Competition between unfunded systems: A European Union challenge

Received (in revised form): 15th September, 2008

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This article has been adapted from the following book chapter: *Free Choice of Unfunded Systems: A Preliminary Analysis of a European Union Challenge*, by Gabrielle Demange. Published in *Pension Strategies in Europe and the United States*, edited by Robert Fenge, Georges de Ménil and Pierre Pestieau. ISBN-10: 0-262-06272-0. Published by The MIT Press. A review of this book will be published in the next issue of the journal.

Abstract The first pillars of social security systems widely differ across European countries, in both the contribution rate and intra-generational redistribution. What would be the impact of these differences if European Union citizens had free access to all systems? This paper aims to highlight some basic features of this question.
Pensions (2008) **13,** 213–220. doi:10.1057/pm.2008.25

Keywords: *unfunded systems, intra-generational redistribution, free choice*

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 the 'Bismarckian' system to the '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 labour integration, a major objective of the European Union (EU).

There are various ways to diminish the impact of such barriers. One is harmonisation. Owing to 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 of influencing social security systems is 'free choice'. By *free choice*, I mean letting any EU citizen choose the system of any EU country *without* moving.[1–3] 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 taxes and fees) and the quality of higher education across the EU-25 countries. Instead of trying to harmonise 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 under the same conditions as natives, a measure

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Table 1: Net public pension wealth as percentage of lifetime wealth

Country	*Single aged 20 (%)*	*Married aged 20 (%)*	*Single aged 40 (%)*	*Married aged 40 (%)*
France	−6	−4	8	12
Germany	−16	−16	−11	−11
The Netherlands	−31	−30	−28	−25

Source: Wildasin.[7]

that is likely to have a dramatic impact on students' choices.

We proceed as follows. The 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 is discussed. We then compare 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 analyse citizens' behaviours. The analysis is based on Demange.[4]

An appraisal of the diversity of pension systems across the EU

The Whitehouse report[5] shows how different and complex the pension systems are in nine Organisation for Economic Cooperation and Development countries. Even for countries with roughly identical characteristics, pension systems may differ significantly. Owing 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 an interest rate. It can be positive or negative. Such a measure only gives an approximation of the impact of the system on welfare.[6] 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 labour. Despite this, the differences between the NPPW across seven European countries as provided by Wildasin[7] are large enough to indicate how important the differences across systems are. Table 1 gives the NPPW as the percentage of lifetime wealth for France, Germany and the Netherlands. The table 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 the 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.)

Another way of approaching 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, and hence the level of the pension benefits, varies significantly across countries. For example, this level represented in 2003 roughly 9 per cent of the GDP in the UK, 16.5 per cent in France, 19.5 per cent in Germany and 32.7 per cent in Italy.[8]

As for redistribution, although benefit rules have evolved, systems can still be classified roughly as they were at their setup. 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 (ie sharply decreasing replacement rates) tend to be associated with low contribution rates (ie low replacement rates).

Table 2: Changes in net public pension wealth for migrants as percentage of lifetime wealth

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

Source: Wildasin.[7]

Table 3: Net replacement rate in seven EU countries at 50, 100 and 150 per cent of average earnings

	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
UK	66.1	41.1	30.6

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, on the other hand, is highly prospective and tries to understand the long-run effects that would follow the opening of systems to EU citizens. For this 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 system in various proportions. This leads to a parsimonious description of a pension system with two parameters. One parameter is the contribution rate on earnings and the other parameter, called the Bismarckian factor, determines the intra-generational redistribution operated by the system.[9,10] The pension benefits received by a worker are described as a weighted combination of those he would receive in a Bismarckian system with those he would receive in a Beveridgean system, 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 — and also on the economic environment. We will consider a simple environment, a two-period generation model in which the growth rate of the 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 by interpreting the growth rate of the 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 or detrimental to each worker. 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 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 30 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 the 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 with the longevity risk is roughly 5 per cent.[11] To account for this premium, an extra return on a pay-as-you-go system could be introduced. With these difficulties and the uncertainty for the future in mind, I shall discuss widely differing values for discounted growth rate.

Comparing systems in closed economies

The impact of the two distinct systems on workers in similar economies relies on the two effects just presented: efficiency and distributional effects. By similar economies, we mean the same discounted growth rate and the same distribution of earnings.[12,13]

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 of 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 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 redistribution brought about by social security, an inefficient system can nevertheless be beneficial to some low-income workers, or, in contrast, an efficient system can be detrimental to some high-income workers.

To illustrate the model, let us consider the case of France and the UK. The contribution rates are set, respectively, to 16.5 and 9 per cent. The benefits in the UK system are much less related to earnings than in the French system. 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 of 0.8 and 0.2. The Bismarckian factor in the UK is set at 0.2.

The lifetime wealth as a function of earnings is displayed for the two countries (see Table 4). To illustrate the impact of the discounted growth rate, four values corresponding to one efficient, one neutral and two inefficient systems are considered, 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 that in the UK, the French system is the most efficient system in case (a) and the least 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.

Observe that in cases (a), (b) and (c), workers with a high enough income prefer the system in France to that in the 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 that prevents large efficiency losses.

