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How does ageing affect the welfare state?

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Abstract

Ageing has opposite economic and political effects on the size of the welfare state. On one side, it tends to decrease the profitability of a welfare state that features a PAYG pension system, thus inducing individuals to prefer a smaller system; on the other side, the pivotal (median) voter becomes older (or poorer) and hence more willing to support a larger system. The overall effect is thus ambiguous. We show that specific features of the welfare system, such as its composition and the redistributive design of social security, may change the magnitude of the economic effect and thus of the overall impact of ageing on the size of the welfare state.

JEL classification: H53; H55
Keywords: Welfare state; Bismarckian; Beveridgean; Social security

1. Introduction

The effects of ageing on the welfare state and in particular on social security systems have been extensively studied in the economic and political economy literature (see for instance, Feldstein and Liebman, 2002; Clark et al., 2004; Galasso and Profeta, 2004). Conventional economic wisdom has suggested that population ageing has been responsible for large increases in welfare spending. The rationale is straightforward. Ageing tends to increase the share of beneficiaries of the two largest welfare programs — social security and health care. If the entitlements to benefits from these welfare programs are not modified, spending increases because of the increasing number of recipients. Indeed, there has been a spectacular progression in the last decades in spending on these welfare programs and the trend is expected to continue. Predictions by OECD (2002) indicate that social security spending will typically grow in most OECD countries in the

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next fifty years. Faced with the prospect of further increases in welfare expenditure, several international organizations and leading economists (among many others see World Bank, 1994; Lindbeck and Persson, 2003; European Commission, 2003) have advocated reform measures aimed at keeping welfare spending under control. Yet, these retrenchment measures have often been difficult to implement, since they tend to reduce the (expected) entitlements of elderly workers or retirees and may thus entail large political or electoral costs (see Pierson, 1994, 1996).

While most theoretical and empirical contributions point to a positive correlation between ageing and welfare spending, Razin, Sadka and Swagel (2002) — hereafter RSS — present a theoretical model and empirical analysis that reaches the opposite conclusion: population ageing is associated with less welfare spending. RSS identify some important transmission mechanisms from ageing to welfare spending that deserve to be discussed in a broader prospective.

The contribution of RSS is part of recent political economy literature on social security (see Galasso and Profeta, 2002, for a survey) that has incorporated political or electoral elements into the analysis of the effects of ageing on the determinants of welfare state policies. These contributions typically suggest that population ageing has opposite economic and political effects on social security decisions. The overall effect is thus ambiguous on theoretical grounds and needs to be assessed empirically. RSS consider a simple two-period overlapping generation model, in which young individuals differ in their innate ability and choose whether to become educated (skilled) or not (unskilled). The welfare state is characterized by a proportional tax levied on labor income, and by a lump-sum transfer to all individuals — young and old — that balances the budget every period. The redistributive policy is determined through a majority voting election, in which all agents — young and old — indicate their most preferred tax rate — and hence the lump-sum transfer. No intergenerational link among policies is considered. In this political and economic environment (see the critical appraisal by Simonovits, 2007-this issue), RSS identify a political trade-off due to ageing. On one hand, by increasing the share of retirees, ageing reduces the resources transferred to the (pivotal) young voter, who will thus want to downsize the welfare state, i.e., to reduce the tax rate. On the other hand, ageing modifies the identity of the pivotal (median) voter, who becomes a poorer (less educated) young person, and who benefits more from the redistributive welfare state — and will hence want to increase the tax rate. The overall effect of ageing on social security in the theoretical model set out by RSS is thus ambiguous. In the empirical analysis, however, they suggest that the former economic effect of ageing dominates the latter political effect. Thus, a negative relation emerges between ageing and welfare spending.[1]

A similar trade-off between an economic and a political effect arises in our 2004 paper where the economic effect of ageing is captured by the increase in the share of retirees to workers — the dependency ratio, which reduces the average long-run profitability of a PAYG social security system. Agents are thus induced to downsize the pension system. However, ageing also has a political or electoral effect: the pivotal (median) voter becomes older and supports a larger system. In our theoretical model, the overall impact of ageing on social security is thus again ambiguous. Our simulations, however, indicate that the electoral effect due to the increased political influence of the elderly voters dominates.[2] The overall size of the social security system — as measured by the contribution rate — is forecasted to increase in the six countries analyzed (France, Germany,

[1] In a stochastic political economy model, Boldrin and Rustichini (2000) show that ageing may eventually lead to abandoning PAYG social security systems, since their profitability will dramatically drop due to this demographic process.

