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STATUS QUO PROBLEM IN SOCIAL SECURITY REFORMS

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Several papers show that a privatization of the social security system will not be politically supported by the current generations. The asymmetry in the timing of welfare gains and losses is what generates a status quo bias in favor of the unfunded system. We explore a simple mechanism to offset the status quo problem using a general-equilibrium overlapping generations model with endogenous labor supply calibrated to the Spanish economy. The mechanism implies a privatization of the social security system together with the elimination of compulsory retirement rules. Along the transition path, this mechanism drastically shortens (from three decades to only one decade) the convergence to the new steady state, diminishing the asymmetry in the timing of welfare gains and losses. As a result, there is an increase beyond 50% in the fraction of individuals that are better off with the implementation of such a reform.

Keywords: Dynamic General Equilibrium, Transitional Dynamics, Simulation, Credit Constraints

1. INTRODUCTION

Progressive ageing of the population has raised policymakers' concern about the financial sustainability of pay-as-you-go social security systems. As a consequence, research on the quantitative evaluation of social security reforms has been one of the main topics in this area. The basic finding from steady-state comparisons is that there is a substantial long-run welfare gain in reforming the system, generated by higher lifetime earnings by individuals. For steady-state analysis of social security systems, see Imrohoroğlu et al. (1995) or Huggett and Ventura (1999), among

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others. Regarding the dynamic response of the economy following a reform, the process of building up capital implies transitions that usually span over a minimum of 20 to 30 years, depending on the particulars of the economic environment. See, for example, Auerbach and Kotlikoff (1987), Huang et al. (1997), and Kotlikoff et al. (1998). Therefore, the welfare gains (materialized through higher lifetime earnings) take time to be realized, and this aspect is crucial for the welfare of generations initially alive; see Conesa and Krueger (1999). At the beginning of the reform, older cohorts experience sizeable welfare losses, associated with the loss of social security payments upon retirement. However, they do not internalize the welfare gains associated with the reform, given the time those take to be realized. This asymmetry in the timing of welfare gains and losses is what causes most of the generations alive at the beginning of the reform to end up experiencing net welfare losses. As a result, there arises a *status quo bias* in favor of the pay-as-you-go social security system, regardless of the substantial long-run welfare gains.

This paper explores a simple mechanism to offset the status quo problem in social security reforms using a general-equilibrium overlapping generations model with endogenous labor supply calibrated to the Spanish economy. The mechanism implies a privatization of the social security system together with the elimination of compulsory retirement rules. The results that we present show that compulsory retirement rules require more attention from a policy design perspective than previously awarded in the literature. In our computational experiments, we show that different compulsory retirement rules affect the conclusions regarding the short-run and long-run effects of a privatization of the social security system.

In general, public pension eligibility implies the existence of constraints on the ability of individuals to supply labor services in the market. In Spain, eligibility is incompatible with any source of labor earnings. [For details of institutional features of social security systems in Spain, see Boldrin et al. (1999); for other countries, see Gruber and Wise (1999)]. Moreover, most European social security systems provide incentives for early retirement; see Börsch-Supan (2000) or Rust and Phelan (1997) for the U.S. economy. In the U.S. social security system, retirement is not compulsory, even though the "earnings test" effectively would highly discourage labor supply of the elderly beyond some age. Recent reforms have addressed this disincentive to work, even though it is too early to assess its effects on labor supply.

Butler (2000), who studies the political feasibility of different pension reform options in Switzerland, and Conesa and Garriga (2000), in a quantitative evaluation for the Spanish case, have pointed out the quantitative importance of distortions introduced by the rest of the fiscal system in evaluating social security systems. In the present paper, therefore, we follow these contributions and explicitly introduce government consumption financed through factor earnings taxation.

The economy is an overlapping generations model characterized by uninsurable uncertainty about the length of lifetime. We rule out annuity markets by assumption and agents face a borrowing constraint.[1] This element provides the standard role of a pay-as-you-go social security system as partial insurance against this

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source of market incompleteness. We compute both steady state and the transitional dynamics associated with a reform. For any given compulsory retirement rule, the labor supply is endogenously determined by individuals. We calibrate the model to the Spanish economy, even though the results are more general than the particulars of the Spanish social security system.

There are four main quantitative conclusions of eliminating the compulsory retirement rule as part of a social security reform.

(i) The long-run change in relative prices associated with a reform is much smaller than in the previous literature.
(ii) Long-run welfare implications of a reform are not substantially affected.
(iii) The time span of the dynamic response of the economy is substantially shortened, so that the transition to the new steady state is much shorter (one decade compared to three decades).
(iv) The shorter transition changes the welfare implications for generations initially alive at the beginning of the reform, increasing the fraction of individuals that are better off. In fact, more than 50% of the generations initially alive are better off with the reform, provided that they can supply labor beyond the age of 65, whereas in the compulsory retirement case, we find 40% potential support for the reform. As a consequence, the elimination of compulsory retirement rules can overcome the status quo bias in favor of the pay-as-you-go system.

The basic intuition is as follows. In standard quantitative exercises, long-run welfare gains associated with a fully funded system are generated by higher capital accumulation. Removing the compulsory retirement rule reduces individuals' need for asset accumulation since they need not rely exclusively on asset returns as a source of income when retired. Also, the labor supply decisions of the elderly generate a substantial increase in aggregate labor supply. Therefore, removing the compulsory retirement rule would imply much smaller long-run changes in relative prices (increase in wages and decrease in interest rates). This aspect generates a quantitative difference from those analyses that directly abstract from the labor/leisure choice or those that keep the compulsory retirement rule.

Nevertheless, our quantitative results show that eliminating the compulsory retirement rule does not substantially change the long-run welfare evaluation of the social security privatization. The reason is that the higher increase in labor supply compensates the smaller increase in wages. Therefore, the increase in lifetime earnings (and consumption) is higher, but hours worked are also higher. Overall, steady-state welfare gains of a funded system are of the same order of magnitude, regardless of whether we consider the labor supply decisions of the elderly or not.

