

# What Social Security: Beveridgean or Bismarckian?\*

J. Ignacio Conde-Ruiz  
FEDEA

Paola Profeta  
Università di Pavia and Università Bocconi

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\*Corresponding author: Paola Profeta, Istituto di Economia Politica, Università Bocconi, Via Gobbi 5, 20136 Milano (Italy). Tel: +390258365309, Fax:+390258365318. E-mail: paola.profeta@uni-bocconi.it. J. Ignacio Conde Ruiz, FEDEA, C/Jorge Juan 46, 48001 Madrid, Tel. +914359020, E-mail: conde-ruiz@fedea.es. We thank Vincenzo Galasso for his help and support throughout the entire project. We are grateful to Tito Boeri (Fondazione Rodolfo De Benedetti) to provide us with the ECHP data and the data of the survey on pensions conducted in Italy and especially to Mauro Maggioni for his help. We thank Mirko Cardinale (Watson Wyatt) for useful informations on complementary pensions and MORI research company for data on their pensions poll. We are also grateful to Alberto Alesina and Pierre Pestieau for useful conversations and to Roberto Artoni, Franco Peracchi, Panu Poutvaara, Ernesto Villanueva, participants at the IIPF 2002 Meeting, the workshop “International risk sharing and contracts” (Fiesole, 2002), seminar at CEBR in Copenhagen (2003), the EPCS 2003 Meeting, the CEPR 2003 conference in Naples for helpful comments. The authors acknowledge financial support from Fundación Ramón Areces. All remaining errors are ours.

## Abstract

Bismarckian social security systems are associated with larger public pension expenditures, a smaller fraction of private pension and lower income inequality than Beveridgean systems. This paper introduces a bidimensional voting model to account for all these features. Agents differ in age, income and in their ability to invest in the capital market. The voting game determines the degree of redistribution of the social security system -Bismarckian or Beveridgean- and the pension of the low-income retirees. In an economy with three income groups, low-income support a redistributive (Beveridgean) system; middle-income favor an earning-related system (Bismarckian), while high-income oppose any public system, since they are able to obtain higher returns from investing in the private system. We show that, if income inequality is large, a voting majority of high and low-income agents supports a (small) Beveridgean system, and a large private pillar arises; while the opposite occurs with low inequality. Additionally, a Beveridgean system is more likely to emerge when the capital market provides high returns.

**Keywords:** public versus private social security; pensions systems across European countries; income inequality, structure-induced equilibrium.

**JEL Classification:** H53, H55, D72.

## 1. Introduction

Apart from the typical redistribution across generations, i.e. from young to old, PAYG social security systems may involve redistribution within the same generation across different income levels, i.e. from rich to poor. European social security systems differ in their degree of within-cohort redistribution. Italy, France and Germany have very high replacement rates at all levels of income, while the UK and the Dutch systems provide lower replacement rates for higher earners than for lower earners (see Disney and Johnson 2001). Since contributions are typically proportional to earnings, this implies that the former countries have a social security system which does not redistribute within-cohort, while the latter ones appear to be quite redistributive. In other words, the former countries are of a “Bismarckian” type (there is a tight link between contributions and benefits, and thus low intragenerational redistribution) and the latter are “Beveridgean” (benefits are quite flat and contributions are proportional to earnings, thus intragenerational redistribution is large).

Countries with Bismarckian or Beveridgean systems differ in many features additional to their degree of intragenerational redistribution. Bismarckian systems have typically a larger size of the public pension system, a smaller fraction of private pensions (second and third pillar), lower returns from private pensions and are characterized by a higher degree of income inequality than Beveridgean ones.

The aim of this paper is to provide a positive theory of the redistributive design of the social security systems which accounts for many of these different features of the alternative systems. Two elements are crucial in our analysis: (i) the agents’ different abilities to invest in the capital market, with higher income agents earning higher returns; and (ii) the degree of income inequality, which determines the relative importance of the different income groups in the political process. We show that, in an economy with three income groups, a Beveridgean system may emerge as supported by a coalition of low-income individuals, who benefit from its redistributive component, and high-income individuals, who prefer it, if it is small (low contribution rates) and thus leaves more resources to be invested in the private market, where they can obtain higher returns. Middle-income individuals, instead, do not have any of these reasons, and thus tend to support a Bismarckian system.

Our analysis starts with an empirical motivation. Focusing on European countries, we first classify them according to the degree of intragenerational redistribution provided by the pension system. Using European Commission Household Panel (1993-1996) data, we divide the total population in three income groups of equal size and calculate for each country a “Beveridgean” index as the average of

the differences in the replacement rates for people of different levels of income. As expected, a country like the United Kingdom shows a higher value of this index than countries like Italy and France. Thus, the United Kingdom is more Beveridgean, while Italy and France are more Bismarckian countries. We then collect data on other features that differentiate the two alternative systems. First, our calculations on ECHP data also suggest that Beveridgean social security systems tend to guarantee higher replacement rates to low-income individuals than Bismarckian ones. Second, we show that more Beveridgean countries are associated with lower public pension expenditures than countries that are more Bismarckian. This fact has risen a “puzzle” in the traditional political economy literature. In fact, political economy theories of social security (see Galasso and Profeta 2002 for a review) suggest that Beveridgean systems, involving intragenerational redistribution, should enjoy larger support among low-income people than Bismarckian ones, which do not entail any intragenerational redistribution, and should thus be larger. The solution of the “puzzle” has represented the main issue on which the existing literature on the intragenerational redistributive component of the pension systems has focused on. In particular, papers by Casamatta, Cremer and Pestieau (2000a, 2000b), Cremer and Pestieau (1998) and Pestieau (1999) have explained the negative relation between the degree of intragenerational redistribution and the size of the PAYG system, by studying the effect of the design of the benefit formula (Bismarckian versus Beveridgean) on the optimal size of the social security system. However, these studies do not address why a Bismarckian or a Beveridgean system with the features that we observe may arise. To this respect, this paper aims at providing a solution to the puzzle in a more comprehensive framework, which takes into account many additional features of the alternative systems. Third, using data from the World Development Indicators of the World Bank (2000) we show that countries with Bismarckian systems have lower income inequality than Beveridgean ones. Fourth, we gather additional empirical evidence to confirm that Bismarckian social security systems are typically associated with a smaller fraction of private pension than Beveridgean ones. Finally, data suggest that Beveridgean systems are typically associated with higher returns from the private pensions in the capital market than Bismarckian ones.

All these facts that differentiate Bismarckian and Beveridgean systems are important to understand both their current design and the impact of planned reform. To explain these features, we develop a bidimensional political economy model. In our overlapping generations model, there exist three income groups, with different access to the capital market. High-income individuals are able to earn higher returns from private savings than respectively middle and low-income agents. The design of the social security system is decided through a political process. People vote contemporaneously on two dimensions of the social

security system: the pension level of the low-income group, and the degree of intragenerational transfer in the benefit formula. The latter feature is captured by a Bismarckian factor,  $\alpha$ , which represents the part of the pension depending on each individual's earning, rather than on average earnings. It is well known that in a multidimensional issue space Nash equilibria of a majoritarian voting game may fail to exist. Among the different solutions provided in the literature<sup>1</sup> we use issue-by-issue voting, which has been formalized in the literature by the concept of structural induced equilibrium (as in Conde-Ruiz and Galasso 1999, 2002). We show that low income people support a highly redistributive system (Beveridgean); middle income people favor an earning-related system (Bismarckian), while high income people oppose any public social security system, since they are able to obtain higher returns from investing in a private system. Two political equilibria may arise in our voting game. For high degrees of income inequality, a coalition of the extremes emerges: high-income individuals join the low-income people in a voting majority that supports a Beveridgean system, with a high level of pension for the low income individuals. The overall size of the system is small, and a large private pillar arises. Interestingly, in this equilibrium high-income agents favor a more redistributive (Beveridgean) system, which lowers the cost of providing a pension to the low-income types, and thus allows them to invest more resources in the more profitable private pension system. If income inequality is low, middle-income people represents a majority which sustains a Bismarckian system, with a lower level of the pension for the low-income people, and a larger size of the system. This also leads to a smaller size of the private pillar.

The predictions of our model are consistent with the empirical relations that characterize Bismarckian and Beveridgean systems. Additional support to the specific idea which drives our results can be drawn from an historical perspective, from specific features of the current design of the UK system (Beveridgean scheme), and from the results of surveys conducted in representative countries.

First, the birth and growth of the social security systems shed some lights on the political forces behind the design of a Bismarckian *versus* a Beveridgean system, which are in line with the ideas developed in our paper. The first social security system was created in Germany by Bismarck in 1881. Its introduction is connected with the foundation of the German Reich ten years earlier. Its main feature was to be an *insurance* system, i.e. a system where benefits are earning-related. On the opposite, the Beveridge report, published in 1942 in the United Kingdom, introduced the alternative idea of a *minimum* system, i.e. a system with flat-rate benefits for qualified retirees. These two alternative systems depend on many factors, among which the political elements seem to play a crucial

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<sup>1</sup>Structure induced equilibrium, probabilistic voting, veto power or legislative bargaining and lobbying (see Persson and Tabellini, 2000).

role (see Cutler and Johnson 2001). Interestingly, Bismarckian systems were born under the pressure of what we can define a “middle class”, including influential industrial unions, narrow industrialized groups, politically important blue-collar, but not the poor. It was the same middle class who had considerably contributed to the movement which culminated in the unification of Germany. The introduction of the insurance system was a way to combat dissent and cement the alliance of these social groups with the Reich, in opposition to the socialist forces. In 1871 Bismarck wrote that “The only means of stopping the Socialist movement in its present state of confusion is to put into effect those Socialist demands which seem justifies and which can be realized within the framework of the present order of state and society” (Kohler et al., 1982). As a consequence, the government of the Reich played the main role in the organization of all insurance schemes (old-age, sickness, accident, disability). At that time, the Bismarckian ideas were not introduced in the United Kingdom. In fact, Britain was characterized by a liberal and democratic tradition, influenced by the individualistic ideology developed by leading political economists from Adam Smith to Ricardo, the lack of collectivist political movements, the expansion of private and voluntary collective welfare, the lack of notion of supremacy of the state responsibility, collective good and bureaucracy. The Times in June 1889 reported that: “natural as free individual development is to the English in their island home, equally necessary is for Germany a rigid, centralised, all pervading state control...the german is accustomed to official control, official delays and police supervision from the cradle to the grave....whereas...self-help and spontaneous growth are better suited to Englishmen” (Kohler et al., 1982). In this society, in 1942 the Beveridge report introduced an alternative model of social security. The Beveridgean scheme had a clear purpose of reducing poverty and raising the bottom income to a subsistence level, as a “weapon against mass poverty”, with the flat-rate benefits aiming “at abolishing want, i.e., the number of people who need means-test to reach subsistence” (Hills et al. 1994). At the same time, flat rate benefits stressed the individualistic part: the state action has to be limited to redistribute in favour of the poor, and then individuals privately provide for their own additional needs. Beveridge was convinced that the alternative Bismarckian earning-related system “is damaged to personal saving, while he wanted the maximum scope for private provision above his minimum” (Hills et al. 1994). This means that the Beveridgean plan was created with the intention both of redistributing in favour of the poor and of leaving the maximum freedom to the rich to privately invest their income. In fact, the environment in which the Beveridge report was written is a one in which “the old age pension campaign had a powerful momentum due to the fact that it was built upon an unholy and unintentional alliance between conservatives and socialists.” (Hills et al. 1994).

