies The impact of two distinct systems on the workers in similar economies rely on the two effects just presented, the efficiency and the distributional effects. By similar economies, we mean the same discounted growth rate and same distribution of earnings.[6]

The system for which the *average* wealth of the citizens is larger will be referred to as the *more efficient* system. With a discounted growth rate less than 1 for instance, the more efficient system has the lowest contribution rate (and the reverse holds with a discounted growth rate larger than 1). With two Bismarckian systems, the same comparison holds for each earnings level : the NPPW for identical earnings is larger in

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[6]The differences in pension systems may also have an impact on capital integration, and on the productivity. This aspect is investigated by Casarico (2000) when capital becomes fully mobile, labor remaining immobile.

the country with the more efficient system. This is not necessarily true in the presence of redistribution. As a result of the additional impact of the redistribution implemented by Social Security, an inefficient system can nevertheless be beneficial to some low-income workers, or, at the opposite, an efficient system can be detrimental to some high-income workers.

To illustrate the model, let us consider the case of France (F) and the United Kingdom (UK). The contribution rates are set respectively to 16.5 and 9 percent. The benefits in the UK system are much less related to earnings than in the French one. The value for the Bismarckian factor in France is set at 0.8, that is benefits are given by a combination of a Bismarckian and Beveridgean system with respective weights 0.8 and 0.2. The Bismarckian factor in UK is set at 0.2.

The lifetime wealth as a function of earnings is displayed for the two countries. To illustrate the impact of the discounted growth rate, four values are considered corresponding to an efficient, neutral and two inefficient situations, respectively equal to 4.3, (1.05 computed over 30 years), 1 (neutral system), 0.95, and 0.21 (0.95 over 30 years). Since the contribution rate in France is larger than the one in the UK, the French system is the most efficient system in case (a) and the less efficient in cases (c) and (d). This explains the relative positions of the lifetime wealth for a worker whose earnings are equal to the average.

earnings	50%	100%	150%	slope
(a) $1.05^{30} \approx 4.3$				
F	84 (54 %)	155	225 (145 %)	1.4
UK	80 (62%)	130	179 (138%)	0.99
(b) 1				
F	51.6 (51.6 %)	100	148 (148 %)	0.97
UK	53.6 (53.6%)	100	146 (146%)	0.93
(c) 0.95				
F	51.2 (55.2 %)	99.1	147 (148.4 %)	0.96
UK	53.2 (53.4%)	99.5	146 (146.5%)	0.927
(d) $0.95^{30} \approx 0.21$				
F	43.9(50.4%)	87	130 (149.6 %)	0.86
UK	47.2 (50.8%)	93	138 (149%)	0.91

TAB. 4 – Lifetime wealth

Observe that under cases (a), (b) and (c), workers with a high enough income prefer the system F to that in UK, and the opposite holds in case (d). Thus, with a low discounted growth rate the UK system, although much less related to earnings than the French system, is nevertheless preferred by high-income workers thanks to its low contribution rate which avoids large efficiency losses.

Consider now the 'slopes' in the last column. The slope gives the additional increase in lifetime wealth due to an additional unit of earnings. The slope is a measure of the effective redistribution. When the slope is larger in F than in UK, a worker benefits more (or loses less) from an increase of earnings in F than in UK. This occurs in the first three cases but not in case (d), although the UK system is a priori more redistributive. This can be understood as follows. An additional unit of earnings during the working period

results in an additional contribution plus the associated increase in future pension benefits. The present value of the additional future benefits are equal to the discounted growth rate applied to the additional contribution discounted by the Bismarckian factor. This results in an overall net impact on lifetime wealth (the slope minus 1) which is the average net return per unit of supplementary contribution less the loss due to the supplementary distribution added to 1.[7] Whatever Bismarckian factor, the smaller the discounted growth rate is, the smaller the impact of the increase in the pension benefit and the more important the (negative) effect of the additional contribution. This explains why the lifetime wealth associated with the UK parameters increases more than with the French parameters in case (d).

The system the more favorable to high-income workers   The relative effects of additional earnings on the lifetime wealth (or the NPPW) across different systems, that is the comparison of what we called the slopes, will play an important role to predict the outcome of the free choice. A system is qualified as *more favorable to high-income workers* than another system if the lifetime wealth increases more with earnings than for the other. While the comparison was conducted for citizen-based systems, in which the contributors are the citizens, the same comparison holds more generally in the steady state situations considered below. In our example, the system the more favorable to high-income workers is the French one in cases (a), (b) and (c), and the UK one in case (d). Following our previous discussion, determining which system is the more favorable to high-income workers amounts to compare the average net return per unit of supplementary earning less the loss due to the supplementary distribution in each system. Consider the plausible case where the system with the smaller Bismarckian factor, has the smaller contribution rate. As the discounted growth rate decreases, the more inefficient a pay-as-you-go system is, and the more likely it is that the system with the lower contribution rate is the more favorable to high-income workers.

Equilibrium under free choice

What effect may free choice have ? Let each country open its social security system to any citizen of the other country. Each young worker must contribute to a social security system but freely chooses between the two systems without moving. In order to do so, a worker compares the levels of lifetime wealth expected from contributing to either system. The distributional effects within each system influence this comparison. A crucial point is that these effects are no longer determined by the distribution of earnings of the residents in a country but by that of the contributors who have choose the system. Under free choice, individuals' choices affect the distributional effects within each system, which in turn determine individuals' choices.

