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ABSTRACT

The Macroeconomics of Early Retirement*

Early retirement represents a policy response to the appearance of a mass of redundant middle-aged workers, who were not entitled to a pension transfer in their old age. This policy is distortionary, since it reduces the incentive to accumulate human capital, hence decreasing economic growth: it shifts part of the tax burden on future generations. Why was it adopted? We suggest that alternative policies – which do not introduce long-term distortions, but impose a larger cost on the current young generation of workers – were blocked by the political opposition of a coalition of the extreme: high income workers, who did not plan to retire early, but sought to reduce the current tax burden, and low income workers, who expected to retire early and to benefit from the early retirement pension.

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1. Introduction

Since their adoption between the late 60s and the 70s, early retirement provisions[1] have been so widely used to become a distinctive feature of the social security system in all industrialized countries. Early retirement is not innocuous, tough. Gruber and Wise (1999 and 2003) and Blondal and Scarpetta (1998) have shown that this provision is, in fact, responsible for the dramatic decrease of the labor force participation of the last few decades among middle-aged workers. Table 1 shows that – with the only exception of Japan – in most OECD countries the average labor force participation of males aged between 60 and 64 has dropped by at least 25%. Two striking cases are the Netherlands, from 84.7% in 1960 to only 19.1% in 2000, and France, from 68.7% in 1960 to only 17.8% in 2000. Ahituv and Zeira (2000) have complemented this view by suggesting that, in the presence of technologic progress, workers with lower human capital, or with more technology-specific human capital, are induced to take advantage of this provision, and to retire early. In a demographic context of aging population, this effect contributes to increase the dependency ratio, and therefore exacerbates the financial unbalance of the PAYG social security systems.

In a companion paper, Conde-Ruiz and Galasso (2003), we suggested that the initial adoption of this provision constituted a political response to the appearance of a mass of redundant middle-aged workers, who were not entitled to a pension transfer in their old age. Early retirement awarded them a pension. To be politically sustainable – we also argued – the early retirement policy has to be persistent[2]. In fact, the political support of a relevant fraction of the current young and middle-aged workers hinges on their expectation that the early retirement provision will be in place when they will

[1] As Gruber and Wise (1999), we label as early retirement provision different pathways out of the labor market, such as disability pensions (e.g., in Denmark, Germany, the Netherlands and Norway) and unemployment benefits for the elderly (e.g., in Austria, Finland and Germany).

[2] See also Coate and Morris (1999) and Hassler et al. (2001) on the importance of persistence for the political sustainability of a policy.

be able to take advantage of it. Over the last thirty years, these expectations have been fulfilled, and several workers – induced by the strong incentives that this generous provision[3] has created – have retired early. This effect has been particularly strong among low-income workers. In table 2, using 1996 European Commission Household Panel data, we calculated the difference in the proportion of retirees and inactive individuals across education levels for individuals aged 60 to 65 years in several European countries. In every country, retirement and inactivity – the latter status being possibly associated with receiving disability or unemployment benefits – are more common among the low educated individuals. As suggested also by Casamatta et al. (2002), this is due to the intragenerational redistribution entailed in the early retirement provision. So far, generous early retirement has thus been able to create its own future political constituency.

The novelty of this paper is to focus on the economic distortion introduced by this provision and to relate this feature to the political sustainability of early retirement vis-a-vis alternative policies. Herbertsson and Orszag (2001) have already calculated that early retirement can be held responsible for a reduction in the order of 5 to 7 per cent of potential annual GDP in OECD countries, with even higher figures for EU countries. Here, we argue that there exists an additional effect, since the generous incentives to retire early induce workers to accumulate less human capital. Clearly, this effect is stronger for low-ability workers, who have a relatively higher evaluation of leisure, their opportunity cost, i.e., their foregone labor income, being lower. The growth rate of the economy will thus be reduced, thereby introducing long term distortions.

We then examine whether alternative policies – rather than early retirement – could have been adopted as a political response to the appearance of a large mass of redundant

[3] Actuarially fair early retirement provisions were available in some countries already in the late 50s. Their introduction has a simple economic explanation, since they were designed to provide an early pathway from the labor market to unhealthy people or workers in hazardous sectors. Notice, however, that they did not give an incentive to leave the labor force to every worker. Our analysis applies to generous – or non actuarially fair – early retirement provisions.

middle-aged workers. We concentrate on one-time “bundled” policies, which award an old age transfer to the elderly with incomplete working history, do not touch the entitlement of the elderly with complete working history, and may generate some income redistribution among the young. In our political environment, any feasible policy response to the negative labor market shock has to defeat the status quo – consisting of a simple unfunded social security system that provides an old age pension only to those agents who contributed to the system in their youth – in a pairwise majoritarian voting game. All feasible policies are then evaluated in a pairwise voting game.

When we compare a feasible bundled policy to the early retirement provision, a clear trade-off emerges. Bundled policies do not create long-term distortions, but impose a large cost on the current young generation of workers – since they need to generate enough income redistribution among the young to be preferred to the status quo. Early retirement – on the other hand – has negative, long-lasting effects on the growth of the economy, but induces a lower tax burden on the current young, although the tax bill of all future workers increases. In a pairwise comparison, early retirement enjoys the support of a coalition of the extreme: high income workers, who do not plan to retire early, but sought to reduce the current tax burden, and the low income workers, who expect to retire early and to retain their early retirement pensions in their old age. To capture the relevance of the young agents' expectations, as it is common in the voting models of social security (see Galasso and Profeta, 2002, for a survey), we concentrate on subgame perfect equilibrium outcomes of our voting game.

To analyze these issues, we introduce an overlapping generations economy with human capital accumulation and growth. Young individuals are heterogeneous in their innate ability, which depends on their parents' ability and on the average human capital in the economy. They choose how much human capital to accumulate through an education technology, and when to retire. These decisions determine their labor income. The social security system consists of a PAYG scheme: young workers pay a proportional labor income tax and the proceedings are divided among the retirees. Under early retirement, workers who retire early are awarded an early retirement pension, while those who retire at mandatory age receive the full pension. In this setting, early retirement persistently distorts the human capital accumulation decision of the low-ability types, and thus reduces economic growth.

To evaluate the possible policy responses – status quo, early retirement and bundled policy – we consider an economy in which there initially exists a social security system with no early retirement – the status quo. Then an unexpected shock takes place, which forces a large mass of workers, who have not reached normal retirement age, out of the labor market. These workers have an incomplete working history and thus – under the status quo system – they are not entitled to a pension in their old age. Early retirement and bundled policies provide them respectively an early retirement pension and a (one-time) old age transfer.

There has recently been a growing interest in the political economy of early retirement provisions. Lacomba and Lagos (2000) study a model where individuals vote on the mandatory retirement age for a given level of redistribution of the social security system. Casamatta et al. (2002) complement this effort by studying the political determination of the size of the pension system in a model with endogenous retirement for a given early retirement provision. These papers, as well as Conde-Ruiz and Galasso (2003), represent positive contributions aimed at explaining the different features of the early retirement scheme. Cremer et. al (2002), on the other hand, have a normative approach along the lines of the traditional optimal taxation literature. They show that when first-best redistributive instruments are not available, because some variables, such as individual productivity or health status, are not observable, the use of early retirement provision is part of the optimal-tax transfer policy.

The paper proceeds as follows: Section 2 introduces the economic model and the social security system, while section 3 describes the status quo, the early retirement provision and characterizes alternative policy responses. Section 4 defines the political game and compares the policies. Section 5 concludes. All proofs are in the appendix.

2. The Economic Model

We introduce a two sectors overlapping generations model with growth. In every period, the economy is populated by young and old individuals. Population grows at a constant rate, $n > 0$. Young agents decide how much human capital to accumulate and when to retire. Old agents do not work, retirement being mandatory. All consumption takes place in old age.

Each generation consists of a continuum of agents, who are heterogenous in their innate ability. At any time t, a young agent is characterized by an innate ability level, x_{t-1}, which can be converted into her own level of human capital, h_t, through an education technology. This acquired level of human capital entirely determines her working ability. Agents' innate ability level depends on a relative ability level, z, and on the average human capital in the economy in the previous period, $\widetilde{h}_{t-1}$, specifically, $x_{t-1} = z\widetilde{h}_{t-1}$. The relative abilities, z, are assumed to be distributed according to a time invariant cumulative distribution function $F(.)$, which has mean $\widetilde{z}$, and is skewed, $F(\widetilde{z}) > 1/2$. Thus, the evolution of the innate abilities over time entirely depends on the average accumulation of human capital in the economy, while their distribution across agents is regulated by $F(.)$.

Young individuals decide how much human capital to accumulate. All agents have access to the same Cobb Douglas education technology, which transforms investment in education into human capital[4], according to the agent's innate ability. Thus, as in Glomm and Ravikumar (1992), the law of human capital accumulation is:

$$h_t(e_t, x_{t-1}) = \theta (e_t)^{\gamma} (x_{t-1})^{1-\gamma} \tag{2.1}$$

[4]We interpret the investment in human capital as a learning process which takes place on and off the work place, rather then just as primary or secondary education. According to Becker (1975), the cost of this general training process has to be beared by the workers.

where $h_t(e_t, x_{t-1})$ is the level of human capital that an innate ability type x_{t-1} young individual obtains at time t by investing e_t units of consumption in education, $\theta > 0$ is the productivity of the human capital sector, and $\gamma \in (0, 1)$ represents the relative importance of the education in the accumulation of human capital.

