

The political economy of social security: a survey

Vincenzo Galasso^{a,b,c,*}, Paola Profeta^{d,1}

^a*IGIER, via Salasco 3/5, 20136 Milan, Italy*

^b*Departamento de Economía, Universidad Carlos III de Madrid, 28903 Getafe, Spain*

^c*CEPR, London, UK*

^d*Istituto di Economia Politica, Università Bocconi, via Gobbi 5, 20136 Milan, Italy*

Received 1 October 2000; received in revised form 1 May 2001; accepted 1 May 2001

Abstract

This paper surveys the literature on the political economy of social security. We review models that address the following questions: (i) Why do social security programs that transfer resources from young and middle-aged workers to the elderly exist? (ii) What are the economic and political interactions between social security systems and other redistributive programs of the welfare state? (iii) How does political sustainability shape social security systems in a dynamic economic and demographic environment, and which social security reforms are politically feasible? We characterize this literature along two lines: economic factors and political institutions. We then assess the empirical relevance of the models by comparing their implications to stylized social security facts. © 2002 Elsevier Science B.V. All rights reserved.

JEL classification: H53; H55; D72

Keywords: Redistribution; Multidimensional voting; Political pressure; Political sustainability; Social security reforms

1. Introduction

All developed countries have a social security system. An overwhelming majority of these systems is unfunded (or pay-as-you-go). The systems are financed through a payroll tax levied on current workers' labor income, and provide a pension benefit to retirees, i.e.,

* Corresponding author. IGIER, via Salasco 3/5, 20136 Milan, Italy. Tel.: +39-02-5836-5319; fax: +39-02-5836-5318.

E-mail addresses: vincenzo.galasso@uni-bocconi.it (V. Galasso), paola.profeta@uni-bocconi.it (P. Profeta).

¹ Tel.: +39-02-5836-5332; fax: +39-02-5836-5318.

former workers, who have reached retirement age and have exited the labor market with an entitlement to an old-age pension.

The size of these unfunded social security systems has increased over the last few decades. In 1995, they absorbed 4.5% of GDP in the US, 13% in Italy, 16.5% in France, and over 20% in Sweden. There has been a wide body of literature on the economics of social security (see, among many others, Diamond, 1996; Gramlich, 1996). However, decisions on social security policy, from the initial design of the system to later modifications, go beyond economic theory into the realm of politics. Contributions to political campaigns, lobbying, votes of vested interest groups influence career-oriented policy-makers to sacrifice economic principles for political objectives.

This paper surveys the main contributions in the literature of political economy models of social security. We first review models that analyze the institution of the unfunded social security systems and their development into the most widespread instrument of social insurance. The challenge common to this line of research is to understand why there exist social security programs that transfer resources from young and middle-aged workers to the elderly. We highlight the empirical implications of the stylized models, and compare them to the social security “facts”, that emerge from the empirical literature. Many of the elderly political economy models used unidimensional voting models, and thus at most accounted for a single social security feature, typically the size of the system. This is a significant limitation, since social security systems are known to have several features.²

We then turn to a recent body of literature that applies multidimensional voting models to the analysis of social security systems. These models examine the interactions between social security and other redistributive programs of the welfare state, or among the different characteristics of the social security system. An insight of the multidimensional models is to recognize that the different programs of the welfare state may be economic and political complements or substitutes. These aspects are crucial in determining the size and composition of the welfare state.

Finally, we consider the theoretical contributions to the more heated topic of the current social security debate. We review the literature that studies the response of the current social security systems to changes in the economic and demographic scenario, and the models of social security reforms. In particular, we focus on the following questions: How does political sustainability shape the social security system in a dynamic economic and demographic environment? Which social security reforms would be politically feasible?

We characterize the political economy models of social security by political institutions and economic factors.

Agents' individual preferences over the social security system can be aggregated through several political mechanisms. The political institutions encountered in the literature in the case of a one-dimensional issue space can be classified in three broad

² See Mulligan and Sala-i-Martin (1999b,c) for a review of the main characteristics of these systems around the world.

groups: majority voting, veto-power or constitutional rules, and interest-group models. There is a fundamental difference between interest-group models and models of voting (majority voting or veto-power). The former focus more on the political process, which may allow a powerful minority, the elderly, to carry through an intergenerational redistribution policy. In the latter models, social security arises if there are sufficient economic reasons for at least a majority of the electorate to support the system.

Thus, voting models can be classified according to which economic factors lead young and/or middle aged agents to favor positive levels of social security. We identify five major economic reasons: (i) dynamic inefficiency (Aaron, 1966), (ii) a reduced time horizon in evaluating the social security program (Browning, 1975), (iii) the crowding-out of the aggregate savings by the social security system (Cooley and Soares, 1999a), (iv) the within-cohort redistribution element shared by many social security schemes (Tabellini, 2000), and (v) an altruistic motive (Hansson and Stuart, 1989).

The combination of these two lines of classification—economic factors and political institutions—provides a natural way to catalogue the different models. Table 1 summarizes how the models address our first question: why do social security programs exist that transfer resources from young and middle-aged to retirees? Although voting models (majority voting and veto-power) may display several of the economic features, this characterization does not apply to interest-group models, which rely instead on the political power of the old.

This survey complements Breyer (1994a), who reviewed the previous literature on the political economy of social security. We concentrate on the most recent body of contributions, and also adopt a broader view of the literature that includes models of policy reforms as well as multidimensional voting models of social security. Persson and Tabellini (2000) also provide a comprehensive treatment of the political economics of intergenerational transfers. They however have mainly a didactical purpose and focus on specific economic aspects to explain the rise of social security as an equilibrium outcome of a majoritarian election. They do not survey the literature.

The paper proceeds as follows: Section 2 introduces a general economic environment in order to examine the economic elements in the voting models (majority voting and veto-power). Section 3 analyzes the three different political arrangements encountered in the literature. Section 4 reviews the empirical facts on social security and compares the implications of the models to the facts. In Sections 5 and 6, we discuss, respectively, models of welfare state determination and models of social security reforms. Section 7 concludes.

2. The economic environment of the voting models

In this section, we introduce a simple, yet quite general economic environment in order to examine some of the economic factors that may lead young and middle-aged individuals to vote in favor of unfunded social security systems. This setting abstracts from altruistic motives. In Section 2.5, we discuss the relation between altruistic preferences and the sustainability of unfunded systems in Hansson and Stuart (1989) and Tabellini (2000).

Table 1

Why do social security systems exist?

Economic factors	Political institutions		
	Majority voting	Veto power/unanimity	Interest-group models
Dynamic inefficiency	Browning (1975), Hu (1982), Sjoblom (1985)	Azariadis and Galasso (in press)	
Reduced time horizon	Browning (1975), Hu (1982), Sjoblom (1985), Boadway and Wildasin (1989), Cooley and Soares (1996, 1999a,b), Bohn (1999), Galasso (1999), Conesa and Kruger (1999), Butler (2000)	Cooley and Soares (1999b)	
Altruism Within-cohort redistribution	Tabellini (2000) Tabellini (2000), Persson and Tabellini (2000), Conde-Ruiz and Galasso (1999), Conesa and Kruger (1999)	Hansson and Stuart (1989)	
Crowding-out effects	Boldrin and Rustichini (2000), Cooley and Soares (1996, 1999a,b), Bohn (1999), Galasso (1999), Conesa and Kruger (1999)	Cooley and Soares (1999b)	
Political power of the old	Breyer (1994b), Lambertini and Azariadis (1998), Breyer and Stolte (2001)		Verhoeven and Verbon (1991), Verbon and Verhoeven (1992), Meijdam and Verbon (1996), Grossman and Helpman (1998), Becker and Mulligan (1998), Mulligan Sala-i-Martin (1999a,b,c), Profeta (2000)

We consider an overlapping generations model with capital accumulation in a closed economy. In every period, three generations are alive. We call them “Young”, “Middle-Aged”, and “Old”. Population grows at a constant non-negative rate μ . It follows that in any period for every old there are $(1+\mu)$ middle-aged individuals and $(1+\mu)^2$ young. In every period, agents are endowed with one unit of time, which they divide between work, v , and leisure, l , during the first two periods of their life: $1=v_t^t+l_t^t=v_{t+1}^t+l_{t+1}^t \quad \forall t$, where subscripts indicate calendar time and superscripts indicate the period when the agent was born. Individuals may differ in their working ability. An agent born at time t is fully characterized by a positive working ability level e_t . The distribution of abilities has mean \bar{e} , and is skewed, so that the median ability is lower than the mean ability. Retirement is mandatory in old age.

Non-altruistic agents value leisure, l , and consumption, c , according to a time separable utility function:

$$U(l_t^t, c_t^t) + \beta U(l_{t+1}^t, c_{t+1}^t) + \beta^2 U(c_{t+2}^t) \tag{2.1}$$

where $\beta \in \mathfrak{R}_+$ represents the individual time discount factor, and $U' > 0$ and $U'' < 0$.

