Postponing retirement: the political push of aging

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Abstract

Conventional economic wisdom suggests that because of the aging process, social security systems will have to be retrenched. In particular, retirement age will have to be largely increased. Yet, is this policy measure feasible in OECD countries? Since the answer belongs mainly to the realm of politics, I evaluate the political feasibility of postponing retirement under aging in France, Italy, the UK, and the US. Simulations for the year 2050 steady state demographic, economic and political scenario suggest that retirement age will be postponed in all countries, while the social security contribution rate will rise in all countries, but Italy. The political support for increasing the retirement age stems mainly from the negative income effect induced by aging, which reduces the profitability of the existing social security system, and thus the individuals net social security wealth.

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1. Introduction

The aim of this paper is to assess the political feasibility of the most commonly suggested retrenchment measure of the social security system: postponing retirement. Conventional economic wisdom suggests that – due to population aging – social security systems will have to be largely modified in order to maintain their financial sustainability. Because of the increasing share of retirees to workers, these systems will soon be unable to finance the pension benefits – as calculated under the current rules. Hence, either contribution rates will have to be raised or per-capita pension benefits reduced. Among the latter retrenching measures, postponing retirement has typically been proposed by experts and policy-makers. This policy has been strongly advocated in those countries, such as Belgium, France, and Italy, where the effective retirement age is particularly low, because of the existence of large incentives to retire early built in the social security systems (see Blondal and Scarpetta, 1998, Gruber and Wise, 1999 and 2003). The beauty of this measure is that it allows to keep a sufficient level of old age consumption by combining a longer working carrier – and thus more labor income – with relatively generous pension benefits, albeit at the cost of enjoying less old age leisure.

Will future voters be willing to support such a policy? A recent political-economy literature (see Fenge and Pestieau, 2005, Lacomba and Lagos, 2006, Casamatta et al., 2005, Cremer and Pestieau 2000, Cremer et al. 2004, Conde Ruiz and Galasso, 2003 and 2004) that has examined the introduction of these early retirement provision in the 70s and 80s and their further developments has emphasized the crucial role of the policy persistency (see also Coate and Morris, 1999) in the political success of these measures. In fact, the introduction of these early exit paths from the labor market was welcome also by some young workers who expected to benefit from these provisions. Moreover, recent Eurobarometer surveys suggest that current workers are unwilling to accept an increase in their retirement age (see figure 1). And indeed, most recent reforms featuring an increase in the retirement age allow for long transition periods (see fRdB report, 2000, and Galasso, 2006, for a detailed description of the reform process in six countries).

Unlike the previous literature, this paper suggests that postponing retirement may become feasible in the future because of the political push of aging. In countries with large social security systems, such as most developed economies, which also feature generous early retirement schemes, aging may provoke a major negative income effect by reducing the individuals' pension net wealth. In fact, the increase in the dependency ratio reduces the profitability of systems for all future generations, who hence obtain a worse deal from the social security. Furthermore, if the reduction in the social security return takes the form of lower pension benefits, a substitution effect also arises, since the pecuniary incentive to retire decreases, which push toward postponing retirement.

This paper builds on the politico-economic model introduced by Galasso and Profeta (2004) to provide a quantitative assessment of the political sustainability of social security in six graying societies (France, Germany, Italy, Spain, the UK and the US). Their theoretical framework is enriched to allow for the endogenous political determination of the retirement age. The bi-dimensional preferences of the individuals – over social security contribution rate and retirement age – are aggregated through simple majority voting[1]. Because of the multi-dimensionality of the policy space, Nash equilibria of this voting game may fail to exit. Hence, I resort to the concept of structured induced equilibrium (see Shepsle, 1979), which allows for issue-by-issue voting, where contribution rate and retirement age are voted contemporaneously, yet separately. This issue-by-issue voting is effectively equivalent to obtain two reaction functions, which correspond to the median vote of the electors over one issue for a given vote on the other. The intersection of these two reaction functions gives rise to an issue-by-issue voting equilibrium of the game.

The quantitative evaluation of how political constraints may shape social security systems under population aging operates in two stages. First, the theoretical political economy model is calibrated to match the main economic, demographic and political characteristics and the crucial features of the social security system in each country around the year 2000, which is taken to be the initial steady state. Since all economies are dynamically efficient, social security systems are not Pareto efficient and need to be supported by a political majority. In every country, individuals take economic and political decisions, and the social security contribution rate determined in the political process is calibrated to correspond to the actual average equilibrium contribution rate during the nineties, while the resulting economic aggregates have to be consistent with the long term features of each economy. The simulations of the impact of the electoral constraints on the political determination of social security and retirement age under

[1] Since individuals preferences over the retirement age are non single-peaked, Germany and Spain are dropped from the analysis.

aging are obtained by feeding this calibrated model with the forecasted values of demographic, economic and political variables for the year 2050, which is assumed to be the new steady state, in which the demographic process has stabilized and the social security systems have been modified to copy with these new demographic and economic elements. The social security contribution rate and the retirement age chosen by the year 2050 median voters, as estimated by the model, represent the political equilibrium outcomes of the voting game in 2050.

The paper proceeds as follows. The next section introduces the economic model, the characterization of the political game is at section 3 and the calibration at section 4. Section 5 describes the simulations results, and discusses the extensions, while section 6 concludes.

2. The Economic Model

The economic environment consists of an overlapping generation general equilibrium model, which is calibrated to the main demographic and economic features of each country. The economy is populated by several overlapping generations of workers and retirees. At any time *t*, individuals face a probability of surviving until the next period, $\left(\pi_t^i\right)_{i=1}^G$, which depend on their age *i*, where *G* is the last possible period of any agent's life; subscripts indicate calendar date, and superscripts refer to the agent's period of birth. Agents who reach the *G*-th period of their life face certain death, $\pi_t^G = 0$. The demographic structure of the model can be synthesized by a population profile, which combines these survival probabilities with the population growth rate, n_t. The profile summarizes the fraction of population in each cohort and group type, μ_t^i, with $\sum_{i=1}^G \mu_t^i = 1$ for all *t*. Agents work during the first J periods of their life and then retire. Labor supply is exogenous: labor is supplied inelastically, and retirement age is mandatory.

2.1 Preferences

Agents value consumption and leisure after retirement according to the following expected utility function:

$$\sum_{j=0}^{G}\beta^{j}\left[\prod_{i=0}^{j}\pi_{t}^{i}\right]\left(\frac{\left(c_{t+j}^{t}\right)^{1-\rho}-1}{1-\rho}+\upsilon_{t+j}^{t}\Gamma_{t+j}^{t}\right)\quad\forall j=0,....,G \tag{2.1}$$

where c_{t+j}^{t} and υ_{t+j}^{t} denote respectively consumption and leisure at time *t+j* of an individual born at time *t*, π_{t}^{i} is the age specific individual probability of surviving until the next period, and β is the subjective time discount rate. The utility function features a constant degree of risk aversion over consumption, while the utility from leisure is additive and constant[2], so that an individual who decides to work one additional year has to give up the annual utility level, υ. Finally, ρ indicates the coefficient of relative risk aversion and Γ_{t+j}^{t} is a binary variable taking value zero if the individual works at *t+j*, and one if she does not (i.e., if she retires).