Young agents also decide when to retire. They may retire at mandatory retirement age[5], in which case they work during the entire working period, or they may retire early. To be entitled to a pension transfer for the remaining period of her live, an agent needs to work at least until the minimum retirement age, $\Theta < 1$. If she retires early, i.e., between the minimum and the mandatory retirement age, she obtains a share α of the full pension during the remaining of her youth and in her old age. This parameter α defines the generosity of the early retirement provision: a large α indicates a small reduction in the pension transfer associated with retiring early, and viceversa. Agents retiring at mandatory retirement age receive the full pension. As Conde-Ruiz and Galasso (2003), we call P_t the full pension awarded at time t to an old agent who has worked during the entire working period, and Γ_{t+1}^t the percentage of the full pension awarded at time $t+1$ to an old agent born at time t, then

$$\Gamma_{t+1}^t(\phi_t) = \Gamma_t^t(\phi_t) = \begin{cases} \alpha_t & \text{if } \Theta \leq \phi_t < 1 \\ 1 & \text{if } \phi_t = 1 \end{cases} \tag{2.2}$$

where subscripts indicate the calendar time and superscripts the period in which the agent was born, $\phi_t \in [\Theta, 1]$ represents the retirement age, Θ is the minimum retirement age to be eligible for a pension, and α is the proportion of the full pension paid to an early retiree. According to eq. 2.2, any increase in the retirement age above Θ, but below 1, does not lead to an increase in the pension transfer – that remains equal to $\alpha_t P_t$ – although it raises the value of leisure. This leads to a binary retirement decision, as shown in Lemma 2.1, which is in line with the empirical observations (see Gruber

[5]Notice that, although in a large majority of countries agents are still forced or induced to retire in order to obtain a pension transfer, in a growing number of countries – such as the US – agents can work and – at the same time – receive a pension transfer. In our analysis, we abstract from this possibility. For an analysis of the empirical regularities between social security and retirement see Profeta (2002).

and Wise, 1999).

A linear production function coverts the worker's human capital, weighted by the duration of the working period, ϕ, into the only consumption good:

$$y_t\left(e_t, \phi, x_{t-1}\right) = \phi h_t\left(e_t, x_{t-1}\right) \tag{2.3}$$

There exists a storage technology that transforms a unit of today's consumption into $1+r$ units of tomorrow's consumption. All private intertemporal transfers of resources into the future are assumed to take place through this technology.

Young agents have to decide when to retire, ϕ, and the amount of resources to invest in human capital, e. Additionally, they pay a proportional tax on their labor income, τ, and save all their resources for old age consumption through the storage technology. Old agents take no relevant economic decisions; they simply consume all their wealth. The intertemporal budget constraint of an agent born at time t is thus:

$$c_{t+1}^t = \left(\phi_t h_t\left(1-\tau_t\right) - e_t + \left(1-\phi_t\right)\Gamma_t^t\left(\phi_t\right)P_t\right)\left(1+r\right) + \Gamma_{t+1}^t\left(\phi_t\right)P_{t+1} \tag{2.4}$$

where τ_t is the payroll tax rate which finances the pensions at time t, and P_t and P_{t+1} are respectively the pensions at time t and $t+1$.

Agents are assumed to value leisure, d_t, in their working period and old age consumption[6], c_{t+1}^t, according to a linear utility function:

$$U\left(\phi_t, c_{t+1}^t\right) = \left(1-\phi_t\right)d_t + \beta c_{t+1}^t$$

where β, the individual time discount factor, is assumed to be equal to the inverse of the real interest factor, $\beta = 1/(1+r)$, and the value of leisure, d_t, is normalized to the average stock of human capital in the economy in order to be consistent with a growing environment: $d_t = \delta\widetilde{h}_{t-1}$, with δ being a constant. The utility that an agent attaches to leisure can be interpreted as the utility associated to the free time which becomes

[6]By disregarding current consumption, we abstract from the saving decisions and from the effect of social security on these decisions (see Feldstein, 1974).

available after an early exit from the labor market or, alternatively, as the utility from the income that an agent may obtain from working on a different occupation – typically on the black market – after early retirement.

To summarize, agents decide their retirement age and their human capital accumulation in order to maximize $U\left(\phi_t, c_{t+1}^t\right)$, subject to the budget constraint at equation 2.4. The following lemma characterizes these economic decisions.

Lemma 2.1. *For a given tax rate τ_t, and given proportion α_t, α_{t+1} of the unitary pensions P_t and P_{t+1}, the economic decisions of the agents can be summarized as follows:*

$$\phi_t^*\left(x_{t-1}\right) = \begin{cases} \Theta \textit{ if } x_{t-1} \leq x_{t-1}^R \\ 1 \textit{ if } x_{t-1} > x_{t-1}^R \end{cases} \tag{2.5}$$

$$e_t^*\left(x_{t-1}\right) = \left(\theta\gamma\left(1-\tau_t\right)\phi_t^*\right)^{\frac{1}{1-\gamma}} x_{t-1} \tag{2.6}$$

where

$$x_{t-1}^R = \frac{\left(1-\Theta\right)\left(\alpha_t P_t + d_t\right) - \frac{1-\alpha_{t+1}}{1+r} P_{t+1}}{\left(1-\gamma\right)\left(\theta\gamma^\gamma\left(1-\tau_t\right)\right)^{\frac{1}{1-\gamma}}\left(1-\Theta^{\frac{1}{1-\gamma}}\right)} \tag{2.7}$$

In words, x_{t-1}^R represents the innate ability level of an agent who, at time t, is indifferent between retiring early or at the mandatory retirement age. Because of the redistributive nature of the social security system (see the discussion in section 2.1), individuals with innate ability levels below the threshold retire early, since their foregone income is low, while pension benefits and leisure are equal across types. The other agents retire at mandatory age (see eq. 2.5). This innate ability level, x_{t-1}^R, characterizes the human capital accumulation decisions as well. Agents with innate ability x_{t-1} below the threshold x_{t-1}^R will accumulate less human capital – even in proportion to their innate ability – than agents with more innate ability, $x_{t-1} > x_{t-1}^R$ (see eq. 2.6). The intuition is straightforward. Early retirement shortens the period of time devoted to production, and thus decreases the return from investing in human capital; as the low ability types retire early, they will also accumulate less human capital. Notice that the threshold innate ability, x_{t-1}^R, and therefore the mass of early retirees, is endogenous. It depends positively on the generosity of the early retirement provision, α_t and α_{t+1}, and of today's pension P_t, and on the current tax burden, τ_t. Larger future pension transfers, P_{t+1}, on the other hand, increase the cost of retiring early, provided that early retirement pensions are penalized, $\alpha_{t+1} < 1$, and thereby reduce the threshold innate ability, x_{t-1}^R.

The previous lemma also suggests that agents accumulate human capital at different pace, depending on their innate ability. In fact, it is easy to show that the level of human capital at time t of an innate ability type, x_{t-1}, is $h_t = \left(\theta\phi^\gamma\gamma^\gamma (1-\tau_t)^\gamma\right)^{\frac{1}{1-\gamma}} x_{t-1}$. The average human capital in the economy at the end of the period t can then be obtained by aggregating the accumulation decisions of all agents: $\widetilde{h}_t = \int_0^\infty h_t dF(z) = \left(\theta\gamma^\gamma (1-\tau_t)^\gamma\right)^{\frac{1}{1-\gamma}} \widetilde{h}_{t-1} \left[1 - \mu_{t-1}^R \left(1 - \Theta^{\frac{\gamma}{1-\gamma}}\right)\right]$, where $\mu_{t-1}^R = \int_0^{x_{t-1}^R} z dF(x)$ is the proportion of the relative innate ability that can be attributed to the early retirees at time t. Finally, notice that since the innate ability level depends on the relative ability, z, which is assumed to be time invariant, the distribution of human capital around its average value does not change over time, although the average human capital in the economy may increase.

2.1. The Social Security System

As Conde-Ruiz and Galasso (2003), we consider a balanced budget pay as you go (PAYG) social security system with early retirement, which redistributes from the rich to the poor. This element of within cohort redistribution is crucial, because it induces low ability young to support the social security system[7] (see Conde-Ruiz and Galasso, 1999, Casamatta et al, 2000, and Tabellini, 2000). Every worker pays a proportional tax on her labor income, and the proceedings are divided among old age and early retirees.

[7] Evidence in favor of the existence of this within cohort redistribution can be found in Boskin et al. (1987) and Galasso (2002) among others.