The budget constraints of a type e_t individual born at time t during his or her lifetime are:

$$\begin{aligned} c_t^t + a_{t+1}^t &= e_t w_t (1 - \tau_t) v_t^t \\ c_{t+1}^t + a_{t+2}^t &= e_t w_{t+1} (1 - \tau_{t+1}) v_{t+1}^t + a_{t+1}^t (1 + r_{t+1}) \\ c_{t+2}^t &= a_{t+2}^t (1 + r_{t+2}) + P_{t+2} \end{aligned} \tag{2.2}$$

where a_{t+1}^t represents asset holding at the beginning of period $t+1$, and r_t , w_t , τ_t and P_t are, respectively, the real interest rate, the wage rate, the social security payroll tax rate and the pension transfer at time t . Agents maximize utility (Eq. (2.1)) with respect to asset holdings and to labor supply, subject to the budget constraints, Eq. (2.2), and to the time constraints, and taking the social security system as given.

The social security system imposes a payroll tax, τ_t , on the labor earnings of active generations, young and middle-aged, and transfers the collected amount lump sum to the current retirees, P_t . The budget is balanced in every period. Thus, the pension transfer to the retirees is equal to the payroll tax rate multiplied by the average labor earnings in the economy, $P_t = \tau_t w_t \hat{v}_t$, where $\hat{v}_t = (1+\mu)^2 \hat{v}_t^t + (1+\mu) \hat{v}_t^{t-1}$ denotes the average labor supply in efficiency units, which is a combination of the average labor supply of the young and of the middle-aged workers. An increase in the tax rate directly raises pension benefits. However, it may decrease the average labor supply, $\partial \hat{v}_t / \partial \tau_t < 0$ if the (negative) substitution effect is larger than the (positive) income effect. Notice that, in this setting, the social security system entails an element of within-cohort redistribution. This feature is examined in Section 2.4, but it is disregarded in all other sections by assuming homogeneity in abilities across agents.

On the production side, a constant-returns-to-scale production function uses capital and labor, measured in efficiency units, to produce units of a consumption good. Total capital per capita in the economy is obtained by aggregating the net savings, or end-of-period

asset holdings among generations. From the profit maximization problem of the competitive firms and the equilibrium conditions, factors of production are paid their marginal products.

The definition of economic equilibrium is standard. For a given sequence of social security tax rates, an economic equilibrium is a sequence of allocations and prices, such that, in every period, the consumers problem is solved for each type- e individual in each generation, firms maximize profits, the social security budget constraint is balanced, and labor, capital and goods markets clear.

For a given sequence of social security tax rates, we identify the utility level obtained in an economic equilibrium by every agent with the agent's indirect utility function. At time t , the preference relations over current (and future) tax rates of a type- e young, middle-aged, and old agent are, respectively, characterized by the following indirect utility functions: $u_t^t(e; \tau_t, \tau_{t+1}, \tau_{t+2})$, $u_t^{t-1}(e; \tau_{t-1}, \tau_t, \tau_{t+1})$, and $u_t^{t-2}(e; \tau_{t-2}, \tau_{t-1}, \tau_t)$.

To highlight the different economic factors that are present, we focus on constant sequences of social security tax rates, $\tau_t = \tau \forall t$, and analyze individual preferences over these sequences. This amounts to assuming that young and middle-aged agents form their preferences over the social security tax rate under the assumption that the current scheme will never be modified in the future. Young individuals who do not expect the system to be in place in their old age perceive the current tax rate as a net cost, and would generally not be willing to support the system.³ In the next section, we shall discuss the political arrangements under which sequences of positive tax rates may arise.

Elderly individuals obviously support social security systems, which award them a pension at zero cost. When do young and/or middle-aged agents favor positive levels of social security? A marginal increase in the (constant sequence of) tax rates has three effects on the indirect utility function of a type- e young individual, through (i) a direct increase in the labor income tax in the two working periods, (ii) a net increase in the pension transfer, and (iii) a variation in factor prices, due to changes in the stock of capital and in the average labor supply. The same forces affect a type- e middle-aged individual, but over a reduced time horizon.

We can now review some of the economic factors emphasized in the literature. We concentrate on the third (general equilibrium) effect only in Section 2.3, whereas, to simplify the exposition, we will disregard any change in factor prices in all remaining sections.

2.1. *Dynamic inefficiency*

From Samuelson (1958) and Aaron (1966), it is known that social security may improve the welfare of every individual if the economy is dynamically inefficient, that is, if the implicit rate of return from social security is larger than the real rate of return from

³ The exception is Tabellini (2000), see Section 2.5, in which young agents support social security due to their weak altruism.

capital accumulation. To see this, assume that there is no heterogeneity—we normalize e_t to 1—and no growth in real wages. In a steady state,⁴ a young agent's maximization problem yields the following first-order condition:

$$\frac{[(1 + \mu)(2 + \mu) - (1 + r)(2 + r)]vw}{(1 + r)^2} + \frac{\tau w(\partial \hat{\theta} / \partial \tau)}{(1 + r)^2} = 0. \quad (2.3)$$

Since the implicit return from social security is equal to the population growth rate, μ , the economy is dynamically inefficient if $\mu > r$. In this case, young individuals would prefer a positive level of social security: $\tau > 0$.

Reliance on this economic element to explain support of unfunded systems among the young however is not too appealing, because of both empirical and theoretical problems⁵ (see Abel, 1989, for somewhat controversial evidence in favor of dynamic efficiency, and Homburg, 1991, for a theoretical defence), and it has been largely disregarded. In fact, even in models such as Browning (1975) and Sjoblom (1985), which consider an extreme case of dynamic inefficiency—in their economy, there is no alternative saving technology, i.e., $\mu > 0 > r = -1$ —the assumption that the economy is dynamically inefficient is not crucial. Allowing for private saving, and dynamic efficiency, would not change their main message, which we analyze in the next subsection. More recently, Azariadis and Galasso (in press) have assumed a dynamically inefficient economy to examine the difference in policy outcomes induced by alternative specifications of the political process.

2.2. Reduced time horizon

In a seminal contribution, Browning (1975) proposed that, even in a dynamically efficient economy, middle-aged individuals may choose a positive level of social security, since they only value current and future contributions to, and benefits from, the system, whereas past contributions are a sunk cost. In other words, middle-aged individuals do not take into account the entire cost of social security, since they only consider a reduced time horizon.

To isolate this effect, consider a dynamically efficient economy, $\mu < r$, with no heterogeneity, $e = 1$, and no growth in real wages. The implicit return factor from social security for a middle-aged person who considers previous contributions as a sunk cost, denoted by $1 + l^{\text{MA}}$, is equal to the ratio between future benefits and current contribu-

⁴ To simplify the analysis, we assume that $\beta(1+r)=1$. Since l'_t and l'_{t+1} are obtained from the first-order conditions of the agents' maximization problem, respectively, $U'_{l'_t} = w_t(1-\tau_t)U'_{c'_t}$ and $U'_{l'_{t+1}} = w_{t+1}(1-\tau_{t+1})U'_{c'_{t+1}}$, and given that $U'_{c'_t} = \beta(1+r_{t+1})U'_{c'_{t+1}}$, at a steady state, the labor supply is equal across generations.

⁵ Imrohroglu et al. (1995) are a notable exception. They calibrated a large overlapping generations model to the US economy and showed that the institution of social security can be beneficial to young cohorts, due to dynamic inefficiency.

tions. In a steady state,⁶ we have that $1+i^{\text{MA}}=(1+\mu)(2+\mu)$, and the first-order condition from the maximization problem of a middle-aged individual is:

$$vw \left[-1 + \frac{1+i^{\text{MA}}}{1+r} \right] + \frac{\tau w (\partial \theta / \partial \tau)}{(1+r)} = 0. \quad (2.4)$$

Thus, a middle-aged individual favors a positive amount of social security, $\tau > 0$, if the implicit return from the system (calculated on the reduced time horizon) is larger than the real return on capital accumulation, that is, if $i^{\text{MA}} \approx 1+3\mu > r > \mu$.

Since Browning (1975), this idea has been used in several papers. In particular, Boadway and Wildasin (1989) have generalized this result to an economy with borrowing constraints; whereas Hu (1982), and more comprehensively Sjoblom (1985), have tried to provide a more convincing specification of the underlying political process. Cooley and Soares (1999a) have combined this idea with the crowding out effect to replicate some quantitative features of the US social security system. Finally, Galasso (in press) has calculated the internal rate of return from “investing” in social security for the median voter at several US presidential elections. His results support Browning’s suggestion: for a middle-aged individual (a 44-year-old median voter) the internal rate of return from social security almost always exceeds the return from investment in alternative assets, $i^{\text{MA}} > r$.

2.3. Crowding out

Cukierman and Meltzer (1989) claimed that individuals evaluating public debt policies are sufficiently aware to be able to take into account the effects of the policies on the stock of capital, and thereby on factor prices. Cooley and Soares (1999a) and Boldrin and Rustichini (2000) have extended this idea to social security. They argue that the existence of intergenerational redistribution schemes, such as public debt or social security, tends to crowd out capital, and thus reduces real wages and increases real returns to capital. This creates a redistribution in favor of assets-holders (“capitalist”) and against individuals who rely on labor income (“workers”).