Regarding the transitional dynamics analysis, however, we find that the reform gives rise to much faster convergence to the final steady state of the economy (around 10 years as compared to 30 years for our particular specification). In the transition path following a reform, the dynamic process of adjustment of the capital stock determines the speed of convergence. Since removing compulsory retirement implies a smaller increase in capital accumulation, the transition will be

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faster. Also, without compulsory retirement the endogenous response of aggregate labor supply is higher, so that the initial increase in output per capita is bigger.

The paper is organized as follows. In Section 2, we present the model. In Section 3, we explain the policy experiments considered. Section 4 is a discussion of the calibration of the model to Spanish data. Section 5 contains the results, and Section 6 concludes.

2. ENVIRONMENT

The model is a production economy in discrete time, $t = 1, 2, \ldots$, with three types of agents: households, firms, and government.

The economy is populated by a continuum of ex-ante identical households. At each period, households face uninsurable idiosyncratic uncertainty about the length of their lifetime. Let ψ_j be the survival probability at age j, conditional on being alive at age $j-1$. Total population grows at an exogenous rate n. This generates an endogenous stationary population structure over time, μ, that we normalize to 1, where μ_j denotes the measure of individuals with age j.

There exists a representative firm that uses an aggregate production function $F(K_t, N_t)$ to produce output of the unique final good, Y_t. Let K_t denote the aggregate stock of capital and N_t the aggregate labor supply, measured in efficiency units. The technology $F(\cdot)$ is constant returns to scale, strictly concave, monotonically increasing and satisfies the Inada conditions. We assume that capital depreciates at a constant rate $\delta \in (0, 1)$. The existence of a representative firm and perfectly competitive factor markets implies that input services are paid their marginal products.

Each period, the output of final goods can be used for private consumption, C_t, gross investment, $K_{t+1} - (1-\delta)K_t$, and government consumption, G_t. Hence, for each period, the resource constraint is given by

$$C_t + K_{t+1} - (1-\delta)K_t + G_t \leq F(K_t, N_t), \quad \forall t. \tag{1}$$

We assume that the government and the social security system are two different institutions, with different goals and revenue sources. The social security institution redistributes resources intergenerationally through a pay-as-you-go system, financed with workers' contributions proportional to labor earnings, $\tau_{SS,t}$. The social security system budget constraint is

$$SS_t = \tau_{SS,t} w_t N_t, \tag{2}$$

where SS_t denotes the total expenditure in social security transfers and $w_t N_t$ are aggregate labor earnings. We assume that the social security system is balanced at each period. Individual social security payments are determined as a fixed fraction (replacement rate), b_t, of average labor earnings of individuals currently active at period t.

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The government at each period finances an exogenous sequence of public consumption $\{G_t\}_{t=0}^{\infty}$, using labor income (net of social security contributions) taxes, $\tau_{\ell,t}$, capital income taxes, θ_t, and consumption taxes, $\tau_{c,t}$. Therefore, the period t government budget constraint is

$$G_t = \tau_{c,t} C_t + \tau_{\ell,t}(1 - \tau_{SS,t}) w_t N_t + \theta_t r_t K_t, \quad \forall t, \tag{3}$$

where w_t and r_t are the wage rate and the rental price of capital, respectively. We also assume budget balance at each period t. Notice that labor taxes are defined over labor earnings net of social security contributions, and capital taxes are defined over capital returns net of depreciation.

Households' preferences can be represented by a time-separable utility function defined over consumption and leisure through the life span of agents $\{c_j, (1 - \ell_j)\}_{j=1}^{J}$:

$$\sum_{j=1}^{J} \beta^{j-1} \left(\prod_{i=1}^{j} \psi_i \right) U(c_j, \ell_j), \tag{4}$$

where $\beta > 0$ is the subjective discount factor and $\prod_{i=1}^{j} \psi_i$ is the unconditional probability of being alive at period j. The utility function $U(\cdot)$ is strictly concave, monotone increasing, C^2, and satisfies the Inada conditions. At each point in time households are endowed with one divisible unit of time that can be used to work or can be consumed as leisure. One unit of time of household of age j transforms into ϵ_j units of labor input. Let $\boldsymbol{\epsilon} = (\epsilon_1, \ldots, \epsilon_J)$ be the endowment vector of efficiency units of households, which is assumed to be time invariant. Individuals supply their labor services and assets in competitive markets. Then, they receive a competitive wage, w_t, per efficiency unit of labor supplied in period t, and the rental rate, r_t, per unit of assets. Labor returns are taxed at a rate $\tau_{\ell,t}$ and capital returns are taxed at a rate θ_t. We assume mandatory retirement at age j_r. Once workers are retired, they will receive a lump-sum social security transfer denoted by ss_t, while they are alive. All individuals face a 0 probability of survival beyond age J.

We assume that agents cannot insure themselves against survival uncertainty. This implies that we are ruling out the existence of annuity markets in the economy, thus providing a partial insurance role for a pay-as-you-go social security system. We do so because unfunded public systems of social security traditionally have been viewed as social insurance programs targeting precisely the type of market incompleteness arising from the absence of annuity markets. We will as well assume that agents face a borrowing constraint. The reason to do so is that asset markets are competitive, so that agents can borrow or lend freely in financial markets at a given market rate, r_t. Provided that probability of survival is decreasing in age (and eventually zero), there arises an incentive to borrow from the part of elder individuals, more so for those individuals who certainly will not be alive next period, and therefore will not have to repay their debt. Finally, we assume that households are born without wealth.

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Notice that, even though we have not modeled bequests explicitly, a fraction of the population will leave an accidental bequest. This is a direct result of the absence of annuity markets, so that individuals can die with a positive asset position. Accidental bequests are distributed as lump-sum transfers among agents alive, denoted by B_t.