The pension transfer may depend on the length of the working period of the recipient, but not on her labor income. Since the system is balanced every period, the sum of all pension transfers is equal the sum of all contributions. Thus, the full pension transfer which balances the budget constraint is equal to:

$$P_t = \frac{\overbrace{(1+n)\int \phi_t h_t dF(x_{t-1})}^{\text{Tax Base}} D(\tau_t)\tau_t}{\underbrace{\int \Gamma_t^{t-1}(\phi_{t-1})\, dF(x_{t-2})}_{\text{Old Age Retirees}} + \underbrace{(1+n)\int (1-\phi_t)\,\Gamma_t^t(\phi_t)\, dF(x_{t-1})}_{\text{Early Retirees}}}. \tag{2.8}$$

where $D(\tau_t)$ represents (the complement to one of) a possible deadweight loss induced by the distorsive taxation that reduces the tax base. We assume that an increase in the tax rate increases the deadweight loss, and thus $\partial D(\tau_t)/\partial\tau_t = D'(\tau_t) < 0$. By using the economic decisions at Lemma 2.1, the above expression can be written as follows:

$$P_t = \frac{(1+n)\left[1-\mu_{t-1}^R\left(1-\Theta^{\frac{1}{1-\gamma}}\right)\right]\left(\theta\gamma^\gamma(1-\tau_t)^\gamma\right)^{\frac{1}{1-\gamma}}\widetilde{h}_{t-1}D(\tau_t)\tau_t}{1-(1-\alpha_t)F\left(x_{t-2}^R\right)+(1+n)(1-\Theta)\,\alpha_t F\left(x_{t-1}^R\right)} \tag{2.9}$$

where $F\left(x_{t-1}^R\right)$ represents the fraction of young who decides to retire early at time t.

Thus, in every period, the social security system is completely characterized by the exogenous minimum retirement age, the payroll tax rate, the full pension, and the percentage of the full pension awarded to the early retirees, $(\Theta, \tau, P, \alpha)$.

2.2. The growth rates of the economy

We can now characterize the per capita growth rate of the economy, for a constant sequence of social security tax rates, τ, in an economy with the early retirement provision, $g^{ER}(\tau)$, and without it, $g^{WR}(\tau)$. They are respectively

$$\begin{aligned} g_t^{ER}(\tau) &= \left[1-\mu_{t-1}^R\left(1-\Theta^{\frac{\gamma}{1-\gamma}}\right)\right]\left((1-\tau)^\gamma\theta\gamma^\gamma\right)^{\frac{1}{1-\gamma}} \\ g^{WR}(\tau) &= \left(\theta\gamma^\gamma(1-\tau)^\gamma\right)^{\frac{1}{1-\gamma}} \end{aligned} \tag{2.10}$$

Clearly, $g_t^{ER}(\tau) = \Psi_t g^{WR}(\tau)$ where $\Psi_t = \left[1 - \mu_{t-1}^R \left(1 - \Theta^{\frac{\gamma}{1-\gamma}}\right)\right] \leq 1$, since early retirement reduces the accumulation of human capital by the early retirees. Thus a positive per capita growth rate takes place in the two scenarios, if the investment in human capital is sufficiently productive and the social security tax rate is not too high: $\theta > \Psi_t^{-(1-\gamma)} \left(\gamma^\gamma (1-\tau)\right)^{-1} \quad \forall t$.

3. Early Retirement and Alternative Policy Responses

In Conde-Ruiz and Galasso (2003), we argued that the initial introduction of generous early retirement provisions in many OECD countries represented the political response to the appearance of a large group of redundant or unemployed middle-aged workers who – having an incomplete working history – were not entitled to an old age pension. The introduction of early retirement schemes effectively amounted to award them a pension transfer. We also suggested that the political support in favor of early retirement hinges on an additional element: the existence of a large number of (mainly) low-ability workers, who, after the introduction of early retirement, and thanks to the incentives it produces, have decided to benefit from this provision, and thus to retire early. This last feature is crucial, since it allows the early retirement provision to create its own future political constituency.

In this section, we first model a simple social security system that resembles the system in place in many OECD countries before the introduction of early retirement. We then use this "status quo" model as a benchmark to be compared with the social security system with early retirement and with the alternative policy which we describe later in this section.

3.1. The Status Quo

We consider an economy in which there initially exists a social security system that levies a tax on labor income and provides a lump-sum old-age pension. No early retirement provision is available at this stage. We call this initial social security system the status quo (SQ). Since the budget is balanced every period, the status quo pension at time t can be written as follows:

$$P_t^{SQ} = (1+n)\left(\theta\gamma^{\gamma}\left(1-\tau_t^{SQ}\right)^{\gamma}\right)^{\frac{1}{1-\gamma}}\widetilde{h}_{t-1}D(\tau_t^{SQ})\tau_t^{SQ} \tag{3.1}$$

where τ_t^{SQ} indicates the status quo tax rate[8] at time t. Furthermore, we consider the status quo social security as a defined benefit system, in which pensions are linked to the per capita growth of the economy, through the average human capital. In particular, we assume that

$$P_{t+1}^{SQ} = P_t^{SQ}\frac{\widetilde{h}_t}{\widetilde{h}_{t-1}} = P_t^{SQ} g^{WR}\left(\tau_t^{SQ}\right) \quad \forall t \tag{3.2}$$

where $g^{WR}\left(\tau_t^{SQ}\right)$ is defined at eq.2.10. Thus, for a given average human capital at $t-1$, $\widetilde{h}_{t-1}$, the pension transfer P_t^{SQ} fully characterizes the status quo system – since τ_t^{SQ} has to adjust in order to finance the pension transfers – and its evolution over time. It is now useful to define the indirect utility function at time t for a young individual with innate ability x_{t-1} under the status quo system:

$$v_{t,x}^{SQ} = \underbrace{(1-\gamma)\left(\theta\gamma^{\gamma}\left(1-\tau_t^{SQ}\right)\right)^{\frac{1}{1-\gamma}}}_{I^{SQ}} x_{t-1} + \underbrace{\frac{P_{t+1}^{SQ}}{1+r}}_{K^{SQ}}. \tag{3.3}$$

where I^{SQ} is the part of the (indirect) utility that is proportional to the agents' ability type and K^{SQ} is the constant term.

We now discuss the timing of the events, which is summarized in figure 1. At time $T-2$, the economy is at a steady state with a status quo social security system characterized by a tax rate $\tau_{T-2}^{SQ} = \overline{\tau}^{SQ}$ and a corresponding old-age pension P_{T-2}^{SQ} which grows at the per-capita growth rate of the economy as defined at eq.3.2. At $T-1$, an unexpected

[8]We are implicitly assuming that, in absence of an early retirement provision, all agents retire at normal retirement age. This amounts to impose the following restriction on the value of the leisure: $d_t < P_{t+1}^{SQ}/(1+r)(1-\Theta)\ \forall t$.

shock takes place: a worsening of the economic conditions forces a large mass of workers to exit the labor market before having reached normal retirement age. These redundant workers are low-ability, as suggested by the empirical evidence (see Table 2), and we indicate their mass by $\varepsilon = F\left(x_{T-2}^{R}\right)$. Since the shock was unexpected, it is reasonable to assume that these workers did not modify their human capital accumulation decision to adjust for the reduction in their working period. Nevertheless, the income – and thus the tax base – decreases at $T-1$, because of their early exit from the labor market. The tax rate τ_{T-1}^{SQ} will therefore adjust[9] in order for the pension transfer P_{T-1}^{SQ} to increase the at per capita growth rate of the economy (see eq.3.2). At time T, these redundant workers would not receive an old age pension, since they have an incomplete working history, whereas the elderly with complete working history would obtain their normal pension transfer, P_{T}^{SQ}. The tax rate would temporarily be reduced below its steady state level, $\tau_{T}^{SQ} < \overline{\tau}^{SQ}$, since the number of pensions paid out at time T would drop.

Finally, at $T+1$, the pension transfer would be awarded to all retirees – there are no more elderly with incomplete working history – and all workers would retire at normal retirement age. Notice that at this point the status quo system would revert to its steady state (as at $T-2$). In fact, the proportion of retirees and workers has returned to its steady state level, the pension transfer continues to increase at the per capita growth of the economy $P_{T+1}^{SQ}/\widetilde{h}_{T} = P_{T-2}^{SQ}/\widetilde{h}_{T-3}$ and thus a tax rate is equal to the steady state value $\tau_{T+1}^{SQ} = \overline{\tau}^{SQ}$.

3.2. The Early Retirement Provision

The existence of a mass of elderly people with no entitlement to receive an old-age pension transfer may however induce the policy-makers at time T to institute an early retirement provision, which awards an old-age transfer to the elderly with incomplete

[9]In particular, the tax rate will increase, $\tau_{T-1}^{SQ} > \overline{\tau}^{SQ}$, if $\overline{\tau}^{SQ}$ is on the increasing portion of the Laffer curve induced by the deadweight loss function, $D(\tau_t)$, and decrease otherwise.

working history. As described in section 2.1, we consider an early retirement scheme that guarantees to the agents who have worked until a minimum retirement age, Θ, a proportion $\alpha_t \leq 1$ of the full pension, P^{ER}. The system is financed through a tax on labor income, τ^{ER}. Two further elements characterize our early retirement provision. First, the introduction of early retirement does not modify the entitlement of the elderly with complete working history at time T, and thus $P_T^{ER} = P_T^{SQ}$. Second, as in the status quo, under early retirement pensions are indexed to the growth of the economy: $P_{t+1}^{ER} = P_t^{ER}\widetilde{h}_t/\widetilde{h}_{t-1} = P_t^{ER} g^{ER}\left(\tau_t^{ER}\right) \forall t$ (see eq.2.10).