Agents face the following sequence of budget constraints:

$$c_{t+j}^{t}+a_{t+j+1}^{t}=a_{t+j}^{t}R_{t+j}+y_{t+j}^{t}+H_{t+j}^{t}\qquad\forall j=0,....G \tag{2.2}$$

where a_{t+j+1}^{t} and y_{t+j}^{t} represent respectively the end-of-period asset holding and disposable income at time *t+j*, and R_{t+j} is the interest factor on private financial assets. Since some individuals fail to survive until the next period, their involuntary bequest, which amounts to $H_{t+j}^{t}=(1-\pi_{t+j-1})\,a_{t+j}^{t}R_{t+j}/\pi_{t+j-1}$, has to be redistributed. As commonly assumed in the literature, the assets of those who do not survive are shared among all living individuals with the same age. Effectively, this amounts to assuming that individuals enter a one-year annuity contract to distribute the assets of the deceased. Alternatively, asset holdings may be redistributed in a lump sum fashion among survivors of all ages and types or only to young individuals.

The disposable labour income respectively for workers and retirees is thus summarized as follows:

$$\begin{aligned} y_{t+j}^{t} &= \varepsilon_{t+j}^{j}\cdot h_{t+j}^{t}\cdot w_{t+j}(1-\tau_{t+j}) \quad \forall j=s,....,J-1. \\ y_{t+j}^{t} &= P_{t+j}^{j} \qquad\qquad\qquad\qquad \forall j=J,....G. \end{aligned} \tag{2.3}$$

where w_{t+j} indicates wage per efficiency unit, ε_{t+j}^{j} is a measure of labour efficiency unit, which may depend on the worker's age, s is the initial age at which agents begin

[2] Section 5.1 discusses the results obtained with an age dependent value of leisure.

their working career and τ_{t+j} and P^j_{t+j} represent respectively the contribution rate to social security and the (annuity) pension benefit received by a retiree aged *j*. The number of worked hours at time *t+j* by an agent born at time *t*, h^t_{t+j}, is constant, since the labour supply is assumed to be exogenous.

2.2 Technology

The production side of the economy is characterized by a constant returns to scale aggregate production function, which transforms the productive inputs – labor and capital – into the production of a final good. The economy enjoys an exogenous technical progress that enhances labor productivity. The aggregate production function can be represented as follows:

$$Q_t = f\left[\eta_t (1+\lambda)^t, k_t\right] = bk_t^\theta \left[\eta_t (1+\lambda)^t\right]^{1-\theta} \tag{2.4}$$

where λ is the growth rate of labour productivity – a crucial variable for the profitability of the unfunded social security systems – η is a measure of the per capita unit of labour measured in efficiency units, *k* denotes the per capita stock of capital, *b* is a total factor productivity index and θ is the factor share of capital.

The labour supply in efficiency units is determined by the product of the exogenous average number of hours worked and the average labor efficiency units in the economy:

$$\eta_t = h\sum_{i=1}^{J} \varepsilon_t^i \mu_t^i \tag{2.5}$$

The aggregate capital stock is obtained by aggregating the individual net savings over generations:

$$k_t = \sum_{i=1}^{G} \frac{\mu_t^i a_t^{t-i}}{1+n} \tag{2.6}$$

Agents maximize their expected utility – subject to their individual budget constraints – with respect to the consumption flow and to the retirement decision; while firms maximize profits with respect to their choice of the factors of production – capital and labor – given the technological constraint. The optimizing conditions for agents and firms and equilibrium conditions in the factor markets determine the usual expression for hourly wage, w_t, and rate of return on capital, r_t:

$$\begin{aligned} w_t &= f_1\left[\eta_t (1+\lambda)^t, k_t\right] \\ R_t &= 1 + r_t = f_2\left[\eta_t (1+\lambda)^t, k_t\right] + 1 - \delta \end{aligned} \tag{2.7}$$

where δ is the parameter of the physical depreciation rate in the economy and subscripts denote the partial derivatives with respect to the relevant variable – respectively the marginal product of labor and capital.

2. 3 Social Security Systems

The social security system is modelled as pure unfunded scheme. In every period, total contributions equal total benefits. Since every agent at any time *t* contributes a fraction τ_t of her labour income, total contributions depend on the tax rate τ_t and on the retirement age J according to the following equation:

$$T_t(\tau_t, J_t) = \tau_t \sum_{j=s}^{J_t - 1} \mu_t^j \varepsilon_t^{t-j} h_t^{t-j} w_t^j \tag{2.8}$$

Everywhere, pension benefits represent an annuity paid to the retirees. Under budget balance, the total amount of pensions paid out to retirees is equal to the aggregate contributions of the current workers:

$$T_t(\tau_t, J_t) = \sum_{j=J}^{G} P_t^j \mu_t^j \tag{2.9}$$

In what follows, social security contributions and retirement age will be chosen in the political arena, whereas the pension benefits will be residually determined to balance the budget at eq. 2.9. Notice however that, in the analysis of the aging process, if there were no politically driven changes in τ and *J*, all the required adjustments to the social security system would have to take place through the pension benefits. As such, the system resembles a defined contribution (DC) scheme[3]. Furthermore, as the economic model does not feature any within cohort heterogeneity (for instance in income, education or survival probability), the social security systems will not entail any intragenerational redistribution.

2.4 Economic Equilibrium

For a given sequence of social security contribution rates[4], labor productivity and population growth rates, and retirement ages, $(\tau_t, n_t, \lambda_t, J_t)_{t=0}^{\infty}$ a competitive economic

[3] Section 5.1 discusses the results in a different voting environment in which voters determine the retirement age and the pension level, while the contribution rate is residually fixed to balance the budget. In that case, aging would affect the contribution rate – rather than the pension benefit – and the system would resemble a defined benefit (DB) scheme.

[4] Notice that the economic equilibrium is obtained for a given sequence of social security contribution rates, since the determination of these contribution rates occurs in the political arena.

equilibrium is characterized by a sequence of allocations and prices, (c^t_{t+j}, w_t, R_t) $\forall t = 0,....,\infty;$ $\forall j = 0,....,G;$ that in every period satisfies the following conditions:

- the consumer problem is solved for each generation $\forall j = 0,....,G.$ Hence, every agent aged *j* maximizes the expected utility at eq. 2.1 with respect to c^t_{t+j} and given the sequence of budget constraints at eq. 2.2;
- firms maximize their profits, and the conditions at eq. 2.7 are satisfied;
- labor, capital and goods markets clear, and thus respectively eq. 2.5, eq. 2.6, and the following expression are satisfied:

$$\sum_{i=1}^{G}\left(a_t^{t-i+1} + c_t^{t-i+1}\right)\mu_t^i = f\left(\eta_t, k_t\right) + \left(1-\delta\right)\sum_{i=1}^{G}\mu_{t-1}^i a_{t-1}^{t-i}. \qquad (2.10)$$

3. The Political Game

In the political environment, individuals express their preferences over two crucial aspects of the social security system: the contribution rate and the retirement age. Individual preferences are then aggregated through a simple majority voting model[5].