2.1. Timing of Decisions

The timing of individual decisions is the following: At the beginning of each period, agents of working age receive a lump-sum accidental bequest. Then they decide their labor supply and lend their capital to firms. After production takes place, they receive labor and capital income, consuming part of it and saving for the next period. For retired agents, this is simpler: At the beginning of the period, they receive the lump-sum bequest, lend capital to firms, and receive social security payments and rental income. Then, they decide about consumption and savings. Finally, the survival uncertainty is realized.

2.2. Competitive Equilibrium

Let $a \in \boldsymbol{R}_+$, $j \in \boldsymbol{J} = \{1, 2, \ldots J\}$, and $\boldsymbol{S} = \boldsymbol{R}_+ \times \boldsymbol{J}$. Let μ_j be the measure of agents of age j in the economy, such that $\sum \mu_j = 1$.

DEFINITION 1. *Given a sequence of replacement rates* $\{b_t\}_{t=1}^{\infty}$, *a sequence of government consumption* $\{G_t\}_{t=0}^{\infty}$, *and an initial capital stock* K_1, *a competitive equilibrium is a sequence of individual functions for the households* $\{v_t, c_t, a'_t, l_t : S \to R_+\}_{t=1}^{\infty}$, *sequences of production plans for firms* $\{N_t, K_t\}_{t=1}^{\infty}$, *prices* $\{w_t, r_t\}_{t=1}^{\infty}$, *government policies* $\{\tau_{\ell,t}, \tau_{c,t}, \theta_t, \tau_{SS,t}, ss_t\}_{t=1}^{\infty}$, *and a sequence of accidental transfers* $\{B_t\}_{t=1}^{\infty}$, *such that, for all* t,

(i) *Given prices, policies, transfers, and the initial conditions,* v_t *is the solution of the following problem (where* c_t, a'_t *and* ℓ_t *are the associated policy functions*):

$$v_t(a, j) = \max_{c, a', \ell} \{u(c, \ell) + \beta \psi_{j+1} v_{t+1}(a', j+1)\}, \tag{5}$$

subject to

$$(1 + \tau_{c,t})c + a' \leq (1 - \tau_{\ell,t})(1 - \tau_{SS,t}) w_t \epsilon_j \ell + \cdots$$
$$+ [1 + r_t(1 - \theta_t)](a + B_t), \qquad j < j_r, \tag{6}$$
$$(1 + \tau_{c,t})c + a' \leq ss_t + [1 + r_t(1 - \theta_t)](a + B_t), \quad j \geq j_r, \tag{7}$$
$$a' \geq 0, \tag{8}$$
$$c \geq 0, \tag{9}$$
$$0 \leq \ell \leq 1. \tag{10}$$

The functions $\{c_t, a'_t, \ell_t : S \to R_+\}_{t=1}^{\infty}$ *are the policy functions associated with this optimization problem.*

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(ii) *Factors get paid their marginal products*:

$$r_t = \frac{\partial F(K_t, N_t)}{\partial K_t} - \delta, \tag{11}$$

$$w_t = \frac{\partial F(K_t, N_t)}{\partial N_t}. \tag{12}$$

(iii) *The government policies satisfy*

$$ss_t = b_t \frac{w_t N_t}{\sum_{j=1}^{j_r-1} \mu_j}, \tag{13}$$

$$\tau_{SS,t} w_t N_t = ss_t \sum_{j=j_r}^{J} \mu_j = SS_t, \tag{14}$$

$$G_t = \tau_{c,t} \sum_{j=1}^{J} c_t(a, j)\mu_j + \tau_{\ell,t}(1 - \tau_{SS,t}) w_t N_t + \theta_t r_t K_t. \tag{15}$$

(iv) *Accidental bequests are given by*

$$B_{t+1} = \sum_{j=1}^{J} (1 - \psi_{j+1})\mu_j a_t'(a, j). \tag{16}$$

(v) *Markets clear*

$$K_{t+1} = \sum_{j=1}^{J} \mu_j a_t'(a, j) \tag{17}$$

$$N_t = \sum_{j=1}^{jr-1} \mu_j \epsilon_j \ell_t(a, j) \tag{18}$$

$$\sum_{j=1}^{J} c_t(a, j)\mu_j + K_{t+1} - (1 - \delta)K_t + G_t = F(K_t, N_t). \tag{19}$$

DEFINITION 2. *A stationary equilibrium is an equilibrium where all allocations measured in per capita terms and prices are constant over time.*

Some of the elements on the definitions deserve an explanation. The borrowing constraint faced by individuals appears in equation (8). Given the timing chosen, accidental bequests receive a return. Equation (13) implies that retirement transfers are computed as a fraction b_t of the average wage. Equation (14) implies that the social security system is balanced at each period. Notice also that, by construction, combining equations (13) and (14), we obtain the result that the social security tax is equal to the replacement rate times the dependency ratio (defined as the ratio of retirees to active population, $\sum_{j=j_r}^{J} \mu_j / \sum_{j=1}^{jr-1} \mu_j$).

Equation (15) implies that the government budget constraint is satisfied at each period. Notice that labor earnings are taxed net of social security contributions and

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capital earnings are taxed net of depreciation. Accidental bequests are computed as a fraction of assets owned by those individuals that die at the end of the period and the number of agents that will be alive next period (the total size of population is stationary and normalized to one at each period); see equation (16). Market-clearing conditions for factor markets (capital and labor) and the goods market are described by equations (17), (18), and (19), respectively.

3. POLICY EXPERIMENT

We want to show how the compulsory retirement rules might affect welfare of individuals facing a potential social security reform, as well as long-run welfare effects (steady-state welfare comparison). At the initial steady state, retirement is compulsory at age j_r, so that there is no working decision for individuals of age j_r or older. We explore to what extent removing compulsory retirement might affect the evolution of relative prices as well as the welfare of individuals alive at the beginning of the reform.

To do so, we compute the transitional dynamics associated with a social security reform in two cases. The first case, the benchmark for comparison, implies keeping the compulsory retirement rule. The second case computes the transitional dynamics and welfare changes when individuals are left free to choose how much labor (if any) to supply in the market, regardless of age.