An additional interesting fact characterizes the birth of social security schemes: richer countries, such as the United States, were particularly late in adopting such institutions. Cutler and Johnson (2001) argue that since in richer countries the capital markets are more developed, there is less need and more private opposition to the introduction of a public system. This line of reasoning is similar to our idea that, in a given country, rich individuals oppose the public social security system, because they can find better private provisions.

A second interesting indirect support to the idea developed in our paper comes from some specific features of the social security system in the United Kingdom, i.e. the most Beveridgean scheme. The principles on which this system was founded at the beginning are still alive in the current purpose and design of the system. Following the European Commission (2001), the UK system is designed with the purpose of “targeting additional resources on the less well-off... earnings-related benefits are a small part of state provision, and better-off workers are expected to rely on voluntary occupational and savings pension income”. As a consequence, “private pensions contribute significantly to the income of pensioners, in particular higher up the income distribution. For the top quintile of pensioners, for example, state pensions account for only around a quarter of total income”. This result is based on two features<sup>2</sup>: (i) low-income individuals (with income below the Primary Threshold, PT, corresponding to 76 pounds per week in 2001) pay zero contributions and receive no pension from the State-Earning Related Pension Scheme (SERPS), but they benefit from the Basic State Pension (BSP), which is a flat benefit, and from specific benefits targeted to them; (ii) there is the possibility of “opting out” of the public system, which means that workers with an income between a Primary Threshold and an Upper Earning Limit (UEL, corresponding to 535 pounds per week in 2001) can choose between paying 10% as contributory tax rate to the public system, or paying a reduced rate of 8,4%. The employer pays 12,2% if the worker does not opt out, or 9,2% if the worker opts out, for the income above a Secondary Threshold (84 pounds per week).<sup>3</sup> In case of “opting out”, the individuals receive only the Basic State Pension (BSP) and no State-Earning Related Pension Scheme (SERPS)<sup>4</sup>. This design of the system implies that: (i) there is a large redistribution towards low-income individuals, with a great attention to the level of pension received by the poor, and (ii) there exists an automatic convenience for high-income individuals of “opting out” of

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<sup>2</sup>See Disney and Johnson (2001) for a detailed description of the UK pension system.

<sup>3</sup>Notice that workers pay zero taxes on the part of income exceeding the UEL. Employers pay zero taxes for the earnings between Primary and Secondary Thresholds.

<sup>4</sup>SERPS typically corresponds to 25% of the income of the best twenty years of contributions between the UEL and a Lower Earning Limit (LEL, corresponding to 67 pounds per week in 2001).

the public system<sup>5</sup>. These two features correspond to our idea that Beveridgean systems may be supported by a coalition of low and high-income individuals: low-income are favored by the design of the redistributive system, and high-income individuals may support a Beveridgean system, as long as this is small and allows for a large use of private provisions. In fact, rich individuals tend to agree on the proposal of paying less taxes and receive less benefits (which is a concrete choice under “opting out”).

Finally, interesting results which support our idea can be found in surveys on pensions recently conducted in some countries. Table 1 presents the results of our calculations on the data from a survey conducted by Boeri, Borsch-Supan and Tabellini in 2002 in Italy, which, as it will be clear in the next section, is a quite Bismarckian system. Table 1 shows that the majority of rich individuals (52.5%) agree on a reform composed by a lower level of taxes and lower pension. This result seems in line with the idea that in a Bismarckian system high-income individuals are “not happy”, since they realize that taxes are too high and that they would be better off paying lower taxes, even though this implies a reduction of the pension level. In fact, with a reduction of taxes, they can more than compensate for the reduced benefits by investing their income into the private market which is more convenient to them. This is exactly what they can do in a Beveridgean system like the UK, as we have seen below. On the contrary, middle-income individuals are more or less “happy” with the system (46% of them do not want a reform which reduces taxes and contributions). Finally, poor individuals are less informed than the others (15% don’t know the answer) and the majority of them do not want to decrease taxes and pensions. Intuitively, poor individuals are always in favor of the highest possible level of public pension, because they do not find enough profitable to invest in the private market. We expect that this result holds regardless of the type of the system, while it should be stronger if the system is redistributive (Beveridgean), since in this case poor individuals have an additional reason to prefer the public pension. In fact, pensions poll conducted in the UK by MORI (Market and Opinion Research International) in September 2000 show that 58% of individuals in the low-income group<sup>6</sup> would accept the proposal “pay extra in tax to increase the state pension”<sup>7</sup>. This result suggests

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<sup>5</sup>In fact an individual with income above the UEL will easily find it convenient to opt out of the system, pay a reduced tax rate on the part of his income between the PT and the UEL, and allow the employer paying less for the part of income above UEL, even though he will receive zero benefits corresponding to his income between UEL and LEL, because he is always receiving zero benefits for the part of his income above UEL.

<sup>6</sup>The low-income groups is identified by occupation, and corresponds to the group identified in table 1 for Italy.

<sup>7</sup>Notice that in the UK the question asked is whether to increase taxes and pensions (opposite to Italy, where they ask to decrease both) since a Beveridgean system is already quite small.



that in the UK low-income individuals are strongly in favor of the public system, even more than in Italy, since they realize that the public system redistributes in their favor.

The paper is organized as follows: the next section provides the empirical motivation of the paper, by performing an empirical analysis and collecting data on the different characteristics of alternative systems. The following sections introduce the economic environment, the voting game and the politico-economic equilibria. Section 6 concludes. All proofs are in the appendix.

## 2. Empirical Motivations

In this section we first use data from the European Commission Household Panel (ECHP) from 1993 to 1996 (4 waves) to classify the social security systems between Bismarckian and Beveridgean, according to their degree of redistribution. Second, we show that, contrary to the predictions of traditional political economy models of social security, Bismarckian systems are larger than Beveridgean ones. Third, we collect data on other features that differentiate the two alternative systems: the pension received by the low income people, the degree of inequality and the size of the private pension pillar.

The ECHP provides data on personal wage-salary earnings and pensions, together with many personal informations for a sample of individuals in the following European countries: Denmark, Netherlands, Belgium, Luxembourg, France, United Kingdom, Ireland, Italy, Greece, Spain, Portugal, Austria, Finland and Sweden<sup>8</sup>. For each country, we merge the data of two successive waves and calculate the replacement rates, defined as the ratio of post-retirement pension benefits to pre-retirement earnings. As in Nicoletti and Peracchi (2001, 2002) the replacement rates are calculated from the four waves of the ECHP on a subsample of people aged 55-69 at the time of retirement. Using the data on self-reported main activity status in each month, we select the individuals who retired in any month between February 1993 and December 1996, and compute their replacement rate as the ratio of monthly pension benefits in the year of retirement (annual pension income divided by the number of months of retirement) and monthly earnings during the previous year. Pension income only includes old-age pensions, and earnings are the wage and salary earnings, net of taxes and social security contributions (with the exception of France, where income is gross<sup>9</sup>). The replacement rates for

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<sup>8</sup>For a detailed description of the ECHP data see Peracchi (2002) and Nicoletti and Peracchi (2001, 2002).

<sup>9</sup>The use of gross income does not affect the replacement rate, as long as the ratio between net and gross earnings is equal to the ratio between net and gross pension benefits, as explained by Nicoletti and Peracchi (2002).

the Netherlands and Sweden are not computed, due to the lack of data<sup>10</sup>. Pooling for each country the replacement rates for individuals retiring at any month in the considered period, our sample sizes are still quite small, ranging from a maximum of 336 observations in Italy to a minimum of 15 observations in Finland.<sup>11</sup>

These observations are then partitioned in three income groups of equal size. For each group, we calculate the median<sup>12</sup> replacement rate. How the replacement rates vary across income groups depends on the country. We thus construct a “Beveridgean” index as the average of the differences between the replacement rates of the three income groups (difference between the replacement rate of the low and the middle income, of the middle and the high, and of the low and the high). Table 2 shows the results. As expected, the UK and Luxembourg have a higher Beveridgean index (respectively 0,548 and 0,5) followed by Denmark (0,34), while France, Italy and Spain show lower values (respectively 0,19, 0,169 and 0,139), thus being more Bismarckian.

Table 3 shows EC data on pension expenditures in European Countries (as % of GDP): the United Kingdom, Luxembourg and Netherlands enjoy lower pension expenditures than, for instance, Italy, France and Spain. A joint look at tables 1 and 2 - notice that Disney and Johnson (2001) argue that Netherlands have a Beveridgean system- suggests that more Beveridgean countries are typically associated with lower public pension expenditures than Bismarckian ones.

Table 4 shows that according to our calculations on the ECHP data, countries with a higher Beveridgean index are associated with a higher replacement rate for low-income individuals, both calculated as the replacement rate of the bottom 33% and the bottom 20% of the distribution of earners. This suggests that more Beveridgean systems offer a higher pension to low income individuals.<sup>13</sup>

Table 5 reports measures of inequality from the World Development Indicators, World Bank 2000. The table shows that the Gini index is significantly higher in the UK (36.1) than in Italy (27.3) or France (32.7). This is due to a higher concentration of income in the highest 20% in the UK, while the “middle” class (second, third and fourth 20% of the distribution) is significantly larger in Italy (55) and France (52.6) than in the UK (50.4). These results suggest that the lower

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<sup>10</sup>For the Netherlands the monthly information on activity status is not available, while data for Sweden start from 1996 and thus no longitudinal informations are available in the 4 waves.

<sup>11</sup>Clearly, four waves are not sufficient to reproduce the entire lifetime profile of the observed individuals. In particular, we do not calculate the replacement rates for individuals that experience an unemployment spell before retirement. Nevertheless, the classification obtained from this data is sensible and in line with previous studies (Disney and Johnson (2001)).

