Political (In)Stability of Social Security Reform*

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Abstract

In this paper we consider an economy populated by overlapping generations, who vote on abolishing the funded system and replacing it with the pay-as-you-go scheme (i.e. unprivatizing the pension system). We compare politically stable and politically unstable reforms and show that even if the funded system is overall welfare enhancing, the cohort distribution of benefits along the transition path turns unprivatizing social security politically favorable.

Key words: pension system reform, time inconsistency, welfare

JEL Codes: H55, D72, C68, E17, E27

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1 Introduction and motivation

With the aging population a number of countries underwent a reform from defined benefit pay-as-you-go (PAYG DB) pension system to defined contribution partially funded systems (FDC) between mid 1990s and early 2000s, see Holzman and Stiglitz (2001), Bonoli and Shinkawa (2006), Gruber and Wise (2009). These reforms had some specific features in these countries, but they also share many common characteristics. First, with no exceptions, these countries started from PAYG DB systems and honored the pension obligations with a transition period for the cohorts not yet retired but already unable to adjust to the DC rules. Second, these systems typically consist of multiple pillars: a mandatory PAYG DC pillar as well as a mandatory funded DC pillar. In addition, voluntary funded pillars were equipped with tax incentives to foster private old-age savings in the face of decreasing replacement rates in the obligatory pension system.

These reforms were likely to deliver long-run welfare gains, even accounting for the transition costs, see Hagemejer et al. (2015a). Yet, with the recent global financial crisis many of these countries have suspended or even reverted the reform, see Bonoli and Shinkawa (2006). As scrutinized by Jarrett (2011), all of the Central and Eastern European countries have temporarily shifted the contributions to the mandatory pay-as-you-go pillar at the expense of the mandatory funded pillar. In addition, some of these countries – notably Hungary and to some extent Bulgaria, Poland and Slovakia – have effectively nationalized part of the stock of private pension savings, increasing further the importance of the pay-as-you-go pillar. At the same time, none of these countries attempted to abandon the defined contribution feature of these pension systems. Given this type of reforms, one should expect the reduction in capital accumulation as well as reduction in future benefits due to lower indexation in the state-run PAYG pillars than the rate of return on capital. In fact, Jarrett (2011) argues that the reduction in future pension benefits amounts to about 10% for Slovakia and as much as 21-22% for Hungary and Poland. Similar figure for Poland is confirmed by Hagemejer et al. (2015b). These reforms were introduced without much political or social opposition – unlike the increases of the minimum eligibility retirement age introduced in roughly the same circumstances of the global financial crisis. How come a policy that received public support just 15 years earlier is reverted with no social unrest? Are pension system reforms establishing a funded pillar inherently unstable?

Introducing the pension system reforms typically involves cohorts with a welfare gain and cohorts with a welfare loss. It has been long established in the political economy literature that if pension system reforms were to be voted over, implementing the reform requires for the majority of the living cohorts to gain from it. Yet, many of the reforms analyzed in the literature often emphasize long-run welfare and macroeconomic gains as well as overall efficiency rather than the costs to the cohorts experiencing the reform. Using the example of one of the CEECs, Hagemejer et al. (2015a) provide evidence that

the moment when more than half of living cohorts gain from the reform may indeed be distant, see Figure 1.

In this paper we ask a simple question: suppose that for whatever reason a pension system reform is implemented that does not have sufficient social support – how long does it actually take before it becomes politically stable? Clearly, we do not mean to answer this question by counting the cohorts gaining from the original reform. Rather, we run simulations in which we allow agents to vote on different dates (once in each simulation) on reverting the original reform. The living cohorts – even if they benefit from having the funded pillar in the past – may still prefer to capture the collected contributions in exchange for a contemporaneous gain from lower taxes. For such choice to be optimal, current gain must be higher than the loss due to the decrease of the future pension benefits of the living cohorts – not all cohorts. One cannot answer if whether such conditions are ever fulfilled, or if they depend on the demographic structure and macroeconomic situation without a rigorous framework.

There is an extensive literature on political stability of DB PAYG pension system. For example Cooley and Soares (1999) show that relatively large DB PAYG social security can emerge as an outcome of political equilibrium, a voting coalition between low-productivity youth and the old, who all benefit from the inherent redistribution. Actually, Cooley and Soares (1996) also show that the PAYG funding of the social security system survives also the shocks to the demographic structure, such as the baby boom. For the extensive review of the literature see de Walque (2005), Galasso and Profeta (2002) or Mulligan and Sala-i Martin (2004).

Related literature based on the seminal work of Auerbach and Kotlikoff (1987) analyzes the effects of pension system reform. The main findings in the literature are that privatizing the social security (switching to FDC system) brings welfare gains in the long run, especially when eliminating distortionary taxation. However, the generations alive during the transition periods lose since they have to both save for their pensions and pay higher taxes in order to finance pensions of agents who are old during reform, see for example Huang et al. (1997). This finding makes such a reform politically challenging. Hagemejer et al. (2015a) argues that public debt allows to smooth out the cost of transition among both current and future cohorts, reducing the welfare loss for the living generations. Long-run gains may be lower than previewed as well, for example Conesa and Krueger (1999), Nishiyama and Smetters (2007), Fehr (2009) demonstrate that taking into account idiosyncratic income uncertainty lowers the gains from privatization since the loss of insurance against bad income shocks lowers welfare.

While majority of the literature asks if a reform can gain sufficient political support to get implemented, we refocus the analysis on the interplay between the per-cohort welfare and the changes in population structure after the reform. We thus contribute to the literature by analyzing whether the pension system reforms are politically stable – rather than just feasible. To this end we exogenously introduce a social security reform

and we allow agents to unexpectedly be given the opportunity to revert some of the reform features at exogenously given periods. One of the intuitions we want to check concerns the role of cohort exchange in determining the political stability. Indeed, as time passes the generations that lose due to reform die and generations that gain from the reform are born, which is likely to affect the political support among the contemporaneously living agents for sustaining the reform. Moreover, the stock of savings accumulated in the funded pillar as well as the share the pension benefits play in financing the old-age consumption are likely to affect the welfare evaluation of reverting the reform. Since the privatization of the pension system implies immediate costs and delayed gains it is crucial for such a reform to be politically stable. Otherwise it may be the case that before agents start enjoying the benefits of the privatization itself, the reform is reverted implying inefficiency: costs without gains. As evidenced by the recent wave of changes to the pension systems, such analysis is of paramount policy relevance.

As a study case we consider Poland, a country that introduced a change from PAYG DB to a two pillar DC with a PAYG pillar and a funded pillar in 1999. In 2011 this country has shifted the contributions away from the funded pillar towards the PAYG pillar, whereas in 2013 part of the savings in the funded pillar were nationalized and future contributions were largely limited. As discussed above, such developments were not singular, which makes Poland a useful and a fairly representative case study. Our main findings are that in general pension system reform does not become politically stable as time passes. Nevertheless, some of the elements of the reform do gain political support with due time. Agents want to dismantle the reform even though it benefits the society (when taking into account current and future unborn populations). The main reason for their support for such a vote is the fact that reverting the reform benefits the living cohorts immediately.

The paper is structured as follows. In section 2, we outline our overlapping generations model including the political economy component. In the next section 3, we describe calibration. Then, in section 4, we discuss results. Section 5 concludes the paper.

2 Theoretical model

For our analysis we use the overlapping generations model in the spirit of Auerbach and Kotlikoff (1987) with exogenous productivity growth. We assume that the defined contribution pension system with a pay-as-you-go and funded pillars is introduced unexpectedly in period 2. Period 1 – the first steady state – is used to calibrate the model to the case of a Polish economy prior to the 1999 pension system reform.