Since the policy space is bi-dimensional, a Nash equilibrium of this voting game may fail to exist, as Condorcet cycles typically arise (see for instance Ordershook, 1986). To overcome this problem, I follow Shepsle (1979) in analyzing voting equilibria induced by institutional restrictions, i.e., structure-induced equilibria.

The political system that aggregates the individual preferences over the alternatives (τ, J) into a political outcome is characterized by an institutional arrangement – namely a committee system, a jurisdictional arrangement, and an assignment rule – that allows issue-by-issue voting. In particular, the political system is characterized by the following arrangements: (i) Committee of the Whole – there exists only one committee, which coincides with the electorate; (ii) Simple Jurisdictions – each jurisdiction is a single dimension of the issue space, $\{\{\tau\},\{J\}\}$, that is, one jurisdiction has the power to

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[5] Although pension policies may involve a more complex decision process than simple majority voting, electoral concerns are perhaps the key factor for policy-makers dealing with large welfare programs, such as social security, which – once established – build their own political constituencies (see Pierson, 1996). Simple majority voting hence represents the minimal political environment where to analyze these electoral concerns; and has the advantage of providing a coherent and transparent analysis of the impact of the demographic dynamics on the political process.

deliberate on the social security contribution rate, τ , and another on the retirement age, J ; (iii) Assignment Rule – every simple jurisdiction is assigned to the committee of whole; and (iv) Germaneness Amendment Control Rule – amendments to the proposal are permitted only along the dimensions that fall in the jurisdiction of the committee, that is, if the proposal regards τ , only amendments on τ are permitted, and viceversa.

In this political system, the entire electorate has jurisdiction on the two issues, but only issue-by-issue. The restriction that each issue is on the floor separately is achieved through simple jurisdictions and germaneness amendment rule, and it is needed to overcome the possible lack of a Nash equilibrium. No further restrictive jurisdictional arrangements are imposed. The choice of a committee of the whole, for example, guarantees that no subset of the electorate which constitutes a committee is effectively awarded veto power over an issue. In fact, any such committee could block any alternative to the status quo which would be preferred by a majority of the electorate, but not by a majority of the members of this committee.

This notion of structure induced equilibrium (see Shepsle, 1979, for a detailed description) allows to capture the electoral concerns by the politicians, and to retain the flavour of the median voter theorem. By creating an issue-by-issue voting, the policy space is separated into two issues and one median voter may be identified for each issue. Effectively, this bi-dimensional voting game amounts to characterizing two reaction functions for the two median voters. A $\tau(J)$ reaction function describes the decision of the median voter over the social security contribution rate for a given retirement age, J; while a $J(\tau)$ reaction function characterizes the decision of the median voter over the retirement age for a given social security contribution rate, τ. The intersection of these two reaction functions identifies a structural induced equilibrium.

Finally, the voting game is considered to take place once-and-for-all. However, the results may easily be generalized to a repeated voting environment, in which an implicit social contract among successive generations of voters may emerge to induce a majority of voters – and hence some workers – to support a social security system featuring a certain retirement age (see Conde-Ruiz and Galasso, 2003 and 2005, for a generalization of the notion of structure induced equilibrium to a repeated voting environment).

The next section examines the voting behaviour over the social security contribution rate, and thus the reaction function $\tau(J)$, whereas section 3.2 analyzes the vote over the retirement age, and thus the reaction function $J(\tau)$. The complete characterization of the structure induced equilibrium in the two steady states is in section 5.

3.1 Individual Preferences over contribution rates

A large theoretical literature (see Galasso and Profeta, 2002, and Persson and Tabellini, 2000 for a survey) and some recent empirical work (see Boeri, Börsch-Supan and Tabellini, 2002) suggest that preferences over social security contribution rates – for a given retirement age – depend on the individuals' age and possibly income, and on the main features of the system. Since a PAYG social security system imposes a contribution on the workers and provides a pension transfer to the retirees, the elderly will generally support the system, whereas workers will be willing to incur in current and future costs only if they expect to be sufficiently compensated by future pension benefits. Age thus represents a crucial factor to determine the individual support to the system, since past contributions represent a sunk cost, which does not affect the agents' decisions. Clearly, middle aged and elderly individuals are more supportive of social security systems, as they will mostly enjoy pension benefits in their remaining time horizon. This property of the preferences over the social security contribution rate helps to identify the median voter over the social security contribution rate, who coincides with the median age among the voters.

How do these individual preferences depend upon the mandatory retirement age? Postponing retirement induces two opposite effects on the individual preferences. For every worker, the contribution period – that is, the remaining years of contributions – will increase; thereby reducing the profitability of the system. Individuals, who already retired, are instead not affected by this change. Yet, postponing retirement decreases the share of retirees per workers, thereby reducing the dependency ratio, and hence increases the profitability of the system. The overall effect is thus ambiguous. Simulations in Galasso and Profeta (2004) indicate that postponing the retirement age leads the median voter to reduce the contribution rate – and thus total pension spending. Moreover, individual pension benefits decrease, as suggested also by Breyer and Kifmann (20012). Figures 2 to 5, which display the equilibria in 2000 and 2050 for these four countries as the intersection between the two reaction functions, confirm these previous findings (i.e., $\tau(J)$ is negatively sloped).

3.2 Individual Preferences over retirement age

To characterize a structure induced equilibrium, the individual preferences over the effective retirement age for all workers – given level of the social security contribution rate – have to be analyzed. In particular, do these preferences differ according to the voters' age? And how do they depend on the social security contribution rate?

Unlike in the individual retirement decision, where single workers are unable to induce large (aggregate) effects in the economy (see for instance, Crawford and Lilien, 1981, and Sheshinski, 1978), when voting over the effective retirement age (for a given contribution rate), agents have to consider additional determinants, besides the labor-leisure trade-off associated with any individual retirement decision. First, for a given social security contribution rate, an increase in the mandatory retirement age rises the annual pension transfer, since it reduces the dependency ratio. Second, a higher retirement age induces general equilibrium effects on rate of returns and wages. In particular, since individuals experiencing longer working years need to save less for future consumption, the stock of capital will decrease, thereby rising the rate of returns but depressing wages. This will directly affect individuals' lifetime income – and thus their utility – and will also modify those economic incentives to retire, which are typically considered in any individual retirement decision – such as the opportunity cost of leisure and the lifetime income.