Both reforms are conducted as follows. In period 1, the economy is in the steady state corresponding to an economy with a pay-as-you-go social security system as described earlier. No reform is anticipated by agents in this economy. Then, at the beginning of period 2, the reform is announced and put into place. In the case of a one-shot reform, the replacement rate is set to 0 from then on. Accordingly, social security contributions are also set to zero. Therefore, individuals adjust their labor supply in period 2 as a response to such a reform, but assets are given by their past decisions.

Along the transitional dynamics following such a reform, we opted for fixing the capital earnings tax rate and the consumption tax rate, and let the labor tax rate adjust in order to satisfy the government budget constraint. The results in terms of the evolution of aggregates and the welfare effects are not significantly affected by this choice.

4. CALIBRATION

In this section, we describe the chosen functional forms and the calibration procedure. Preferences are represented by the utility function

$$U(c_j, \ell_j) = \frac{\left[c_j^{\gamma}(1-\ell_j)^{1-\gamma}\right]^{1-\sigma}}{1-\sigma}, \tag{20}$$

where $\gamma \in (0, 1)$ is the consumption share in the utility function and σ is the coefficient of relative risk aversion (the inverse of the elasticity of substitution).

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This utility function collapses into one argument—consumption—once workers are retired.

The technology is a constant-returns-to-scale Cobb-Douglas production function,

$$F(K_t, N_t) = K_t^{\alpha} N_t^{1-a}, \tag{21}$$

where $\alpha \in (0, 1)$.

Parameters in the model have been calibrated so that the initial steady state matches selected aggregates of the Spanish economy.

A period in the model is one year, and we assume that agents live 66 periods with the retirement age at 46. Hence, the model can be interpreted as one in which individuals are born economically at age 20, retire at age 65 and live up to a maximum of 85 years. The survival probabilities $\{\psi_j\}_{j=1}^{J}$ have been taken from the TEMPUS database of the National Institute of Statistics (INE). The empirical evidence for the Spanish economy shows that population has not grown in the past decade; therefore, we set $n = 0$. Given survival probabilities and zero population growth, we chose the maximum age, 85, so that the population structure generated by the model implies a dependency ratio of 0.33, which is consistent with the 1995 Active Population Survey (EPA). Overall, life expectancy implied by the model is 78 years old, conditional on being alive at age 20.[2]

We fix the yearly discount factor to $\beta = 0.986$ and the coefficient of relative risk aversion to $\sigma = 2$. Together, these two values imply a capital–output ratio of 2.4, which is the average ratio for the past decade of private capital to GDP in the Spanish economy.

The consumption share in the utility function has been set so that households allocate about 24.5% of their discretionary time in market activities. Setting $\gamma = 0.35$ in the model implies that individuals work an average while active of 24.5% of their time endowment. Active adults in Spain work an average of 1,250 hours a year, according to the 1995 Wage Survey (Encuesta de Salarios). If we consider discretionary time to be 14 hours a day (from every day, we subtract 8 hours for sleeping and 2 hours for eating and personal care), this implies that total discretionary time is 5,110 hours. This way, we obtain the 24.5% number. Those numbers are consistent with the evidence reported by Prescott (1999) that adults in Spain work on average 40% less than in the U.S. economy.

The labor earnings age profile $\{\epsilon_j\}$ has been taken from the 1995 Wage Survey. Labor services in our model are homogeneous, and so, there is a single wage per efficiency unit of labor. Therefore, we choose $\{\epsilon_j\}$ to match the age profile of average wages in the cross section of Spanish data.[3] However, the empirical evidence gives an age–earnings profile only until age 65; there are no data afterward. Moreover, problems of self-selection could be observed in the efficiency units of those few individuals that work after age 65. Therefore, we determine efficiency units after age 65 through a projection of the same decreasing trend (which already starts at age 54).

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In the technology, we set the capital share $\alpha = 0.375$; see Doménech and Taguas (1995) and Zabalza (1996). The depreciation rate is set to $\delta = 0.09$, which implies an initial steady-state investment-to-output ratio (21.5%), consistent with the average of the past decade.

The social security replacement rate is set to 73.2%, which corresponds to the average retirement pension over the average wage in the data. Then, the dependency ratio implied by the population structure generates a social security contribution of 24.5% of gross labor earnings for the pay-as-you-go system to be self-financing. Notice that social security contributions over labor earnings are 26.6% in the Spanish data.[4]

The level of government consumption is chosen so that, in the initial steady state, the ratio of government consumption to GDP matches the average for the past decade of its empirical counterpart; thus, $G/Y = 0.175$. In determining taxation on factor earnings, we follow Boscá et al. (1999). They develop consistent measures of the effective tax rate on factors' income following the methodology of Mendoza et al. (1994), for OECD countries.

The way we proceed is as follows. We fix the (net of depreciation) capital earnings tax rate to $\theta = 18.7\%$, which corresponds to the effective tax rate on capital returns according to Boscá et al. (1999). Analogously, we fix the consumption tax rate to $\tau_c = 10.5\%$. The government budget constraint was given by (15). So, dividing by output and substituting the factor shares of output, we get, in steady state,

$$\frac{G}{Y} = \tau_c \frac{C}{Y} + \tau_\ell (1 - \tau_{SS})(1 - \alpha) + \theta \left(\alpha - \delta \frac{K}{Y} \right), \tag{22}$$

where

$$\frac{C}{Y} + \delta \frac{K}{Y} + \frac{G}{Y} = 1.$$

Then, to finance a government consumption of 17.5% of GDP, as observed in the data, the government budget constraint implies a tax on labor earnings (net of social security contributions) equal to 17.2%. This figure is roughly consistent with the observed effective taxation of labor earnings (not including social security contributions), since Boscá et al. (1999) find a figure of 18%. Notice that changes in social security contributions and changes in the capital–output ratio will affect the government budget constraint, and the labor tax will adjust according to (22). The resulting (net of depreciation) after-tax return on capital is 5.4%.