To appreciate the positive effect on the rate of returns, consider a two-period version of our dynamically efficient economy, with no heterogeneity, $e=1$, and with exogenous labor supply.⁷ In a steady state, the first-order condition for a young individual is:

$$-vw + \frac{wv(1+\mu)}{1+r} + \frac{[a \frac{\partial r}{\partial k} + \frac{\partial P}{\partial w} \frac{\partial w}{\partial k}] \frac{\partial k}{\partial \tau}}{1+r} = 0. \quad (2.5)$$

⁶ See footnote 4.

⁷ By assuming exogenous labor supply, these models disregard the effects that the social security system may have on factor prices through this channel. In particular, if taxation is distortionary and reduces the labor supply, there would be an increase in the wage rate and a decrease in the rate of return. These effects would dampen the crowding-out effect.

Because of dynamic efficiency, the sum of the first two terms is negative. The third term represents the positive effect of an increase in the tax rate on the returns on the young individual's assets, and the negative impact on the future pension, due to the decrease in the wages. With asset holdings, a , and the crowding out effect, $(\partial r/\partial k)$ $(\partial k/\partial \tau)$ large enough, a young individual is willing to use a return-dominated saving technology, i.e., social security, in order to increase the returns on private assets, and thus $\tau > 0$.

In a two-period overlapping generations model, Boldrin and Rustichini (2000) fully characterize political economy equilibria with social security that arise exclusively because of this crowding out effect. Cooley and Soares (1999a), on the other hand, use a four-period overlapping generations economy to combine this effect with Browning's idea, as summarized in Section 2.2. They emphasize the importance of the former element for the sustainability of the system, but the empirical relevance of this crowding out effect remains to be tested.

2.4. Within cohort redistribution

Tabellini (2000), and later Casamatta et al. (1999) and Persson and Tabellini (2000), suggested that some young individuals may favor positive social security systems because of the within-cohort redistribution element. Boskin et al. (1987) have shown that the US social security system redistributes within cohorts across different family types by yielding higher returns to low-income than high-income individuals. A direct consequence of this intragenerational redistribution is that, even in a dynamically efficient economy, social security may be more profitable than capital accumulation for low income individuals.

Consider a two-period, dynamically efficient economy, with no growth in real wages. Denoting the implicit return from social security for a type- e young individual by i_e , in a steady state we have: $1+i_e=(1+\mu)\bar{v}/ev(e)$, which implies $i_e > \mu$ if $\bar{v} > ev(e)$. Agents whose labor income is below the mean labor income in the economy thus receive a higher implicit return than the average return μ . The first-order condition for a type- e young individual can be written as

$$ev(e)w \left[-1 + \frac{1+i_e}{1+r} \right] + \frac{\tau w(1+\mu)}{1+r} \frac{\partial v}{\partial \tau} = 0. \quad (2.6)$$

Thus, a type- e young individual favors a positive amount of social security, $\tau > 0$, if the implicit return from the system is larger than the real return on capital accumulation, $i_e > r > \mu$. These models typically suggest that in a Beveridgean system, in which the intragenerational redistribution component is large, more income inequality leads to more social security. The empirical relevance of this implication is unclear, as we will indicate in Section 4.

2.5. Altruism

Hansson and Stuart (1989) and Tabellini (2000) describe social security systems when young agents have altruistic preferences towards the old. In Hansson and Stuart (1989),

young agents, in choosing their current savings, take into account the behavior of future altruistic young individuals. As Veall (1986) had previously suggested, agents recognize that, if they have not saved enough for old-age consumption, the future young will be willing to provide them with an old-age transfer. This Stackelberg behavior leads to an inefficient allocation of resources. In fact, agents rationally “undersave” to induce future young to award them a transfer, yet every individual would benefit from shifting private resources from consumption during youth to old-age. In this context, a social security would arise under unanimity rule to improve allocation by achieving this shift of resources into the future.

Tabellini (2000) combines weakly altruistic preferences with intragenerational redistribution. In his model, heterogeneous, altruistic agents vote every period on the current social security level, which they believe to be unrelated to any future benefit. Since their altruism is weak, young individuals are not willing to provide a private transfer to the elderly. However, low-income young favor a positive social security level, since the utility from their parents receiving a pension outweighs the direct (utility) cost of the tax.

3. The political institutions

In the literature of political economy models of social security, political institutions are used to aggregate individual preferences over social security into a policy outcome. We shall review three broad classes of political arrangements: majority voting, veto-power or constitutional rules, and interest groups or lobbying.

3.1. Majority voting

In this class of models, agents vote on social security tax rates, and the policy outcome corresponds to the tax rate, which obtains a majority of the votes.

Selfish young and middle-aged agents are not willing to sustain a social security system unless they expect the system to remain in place until their old age. Early models, such as Browning (1975), disregard this problem by considering a once-and-for-all election. This is equivalent to assuming that there exists full commitment over future policies, and that future changes of the system, even Pareto improving, are not feasible. Later contributions have tried to amend these unrealistic features by considering that elections take place every period, and that previous policies can be changed at zero cost. In particular, Hu (1982) introduced revoting opportunities in Browning’s (1975) setting. However, Hu’s voters are not fully rational, because they perceive the outcomes of future elections to have a random component and attach a subjective probability to the event that today’s policy affects future outcomes. Sjoblom (1985) took a significant step forward towards explaining the voting behavior of rational agents in repeated elections over social security. He extended Hammond’s (1975) seminal idea of implicit contracts among successive generations of individuals to a repeated voting environment. This idea is simple, yet quite intriguing. The voting game gives rise to a social contract, which implicitly defines a system of rewards and punishments. Young voters may agree to transfer resources to current retirees because

they expect to be rewarded with a corresponding transfer in their old age. Failures to comply with the contract, and therefore to provide pensions to current retirees, are punished with no old-age transfers.

These contracts can be enforced in an overlapping generations model by a sequence of trigger strategies. To see this, it is useful to introduce a simple majority voting game over social security tax rates. We use the two-period version of the overlapping generations model described in the previous section with no heterogeneity. Players in this voting game are all agents alive at every election. As in Boldrin and Rustichini (2000), for each generation at time t , we identify a representative player, young and old. An action at time t for a young player is a tax rate, $a_t^y \in [0,1]$, and analogously for an old player, $a_t^o \in [0,1]$. At time t , the public history of the game is given by the sequence of tax rates until $t-1$: $h_t = (\tau_0, \tau_1, \dots, \tau_{t-1}) \in [0,1]^t$. A time t strategy for a young voter is a mapping from the history into the action space, $\sigma_t^y: h_t \rightarrow [0,1]$; and analogously for an old voter, $\sigma_t^o: h_t \rightarrow [0,1]$. In a majority voting game, the political outcome has to be preferred to any other outcome by a majority of voters. Thus, since the young constitute a majority of the voters, the political outcome is determined by the action of the young, $\tau_t = a_t^y$. For a given sequence of actions profiles, $(a_0^y, a_0^o, \dots, a_t^y, a_t^o, a_{t+1}^y, a_{t+1}^o, \dots)$, and corresponding outcomes, $(\tau_0, \dots, \tau_t, \tau_{t+1}, \dots)$, the payoff function of a young player at time t is given by his or her indirect utility function, $v_t^y(\tau_t, \tau_{t+1})$, and analogously for an old player, $v_t^{o-1}(\tau_{t-1}, \tau_t)$. The equilibrium concept we use is subgame perfection.

In this voting game, what kind of strategy profile supports an implicit contract, and thus a positive level of social security as a subgame perfect equilibrium outcome? Consider any strategy profile $(\sigma_s^{y*}, \sigma_s^{o*})_{s=t}^\infty$ such that:

$$\sigma_s^{y*} = \begin{cases} \tau_s^* & \text{if } \tau_{s-i} = \tau_{s-i}^* \text{ for } i = 1, \dots, s-t \\ 0 & \text{otherwise} \end{cases} \quad (3.1)$$

and call $(v_s^*)_{s=t}^\infty$ the resulting payoffs for the young. Since old voters are a minority, their actions are not relevant, as they cannot affect the outcome of the game. The young are required to vote for a tax rate τ_s^* , at time s , if the sequence of tax rates $(\tau_i^*)_{i=1}^{s-1}$ has been played in the past, and to vote a zero tax rate otherwise. This strategy profile is an equilibrium, if no agent has an incentive to deviate from it. That is, no young person has to be the first to vote for a tax different from the optimal policy $\tau_s \neq \tau_s^*$, and it has to be incentive compatible to punish all defectors.

The best deviation for a young individual is to vote for a zero tax rate, $\tau_s = 0$, in which case she receives no old-age transfer, and the associated payoff is her indirect utility level $v_s^s(0, 0)$; whereas the payoff from the strategy σ_s^{y*} is v_s^* . Thus, if $v_s^* \geq v_s^s(0, 0)$, a young person will not deviate. The utility from punishing a defector is again $v_s^s(0, 0)$, since the punisher effectively dismantles the system, which exceeds the utility from not punishing the defector, because $v_s^s(0, 0) \geq v_s^s(\tau^*, 0)$ for $\tau^* \geq 0$. Hence, if the existence of a social security system provides at least the same utility to the young as no social security (or more), i.e., $v_s^* \geq v_s^s(0, 0) \forall s$, the above strategy profile, $(\sigma_s^{y*}, \sigma_s^{o*})_{s=t}^\infty$, is a subgame perfect strategy profile. The economic reasons underlying this result were reviewed in the previous section.