2.1 Firms

We assume perfectly competitive production sector that uses labor L_t and capital K_t to produce output Y_t with the Cobb-Douglas technology:

$$Y_t = K_t^{\alpha}(z_t L_t)^{1-\alpha}, \tag{1}$$

where z_t captures exogenous labor augmenting technological progress. Hence, return on capital r_t and real wage w_t are given by

$$r_t = \alpha K_t^{\alpha-1}(z_t L_t)^{1-\alpha} - d \tag{2}$$

$$w_t = (1-\alpha)K_t^{\alpha} z_t^{1-\alpha} L_t^{-\alpha} \tag{3}$$

and the depreciation rate of capital is denoted as d.

2.2 Agents

Each agent lives for for up to J periods[1]. We denote her age as $j \in \{1, 2, ..., J\}$. Agents of the same age are homogeneous, we denote the size of cohort of age j in period t as $N_{j,t}$. Agents discount factor is denoted as δ, additionally agents may die in each period. Probability that the agent born in period t is alive in period $t+j$ is denoted as $\pi_{t,t+j}$. Agents choose consumption $c_{j,t}$, labor $l_{j,t}$ (for which they receive the real wage w_t) and savings $s_{j,t}$ (the interest rate on savings is denoted as r_t) to maximize the following utility function

$$U_t = \sum_{j=1}^{J} \delta^{j-1} \pi_{t,t+j-1} u(c_{j,t+j-1}, l_{j,t+j-1}) \tag{4}$$

where $u(c_{j,t}, l_{j,t}) = \ln c_{j,t} + \phi \ln(1 - l_{j,t})$, with $\phi \geq 0$. The budget constraint that agents face follows

$$(1-\tau_{c,t})c_{j,t} + s_{j+1,t+1} = (1-\tau_{l,t})\Psi_{j,t} + (1 + r_t(1-\tau_{k,t}))s_{j,t} \tag{5}$$

where τ_l denotes income tax, τ_c consumption tax, τ_k capital income tax and $\Psi_{j,t}$ current period income from labor or pension, which is given by the following formula

$$\Psi_{j,t} = \begin{cases} (1-\tau) w_t l_{j,t} - \Upsilon_t, & \text{for } j < \bar{J}_t \\ b_{j,t} - \Upsilon_t & \text{for } j \geq \bar{J}_t \end{cases} \tag{6}$$

In the above formulaτ denotes the social security contributions, $\bar{J}_t$ exogenous retirement age, Υ_t lump sum taxes, and $b_{j,t}$ pensions, which we discuss below[2].

[1] We assume $J = 80$ which corresponds to 100 years in the data and $j = 1$ to 20 years.

[2] We assume that unintended bequests are redistributed within the same cohort.

2.3 Pension system

In the initial steady state the economy is characterized by the pay-as-you-go defined benefit (PAYG DB) pension system and we change the system unexpectedly in the second period to a two-pillar, partially funded defined contribution (FDC). In the PAYG DB system contributions go into the public fund which are used to pay pensions of retired. If there is deficit in the pension fund the government is obliged to finance it, denoted as $subsidy_t$. The budget constraint of the pension fund under PAYG DB is thus given by:

$$\sum_{j=\bar{J}_t}^{J} N_{j,t} b_{j,t}^{PAYG-DB} = \tau \sum_{j=1}^{\bar{J}_t-1} N_{j,t} w_{j,t} l_{j,t} + subsidy_t. \tag{7}$$

In the FDC system there are two pillars: the pay-as-you go and the funded one. Both are defined contribution, with τ^I denoting the contribution rate to the PAYG pillar and τ^{II} denoting contributions to the funded pillar with $\tau^I + \tau^{II} = \tau$. Keeping the total contribution rate constant allows to maintain the distortions unchanged after the pension system reform and replicates the features of the actual reform implemented in Poland. Similarly, b^I and b^{II} denote benefits from, respectively, 1st and 2nd pillar. Contributions to the the PAYG pillar are recorded and indexed at the rate r_t^I which is equal to payroll growth in the economy. Such choice, again, replicates the features of the reform implemented in Poland. Contributions to the funded pillar are invested with return r_t^{II}=r_t. At retirement both stocks of contributions are converted to an annuity, but the difference between indexation in the PAYG pillar and accruing interest in the funded pillar remain[3]. Moreover, the pension benefit from the PAYG pillar is indexed by 25% of the payroll growth, again, replicating the features of the Polish pension legislation. Summarizing, the pension benefits are given by:

$$b_{j,t}^I = \begin{cases} 0, & \text{for } j < \bar{J}_t \\ \dfrac{\sum_{s=1}^{\bar{J}_t-1} \left[\Pi_{i=1}^{s}(1+r_{t-j+i-1}^I)\right] \tau_{t-j+s-1}^I w_{t-j+s-1} l_{s,t-j+s-1}}{\Pi_{s=\bar{J}_t}^{J} \pi_{s,t}}, & \text{for } j = \bar{J}_t \\ (1 + 0.25 \cdot r_t^I) b_{j-1,t-1}^{\iota} & \text{for } \bar{J} < j \leq J \end{cases} \tag{8}$$

$$b_{j,t}^{II} = \begin{cases} 0, & \text{for } j < \bar{J}_t \\ \dfrac{\sum_{s=1}^{\bar{J}_t-1} \left[\Pi_{i=1}^{s}(1+r_{t-j+i-1}^I)\right] \tau_{t-j+s-1}^{II} w_{t-j+s-1} l_{s,t-j+s-1}}{\Pi_{s=\bar{J}_t}^{J} \pi_{s,t}}, & \text{for } j = \bar{J}_t \\ (1 + r_t^{II}) b_{j-1,t-1}^{\iota} & \text{for } \bar{J} < j \leq J \end{cases} \tag{9}$$

Consequently, the balance in the PAYG pillar, to be financed by the government via

[3]Savings of pensioners who died earlier in the funded pillar are used to finance pensions of pensioners that live longer.

$subsidy_t$, is given by:

$$\sum_{j=\bar{J}_t}^{J} N_{j,t} b^I_{j,t} = \tau^I_t \sum_{j=1}^{\bar{J}_t - 1} N_{j,t} w_t l_{j,t} + subsidy_t. \tag{10}$$

In the funded pillar collected contributions are invested, earning the return $r^{II}_t = r_t$. Therefore, the funded pillar savings of agent aged j in period t evolve according to:

$$s^{II}_{j+1,t+1} = (1 + r^{II}_t) s^{II}_{j,t} + \tau^{II}_t w_t l_{j,t}. \tag{11}$$

The pension system reform as described above constitutes the baseline scenario[4]. First, we establish the initial steady state of the PAYG DB economy. In period $t = 2$ social security system is unexpectedly changed to a defined contribution with a PAYG and funded pillars. Despite the reform, the pension benefits of the living retirees are honored. Moreover, the first 10 cohorts after the pension system reform also obtain PAYG DB pension benefits. Thus, the reform affects cohorts born after 1950, which in our model corresponds to cohorts of age $j \leq 49$ in period $t = 2$. The analyzed scenarios will comprise changes to this pension system.