<sup>12</sup>The median is less affected than the mean by the existence of atypical data. Notice that Nicoletti and Peracchi (2001, 2002) also use a median regression model.

<sup>13</sup>Notice that in our model the higher is the minimum pension, the higher is the replacement rate of the low-type individual.

is the income inequality in a country, the more Bismarckian its system is.

Table 6 reports measures of the extension of the second pillar in the European countries. The data reported by the Green Paper of the European Commission 1997, based on the European federation for Retirement Provision 1996 show very large differences across countries: pension funds assets represent 79.4% of the GDP in the UK and 88.5% in the Netherlands, while in France they absorb only 3.4% of the GDP and an even smaller amount (1.2%) in Italy. Supplementary pensions represent 28% of the total pension in the UK, and only 2% in Italy. These data suggest that the second pillar is much more developed in Beveridgean countries, where the public pillar is smaller, than in Bismarckian countries, where the public pension offers very large amounts. This relation is confirmed by the data on the total value of pension funds from 1998 to 2000. Finally, table 6 shows also that higher returns from private pensions tend to characterize more Beveridgean systems: the average nominal rate of return from pension funds is 15.5 in the UK, which is the highest value for the available countries, and market capitalization is 149.9% of GDP, while in France it is 38.9% and in Italy only 21.7%.

### 3. The Economic Environment

We consider a two-period overlapping generations model. Every period two generations are alive: Young and Old. Population grows at a constant rate,  $n > 0$ . Individuals work in youth and retire in old age. Within each generation, there are three types of agents ( $j$ ): low, middle and high ability ( $j = L, M, H$ ), whose proportions are respectively  $\rho^L$ ,  $\rho^M$  and  $\rho^H$  where  $\rho^j < 1/2$ . Wages are equal to the working abilities, and are respectively  $w^L$ ,  $w^M$  and  $w^H$ , with  $w^L < w^M < w^H$ . We call  $\bar{w}$  the mean wage income,  $\bar{w} = \rho^L w^L + \rho^M w^M + \rho^H w^H$ , and we further assume that the distribution of abilities and income is positively skewed so that the average income,  $\bar{w}$ , exceeds the median income,  $w^M$ .

Agents value consumption in youth and in old age through a constant elasticity of substitution utility function. Young agents pay a proportional tax,  $\tau_t$ , on their wage income and decide how much to save for old age consumption. We assume that the three groups have different access to the capital market: low income people obtain a lower return on their saving than middle income people, who in turn obtain a lower return than high income people. This is meant to capture the differences in informations, degrees of risk aversion, and in the ability to manage their portfolio among individuals of different income groups. This assumption is in line with the results of Blake (1996). Using data for the United Kingdom, he shows that the expected return on assets increases with the level of wealth: the poorest investors expect a return on their portfolios of 7.99% while the wealthiest

investors, who take a higher level of risk, expect a return of 17.96% . In particular, we assume that the middle income group faces an interest rate which is weakly higher than the implicit average rate of return from the social security system, the population growth rate in our model, while the low-income group faces a lower interest rate. Therefore, an individual of ability  $j$  who save 1 euro in period  $t$  will have a return of  $(1 + r^j)$  euro in period  $t + 1$ , with  $r^L < n \leq r^M < r^H$ <sup>14</sup>.

Old agents do not work. They receive a pension transfer, whose amount may depend on their wage, as it will be specified below. We call  $p_t^j$  the pension awarded at time  $t$  to a type- $j$  old agent.

The representative type- $j$  young agent in period  $t$  solves the following optimization problem:

$$\max_{c_t^{t,j}, c_{t+1}^{t,j}} U(c_t^{t,j}, c_{t+1}^{t,j}) = u(c_t^{t,j}) + \beta u(c_{t+1}^{t,j}) \quad (3.1)$$

subject to the individual budget constraints and a non-negativity constraint on savings:

$$\begin{aligned} c_t^{t,j} + s_t^j &\leq w_t^j (1 - \tau_t) \\ c_{t+1}^{t,j} &\leq s_t^j (1 + r^j) + p_{t+1}^j \\ 0 &\leq s_t^j \end{aligned} \quad (3.2)$$

where  $0 < \beta \leq 1$  is a factor of time preference, superscripts indicate the period when the agent was born and subscripts indicate the calendar time. The utility function  $u(\cdot)$  is strictly concave, with a coefficient of risk aversion larger than one<sup>15</sup> ( $r_R(x) = -xu''(x)/u'(x) > 1$ ).

Notice that the restriction on non-negative savings rules out the possibility of borrowing in youth against future pension payments. This is a realistic assumption in a two overlapping generations model (see Diamond and Haussman (1984)) and standard in this literature. When  $s_t^j > 0$  the first order condition for an interior solution defines the optimal saving decision of a type- $j$  individual. Then for a given social security system the optimal level of savings,  $s_t^{*,j}$ , are implicitly defined by the following first order condition:

$$u'(w_t^j (1 - \tau_t) - s_t^j) = \beta u'(s_t^j (1 + r^j) + p_{t+1}^j) (1 + r^j) \quad (3.3)$$

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<sup>14</sup> $r^L < n$  is not a crucial assumption to obtain the main results in the paper as it becomes clear in the next sections, but it guarantees that low-income young individuals are always in favor of the existence of the pension system no matter of the degree of intragenerational redistribution within the social security system.

<sup>15</sup>This assumption is consistent with the empirical estimates (see Auerbach and Kotlikoff (1987)).

Thus, savings are increasing in the interest rate and in disposable wage income and decreasing in the pension transfer. A large enough social security transfer totally crowds out private saving. Specifically,  $s_t^j = 0$  if the level of pension is such that:  $u'(w_t^j(1 - \tau_t)) > \beta(1 + r^j)u'(p_{t+1}^j)$ .

### 3.1. The Social Security System

We consider a pay as you go (PAYG) social security system, in which workers contribute a fixed proportion of their labor income to the system, and the proceedings are divided among the old. We assume that a type- $j$  retiree receives a pension,  $p_{t+1}^j$ , which consists of two parts: i) a contributory part  $\alpha$  which is directly related to individual earnings,  $w^j$ ; and ii) a non-contributory part  $1 - \alpha$  which depends on average earnings,  $\bar{w}$ . The system is assumed to be balanced every period, so that the sum of all awarded pensions is equal to the sum of all received contributions. Therefore, at steady-state the average return from the social security system is given by the population growth rate. These properties yield the following expression for the pension received by a type- $j$  pensioner:

$$p_t^j = (1 + n)\tau_t \left( \alpha_t w^j + (1 - \alpha_t) \bar{w} \right) \phi(\alpha_t) \quad (3.4)$$

where  $\phi(\alpha_t) \equiv (1 - \eta(1 - \alpha_t))$ .

The variable  $\alpha_t$  is the Bismarckian factor, that is the fraction of pension benefits that is related to contributions. When  $\alpha = 1$  the pension scheme is contributory or purely Bismarckian; and when  $\alpha = 0$  pension benefits are uniform and the scheme is redistributive or purely Beveridgean. For intermediate values,  $0 < \alpha < 1$ , due to the combination of a proportional labor income tax and the non-contributory part, there exists an element of within-cohort redistribution, from rich to poor, which is higher the lower is the Bismarckian factor  $\alpha$ . In general, we may define a system to be Bismarckian if  $\alpha > 1/2$  and Beveridgean if  $\alpha < 1/2$ <sup>16</sup>.

The parameter  $\eta$  identifies a distortionary effect associated to the non contributory part of the social security system. This is meant to capture the different impact of the social security tax rate on the labor-leisure decision under the two systems. In a Bismarckian system, there is a close link between the final pension of a worker and her history of contributions, which can thus be interpreted as forced savings. In a Beveridgean system, on the other hand, this link does not exist, or it is weaker, and thus workers may interpret their contributions as a pure tax, that affects their labor decision. In other words, pensions are less costly,

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<sup>16</sup>Notice that the value of  $1/2$  is just convenient, but not fundamental for the purpose of our analysis, which is based on comparisons. In other word, the only relevant feature here is to compare more Bismarckian versus more Beveridgean systems.

in terms of deadweight loss from taxation, in a Bismarckian scheme than in a Beveridgean one<sup>17</sup>.

As in Tabellini (2000) and Conde-Ruiz and Galasso (1999), the redistributive effect of the social security system can be crucial in our political game, because it increases the internal rate of return of the social security system for low ability young.<sup>18</sup>

The PAYG social security budget constraint is the following:

$$\sum_{j=\{L,M,H\}} \rho^j p_t^j = (1+n)\tau_t \bar{w} \phi(\alpha_t) \quad (3.5)$$

In every period, the social security system can be characterized by the pension received by a type- $j$  individual ( $j = M, L, H$ ), the payroll tax rate, and the Bismarckian factor:  $(p^j, \tau, \alpha)$ . The budget constraints at equations 3.4 and 3.5 can then be used to calculate the pensions for the other two types of individuals. Given the budget constraints, it is sufficient to assume that two variables are determined by the political process, to have the equilibrium of the entire social security system. We assume that these two variables are  $\alpha$  and  $p^L$ . We clearly choose  $\alpha$  because our analysis focuses on the degree of intragenerational redistribution in the pension system, which is represented by the value of  $\alpha$ . Then, between  $\tau$  and one of the three levels of pensions, we choose the minimum pension, i.e.  $p^L$ , for three types of reasons: (i) Disney et al. (1998) argue that the pension level of the low-income individuals play a key role in shaping the redistributive structure of the system; (ii) as already mentioned in the introduction, one of the main purposes of the Beveridge Report (1942), which underlies the design of a social security system alternative to the Bismarckian one, was to guarantee through the social security system a minimum income to maintain a certain standard of living for the poorest; (iii) from a technical point of view, the choice of  $p^L$  is preferred, as we will discuss in section 4.2.1.

Once the minimum pension and the Bismarckian factor are determined, using the PAYG budget constraint, the tax rate is also fully characterized. In other words, for a given  $p_t^L$  and  $\alpha_t$ , we have that:

$$\tau_t = \frac{p_t^L}{(1+n)(\alpha_t w^L + (1-\alpha_t)\bar{w})\phi(\alpha_t)} \quad (3.6)$$

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<sup>17</sup>See Mulligan (2001) for an explanation about the deadweight cost of taxation in political economy models and De Donder and Hindriks (1999) for the analysis of labor market distortions associated to social security systems.