[2] The simulation results in our 2004 paper are confirmed by Bohn (1999, 2005) and Cooley and Soares (1996).

Italy, Spain, the UK and the US) — albeit not necessarily its generosity as measured by the replacement rate.[3]

To sum up, while most contributions in the political economy literature identify opposite economic and political effects, they differ in their empirical assessment of their relative size, and thus in the overall effect of ageing on the size of the welfare state. Here we contribute to the debate by focusing on two specific determinants of the relative magnitude of the economic effect of ageing: (i) the composition of the welfare state and (ii) the redistributive design of the PAYG social security system.

In a model featuring a welfare state composed of a social security system and a pure income redistribution program based on Meltzer and Richard (1981), we propose that the negative economic effect of ageing on the size of the welfare state increases with the fraction of the welfare expenditure going to pensions, due to the decline in profitability of a PAYG system under ageing. When the political effect does not depend on the composition of the welfare state — as in our model, but unlike in more comprehensive political settings such as in Conde-Ruiz and Galasso (2005) — this political effect is more likely to dominate the economic effect in countries with smaller pension programs.

Also the redistributive design of social security may modify how ageing affects the welfare state. Social security systems are broadly classified[4] between "Bismarckian" schemes, featuring a tight link between individuals' contributions and pension benefits (as, for instance, France, Germany and Italy), and thus entailing low intragenerational redistribution, and "Beveridgean" schemes, where public pension benefits are only loosely linked to contributions and thus within-cohort redistribution is large (e.g., in UK and US). Beveridgean systems are typically of smaller size than Bismarckian. Our theoretical model suggests that in countries featuring less redistributive (more Bismarckian) social security systems, the negative economic effect of ageing on the size of the pension system is smaller. This is because, for the low-wage pivotal (median) voter, the reduction in the long-run profitability of the PAYG system due to ageing is smaller in a less redistributive scheme where pension benefits are closely related to low-wage, than in a Beveridgean scheme, where they depend on the (higher) average wage. Moreover, if the political effect is independent of the redistributive design of the PAYG schemes, as in the model proposed in Section 2, in Bismarckian systems the political effect is more likely to dominate the economic effect, and thus ageing is more likely to lead to a larger welfare system. This prediction of the model is in line with the empirical analysis in Disney (2007-this issue).

The paper is organized as follows. The following section presents the model and the political economic equilibrium. Section 3 analyzes the two channels for the economic effect of ageing, while Section 4 discusses the associated political effects as emerging from the existing literature. Section 5 concludes.

2. The model

We consider a two-period overlapping generations model. In 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. Young individuals have different productivity, which coincides with their wage incomes; w_i indicates the productivity of the *ith* individual. Productivity is distributed according to

[3] For instance, when labor market distortions from taxation are considered, the equilibrium social security contribution rate in Spain is expected to increase from 21.3% in 2000 to 33.8% in 2050 — and from 9.7% in 2000 to 18.7% in the US.

[4] See Disney (2004) and Conde-Ruiz and Profeta (in press).

a cumulative distribution $G()$ on the interval [0, 1], with g denoting the density function. We indicate the mean wage income by $\bar{w}$ and we assume the wage income distribution to be skewed, and thus the median wage income is lower than the mean.