2.4 Government

Government collects taxes in order to finance exogenously given government expenditure, pension system deficit and to service outstanding debt. The budget constraint of government is as follows

$$G_t + subsidy_t + r_t D_{t-1} = T_t + (D_t - D_{t-1}) + \sum_{j=1}^{J} N_{j,t} \Upsilon_t$$

where G_t denotes government expenditure, D_t government debt and

$$T_t = \tau_{l,t} \big[(1 - \tau) \sum_{j=1}^{\bar{J}_t} w_t l_{j,t} N_{j,t} + \sum_{j=\bar{J}_t}^{J} b_{j,t} N_{j,t} \big] + \sum_{j=1}^{J} (\tau_{c,t} c_{jt} + \tau_{k,t} r_t s_{j,t}) N_{j,t} \tag{12}$$

Furthermore, we assume that the budget constraint is closed with the government debt. In order to assure that the debt returns to the steady state in the long run we assume the following fiscal rule on the consumption income tax

$$\tau_{c,t} = (1 - \varrho) \tau_c^{ss,new} + \varrho \tau_{c,t-1} + \varrho_D (D_{t-1} - D^{ss,new}) \tag{13}$$

where ϱ measures the autoregression of the tax rate, and ϱ_D the strength of reaction to deviation of government debt from its steady state values ($\tau_c^{ss,new}$ and $D^{ss,new}$ denotes,

[4]For more details on the original reform see Hagemejer et al. (2015a)

respectively, values of consumption tax and debt in the new steady state).

2.5 Closing the model

The model is closed with clearing conditions for the goods market

$$\sum_{j=1}^{J} N_{j,t}c_{j,t} + G_t + K_{t+1} = Y_t + (1-d)K_t, \tag{14}$$

the labor market

$$L_t = \sum_{j=1}^{\bar{J}_t - 1} N_{j,t}l_{j,t}, \tag{15}$$

and the capital market

$$K_{t+1} + D_{t+1} = \sum_{j=1}^{J} N_{j,t}(s_{j+1,t+1} + s^{II}_{j+1,t+1}). \tag{16}$$

2.6 Political economy

We allow agents to unexpectedly vote on keeping the reformed pension system intact or to make some changes. We run the simulations for the different dates of such a voting to see how the political decision changes in time. We assume in each simulation that once the system is changed it remains intact forever. We allow voters to vote on the following elements of the pension reform. First, voters can decide about diverting from the funded pillar to the PAYG pillar, which we call shift of contributions and denote in the reminder of this paper as Policy 1[5]. Second, voters can change the way pensions from the funded pillar are paid after the retirement – as opposed to the system as described in Section 2.3 – at retirement all accrued contributions could be transferred to the PAYG pillar and indexed subsequently according to equation (8) for $\bar{J} < j \leq J$. We call this policy shift pensions and in the reminder of the paper denote as Policy 2. Third policy option is the combination of the two, i.e. voters can express support for both these policy changes in the same voting. We call this policy 3.

More specifically, in Policy 1, social security contributions which prior to the voting keep the ratio $\tau^I = 2\tau^{II}$ are chaned to $\tilde{\tau}^I = 5\tilde{\tau}^{II}$, keeping the total social security contributions at the same level, as well as other features of the system intact. Such shift of the social security contributions is in line with the actual design of the policy change in Poland as of 2011. In Policy 2 savings in the second pillar are transferred to the public

[5]Policy 1 resembles changes to the Polish pension system implemented as of 2011. It implies a shift of contributions from the funded pillar to the PAYG pillar with the following schedule. The initial 7.3% of payroll (or 1/3 of the social security contribution) was reduced to 2.3% as of 2011, to be gradually increased to 3.5% over the subsequent 5 years: 2.8% in 2013, 3.1% in 2014-2015, 3.3% in 2016 and 3.5% afterwards. This schedule was not kept, however, because in 2013 another policy change was introduced, keeping the contributions to the funded pillar at 2.3% permanently.

pension funds and pensions are calculated according to:

$$b^I_{j,t} = \begin{cases} 0, & \text{for } j < \bar{J}_t \\ \frac{\sum_{s=1}^{\bar{J}_t - 1} \left[\Pi_{i=1}^{s}(1+r^I_{t-j+i-1})\right] \tau^I_{t-j+s-1} w_{t-j+s-1} l_{s,t-j+s-1} + s^{II}_{j,t}}{\Pi_{s=\bar{J}_t}^{J} \pi_{s,t}}, & \text{for } j = \bar{J}_t \\ (1 + 0.25 \cdot r^I_t) b^I_{j-1,t-1} & \text{for } \bar{J} < j \leq J \end{cases} \tag{17}$$

and for all cohorts after the voting

$$b^{II}_{j,t} = 0, \tag{18}$$

which too replicates the features of a policy change in Poland, implemented in 2013.

Note that these policies are bound to have different effects for the welfare of the living as well as future cohorts. Policy 1 reduces the amount of contemporaneous deficit in the PAYG scheme at the expense of slower capital accumulation and lower pension benefits after the retirement. With general government consumption fixed, reduction in $subsidy_t$ allows for the reduction in taxes, relative to the baseline scenario, thus yielding an immediate benefit. While future pension benefits are likely to be lower, this can be compensated for by the private voluntary savings of the agents. However, interest earned on private voluntary savings is subject to capital income tax, whereas the contributions to the funded pillar are not. Policy 2 reduces immediately the debt of the government, because there is actually a large transfer to the pension system, whereas the government collects these proceeds. Since this transfer is large – the longer the cohort participates in the funded pillar, the larger the stock of accrued contributions – the government debt is reduced, which translates to a substantial reduction in taxation. Yet, it is accompanied by a lower path of benefits growth after retirement.

As a voting procedure we employ pure majority voting, with no strategic voting. Also, agents have no altruistic motives. Only agents living at the times of vote can do that. An agent is in favor of a given policy if her subsequent lifetime utility is higher than the status quo. We operationalize utility from a policy change as consumption equivalent, discounted to the age of $j = 1$. Agents with negative consumption equivalents are not in favor of a policy change, thus the change is implemented if at least 50% of the living cohorts, weighted by the size of the cohort, benefit from a policy change.

The ordering of the votes is as follows. First, agents choose between the baseline scenario of no policy change and Policy 1. Then, agents vote between the winner the this vote and Policy 2. Finally, in the last vote agents choose between the winner of the previous vote and Policy 3, i.e. a combination of Policy 1 and Policy 2. We have tested explicitly it the preferences are transitive in the case of our set up. If they were not, the sequence of voting could affect the final outcome. However, for a number of realistic calibrations the sequence of voting has proven to be irrelevant for the final outcome. Given the schedule of voting, after each round we implement the policy which had the

highest support vis-a-vis the alternatives.

3 Calibration and description of simulations

We calibrate the model to match the features of the Polish economy. To avoid bias due to the cyclical effects, we rely on averages for a decade prior to the pension system reform in 1999. We use the detailed demographic projection released by the Aging Work Group (AWG) of the European Comission to reproduce the arrival of new cohorts to the economy as well as annual survival probabilities for each cohort. The projection is available until 2060. We take a conservative assumption that the population stabilizes after that, so as of 2140 there are no changes in the size, nor the age structure of the living cohorts. We also use the projection for the exogenous technological progress from AWG as of 2010, whereas for the years between 1999 and 2010 we use the actual data on the TFP growth estimated for the Polish economy. The AWG scenario for productivity assumes gradual convergence to the average EU level of 1.7% per annum between 2010 and 2040 and a stable growth at this rate thereafter. These assumptions are used in both the baseline scenario and for simulating the outcomes of the policy change, as described in Section 2.6.