This approach typically generates a high degree of indeterminacy, since many tax-rate sequences can be sustained as an equilibrium outcome of the voting game. This feature has drawn strong criticism on the ground that a good theory of social security should be able to deliver sharp empirical implications, rather than indeterminacy. Because of lack of clear consensus on the equilibrium selection device, several mechanisms have been used. Cooley and Soares (1999a) focus on the constant sequence of social security tax rates that are chosen by the initial voters, when the implicit contract only allows future voters to continue or abandon the system. Boldrin and Rustichini (2000) consider voting equilibria in which the first generation to introduce the system extracts all the gains, and leaves future generation of voters indifferent between continuing with the system or dismantling it. Azariadis and Galasso (in press) examine the complete set of equilibrium tax rates that may arise and be sustained through these implicit contracts, and propose an alternative political specification with veto power.

3.2. *Veto power*

In democratic societies, substantive changes in economic policy often require more than approval by a simple majority. This is especially true if the policy adjustments adversely affect the vested interests of a politically significant group as in the case of social security.

A political arrangement that partly precommits fiscal policy by awarding veto power over policy changes to the old voters was initially applied to social security decisions by Hansson and Stuart (1989). They view legislation as an implicit contract among living generations, in which a minority, the elderly, can block any policy modification that would make them worse off. In their economic setting, reviewed in Section 2.5, the existence of constitutionally awarded veto power is crucial to obtaining a political equilibrium with a Pareto-improving social security system. In a majoritarian version of their voting game, social security would still arise, since the young median voter would substitute the private transfer to the old with a social security transfer. However, the allocation of resources would be inefficient, because the social security transfer would be too small.

Azariadis and Galasso (in press) compare the set of equilibrium social security tax-rate sequences in majority voting and veto-power voting games. Their idea is to modify the majority voting game described in the previous section by giving the old veto-power over the current policy. The action of a young at time t thus becomes a tax rate proposal, whereas the action of an old player is whether or not to veto the young's proposal $a_t^o = \{Y, N\}$. Analogously, for an old voter at time t , a strategy is a mapping from the history and from the current young agents' action into the action space: $\sigma_t^o: h_t \times a_t^y \rightarrow \{Y, N\}$. In this majority voting game with veto power, the political outcome is the tax preferred by the old between the two taxes on the agenda, the status quo and the proposal made by the young. The equilibrium concept is again subgame perfection.

In this setting, Azariadis and Galasso (in press) show that a constitutional grant of veto power to the minority—the elderly—eliminates all cyclical sequences and all dynamic inefficiency from majoritarian political economy equilibria. Empirically, how-

ever, we do not observe constitutional veto power in social security policy decisions. To address this, Azariadis and Galasso (in press) endogenize the voting structure, by allowing the electorate to choose between a majoritarian and a constitutional veto power system in every period. The potential introduction of a constitutional veto power system is sufficient to reduce the set of equilibria, even if veto power is never awarded.

3.3. *Interest-group models*

Unlike voting models, interest-group models consider why the old have their way through the political process. This allows to analyze the existence of social security programs in democratic as well as in non-democratic countries. Interest-group models include two approaches: influence function and support function models. The former explain the existence of social security from political competition between two groups, young and old, each exerting political pressure on policymakers to obtain a positive transfer from the other group. The latter assume a government that maximizes a political support function composed of the utility of the currently living generations, and, possibly, of the contributions from lobbies representing the interest of each generation. In what follows, we treat the two approaches separately.

An early model of competition among special groups (taxpayers and subsidized agents) for political influence is due to Becker (1983, 1985). This model stresses the importance of political pressure rather than voting as a determinant of the political equilibrium for redistribution policies, although social security is not specifically analyzed. Applications of this approach to social security issues are Becker and Mulligan (1998) and Mulligan and Sala-i-Martin (1999a). These models assume a society composed of two groups, young and old. Individuals are identical within groups. Agents in each group undertake political activities that generate the group's political pressure. These activities can be time-intensive⁸ (Mulligan and Sala-i-Martin, 1999a), or good-intensive, i.e., related to the resources spent in lobbying, contributing to campaign expenditures, cultivating bureaucrats and politicians (Becker, 1985; Becker and Mulligan, 1998). The political activities can also depend on the size of the group, as in Becker (1983, 1985). Unfortunately, this size effect has often been neglected in the social security literature (with the exception of Profeta, 2000), although it may be crucial in analyzing the impact of demographic changes on the political equilibrium.

The political activity of creating pressure typically is accompanied by a free-rider problem, since the benefits obtained by each agent depend on group pressure by all members of the group. In response to the free-rider problem, a group may introduce a

⁸ The free-time dedicated to the political activities may also be interpreted as the degree of "political single-mindedness" in each group. If every citizen has a fixed amount of resources to allocate among different issues, then the issue that attracts the largest share of the group's political resources will be politically more successful. Analogously, the group whose members turn out to be focused on a single issue (single-minded) will also be more politically successful than the group whose members care about different issues.

distortionary policy, which aligns its members' individual interest with the group's interest.⁹

In the end, the policy outcome—in this case, the intergenerational transfer—depends on each group's pressure, size, and on other characteristics, through an influence function. The group exerting more influence wins the political competition and receives a transfer from the other group. Influence functions are typically symmetric, so that both groups share the same fundamental political power, i.e., the way in which the pressure exerted by a group is converted into political influence is the same for both groups. Thus, the existence of the social security transfer depends on the economic reasons that lead the old group to exert more pressure than the young, rather than on political elements. Mulligan and Sala-i-Martin (1999a) focus on an economic and a demographic element. First, they argue that the old have lower human capital, and thus lower labor productivity. Because of their lower wages, it is less costly for the old group to set a higher tax rate on their members, and to induce them to retire. Once retired, they will spend more time in lobbying to obtain transfers from the young group. Therefore, social security is associated with retirement. Second, since the young will eventually become old, they exert less opposition. These two elements increase the pressure exerted by the old group and its relative influence on the policymaker, which in turn determines the political success of the "gerontocracy". Becker and Mulligan (1998) instead emphasize the role of the deadweight cost that results from the distortionary effects of the transfer payments on labor supply, investments, and other economic choices. In this case, the effective amount of resources transferred to a group is lower than the amount of resources paid by the other group. They suggest that the young favor social security policies associated with large marginal deadweight costs (such as distortions on the elderly labor supply) in order to limit the size of the program, whereas the old exert excessive pressure, which determines their success.

Interest-group models of social security based on political support functions are developed by Verhoeven and Verbon (1991), Verbon and Verhoeven (1992) and Grossman and Helpman (1996, 1998). In these models, social security is the equilibrium outcome of a political process in which the government maximizes a political support function that contains the utility of the two currently living generations. Grossman and Helpman (1998) suggest that governments may also care about the political contributions from the lobbies that represent the interest of the two generations, young and old.

These models assume no commitment: today's policymakers have perfect foresight, but they cannot affect future policies. In Verhoeven and Verbon (1991) and Verbon and Verhoeven (1992), policymakers are infinitely long-lived. Political equilibria with social security may arise even when current politicians take future policies as given, if the political pressure of the old is sufficiently large. Grossman and Helpman (1998) consider a sequence of short-lived governments that are unable to precommit the future course of redistributive taxation. They adopt a Markov-perfect-equilibrium concept. Agents con-

⁹ For instance, in Mulligan and Sala-i-Martin (1999a), each group imposes a labor income tax on its members in order to induce the individuals to choose the (higher) level of leisure (and the political activity) that is optimal from the group's perspective.

dition their political actions on the current state of the economy, and they expect future policies to depend on the state of the economy that will prevail when later decisions are taken.

As in the influence models, social security arises in equilibrium because the old win the political competition. However, in this case, their success is mainly due to political elements. In Grossman and Helpman (1998), the political process is not symmetric, since the old are assumed to be organized in lobbies, and thus to be more efficient in exerting pressure than the young. This assumption implies that, when governments are unable to commit, it is difficult to guarantee transfers to the young, since these transfers could be undone in the next period. Moreover, since the old are the only contributors to the political campaigns, they receive more transfers.¹⁰ In Verbon and Verhoeven (1992) economic and political elements contribute to determining the political success of the old, since the social security system is more efficient than alternative savings schemes, and the preferences of the politicians are biased towards the elderly.

4. Do political economy models explain the facts?

The political economy theories reviewed in Sections 2 and 3 provide a variety of explanations for why social security systems were introduced and then sustained. How well do the different theories perform in explaining the main social security “facts?”

The empirical literature on social security includes contributions by Tabellini (2000), Lindert (1996), Perotti (1996), Breyer and Craig (1997), and Mulligan and Sala-i-Martin (1999a) and identifies the main determinants of the size of the social security systems around the world. These determinants can be classified in four groups: demographics, financial “performance” of the system, income distribution, and income factors.

