Political (In)Stability of Social Security

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Abstract

We analyze political stability of social security that involves pre-funding. We employ an overlapping generations model with intra-cohort heterogeneity and introduce partial funding, which is efficient in Kaldor-Hicks sense and has majority political support. Subsequently, agents vote on capturing the accumulated pension assets, and replacing it with the pay-as-you-go scheme. We show that even if capturing assets reduces welfare in the long run, the distribution of benefits across cohorts living at the time of voting yields always sufficient political support. We explain the mechanisms which yield this counter-intuitive result. Preventing the asset capture requires switching off the fiscal channel, i.e. funding becomes politically stable if capturing of the pension assets cannot be used to reduce taxation and/or public debt.

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1 Introduction and motivation

The objective of this study is to consider political stability of the funded pension systems. Political support for social security has been extensively studied in economic theory with the key questions encompassing the very existence of inter-generational transfer (e.g. Samuelson 1958, Aaron 1966, Breyer 1989, Boll et al. 1994, Krieger and Ruhose 2013), the size of these transfers and (e.g. Browning 1975, Boldrin and Rustichini 2000, Casamatta et al. 2001) and the political economy of arriving at a social contract (e.g. Sjoblom 1985, Boadway and Wildasin 1989a,b, Cooley and Soares 1996, 1999a,b, Tabellini 2000, Conde-Ruiz and Galasso 2005, Kelley 2014, Parlevliet 2017). This literature typically refers to social security as means of transferring the earnings of currently working generations to those who are unable to work, through pay-as-you-go redistribution (PAYG), with the outside option consisting of no social security at all. Extensive overview of findings in this literature have been synthesized in series of review studies (Galasso and Profeta 2002, de Walque 2005, Mulligan and Sala-i Martin 2015), with the general consensus that if social security is politically feasible, it becomes also politically stable.

The theoretical result that pension systems are stable typically relies on the the assumption that a generation which refuses to contribute to social security is permanently punished with reciprocity, i.e. no future generation pays for its pension benefits. However, pensions do not need to be financed on a pay-as-you-go basis: partial funding in the pension system is a viable alternative. With (pre)funding, in essence, retirees receive their *own money*. Hence, political stability of funded systems cannot rely on the retaliation mechanics proposed in the earlier literature.[1] Introducing the funding pillar changes the nature of the inter-generational transfers and thus the trade-offs. We contribute to the literature by analyzing the political economy of funded pension systems.

Analyzing political stability of the funded pension system is relevant not only from an academic but also from a policy perspective. A considerable number of countries has full or partial funding in their compulsory pension systems: either for many decades already, or with the first covered cohorts reaching pensionable age soon. Indeed, many countries introduced at least partial funding to their pension systems between mid 1990s and early 2000s (see Holzman and Stiglitz 2001, Bonoli and Shinkawa 2006, Gruber and Wise 2009). Most of these countries originally had a defined benefit (DB) Beveridgean system financed on a pay-as-you-go basis. With the reform, they often altered both features of the pension system. First, they replaced the Beveridgean formula with an individualized defined contribution formula for pensions, the so called Bismarckian system. Second, they invariably instituted the so called multi-pillar setting: the publicly managed pillar with the pay-as-you-go (PAYG) and the privately managed pillar with funding. These two types of pillars formed jointly the compulsory, universal pension system.[2] These reforms were likely to deliver long-run welfare gains, even accounting for the transition costs, i.e. improve welfare in the Kaldor-Hicks sense.[3] Surprisingly, decade or so after implementation of these reforms, governments in a vast majority of these countries have captured the assets accumulated in the funded pillars, reducing or eliminating the funded pillar while raising the share of contributions going to the PAYG pillar (Schwarz

[1] Naturally, the performance of the economy, which determines the value of accumulated financial assets, depends largely on the incentives to work of the contemporaneously working generations – but the value of pensions coming from the funded pillar does not depend on the willingness of these generations to contribute to the pension system.

[2] In addition, voluntary funded pillars were established, with tax incentives to encourage private old-age savings.