We use the actual data on employment rate from the Labor Force Survey to calibrate the preference for leisure ϕ. Subsequently, we seek the the discount rate δ that would be consistent with an interest rate of approximately 7.5%, as observed in the economy in real terms between 1990 and 1999. This level prevailed also after the reform of 1999, as this is was the average net rate of return recorder in the funded pillar between 1999 and 2012. We set the depreciation rate d that would be consistent with an investment rate of approximately 20% share in GDP. Following the standard in the literature, we assume the $\alpha = 30\%$. The retirement age $\bar{J}$ is calibrated to actual data on effective retirement age collected by the OECD and was assumed to increase gradually. Thus it equals 61 in 1999 and grows by one additional year in each decade until it reaches 67 in 2070.

The share of government expenditure in GDP is set at 20% to replicate the actual proportions. The capital income tax τ_k is set at *de iure* rate of 19%. The labor income tax τ_l was calibrated to replicate the ratio between the labor income tax revenues and the labor revenue in the national accounts, thus at its effective rather than nominal rate. The replacement rate in the PAYG DB system was set as to replicate the share of pensions in GDP prior to the reform of 1999. Knowing the replacement rates, we set the overall contribution rate τ to reproduce the pension system deficit as observed in the years prior to the reform at 1.5%. We also assume that the initial and final government debt to GDP ratio equals 45%, which corresponds to the value of government debt in the late 90s in Poland. The split between τ^I and τ^{II} follows the proportions set by Polish legislation. Parameters are summarized in Table 1.

The solution of an individual perfect foresight agent is computed recursively using the Gauss-Seidel algorithm. Once it is established for the initial steady state, it is also computed for the final steady states, depending on the policy option. Thus, there are four possible final steady states. In the baseline scenario of no policy change we set the transition path between the initial and the adequate final steady state. We guess the path of capital per worker in each period of the path and recursively, using the Gauss-Seidel algorithm find equilibria for each period. We compute w and r. Subsequently y is computed and used to calculate variables related to pension system and government sector, such as G, T, S, D, Υ as well as the individual benefits $b_{1,j}$ and $b_{2,j}$. From the computation of policy functions, choice variables c_j, s_j and l_j are computed. Finally, k is updated in order to satisfy market clearing. This procedure is repeated until the difference between k from subsequent iterations is negligible[6]. Once the the equilibrium is reached, utilities are computed and discounted to reflect utility of the first generation in our model, i.e. 20-year olds.

In the case of the policy change scenarios, until each exogenously assumed policy vote date, we assume that the economy pursues the path from the previous voting. Before the first voting in 2014, we assume that the economy follows the baseline scenario. If the majority votes in favor of a given policy change, the voting over the other policy changes happens with reference to the status quo policy, not the one that already gained support. For example, in year 2014, the baseline scenario is always the original pension system reform. Thus, to adopt Policy 3, for example, it would have to have a higher level of support than Policy 1 and Policy 2, relative to the baseline. In other words, in subsequent voting in a given period agents do not update the baseline to incorporate the already supported policies, but always compare to the status quo of no policy change.

We set the length of the the transition path in order to assure that the new steady state is reached, i.e. last generation analyzed lives the whole life in the new demographic and policy steady state. The last voting takes place when all cohorts are already collecting pension benefits from the reformed system (i.e. 160 periods after the original reform of 1999), so the policy stabilizes at the latest in 2234. The population stabilizes in 2140. We thus set the length of the path to 450 periods.

4 Results

This section discusses the results of the simulations. We show what is the outcome of voting on the three alternative policies at subsequent dates, as the population structure changes and the costs of the initial pension system reform materialize. We discuss in detail the welfare effects of the winning policies. We also show some of the macroeconomic effects of policy changes.

[6]In each iteration, error is computed as the l_1-norm of the difference between capital vector in subsequent iterations.

4.1 The effects of reforms on selected variables

The original pension reform takes place in 1999. Next, we check how support for dismantling the pension reform changes in time. We allow voters unexpectedly to vote on dismantling the pension reform. In the first simulation we assume that this voting takes place in 2014. Next, we run simulations assuming that voting takes place in 2024, 2034, 2044, 2054, 2064, 2074, 2084, 2094 and 2154. In order to develop intuition for our result we present more detailed analyzes of cost and benefits of such a policy change in case of 2014 and 2044 voting. The effect of all three policy changes on pensions, taxes and government debt in case of 2014 voting are presented in Figure 5 and in case of 2044 in Figure 6.

Policy 1 redirects contributions from the funded pillar to the PAYG pillar. This shift lowers pension benefits for two reasons. First, the return in the PAYG pillar equals the payroll growth, which is lower than the interest rate in the funded (see Figure 4). This also lowers the effective replacement rates. Second, pensions in the capital pillar are indexed with the interest rate and in the PAYG pillar with 25% of the payroll growth. At the same time shifts of contributions reduces the deficit in the public pension fund and results in lower consumption taxes as well as government debt (given our fiscal rule (13) the government debt returns to the initial level but taxes remain lower forever). This shifts some of the burden of financing pensions of current generations on future generations and benefits current ones. In order words implicit debt (in the PAYG pillar) after this is permanently higher. The benefits for current generations manifest themselves in lower taxes. Interestingly, these effects are independent of the moment of voting (compare the effects of Policy 1 on Figures 5 and 6).

Policy 2 means that accrued contributions in the funded pillar are shifted to the PAYG system and used to finance current pensions. This does not affect replacement rates at retirement, but this shift substantially lowers the indexation rate of pension benefits and results in lower average pension benefits. Differently than in case of Policy 1 the decline in pensions in case of 2014 voting is quite small comparing to the case of 2044 voting. This is because in 2014 the funded is operating for 15 years only, and for most voters share of pension coming from the this pillar is small. However, in case of 2044 voting the result is different. Since, by 2044, the funded pillar collects the contributions from an entire set of working cohorts, it contributes much larger share of pension benefits for most voters. At the same time this policy leads to smaller deficit in the PAYG pillar, shifting the burden of pension financing to the future generations. This benefits current generations as it allows to substantially reduce tax rates contemporaneously, although it leads to a higher implicit debt (in the PAYG system).

The effects of Policy 1 and Policy 2 add up in Policy 3. The pension benefits are lower, but the taxes drop even stronger and the fiscal burden of future pensions financing is shifted to the future generations (growth of an implicit debt). Similarly as in case of

policy 2 the decline in pension benefits is much smaller if policy is introduced in 2014 than in 2044.

All policy changes have little effect on macroeconomic variables. Lower consumption taxes create less distortions in the intra-temporal choice between consumption and leisure, so labor supply slightly increases, see Figures 7 and 8. Dismantling of the funded pillar leads to lower aggregate savings and lower capital per worker, see Figures 7 and 8. There is some initial increase in capital per worker in the first years after the reform, these are the transitory cohort responding with higher savings to lower future pensions facilitated with lower taxes today, as is standard results in the literature.

4.2 Voting result and welfare considerations

The results of subsequent votes on Policies 1, 2 and 3 are presented in Table 2. Surprisingly, agents always want to dismantle some of the elements of the funded system. Initially, if voting takes place in 2014 or in 2024 they choose Policy 3, i.e. the combination of shifting the contributions and shifting the pensions to the PAYG pillar. If the voting takes place after 2024 they only want to shift contributions to the PAYG system (Policy 1). As expected, support for pensions shift declines with time and it turns out that if such a reform survives initial years voters would want to preserve the funded pillar. However, surprisingly, support for shifting contributions does not decline in time and agents always want to shift contributions from the funded to the PAYG pillar.