5. QUANTITATIVE RESULTS

5.1. Steady State

The steady-state comparisons of the different policy experiments performed are displayed in Table 1. For the most part, we show percentage variation with respect to the initial steady state with a pay-as-you-go social security system.

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Table 1. Steady-state comparisons

Variable	PAYG	FF + Comp. Ret.	FF + Endog. Ret.
After-tax interest rate (%)	5.4	2.7	4.1
Gross wages (Δ%)	—	15.7	6.7
After-tax wages (Δ%)	—	71.1	61.9
Labor supply (Δ%)	—	17.5	32.0
Average hours worked (%)	24.5	27.8	31.3
K/Y ratio (%)	2.4	3.1	2.8
G/Y ratio (%)	17.5	12.9	12.4
Aggregate output (Δ%)	—	36.0	40.9
Aggregate consumption (Δ%)	—	33.8	47.2
Labor tax (%)	17.2	7.6	5.2
Capital tax (%)	18.7	18.7	18.7
Consumption tax (%)	10.5	10.5	10.5
Social security tax (%)	24.5	—	—
Cons. equival. variation (Δ%)	—	44.9	44.0

A reform where individuals are not free to choose their labor supply endogenously after age 65, even in the case of a fully funded system, generates effects on macroeconomic aggregates and welfare gains similar to standard results in the literature that does not consider the labor–leisure choice. See the column labeled FF + Comp. Ret. in Table 1. There is a huge increase in capital accumulation because individuals compensate for the loss of social security payments by increasing their asset accumulation to provide income for their retirement age. Therefore, the capital–output ratio increases substantially, and so do wages and output per capita, while interest rates decrease. The productivity of labor increases by 16%, and this fact, together with the elimination of social security contributions and the decrease in labor income taxes, results in a 71% increase in after-tax wages. Labor supply, measured in efficiency units of labor, increases 18% (partly because of the increase in average hours worked, 13%, and the rest is the result of the change in the age profile of hours worked).

Overall, a newborn in a fully funded system has 45% higher welfare (measured in consumption-equivalent variation). Welfare gains of this size are commonly viewed as an argument (beyond that of unfavorable demographic dynamics) to reform the social security system. In fact, these welfare gains are substantially higher than previous findings in the literature (around 30–35%). The reasons are the consideration in the analysis of the rest of the fiscal system, as shown by Bütler (2000) and Conesa and Garriga (2000), together with the particularly low initial labor supply in the Spanish economy. The effects of the consideration of the rest of the fiscal system are twofold: First, the existence of other distortions (capital and labor earnings taxation) increases the distortionary effects of social security contributions at the margin; that is, distortions are convex, so that gains from their elimination increase. Second, the increase in output implies that the same level of

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government consumption can be financed with smaller tax rates since the reform is revenue-neutral from the point of view of the government budget (not including social security). Notice the important drop in the labor earnings tax since the financial needs relative to output decrease substantially.[5]

Finally, we repeated the same exercise fixing the labor earnings tax at its initial level and adjusting capital taxes to balance the government budget. The results imply even higher capital accumulation, but a smaller increase in labor supply. Overall, the welfare and output increases were of the same order of magnitude. The results of this alternative simulation are available upon request.

However, those results change whenever we consider the labor decisions of the elderly in a fully funded system. The results are displayed in the column labeled FF + Endog. Ret. in Table 1. First, we observe that the increase in aggregate labor supply (measured in efficiency units) is much higher: 32% (28% of this increase is accounted for by the increase in average hours and the rest by the change in the age profile of hours worked). Provided that elder individuals can have labor income, their need to save is significantly reduced. Thus, the increase in aggregate capital is smaller. Overall, where the higher increase in aggregate labor supply dominates, the reform results in a higher increase in aggregate output than in the previous case. Accordingly, a smaller increase in the capital–output ratio results in a much smaller change in relative prices. In terms of welfare evaluation, however, there is no substantial difference; the increase in welfare is equivalent to a 44% increase in consumption over the lifetime of individuals, only one percentage point less than in the compulsory retirement case. The increase in consumption is higher, but this is compensated in terms of utility by the increase in hours worked.

The differences in terms of the age distribution of asset holdings are depicted in Figure 1. We confirm that asset accumulation is smaller whenever individuals are allowed the possibility of working beyond the age of 65, once the reform of the social security system has been implemented. However, there is no substantial change in its age profile. In Figure 1, we label the distribution corresponding to the initial steady state with a pay-as-you-go social security system as PAYG. The final steady state with compulsory retirement and the one where individuals can work beyond age 65 are labeled as FF + Comp. Ret. and FF + End. Ret., respectively.

The age distribution of hours worked for the three scenarios considered is displayed in Figure 2. One important feature of the distribution corresponding to the initial steady state (PAYG) is that hours worked near the age of retirement were already quite low (after age 60, hours worked are below 15% of discretionary time of individuals). This is not the case for the compulsory retirement scenario under a fully funded social security system (FF + Comp. Ret.). If individuals are allowed to work beyond age 65, then they will reduce hours worked before that age, while there is positive labor supply beyond that age. Moreover, labor supply is decreasing until age 77, but then it bounces up. The reason for this behavior comes from survival uncertainty. In fact, if we remove survival uncertainty from the model or, equivalently, introduce annuity markets, this pattern does not appear.