These restrictions guarantee that for given values of α_t and Θ the early retirement provision is fully characterized. In particular, at time T, the tax rate τ_T^{ER} is set to provide[10] the full pension, $P_T^{ER} = P_T^{SQ}$, to the elderly with complete working history and a reduced pension, $\alpha_T P_T^{ER}$, to the early retirees. In the following periods, $t > T$, the full pension (and thereby the early retirement pension via the parameter α) evolves according to $P_{t+1}^{ER} = P_t^{ER}\widetilde{h}_t/\widetilde{h}_{t-1}$, and the tax rate, τ_{t+1}^{ER}, adjusts accordingly (see figure 1).

The introduction of a generous early retirement provision increases the financial requirements of the system, which now has to provide for more pensions, both initially and in the long-run, $\tau_{T+i}^{ER} > \tau_{T+i}^{SQ} \; \forall i \geq 0$. The growth of the economy is instead reduced, $g_{T+i}^{ER} < g_{T+i}^{SQ} \; \forall i \geq 0$, where g_{T+i}^{ER} and $g_{T+i}^{SQ} = g_{T+i}^{WR}$ follow from eq.2.10. The extent to which the size of the system increases depends on the generosity of the early retirement provision, measured by α, and on the proportion of workers who retire early. Notice that, after the initial shock at time $T-1$ that gives raise to an exogenous initial group of agents with incomplete working history, ε, in the following periods the mass of early retirees, $F\left(x_t^R\right)$ with $t \geq T-1$, is endogenous and depends on the features of the early retirement provision (see eq. 2.7). To simplify the analysis, in what follows we assume that the exogenous initial mass of workers who is forced to exit the labor market at

[10]We assume that there always exists a tax rate, τ_t^{ER}, generating enough tax proceeds to finance the pension benefits.

$T-1$ equals the mass of early retirees that arises endogenously in the following periods. Thus, $\varepsilon = F\left(x_{t-1}^{R}\right) = F\left(x_{t}^{R}\right)\ \ \forall t \geq T-1$ and $\alpha_t = \alpha\ \forall t$.

Finally, the indirect utility obtained under early retirement by the early retires and by those who work till mandatory retirement age are respectively:

$$
\begin{aligned}
v_{t,x}^{ER} &= \underbrace{(1-\gamma)\left(\Theta\theta\gamma^{\gamma}\left(1-\tau_{t}^{ER}\right)\right)^{\frac{1}{1-\gamma}}}_{I^{ER}} x_{t-1} + \underbrace{(1-\Theta)\left(\alpha_t P_{t}^{ER} + d_t\right) + \alpha_{t+1}\frac{P_{t+1}^{ER}}{1+r}}_{K^{ER}} \\
v_{t,x}^{NR} &= \underbrace{(1-\gamma)\left(\theta\gamma^{\gamma}\left(1-\tau_{t}^{ER}\right)\right)^{\frac{1}{1-\gamma}}}_{I^{NR}} x_{t-1} + \underbrace{\frac{P_{t+1}^{ER}}{1+r}}_{K^{NR}}
\end{aligned} \qquad (3.4)
$$

where I^{ER} and I^{NR} represent the part of the (indirect) utility that is proportional to the agents' ability type and K^{ER} and K^{NR} represent the constant terms respectively for the early retirees and for the agents who retire at normal retirement age.

3.3. Alternative Policy Responses

In this section, we examine alternative political responses to the appearance of a mass of redundant middle aged workers, which – contrary to the early retirement provision – do not introduce long term distortions in the economy.

The simplest of these responses would be a policy which, at time T, imposes an income tax on the young and provides a transfer only to the workers with incomplete working history. This policy would be relatively inexpensive, would not introduce long term distortions, and would clearly be supported by the workers with incomplete working history. However, no young individual would prefer it to the status quo.

To design a policy that would be preferred to the status quo by some young agents, we hence need to examine policies that – besides providing a transfer to the workers with incomplete working history – entail some redistribution among the young. This should not be surprising. Also early retirement bases its political support among the young on an element of intragenerational redistribution, due to the difference in the opportunity cost of leisure among individuals of different income classes.

How may alternative policies achieve redistribution among the young? We consider a family of policies which impose a proportional tax on labor income and provide a lump-sum transfer to all the young. This policy redistributes from the rich to the poor, however – as the early retirement provision – does not explicitly target redistribution in favor of specific income groups. This represents an important modelling choice. In fact, several alternative policies may be tailored to defeat both the status quo and early retirement by bundling together an old age transfer to the elderly with incomplete working history and enough targeted redistribution. In the same fashion, however, we can appropriately modify our simple early retirement provision to achieve more targeted redistribution in order to defeat these alternative policies, and so on. To obtain a meaningful comparison with the status quo and early retirement, we thus choose to restrict the policy space to policies which do not introduce long term distortions, which may achieve intragenerational redistribute, but which – like the early retirement provision – are not explicitly allowed to "buy votes" from a specific income groups through targeted redistribution.

Do these "non-targeted" policies and early retirement represent a good approximation of the policies implemented after the labor market shocks in the late sixties and early seventies? We think that the answer is, to a large extent, positive. In fact, although in few cases initial early retirement schemes were only offered to a restrict group of workers – e.g., in France to workers in the Steel industry or in Germany to unemployed workers – the main provision soon turned very general and was offered to virtually all workers.

Our family of alternative policies can be represented by a policy that – at time T – bundles together the old-age pension to the elderly with complete history with transfers to the young and to the remaining elderly, and – at time $T+1$ – mimics the status quo, by providing exclusively an old age transfer to the elderly with complete working history (see figure 1). More precisely, our bundled policy (BP) consists of:

- a sequence of pension transfers to the elderly with complete working history, P_t^{BP} $\forall t \geq T$, financed by a sequence of tax rates on labor income, τ_t^{BP} $\forall t \geq T$, such that (i) at time T, the transfer is equal to the status quo pension, $P_T^{BP} = P_T^{SQ}$, and (ii) future pensions are linked to the growth of the economy, as under the status quo and early retirement, $P_{t+1}^{BP}/\widetilde{h}_t = P_t^{BP}/\widetilde{h}_{t-1}$ $\forall t \geq T$;
- a transfer at time T to the elderly with incomplete working history that is equal to the pension awarded to the same agents at time T under early retirement, $T_T^O = \alpha P_T^{ER}$;
- a transfer at time T to all young agents, T_T^Y; and
- a tax rate s_T – at time T – levied on the labor income net of social security taxes, which rises enough revenues to finance the transfer to the young and to the old with incomplete working history, i.e., $(1+n)\, T_T^Y + F\left(x_{T-1}^R\right) T_T^O$.

Under this bundled policy, the elderly at time T – regardless of their working history – receive the same treatment as under early retirement. The degree of redistribution among the young – namely on T_T^Y – represents the instrument for the bundled policy to increase its political support. Our bundled policy can in fact be indexed by T_T^Y , or, equivalently, by the tax rate, s_T, that finances this, T_T^Y, and the old age transfer, T_T^O. This policy has only a one-time negative impact – at time T – on the growth rate of the economy, whose relevance depends on the degree of redistribution, s_T. In particular, the growth rate of the economy at time T is $g_T^{BP}(s_T) = \left(\theta\gamma^{\gamma}(1-s_T)^{\gamma}\left(1-\tau^{BP}\right)^{\gamma}\right)^{\frac{1}{1-\gamma}} < g^{SQ}$ $\forall s_T > 0$.

In all future periods, all retirees would receive an old age pension and all workers would retire at normal retirement age. Thus, since $P_T^{BP} = P_T^{SQ}$ and future pensions[11]

[11] Notice that although the absolute pension transfer would be lower under the bundled policy, $P_t^{BP} < P_t^{SQ}$ $\forall t > T$, since at time T there would be a lower human capital accumulation under the bundled policy (lower $\widetilde{h}_T$), the relative pension transfer, i.e., as a proportion of the stock of human capital, would coincide $\left(P_t^{BP}/\widetilde{h}_{t-1}\right) = \left(P_t^{SQ}/\widetilde{h}_{t-1}\right)$ $\forall t > T$.

evolve according to the growth of the economy, $P_{t+1}^{BP}/\widetilde{h}_t = P_t^{BP}/\widetilde{h}_{t-1}$ $\forall t \geq T$, it is easy to show that the social security tax rate under the bundled policy would coincide with the tax rate under status quo, $\tau_t^{BP} = \tau_t^{SQ}$ $\forall t > T$, and thus the growth rates would coincide as well, $g_t^{BP} = g_t^{SQ}$ $\forall t > T$.

It is useful to characterize the indirect utility function at time T of a young agent with innate ability type x_{T-1}. As previously mentioned, this utility will depend on the tax rate s_T which determines the young-age transfer:

$$v_{T,x}^{BP}(s_T) = \underbrace{(1-\gamma)\left(\theta\gamma^{\gamma}\left(1-\tau_T^{BP}\right)(1-s_T)\right)^{\frac{1}{1-\gamma}}}_{I^{BP}} x_{T-1} + \underbrace{T_T^Y + \frac{P_{T+1}^{BP}}{1+r}}_{K^{BP}}. \tag{3.5}$$

where, as usual, I^{BP} represents the part of the (indirect) utility that is proportional to the agents' ability type and K^{BP} is the constant term.

4. The Political Game

In this section, we examine the politics behind the policy response to the labor market shock. At time T, our economy is populated by two types of elderly, those who have a complete working history and those who do not, since at $T-1$ they were forced out of the labor market. According to the policy in place at $T-1$ – the status quo – the latter group of elderly would not be entitled to any pension benefit. However, policy changes may take place at T that award them a pension transfer.