[3] A study available for Poland shows that these welfare gains could actually be sizable, app. 2-3% of lifetime consumption (Makarski et al. 2017). These reforms, with no exception, honored all the pension obligations for the transition cohorts (already retired or too close to retirement to meaningfully adjust). They also kept the contribution rates intact. On the one hand, honoring pension obligations towards older cohorts when contribution rate is fixed imposes a fiscal cost: the gap due to transferring part of the collected contributions to the funded pillar, when contemporaneously pensions have to be paid in full amount. On the other hand, they also improved efficiency, by linking labor supply to future pension benefits and by fostering the rate of capital accumulation.

2011, Schwartz 2014).[4] These policy reversals are projected to reduce pension benefits (by roughly 10-20%, see Jarrett 2011, Hagemejer et al. 2015, for Slovakia and Hungary, as well as Poland, respectively), and thus should not be politically feasible in democracies. Yet, they appear to be prevalent. Our study explains this phenomenon.

To study political support for the funded pension systems we develop an overlapping-generations general equilibrium model with voting. Agents in our setup decide periodically if they prefer the funded pillar to continue, or if they prefer the government to capture the accumulated assets, translate the actual assets to drawing rights in the PAYG pillar, and utilize the captured funds to reduce taxation. Essentially, the agents face a trade off between lower future pensions (funded pillar yields higher rates of return than the PAYG pillar) and lower current taxation. The total welfare due to this change will additionally be affected by the general equilibrium effects related to adjusted labor supply, private voluntary savings and life-time consumption profiles to fully measure up the immediate gains versus delayed losses.[5] Unlike the earlier literature, we compare the once-and-for-all voting – equivalent to retaliation in the PAYG literature – with the case of transitory capturing of the assets.[6] The latter is interesting, because it is analogous to the no-retaliation case in the PAYG literature. If agents may capture the assets, but expect the asset accumulation to resume immediately afterwards, their perception of penalty from asset capture is different than in the case of once-and-for-all scenarios.

Our overlapping generations setup explains the prevalence of asset captures, despite the fact that this policy reduces welfare in the long run. First, capturing assets increases the current government revenue: the contributions that would have to be transferred to the privately managed funded pillar go to the publicly managed PAYG pillar and thus may be utilized to finance the current pension obligations. Hence, it improves pension system balance and thus allows to lower the contemporary tax rates. Second, capturing of the accumulated pension wealth by the government allows to reduce the outstanding public debt and/or thus, to further reduce taxation. Both of the effects are transitory in a sense that they mostly affect the living cohorts. By contrast, since indexation in PAYG is typically lower than the interest rate earned on accumulated assets, pensions are permanently lower. In addition, the younger the cohort at the moment of voting, the more interest it fails to earn on the funded pillar, hence raising the delayed private costs relative to the voting retirees or cohorts close to the retirement. The current gains versus the delayed losses represent the main trade-off in our model and we show that, the fiscal channel may indeed dominate the pension channel for a sufficient share of the voting cohorts at any point in time in the case of the once-and-for-all scenario: there is always a sufficient share of voters who favor capturing the assets from the funded pillar. The results are similar for the one-off scenario: the benefits from capturing the assets always outweigh the costs. We explain the reasons for these different effects, but conclude that overall the funded pension system is not politically stable if PAYG system is available as an alternative.

Our study relates to the literature on "privatizing social security", which tends to emphasize (Hicksian) welfare improvement.[7] In this literature the key policy challenge lies in timing the introduction of the funding: the transition cohorts have to finance the pensions of both their predecessors and themselves (Huang et al. 1997). The timing issue may be addressed with the use of public debt, to smooth the costs of the reform across generations (Belan and Pestieau 1999, Song et al. 2015, Makarski et al. 2017). It

[4] No country among the reformers considered abandoning the defined contribution feature of their pension systems.

[5] Note, that this problem is analogous, *au rebours*, to the introduction of the funded pillar in an economy with PAYG pensions. Introducing the funded pillar yields delayed gains in the form of higher pensions and lower future taxes – but at the expense of contemporaneous increase in taxation. Here, the gains from capturing the assets are immediate, whereas the costs in the form of lower pensions are delayed.

[6] The case of once-and-for-all voting, yielding permanent abandoning of the funded pillar in the pension system, is analogous to the cases studied typically in the literature started by Cooley and Soares (1996, 1999a,b).