Interestingly, voters support it even though such a policy change lowers overall welfare - the aggregate consumption equivalent for all cohorts is negative, but for the living ones is positive, for details see Hagemejer et al. 2015a. The reason for that is that even though all these policy changed deteriorate overall welfare they improve the situation of the largest fraction of agents living at the period of voting at the expense of future generations. Figure 9 shows consumption equivalent of all three policy changes (against the no policy change) in case of 2014 voting and Figure 10 shows the same for 2044 voting. In the case of 2014 voting both considered policy changes benefit the living generations and hurt future generations (who cannot vote). In the case of 2044 voting only Policy 1 benefits the living generations (still deteriorating the welfare for the future generations who cannot vote), but Policy 2 and 3 do not.

Each policy change lowers the pension benefits in the future, but allows to lower taxes immediately, especially in the periods directly after the policy change. At the same time implicit debt increases as the burden of pension benefits financing in the future is shifted on future generations. Note also that agents are have perfect foresight and are fully rational – expecting lower pension benefits they are still able to make provisions for smoothening lifetime consumption by increased private savings. It is easier if contemporaneous taxes drop.

Clearly, the analyzed policies affect young and old living generations differently. Thus,

there is an important difference in case of earlier versus later voting dates. Early, the funded pillar is relatively small. Therefore, Policy 2 only marginally lowers the pension benefits. However, with increasing participation in the funded pillar, shifting pensions has bigger effect on welfare of the living generations, reducing the voters support, compare Figures 9 and 10. Therefore, initially the effect of lower taxes prevails over the effect of lower pensions for all three policy changes, but as time passes it remains true only for Policy 1.

5 Conclusions

The literature on the effects of privatization of social security with aging population is extensive. It mostly finds that even is such a reform is welfare improving (which usually is true), it benefits mostly future generations and cohorts working during transition usually incur a welfare loss. It means that as time passes the fraction of living agents benefiting from the reform is increasing. Hence an intuition that support for such a reform increases in time and at some point it should become politically stable. In our paper we ask whether it is actually true. Surprisingly, it turns out that it is not.

We develop an OLG model with an exogenous pension system reform in period 2, which introduces a partially funded two-pillar defined contribution system in the place of a pay-as-you-go defined benefit system. Because in the model the obligations associated with the pension benefits of the initially old generations are honored, the reform introduces a large welfare cost to most of the living cohorts. While we allow the public debt to increase in response to the reform, taxes also need to adjust, thus making the living cohorts pay not only their own pension contributions, but also finance partially the inherited DB pension benefits. As the initial retirees die, the pension system reform becomes beneficial to all living cohorts. On exogenously chosen dates we allow the agents to vote over shifting the contributions and/or the pensions away from the funded pillar towards the PAYG pillar. We gradually shift the date of the voting on these three options more and more towards the future. We find that the political support for the shift of pensions decreases as the role of pensions from the funded pillar grows. However, even 150 years after the initial reform, there is still sufficient political support to shift the contributions away from the capital pillar and towards the PAYG pillar. In fact, this support is high and constant in time. Shifting contributions results in lower pension benefits in the future, but provides an immediate fiscal relief via lower taxes. Also the accumulating deficit in the pension system will burden the future generations, who cannot vote – it is implicit rather than explicit and priced in contemporaneous taxes. Thus, if allowed to vote, the living cohorts will always distribute this short-term welfare gain away at the expense of the future generations.

One possible interpretation of these findings is that the contribution rate to the capital

pillar has been set at excessively high level, so rational agents adjust it downwards to the preferred levels. However, the net welfare effect of shifting the contributions away from the funded pillar is negative – it is positive only for the living cohorts. Thus, our findings should rather be interpreted as evidence that pension system reforms following the guidelines of The World Bank from 1990s and early 2000s may suffer from the credibility shortage. In fact, even if they last for as long as a generation, they only become immune to the risk of shifting the pensions. The risk of shifting the contributions is permanent and thus should be taken into account when designing pension system reforms. Notably, if pensions and/or contributions are shifted away from the capital pillar, such unstable reform generates only welfare costs, because the welfare gains do not materialize.

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Tables and figures

Table 1: Calibrated parameters

α	capital share	0.30
τ_l	labor tax	0.11
ϕ	preference for leisure	0.53
δ	discount factor	0.98
d	depreciation rate	0.055
τ	soc. security contr. rate	0.0645
ρ	replacement rate	0.305
		resulting
dk/y	investment rate	0.21
D/y	debt to GDP ratio	0.45
r	interest rate	0.075

Table 2: Results of voting in different years.

2014	2024	2034	2044	2054	2064	2074	2084	2094	2154
Wining Scenario									
3	3	1	1	1	1	1	1	1	1
Overall Welfare Effect (in % of permanent consumption)									
-0.42	-0.32	-0.24	-0.20	-0.16	-0.12	-0.10	-0.10	-0.10	-0.02
Political Support for Scenario 1 in % (against no policy change)									
99	99	99	99	99	99	99	99	99	99
Political Support for Scenario 2 (against no policy change)									
82	74	47	48	26	21	20	21	13	8
Political Support for Scenario 3 (against no policy change)									
99	99	99	62	50	43	42	40	38	42

Figure 1: Share of living population gaining from the reform, weighted by cohort size, based on Hagemejer et al. (2015a)

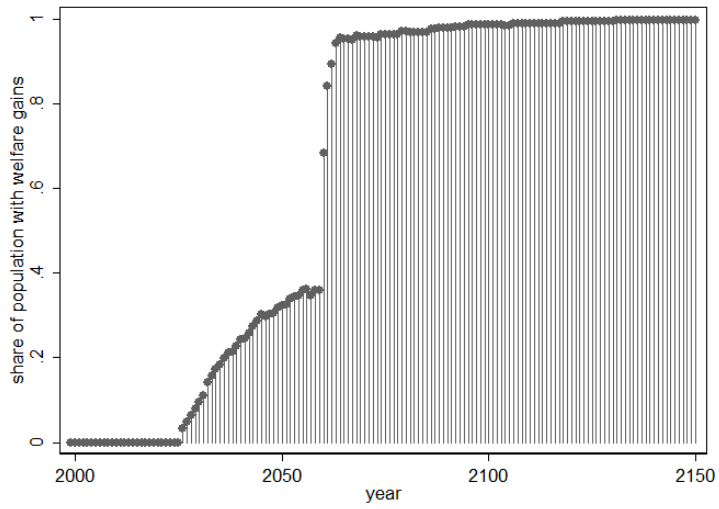
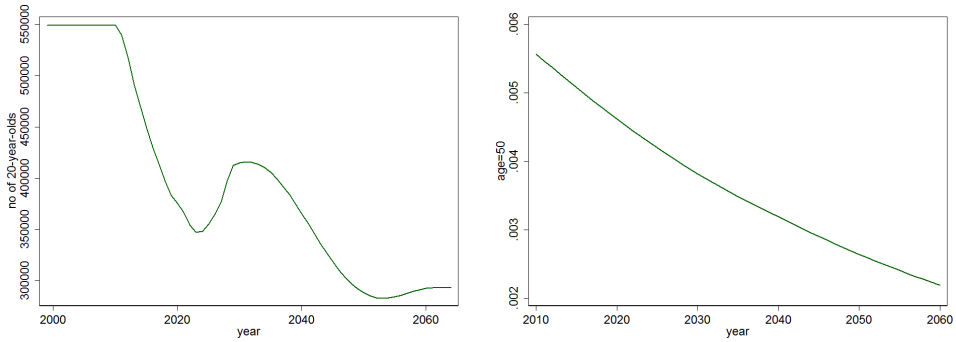
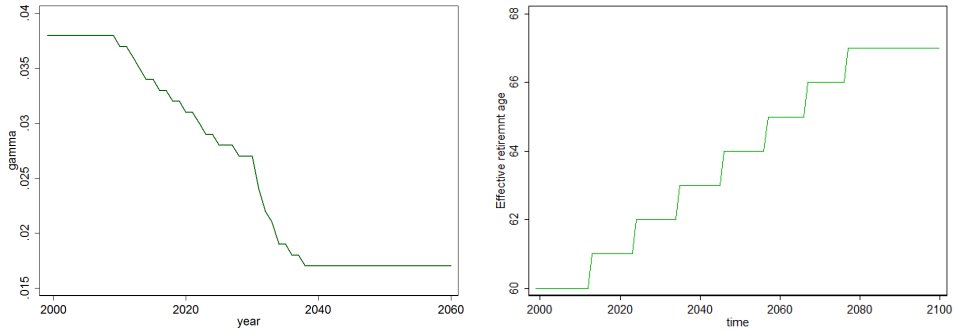