<sup>18</sup>Evidence in favor of the existence of this within-cohort redistribution for the US system can be found in Boskin et al. (1987) and Galasso (2002).

and the pensions for the middle and high-type are respectively:

$$\begin{aligned} p_t^M &= \frac{(\alpha_t w^M + (1 - \alpha_t) \bar{w})}{(\alpha_t w^L + (1 - \alpha_t) \bar{w})} p_t^L \\ p_t^H &= \frac{(\alpha_t w^H + (1 - \alpha_t) \bar{w})}{(\alpha_t w^L + (1 - \alpha_t) \bar{w})} p_t^L \end{aligned} \quad (3.7)$$

Notice that if the system is purely Beveridgean,  $\alpha = 0$ , pensions are equal across types,  $p_t^L = p_t^M = p_t^H$ , while the replacement rates ( $p_t^j/w^j = (1 + n)\tau_t \bar{w}/w^j \forall j = L, M, H$ ) are decreasing in labor income. On the other hand, if the system is purely Bismarckian,  $\alpha = 1$ , pensions are increasing in labor income,  $p_t^L < p_t^M < p_t^H$ , while the replacement rates are equal across types ( $p_t^j/w^j = (1 + n)\tau_t \forall j = L, M, H$ ).

### 3.2. The Economic Equilibrium

The following definition introduces the economic equilibrium, given the values of the social security system, which will be determined by the political game.

**Definition 3.1.** For a given sequence  $\{\tau_t, \alpha_t, p_t^L\}_{t=0}^\infty$ , and exogenous interest rates,  $r^L$ ,  $r^M$  and  $r^H$ , an economic equilibrium is a sequence of allocations,  $\{(s_t^j, c_t^{t,j}, c_{t+1}^{t,j})\}_{j=\{L,M,H\}}^{t=0,\dots,\infty}$ , such that:

- In every period agents solve the consumer problem, i.e., every type  $j$  young individual maximizes her utility function  $U(c_t^{t,j}, c_{t+1}^{t,j})$  with respect to  $s_t^j$ , and subject to the individual budget constraints;
- The social security budget constraint is balanced every period;
- The goods market clears every period:

$$\sum_{j=\{L,M,H\}} \left[ (1 + n) \rho^j c_t^{t,j} + \rho^j c_t^{t-1,j} \right] = (1 + n) \bar{w} (1 - \eta (1 - \alpha_t) \tau_t)$$

The life-time utility obtained in equilibrium by a type  $j$  young agent and the remaining life-time utility for a type  $j$  old agent are represented respectively by the following indirect utility functions:

$$v_t^{t,j}(p_t^L, \alpha_t, p_{t+1}^L, \alpha_{t+1}) = u(w_t^j (1 - \tau_t) - s_t^{j*}) + \beta u(s_t^{j*} (1 + r^j) + p_{t+1}^j) \quad (3.8)$$

$$v_t^{t-1,j}(p_t^L, \alpha_t) = u(K_t^j (1 + r^j) + p_t^j) \quad (3.9)$$

where  $s_t^{j*}$  is the optimal level of saving obtained at equation 3.3,  $\tau_t$  is a function of  $p_t^L$  and  $\alpha_t$  by equation 3.6,  $p_{t+1}^j$  and  $p_t^j$  are functions of  $p_{t+1}^L, \alpha_{t+1}$  by equations 3.7, and  $K_t^j$  is a constant which does not depend on current or future values of the social security system<sup>19</sup>.

## 4. The Political Institution

The size and composition of the social security system are determined through a political process which aggregates agents' preferences over the minimum pension,  $p^L \geq 0$ , and the Bismarckian factor,  $\alpha \in [0, 1]$ .

Since the issue space is bidimensional ( $p^L$  and  $\alpha$ ), Nash equilibrium of a majoritarian voting game may fail to exist. The literature provides alternative solutions (see Persson and Tabellini, 2000): probabilistic voting, lobbying, structure induced equilibrium, agenda setting. We adopt a majoritarian voting system and use the concept of issue by issue voting. This equilibrium concept has been formalized in the notion of structure induced equilibrium by Shepsle (1979), and it has been used in the context of political economy models of social security by Conde-Ruiz and Galasso (1999 and 2003). As in their papers, our game is intrinsically dynamic, since it describes the interaction among successive generations of workers and retirees. We therefore use their concept of subgame perfect structure induced equilibrium, which reduces the game to a dynamic issue-by-issue voting game.

Elections take place every period. All persons alive, young and old, simultaneously but separately cast a ballot over the two dimensions  $p^L$  and  $\alpha$ . Since every agent has zero mass, no individual vote could affect the outcome of the election. We assume sincere voting. The two dimensions can be interpreted as two different jurisdictions. One of them has to decide over  $p^L$ , and the other over  $\alpha$ . The decision is the outcome of separate votes, one over each dimension.

We analyze the case of full commitment, in which voters determine the constant sequence of the parameters of the welfare state  $(p^L, \alpha)$ . In other words, current voters can determine future policies. In the absence of a state variable, this voting game is static, and the result in Shepsle (1979) [Theorem 3.1] can be applied to obtain the sufficient conditions for a (structure induced) equilibrium to exist. In particular, if preferences are single-peaked along every dimension of the issue space, a sufficient condition for  $(p^{L*}, \alpha^*)$  to be an equilibrium of the voting game with full commitment is that  $p^{L*}$  represents the outcome of a majority voting over the jurisdiction  $p^L$ , when the other dimension is fixed at its level  $\alpha^*$ , and

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<sup>19</sup>Specifically,  $K_t^j = s_{t-1}^j(1 + r^j)$ .



viceversa.<sup>20</sup>

The results obtained in the case of commitment can be extended to the case without commitment, where voters may only pin down the current values of  $p^L$  and  $\alpha$ , although they may expect their current voting behavior to affect future voters' decisions. This general result has been proved by Conde-Ruiz and Galasso (1999 and 2003) in a similar economic and political environment. Therefore, we argue that this result applies also to our case, and there is no need to repeat their proofs.

The outcome of the simultaneous voting game depends on which are the variables to vote on. We let individuals vote on the minimum pension  $p^L$  and the Bismarckian factor  $\alpha$ . In this case the voting coalitions supporting the equilibrium outcome are the same regardless of whether individuals vote sequentially or simultaneously over each jurisdiction. The choice of any other pair of voting variables is not robust to sequential voting. We will discuss this issue in more details in section 4.2.1.

To sum up, in this paper we focus exclusively on the case of commitment. Individuals' votes over each dimension of the issue space,  $(p^L, \alpha)$ , are examined issue-by-issue. Voters cast a ballot over a constant sequence of  $p^L$ , for a given constant sequence of  $\alpha$ , and viceversa. For each dimension,  $p^L$  and  $\alpha$ , votes are then ordered to identify the median voters, and their voting functions  $p^L(\alpha)$  and  $\alpha(p^L)$ . The points at which these median functions intersect,  $(p^{L*}, \alpha^*)$ , represent the (structure induced) equilibrium outcomes of the game.

A preliminary result is necessary: from Shepsle (1978) a sufficient condition for the existence of a structure induced equilibrium is that voters' preferences are single-peaked over the issue space  $(p^L, \alpha)$ . We assume that the single-peakness condition over each issue is satisfied, which implies that the following condition is satisfied:<sup>21</sup>

$$\eta \leq \min\{(w^j (\bar{w} - w^L) - N^j \bar{w} (w^j - w^L)) w^j w^L, (\bar{w} - w^L) / (2\bar{w} - w_L)\} \quad (4.1)$$

For a given level of pension obtained by the low income individual, the above condition guarantees that it is not possible at the same time to increase the intragenerational component within the social security system and decrease the payroll tax.

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<sup>20</sup>See Persson and Tabellini (2000) for a simple explanation of how to calculate a structure induced equilibrium.

<sup>21</sup>See the technical Appendix for the formal proof of this condition.

#### 4.1. Voting on the minimum pension ( $p^L$ )

Regardless of the type of the social security scheme, the elderly are net recipients from the system. Therefore, for any value of  $\alpha$ , they choose the pension transfer for the low income,  $p^L$ , that maximizes their pension (see equation 3.7). This is clearly the highest possible value, i.e.  $p^L$  s.t.  $\tau = 1$ .

Today's young individuals may be willing to vote in favor of the pension system, and thus to bear the cost of a current transfer, if their vote will also have an impact on its future size, and thus on their future benefits. In the game with commitment, a type- $j$  young individual chooses her vote,  $p_j^L$ , by maximizing her indirect utility function with respect to a constant sequence of minimum pensions,  $p_{t,j}^L = p_{t+1,j}^L = p_j^L$ .

The most preferred level of the minimum pension of a type- $j$  young individual is given by:

$$p_j^L(\alpha) \in \arg \max_{p^L} u \left( w_t^j (1 - \tau_t) - s_t^{*,j} \right) + \beta u \left( s_t^{*,j} (1 + r_j) + p_{t+1}^j \right) \quad (4.2)$$

Notice that a type- $j$  worker will always be in favor of zero minimum pension (i.e. zero payroll tax) if

$$(1 + r^j) > (1 + n)\phi(\alpha) \left( \alpha + (1 - \alpha) \frac{\bar{w}}{w^j} \right) \quad (4.3)$$

If, on the other hand, the previous condition is not satisfied, he will be in favor of a positive minimum pension, which is implicitly defined by the following equation:

$$u' \left( w_t^j (1 - \tau_t) \right) = \beta u' \left( p_{t+1}^j \right) (1 + n)\phi(\alpha_t) \left( \alpha_t + (1 - \alpha_t) \left( \bar{w}/w_t^j \right) \right) \quad (4.4)$$

The intuition of the previous result is the following: if the rate of return of his saving technology,  $(1 + r^j)$ , is higher than the rate of return of social security,  $(1 + n)\phi(\alpha) \left( \alpha + (1 - \alpha) \bar{w}/w^j \right)$ , a type- $j$  worker would prefer to transfer resources to the future using the private saving technology rather than the social security system. Thus, he will prefer a zero minimum pension and positive savings. Otherwise, he will choose a positive minimum pension and no private savings<sup>22</sup>.

It is important to notice that the young individual's vote depends on the type of social security system. For instance in a purely Bismarckian system ( $\alpha = 1$ ),

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<sup>22</sup>Notice that for a given level of  $\alpha$ , voting over the jurisdiction  $p^L$  is completely equivalent to voting over the jurisdiction  $\tau$  (the first order conditions for  $p^L$  and for  $\tau$  are exactly the same). Individuals always vote the level of  $\tau$  or of the minimum pension that transfers the optimal level of resources into the future. In fact, for a given  $\alpha$  there is a one-to-one correspondence between the two variables ( $p^L$  and  $\tau$ ) through the balanced social security budget constraint.

a type- $j$  young votes for a positive minimum pension if  $r^j \leq n$ ; while in a purely Beveridgean one ( $\alpha = 0$ ) he will support a positive minimum pension if  $r^j < (\bar{w}/w^j)(1+n)\phi(\alpha) - 1$ .