[7] The general conclusion of welfare gains survives a number of sensitivity checks, see a discussion by Conesa and Krueger (1999), Fehr (2009), admittedly Nishiyama and Smetters (2007) argue that the insurance motive may indeed be large.

also matters greatly for political economy: the fact that the losing, transition cohorts are the ones who would have to support the reform calls for a mechanism to transfer future welfare gains to compensate the current losses, which makes public debt particularly useful (Conesa and Garriga 2008, compare a variety of options for introducing a funded pillar implicitly with political support). While this literature analyzes political economy of *introducing* the funded social security, there appears to be no consideration so far on whether funded pillar, once introduced, is *politically stable*. While majority of the literature on privatizations asks if a reform can gain sufficient political support to get implemented, we ask if it will be subsequently sustained. We show that it will not be sustained if there is an outside option of the unfunded, PAYG system. Two effects are at play. On the one hand, as time passes, the losing generations (alive at the date of reform) pass away and new gaining generations are born, which gradually shifts the political support in favor of privatization among the contemporaneously living cohorts. This is the standard result in the OLG literature. On the other hand, the stock of assets accumulated in the funded pillar is likely to raise the gains from capturing the assets, i.e. "unprivatizing". In contrast to the privatization, which implies immediate costs and delayed gains, "unprivatizing" implies immediate gains and delayed costs. The evidence from large number of countries over the past several years suggests that this time distribution of gains may feed into an inherent political instability.

Our study serves also to explain one more paradox. Namely prior political economy literature formulates several predictions concerning the PAYG pension systems: longevity should lead to larger social security (longevity channel), and young low-ability agents should form a coalition with retirees that raises the extent of redistribution (coalition channel). These two channels operate in the same direction in an aging economy: resistance against a DC system (Bismarckian) and in favor of DB system (Beveridgean). Meanwhile, the reforms introduced in many countries around the world in late 1990s and early 2000s did exactly that, using longevity as main motivation. Moreover, reforms which introduce funding reduce the size of social security understood as government-mediated transfer from young to old: once funding is established and transition period is over, the part which is explicitly redistributed from younger to older generations becomes smaller with funding, *ceteris paribus*. Finally, in the light of the standard theories, with longevity, political support towards a DB system and opposition against the DC system should be stronger due to the changing age structure of the society. Hence, the very existence of reforming social security to DC and its partial "privatization" is inconsistent with the theoretical predictions from the literature. We show that the this puzzle may be explained by mechanisms missing in the previous literature. One of the main drivers is the fiscal side, which was highly stylized in the earlier literature: the effects coming from tax adjustments are so strong that they dominate the longevity channel as well as the coalition channel. General equilibrium effects on wages and interest rates are the second main driver of the explanation. Our model, encompassing these additional mechanisms, may serve to explain the evolution of the pension systems around the world.

The remainder of our paper is structured as follows. In section 2, we outline our overlapping generations model including the political economy component. In the next section, we describe calibration and analyzed policy options. To relate closely to the recent policy changes, the economy and the pension system features have been calibrated to the case of Poland. This country has introduced a reform from PAYG DB to a two-pillar DC with a PAYG pillar and a funded pillar in 1999. In 2011, Poland has shifted the contributions away from the funded pillar towards the PAYG pillar, whereas in 2013 part of the assets in the funded pillar were nationalized. Poland is by far not singular in this sequence of reforms, which makes it a useful and a fairly representative case to study. Then, in section 4, we discuss results. Section 5 concludes the paper with policy implications of this study.

2 The theoretical model

We construct a small open economy model populated with overlapping generations and intra-cohort heterogeneity. In the original steady state, this economy has a defined benefit pay-as-you-go system (PAYG-DB), i.e. pensions are a fixed proportion of earnings. The first steady state is calibrated to replicate Polish economy prior to the any pension system reform. This economy introduces a reform to a two-pillar defined contribution system, keeping the contribution rates unchanged and honoring the obligations towards the older generations. This partial privatization of the social security improves welfare in Kaldor-Hicks sense and has political support in pure majority voting at the moment of implementation. To analyze political stability of the funded pillar, we allow subsequent voting on capturing assets accumulated in the funded pillar. As suggested by the intuition from the earlier literature, the gaining cohorts eventually gain majority due to demographics, which was believed to guarantee long term political viability of two-pillar systems. However, the living cohorts – even if they benefit from having the funded pillar – may still prefer to capture the collected contributions in exchange for contemporaneously lower taxes: the current welfare gain from lower taxes may outweigh the welfare loss due to decline in pension benefits. Also, the welfare of the future cohorts is irrelevant, since these cohorts cannot vote.