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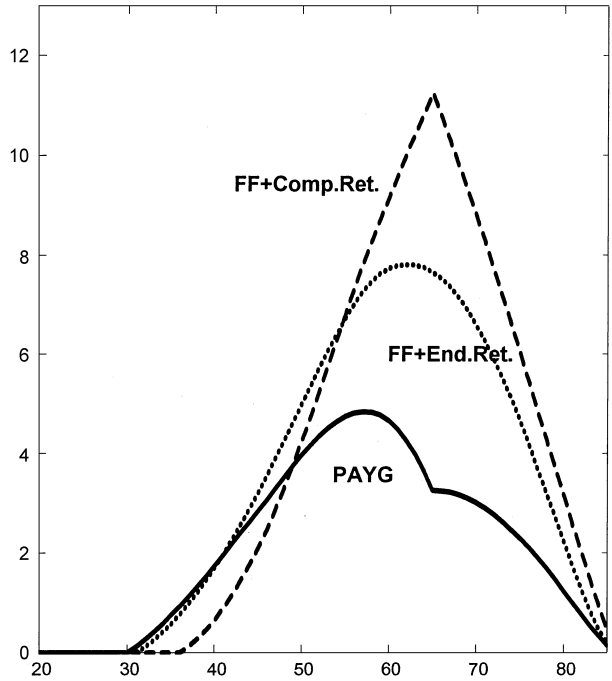


FIGURE 1. Steady-state asset distribution.

The probability of survival beyond the age of 77 is relatively low. Therefore, individuals optimally choose to consume a high fraction of their remaining assets (see Figure 1). Thus, in the event of survival, individuals are left with few assets as a source of income and therefore decide to supply more labor in order to increase their earnings. Clearly, this type of behavior does not arise in the presence of annuity markets. Nevertheless, the implications of this type of behavior for aggregate labor supply are very small, given that both the number of individuals of this age and their efficiency units of labor are rather small.

Finally, the jump in hours worked observed at the age of 30 (34 for the case of a fully funded system with compulsory retirement) corresponds to the moment at which individuals start accumulating positive amounts of assets. The lower the interest rate (the higher the wage), the later individuals start accumulating assets.

5.2. Transitional Dynamics

The transitional dynamics generated by the reform are displayed in Figures 3 and 4, for the case when compulsory retirement is still in place and for the case in which we remove it, respectively.

The key difference between these two reforms comes from the response in aggregate labor supply. Obviously, the initial increase corresponding to the moment

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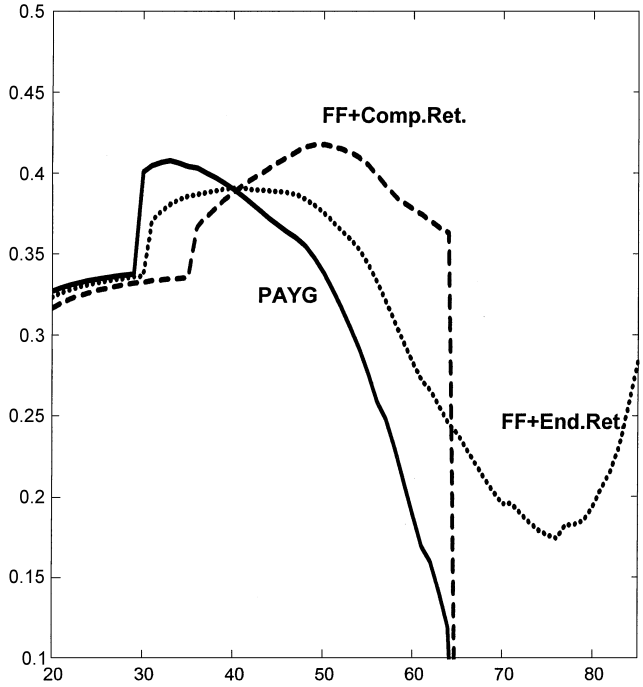


FIGURE 2. Steady-state distribution of hours worked.

when the reform starts is substantially greater when we allow individuals beyond age 65 to choose their hours worked optimally.

As we mentioned before, the increase in asset/capital accumulation corresponding to the case with endogenous labor supply of the elderly is substantially smaller. It is the process of capital accumulation that determines the duration of the transitional dynamics and the time the economy takes to converge to its new steady state.

The basic result of combining these two elements—higher response of hours worked and smaller increase of capital accumulation—is that the transition is much faster in the event of removing compulsory retirement as part of the reform (output per capita reaches its final steady-state value within a decade, as compared to roughly three decades for the compulsory retirement case), displayed in Figure 4.

The speed at which the transition takes place is very important for welfare evaluation purposes. If the reform has associated higher speed of transition, this will imply that the benefits generated by the reform will materialize more quickly, substantially affecting the welfare implications for individuals initially alive at the beginning of the reform. In general, the literature evaluating the transitional dynamics associated with this type of reform implies much longer transitions, so that the welfare gains associated with it (mainly higher wages) do not compensate for

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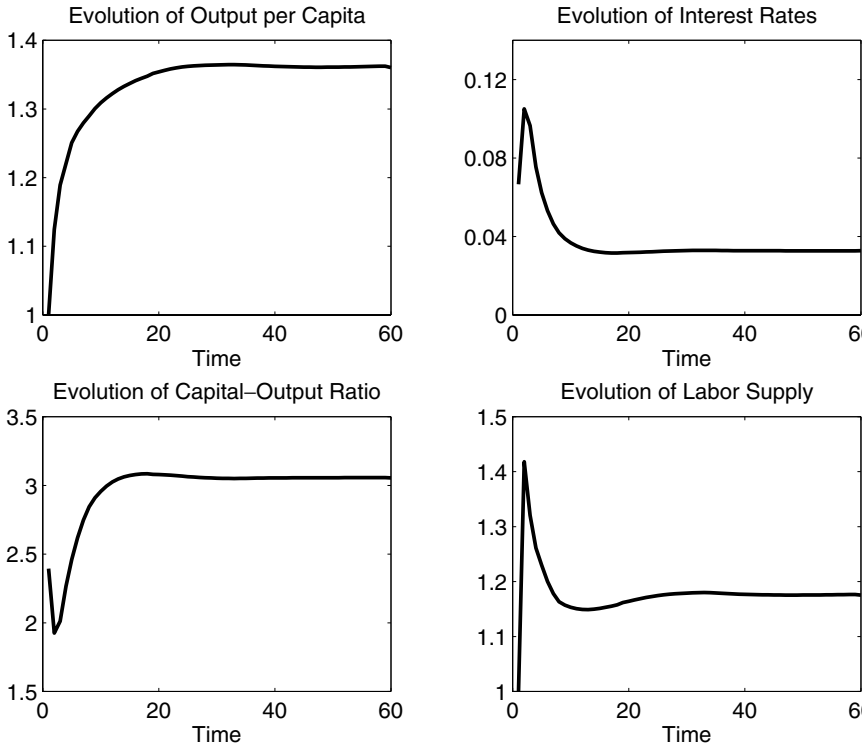