Young agents pay a proportional tax, τ_t, on their wage income, which finances a welfare state consisting of two programs: a redistributive scheme following Meltzer and Richard (1981), which provides a lump-sum transfer b to all young individuals, and a PAYG social security system, which provides a pension P_i to a type-i elderly person. The budget is balanced in every period. This modeling of the welfare state thus departs from the RSS "bundling" formulation, in which all individuals — young and old — receive the same transfer. We suggest that pure income redistribution schemes and pension systems are composed of separate welfare state programs — often with separate formal budgets — that tend to target different individuals.[5]

We assume exogenous labor supply, but introduce an exogenous tax distortion, which delivers a standard Laffer curve, $\tau(1-\tau)$. A fraction $\lambda \in (0, 1)$ of tax revenues is allocated to the lump-sum income redistribution and a fraction $(1-\lambda)$ to pensions. The determination of the pension benefits for a type-i old individual differs from RSS. As in Conde-Ruiz and Profeta (in press), a pension consists of a contributory part, α, which is directly related to individual earnings, w_i, and of a non-contributory part, $1-\alpha$, which depends on average earnings, $\bar{w}$. Hence, a system is purely Beveridgean for $\alpha=0$, and purely Bismarckian for $\alpha=1$. We assume that a fraction of total revenue is lost during the redistributive process (deadweight loss): this fraction is $\eta(1-\alpha)\gamma$ for tax revenues allocated to pensions and η for tax revenues allocated to pure income redistribution. The parameter η identifies a distortionary effect associated with income redistribution and with the non-contributory part of the social security system. This is meant to capture the impact of redistributive programs on the labor-leisure decisions,[6] which is exogenous in our model. The parameter $\gamma(>1)$ indicates that, in a dynamically inefficient economy, a redistributive pension system causes more distortion than a pure income redistribution scheme, as the benefits associated with the tax contributions are only received in the future. For pensions, the distortion is assumed to stem only from the non-contributory part of the scheme. This is because social security contributions have a 'saving' component, since current contributions constitute forced saving providing a claim to future pension benefits, and a 'tax' component, when current contributions are not directly linked to future pension benefits. Clearly, the more Beveridgean the system is, the larger the 'tax' component relative to the 'saving' component.[7]

The distortion from taxation, $D(<1)$, the total tax revenues, T, the lump-sum transfers, b, and the pension benefits, P_i, can be summarized as follows:

$$D(\alpha,\lambda) = \eta[(1-\alpha)(1-\lambda)\gamma + \lambda] \tag{1}$$

$$T = \bar{\omega}\tau(1-\tau)(1-D) \tag{2}$$

$$b = \lambda T \tag{3}$$

$$P_i = (1-\lambda)(1+n)\left[\alpha\frac{w_i}{\bar{w}} + 1-\alpha\right]T \tag{4}$$

where we have dropped the time index.

[5] In a more comprehensive economic and political environment, these different redistributive targets will shape individual preferences over these welfare state programs (see Conde-Ruiz and Galasso, 2005).

[6] Endogenous labor supply is considered in Kothenburger et al. (2005). See also Mulligan (2001) for a discussion of the deadweight cost of taxation in political economy models, and De Donder and Hindriks (2002) for an analysis of labor market distortions associated with social security systems.

[7] Disney (2004) provides empirical evidence on this distortionary component.

A young individual's utility depends only on his or her consumption, which is equal to the sum of the net wage, the lump-sum transfer in youth and the discounted old age pension:

$$U_i = w_i(1-\tau) + b + \frac{P_i}{1+r}. \tag{5}$$

Unlike in RSS, where individuals choose whether to become educated, in our setting there is no economic decision. This simplifies the economic analysis and allows us to generalize the formulation of the welfare state, but at the cost of missing the Laffer curve induced in RSS by the education decision (which has been criticized by Simonovits, 2007-this issue). To address this drawback, we decided to introduce an exogenous Laffer curve, which is assumed to depend on several welfare state features, as detailed in the discussion above.

As in RSS, we aggregate preferences over τ through a majority voting process. Individuals vote once-and-for-all on the level of the tax rate $\tau \in [0,1]$, which, in our budget-balanced setting, also defines the size of the welfare state. Unlike in RSS, but as in many other contributions to the political economy literature of social security (see our survey, 2002), we thus assume that, when voting at time t, young individuals realize that their current choice of τ will also affect the size of future pension benefits. In other words, we introduce an intergenerational link into the voting game[8], which is not present in RSS.