Our model features intra-cohort heterogeneity in order to analyze two important dimensions. First, the earlier literature on pension system reform suggests coalitions across generations and productivity types for fostering the redistribution, in the spirit of Aaron (1966) and Cooley and Soares (1999a). For the sake of comparison we also provide the results for a single agent cohort. Second, poverty is often a policy concern: both poverty at the old-age and low income youth. Thanks to intra-cohort heterogeneity, we can observe the changes in poverty and thus compare the policy outcomes along this metric.

2.1 International capital markets

Households have access to international capital markets in which they can borrow or lend at the interest rate r_t. As proposed by Schmitt-Grohe and Uribe (2003), the domestic interest rate r_t equals the the World interest rate r_t^* adjusted for the risk premium according to

$$r_t = r_t^* + \xi \frac{B_t}{Y_t}$$

where B_t is the level of foreign debt in the economy, Y_t denotes GDP and ξ is a constant. Following this standard formula, the ratio of foreign debt to GDP increases the interest rate at which domestic agents can borrow at international markets.[8]

2.2 Firms

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

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

[8]With the domestic interest rate equal to foreign interest rate models yield implausibly large swings in Net Foreign Assets position, hence the adjustment for debt. Since we calibrate the model to the case of Poland, an emerging economy, the closed economy assumption, with endogenously determined interest rates, yields a decline in the interest rate due to convergence of productivity to the levels characteristic of advanced economies. With declining interest rates, relative attractiveness of the funded pillar is lower, hence making our approach conservative. Moreover, Poland, as an EU Member, is closer to an open economy case. Our main results are the same for a closed economy calibration, the detailed results are available upon request.

where z_t captures exogenous labor augmenting technological progress. Hence, profit is maximized when return on capital $r_t - d$ (d denotes the depreciation rate of capital) is equalized with marginal product of capital and real wage w_t with marginal product of labor:

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

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

2.3 Households

Each agent of type $\kappa \in 1, ..., \mathcal{K}$ lives for up to J periods, with age denoted as $j \in \{1, 2, ..., J\}$.[9] Agents of the same age are heterogeneous with respect to productivity and the utility function parameters. We denote the size of subcohort κ of age j in period t as $N_{j,\kappa,t}$. The discount factor of an agent of type κ is denoted as δ_κ. Agents face a non-zero probability of dying in each period. The conditional probability that the agent alive in period t is alive in period $t+j$ is denoted as $\pi_{t,t+j}$ and is homogeneous within cohort.

Agents choose consumption $c_{j,\kappa,t}$, labor $l_{j,\kappa,t}$ (for which they receive the real wage w_t) and assets $a_{j,\kappa,t}$ (the interest rate on assets is denoted by r_t) to maximize the following utility function

$$V_{j,\kappa,t}(a_{j,\kappa,t}) = u_\kappa(c_{j,\kappa,t+j-1}, l_{j,\kappa,t+j-1}) + \delta_\kappa \pi_{j,t+1} V_{j+1,\kappa,t+1}(a_{j+1,\kappa,t+1}), \tag{4}$$

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

$$(1-\tau_{c,t})c_{j,\kappa,t} + a_{j+1,\kappa,t+1} = (1-\tau_l)\Psi_{j,\kappa,t} + (1 + r_t(1-\tau_k))a_{j,\kappa,t} + \Upsilon_t + \mathcal{B}_{j,\kappa,t}, \tag{5}$$

where τ_l denotes labor income tax, τ_c consumption tax, τ_κ capital income tax, Υ_t lump sum tax, and $\mathcal{B}_{j,\kappa,t}$ denotes unintended bequests, which are distributed within subcohort. In the budget constraint, $\Psi_{j,\kappa,t}$ signifies the current period income from labor or pension, which is given by the following formula:

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

In the above formula τ denotes social security contributions, $\bar{J}$ denotes retirement age, ω_κ denotes individual productivity and $b_{j,\kappa,t}$ pensions, which we discuss below.