Elderly workers or retirees will typically choose the retirement age that maximizes their pension benefits. In particular, every retiree would potentially like to be the youngest pensioner, so as to minimize the number of people with whom to share resources. Younger individuals may instead be induced to set lower retirement ages in order to anticipate their retirement period, but they would then receive a smaller pension at retirement. Furthermore, the choice of the effective retirement age for all workers has also potentially large general equilibrium effects on rate of returns and wages, as discussed earlier. Since the relative importance of capital and labor income over the lifetime depends on the individuals' age, unlike in section 3.1, individual preferences over the retirement age cannot be ordered according to age. To see this, consider an increase in the retirement age that rises returns but reduces wages. Young individuals have little asset holdings and rely more heavily on labor income. They should in principle oppose this measure. Middle aged workers have more assets, and thus benefit from the higher returns. Yet, their labor income is also larger, due to the increasing wage profile, and thus they suffer from the lower wage rate. It follows that median voter over the retirement age will typically not coincide with the median age among the voters[6].

How are individual preferences on the retirement age affected by a change in the social security contribution rate? A variation in the size of the system produces two effects, which may modify the voters' decision over the retirement age. An increase in the contribution rate, in fact, reduces the net income associated with working, while increasing the pension benefits; the opportunity cost of retiring thus decreases, thereby inducing voters to anticipate the effective retirement age. However, since in this dynamically efficient economy social security is a dominated saving device, an increase in the contribution rate decreases the overall income of the young, thereby inducing them to postpone retirement. Again, which effect prevails cannot be established a priori. In the simulations presented at section 5, however, the retirement age appears to be decreasing in the social security contribution rate (i.e., $J(\tau)$ is negatively sloped) in all countries but the UK (see figures 2 to 5).

4. Calibration

To evaluate quantitatively the future size of the social security system as induced by the policy-makers' electoral concerns and the political feasibility of postponing retirement in a greying societies, I use a two stages methodology, which consists of an initial calibration of the model to the initial steady state and of its simulation for a future steady state. In its initial steady state, the model is calibrated to capture the main economic, demographic and political aspects, and the institutional elements of the different social security systems in France, Italy, the UK and the US, around the year 2000. In this calibration exercise, each country is viewed as a closed economy and the values of the key parameters of the theoretical model are pinned down. To simulate how political constraints will shape social security under aging, the model is then fed with the forecasted values of demographic, economic and political variables for the year 2050, and the social security contribution rates and the effective retirement age, which arise as a political equilibrium at this new steady state, are calculated.

[6] Lacomba and Lagos (2007) instead characterize the individual preferences over retirement age according to the individuals' age and income. In their partial equilibrium environment, wages and rate of returns play no role and preferences are shown to depend upon the initial status quo ante.

In the calibrated model, every period corresponds to one year. Agents are born at age 18 and may live up to age 95 (*G=77*), according to age specific probability of survival. For each country, these probabilities are averages by gender of 1999 official estimates. Given these surviving probabilities, the population growth rate used in the calibration for the year 2000 is calculated to match the elderly dependency ratios (see table 1).

In the labor market, the crucial variables are the average employment rate, which in the model corresponds to the average amount of time dedicated to productive activities, and the labor efficiency by age, which is calculated using country-specific microeconomic data on labour income by age. Another crucial labor market variable needed for the initial calibration of the model is the retirement age, which is set at the median effective retirement age for each country (see table 1).

The calibration of the production side is rather standard. For the constant return to scale production function at eq. 2.4, the value of the average capital share is taken from national accounts, while the exogenous productivity growth is given by the average per-capita GDP growth rate during the nineties. Depreciation rate is set equal to an average value of 5% for all countries. The long term characteristics of each economy are described by its capital-output ratio (see table 1).

The crucial feature of each social security system is taken to be the *equilibrium* – rather than the statutory – social security contribution rate, which in each period equates total contributions to total pension benefits. In the calibration, this equilibrium social security contribution is computed for the nineties; for countries running a budget deficit (or surplus), the transfer from the general taxation is imputed to the contribution rate.

For each country, the model is calibrated to match the capital-output ratio, the equilibrium social security contribution rate and the equilibrium effective retirement age in the initial scenario – that is, in 2000. The contribution rate and the effective retirement age are chosen by the median voter on the respective issue (see Shepsle, 1979). The aggregation of preferences through the median voter is possible since these preferences are single-peaked. Figures 6 and 7 display the preferences of Italian voters of different ages respectively over the social security contribution rate and retirement age in the initial steady state. For the decision of the social security contribution rate, the political system can easily be parameterized to the median age among the voters (see Galasso and Profeta, 2004); whereas in the determination of the retirement age the median voter's age needs not to coincide with the median age among the voters. In computing the median voter, electoral participation rate by age are also considered. These restrictions on the capital-output ratio, on the equilibrium contribution rate and on the equilibrium retirement age (as chosen by the respective median voter) jointly pin down three parameters of utility function: the subjective time discount rate, β, the coefficient of relative risk aversion, ρ, and the leisure parameter, υ, which are reported at table 2 for all countries.

In the second step, corresponding to the simulation exercise, these calibrated parameters are used to characterized the political economy model, which is then fed with forecasted values of economic, demographic and political variables for the year 2050. In particular, to simulate the aging process, official 2050 surviving probabilities are used for France and the US, while for Italy and the UK, they are computed by reducing the 1999 official mortality rate by 10%. The population growth rate used in the simulation for 2050 is also calculated to match – given the corresponding surviving probability – the expected elderly dependency ratios (see table 3); while the forecasts for the exogenous productivity growth are taken from EC projections. The forecasted demographic dynamics modifies also the age of the median age among the voters. All these forecasted parameters are reported at table 3.

With this new set of parameters, the model simulates – in a new steady state – the political sustainability of the social security system – that is, the social security contribution rate chosen by the median voter on this issue in 2050 – and the political feasibility of postponing retirement – that is, the retirement ages chosen by the median voter on this issue in 2050. The simulations results described in the next section will compare the initial steady state equilibrium – as calibrated for the year 2000 – with the new political equilibrium emerging in the 2050 steady state.

5. Simulation results

The main differences between the initial 2000 steady state and the 2050 steady state are induced by the demographic process. Absent a political response to aging, that is, if retirement age and social security contribution rates were to remain unchanged, all economies would undergo severe adjustments. Pension benefits would largely drop, and individuals would choose to increase their savings. The change in the demographic profile – characterized by an older population – and this rise in savings would lead to a sizeable increase in the stock of capital. As a result, wage rate would increase by around 30%, while rate of returns would drastically fall. However, when one considers that the aging process modifies the demographic balance of the social security, but also the political representation of the different generations of workers and retiree – and thus their policy decisions over τ and J – the magnitude of these aggregate effects is dampened.