To describe our political process, we need to introduce the concept of feasible policy. In our terminology, a feasible policy is any policy – early retirement or a bundled policy – that at time T defeats the status quo in a pairwise majoritarian voting game. These feasible policies constitute the win-set of the status quo[12]. The political game than takes place among these feasible policies. To replace the status quo at time T, a policy has thus to be feasible and to defeat all other feasible policies in a pairwise voting game.

[12]See Tsebelis (2002) for a formal definition and a political characterization of the win-set of the status quo.

In other words, our political game can be thought of as a two stage game. In the first stage, we identify all the policies that are preferred to the status quo by a majority of voters. In the second stage, the equilibrium policy response is selected among all feasible policies by pairwise comparisons.

This voting game displays some nice properties. First, it introduces a status quo bias – thereby making the current system more difficult to modify – since we require the policy that will eventually be adopted to be preferred to the status quo by a majority of voters. This represents a weak requirement – particularly in a political game that determines the design of a very broad welfare program, such as the social security system – which, however, needs not to be satisfied in other sequential agenda settings[13]. Second, it eliminates the possibility of Condorcet cycles among the status quo and two alternative policies – early retirement and a bundled policy – which would typically arise in a voting game based on pairwise comparisons among all policies[14].

We now turn to the selection of the feasible policy responses by analyzing the pairwise comparisons among the status quo and respectively early retirement and the bundled policy.

4.1. Status Quo and Early Retirement

We consider a pairwise majority voting at time T between the status quo and the system with the early retirement provision. The voting behavior of the elderly is straightforward: those with incomplete working history vote for early retirement, while the others abstain, since they receive the same treatment under the two policies. Young voters, on the other hand, may not be willing to sustain early retirement – or any social security system – unless they expect this transfer policy to be in place in their old age. This is a common feature of virtually all voting models of intergenerational transfers (for a review

[13]See Benheim, Ragel and Rayo (2002) – and references therein – for a recent discussion of the power of control in agenda setting.

[14]Notice however that Condorcet cycles may still potentially arise among feasible policies in the second stage.

see Galasso and Profeta, 2002). As many contributions in this literature, we concentrate on subgame perfect equilibrium outcomes of this voting game. If young agents believe their current voting decision to influence future voters, they may be willing to sustain an early retirement provision – and to retire early – since they expect to be rewarded in their old age with an early retirement pension. Young voters who do not expect to retire early vote for the status quo, in order to avoid the larger tax burden.

It is useful to define the innate ability level of an agent who is indifferent between voting for the status quo and voting for the early retirement provision – and thus retiring early: $x^{ES} = \left(K^{ER} - K^{SQ}\right) / \left(I^{SQ} - I^{ER}\right)$. The next proposition hinges on the previous discussion to find a condition for the early retirement provision to be a subgame perfect equilibrium of our pairwise voting game[15].

Proposition 4.1. *If* $F\left(x^{ES}\right) > \frac{1}{2}\left(1 - \frac{F\left(x^{R}\right)}{1+n}\right)$, *then the early retirement provision represents a (Subgame perfect) political equilibrium outcome of our pairwise voting game against the status quo, at every election since period* T, *and hence is feasible.*

This proposition suggests that the political sustainability of the early retirement provision – vis a vis the status quo – increases the larger is the group of agents willing to retire early, $F\left(x^{R}\right)$, and the higher is the degree of income inequality in the economy[16].

4.2. Status Quo and Bundled Policy

We now examine the pairwise comparison between our bundled policy and the status quo. Elderly with incomplete working history clearly prefer the bundled policy, which awards them a transfer, T_T^O; whereas all other elderly are indifferent and thus abstain. Among the young, for any $s_T > 0$ – i.e., as long as some transfers, T_T^O, are paid to the elderly with incomplete working history – rich individuals prefer the status quo,

[15] It is well known that social security games give typically rise to multiple equilibria (see Galasso and Profeta, 2002). We shall discuss this issue in section 4.5.

[16] See Conde-Ruiz and Galasso (2003) for the analysis of a voting game in which agents vote over the size of the social security system and over the existence of the early retirement provision.

which imposes a lower tax burden. Low income young, on the other hand, may benefit from the bundled policy, if this provides enough income redistribution. We can thus define the innate ability level of a young agent who is indifferent between voting for the status quo or for the bundled policy: $x^{BS}(s_T) = \left(K^{BP} - K^{SQ}\right) / \left(I^{SQ} - I^{BP}\right)$. This threshold depends on s_T to indicate that some degree of income redistribution is required for low-ability young to support the bundled policy. We can now state the following proposition:

Proposition 4.2. *If $F\left(x^{BS}(s_T)\right) > \frac{1}{2}\left(1 - \frac{F(x^R)}{1+n}\right)$, then the bundled policy characterized by the tax rate s_T (> 0) represents a political equilibrium outcome of our pairwise voting game against the status quo, at time T, and hence is feasible.*

In a nutshell, to defeat the status quo in a pairwise majoritarian voting game, the bundled policy has to generate enough redistribution among the young that the voting coalition between the elderly with incomplete working history and the low ability young who benefit from the policy constitutes a majority of the voters.

4.3. Bundled Policy and Early Retirement

We can now turn to the pairwise voting game between a feasible bundled policy and the early retirement provision. Since the political support for early retirement hinges on expectation of future policies, we focus on subgame perfect equilibrium outcomes, thereby allowing young agents to believe that their current voting behavior may have an influence on future voters.

As discussed in section 3, the elderly receive equal treatment under early retirement and under bundled policy, and thus abstain from voting. To analyze the voting behavior of the young, we have to distinguish those agents who under early retirement would retire early – the early retirees – from those who would not. Let $x^{EB}(s_T)$ be the ability level of a former type of agent – i.e., an early retiree – who is indifferent between voting for the bundled policy or for the early retirement provision: $x^{EB}(s_T) = \left(K^{ER} - K^{BP}\right) / \left(I^{BP} - I^{ER}\right)$. And let $x^{NB}(s_T)$ be the ability level of a latter type of agent, who is indifferent between the two policies: $x^{NB}(s_T) = \left(K^{NR} - K^{BP}\right) / \left(I^{BP} - I^{NR}\right)$. Clearly, both thresholds depend on the tax rate s_T, which characterizes the degree of redistribution in the bundled policy. Moreover, notice that the feasible bundled policies are indexed by the tax rate s_T as shown in Proposition 4.2. Finally, let $\widetilde{x}^{EB}(s_T) = Max\left\{0, x^{EB}(s_T)\right\}$ and $\widetilde{x}^{NB}(s_T) = Max\left\{0, x^{NB}(s_T)\right\}$. We can now state the following proposition, which provides a comparison between these two policies in a pairwise voting game. Notice that the winner in this pairwise voting game between feasible early retirement and bundled policy is a Condorcet winner of our political game, since both policies belong to the win-set of the status quo.

Proposition 4.3. *A bundled policy characterized by the tax rate s_T represents a (Subgame perfect) political equilibrium outcome of our pairwise voting game against early retirement, at every election since time T, if the tax rate s_T is such that one of the following conditions holds:*

- *For $I^{BP} > I^{NR} > I^{ER}$ (small s_T): $F\left(\widetilde{x}^{EB}(s_T)\right) < 1/2$;*
- *For $I^{NR} > I^{BP} > I^{ER}$ (medium s_T): $F\left(\widetilde{x}^{NB}(s_T)\right) - F\left(\widetilde{x}^{EB}(s_T)\right) > 1/2$;*
- *For $I^{NR} > I^{ER} > I^{BP}$ (large s_T): $F\left(\min\left\{\widetilde{x}^{EB}(s_T), \widetilde{x}^{NB}(s_T)\right\}\right) > 1/2$.*

This proposition suggests that the composition of the voting coalition in favor of the bundled policy – and against early retirement – depends on the degree of redistribution at time T, and thus on s_T. Figures 2 to 4 display the utility by ability types under the two policies for different values of s_T, and provide a graphic interpretation of this proposition. For small s_T, the bundled policy is less costly than early retirement, and thus all young voters who do not expect to retire early will support the bundled policy. Even the early retirees with medium ability – above the threshold $x^{EB}(s_T)$ – will vote for the bundled policy, since the benefit from the reduction in the tax burden prevails over the utility from the pension transfer and from leisure (see figure 2). For medium s_T, there is more redistribution, and the tax burden under the bundled policy becomes larger than under early retirement. In this case (see figure 3), the voting coalition in favor of the bundled policy is composed of the medium ability types, $x^{EB}(s_T) < x < x^{NB}(s_T)$. Among these agents, the early retirees benefit only marginally from retiring early, and thus prefer the redistribution provided by the bundled policy; while for the agents who retire at normal retirement age, the two systems have similar costs, but the bundled policy provides a larger benefit, since it awards them a transfer, T_T^Y. Notice that in this case early retirement is supported by a coalition of the extreme: the poorest and the richest young. Finally, for large values of the tax rate s_T, the tax burden is large and finances a massive redistribution. In this case (see figure 4), the support for the bundled policy comes from the low ability agents, who are less penalized by the high taxes and benefit from the redistribution. To summarize, a reduction in s_T decreases the support for the bundled policy against early retirement among the low-income young, while increasing the support among the high-income young. The numerical example of the next section will quantify these effects.