2.4 Pension systems

This economy features **pay-as-you-go defined benefit (PAYG DB) pension system in the initial steady state**. In this system, the pensions were expressed as a replacement rate on pre-retirement earnings, following

$$b_{\bar{J},\kappa,t}^{PAYG-DB} = \rho \omega_\kappa \frac{\sum_{j=1}^{\bar{J}-1} w_{t-1} l_{j,\kappa,t-1}}{\bar{J}-1}, \tag{7}$$

where ρ denotes the replacement rate. In the PAYG DB system, contributions of the currently working are used to pay pensions of the currently retired. If there is deficit in the pension fund, the government is obliged to finance it, which we denoted by $subsidy_t$. The budget constraint of the pension system under

[9] We set $j = 1$ to signify 21 years of age and use the available mortality tables, which sets $J = 80$ as they are typically available until the age of 100.

PAYG DB is thus given by:

$$\sum_{\kappa=1}^{\mathcal{K}} \sum_{j=\bar{J}}^{J} N_{j,\kappa,t} b_{j,\kappa,t}^{PAYG-DB} = \tau w_t L_t + subsidy_t. \tag{8}$$

We change the system unexpectedly in the second period to a **two-pillar, partially funded defined contribution (DC) pension system**. In the DC system there are two pillars: the pay-as-you go pillar and the funded pillar, with τ^{PAYG} denoting the contribution rate to the PAYG pillar and τ^F denoting contributions to the funded pillar, where $\tau^{PAYG} + \tau^F = \tau$. [10] Similarly, b^{PAYG} and b^F denote benefits from PAYG pillar and funded pillar, respectively.

The contributions to the PAYG pillar are recorded and indexed at the rate of payroll growth in the economy, i.e. $r_t^{PAYG} = w_t L_t / w_{t-1} L_{t-1} - 1$. Contributions to the funded pillar are invested and offer the return equal to the interest rate r_t. During the working period, agents accumulate pension funds in both pillars according to:

$$\begin{aligned} f_{j,\kappa,t}^{PAYG} &= (1 + r_t^{PAYG}) f_{j-1,\kappa,t-1}^{PAYG} + \tau_t^{PAYG} \omega_{j,\kappa,t} w_t l_{j,\kappa,t} \\ f_{j,\kappa,t}^{F} &= (1 + r_t) f_{j-1,\kappa,t-1}^{F} + \tau_t^{F} \omega_{j,\kappa,t} w_t l_{j,\kappa,t}. \end{aligned} \tag{9}$$

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.[11] Summarizing, the pension benefits are given by:

$$b_{j,\kappa,t}^{PAYG} = \begin{cases} 0, & \text{for } j < \bar{J} \\ f_{\bar{J},\kappa,t}^{PAYG} / LE_{\bar{J}_t,t}, & \text{for } j = \bar{J} \\ (1 + r_t^{PAYG}) b_{j-1,\kappa,t-1}^{PAYG} & \text{for } \bar{J} < j \leq J \end{cases} \tag{10}$$

$$b_{j,\kappa,t}^{F} = \begin{cases} 0, & \text{for } j < \bar{J} \\ f_{\bar{J},\kappa,t}^{F} / LE_{\bar{J}_t,t}, & \text{for } j = \bar{J} \\ (1 + r_t) b_{j-1,\kappa,t-1}^{F} & \text{for } \bar{J} < j \leq J \end{cases} \tag{11}$$

with $LE_{\bar{J},t} = \sum_{s=0}^{J-\bar{J}} \frac{\pi_{\bar{J}+s,t+s}}{\pi_{\bar{J},t}}$ denoting life expectancy at retirement.

In the **transition period**, the public system pays out the defined benefit pensions (PAYG DB: $b^{PAYG-DB}$), but also starts paying out the defined contribution pensions (PAYG DC: b^{PAYG}), while a part of the contributions τ^F that used to serve the purpose of financing the pension benefits goes into the funded pillar.[12] Hence, there is a transitory deterioration in the balance of the public pillar: recall equation (8), where instead of total contributions τ, the public pillar receives only $\tau^{PAYG} = \tau - \tau^F$. Since this is a DC pillar, after the transition is complete, $subsidy_t$ eventually becomes effectively zero.

The transition from a PAYG DB system to a two-pillar DC system, as described above, constitutes the baseline scenario of our simulations. The analyzed voting scenarios will comprise changes to this setup. We allow agents to vote in favor of "unprivatizing" the pension system at different dates, i.e. once in each simulation agents evaluate the potential individual gains and losses from capturing the assets accumulated

[10] Keeping the total contribution rate constant allows to maintain the distortions unchanged after the pension system reform. Such reform was introduced in Poland in 1999 and in many other countries of the Central and Eastern Europe as well as Sweden over the course of 1990s and 2000s (see Holzman and Stiglitz 2001, Orszag and Stiglitz 2001, Jarrett 2011, Schwarz 2011, Schwartz 2014).