How does aging affect the political determination of retirement age and social security contributions? For a given retirement age, population aging is known to have two opposing economic and political effects on the determination of the contribution rate (see Razin et al., 2002, and Galasso and Profeta, 2004 and 2007). While aging reduces the profitability of the system – thereby making its downsizing more convenient – the pivotal political agent (the median voter) becomes older and thus more favorable to increase social security spending[7]. The overall effect is hence ambiguous. However, the simulation results reported at figures 2 to 5 suggest that the political push dominates in all countries: aging shifts the reaction function $\tau(J)$ upward.

How does aging modify the individual preferences over retirement – for given the social security contribution rate? Again, two main effects occur. Aging reduces the average profitability from social security. For a sizable pension spending, this generates a reduction in the lifetime income of all generations. This negative income effect will encourage individuals to postpone retirement. For a given social security contribution rate, aging will reduce also the pension benefits' replacement rate, since fewer resources will have to be shared among more retirees. This amounts to a negative substitution effect, which reduces the pecuniary incentives to retire early and leads again to an increase in the retirement age[8]. Therefore, through these negative income and substitution effects, aging unambiguously generate a political push for postponing retirement: the reaction functions $J(\tau)$ shifts upward (see figures 2 to 5).

Table 4 presents the simulations' results on the political feasibility of postponing retirement in an aging environment. For each country, the first line describes the main features for the year 2000, while the second following line characterizes the equilibrium

[7] Marquardt and Peters (1997) refer to this divergence between individual preferences for lower contributions and electoral demand for more spending as collective madness.

[8] In a partial equilibrium setting, in which individuals may only react to aging by modifying the retirement age, Lacomba and Lagos (2006) reach a different conclusion. See also Crettez and Le Meitre (2002) results on the effect of aging on the optimal retirement age.

outcomes of this bi-dimensional voting game for the year 2050. Two crucial results immediately emerge. In all countries, there is a large raise in the retirement age chosen by the median voter, with respect to the initial equilibrium in 2000. In all countries but Italy, the social security contribution rate and the generosity of the pension benefit also increase. Moreover, the stock of capital increases in all economies. Wages rise – between 1% in France and 16% in Italy – thereby increasing the opportunity cost of retiring. Returns on capital instead fall (by around 20 basis points) thus reducing the (large) gap in performance between social security and alternative savings.

The largest increase in the retirement age – from 58 to 67 years – is forecasted to occur in France and Italy – the two countries featuring the smallest initial retirement age. In Italy, the dramatic aging process will create a sizable, negative income effect. For a retirement age of 67 years, the social security contribution rate will correspond to 34.9%, hence leading to a reduction in pension spending (and in the replacement rate), in line with the EC-OECD estimates (see figure 2). In France, the strong increase in the median age among the voters will induce a large upward shift in the reaction function $\tau(J)$, as shown in figure 3, and thus higher contributions and more pension benefits. The reduction in the net labor income and the contemporaneous increase in the pension benefits create a pecuniary incentive to retire (a positive substitution effect), which partially compensates the negative (income) effect of aging. Overall, the retirement age will largely be postponed in France, but the social security contribution rate will still increase – from 22.4% to 27.1%. In the United Kingdom (see figure 4), the aging of the voters will lead to an even more substantial shift in the reaction function $\tau(J)$, and to a large increase in the social security contribution rate, which generate a positive substitution effect. Retirement age will increase by seven years, and the contribution rate will reach 27.1%. In the United States, the negative income effect of aging and the aging of the electorate are expected to be more moderate. In fact, the simulations suggest that in the year 2050 either an equilibrium with retirement age at 68 and a corresponding contribution rate of 13.5%, or an equilibrium with retirement at age 69 and a contribution rate of 11.9% will prevail.

5.1 Extensions and Discussion

The previous results are robust to several modifications of the economic and political environment. This section presents the results of a model that allows for an age-dependent value of leisure; it discusses the impact of introducing a distortionary effect of taxation on the political equilibrium; and finally it addresses the different issues that aging may raise in a defined benefit (DB) social security system.

Consider individuals that are characterized by an age dependent disutility from working. According to the notation at section 2.1, υ_{t+j}^{t}, the value of leisure at time *t*+*j* of an individual born at time *t*, may thus depend on *j*, i.e., on the age of this individual. In particular, the value of leisure increases with age – at least after a certain age – for instance because of health, or only behavioural, reasons that make working more tiring (or just more demanding) for elderly individuals. To calibrate this weakly increasing age dependent value of leisure, I use the measure of global cognitive performance obtained in simple tests of orientation, memory, verbal fluency and numeracy, which is available in the SHARE survey (see Adam et al. 2006). These cognitive skills, which decrease from an average value of 0.14 for an individual aged 50 to 54 years to -0.35 for a person older than 85, provide an important information on the ability to perform these four tasks that are certainly needed in most jobs. The harder it is to perform these tasks, the more unpleasant working will turn out to be.

The quantitative results obtained by simulating this new economic environment are in line with the results of the model described at sections 4 and 5, and reported in table 4. For Italy and France, the new simulations indicate a social security system in the year 2050 characterized by a slightly lower retirement age that predicted in the previous simulations – respectively 66 and 64 years – but higher contributions (35.9% and 29.7%). The simulations results for the US are instead unchanged – thereby confirming the robustness of the previous conclusions.

The economic environment described in section 2 may seem to overstate the increase in social security spending induced by the aging process, since the model does not include a labor-leisure decision[9], and hence does not capture the distortionary effect introduced by an increase in the social security contributions. Young workers may represent a minority in the political arena, but they could vote with their feet in the labor market, by responding to an increase in pension contributions with a large drop in their labor supply. Indeed, as shown in Galasso and Profeta (2004), introducing an explicit labor leisure decision in the model does not lead to major changes in the results. The existence of an explicit distortion from labour taxation does not impose a tight limit on

[9] The model does not allow the individuals to choose on the intensive margin – i.e., on the share of each period dedicated to working.

the increase in pension spending driven by the aging process, because of the general equilibrium effects that aging induces – namely, the increase in wages – and which tend to counterbalance the distortionary effect of taxation[10]. For a given retirement age, the chosen contribution rate would be smaller when this distortionary effect is accounted for, particularly in Italy and the UK, but the qualitative results would not change.

The combination of a budget balanced social security system and an issue-by-issue voting on contribution rate and retirement age allows the analysis of the impact of aging on a defined contribution (DC) scheme. Would the results of the previous section extend to an economy characterized by defined benefit social security system?

Consider again a budget balanced social security system, but now individuals vote issue-by-issue on the retirement age and on pension benefits – for instance on the replacement rate. The voting decision on the pension benefit for a given retirement age follows the same logic as in the previous model (section 3.1). But, the choice on the retirement age for a fixed pension level – rather than for a given contribution rate – may provide new insights, since postponing retirement does not affect the pension benefits (as in the previous case), but reduces instead the contribution rates. Young individuals would hence perceive an immediate positive effect from an increase in the retirement age, as current contributions would fall.