Figure 2: No of 20-year-olds arriving in the model in each period (left) and mortality rates across time for a selected cohort.



Source: EUROSTAT demographic forecast until 2060

Figure 3: Labor augmenting productivity growth rate projection (left) and actual retirement age in economy, past values and forecasts.



Source: technological progress rate following European Commission & effective retirement age based on OECD, afterwards it is an assumption.

Figure 4: Interest rate and payroll growth rate in no policy change scenario.

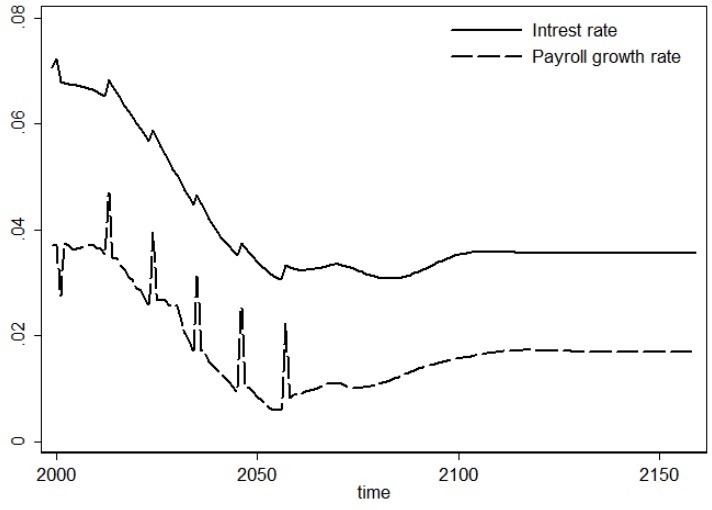
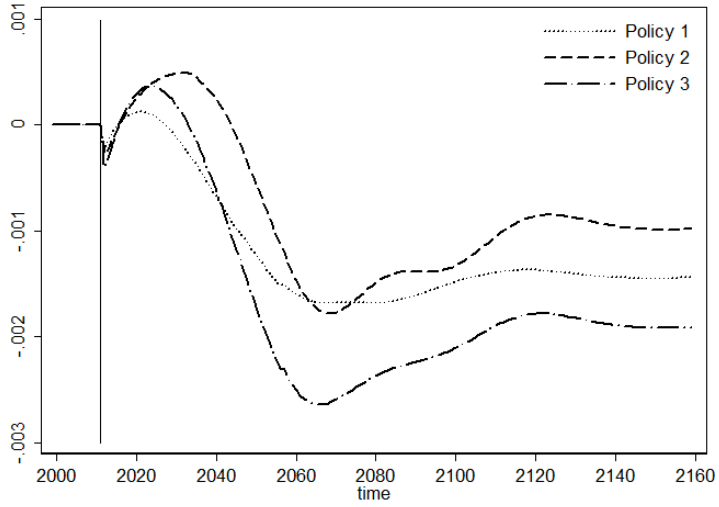
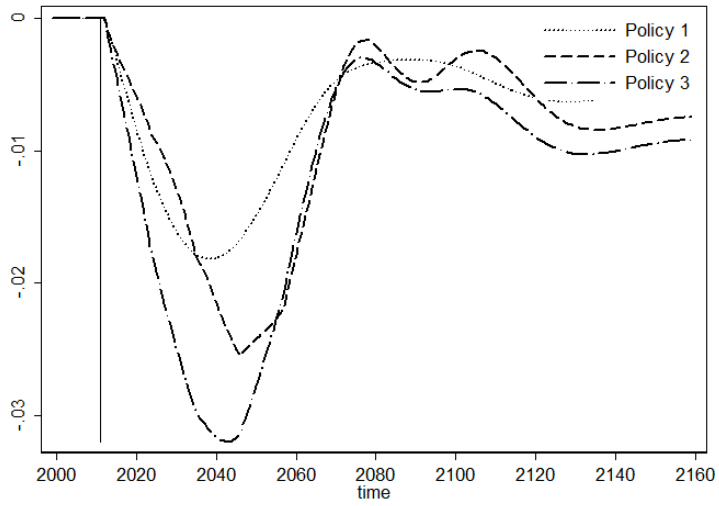


Figure 5: The effect of the policies on selected variables in case of 2014 voting.

(a) Ratio of average pensions after policy change to average pension with no policy change



(b) Difference in tax rates after policy change and with no policy change



(c) Difference in debt to GDP ratios after policy change and with no policy change

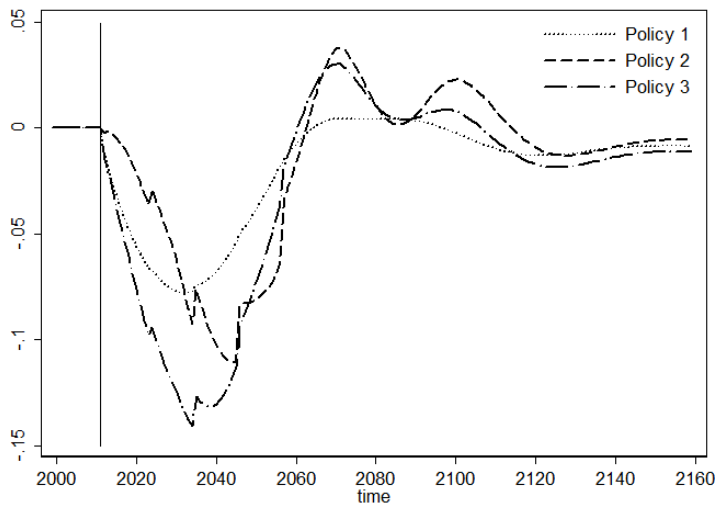
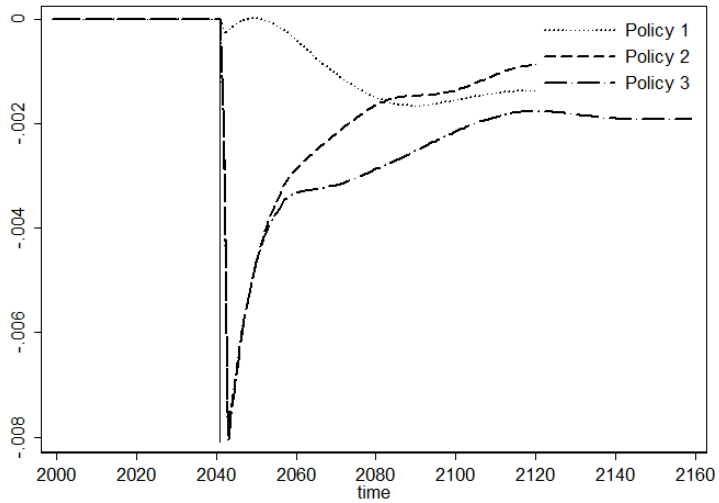
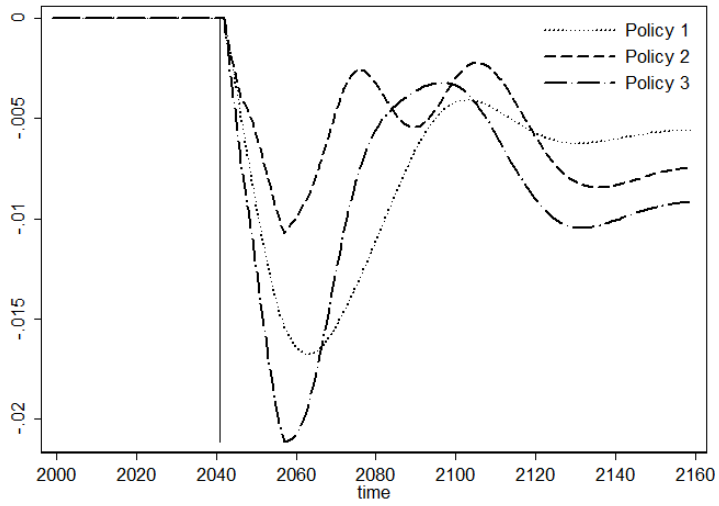