Taken together, propositions 4.2 and 4.3 suggest that there exists a trade-off in choosing the degree of redistribution for the bundled policy. In fact, while a high degree of redistribution – a large s_T – is needed for the bundled policy to be voted by low ability young and thus to be feasible, i.e., to defeat the status quo, a low degree of redistribution – a small s_T – typically increases the support for the bundled policy against the early retirement provision. Whether there exists an intermediate level of redistribution, which allows the bundled policy to defeat both the status quo and early retirement, it depends on several elements, such as the size of the initial mass of workers who were forced to exit the labor market, the degree of income inequality and the impact that these policies have on the growth of the economy.

4.4. A Numerical Example

To obtain a flavor of these results and to provides a quantitative assessment of the relative importance of the effects discussed above, we parametrize our simple model to the Italian social security system. Every period corresponds to 40 years, however, the elderly only survive during half of the period, i.e., for 20 years. Thus, the first period includes agents who are 25 to 64 years old, while the second those who are 65 to 84. Population grows at 1% per year. In the human capital accumulation, the relative importance of the education, γ, is set equal to 0.25, while the productivity parameter, θ, is calibrated to obtain an annual growth rate of the economy of 1.5% and is equal to 2.4. The relative abilities, z, are distributed according to a piecewise uniform density function, whose parameters are calibrated to give a median to mean ratio of 0.75.

At steady state, under the status quo, the tax rate, $\overline{\tau}^{SQ}$, is almost 20%, in line with the average contribution rate before the adoption of generous early retirement provisions. The deadweight loss due to the distortionary taxation is characterized by the following function: $D(\tau) = (1-\tau)^{\lambda}$ with $\lambda = 2/3$, which implies that the maximum revenue is obtained for $\tau = 60\%$.

Under early retirement, the minimum retirement age, Θ, is set equal to 4/5 of the first period, and thus to 57 years. According to the Italian legislation – prior to the 1995 reform – early retirees would then obtain 80% of the full pension: $\alpha = 0.8$. A crucial element in our calculation is the mass of early retirees. Using Bank of Italy survey data, we calculate the median retirement age in 1993 to be 57 years. The valuation of leisure, δ, is thus calibrated to obtain that the endogenous mass of early retirees, $F\left(x^R\right)$, corresponds to 50% of the working population. We obtain $\delta = 0.46$. The social security system with early retirement is financed by a payroll tax on labor income. We set this tax rate, τ^{ER}, to 25%, which is in line with the average Italian tax rate over the last thirty years. Moreover, we consider that, under the status quo, the elderly with incomplete working history would be rewarded at time T a minimum non-contributory pension, which provides them a transfer equal to 30% of the full pension. This transfer is meant to capture a feature of the Italian social security system, which allows elderly people with low income who do not have a complete working history to receive a so called "social" pension.

Under this parametrization, at time T, the status quo would be characterized by a tax rate equal to 11.7% while the tax rate under early retirement, τ^{ER}, would be 25%, and the early retirement provision would defeat the status quo by a tiny margin, with 51% of the votes.

A feasible bundled policy, i.e., one that is preferred by a majority of voters to the status quo, would require, at time T, intermediate degrees of redistribution: s_T between 20% and 26%. This would imply that a measure of the overall tax rate for the bundled policy, $s_T + \tau_T^{BP} - s_T \tau_T^{BP}$, would range between 29% and 37.7%, while the status quo tax rate would be only 11.7%. At $T+1$, the tax rate under both policies would be 19.8%. However, the pension under the status quo would be at least 7.6% larger than under the bundled policy, due to the higher growth rate of the economy under the status quo at time T.

For these intermediate degrees of redistribution, corresponding to figure 2, the bundled policy would not defeat early retirement. To see why, consider $s_T = 20\%$. The overall tax rate of the bundled policy at time T exceeds the cost of early retirement, 29% vs. 25% – although early retirement increases the tax burden on all future generations, 25% vs. 19.8% – and there is virtually no difference in the full pension at time $T+1$. In this case, poor – whom ability is below 39% of the average – and rich agents – whom ability is above 172% of the average – prefer early retirement, which obtains a voting majority of 60%, as shown in figure 5. As s_T increases, the bundled policy gains support among the poor – because of the increase in the redistribution – and loses votes among the middle income agents – due to the increase in the tax burden. The overall effect favor early retirement, whose voting majority raises steadily from 60% for $s_T = 20\%$ to

87.7% for $s_T = 27\%$.

4.5. Multiplicity of Equilibria

In our setting, the early retirement provision, as well as any policy which contemplates a social security system, bases its political support on the expectations – held by the young – that the scheme will be in place in the future. Young workers are willing to foot the current bill, as they expect to be rewarded with a corresponding transfer in their old-age. These social security game, played by successive generations of voters, have been shown to sustain different forms of intergenerational transfers (see Galasso and Profeta, 2002 for a survey). Indeed, several sequences of tax rates and of pension transfers can be sustained as these game typically generates multiple equilibria. For instance, an extreme case occurs when the young believe to receive no transfer in their old age, in which case no social security arises. Contributions in the political economy literature of social security have adopted different selection criteria to single out an equilibrium outcome. Esteban and Sakovics (1993) introduce a transaction cost, while Azariadis and Galasso (2002) consider a constitutional veto power, to shrink the set of equilibria. Boldrin and Rustichini (2000) select their equilibrium by assigning the entire gain from the social security system to the first generation to introduce the system while leaving all future median voters indifferent. Our paper is closer in spirit to Cooley and Soares (1999), since – by considering a constant (relative to the stock of human capital) sequence of pension transfers – we assume that the initial median voter shares the gains from introducing the system with all future generations of (median) voters.

5. Conclusions

In Conde-Ruiz and Galasso (2003), we suggested that the adoption of the early retirement provision, which in most industrialized countries took place between the late 60s and the 70s, represented a political response to the appearance of a large group of redundant middle-aged workers. These workers had an incomplete working history, and thus were not entitled to a pension transfer in their old age. This has not been a one-time policy. Since then, in fact, this provision has become a common early pathway out of the labor market for several generations of workers.

In this paper, we argue that the early retirement provision introduces a long run distortion in the economy. In fact, the prospect of retiring early – by shortening the working life – reduces the incentives to accumulate human capital, thereby decreasing economic growth. This disincentive is larger for the low-ability workers, who have a relatively higher evaluation of leisure, their foregone labor income being lower. However, this provision shifts part of the increase in the tax burden on future generations.

Was this distortionary policy the only possible response to the appearance of redundant workers with no entitlement to a pension? Certainly not. A wide variety of temporary policies were available to transfer resources to the workers initially hit by the negative shock in their old age. However, these one-time policies did not typically enjoy the support of a large share of voters, and thus did not constitute a political equilibrium.

To see this, we have analyzed alternative policies that (i) provide the elderly with incomplete working history with the same transfer as the early retirement pension, (ii) have no impact on the elderly entitled to an old-age pension, and (iii) provide a lump-sum (redistributive) transfer to the young. These bundled policies are then compared in a pairwise majoritarian voting to the status quo and to early retirement.

A clear trade-off emerges from comparing a bundled policy to the early retirement provision. To win the support of the low-ability young – and thereby to defeat the status quo – a bundled policy has to generate enough income redistribution among the young. Thus, unlike early retirement, this one-time policy does not reduce the long-term economic growth, but imposes a larger tax burden on the current young generation of workers. In a pairwise comparison, early retirement wins the support of a coalition of the extreme: high income workers, who do not plan to retire early, but prefer this provision because of its lower current tax burden, and the low income workers, who expect to retire early.

Finally, what can we say about the future of early retirement? In our model, the aging process leads to higher social security tax rate, in order to guarantee the vested interests of the elderly, i.e., their pensions, and to lower economic growth. In the political game, population aging tends to create more support for early retirement by increasing the political power of the elderly and by exacerbating the one-time distortion associated to the alternative bundled policy. Thus, despite creating more financial distress, aging indeed increases the political support for early retirement.

Is there however a limit – either a financial or political constraint – to the size of a social security system? It could reasonably be argued that a political system should allow the negative effects of demographic shocks to be shared across generations[17]. For instance, the social security tax rate that finances the pension transfers could be directly – or via political representation – voted upon. In that case, young workers may choose to oppose the increase in the tax rate needed to retain the pension transfer in an aging society. In such a political environment, the support for the early retirement may indeed decrease because of the population aging, along the lines of the work by Boldrin and Rustichini (2000), who show that, in the context of a decreasing population growth rate, a majority of voters may eventually choose to dismantle the existing PAYG social security system.

[17] See Cremer and Pestieau (2000) for a discussion of the effects of population aging on the social security system under different specifications of the political process.