Also in this environment, when population ages, the profitability of a PAYG social security system drops. For a given retirement age, the same economic and political effects described in section 3.1 emerge, leading to an increase in the contribution rate – although the impact on the pension benefits is uncertain. In the determination of the retirement age, however, the different nature of a DB scheme emerges. Given the pension benefit (or alternatively the replacement rate), aging increases the contribution rate. Individuals are poorer, and would thus prefer to postpone retirement, due to this negative income effect. Contemporaneously, however, the opportunity cost of retirement, i.e., the net labor income, drops – thus providing an incentive to retire earlier. If the former (income) effect instead prevails, the same qualitative results as in the previous model emerge: retirement age is postponed and pension spending is reduced. If instead the latter (substitution) effect dominates, aging may actually lead to lower retirement age and thus to a higher pension spending. This discussion hence

[10] Furthermore, as suggested by Disney (Economic Policy, 2004), the extent to which social security contributions should be accounted for as a distortionary taxes – rather than as a contribution to a saving scheme – is questionable, especially in DC systems.

confirms that – even when political constraints are accounted for – DB schemes are more sensitive to demographic shocks, and feature larger increases in pension spending.

6. Concluding Remarks

These simulations on the simultaneous political determination of social security contribution rate and retirement age shed a new light on the political viability of the most commonly endorsed reform measure: postponing retirement. When all political constraints are considered, the retirement age is expected to increase in all countries – thereby mitigating the hike in the social security contribution rates usually associated to the aging process (see Galasso and Profeta, 2004). According to these simulations, Italy will benefit the most from this policy, whereas the UK is still estimated to experience a large increase in pension spending, despite the raise in the retirement age.

The political demand for postponing retirement is mainly due to the aging process, which also induces the demand for more pension spending. While the effect of aging on the political determination of the contribution rate occurs through an increase in the median voter's age (see also Disney, 2007, Galasso and Profeta, 2007, Razin and Sadka, 2007, and Simonovits, 2007 for a symposium on these issues), population aging leads to later retirement mainly because of a negative income effect. By reducing the profitability of social security, aging decreases the individual net social security wealth – thereby inducing them to retire later. The magnitude of this phenomenon may depend on the specific features of the social security system. For instance, in defined contribution schemes, e.g., in Italy, the political push to postpone retirement is stronger, because aging – leading to a reduction in the pension benefits – reduces also the incentives to retire early.

To my knowledge, this paper is the first to provide some evidence in favor of the political feasibility of postponing retirement. This analysis could however be extended in two directions. First, the dynamics of the political determination of social security contribution and retirement age should also be examined. In a theoretical model featuring a Markow perfect equilibrium, Conde-Ruiz, Galasso and Profeta (2005) provide a first step in this direction. Second, this paper, as well as most of this literature, concentrates on the supply side of the retirement decision. A model that explicitly accounts for the labor demand of older workers by the firm is also needed to capture the full implications of this often advocated retirement policy.

Table 1: Estimated Parameters of the Model

	France	Italy	UK	US
Population Growth	1.04%	0.7%	0.5%	1.35%
Old Age Dependency Ratio	25.9%	27.9%	25.3%	20.5%
Average Employment	65.4%	45.6%	64.7%	60%
Median Age among the Voters	43	44	45	47
Capital Share	31%	38%	30%	36%
Capital-Output Ratio	2.21	3.18	1.81	2.43
Productivity Growth	1.6%	1.92%	2.6%	1.94%
Social Security Contribution Rate	22.4%	38.0%	14.5%	9.7%
Effective Retirement Age	58	58	63	63

Table 2: Calibrated Parameters of the Model

	France	Italy	UK	US
ρ	2.24	2.67	3.65	4.17
β	1.01	1.07	1.04	1.08
υ	1.7	1.8	2.9	0.75

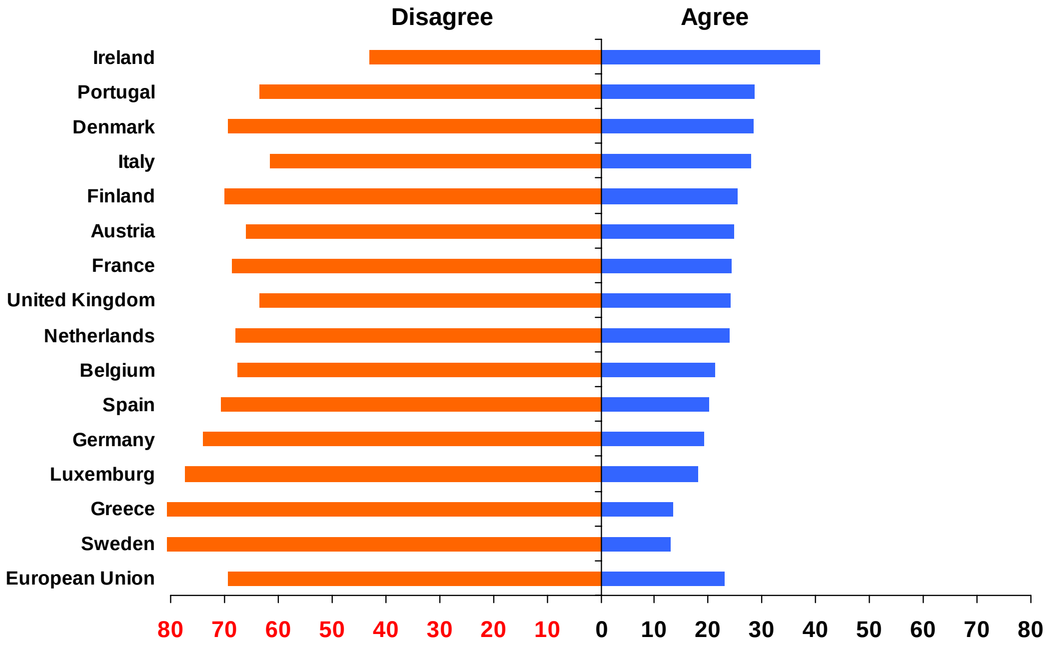
Table 3: Forecasted Parameters of the Model

	France	Italy	UK	US
Population Growth	-0.05%	-1.5%	-1.0%	0.25%
Old Age Dependency Ratio	48.8%	64.5%	44.3%	36.3%
Median Age among the Voters	53	57	53	53
Productivity Growth	1.8%	1.8%	1.7%	1.94%

Table 4: Simulations' results, postponing retirement

		Median age among the voters	Retirement age	Social security contribution rate	Replacement rate
France	2000	47	58	22.4%	55.0%
	2050	56	67	27.1%	63.3%
Italy	1992	44	58	38.0%	98.9%
	2050	56	67	34.9%	69.4%
UK	2000	45	63	14.5%	56.7%
	2050	53	70	27.1%	104.8%
US	2000	47	63	9.7%	40.8%
	2050	53	68	13.5%	46.1%
	2050	53	69	11.9%	43.5%

Figure 1: Retirement age should be increased: individuals work more and enjoy less retirement period.