This suggests that low-income young always vote for a positive pension in a Bismarckian system,  $r^L < n$ , but they are also willing to vote for a positive pension in a Beveridgean system, provided that the distortion is not too large,  $\eta \leq 1 - (1 + r^L)w^L/(1+n)\bar{w}$ . On the other hand, high-income young always vote for zero minimum pension (i.e. zero payroll tax), since they have access to a better saving technology,  $r^H > n$ , and are net contributors in a Beveridgean (redistributive) system ( $w^H > \bar{w}$ ). The voting behavior of the middle-income young depends instead on the degree of redistribution ( $\alpha$ ) and on the performance of the social security system relative to the one of the assets that they may access on the capital market ( $r^M$  versus  $n$ ).

Finally, to complete the ordering of the votes over  $p^L$ , it is sufficient to notice that if both low and middle-income young choose to vote for a positive minimum pension, the middle-income young will vote for a larger pension:  $p_M^L(\alpha) > p_L^L(\alpha)$ <sup>23</sup>. The intuition is straightforward: richer individuals want to move more resources into the future and therefore, since they use the social security system as their only saving technology, they prefer higher pensions than lower income agents<sup>24</sup>. Therefore, if the type- $M$  young individuals are willing to join the low-income individuals in supporting the social security system, they vote for higher pension than the low-type young.

In order to simplify the number of cases of possible equilibria<sup>25</sup> in the following analysis we focus on the case where middle-income young individuals prefer the private technology as a saving device. In this case the identity of the median voter depends on the size of the low-income group. In fact, middle-income individuals join the high-income in choosing a minimum pension equal to zero. Therefore we have two scenarios: (i) if the median voter is a low-type young (when  $\rho^L \geq n/(2(1+n))$ )  $p^L$  is positive and the middle and high-type complement their transfers of resources into the future through private savings; (ii) if the median voter is a middle-type young (when  $\rho^L < n/(2(1+n))$ ), there are no pensions and all transfers into the future occur through private savings.

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<sup>23</sup>Since the coefficient of risk aversion is larger than one, it is easy to show that  $dp_j^L/dw^j < 0$ .

<sup>24</sup>This result was already in Casamatta et al. (2000a).

<sup>25</sup>Notice that we focus on the coalitions formed over the Bismarckian factor. For this result it is not important the identity of the median voter over the minimum pension. The main results hold true if one wants to analyze all the possible cases.

## 4.2. Voting on the Bismarckian factor

The old have again a simple choice. Since they are no longer required to contribute to the system, they vote for the Bismarckian factor that maximizes their current transfer for a given level of  $p^L$ . Clearly, low-type old are indifferent on this dimension, because their final pension,  $p^L$ , is already determined. Middle and high-income old vote for  $\alpha = 1$  (a purely Bismarckian system), since, for a given minimum pension, a Bismarckian system maximizes their pension transfers:

$$\frac{dp^j}{d\alpha} = \frac{\bar{w}(w^j - w^L)}{(\alpha w^L + (1 - \alpha)\bar{w})^2} p^L > 0; j = M, H \quad (4.5)$$

We now turn to the young. Because of the assumption of commitment over the social security policies, the voting decision of a type- $j$  young individual amounts to maximizing her indirect utility (equation 3.9) with respect to current and future Bismarckian factors,  $\alpha_t = \alpha_{t+1} = \alpha$ , for a given value of current and future minimum pensions,  $p_t^L = p_{t+1}^L = p^L$ . To appreciate the voting behavior of the young, notice that, for a given value of  $p^L$ , an increase in the Bismarckian factor has a double effect: it raises the pensions to the middle and high types (see equation 3.7), and hence it increases the tax rate to finance the additional pension transfers (see equation 3.6). The next proposition provides a characterization of their voting behavior and the main result of the paper.

**Proposition 4.1.** *Low-type young individuals choose a purely Beveridgean system ( $\alpha = 0$ ). Young type- $j$  individuals, with  $j = M, H$  vote for:*

$$\begin{aligned} \alpha &> 1/2 && \text{if } 1 + r^j < 1 + R^j \\ \alpha &< 1/2 && \text{if } 1 + r^j > 1 + R^j \end{aligned} \quad (4.6)$$

where

$$1 + R^j = (1 + n) \frac{(2 - \eta)^2}{4} \frac{w^j - w^L}{w^j(1 - \eta) - \frac{w^j}{\bar{w}} w^L} \quad (4.7)$$

This proposition suggests that low-income young prefer a Beveridgean system, which, for a given  $p^L$ , reduces their wage bill. The voting behavior of the middle and high-income young is more interesting to analyze. Three elements are crucial in their voting decision:

1. the performance of the social security system relative to the saving technology  $(1 + n)/(1 + r^j)$ : a better performance increases the support for a Bismarckian system;

2. the Beveridgean distortion factor  $\eta$  : a larger distortion increases the support for a Bismarckian system<sup>26</sup>; and
3. the redistributive element ( $w^j/\bar{w}$ ): a larger impact (smaller  $w^j/\bar{w}$ ) increases the support for a Beveridgean system.

High-income types are net contributors to a redistributive (Beveridgean) system. Nevertheless, they are willing to sustain a Beveridgean system ( $\alpha < 1/2$ ) if the return on their private assets is sufficiently high. The intuition is straightforward: a Beveridgean system reduces their pension transfer, but also their contributions to the system, which may more conveniently be invested in a private asset. This represents a crucial insight of the model. It suggests that alternative saving opportunities may be relevant in shaping the individual preferences over the social security system. If, on the other hand, the return on private asset is not sufficiently high, high-income choose a Bismarckian scheme<sup>27</sup>.

Middle-income types also prefer a Beveridgean system if the return on their private assets is sufficiently high. Their preferred level of the Bismarckian factor can be larger or smaller than the one preferred by the high-type, depending on the level of the interest rate.

To summarize, if high types young obtain sufficiently high returns on private assets, a Beveridgean system is always supported by a coalition of the extremes: low and high types young. Thus, if they constitute a voting majority or if they are joined by the middle-type young, a Beveridgean system arises. If, on the other hand, they do not constitute a majority, and the middle-type young oppose a Beveridgean system, a Bismarckian system arises.

#### 4.2.1. Discussion

In our model, the political decision over the social security system includes two jurisdictions (i.e issues)  $(\alpha, p^L)$ , while the third variable which defines completely the social security system, the payroll tax  $\tau$ , is residually determined to balance the budget constraint. We refer to this political system as a  $p^L$ -*legislature*. Alternatively, we could consider a  $\tau$ -*legislature*, i.e. a system where the issues to be decided are  $\tau$  and  $\alpha$ . In this case, the voting behavior would be different. In particular, while voting over  $\tau$  for a given  $\alpha$  gives the same results as voting over  $p^L$  for a given  $\alpha$  (see section 4.1), the voting behavior over  $\alpha$  would be different. To see this, consider the voting behavior of a high-type young individual

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<sup>26</sup>It can be easily shown that the derivative of the RHS of equation 4.3 with respect to  $\eta$  is positive.

<sup>27</sup>This result holds for high-income savers. High type non-savers wish to transfer resources into the present. Thus, even for low private returns, they may be willing to support a Beveridgean scheme in order to decrease today's contributions, and hence to increase today's net income.

when  $r^H \geq R^H$  (see equation 4.6). Under the  $p^L$ -legislature, this individual supports a Beveridgean system. However, under the  $\tau$ -legislature he would vote for a pure Bismarckian system. This is because supporting a more Beveridgean system would not diminish his tax burden (as in the  $p^L$ -legislature), while it would decrease his pension.

A justification for our setting, in addition to what explained in section 3.1, is that the  $p^L$ -legislature is robust to sequential voting, while the  $\tau$ -legislature is not. Consider a two stages sequential voting where  $\alpha$  is decided at the first stage and  $p^L$  (in a  $p^L$ -legislature) or  $\tau$  (in a  $\tau$ -legislature) at the second stage. Consider again the voting behavior of a high-type young individual when  $r^H \geq R^H$ . Under the  $p^L$ -legislature, with sequential voting this individual supports a Beveridgean system at the first stage, exactly as he does with simultaneous voting. On the other hand, under the  $\tau$ -legislature, with sequential voting he still supports a Beveridgean system at the first stage (differently from what he does with simultaneous voting) because he knows that a more Beveridgean system at the first stage implies a lower tax rate to be paid at the second stage.

## 5. The Political Economy Equilibrium

The previous sections have separately analyzed the voting behavior of all individuals along the two dimensions of the issue space, i.e., the minimum pension and the Bismarckian factor, under the assumption of commitment. Since preferences are single peaked (under condition 4.1), we can now apply Shepsle's (1979) result, and characterize the structure induced equilibria of the game with commitment. The next proposition characterizes the politico-economic equilibrium outcomes of our voting game.

**Proposition 5.1.** *When there is a sufficiently large number of low-income individuals, i.e.,  $\rho^L > n/(2(1+n))$ , and low and middle-income young constitute a majority of the voters, i.e.  $\rho^L + \rho^M > (2+n-\rho^L)/2(1+n)$ , there exists a structure induced equilibrium  $(p^{L*}, \alpha^*)$  of the voting game with commitment, such that:*

- i) *For  $r^M > R^M$ , a Beveridgean system prevails ( $p^{L*} = p_L^L$  and  $\alpha^* < 1/2$ )*
- ii) *For  $r^M < R^M$  and  $r^H < R^H$ ,  $p^{L*} = p_L^L > 0$  and the system is Bismarckian ( $\alpha^* > 1/2$ ) for  $\rho^L \leq (2+n)/(3+2n)$  and purely Beveridgean ( $\alpha^* = 0$ ) otherwise.*
- iii) *For  $r^M < R^M$  and  $r^H > R^H$ ,  $p^{L*} = p_L^L > 0$  and the system is Bismarckian ( $\alpha^* > 1/2$ ) for  $\rho^M > (\rho^L + n)/(2(1+n))$  and Beveridgean ( $\alpha^* < 1/2$ ) otherwise.*

First notice that if there is a small proportion of low-income young, i.e., if  $\rho^L < n/(2(1+n))$ , no social security system would arise in equilibrium, i.e.  $p^{L*} = 0$ . This result arises from section 4.1 and it is a usual result in the literature.