The individual preferences over the size of the welfare state are easily determined. Elderly individuals bear no cost from taxation and hence aim at maximizing total transfers: they choose $\tau = 1/2$. The first order condition from the political decision of a type-i young individual is:

$$-w_i + \left(\lambda\bar{w} + \frac{(1-\lambda)(1+n)[\alpha w_i + (1-\alpha)\bar{w}]}{1+r}\right)(1-D)(1-2\tau) = 0 \tag{6}$$

where the first term represents the current cost of taxation and the second expression measures current and discounted future benefits from the welfare state. Since preferences are single-peaked, the equilibrium tax rate coincides with that chosen by the median voter, who will belong to the young if population growth rate is positive. The most preferred tax rate for the median voter, i.e., a young individual with wage income w_m, is thus:

$$\tau^* = \frac{1}{2} - \frac{w_m}{2K_m(1-D)} \tag{7}$$

where

$$K_m = \left(\lambda\bar{w} + \frac{(1-\lambda)(1+n)[\alpha w_m + (1-\alpha)\bar{w}]}{1+r}\right) \tag{8}$$

summarizes the composition of the current and future transfers from the welfare state to a type-m young agent — the median voter.

Finally, to identify the median voter's wage income, notice that the elderly prefer a higher tax rate than any young individual, and that the preferences of the young over the tax rate are weakly

[8] This simple once-and-for-all voting game may be replaced by a sequence of elections — each determining the current tax rate. It is easy to show that the political outcome of the once-and-for-all voting game may also be supported as a subgame perfect equilibrium of a repeated game among subsequent generations of voters (see our 2002 survey).

decreasing in their wage income, $\partial\tau/\partial w \leq 0$. Hence, the median voter is a young individual with productivity w_m such that $1+(1+n)G(w_m)=(1+(1+n))/2$, i.e.,

$$w_m = G^{-1}\left(\frac{n}{2(1+n)}\right). \tag{9}$$

Eq. (7) suggests that the equilibrium tax rate depends on the composition of the welfare state, λ, and on the degree of redistribution of the social security system, α. These features affect the benefit composition from the welfare state, K_i, and the level of tax distortion, D, typically creating a trade-off. Moreover all redistribution in the welfare state (lower α and higher λ) increases the appeal to the low-wage median voter, but also generates more tax distortions. Hence, the overall effect on the equilibrium tax rate is ambiguous. In what follows, we introduce some additional assumptions about the relative magnitude of these effects to help the model to fit the stylized facts.

Since Bismarckian systems are known to be larger than Beveridgean (see Conde-Ruiz and Profeta, in press; Casamatta et al., 2000; Disney, 2004), to be consistent with this fact, our model should deliver $\partial\tau/\partial\alpha>0$. To guarantee this result, we assume that the tax distortion η is larger than a threshold value $\tilde{\eta}$:

$$\eta > \tilde{\eta} = \frac{\frac{(\bar{w}-w_m)(1+n)}{1+r}}{\gamma K_m + \frac{(\bar{w}-w_m)(1+n)}{1+r}\frac{D}{\eta}}. \tag{10}$$

Analogously, larger welfare states are typically associated with a predominant pension program and little pure income redistribution (see Conde-Ruiz and Galasso, 2005). To obtain this feature, that is, $\partial\tau/\partial\lambda<0$, we assume that the distortion η is larger than a threshold value $\bar{\eta}$:

$$\eta > \bar{\eta} = \frac{\bar{w}-\frac{1+n}{1+r}[\alpha w_m + (1-\alpha)\bar{w}]}{[(1-\alpha)\gamma(1-2\lambda)-2\lambda]\bar{w}-\frac{1+n}{1+r}[\alpha w_m + (1-\alpha)\bar{w}]\left[2\frac{D}{\eta}-1\right]} \tag{11}$$

3. The effects of ageing

In our simple environment, ageing, as captured by a decrease of n, has an unambiguously negative economic effect on the size of the welfare system. That is, for a given w_m:

$$\frac{\partial\tau}{\partial n} = \frac{w_m}{2(K_m)^2(1-D)}\frac{(1-\lambda)[\alpha w_m + (1-\alpha)\bar{w}]}{1+r} > 0. \tag{12}$$

Hence, compared to RSS, where also the economic effect is ambiguous, our setting may help to sharpen the consequence of ageing for the tax rate.