Source: Eurobarometer

Figure 2: Politico-economic equilibria in Italy

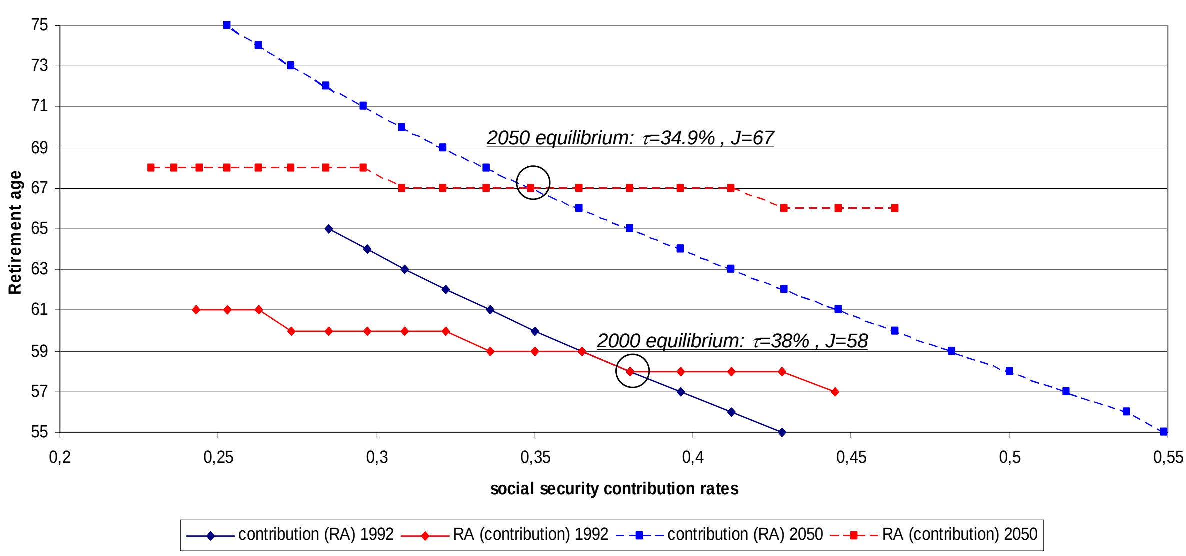


Figure 3: Politico-economic equilibria in France

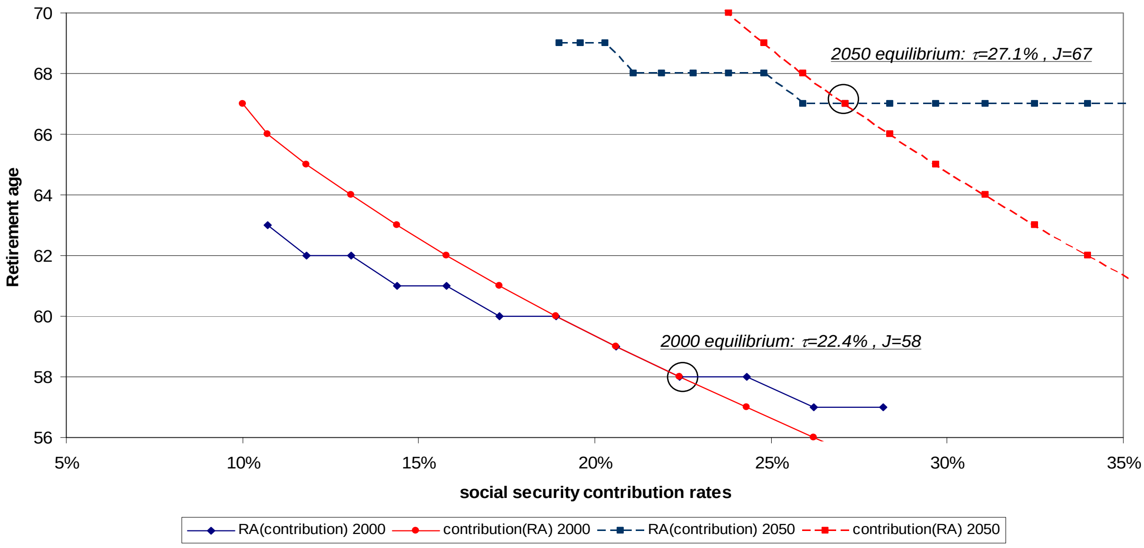


Figure 4: Politico-economic equilibria in the UK

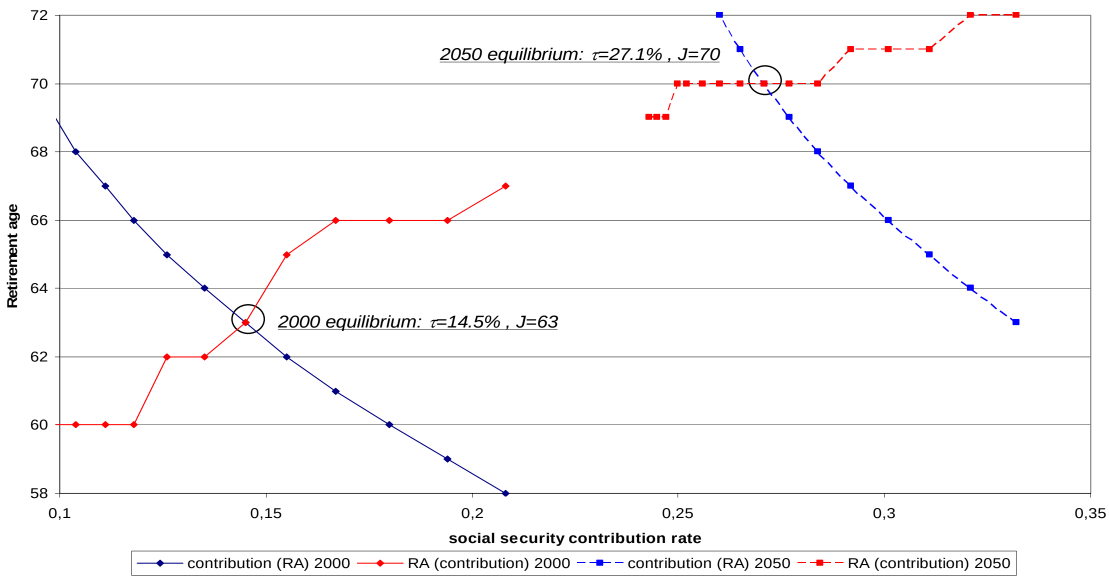


Figure 5: Political-economic equilibria in the US