Case i) of the previous proposition suggests that a Beveridgean system is an equilibrium as long as the middle-income young have sufficiently high returns from private savings and thus join the low-income in supporting a Beveridgean system, regardless of the vote of the high-income young.

Case ii) points out that a Bismarckian system arises as an equilibrium when both high and middle-income young have sufficiently low returns from private savings, provided that the low-income young do not constitute a majority of the voters. In this case in fact, low-income would be the only ones to benefit from a Beveridgean system. This result suggests that countries with more efficient capital markets, which provide higher returns, are more likely to have a Beveridgean system.

The most interesting results arises when middle-income young individuals do not enjoy sufficiently high returns from private savings, but high-income young individuals do (case iii). In this case, which is illustrated in figure 1, a Beveridgean system may be supported by a voting coalition of low and high-income young individuals. This equilibrium resembles the “ends against the middle” result in Epplé and Romano (1996): in the presence of private alternative, high and low-income individuals prefer lower public expenditure (with the rich choosing more private consumption) against the middle-income who would prefer more public expenditure. However, if there exists a large share of middle types, a Bismarckian system arises. In this sense, this result suggests that more inequality, as measured by a large share of low and high-income young, is more likely to be associated with Beveridgean systems, and viceversa.

To summarize, proposition 4.2 delivers predictions which are consistent with the empirical relations that motivated our analysis (see section 2): PAYG Beveridgean systems are associated with larger inequality than Bismarckian ones (see table 5) and they are more likely to emerge in countries with more developed capital markets, that enjoy higher returns (see table 6).

The next Corollary delivers an additional empirical predictions and show that our bidimensional voting model is able to account for the “puzzle”, i.e. the negative relation between the degree of redistribution of a system ( $\alpha$ ) and its size ( $\tau$ ).

**Corollary 5.2.** *The equilibrium level of the pension of low-income type is weakly decreasing in  $\alpha$ , while the equilibrium tax rate is weakly increasing in  $\alpha$ .*

Corollary 4.3 shows that a Beveridgean system is associated with a higher pension for the low-income individuals, as we have found in the data (see table

4). Moreover, a Beveridgean system is associated with a lower size of the PAYG system (a lower tax rate) than a Bismarckian (see table 3). The second result was already in Casamatta et al (2000a). In our model, this is because a Beveridgean system is supported by a coalition of low-income, who prefer a higher pension for themselves, and high-income types, who are in favor of a high pension for the low-income types if this is combined with a lower tax rate, so that they pay less taxes and can invest more in the private assets.

Finally, what happens if we relax the assumption of commitment and consider a game in which voters may only determine the current Bismarckian factor and minimum pension? Following Conde Ruiz and Galasso (1999, 2002) the results in proposition 4.2 can be generalized to a game without commitment. There exists a system of punishment and rewards, which makes the equilibrium outcome of the game with commitment a *subgame perfect* equilibrium outcome of the game without commitment. The intuition is straightforward. Old agents' voting behavior does not depend on tomorrow's policy and thus on the existence of commitment. Young individuals, who were in favor of a positive social security system (either Beveridgean or Bismarckian) in case of commitment, will now be willing to enter an "implicit contract" among successive generations of voters to sustain the welfare state. This "implicit contract" specifies that, if current young support the existing welfare system, they will be rewarded with a corresponding transfer of resources in their old age, otherwise they will be punished, and receive no transfers.

## 6. Conclusions

This paper provides a comprehensive analysis of social security systems which differ for their degree of intragenerational redistribution. We collect data from the European Commission Household Panel (4 waves) which show that more Bismarckian systems are associated with larger pension expenditures. These data also suggest that Beveridgean systems are characterized by a very high level of the replacement rate of the lowest income people. Other features that differentiate Bismarckian and Beveridgean systems are the following: Bismarckian systems tend to be associated with lower inequality and with a lower size of the private pillar. All these features motivate our model, which aims at jointly determining the level of the minimum pension and the degree of redistribution of the pension formula (the Bismarckian factor) in a bidimensional political economy approach, taken into account all the observed relations. The explanation is very intuitive: in an economy with three groups, which differ in income and in their ability to invest in the capital market, low-income people support a redistributive system, which provides them a higher pension and redistribute in their favor; middle-income



favor an earning-related system, with a tight link between their contributions and their benefits (provided that the alternative private pillar does not provide them with high enough returns), while high-income people prefer a redistributive system, which guarantees a higher pension to the low-income types provided that this is combined with a smaller size of the public system (and thus, of the contributions to be paid), so that they can invest more in the private system, which guarantees them higher returns. If income inequality is large, a coalition of the extreme emerges where high and low-income people form a voting majority which supports a (small) Beveridgean system, and a large private pillar may arise; if income inequality is small, middle-income and elderly people represent a majority which sustains a (large) Bismarckian system and the private pillar turns out to be small. Additionally, we show that when capital markets are more efficient and provide higher returns, Beveridgean systems are more likely to emerge.

This analysis could be extended in several directions. First, as a general remark, this paper provides a positive analysis, whereas the policy implications are not exploited yet. This will be our next step. Second, a careful analysis of policy implications will introduce the analysis of reforms. More specifically, the role that the intragenerational redistributive component may play in reforms of the social security system has been generally disregarded in the political economy literature. With our theoretical framework, one may ask questions like the following: (i) how would the aging process modify the design of the social security systems with respect to their degree of intragenerational redistribution? (ii) how would reforms of the degree of redistributiveness of the public PAYG system affect the development of the private pension schemes? If the aging process implies a larger PAYG system, high-income individuals will tend to shift their support in favor of a more Bismarckian scheme. An indirect evidence of this effect can be found in the Italian reform of 1995, which, after a large increase of pension expenditures, introduced a more Bismarckian scheme, by changing the benefit formula from defined benefits to defined contributions. Third, the data collected in this analysis and the predictions of the model suggest that the pension systems in European countries differ in many aspects. Many questions arise: (iii) what role will current policies, such as the harmonization of the pension systems in a European context, have on the differences among European pension systems? (iv) do we expect European countries to react differently to current common trends, such as the aging process? All these questions suggest directions for future research.

## A. Appendix

### A.1. Single peakness

If  $\eta \leq \min\{(w^j(\bar{w} - w^L) - N^j \bar{w}(w^j - w^L))w^j w^L, (\bar{w} - w^L)/(2\bar{w} - w^L)\}$ , preferences of all individuals are single-peaked in both  $p^L$  and  $\alpha$ .

Proof

i) Some straightforward algebra is sufficient to show that  $v_t^{t,j}(p^L, \alpha)$  is a concave function of  $p^L$ .

ii) To analyze the preferences over  $\alpha$ , first notice that, for a given  $p^L$ , an increase of  $\alpha$  increases the tax rate (equation 3.6) only if  $\eta \leq (\bar{w} - w^L)/(2\bar{w} - w^L)$ :

$$\frac{\partial \tau}{\partial \alpha} = - \frac{-p^L[(\alpha w^L + (1 - \alpha)\bar{w})\eta + \phi(w^L - \bar{w})]}{((1 + n)\phi(\alpha)(\alpha w^L + (1 - \alpha)\bar{w})^2)}$$

In this case, an increase of  $\alpha$  (for a given  $p^L$ ) reduces the utility of a low-type (equation 3.8), who, as a consequence, will vote for  $\alpha = 0$ . On the other hand, an increase of  $\alpha$  increases the middle and high type's pensions (equations 3.7):

$$\frac{\partial p^j}{\partial \alpha} = \frac{\bar{w}(w^j - w^L)p^L}{(\alpha w^L + (1 - \alpha)w^H)^2} > 0 \text{ for } j = M, H$$

Thus, for middle and high-type savers,  $s^{*,j} > 0$ , and by the envelop theorem, we can concentrate on the effect on the lifetime income (indicated by  $I^j$ ):

$$\frac{\partial I^j}{\partial \alpha} = \frac{p^L}{(\alpha w^L + (1 - \alpha)\bar{w})^2} \left[ - \frac{w^j[(\alpha w^L + (1 - \alpha)\bar{w})\eta + \phi(w^L - \bar{w})]}{(1 + n)\phi(\alpha)^2} + \frac{\bar{w}(w^j - w^L)}{1 + r^j} \right] = 0$$

If an internal solution exists, there are two levels of  $\alpha$  such that the first order condition is equal to zero:

$$\begin{aligned} \alpha_A^j &= a + b \\ \alpha_B^j &= a - b \end{aligned}$$

where

$$\begin{aligned} a &= \frac{w^j(\bar{w} - w^L) - ((1 - \eta)N^j(\bar{w}(w^j - w^L)))}{\eta N^j \bar{w}(w^j - w^L)} \\ b &= \frac{\sqrt{((\bar{w} - w^L)w^j)^2 - N^j(\bar{w}(w^j - w^L))(\bar{w} - (1 - \eta)w^L)w^j}}{\eta N^j \bar{w}(w^j - w^L)} \end{aligned}$$

Since  $\eta N^j \bar{w} (w^j - w^L)$  is always positive, a sufficient condition to guarantee that preferences are *single peaked* is to impose that  $\alpha_A^j > 1$  (notice that  $\alpha_A^j > \alpha_B^j$ ). After some algebra, this condition turns out to be the following:

$$\eta < \frac{w^j (\bar{w} - w^L) - N^j \bar{w} (w^j - w^L)}{w^j w^L}$$

Therefore,  $\eta \leq \min\{(w^j (\bar{w} - w^L) - N^j \bar{w} (w^j - w^L))/w^j w^L, (\bar{w} - w^L)/(2\bar{w} - w^L)\}$  guarantees that preferences over  $\alpha$  are single-peaked. ■

## A.2. Proof of Proposition 4.1

We know that, if  $\eta \leq (\bar{w} - w^L)/(2\bar{w} - w^L)$  (as assumed by condition 4.1) a low-income young individual votes for  $\alpha = 0$ . To analyze the preferred level of  $\alpha$  for middle and high-type savers,  $s^{*,j} > 0$ , by the envelop theorem, we can concentrate on the effect on the lifetime income (indicated by  $I^j$ ):

$$\frac{\partial I^j}{\partial \alpha} = \frac{p^L}{(\alpha w^L + (1 - \alpha)\bar{w})^2} \left[ -\frac{w^j [(\alpha w^L + (1 - \alpha)\bar{w}) \eta + \phi(w^L - \bar{w})]}{(1 + n)\phi(\alpha)^2} + \frac{\bar{w}(w^j - w^L)}{1 + r^j} \right] = 0$$

Since preferences are concave in the interval  $\alpha \in [0, 1]$ , if the first order condition of a type- $j$  individual is positive,  $\frac{\partial I^j}{\partial \alpha} > 0$ , at  $\alpha = 1/2$ , her most preferred level of  $\alpha$  is achieved for  $\alpha > 1/2$  (Beveridgean) and viceversa. It can be proved that the first order condition is positive at  $\alpha = 1/2$  if and only if:

$$1 + r^j < (1 + n) \frac{(2 - \eta)^2}{4} \frac{w^j - w^L}{w^j (1 - \eta) - \frac{w^j}{\bar{w}} w^L}$$

Therefore the above condition guarantees that the individual votes for a Beveridgean system.