Demographic factors include the proportion of elderly, i.e., people over 65 years old, in the total population, and the median voter’s age. Factors related to the financial “performance” of the system include the growth rate of the economy, the real interest rate, the inflation, and the deadweight cost. Income distribution factors are measures of the pre-tax income inequality, such as the Gini coefficient, the mean to median income ratio, and measures of the skewness of the income distribution. Income factors are typically measures of the average income of the country.

The results differ depending on the specification of the variables and on the data set, but some significant common evidence has emerged from the empirical studies. Here are the main social security facts, which are summarized in Table 2.

(1) The size of social security increases with the proportion of elderly people in the population (Tabellini, 2000; Perotti, 1996; Breyer and Craig, 1997). This result is particularly strong when the size of social security is measured as the share of social security expenditure of GDP (Breyer and Craig, 1997), or as the share of social security

¹⁰ The political process can also give extra weight to the well-being of the old, for instance because the old care less than the young about ideological issues, and therefore they are more willing to compromise their party affinity in return for personal benefits (see Dixit and Londregan, 1996).

Table 2
Political economy theories and the “facts”

	Demographics		Financial “performance”			Income distribution		Income	Others		
	Median voter’s age	Proportion of elderly ^a	Growth rate	Real interest	Inflation rate	Inequality	Skewness	Log GNP per capita	Design (mandatory retirement and firm’s share of payroll tax)	Time trend	Electoral (voter and executive turnout)
Facts	+	Total: +or hump-shaped, per capita not significant or hump-shaped	+	–	+	(+)	Not significant	+	+	+	+
Browning, Hu, Sjoblom, Boadway–Wildasin, Cooley–Soares	+	Total: +, per capita: +/-	+	–							
Boldrin–Rustichini		Total: +, per capita: +/-	+	–							
Tabellini		+	+	–			+				
Hansson–Stuart		Total: +, per capita: +/-	+	–							
Verhoeven–Verbon		+	+	–	+						
Becker, Becker–Mulligan		–									
Mulligan–Sala-i-Martin			+						+		
Profeta		Hump-shaped									

^a The results may depend on whether the dependent variable is the total or the per capita social security expenditure/GDP.

and welfare expenditure of GDP (Tabellini, 2000; Perotti, 1996), or as the proportion of social security and welfare expenditure on total government spending (Tabellini, 2000). However, when the dependent variable is the benefit per retiree, instead of the total benefit, the proportion of elderly may turn out not to be significant, as in Breyer and Craig (1997) and in Mulligan and Sala-i-Martin (1999a). Lindert (1996) provides evidence of a non-linear relation between the size of social security and the relative proportion of elderly. He divides the total population in four groups: school-agers (5–19 years old), young adults (20–39 years old), middle-aged adults (40–64 years old) and elderly (over 65 years old)—and shows that social security expenditure as percentage of GDP is increasing with the share of elderly to middle-aged adults until a maximum is reached (corresponding to 305 elderly per 1000 persons aged 20–64), after which the relation is reversed. This threshold decreases to 224 elderly per 1000 working-age adult when the dependent variable is the social security expenditures per elderly person relative to the GDP per person of working age. He also identifies an additional effect: social security expenditures are higher in populations with more young and middle-aged adults.

(2) The size of social security is larger, the higher is the growth rate of the economy (Perotti, 1996; Breyer and Craig, 1997), and the higher is the inflation rate (Breyer and Craig, 1997). In a reduced sample, Breyer and Craig (1997) provide some evidence that the social security size is negatively correlated with the real interest rate.

(3) The size of social security is (weakly) larger, the greater is the inequality in pre-tax income. This relation has been tested using several specifications. Tabellini (2000) measured inequality by the ratio of the pre-tax income received by the top 20% of the population to the pre-tax income received by the bottom 40% of the population. He found this variable to have a significant positive impact on the size of social security, particularly when measured in proportion to total government expenditure. Using the share in income of middle class as a measure of equality, Perotti (1996) confirms the validity of the previous result in a sample of democratic countries only. Weaker results are obtained by Lindert (1996) and Breyer and Craig (1997). The former study finds that income inequality, measured as the sum of the natural logs of the “upper income gap” (the ratio of the income of the top quintile over the income of the middle quintile) and the “lower income gap” (the ratio of the income of the middle quintile over the income of the bottom quintile), is not significant in explaining the size of social security. The latter work finds that the Gini coefficient is never significant. However, if a more appropriate measure—the “Gini coefficient for a flat benefit rate”, i.e., the product of the Gini coefficient and a dummy variable that takes value 1 when the program provides a flat benefit and 0 otherwise—is used, this variable turns out to be significant, although at a low level.

(4) The size of social security expenditure as a fraction of GDP is larger, the higher is GNP per capita (Breyer and Craig, 1997; Mulligan and Sala-i-Martin, 1999a). This result is known as the “Wagner’s law” and generally applies to all kinds of government expenditures. Lindert (1996) finds that this result is weaker when only social security, rather than all government spending, is considered.

(5) Other factors turn out to be significant. Breyer and Craig (1997) point out that in all programs around the world there is a significant, increasing and unexplained “time trend”

in social security expenditure. Lindert (1996) emphasizes the relevance of “electoral variables”, i.e., voter turnout and executive turnout, both of which have a positive impact on the size of social security. Mulligan and Sala-i-Martin (1999a) observe that some features of the “design” of the programs may have a significant and strongly positive impact on the size of social security, particularly the existence of a mandatory retirement rule and the way of financing the program, measured as the share of the payroll tax rate paid by the firm.

How do the political economy theories reviewed so far perform in explaining these facts?¹¹

Majority voting models are able to account for most of the demographic facts discussed above. In the models following Browning (1975) that were reviewed in Section 2.2 (Hu, 1982; Sjoblom, 1985; Boadway and Wildasin, 1989; Cooley and Soares, 1999a), an increase in the proportion of elderly in the population raises the median voter’s age, and thus increases the size of the system. Additionally, if voting takes place on the tax rate, and pension benefits are residually determined to balance the budget, as in Cooley and Soares (1999a) and Boldrin and Rustichini (2000), an increase in the proportion of elderly raises the dependency ratio, thereby decreasing per capita benefits. The overall effect on the per capita pension benefit is thus ambiguous, since more resources (due to the higher tax rate) are shared among more retirees. The introduction of the crowding-out effect, described in Section 2.3 (Cooley and Soares, 1999a; Boldrin and Rustichini, 2000), reinforces these results. Since more elderly are associated with a larger stock of capital per capita, and thus with lower interest rates, the median voter will increase the size of the system. An increase in the proportion of elderly in the population raises the equilibrium social security tax rate in Tabellini (2000) and Hansson and Stuart (1989) as well.

Interest-group models focus on the per-capita transfers, and de-emphasize the demographic aspects of social security. Nevertheless, Verhoeven and Verbon (1991) and Verbon and Verhoeven (1992) suggest that an increase in the proportion of the elderly in the population raises their political power and thus the pension benefits. Becker (1983, 1985) and Becker and Mulligan (1998) argue that the rapid aging of the population will reduce, rather than increase, social security, since the larger group will experience higher deadweight costs and larger free rider effects, and will thus be less efficient in exerting political pressure. These two effects are combined in Profeta (2000), who shows that the overall effect of aging on social security may be hump shaped, as suggested by Lindert (1996).

Majority voting models do not provide direct implications regarding the economic factors examined at point 2. However, Persson and Tabellini (2000) argue that if social security is viewed by the voters as an alternative saving instrument, the equilibrium tax rate chosen by the median voter depends positively on the relative performance of the system, i.e., positively on the growth rate of the economy, and negatively on the real rate of return. Verhoeven and Verbon (1991) and Verbon and Verhoeven (1992) provide a

¹¹ See Table 2 for a concise summary of the implications provided by each model.

similar explanation in the context of an interest-group model. In addition, Mulligan and Sala-i-Martin (1999a) suggest that higher growth rates of the economy are associated with larger social security transfers, since more elderly people are induced to retire, thus increasing political pressure that can be exerted by retired people. Interest-group models typically identify the deadweight cost as a crucial determinant that limits the size of the social security system (Becker, 1983, 1985; Becker and Mulligan, 1998; Profeta, 2000, see also Breyer, 1994b).

Political economy models perform poorly when faced with the remaining determinants of social security. For instance, Wagner's Law—the increase of the relative size of the system with the average income in the economy—is a puzzling stylized social security fact that no model is able to account for. Models in which social security entails an element of within-cohort redistribution (Tabellini, 2000) are the obvious candidates for explaining the (weak) positive relation between the size of social security and the pre-tax income inequality. However, they do not address why some (Beveridgean) social security systems have been designed to include an intragenerational redistribution component as opposed to others (Bismarckian). Neither do they examine why Bismarckian systems are typically larger than Beveridgean ones (see Casamatta et al., 1999). Additionally, as Tabellini (2000) suggested, it remains to be explained why an instrument of intergenerational redistribution—social security—is sometimes used to carry out some degree of intragenerational redistribution that could be achieved through alternative income redistribution instruments.