As expected, the political effect goes in the opposite direction, since ageing increases the share of elderly in the population, and thus changes the identity of the median voter, who will have a lower wage income:

$$\frac{\partial w_m}{\partial n} = 2g(w_m)(1+n)^2 > 0. \tag{13}$$

This poorer median voter will then choose a larger welfare state. The final effect is however ambiguous, as in RSS and in our (2004) paper, and depends on the relative magnitude of the economic and political effects.

We now analyze how the economic effect of ageing on the size of the welfare state may depend on some specific features of the welfare state, such as its composition and the redistributive design of the PAYG system.

By differentiating Eq. (12) w.r.t. λ, we see that the larger the share of pensions in the welfare state, the stronger the (negative) economic effect of ageing will be, i.e., $\partial^2\tau/\partial n\partial\lambda<0$. This result is intuitive: ageing decreases the profitability of the PAYG system by increasing the proportion of the beneficiaries relative to the contributors to the system but does not affect the profitability of a pure income redistribution program, which only goes to the young. Hence, the larger the share of pensions in the welfare state, the larger the decline in profitability associated with ageing, and thus the stronger the economic effect of ageing.

The magnitude of the economic effect may also depend on the redistributive design of the social security system. In particular, by differentiating Eq. (12) w.r.t. α, it can be shown, after some simple algebra, that if condition 10 is satisfied, in more Bismarckian systems the economic effect of ageing on the size of the welfare system is lower, that is, $\partial^2\tau/\partial n\partial\alpha<0$. This result hinges on the different cost of ageing for the median voter in a Bismarckian and in a Beveridgean system. In fact, although ageing always decreases the long-run return of young individual contributions to a PAYG pension system, in Bismarckian schemes this negative effect is smaller, since a larger part of the median voter's pension is linked to his or her (low) wage income than to the (higher) average wage income.

In our simple setting, neither the redistributive design of the PAYG system (α) nor the composition of the welfare state (λ) has an impact on the political effect[9], since the expression in Eq. (12) depends on neither. Hence, our model suggests that the relative importance of the political effect in the overall impact of ageing on the size of the welfare state is larger in more Bismarckian schemes, and when there is a lower share of pensions in the welfare state. In these cases, the political effect is thus more likely to dominate — and ageing to lead to a larger welfare spending (as a percentage of GDP).

Our simple model delivers a testable prediction: ageing is more likely to increase the size of the welfare state in the presence of a Bismarckian pension scheme. The empirical analysis in Disney (2007-this issue) confirms our conclusion. Using data on the heterogeneity of expected replacement rates for different household types, Disney calculates a coefficient of variation of replacement rates, which represents an index of how Beveridgean a system is: high values of this coefficient indicate a more Beveridgean scheme. While the dependency ratio is found to have a positive and significant effect on the level of the PAYG contribution rate (i.e., the overall effect of ageing on the size of the PAYG system is positive), the interaction between the dependency ratio and this Beveridgean index has a negative and significant effect on the level of PAYG tax rate. In other words, consistent with our theory, ageing has a smaller effect on the PAYG tax rate in countries with more Beveridgean systems.

4. Discussion of some political effects

The results in the previous section indicate that a more detailed characterization of the welfare state than in RSS may help to uncover some additional — empirically relevant — economic channels whereby the demographic process affects the size of the welfare state. Yet, this analysis has failed to identify additional political effects of ageing, due to the stylized formulation of the

[9] In the case of a radical increase of λ up to 1, i.e., no pension transfers, the elderly become indifferent with regard to the size of the welfare state. We may thus assume that they will still vote for $\tau=1/2$.

political process. Perhaps the main limitation is abstraction from examining how these new elements — the composition of the welfare state and the redistributive design of the PAYG system — are determined in the political process. In other words, ageing may have an additional (indirect) political impact on the size of the welfare state through its effects on the political decisions regarding the composition of the welfare state and the redistributive design of pensions.

Conde-Ruiz and Galasso (2005) analyze the political sustainability of a welfare system composed of an income redistribution scheme and a PAYG social security system as a political equilibrium of a two-dimensional majoritarian election. The two welfare state programs are supported by different coalitions of voters. Retirees and low-income young favor social security. Low-income young also support the intragenerational redistribution scheme, which is however opposed by the elderly voters. In this framework, an increase of the number of elderly voters due to ageing will increase support for the pension scheme, but may lead to a lower support for intragenerational redistribution. The political effect of ageing would thus increase the share of pensions in the welfare state and may counterbalance the economic effect described in the previous section.