The previous example illustrates this interaction. Consider the neutral case (b) for instance. Initially, workers with wages smaller than the average one are better off in the UK system than in the French system. At the opening of the systems, presumably, low-income workers will choose the UK system, and the high-income workers will choose the French one (as is surely true if they base their choice on the initial situation).

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[7]For example, in case (c) for the UK parameters, an additional unit of earning results in an additional contribution of 0.09, which offers an average discounted return of 0.085 (0.09 times 0.95), out of which only 0.2 are distributed to the worker, i.e. 0. 017. This gives the slope 1-0.09+ 0.017, that is 0.927. More formally, an additional unit of earnings during the working period results in an additional contribution equal to the contribution rate, τ , and in an increase in the future pension equal to $\tau g \alpha$ where g is the population growth rate and α is the Bismarckian factor (α is 1 for a Bismarckian system and is null for a beveridgean system). Discounting by the interest rate r the slope is $1 - \tau + \frac{g}{r} \tau \alpha$.

But then the average contributors' earnings to the UK system will diminish and that to the French one will raise. As a result, the effective redistribution within the UK system decreases and the initial incentives to choose it is reduced, triggering new choices.

This example suggests that the full impact of free choice should be assessed at a steady state situation, in which the incentives to choose either system are no longer changing overtime. Such a situation is called a rational expectations equilibrium. Let us spell out the role of expectations. Observe that the distribution of earnings of the current contributors to a system will determine the future redistributive gains or losses within a system. The distribution of earnings of the contributors next period will determine the level of pension benefits. In an environment of free choice, these distributions are uncertain and workers must form some expectations. At equilibrium, these expectations must be correct. Although strong an assumption, this is plausible at a steady state situation. In such a situation, equilibrium requires two conditions (1) the earning distribution of the contributors to each system is constant overtime, determined by the choices of individuals (2) these choices are 'rational', in the sense that they are based on correct expectations on the pension benefits associated to each system (the so-called rational expectations hypothesis).

The interaction between individuals' expectations and returns to the systems make the analysis relatively complex. In particular multiple equilibria are possible. However the typology is quite simple, dictated by the choice of high-income workers.

Recall that the increase in lifetime wealth due to an additional unit of earnings is larger in the system that is he more favorable to high-income workers. This has strong implications on individuals choices. The decision about which system to choose depends on the workers' earnings. If workers do not all prefer the same system, they split themselves according to a cutoff value : workers with earnings larger than the cutoff value choose the system the more favorable to high-income workers and those with lower earnings choose the system the less favorable to high-income workers (workers with earnings equal to that cutoff value are indifferent between the two systems). As a result, *the system the less favorable to high-income workers is eliminated whenever it is also the less efficient*. The intuition is clear. If both systems survive, workers with earnings equal to the cutoff value achieves the same lifetime wealth in both systems. Observe that these workers benefit from redistribution in the system the more favorable to high-income workers because their earnings are at the bottom of the distribution of the contributors. They are instead penalized in the other system because their earnings are at the top. Hence, for these workers to achieve an identical lifetime wealth in the systems, the redistribution gains in the system the more favorable to high-income workers must be outweigh by efficiency losses. Put differently, the system the less favorable to high-income workers can only survive if efficiency and redistribution effects enter into conflict.

The trade-off between the redistribution and efficiency effects for low income or top income workers determines equilibrium configurations. Low income workers choose the system chosen by wealthy people if the derived redistribution benefits outweigh the loss due to inefficiency. The larger the range of wages, the larger these redistributive benefits. Hence *only the system the more favorable to high-income workers remains active at equilibrium if the range of wages is sufficiently large.* At the opposite, if the range of the earnings was small enough, efficiency considerations dominate and the more efficient system would be the only one to be chosen in the long run.

Instead, various equilibrium configurations are possible when the dispersion of wages is not too large (and the system the less favorable to high income workers is the more efficient) as long as redistribution or efficiency is not a dominant factor. Each system can be the only one to survive, or both can coexist. Such a

phenomena is due to the interaction between expectations and behaviors.

In the illustrative France-UK example, only the French system remains active in case (a) and (b) because it is both at least as efficient as and more favorable to high-income workers than the UK system. Only the UK system remains active in case (d) by the same arguments. In case (c), the outcome depends on the range of wages, and may be indeterminate due to multiple equilibria.

Concluding remarks

Even though the analysis is too simple in many dimensions, it helps us to highlight some features that are likely to be quite robust. First, the analysis shows that the system that is the more favorable to high income workers is not necessarily the more Bismarckian one. Both the levels of the contribution rates and the efficiency or inefficiency of unfunded systems play an important role. In particular, in situations in which unfunded are perceived as very inefficient, the system with the lower contribution rate is the more favorable to high income workers. Second, a large dispersion of wage earnings eliminates the system the less favorable to high income workers even it is the more efficient : the redistribution effects become dominant for the workers who most benefit from redistribution or those who are the more penalized by it. As a result, free choice does not necessarily lead to select the more efficient system.[8]

However, the huge sensitivity of the results to the level of the discounted growth rate would call for analyzing the impact of fluctuations on this variable. A further step would be to incorporate how governmental decisions about the pension systems interact with individual incentives to choose the systems. This would require to describe the adjustments of the systems confronted with the impact of free choice, even if such adjustments can only be slow.

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[8]In some cases, the new situation may even be pareto dominated by the initial one.

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