Another major drawback of this strand of the literature is that it focuses exclusively on explaining one dimension, typically the size, of a social security program that has several components. A theory of social security should be able to explain some of the most relevant features of the program. Mulligan and Sala-i-Martin (1999a), for example, point to the tight link between social security benefits and retirement, i.e., exit from the labor market, and the split of the social security contribution between employer and employee. Other relevant unexplained features of the social security system include its financing through a payroll labor income tax rather than through an overall income tax, its proportional, rather than progressive tax schedule, and its degree of within-cohort redistribution.

5. Multidimensional voting models of social security

A recent stream of literature has examined the multiple characteristics of social security. Multidimensional voting models have been used to analyze the joint determination of different features within the social security system, as well as the relation between social security and other welfare programs.

Lambertini and Azariadis (1998) and Conde-Ruiz and Galasso (1999) examine social security and income redistribution. Specifically, Lambertini and Azariadis (1998) analyze a welfare system composed of pure intragenerational and intergenerational transfers to account for the rapid expansion in the government redistributive expenditure of the last decades. They attribute the increase in the welfare transfers to a shift of political power among the different political coalitions involved in the welfare system. Their political

system is the legislative bargaining model of Baron and Ferejohn (1989). One of the three groups (old, skilled and unskilled young) is randomly chosen to make a policy proposal, which is then voted against the status quo through a simple majority rule. The (randomly chosen) agenda setter exploits her power by proposing her most preferred policy among those which would be approved by a minimum winning coalition. Members in a voting coalition do not have to share similar preferences over the policy. They rather agree to enter a coalition because of a mutually advantageous political bargaining. In a calibrated model of the US welfare state, Lambertini and Azariadis (1998) show that, although unskilled young voters dislike any intergenerational scheme, a coalition of old and unskilled young may support an equilibrium with positive intragenerational and intergenerational transfers.

To analyze multidimensional dynamic voting games, Conde-Ruiz and Galasso (1999) introduce a new equilibrium concept that applies subgame perfection to the notion of structure induced equilibrium due to Shepsle (1979). This subgame perfect structure-induced equilibrium is used to address the puzzle raised by Tabellini (2000) concerning the contemporaneous existence of a social security system with a within-cohort redistribution element and other income redistribution programs. Conde-Ruiz and Galasso (1999) argue that social security owes its wide spread support to two factors: the political power of the elderly, and the intragenerational redistribution component of social security. In a dynamically efficient economy, they show that, for a sufficiently large level of income inequality and enough elderly in the population, a welfare system composed of a within-cohort redistribution scheme and an unfunded social security system constitutes a political equilibrium of a two-dimensional majoritarian election. Social security is sustained by a voting majority of retirees and low-income young, while intragenerational redistribution by low-income young only. This model provides an interesting insight about the relation between income inequality and social security. Due to the homogeneous voting behavior of the old, only changes in the income inequality that affect individuals in their working age have an impact on the size of the system. This observation suggests that the empirical studies should disaggregate income inequality by age groups, and may help to explain the mixed evidence obtained by using measures of “overall” income inequality.

Boldrin and Montes (1998) build on an early work by Becker and Murphy (1988) to argue that social security and public education should be jointly analyzed. They construct a model in which public education and social security are implemented through an intertemporal political game. Young individuals are credit constrained, and thus cannot borrow to finance their human capital accumulation. Public financing of education constitutes a way for these young to borrow the resources to invest in human capital from the middle-aged generation. When they become middle-aged, agents work, and pay an income tax to finance current young’s education, and current old’s pensions. Finally, they receive an old-age pension upon retirement. This system of intergenerational transfers allows human capital accumulation to take place, promotes economic growth, and thus improves the performance of the social security system as a saving device. Boldrin and Montes (1998) show that such an intergenerational agreement can arise as an equilibrium of a majority voting game in which only middle-aged and old are allowed to vote.

Among the models that analyze more than one feature of social security, Conde-Ruiz and Galasso (2000) examine the introduction of an early retirement provision in a two-dimensional majority voting game. Young and old agents cast a ballot over the size of the social security system and the existence of early retirement. Using the notion of subgame perfect structure induced equilibrium introduced in Conde-Ruiz and Galasso (1999), they show that a social security system with an early retirement provision is initially adopted, and sustained over time, if two conditions hold: (i) there exists an initial mass of redundant elderly workers with incomplete working history, who are not entitled to an old-age pension; and (ii) early retirement entails some policy persistence, i.e., this provision induces a large number of early retirements, thereby reinforcing condition (i). The data confirm these theoretical findings. The voting majority in favor of early retirement is composed of elderly agents with incomplete working history, who are not entitled to old-age pensions, and low-income young workers, who expect to retire early.

These contributions suggest that a multidimensional approach may be successful in accounting for the unexplained features of social security, and, perhaps more importantly, in framing social security in the context of a more comprehensive analysis of the welfare state. In particular, new light may be shed on the political and economic complementarities in redistributive programs of the welfare system. These models may also provide a more natural means to study comprehensive reforms of the welfare state, including phasing out of the current social security system, than unidimensional voting models of social security reforms, which we review in the next section.

The multidimensional approach does, however, raise modeling issues. It is well known that Nash equilibria of majority voting games typically fail to exist in a multidimensional issue space. Although several alternative ways of aggregating individual votes have been proposed in the political science literature, a consensus has not been reached on this issue. Different approaches that have been used in the political economy literature include: (i) legislative bargaining; (ii) structure induced equilibrium or subgame perfect structure induced equilibrium; (iii) probabilistic voting; and (iv) lobbying or interest-group models. The approach used to aggregate individual votes (or political activities) is not neutral, but affects the equilibrium policy outcomes. It would therefore be reassuring to identify a political system that best resembles the process of policy-making on social security issues. The dispute is yet unsettled.

6. Political sustainability and reforms

The debate on social security has focused on the response of the systems to current and future demographic and economic dynamics. In particular, attention has been directed to the impact of the aging process on the economic or financial sustainability of these systems. In this section, we first survey the recent literature on political economy models of social-security response to demographic changes. They examine whether the current systems will be politically sustainable, given the demographic dynamics. We then turn to a new strand of literature that analyzes the political viability of social security reforms.

6.1. Political sustainability of current systems

In western populations, the increase in the proportion of old people is due to the combined effect of a decrease in the fertility rate and an increase in the survival rate. These demographic changes affect social security through: (i) the increase of the dependency ratio, i.e., the proportion of retirees per worker; (ii) the stock of capital per capita, which rises, thereby increasing the wages and decreasing the interest rate; and (iii) the increase of the political power of the old population.

Bohn (1999) analyzes these aspects in the context of a nested economic model, which includes features described in Sections 2.2 and 2.3, and in which preferences are aggregated through majoritarian elections. On one hand, as the population becomes older, the age of the median voter increases. On the other hand, the increase in the dependency ratio driven by the aging population does not affect the pension benefits, because the social security payroll tax rate increases to compensate for the increase in the proportion of retirees per worker.¹² In this partial equilibrium setting, Bohn (1999) adopts Browning's methodology to show that, after reasonable demographic changes, the internal rate of return from social security for the new (older) median voter still exceeds the return on alternative safe assets. He argues that extension to include the general equilibrium effects described in Section 2.3 reinforces the evidence in favor of the political sustainability of the system.

In a critical appraisal of this work, Joines (1999) raises two fundamental questions: What does political sustainability exactly mean? And how can the political sustainability of a current system be tested? To address these questions, consider the majority voting model described in Section 3.1, in which elections take place every period and there is no commitment over future policies. In a deterministic environment, a social security system can be introduced, and sustained over time, only if current voters expect the system to be in place in the future.¹³ Therefore, if political sustainability identifies the support of a voting majority, then lack of future sustainability is not compatible with current sustainability, unless either a stochastic environment is considered or the collapse of the system is induced by unexpected (demographic) shocks.

Boldrin and Rustichini (2000), for instance, analyze a stochastic two periods overlapping generations model, in which the population growth rate is weakly decreasing, according to a Markov chain. They show that forward-looking rational voters choose to introduce a social security system, although they expect the system to be eventually abandoned.

Cooley and Soares (1996) adopt a four-period stochastic overlapping generations model to assess quantitatively the sustainability of the US social security system given the post-war demographic shocks. In their model, the relative size of each generation is stochastic. The initial voters determine the (linear) rule that links the pension benefits to

¹² Clearly, the adoption of an alternative, i.e., to leave the tax rate constant and to let the pension benefits adjust to an aging population, would affect the results, since the entire burden of the demographic change would be carried by the retirees.

¹³ Tabellini (2000) is again the exception.

the realized relative share of each generation. The payroll tax rate then adjusts to keep the budget balanced every period. For computational reasons, Cooley and Soares (1996) do not solve the maximization problem corresponding to entire stochastic process, but rather take a short cut, and consider the path of the economy that corresponds to the *expected* sequences of the stochastic variables. Interestingly, the social security system that retains majority support under the expected demographic changes features an increase in the tax rate as the population ages, in order to maintain sufficiently large pension benefits. However, when compared with the post-war realizations of the demographic shocks, this demographic-contingent system would *not* obtain a majority of votes, and therefore it would not be politically sustainable. Unfortunately, due to this short cut, this experiment is inconclusive regarding the political sustainability of the US social security system.