Non-savers are at a corner solution in their saving decision, and thus the envelop theorem does not apply. In particular, they would like to borrow against future pension wealth to transfer resources into the present. Analytically,

$$-\frac{\partial U}{\partial c_t^t} + \beta \frac{\partial U}{\partial c_{t+1}^t} < 0$$

For middle and high type non-savers, the choice of  $\alpha$  amounts to maximize the following expression:  $U(w^j(1 - \tau)) + \beta U(p^j)$ . Thus, we have:

$$\frac{p^L}{(\alpha w^L + (1 - \alpha)\bar{w})^2} \left( -\frac{\partial U}{\partial c_t^t} \frac{w^j [(\alpha w^L + (1 - \alpha)\bar{w}) \eta + \phi(w^L - \bar{w})]}{(1 + n)\phi(\alpha)^2} + \beta \frac{\partial U}{\partial c_{t+1}^t} \frac{\bar{w}(w^j - w^L)}{1 + r^j} \right)$$

The previous FOC is always positive for  $\alpha = 1/2$  if

$$1 + r^j < (1 + n) \frac{(2 - \eta)^2}{4} \frac{w^j - w^L}{w^j(1 - \eta) - \frac{w^j}{\bar{w}} w^L}$$

and therefore  $\alpha^j > 1/2$ . ■

### A.3. Proof of Proposition 4.2

Notice that since  $(1 + r^M) > (1 + n)\phi(\alpha)(\alpha + (1 - \alpha)\frac{\bar{w}}{w^M}) \forall \alpha$  and  $\eta \leq (\bar{w} - w^L)/(2\bar{w} - w^L)$ , the low-type young vote for a purely Beveridgean system and the middle-type young vote always for a zero minimum pension. We assume that young low and middle always constitute a majority ( $\rho^L + \rho^M > (2 + n - \rho^L)/2(1 + n)$ ) and that the median voter over the jurisdiction  $p^L$  is a low-type young ( $\rho^L \geq n/2(1 + n)$ , i.e.  $p^{L*} = p_L^L > 0$ ). We thus have the following three cases:.

i)  $r^M > R^M$ : The middle young always vote for  $\alpha > 1/2$ . Since  $\rho^L + \rho^M > (2 + n - \rho^L)/2(1 + n)$ , the middle-young is always the median voter over the jurisdiction  $\alpha$  (regardless of the preferences of the high) and he supports a Beveridgean system ( $\alpha > 1/2$ ).

ii)  $r^M < R^M$  and  $r^H < R^H$ . In this case the middle and high young vote for  $\alpha > 1/2$ . Since old low types are indifferent,  $2 + n - \rho^L$  is the size of total population. The median voter over the jurisdiction  $\alpha$  is a middle or a high-young only if the low types are less than half the total population ( $\rho^L < (2 + n)/(3 + 2n)$ ), otherwise the median voter is a low-young type. Therefore the system is Beveridgean ( $\alpha^* = 0$ ) only if  $\rho^L > (2 + n)/(3 + 2n)$  and Bismarckian ( $\alpha^* > 1/2$ ) otherwise.

iii)  $r^M < R^M$  and  $r^H > R^H$ . In this case, the middle type young vote for a Bismarckian system  $\alpha > 1/2$  and the high-young vote for a Beveridgean system  $\alpha > 1/2$ . The system is Beveridgean if the low and high-young are the majority of the population, i.e.  $(\rho^H + \rho^L)(1 + n) > (2 + n - \rho^L)/2$ , which is equivalent to say that  $\rho^M < (\rho^L + n)/2(1 + n)$ . Otherwise, if the middle young are the majority,  $\rho^M \geq (\rho^L + n)/2(1 + n)$ , the system is Bismarckian ■.

### A.4. Proof of Corollary 4.3

The most preferred level of a minimum pension for a low ability worker is implicitly defined by the following first order condition:.

$$FOC^L(p_L^L) = -u' \left( w^L \left( 1 - \frac{p_t^L}{(1 + n)(\alpha_t w^L + (1 - \alpha_t)\bar{w})\phi(\alpha_t)} \right) \right) + \beta u' \left( p^L \right) (1 + n)\phi(\alpha)(\alpha + (1 - \alpha)(\bar{w}/w_t^L)) = 0$$

Using the implicit function theorem we can calculate  $dp_L^{L*}(\alpha)/d\alpha = -(dFOC^L(p_L^L)/d\alpha) / SOC(p_L^L)$ . Then,  $sign(dp_L^{L*}(\alpha)/d\alpha) = sign(dFOC^L(p_L^L)/d\alpha)$ , since  $SOC(p_L^L) \leq 0$ . By differentiating  $FOC^L(p_L^L)$  with respect to  $\alpha$ , we obtain that:

$$\frac{dFOC^L(p_L^L)}{d\alpha} = u''(c_t^L)w^L \left( \frac{p_t^L(1+n)\phi(\alpha_t)(\bar{w} - w^L)}{((1+n)(\alpha_t w^L + (1-\alpha_t)\bar{w})\phi(\alpha_t))^2} \right) + \beta u'(p^L)(1+n) \left[ \eta(\alpha + (1-\alpha)(\bar{w}/w_t^L)) + \phi(\alpha)(1 - (\bar{w}/w_t^L)) \right]$$

Since  $\eta \leq (\bar{w} - w^L)/(2\bar{w} - w_L)$ ,  $dFOC^L(p_L^L)/d\alpha$  is negative. Therefore  $dp_L^{L*}(\alpha)/d\alpha \leq 0$ .

The most preferred level of tax for a low ability young individual is implicitly defined by the following first order condition::

$$FOC^L(\tau_L^L) = -u'(w^L(1-\tau))w^L + \beta u'(p^L)(1+n)\phi(\alpha)(\alpha w_t^L + (1-\alpha)(\bar{w})) = 0$$

Using the implicit function theorem, we can calculate  $d\tau_L^{L*}(\alpha)/d\alpha = -(dFOC^L(\tau_L^L)/d\alpha) / SOC(\tau_L^L)$ . Then,  $sign(d\tau_L^{L*}(\alpha)/d\alpha) = sign(dFOC^L(\tau_L^L)/d\alpha)$ , since  $SOC(\tau_L^L) \leq 0$ . By differentiating  $FOC^L(\tau_L^L)$  with respect to  $\alpha$ , we obtain that:

$$\begin{aligned} \frac{dFOC^L(\tau_L^L)}{d\alpha} = & \beta(1+n) \left[ \phi'(\alpha)(\alpha w_t^L + (1-\alpha)\bar{w}) + \phi(\alpha)(w_t^L - \bar{w}) \right] u'(p^L) \left[ \frac{u''(p^L)p^L}{u'(p^L)} + 1 \right] = \\ & \beta(1+n) \left[ \phi'(\alpha)(\alpha w_t^L + (1-\alpha)\bar{w}) + \phi(\alpha)(w_t^L - \bar{w}) \right] u'(p^L) [1 - r_R(p^L)] \end{aligned}$$

Since  $r_R(p^L) > 1$  by assumption and  $\eta \leq (\bar{w} - w^L)/(2\bar{w} - w_L)$ , then  $d\tau^*(\alpha)/d\alpha \geq 0$  ■.

## References

- [1] Auerbach, A.J. and Kotlikoff, L.J. (1987) *Dynamic Fiscal Policy*, Cambridge University Press.
- [2] Blake, David (1996) Efficiency, Risk Aversion and Portfolio Insurance: An Analysis of Financial Asset Portfolios held by Investors in the United Kingdom. *The Economic Journal*, 106, 1175-1195.
- [3] Boeri, T. and Boersch-Supan, A. and Tabellini, G. (2002). Pension Reforms and the Opinions of European Citizens *American Economic Review*, 92, 396-401.
- [4] Boskin, M.J., Kotlikoff, L.J., Puffert, D.J. and Shoven, J.B. (1987) Social Security: A Financial Appraisal across and within generations, *National Tax Journal* 40, 19-34.
- [5] Casamatta, G. and Cremer, H. and Pestieau, P. (2000a). The Political Economy of Social Security, *Scandinavian Journal of Economics* 102(3), 503-522.
- [6] Casamatta, G. and Cremer, H. and Pestieau, P. (2000b). Political Sustainability and the Design of Social Insurance. *Journal of Public Economics* 75 (3), 341-64.
- [7] Conde-Ruiz, J. I. and Galasso, V. (1999) Positive Arithmetic of the Welfare State. *CEPR Discussion Paper* 2202.
- [8] Conde-Ruiz, J. I. and Galasso, V. (2003) Early Retirement, *Review of Economic Dynamics* 6, 12-36.
- [9] Cremer, H. and Pestieau, P. (1988). Social Insurance, Majority Voting and Labor Mobility, *Journal of Public Economics* 68, 397-420.
- [10] Cutler, D. and Johnson, R. (2001). The birth and growth of the social-insurance state: explaining old-age and medical insurance across countries, Federal Reserve Bank of Kansas City RWP 01-13.
- [11] De Donder, P. and Jean Hindriks *Voting over Social Security with Uncertain Lifetimes*, in *Institutional and Financial Incentives for Social Insurance*, edited by C. d'Aspremont, V. Ginsburgh, H. Sneessens and F. Spinnewyn, Kluwer Academic Publishers, Boston, 2002, 201-220.
- [12] Diamond, P.A. and J.A. Hausman (1984) Individual Retirement and Savings Behavior, *Journal of Public Economics* 23; 81-114.