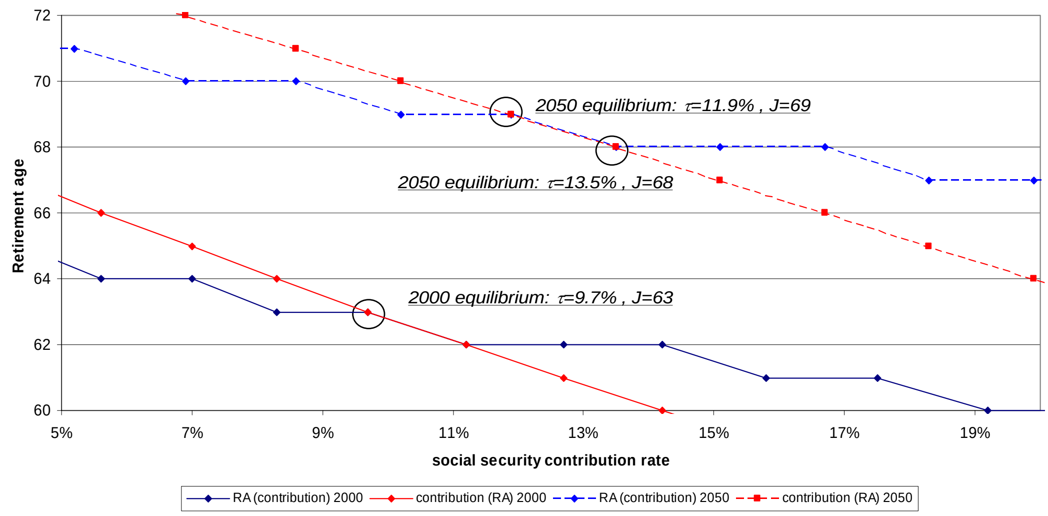


Figure 6: Individual preferences over social security contribution rate in Italy 1992

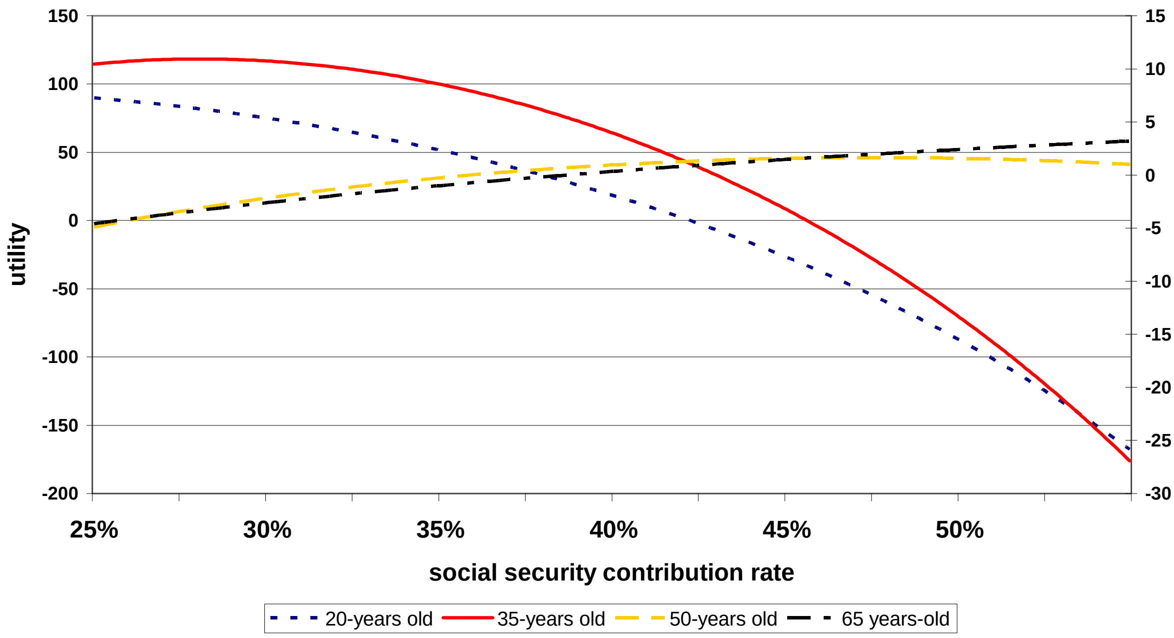
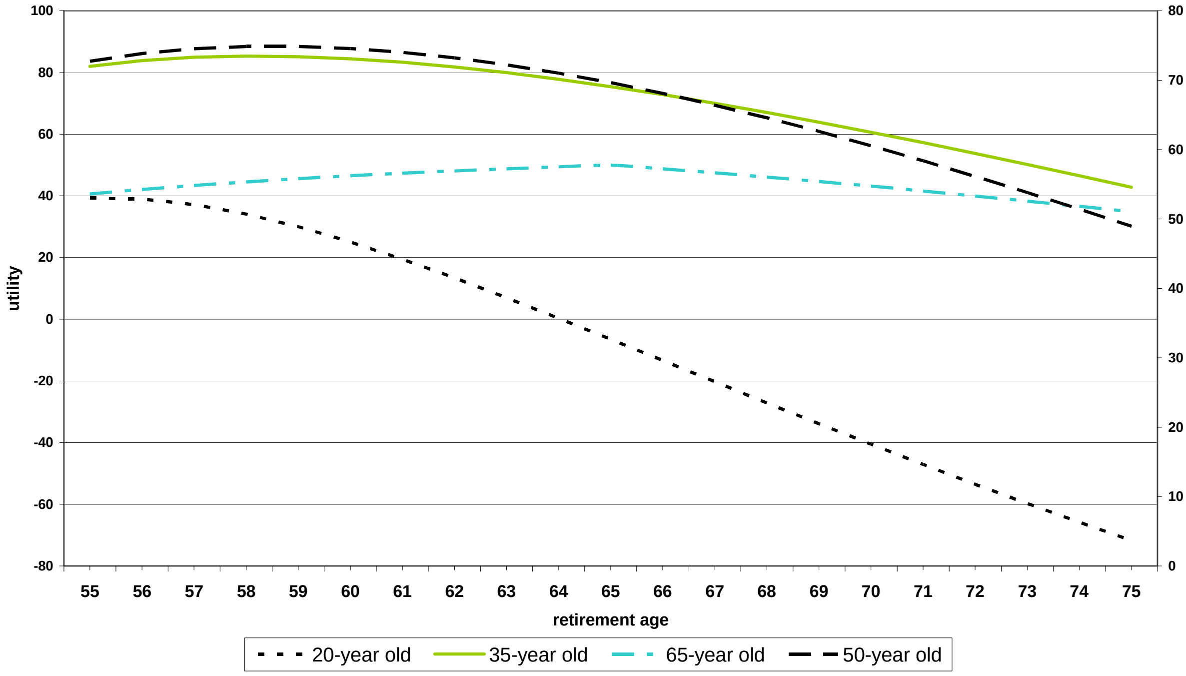


Figure 7: Individual Preferences over the Retirement Age in Italy 1992



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