Table 1

Males Aged 60-64 Labor Force Participation

	1960	1980	2000
Canada	79.7%	64.9%	46.7%
France	68.7%	46.4%	17.8%
Germany	74.8%	47.8%	29.8%
Italy	59.7%	38.9%	31.9%
Japan	84.3%	81.8%	72.1%
Netherlands	84.7%	49.1%	19.1%
Spain	88.1%	64.5%	42.0%
Sweden	78.6%	70.4%	59.9%
UK	87.4%	75.0%	53.1%
US	81.5%	60.1%	50.3%

Data Source: International Labor Organization programme on global estimates and projections of the economically active population (ww.ilo.org)

Table 2

Proportion of Retirees and Inactive among Individuals Aged 60 to 65 by Education Level

	Retirees			Inactive		
	Low	Medium	High	Low	Medium	High
Belgium	35%	18%	14%	28%	16%	6%
Denmark	36%	15%	12%	17%	11%	4%
Finland	25%	15%	8%	30%	12%	11%
France	37%	13%	9%	22%	11%	17%
Germany	25%	20%	16%	31%	10%	5%
Greece	30%	9%	9%	30%	28%	12%
Italy	22%	8%	9%	33%	23%	7%
Spain	17%	3%	5%	42%	44%	14%
UK	24%	17%	10%	25%	19%	14%

Data Source: European Commission Household Panel (1996)

A. Appendix

A.1. Proof of Lemma 2.1

An innate ability type x_{t-1} young agent chooses her level of human capital by maximizing her utility subject to the human capital accumulation technology at eq. 2.1. It is easy to see that the individual optimal level of human capital is $e_t^*(x_{t-1}) = (\theta\gamma(1-\tau_t)\phi_t^*)^{\frac{1}{1-\gamma}} x_{t-1}$. Moreover, notice that since the function $\Gamma_{t+1}^t(\phi_t) = \Gamma_t^t(\phi_t)$ is discrete, individuals will either retire at the minimum retirement age, $\phi_t = \Theta$, or at mandatory age, $\phi_t = 1$. Given the human capital accumulation decision $e_t^*(x_{t-1})$, and the function $\Gamma_{t+1}^t(\phi_t)$ at eq. 2.2, the utility associated with retiring at normal retirement age is equal to $(1-\gamma)(\theta\gamma^\gamma(1-\tau_t))^{\frac{1}{1-\gamma}} x_{t-1} + \Gamma_{t+1}^t(1) P_{t+1}/(1+r)$, while the utility associated with retiring early is $(1-\gamma)(\Theta\theta\gamma^\gamma(1-\tau_t))^{\frac{1}{1-\gamma}} x_{t-1} + (1-\Theta)\left(\Gamma_t^t(\Theta) P_t^{ER} + d_t\right) + \Gamma_{t+1}^t(\Theta) P_{t+1}/(1+r)$. It is straightforward to see that the ability type of an agent who is indifferent between retiring early or at normal retirement age is

$$x_{t-1}^R = \frac{(1-\Theta)(\alpha_t P_t + d_t) - \frac{1-\alpha_{t+1}}{1+r} P_{t+1}}{(1-\gamma)(\theta\gamma^\gamma(1-\tau_t))^{\frac{1}{1-\gamma}}\left(1-\Theta^{\frac{1}{1-\gamma}}\right)}.$$

Young agents with ability type $x_{t-1} \leq x_{t-1}^R$ will retire early, at $\phi_t(x_{t-1}) = \Theta$, whereas agents with ability type $x_{t-1} > x_{t-1}^R$ will work for the entire working period[18], $\phi_t(x_{t-1}) = 1$. ■

A.2. Proof of Proposition 4.1

As discussed in the text, at any time $t \geq T$ elderly with incomplete working history will vote in favor of early retirement (ER), while the other will abstain (or, analogously, will split their votes equally between the two policies). Thus a majority consists of $\left[1 + F\left(x^R\right)/(1+n)\right]/2$ votes.

[18] We assume that individuals who are indifferent between early retirement and retirement at mandatory age will retire early.

Consider the following strategy profile for the young voter with ability type below x^{ES}: at $t = T$, vote for ER; and at $t > T$, vote for ER, if ER has always been in place since $t = T$, otherwise vote for the status quo (SQ). It is easy to see that at time T a young type $x_{T-1} < x^{ES}$ has no incentive to vote for the SQ. In fact, the utility associated with the SQ is $v^{SQ}_{T,x} = I^{SQ} x_{T-1} + K^{SQ}$ (see eq. 3.3), which for any ability type $x_{T-1} < x^{ES}$ is lower than the utility associated with voting for ER that – according to this strategy profile – is $v^{ER}_{T,x} = I^{ER} x_{T-1} + K^{ER}$ (see eq. 3.4). The same reasoning applies to young agents with ability types $x_t < x^{ES}$ $\forall t \geq T$. Moreover, since the mass of elderly is constant at steady state, i.e., for $t > T$, and is assumed to be equal to the exogenous initial mass, i.e., $F\left(x^R_{T-1}\right) = F\left(x^R_t\right)$ $\forall t \geq T$, then if $F\left(x^{ES}\right) + F\left(x^R\right)/(1+n) > \left[1 + F\left(x^R\right)/(1+n)\right]/2$ the voters is favor of ER constitute a majority. ■

A.3. Proof of Proposition 4.2

See proof of proposition 4.1.

A.4. Proof of Proposition 4.3

At $t = T$, elderly receive equal treatment under the two policies, and thus they abstain. Consider that voting strategies like the one described at proposition 3.1 are available. Then, young voters who would obtain a larger utility from ER, if the ER provision would stay in place forever (or, at least during their lifetime) will vote for ER, since they believe that future voters will sustain the ER provision.

Let us begin with small values of $s_T > 0$, such that $I^{BP} > I^{NR} > I^{ER}$. Notice that for $s_T\,(> 0)$ such that $T^O_T = \alpha P^{ER}_T$ and $T^Y_T = 0$ (i.e., the smallest s_T compatible with the BP), $K^{BP} > K^{NR}$, since $P^{BP}_{T+1} > P^{NR}_{T+1}$ due to the higher growth rate under BP. From figure 1.a, it is easy to see that all young agents who would not retire early receive a higher utility from the BP and vote for BP. Among the early retirees, those with the higher ability than $x^{EB}\,(s_T)$ vote for the BP, whereas those with lower ability would be willing to support ER, provided that they follow a voting strategy as in Proposition 3.1- Thus, BP wins this pairwise comparison if this latter group of agents do not constitute a majority: $F\left(\widetilde{x}^{EB}(s_T)\right) < 1/2$.

For medium values of s_T, such that $I^{NR} > I^{BP} > I^{ER}$, the BP loses the votes of the high income young. As shown in figure 1.b, the BP may however provide more utility than the ER to agents with medium income – both among the agents who would not retire early under ER, $x^R < x < x^{NB}(s_T)$, and among those who would, $x^{EB}(s_T) < x < x^R$. In this case, the BP wins the pairwise election if there are enough of these medium income agents: $F\left(\widetilde{x}^{NB}(s_T)\right) - F\left(\widetilde{x}^{EB}(s_T)\right) > 1/2$. Notice that $x^{EB}(s_T)$ could take negative values, in which case all early retirees prefer the BP.

Finally, for large s_T, such that $I^{NR} > I^{ER} > I^{BP}$ the BP is supported by the low (and possibly medium) ability types (see figure 1.c), due to its high degree of redistribution. High (and medium) ability types prefer the less costly ER provision. Thus, BP wins this pairwise voting game if $F\left(\min\left\{\widetilde{x}^{EB}(s_T), \widetilde{x}^{NB}(s_T)\right\}\right) > 1/2$ ■

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Figure 1: The Time of Events