[11] Contributions of those agents who die prior to claiming benefit are added to the pension contributions of the survivors, i.e. are distributed equally within subcohort and remain within the pension system.

[12] For details on the pension system reform in Poland see Chlon et al. (1999).

in the funded pillar. The voting comes unexpected, i.e. agents do not know that such a vote will be offered and they assume that after the vote the economy will continue as voted (an approach similar to Phelan 2006). Agents in our model do not vote strategically in a sense that (i) they care about their own welfare alone, (ii) the vote comes unexpectedly, and (iii) agents have no reason to believe such voting would repeat at any point later in time. Details of the voting alternatives are discussed in section 2.7 later in text.

2.5 Government

Government collects taxes in order to finance some exogenous expenditure, pension system deficit and to service the outstanding debt. The revenues of the budget are defined by:

$$T_t = \tau_{l,t}\big[(1-\tau)w_t L_t + \sum_{\kappa=1}^{\mathcal{K}}\sum_{j=\bar{J}}^{J} b_{j,\kappa,t}N_{j,\kappa,t}\big] + \sum_{\kappa=1}^{\mathcal{K}}\sum_{j=1}^{J}(\tau_{c,t}c_{j,\kappa,t} + \tau_{k,t}r_t a_{j,\kappa,t})N_{j,\kappa,t}, \tag{12}$$

which implies the government budget constraint of:

$$G_t + subsidy_t + r_t D_{t-1} = T_t + (D_t - D_{t-1}) + \sum_{\kappa=1}^{\mathcal{K}}\sum_{j=1}^{J} N_{j,\kappa,t}\Upsilon_t, \tag{13}$$

where G_t denotes government expenditure and D_t government debt. Whenever budget deficit emerges, it is cushioned by adjustment in public debt, but that adjustment subsequently triggers smooth adjustment of consumption taxes, following:

$$\tau_{c,t} = (1-\varrho)\tau_c^{final} + \varrho\tau_{c,t-1} + \varrho_D((\tilde{D/Y})_t - (D/Y)^{final}), \tag{14}$$

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. The values of τ_c^{final} and $(D/Y)^{final}$ denote the new steady state values of consumption tax and debt share in GDP, respectively. Our fiscal rule is forward looking in a sense that $(\tilde{D/Y})_t$ denotes debt share averaged with a moving average over two past, current and two future periods. This allows taxes to react to future changes in debt, not only to the contemporaneous change in government imbalance. The initial ratio debt to GDP ratio is set in concordance with the data at 45%. To eliminate the effects associated with the change in the long run debt ratio, the ratio in the final steady state is also set to 45%.

2.6 Closing the model

The model is closed with market clearing conditions for:

$$\text{the labor market:} \quad L_t = \sum_{\kappa=1}^{\mathcal{K}}\sum_{j=1}^{\bar{J}-1} N_{j,\kappa,t}\omega_\kappa l_{j,\kappa,t}, \tag{15}$$

$$\text{the capital market:} \quad K_{t+1} + D_{t+1} = \sum_{\kappa=1}^{\mathcal{K}}\sum_{j=1}^{J} N_{j,t}(a_{j+1,\kappa,t+1} + f^F_{j+1,\kappa,t+1}) + B_{t+1}, \tag{16}$$

$$\text{the goods market:} \quad \sum_{\kappa=1}^{\mathcal{K}}\sum_{j=1}^{J} N_{j,\kappa,t}c_{j,\kappa,t} + G_t + K_{t+1} + NX_t = Y_t + (1-d)K_t, \tag{17}$$

where NX_t denotes current account. Net foreign asset position evolves over time according to the following formula

$$B_{t+1} - B_t = r_t B_t - NX_t. \tag{18}$$

2.7 The political economy

We assume that the collective decision concerning the future of the pension system is made through pure majority voting. Agents who recall positive welfare from a policy change under voting are considered to favor this policy over *status quo*. Welfare effects of the reform expressed in consumption equivalent of lifetime consumption of the agent is measured as:

$$W_{j,\kappa,t} = 1 - \exp\left(\frac{V^b_{j,\kappa,t} - V^r_{j,\kappa,t}}{\sum_{s=0}^{J} \delta_m^s \frac{\pi_{j+s,vt}}{\pi_{j,vt}}}\right), \tag{19}$$

where t is voting date, $V^b_{j,\kappa,t}$ utility in status quo scenario and $V^r_{j,\kappa,t}$ utility in case the change in question was implemented.