Figure 6: The effect of the policies on selected variables in case of 2044 voting.

(a) Ratio of average pensions after policy change to average pension with no policy change



(b) Difference in tax rates after policy change and with no policy change



(c) Difference in debt to GDP ratios after policy change and with no policy change

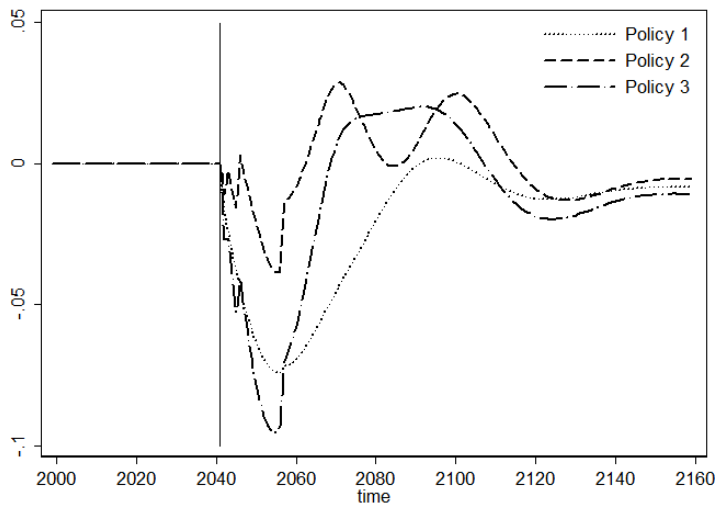
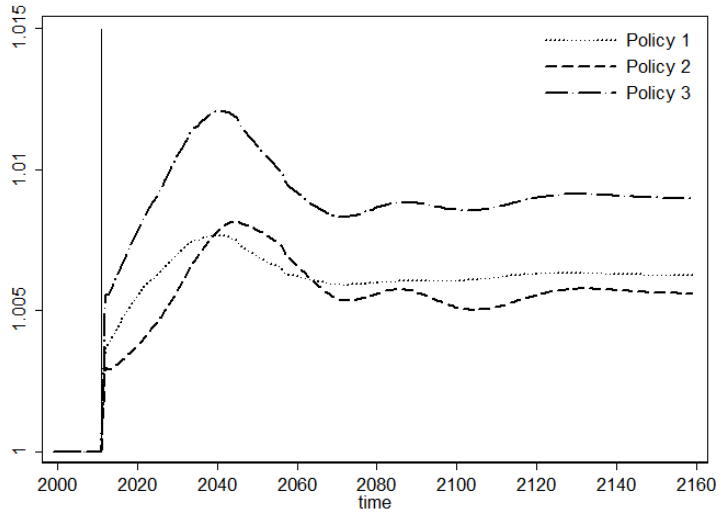


Figure 7: The effect of the policies on selected macoeconomics variables in case of 2014 voting.

(a) Ratio of total labor after policy change to total labor with no policy change



(b) Ratio of capital after policy change to capital with no policy change

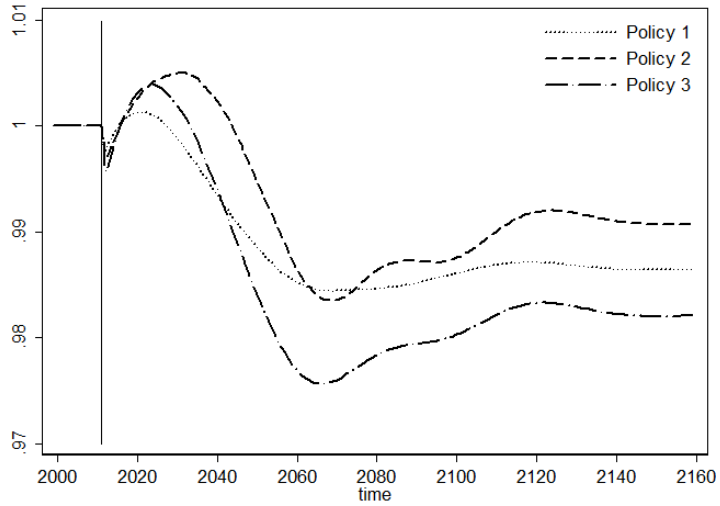
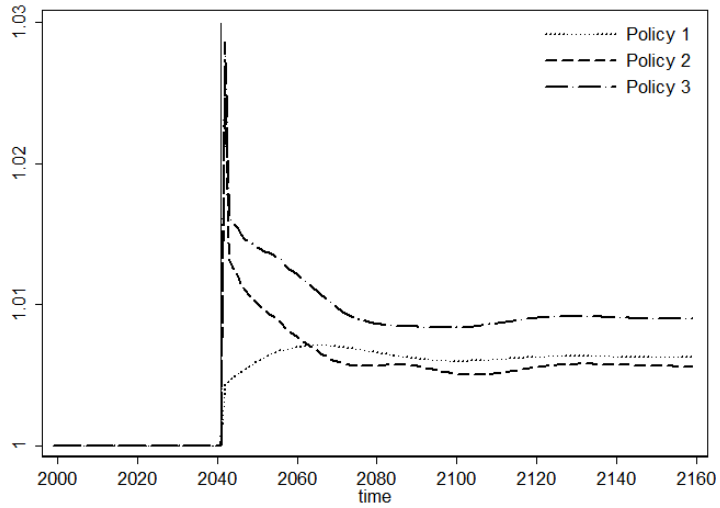


Figure 8: The effect of the policies on selected macoeconomics variables in case of 2044 voting.