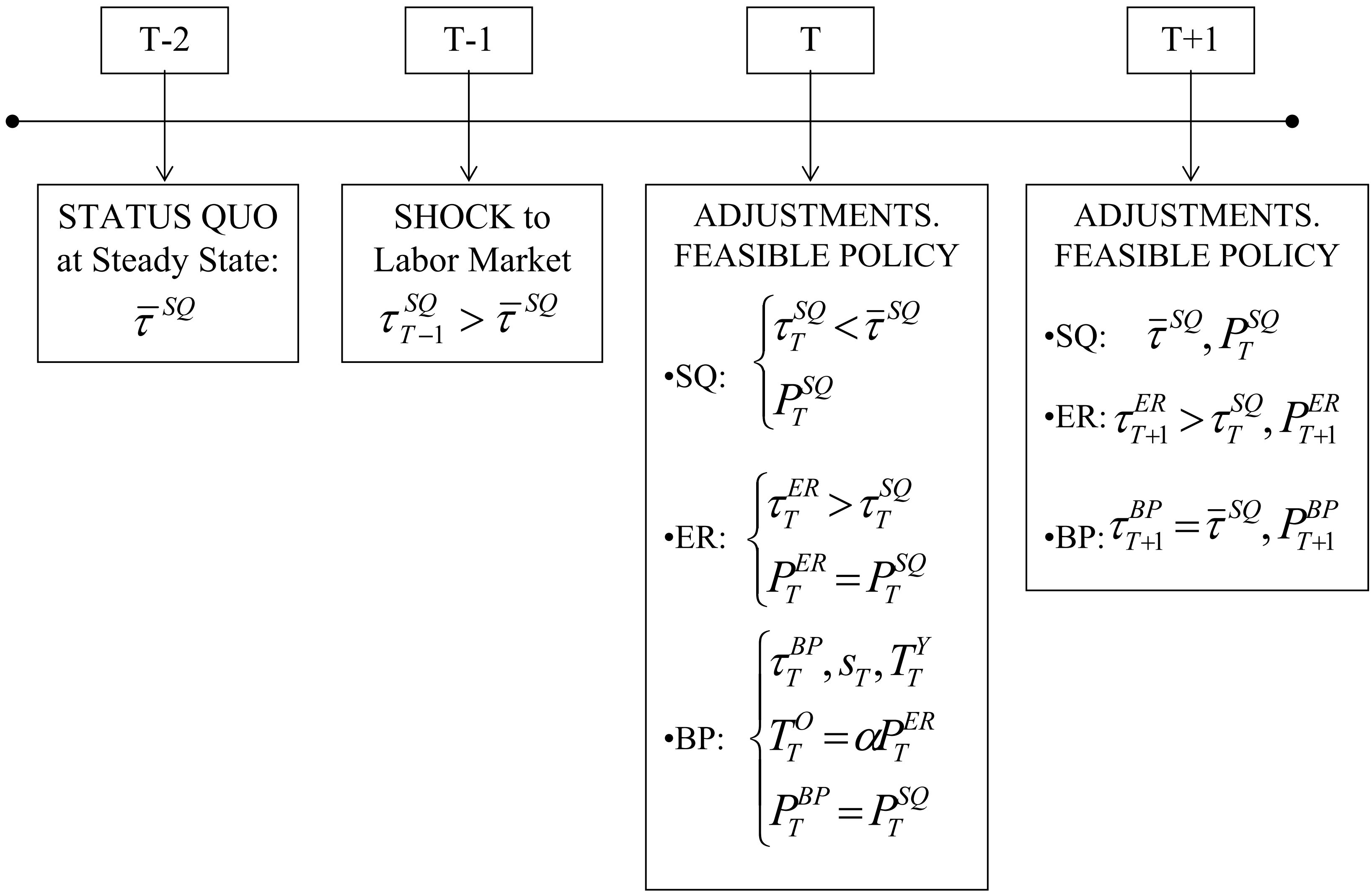

Figure 2: Early Retirement and Bundled Policy. Small s_T

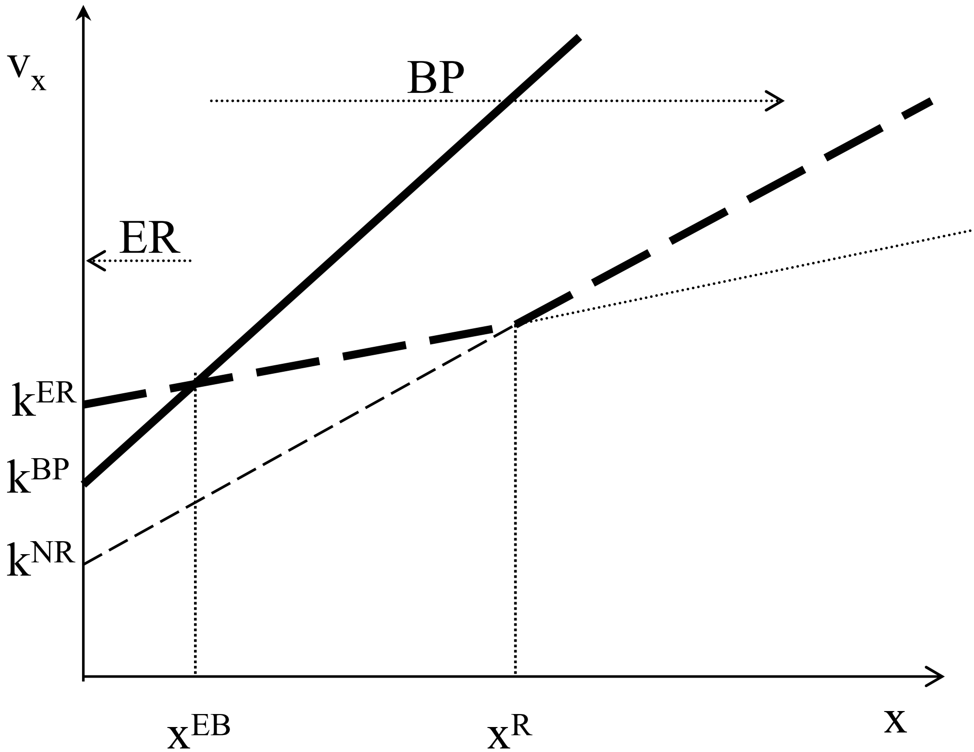

Figure 3: Early Retirement and Bundled Policy. Medium s_T

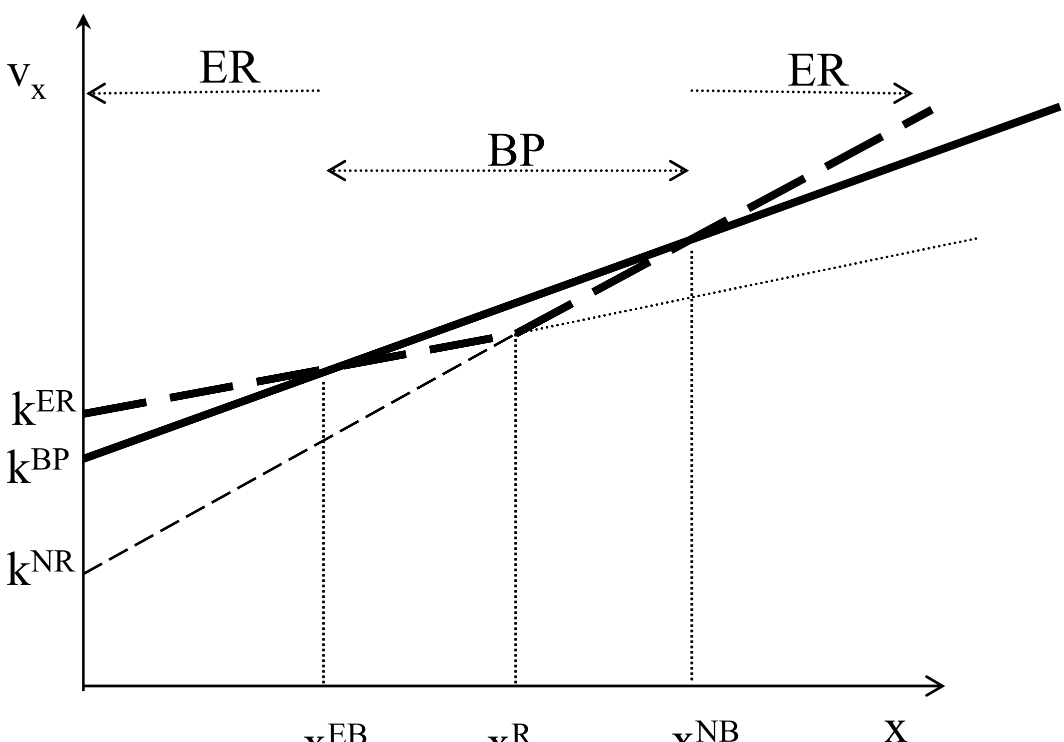

Figure 4: Early Retirement and Bundled Policy. Large s_T

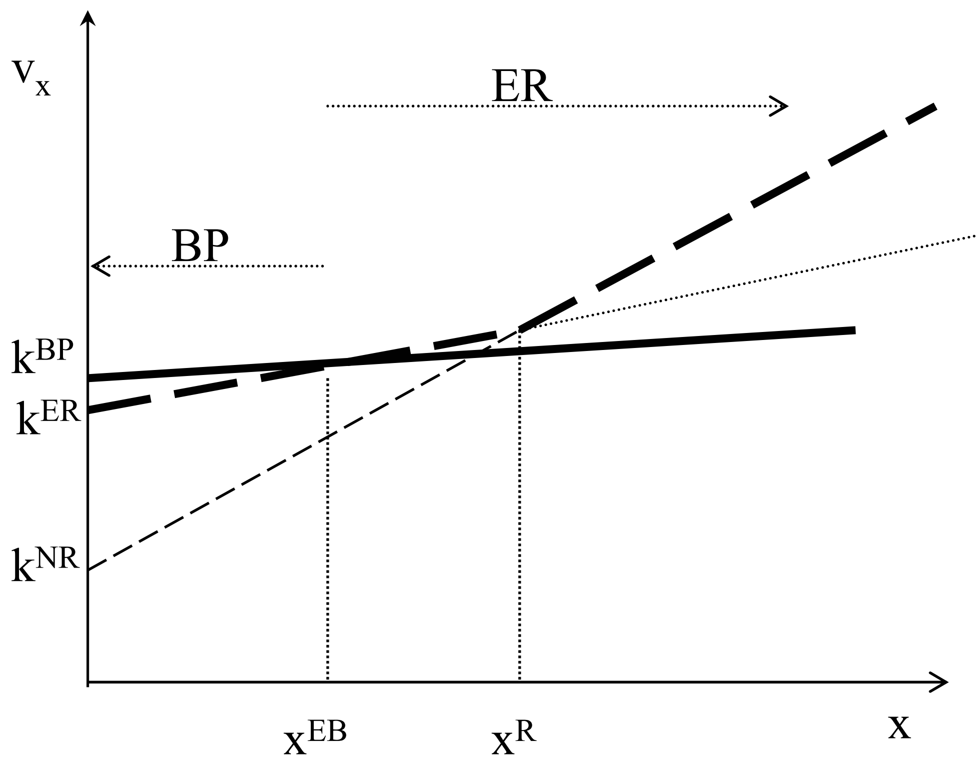

Figure 5: Utility by Ability Level