Consider now the 'slopes' in the last column. The slope gives an additional increase in lifetime wealth due to an additional unit of earnings. The

Table 4: Lifetime wealth

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

slope is a measure of the effective redistribution. When the slope is larger in France than in UK, a worker benefits more (or loses less) from an increase of earnings in France than in the 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 is 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) that is the average net-return-per-unit of supplementary earning less the loss due to the supplementary distribution added to 1.[14] Whatever the Bismarckian factor, the smaller the discounted growth rate, 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 more favourable 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 in predicting the outcome of free choice. A system is qualified as *more favourable 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 more favourable to high-income workers is the French one in cases (a), (b) and (c) and the UK one in case (d). Following our previous analysis, the system the more favourable to high-income workers is the one for which the average net return per unit of supplementary earnings diminished of the loss to supplementary distribution is the largest. 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 the pay-as-you-go system, and the more likely it is that the system with the lower contribution rate is more favourable 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 can freely choose 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 chosen 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, low-income workers will presumably choose the UK system, and the high-income workers will choose the French system (as is surely true if they base their choice on the initial situation). But then the average contributors' earnings to the UK system will diminish and those to the French one will rise. As a result, the effective redistribution within the UK system decreases and the initial incentives to choose it are reduced, triggering new choices.

This example suggests that the full impact of free choice should be assessed in 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 future redistributive gains or losses within a system. The distribution of earnings of the contributors in the 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 this is a strong assumption, it is plausible in 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; and (2) these choices are 'rational', in the sense that they are based on correct expectations of the pension benefits associated with each system (the so-called rational expectations hypothesis).

The interaction between individuals' expectations and returns to the systems makes the analysis relatively complex. In particular, multiple equilibria are possible. The typology, however, is quite simple, and is 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 more favourable to high-income workers. This has strong implications for 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 more favourable to high-income workers and those with lower earnings choose the system less favourable to high-income workers (workers with earnings equal to the cutoff value are indifferent between the two systems). As a result, *the system less favourable to high-income workers is eliminated whenever it is also less efficient*. The intuition is clear: if both systems survive, workers with earnings equal to the cutoff value achieve the same lifetime wealth in both systems. Observe that these workers benefit from redistribution in the system more favourable to high-income workers because their earnings are at the bottom of the distribution of the contributors. They are instead penalised 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 that is more favourable to high-income workers must be outweighed by efficiency losses. Put differently, the system that is less favourable 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 high-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 that is more favourable to high-income workers remains active at equilibrium if the range of wages is sufficiently large.* In contrast, if the range of the earnings were small enough, efficiency considerations would dominate and the more efficient system would be the only one to be chosen in the long run.

Various equilibrium configurations are possible when the dispersion of wages is not too large (and the system that is less favourable to high-income workers is 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 phenomenon is due to the interaction between expectations and behaviours.

In the illustrative France–UK example, only the French system remains active in cases (a) and (b) because it is both at least as efficient as and more favourable 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 overly simple in many dimensions, it helps us highlight some features that are likely to be quite robust. First, the analysis shows that the system that is more favourable to high-income workers is not necessarily the more Bismarckian system. 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 systems are perceived as very inefficient, the system with the lower contribution rate is more favourable to high-income workers. Secondly, a large dispersion of wage earnings eliminates the system that is less favourable to high-income workers even if it is more efficient: the redistribution effects become dominant for the workers who most benefit from redistribution or those who are more penalised by it. As a result, free choice does not necessarily lead to a selection of the more efficient system.[15]

The great sensitivity of the results to the level of the discounted growth rate does, however, call for an analysis of the impact of fluctuations on this variable. A further step would be to incorporate how governmental decisions about the pension systems interact with individuals' incentives to choose the systems. This would require a description of the adjustments of the systems confronted with the impact of free choice, even if such adjustments can only be slow.

Acknowledgments

Support of the CEPREMAP is gratefully acknowledged.

References and Notes

1 Thus, our analysis differs from studies that examine the impact of national unfunded systems on the individuals' decisions to migrate.[2,3]
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3 Breyer, F. and Kolmar, M. (2002) 'Are national pension systems efficient if labor is (im)perfectly mobile?' *Journal of Public Economics*, Vol. 83, pp. 347–374.
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5 Whitehouse, E. (2003) 'The value of pension entitlements: A model of nine OECD countries', OECD Social, Employment and Migration Working Papers; 9.
6 The net public pension wealth varies as welfare only in the absence of liquidity constraints or uncertainty.
7 Wildasin, D. (1999) 'Public pensions in the EU: Migration incentives and impacts', in Panagariya, A., Portney, P. R. and Schwab, R. M. (eds.) 'Environmental Economics and Public Policy: Essays in Honor of Wallace E. Oates', Edward Elgar, Chettelham, UK.
8 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 available at: http://www.ssa.gov/policy/docs/progdesc/ssptw/2004–2005/europe/guide.html. The same document gives 23.8 per cent 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).
9 I use here the modelling of Casamatta *et al.*[10]
10 Casamatta, G., Cremer, H. and Pestieau, P. (2000) 'The political economy of social security', *Scandinavian Journal of Economics*, Vol. 102, pp. 502–522.
11 Brown, J. R., Mitchell, O. and Poterba, J. M. (2001) 'The role of real annuities and indexed bonds in an individual accounts retirement program', in Campbell, J. and Feldstein, M. (eds.) 'Risk Aspects of Investment-Based Social Security Reform', University of Chicago Press for NBER, Chicago, US.

12 The differences in pension systems may also have an impact on capital integration, and on the productivity. This aspect is investigated by Casarico[13] when capital becomes fully mobile, labour remaining immobile.

13 Casarico, A. (2000) 'Pension systems in integrated capital markers', *Topics in Economic Analysis and Policy*, Vol. 1, pp. 1–17.

14 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 (0.09×0.95), out of which only 0.2 are distributed to the worker, that is 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 $1-\tau+(g/r)\tau\alpha$.

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