FIGURE 3. Transitional dynamics, compulsory retirement.

the welfare losses associated with the loss of claims on future retirement pensions. Considering the labor–leisure decisions of the elderly slightly increases the speed of convergence following the reform. See Conesa and Krueger (1999) and Conesa and Garriga (2000). Here, we just showed that a policy eliminating a compulsory retirement rule as part of the reform does substantially increase the speed of convergence.

We also evaluated the transitional dynamics for progressive eliminations of the pay-as-you-go social security systems. More precisely, the replacement rate is linearly decreased through a given time span (we tried 20 or more years) or preannouncing the reform a given time in advance. Accordingly, social security payments and contributions are similarly decreased in order to satisfy self-financing of the social security system. The results are similar to those observed in previous works, in the sense that the speed of convergence to the final steady state is reduced, and more so the longer the reform. Overall, welfare losses are smaller, but the fraction of individuals that benefit from the reform is substantially reduced.

The results presented here show that compulsory retirement rules require more attention from a policy design perspective than previously awarded in the literature.

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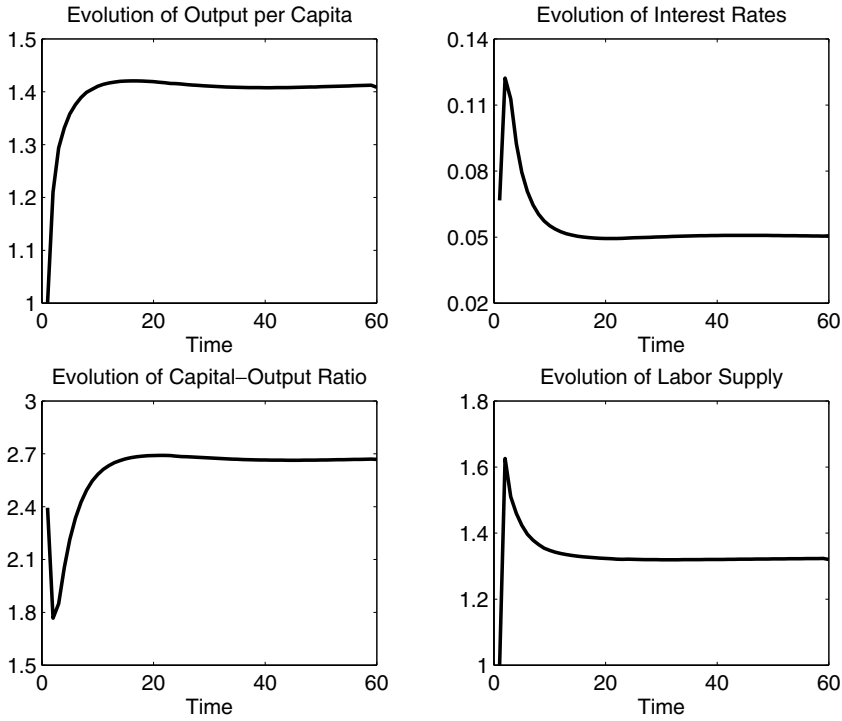


FIGURE 4. Transitional dynamics, endogenous retirement.

5.3. Welfare Evaluation

We already discussed the welfare comparisons corresponding to steady-state outcomes, using consumption-equivalent variation as a welfare measure. There were important welfare gains in the long run, and they did not differ substantially depending on whether the compulsory retirement rule is maintained or removed. More relevant is evaluating the welfare implications for individuals initially alive at the beginning of the reform, and this is possible provided we have computed the transitional dynamics associated with the reform.

The fraction of the initial population that ends up experiencing welfare gains is a measure of popular support that this type of reform might have. Conversely, the fraction of individuals that end up realizing welfare losses is a measure of the *status quo* bias in favor of the pay-as-you-go social security system. However, this measure must be interpreted with caution. They cannot be interpreted as political economy outcomes unless one takes the naive approach of assuming that individuals forecast that once policies are put into place those will never be changed again by the political process.[6]

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To illustrate this point, suppose we would have proceeded conversely, computing the initial equilibrium of a fully funded system and computing the transitional dynamics associated with starting a pay-as-you-go social security system. If we were to evaluate the willingness of individuals to implement such a policy, the answer would be positive; most of the individuals initially alive are better off when a pay-as-you-go social security system is put into place. In fact, this answer is quite intuitive; implementing such a system implies free-riding on the part of middle-and old-age generations with respect to young and future generations. In a political economy equilibrium, individuals currently alive would take into account incentives of future individuals to revert this type of reform; moreover, the same individuals would change their political position through time, depending on age. Thus, an evaluation of this type of reform from a political economy perspective is much more complex and goes beyond the scope of this paper. For political economy approaches to social security systems, see Cooley and Soares (1996, 1999), Galasso (1999), and Boldrin and Rustichini (2000).

The welfare impact of the reform, measured in consumption-equivalent variation, is displayed in Figure 5, for the two cases examined. Notice that welfare gains for young individuals are quite high, reaching levels of almost 40%. Then, welfare gains are decreasing with age and eventually become negative. Notice that welfare losses for individuals currently obtaining a retirement pension are huge, in particular for the older ones.