Meijdam and Verbon (1996) and Galasso (1999) examine how social security systems need to be modified in order to retain political support under reasonable demographic dynamics. In the context of an interest-group model (see Section 3.3), Meijdam and Verbon (1996) analyze the effects of expected and unexpected decreases in the population growth rates on the social security tax rate. They suggest that, if the initial size of the system is small relative to savings, an anticipated decrease in the population growth rates (aging) raises the tax rate, whereas the effect is ambiguous for unexpected shocks. The intuition is straightforward. Aging increases assets per capita, reduces the interest rate, and raises the dependency ratio and the political influence of the elderly. In their interest-group model, the first effect causes a reduction in the tax rate, whereas the remaining effects induce an increase. The total impact is ambiguous, unless agents anticipate the future changes and can modify their asset holding decisions accordingly. In this case, the effects on the dependency ratio and on the political influence of the elderly dominate, and the tax rate increases.

In a large overlapping generations model calibrated to the US economy, Galasso (1999) compares the social security systems that would be supported by a majority of voters under different demographic dynamics at a steady state. He shows that an aging population, characterized by a lower population growth rate and a higher survival probability, is associated with a higher social security tax rate. In fact, the increase in the age of the median voter strongly dominates the negative effect on the dependency ratio, which reduces the implicit returns from social security. Although this result is suggestive of the relative magnitude of the effects at work, it is a steady-state comparison, and abstracts from relevant transitional issues.

Breyer and Stolte (2001) suggest that the current sustainability of most social security systems relies on the endogeneity of the labor supply, an element disregarded by most other models.¹⁴ They argue that, as the population ages, workers become poorer, since they expect their future pensions to be reduced. As a result, they are willing to supply more labor, and their labor supply becomes less elastic. Therefore, in a majority voting model in which the median voter belongs to the elderly, the social security tax rate increases as the

¹⁴ Breyer (1994b) suggests that social security systems are not too large, as argued by Browning (1975), because of their distortionary effect on the labor supply.

population growth rate decreases, because the elderly are able to exploit the workers who have become more vulnerable.

6.2. *Social security reforms*

All the models in the previous subsection share a common feature. They assess the political sustainability of a social security system by comparing the existing system to a scenario in which there is no social security, and where previous contributions are a sunk cost, i.e., they are not even partially reimbursed. Clearly, as argued by Cooley and Soares (1996) and Bohn (1999), current systems become less sustainable when compared to alternative schemes that allow for partial reimbursement of previous contributions. This approach has been used by Cooley and Soares (1999b) and Conesa and Kruger (1999) to study the political implementability of alternative reform proposals to privatize social security.

Cooley and Soares (1999b) consider transition policies that are politically implementable when social security benefits are gradually eliminated and replaced with private savings. They define a reform to be implementable if it is welfare improving for a majority of the current population, and analyze a gradual reduction of the existing social security replacement rate, i.e., the ratio of the pension to the average earnings, over three periods. The reform reduces workers' future benefits, as well as their lifetime contributions to the social security system. During the transition, the benefits to the current retirees can be financed by taxes on labor income, on capital income, and on consumption, or by issuing debt. Typically, policies that use labor income taxes turn out to be opposed by the young, while taxing capital income and consumption is opposed by the elderly. Cooley and Soares (1999b) show that, for two periods, a majority of the population opposes any reform, and from the third period on (around 1980) a reform is supported. A condition for the reform to be implementable is that, during the transition, pension benefits are partially financed by debt. In this case, part of the costs of the privatization is transferred to future generations, so increasing support for the change among current generations.

If a reform requires all the agents in the economy to be better off, the main result does not change. As before, the political feasibility of a reform relies on the use of debt that shifts the burden of the transition to future generations, which may accept to bear the debt due to higher capital stock induced by the privatization. In their computation, there exists a minimum share of the benefits financed by debt such that all current generations are indifferent between the reform and the status quo, and the reform can be implemented.¹⁵

Conesa and Kruger (1999) analyze the political implementability of three alternative transition reforms: (a) the immediate termination of the social security system; (b) a

¹⁵ Notice that, despite the reduced replacement rate, even current older workers favor the reform. In fact, since they expect future replacement rates to decrease, they increase their labor supply and accumulate more assets for their retirement. As a consequence, labor income and interest rates increase and the average earnings increase. This offsets the direct effect of the decrease in the replacement rate and allows for higher pension benefits.

gradual termination with the current replacement rate (equal to 50%) reduced by one percentage point a year over a 50-year period and payroll taxes accordingly reduced; and (c) an initial announcement of the elimination of the system, followed by termination 20 years later. The authors base support for the alternative reforms on elements surveyed in Section 2. The reforms involve (i) intergenerational redistribution, since older agents who have contributed to the social security system lose part of (reform (b)) or all of (reform (a)) their entitlements; (ii) intragenerational redistribution from high to low productivity agents, since payroll taxes are proportional to labor income, while benefits are not related to contributions; and (iii) general equilibrium effects, through changes in wages and the interest rate during the transition. Additionally, the termination of the social security system involves an efficiency gain from the elimination of the distortionary payroll tax to finance social security benefits. The crucial element, however, is that the current social security system acts as a partial insurance device against idiosyncratic income uncertainty. Therefore, more within-cohort heterogeneity, driven by idiosyncratic uncertainty on individual labor productivity, reduces political support for reform. Because of the large intergenerational and intragenerational redistribution effects induced by the reforms, no reform is supported by a majority of the population. Reforms (b) and (c) have less political support than (a), since they involve a larger loss for middle-aged (reform (b) and reform (c)) and young (reform (c)) generations.

Privatization is not the only possible reform. In a calibrated model of the Swiss economy, Butler (2000) examines four alternative reforms of the PAYG social security system that is expected to become financially unbalanced by 2005: a reduction in the benefit level, an increase in the legal retirement age, an increase in the proportional payroll tax rate, and an increase in earmarked consumption taxes. If the internal rate of return of the pension system is lower than the real interest rate and taxation is sufficiently distortionary, the size of social security would be reduced. An increase in retirement age is the most favored reform. It is clearly supported by agents above current retirement age. When compared to a reduction in benefits, it is also supported by middle-aged working agents, who are (approximately) indifferent between the two regimes. For high degrees of distortionary taxation, younger individuals prefer this reform to an increase in payroll or consumption earmarked tax rates. This is so, since an increase in the tax rate, particularly in the second half of their working life when productivity levels and thus labor and capital income are high, would entail a larger distortionary effect.

7. Concluding remarks

Browning (1975) proposed that the large size of social security systems in democracies is due to political factors related to the age of the median voter. Since this insight, there has been a subsequent literature on political economy models of social security. What can be learned from this literature?

Initial contributions have focused on the nature of the “social contract” that supports the social security system. Browning (1975) assumed an extreme form of commitment over future policies in the form of once-and-for-all decisions. Later models have shown

that, in absence of a commitment device, social security can arise as the outcome of an implicit, unwritten contract among successive generations of individuals. A social contract defines a system of rewards and punishments that induces young voters to transfer resources to retirees, because they expect to be rewarded with a corresponding transfer in their old age. Interest-group models, on the other hand, have highlighted the role of political pressure exerted by the elderly to obtain a pension transfer.

In the last few decades, there has been a dramatic increase in the social security expenditure, which in most industrialized countries has been related to the contemporaneous population aging process. As a response, a large literature has looked at financial sustainability of social security systems under the expected demographic dynamics (see Auerbach and Kotlikoff, 1987). The political economy literature has examined the demographic issue from a different perspective. Voting models have shown that an aging population has two opposite effects on social security: it increases the dependency ratio, thereby reducing the profitability of the system, and it raises the median voter's age, which creates more support for a larger social security system. Theoretical and simulated models have related the impressive increase in the size of the system to the aging process, and have considered how current systems can be expected to react to future demographic dynamics (see Sections 4 and 6).

Demographics alone, however, is not sufficient to explain the entire magnitude of the rise in the social security expenditure. Mulligan and Sala-i-Martin (1999a) identify a missing element in the political power of the old, created by the retirement policies that require, or induce, the old to exit the labor market in order to receive a pension. But why has this political power increased over the years? The reason for the rise in the social security expenditure of the last few decades remains an open question.

Literature that analyzes social security in a wider, multidimensional context, which we reviewed in Section 5, will perhaps be able to make some progress in this direction. Future studies in this literature should also address the following questions: Is the increase in social security expenditure related to the retirement policy? Or to the rise in other welfare programs, mainly targeted to the old, such as health care? Or to some intrinsic feature of the development process that leads richer countries to have larger systems?