(a) Ratio of total labor after policy change to total labor with no policy change



(b) Ratio of capital after policy change to capital with no policy change

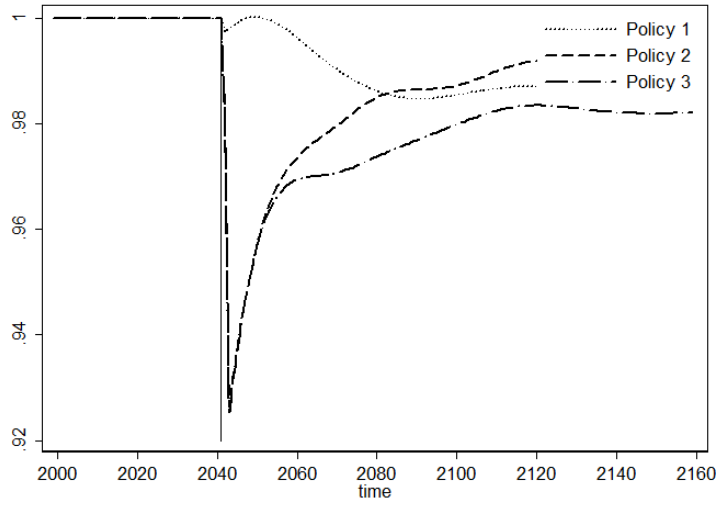
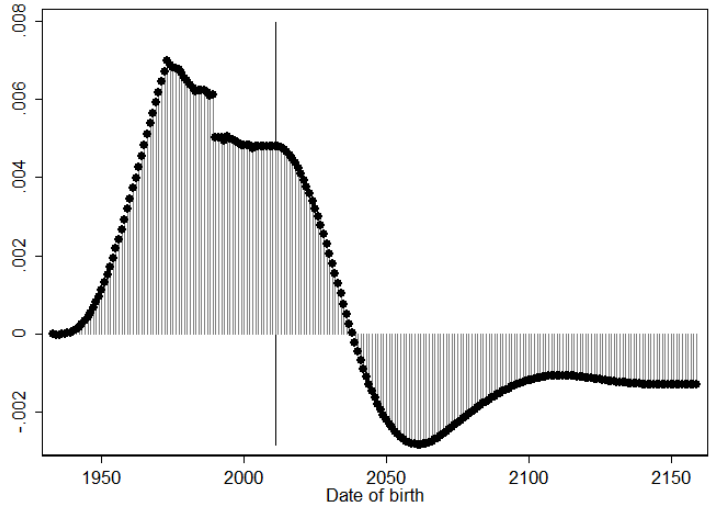
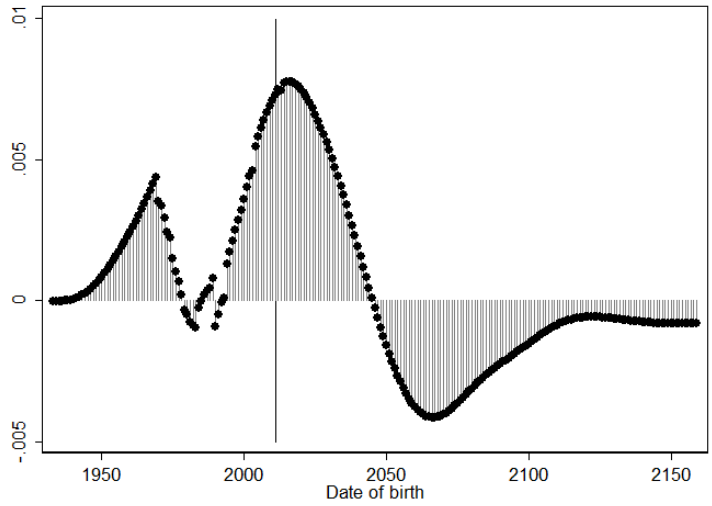


Figure 9: Consumption equivalent of the three policies in 2014 voting.

(a) Policy 1



(b) Policy 2



(c) Policy 3

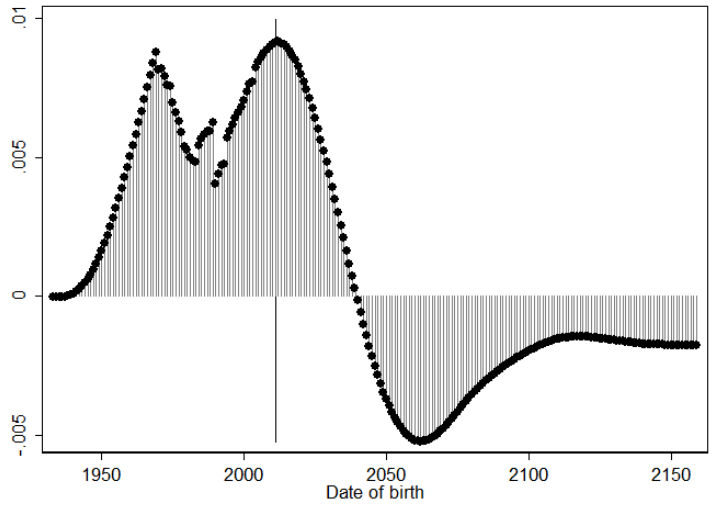
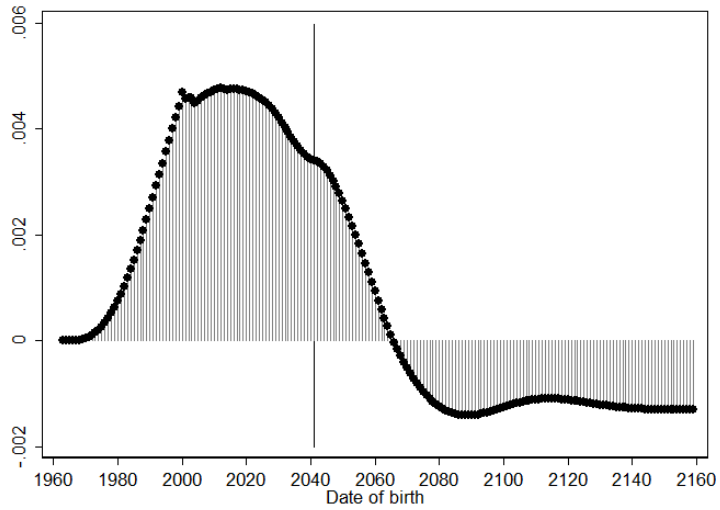
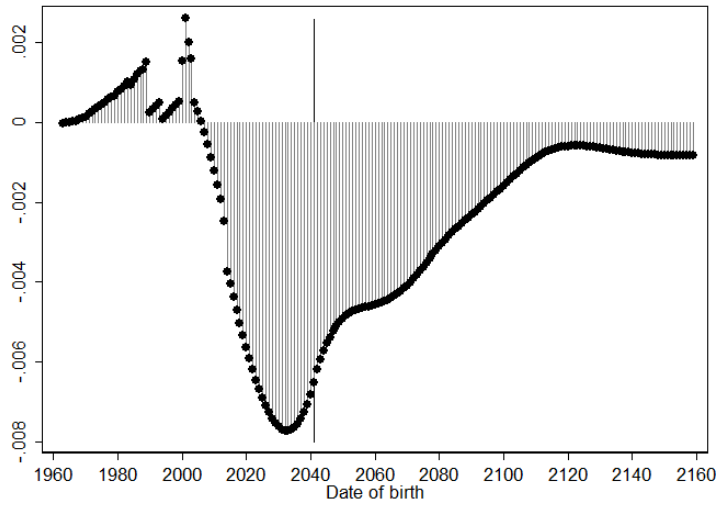


Figure 10: Consumption equivalent of the three policies in 2044 voting.

(a) Policy 1



(b) Policy 2



(c) Policy 3