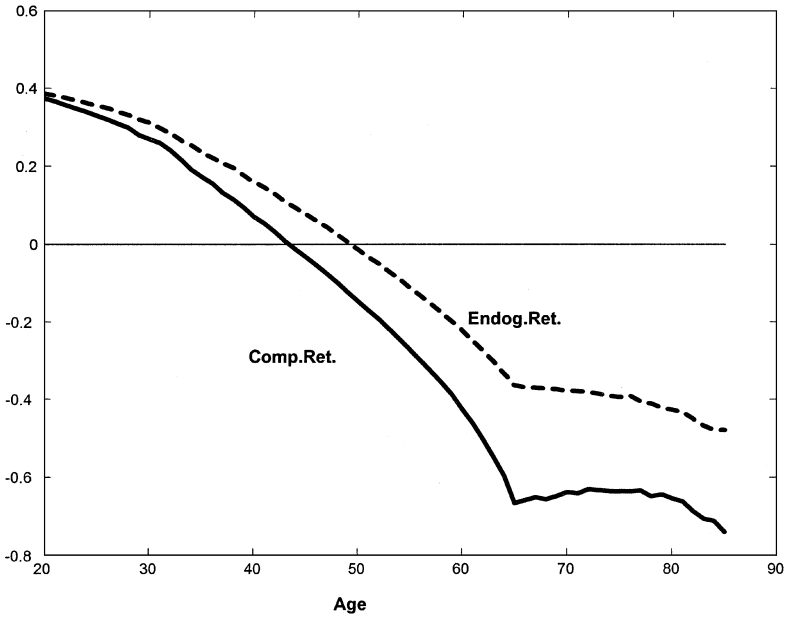


Figure 5. Equivalent variation in consumption.

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Notice that in the case in which the compulsory retirement rule is eliminated welfare losses are more moderate and a higher fraction of the population experiences welfare gains. Obviously, the negative impact of the reform for individuals already retired or near retirement is substantially smaller. The option of supplying labor in the market allows that result.

Individuals who experience welfare gains in the case of compulsory retirement are those younger than 44. However, whenever we allow for endogenous labor supply, individuals younger than 50 experience welfare gains. Overall, given the population structure, 40.6% of the population would be better off in the first case; this percentage is increased to 50.6% (breaking the *status quo* bias) in the case of removing the compulsory retirement rule. The reason for this result is that the transitional dynamics imply much faster convergence to the new steady state, so that middle-age individuals have time to benefit from the higher wages associated with the reform, compensating for the welfare loss due to the loss of a future retirement pension.

Progressive reforms substantially reduce both the size of welfare gains and losses and the fraction of individuals that is better off with the reform.

It is important to put these results in perspective, comparing them with the welfare gains associated with steady-state comparisons. A benevolent legislator, taking into account the long-run effects of a reform, could opt for keeping a system of compulsory retirement, even though it would go against individuals' incentives. However, in terms of maximizing the fraction of individuals initially alive that might be better off with a reform or minimizing welfare losses for individuals alive at the beginning of the reform, the option would be the reverse: eliminate the compulsory retirement rule.

6. CONCLUSIONS

We explore the role of compulsory retirement for the quantitative evaluation of social security reforms.

This paper explores a simple mechanism to offset the status quo problem in Social Security reforms using a general-equilibrium overlapping generations model with endogenous labor supply calibrated to the Spanish economy. The mechanism implies a privatization of the social security system together with the elimination of compulsory retirement rules. Compulsory retirement rules are associated with pay-as-you-go social security systems in most European countries, and in particular in Spain, and there seems to be no justification to maintain such rules when reforming the social security system.

The results we present here show that compulsory retirement rules require more attention from a policy design perspective than previously awarded in the literature. In our computational experiments, we show that different compulsory retirement rules affect the conclusions regarding the short-run and long-run effects

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of a privatization of the social security system. There are four main quantitative conclusions of our exercise:

(i) The long-run change in relative prices associated with a reform is much smaller than in the previous literature.
(ii) Long-run welfare implications of a reform are not substantially affected.
(iii) The time span of the dynamic response of the economy is substantially shortened, so that the transition to the new steady state is much shorter (one decade compared to three decades) due to the higher increase in labor supply and less need for capital accumulation.
(iv) Welfare implications for initial generations are more favorable than those previously found in the literature. The shorter transition changes the welfare implications for generations initially alive at the beginning of the reform, increasing the fraction of individuals that is better off (smaller welfare losses and higher fraction of the population experiencing welfare gains). In fact, more than 50% of the generations initially alive are better off with the reform, provided that they can supply labor beyond the age of 65, whereas in the compulsory retirement case, we find 40% potential support for the reform. As a consequence, the elimination of compulsory retirement rules can overcome the status quo bias in favor of the pay-as-you-go system.

NOTES

1. With competitive asset markets, individuals with low survival probability will have an incentive to borrow as much as they can. The presence of borrowing constraint rules out this incentive problem.

2. Alternatively, we could have decided to choose the maximum age in order to match life expectancy for individuals alive at age 20. However, given the emphasis in social security issues, we decided to match the dependency ratio. Nevertheless, the implied life expectancy is empirically plausible (unconditional life expectancy in Spain was 77.5 in 1999 and projections are of 79 for 2020).

3. Álvarez-Albelo (2000), in a theoretical framework very similar to ours, determines endogenously the age earnings profile of individuals through a process of learning-by-doing, and studies how this aspect affects the labor supply decisions of individuals.

4. Boscá et al. (1999) estimate an equivalent tax rate of social security contributions on labor earnings around 22%. Our number, obtained directly from replacement rates is in between these two figures. Notice that we are assuming a stationary population structure and a social security balanced budget.

5. In alternative exercises, we decided to fix government consumption as a fraction of GDP, so that labor taxes drop less than in the scenario reported. Clearly, this type of policy implies smaller welfare gains associated with the reform. We opted for fixing the level of government consumption (not its ratio over GDP) so that the reform is revenue-neutral.

6. Equivalently, we could assume that there is a commitment technology available to the government to bind future policies to the outcome of the initial election.

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