- [13] Disney, R., M. Mira d'Ercole and P. Scherer (1998), Resources During Retirement, Aging Working Paper 4.3, OECD.
- [14] Disney, R. and Johnson, P. ed. (2001) *Pension Systems and Retirement Incomes across OECD countries*. Edward Elgar editor.
- [15] Epple, D. and Romano, R. (1996) Ends Against the Middle: Determining Public Service Provision when There are Private Alternatives *Journal of Public Economics* 62, 297-325.
- [16] European Commission Household Panel. Wave 1993, 1994, 1995, 1996.
- [17] Galasso, V. and Profeta, P. (2002) Political Economy Models of Social Security: A survey, *European Journal of Political Economy* 18(1), 1-29.
- [18] European Commission (1997). Supplementary Pensions in the Single Market. A Green Paper.
- [19] European Commission (2001). Economic Policy Committee Report. Budgetary challenges posed by ageing populations.
- [20] Galasso, V. (2002), The US Social Security: A Financial Appraisal for the Median Voter, *Social Security Bulletin* 64 n.2
- [21] Hills, J. Ditch, J. and Glennerster, H. (eds) (1994). Beveridge and Social Security. Clarendon Press. Oxford.
- [22] Kohler, P. Zacher, H. and Partington, M. (eds) (1982) The evolution of social insurance 1881-1981. St. Martin's Press, London. New York.
- [23] MORI Pensions Poll (2000) [www.mori.com/polls](http://www.mori.com/polls)
- [24] Mulligan, C.B. (2001) "*Economic Limits on "Rational" Democratic Redistribution*" mimeo
- [25] Nicoletti, C. and Peracchi, F. (2002). Aging in Europe: A cross-country comparison. mimeo, University of Essex and University of Rome Tor Vergata.
- [26] Nicoletti, C. and Peracchi, F. (2001). Aging in Europe: What can we learn from the Europanel? in T. Boeri, A. Borsch-Supan, A. Brugiavini, R. Disney, A. Kapteyn and F. Peracchi (eds), *Pensions: More informations, less Ideology. Assessing the Long Term Sustainability of European Pension Systems: Data requirements, Analysis and Evaluations*, Kluwer, Dordrecht.

- [27] Peracchi, F. (2002). The European Community Household Panel: A review, in *Empirical Economics*, 27, 63-90.
- [28] Pestieau, P. The Political Economy of Redistributive Social Security (1999), w.p. *International Monetary Fund*
- [29] Persson, T. and Tabellini, G. (2000) *Political Economics. Explaining Economic Policy*. MIT Press.
- [30] Shepsle, K. (1979). Institutional arrangements and equilibrium in multidimensional voting models. *American Journal of Political Science* 23: 27-59.
- [31] Tabellini, G. (2000) A Positive Theory of Social Security, *Scandinavian Journal of Economics* 102, 523-545.
- [32] World Bank (2000). World Development Indicators.



**Table 1. Results of a survey pension in Italy**

	Would you accept a reduction in contribution and pension? *	
Rich**	Yes	52,5%
	No	37,5%
	Don't know	10%
Middle**	Yes	45%
	No	46%
	Don't know	9%
Poor**	Yes	35%
	No	50%
	Don't know	15%
<p><i>Source: our calculations from data of Boeri, Tabellini, Borsch-Supan (2002)</i></p> <p><i>* Precise question: Would you accept the following proposal: a reduction by 50% of your contributions to the public pension system, receiving this amount cash, and a reduction of your pension as if you had worked 50% of your salary from tomorrow on?</i></p> <p><i>** Income groups divided by occupations</i></p>		

**Table 2: Replacement Rates Across Income Groups in European Countries**

Country	Germany	Denmark	Netherlands	Belgium	Luxembourg	France	United Kingdom	Ireland	Italy	Greece	Spain	Portugal	Austria	Finland
Low	n.a.	1,2749	n.a.	0,9208	3	1,0295	2,1667	0,7084	1,0500	0,9722	1,0707	1,2177	1,0303	1,3495
Middle	n.a.	0,7378	n.a.	0,7914	0,9053	0,8300	0,6140	0,6535	0,8496	0,7938	0,8686	0,7661	0,6603	1,0421
High	n.a.	0,6524	n.a.	0,7143	0,8205	0,7450	0,5118	0,6043	0,7902	0,9143	0,8491	1,0000	0,7129	1,1766
(L-M)/L	n.a.	0,4213	n.a.	0,1406	0,6982	0,1938	0,7166	0,0775	0,1909	0,1836	0,1887	0,3708	0,3591	0,2278
(M-H)/M	n.a.	0,1157	n.a.	0,0974	0,0937	0,1024	0,1664	0,0753	0,0699	-0,1519	0,0225	-0,3052	-0,0796	-0,1291
(L-H)/L	n.a.	0,4883	n.a.	0,2243	0,7265	0,2763	0,7638	0,1469	0,2475	0,0595	0,2070	0,1788	0,3081	0,1282
Beveridgean index	n.a.	0,3418	n.a.	0,1541	0,5061	0,1908	0,5489	0,0999	0,1694	0,0304	0,1394	0,0814	0,1958	0,0756
n° obs. Low		30		25	7	64	37	21	112	35	40	50	20	5
n° obs. Middle		30		25	8	64	37	21	112	35	40	50	20	5
n° obs. High		30		25	7	64	37	20	112	34	39	50	20	5
n° obs. Total		90		75	22	192	111	62	336	104	119	150	60	15

*Source: our calculations from ECHP 1993-1997*

**Table 3: Public Pension Expenditures in European Countries (% of GDP)**

<b>Country</b>	<b>Germany</b>	<b>Denmark</b>	<b>Netherlands</b>	<b>Belgium</b>	<b>Luxembourg</b>	<b>France</b>	<b>United Kingdom</b>	<b>Ireland</b>	<b>Italy</b>	<b>Greece</b>	<b>Spain</b>	<b>Portugal</b>	<b>Austria</b>	<b>Finland</b>
2000	11,8	10,5	7,9	10,0	7,4	12,1	5,5	4,6	13,8	12,6	9,4	9,8	14,50	12,10
2010	11,2	12,5	9,1	9,9	7,5	13,1	5,1	5,1	13,9	11,9	8,9	11,8	14,4	11,7
2020	12,6	13,8	11,2	11,4	8,2	15	4,9	6,8	14,8	14	9,9	13,1	14,7	13,6
2030	15,5	14,5	13	13,3	9,2	16	5,2	7,5	15,7	16,8	12,6	13,6	15,8	14,7
2040	16,6	14	14	13,7	9,5	15,8	5	8,5	15,7	20,2	16	13,8	15,2	14,8
2050	16,9	13,3	13,6	13,3	9,3	15,8	4,4	8,5	14,1	20,8	17,3	13,2	13,50	14,80

*Source: European Commission (2001)*

**Table 4. Replacement rates for low income individuals**

	<b>Germany</b>	<b>Denmark</b>	<b>Netherlands</b>	<b>Belgium</b>	<b>Luxembourg</b>	<b>France</b>	<b>United Kingdom</b>	<b>Ireland</b>	<b>Italy</b>	<b>Greece</b>	<b>Spain</b>	<b>Portugal</b>	<b>Austria</b>	<b>Finland</b>
Replacement Rate bottom 33,33%	n.a.	1,2749	n.a.	0,9208	3	1,0295	2,1667	0,7084	1,0500	0,9722	1,0707	1,2177	1,0303	1,3495
n° obs.		30		25	7	64	37	21	112	35	40	50	20	5
Replacement Rate bottom 20%	n.a.	2,0017	n.a.	1,3171	3	1,2169	2,3067	0,7566	1,5648	1,2850	1,1567	1,4682	1,7864	1,5040
n° obs.		18		15	5	38	22	12	67	19	24	30	12	3

**Source: our calculations from ECHP 1993-1997**

**Table 5: Measures of Inequality in European Countries**

<b>Country</b>	<b>Germany</b>	<b>Denmark</b>	<b>Netherlands</b>	<b>Belgium</b>	<b>Luxembourg</b>	<b>France</b>	<b>United Kingdom</b>	<b>Ireland</b>	<b>Italy</b>	<b>Greece</b>	<b>Spain</b>	<b>Portugal</b>	<b>Austria</b>	<b>Finland</b>
Gini index	30	24,7	32,6	25	26,9	32,7	36,1	35,9	27,3	32,7	32,5	35,6	23,1	25,6
Lowest 20%	8,2	9,6	7,3	9,5	9,4	7,2	6,6	6,7	8,7	7,5	7,5	7,3	10,4	10
II+III+IV 20%	53,4	55,9	52,6	56	54,1	52,6	50,4	50,4	55	52,2	52,2	49,3	56,3	54,2
Highest 20%	38,4	34,5	40,1	34,5	36,5	40,2	43	42,9	36,3	40,3	40,3	43,4	33,3	35,8
Survey year	1994	1992	1994	1992	1994	1995	1991	1987	1995	1993	1990	1994-95	1987	1991

*Source: World Development Indicators, World Bank 2000*

**Table 6: Second pillar and financial indicators**

Country	Germany	Denmark	Netherlands	Belgium	Luxembourg	France	United Kingdom	Ireland	Italy	Greece	Spain	Portugal	Austria	Finland
Pension funds assets as %GDP (1993)	5,8	20,1	88,5	3,4	n.a.	3,4	79,4	40,1	1,2	n.a.	2,2	n.a.	n.a.	n.a.
Supplementary pension as % of total pension (1993)	11	18	32	8	na	21	28	18	2	n.a.	3	n.a.	n.a.	n.a.

*Source: Green Paper EC 1997. Based on European Federation for Retirement Provision (EFRP)-European Pension Funds 1996*

Country	Germany	Denmark	Netherlands	Belgium	Luxembourg	France	United Kingdom	Ireland	Italy	Greece	Spain	Portugal	Austria	Finland
Total Value of Pension funds (US\$ billions)														
1998	172	n.a	470	9	n.a	77	1159	46	n.a	n.a	n.a	13	n.a	n.a
1999	215	n.a	400	10	n.a	70	1385	49	n.a	n.a	n.a	13	n.a	n.a
2000	188	n.a	441	14	n.a	85	1256	50	n.a	n.a	n.a	11	n.a	n.a

*Source: Watson Whyatt*

Country	Germany	Denmark	Netherlands	Belgium	Luxembourg	France	United Kingdom	Ireland	Italy	Greece	Spain	Portugal	Austria	Finland
Pension funds 1984-93. Average Nominal Rates of Return (Real in parenthesis)	9,4 (7,1)	10 (6,3)	9,5 (7,7)	11,8- (8,8)	n.a.	n.a.	15,5 (10,2)	14 (10,3)	n.a.	n.a.	13,8 (7)	n.a.	n.a.	n.a.
Market capitalization in % of GDP (1996)	29,6	41,8	97,8	45,9	193,4	38,9	149,9	49,7	21,7	19,7	42,3	23,7	14,3	50,7

*Source: Green paper EC1997. Based on Federation of European Stock Exchanges and European Commission*

**FIGURE 1**