The normative message of the literature on financial sustainability has been that reform is required to keep the system in balance, either through a structural change, for example from the PAYG to a mixed or unfunded system, or a "parametric" reform, for example, a rise in the retirement age, or a change in the formula used to calculate the pension benefits. Since decisions on social security reforms, just like any other social security policies, are in the realm of politics, political feasibility is important. Which reform would obtain the support of a simple (or qualified) majority of voters? The few contributions along these lines have not been able to provide general results, and have focused on calibrated models of the US social security system. In these cases, they have provided a negative answer. Although there may be gains from moving to an unfunded, or mixed system, no social security reform would obtain the required majority, due to transition costs that would have to be imposed on the current (voting) generations. Does this represent a description of the reality? Or is it a limitation that these political economy models of social security have not been able to identify a politically feasible reform?

Some reforms have indeed been implemented around the world, mainly in countries in which the existing social security systems were relatively small. In other countries, like the US, despite the political debate, no reform has taken place yet. In fact, the calibrated studies of the US social security system suggest that no reform is politically feasible. Should a reform be implemented in the future, the existing models would prove to have very little explanatory power.

Acknowledgements

We thank Friedrich Breyer, Xavier Sala-i-Martin and two anonymous referees for the useful comments. All remaining errors are ours. Vincenzo Galasso acknowledges financial support from the Spanish Ministry of Education DGICYT PB96-0118. Part of this paper was written while Vincenzo Galasso was visiting Universitat Pompeu Fabra.

References

- Aaron, H., 1966. The social insurance paradox. *Canadian Journal of Economics and Political Science* 32, 371–374.
- Abel, A.B., 1989. Assessing dynamic efficiency: theory and evidence. *Review of Economic Studies* 56, 1–19.
- Auerbach, A.J., Kotlikoff, L.J., 1987. *Dynamic Fiscal Policy*. Cambridge Univ. Press, New York.
- Azariadis, C., Galasso, V., in press. Fiscal constitutions. *Journal of Economic Theory*.
- Baron, D.P., Ferejohn, J.A., 1989. Bargaining in legislature. *American Political Science Review* 83, 1181–1206.
- Becker, G.S., 1983. A theory of competition among pressure groups for political influence. *The Quarterly Journal of Economics* 98, 371–400.
- Becker, G.S., 1985. Public policies, pressure groups and deadweight costs. *Journal of Public Economics* 28, 329–347.
- Becker, G.S., Mulligan, C., 1998. Deadweight costs and the size of government. NBER w.p.# 6789.
- Becker, G.S., Murphy, K.M., 1988. The family and the state. *Journal of Law and Economics* 31, 1–18.
- Boadway, R.W., Wildasin, D.E., 1989. A median voter model of social security. *International Economic Review* 30, 307–328.
- Bohn, H., 1999. Will social security and medicare remain viable as the U.S. population is aging? *Carnegie-Rochester Conference Series on Public Policy* 50, 1–53.
- Boldrin, M., Montes, A., 1998. Intergenerational transfer institutions: public education and public pensions. Mimeo, Department of Economics, Universidad Carlos III, Madrid.
- Boldrin, M., Rustichini, A., 2000. Political equilibria with social security. *Review of Economic Dynamics* 3, 41–78.
- Boskin, M.J., Kotlikoff, L.J., Puffert, D.J., Shoven, J.B., 1987. Social security: a financial appraisal across and within generations. *National Tax Journal* 40, 19–34.
- Breyer, F., 1994a. The political economy of intergenerational redistribution. *European Journal of Political Economy* 10, 61–84.
- Breyer, F., 1994b. Voting on social security when labor supply is endogenous. *Economics and Politics* 6, 119–130.
- Breyer, F., Craig, B., 1997. Voting on social security: evidence from OECD countries. *European Journal of Political Economy* 13, 705–724.
- Breyer, F., Stolte, K., 2001. Demographic changes, endogenous labor supply and the feasibility of pension reforms. *Journal of Population Economics* 14, 409–424.
- Browning, E., 1975. Why the social insurance budget is too large in a democracy. *Economic Inquiry* 13, 373–388.

- Butler, M., 2000. The political feasibility of pension reform options: the case of Switzerland. *Journal of Public Economics* 75, 389–416.
- Casamatta, G., Cremer, H., Pastieu, P., 1999. The political economy of social security. CORE Discussion Paper #9955.
- Conde-Ruiz, J.I., Galasso, V., 1999. Positive arithmetic of the welfare state. CEPR Discussion Paper Series #2202.
- Conde-Ruiz, J.I., Galasso, V., 2000. Early retirement. CEPR Discussion Paper Series #2589.
- Conesa, J.C., Kruger, D., 1999. Social security reform with heterogeneous agents. *Review of Economic Dynamics* 2, 757–795.
- Cooley, T.F., Soares, J., 1996. Will social security survive the baby boom? *Carnegie-Rochester Conference Series on Public Policy* 45, 89–121.
- Cooley, T.F., Soares, J., 1999a. A positive theory of social security based on reputation. *Journal of Political Economy* 107, 135–160.
- Cooley, T.F., Soares, J., 1999b. Privatizing social security. *Review of Economic Dynamics* 2, 731–755.
- Cukierman, A., Meltzer, A., 1989. A political theory of government debt and deficits in a Neo-Ricardian framework. *American Economic Review* 79, 713–732.
- Diamond, P., 1996. Proposals to restructure social security. *Journal of Economic Perspectives* 10, 67–88.
- Dixit, A., Londregan, J., 1996. The determinants of success of special interests in redistributive politics. *The Journal of Politics* 58, 1132–1155.
- Galasso, V., 1999. The US social security system: what does political sustainability imply? *Review of Economic Dynamics* 2, 698–730.
- Galasso, V., in press. The US social security: a financial appraisal for the median voter. *Social Security Bulletin*.
- Gramlich, E.M., 1996. Different approaches for dealing with social security. *Journal of Economic Perspectives* 10, 55–66.
- Grossman, G.M., Helpman, E., 1996. Electoral competition and special interest politics. *Review of Economic Studies* 63, 265–286.
- Grossman, G.M., Helpman, E., 1998. Intergenerational redistribution with short-lived governments. *The Economic Journal* 108, 1299–1329.
- Hammond, P., 1975. Charity: Altruism or cooperative egoism. In: Phelps, E.S. (Ed.), *Altruism, Morality and Economic Theory*. Russell Sage Foundation, New York, pp. 115–131.
- Hansson, I., Stuart, C., 1989. Social security as trade among living generations. *American Economic Review* 79, 549–559.
- Homburg, S., 1991. Interest and growth in an economy with land. *Canadian Journal of Economics* 24, 450–459.
- Hu, S.C., 1982. Social security, majority-voting equilibrium and dynamic efficiency. *International Economic Review* 23, 269–287.
- Imrohoroglu, A., Imrohoroglu, S., Joines, D.H., 1995. A life cycle analysis of social security. *Economic Theory* 6, 83–114.
- Joines, D.H., 1999. Will social security and medicare remain viable as the U.S. population is aging? A comment. *Carnegie-Rochester Conference Series on Public Policy* 50, 55–60.
- Lambertini, L., Azariadis, C., 1998. The fiscal politics of big governments: do coalitions matter? Mimeo, Department of Economics, UCLA.
- Lindert, P.H., 1996. What limits social spending?. *Explorations in Economic History* 33, 1–34.
- Meijdam, L., Verbon, H.A.A., 1996. Aging and political decision making on public pensions. *Journal of Population Economics* 9, 141–158.
- Mulligan, C.B., Sala-i-Martin, X., 1999a. Gerontocracy, retirement and social security. NBER working paper #7117, Cambridge, Mass.
- Mulligan, C.B., Sala-i-Martin, X., 1999b. Social security in theory and practice (I): facts and political theories. NBER working paper #7118, Cambridge, Mass.
- Mulligan, C.B., Sala-i-Martin, X., 1999c. Social security in theory and practice (II): efficiency theories, narrative theories, and implications for reform. NBER working paper #7119, Cambridge, Mass.
- Perotti, R., 1996. Growth, income distribution, and democracy: what the data say. *Journal of Economic Growth* 1, 149–188.
- Persson, T., Tabellini, G., 2000. *Political economics. Explaining Economic Policy*. MIT Press, Cambridge, MA.

- Profeta, P., 2000. Demography, retirement and the future of social security. Econpublica-Università Bocconi working paper #68.
- Samuelson, P.A., 1958. An exact consumption-loan model of interest with or without the social contrivance of money. *Journal of Political Economy* 66, 467–482.
- Shepsle, K.A., 1979. Institutional arrangements and equilibrium in multidimensional voting models. *American Journal of Political Science* 23, 27–59.
- Sjjoblom, K., 1985. Voting for social security. *Public Choice* 45, 225–240.
- Tabellini, G., 2000. A positive theory of social security. *Scandinavian Journal of Economics* 102, 523–545.
- Veall, M.R., 1986. Public pensions as optimal social contracts. *Journal of Public Economics* 31, 237–251.
- Verbon, H.A.A., Verhoeven, M.J.M., 1992. Decision making on pension schemes under rational expectations. *Journal of Economics* 56, 71–97.
- Verhoeven, M.J.M., Verbon, H.A.A., 1991. Expectations on pension schemes under non-stationary conditions. *Economic Letters* 36, 99–103.