The endogenous decision of redistributive design of the social security system has been analyzed by Conde-Ruiz and Profeta (in press) in a bidimensional voting game over the size of social security and its redistributive design. Beveridgean systems are supported by an electoral coalition of low-income agents, who gain from its redistributive feature, and high-income individuals, who seek to minimize their tax contribution in order to invest their resources in alternative private schemes. Bismarckian systems are supported by the middle class. In this political environment, ageing delivers a trade-off: It increases the political power of the old, who prefer a Bismarckian system; but, it induces high and middle-income young types to prefer a small Beveridgean system, by reducing the performance of the social security system relative to the saving technology. When the ageing process is moderate, the former effect dominates: Bismarckian systems are more likely to emerge and the welfare state is larger. However, a severe ageing process may lead to a small Beveridgean system, as even middle-income individuals modify their preferences.

5. Concluding remarks

The conventional wisdom in the political economy literature is that ageing has opposite economic and political effects on the size of the welfare state, with the overall effect depending therefore on the relative magnitude of the two effects. While the empirical literature in general finds the political effect of ageing to dominate, so leading to a larger welfare state (as a ratio to output), the discussion of RSS based on their econometric analysis surprisingly reaches the opposite conclusion.

We have modified the theoretical framework of RSS to examine additional economic effects of ageing on the size of the welfare state. In particular, we have concentrated on the composition of the welfare state — between a pure income redistribution scheme and a pension system — and on the redistributive design of PAYG pension schemes. Our theoretical model suggests that both channels may be needed to further qualify the impact of ageing on the welfare state. The negative economic effect of ageing is stronger in a welfare state with a predominant social security scheme, since ageing reduces the profitability of a PAYG scheme. This negative economic effect is however smaller in Bismarckian social security systems, where the low-wage median voter is less affected by the reduction in the long-run profitability of the PAYG scheme. Interestingly, the latter theoretical prediction is confirmed by Disney (2007-this issue) in his empirical analysis.

The present debate has abstracted from the role of retirement policies, which may however be crucial for determining the final effect of ageing on the size of the welfare system. In fact, a combination of ageing and early retirement may induce so large an increase in the size of social security as to make a system financially non-sustainable. For instance, Profeta (2002) shows that in countries with a larger share of elderly in the population, the length of retirement increases. The longer retirement induces more social security expenditures, although in per capita terms the result is less clear, since the total amount of the social security transfer is divided among more retirees. Yet, retirement policies may mitigate the effect of ageing on social security. In Galasso and Profeta (2004) we show that an increase of retirement age may be the only politically feasible solution to pensions problems induced by population ageing. In a theoretical paper that endogenizes the political choice of the retirement policy, Conde-Ruiz, Galasso and Profeta (2005) identify an additional effect of ageing on social security, due to its impact on early retirement. Together with the standard opposite economic and political effects described above, the latter paper suggests that an increase in the share of the elderly in the population reduces pension benefits, thereby inducing the elderly to postpone retirement. This additional channel may prove crucial, since a reduction in the number of early retirees will lead to a decrease in social security contribution rates. Whether ageing will increase or reduce the size of social security thus depends again on which effect dominates.

Most contributions in this political economy literature hence suggest that ageing reduces the economic incentives to keep social security, while at the same time modifying the political representations of the different generations in favor of the elderly, and thus making for more support for social security. We have contributed to this literature by enriching the characterization of the possible economic effects of ageing. Yet, the relevance of this debate is ultimately empirical. RSS and Disney (2007-this issue) examine the current and past experiences of a set of OECD countries and reach opposite conclusions. An additional test of the impact of ageing on the size of the welfare system would be to analyze directly the preferences of the voters in ageing countries. Survey data from Eurobarometer 56.1 (2001) show strong support for a large public pension system among European citizens, who are willing to pay higher taxes in order to maintain their current level of pension benefits, but are not willing to reduce contributions at the cost of receiving lower pension benefits. Hence, despite the current ageing process, individuals do seem to prefer a larger welfare state.

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