The first voting: two-pillar DC system First, we measure the welfare effects of replacing the PAYG DB system with the two-pillar DC system. Agents face the following trade-offs. First, with longevity, the PAYG DB system would require permanent subsidy from the government, because longer life at retirement would raise the amount of pensions to be paid out. This deficit would be financed with consumption tax and debt according to the fiscal rule given by equation (14). If the system is replaced by a DC system, the pension pillar eventually becomes balanced, which reduces the taxes in the long run. Second, the PAYG DB pensions are higher than the DC pensions. Third, funded pillar will raise the pensions due to the fact that interest earned on accumulating assets will exceed the indexation in the PAYG, publicly managed pillar. Fourth, during the transition period, the gap in the publicly managed pillar will emerge, necessitating transitory increase in taxes (smoothed by the transitory increase in public debt). Finally, there are general equilibrium effects, stemming from adjustment in private voluntary savings (in the face of pensions from DC being lower than from DB) and in labor supply (the DC system provides stronger incentives to work, due to a clear link between contributions and pensions). These four effects, together with the general equilibrium effects will determine the overall welfare of the change from PAYG DB system to a two-pillar DC system.

In addition, the introduction of the DC system necessitates establishing the amount of drawing rights that would have accumulated in $f^{PAYG}_{j,\kappa,t}$ if it existed in the past. Naturally, the cohorts who worked prior to the implementation of the two-pillar DC system have zero holdings in $f^F_{j,\kappa,t}$ at $t = 1$.

Honoring the pensions of the retirees from the PAYG DB system after the change to the DC system was frequently extended to the cohorts close to retirement at the moment of the reform. For example, in the case of Poland, cohorts older than 40 years at the moment of the change continued to receive pensions according to pre-change rules. We assume that cohorts older than 40 years at the moment of the reform receive pension benefits according to equation (7). All subsequent cohorts received pensions following equations (10) and (11).

We evaluate the welfare of each cohort relative to the alternative of continuing with PAYG DB pension system. Based on these computations we are able to judge which subcohorts are in support of turning the Beveridge'an system Bismarckian with partial funding and which are not.

The subsequent voting: capturing assets from the funded pillar Second, we measure the welfare effects of capturing assets accumulated in the funded pillar. Agents (unexpectedly) are allowed to choose between keeping the two-pillar DC pension system intact and a combination of reducing the funded pillar and raising the PAYG pillar. Once there is sufficient political support for reducing the funded pillar, agents treat this outcome as permanent in evaluating their welfare (i.e. they expect no subsequent voting). We allow for different dates of this second voting. The intuition from the "privatizing social security" literature

emphasizes that once the transition period is concluded, all of the living agents benefit from the two-pillar system, hence it should be politically stable. Our intuition proposes an alternative mechanism: reducing the funded pillar offers immediate gains at the expense of future generations, regardless of the share of agents benefiting from the two-pillar system.

We allow agents to vote on two types of reducing the funded pillar. First, voters can decide about diverting (part of) social security contributions away from the funded pillar to the PAYG pillar. This option does not reduce the overall contribution rate and it increases the size of the public social security in the economy.[13] We call such change a shift of contributions and denote in the remainder of this paper as Policy 1. This policy option mimics the type of changes that have been temporarily or permanently implemented by all Central and Eastern European countries in the aftermath of the global financial crisis. Since in most countries which followed policy of this type, some contributions continue to be transferred to the funded pillar, instead of completely removing it, we change the proportions. More specifically, prior to any voting $\tau^{PAYG} = 2\tau^{F}$ whereas the vote changes the proportions to $\tilde{\tau}^{PAYG} = 5\tilde{\tau}^{F}$ (with $\tau^{PAYG} + \tau^{F} = \tilde{\tau}^{PAYG} + \tilde{\tau}^{F} = \tau$).[14] This policy is permanent in a sense that the funded pillar is permanently reduced.

Second, voters can decide that the assets in the funded pillar are transferred from the funded pillar to the PAYG pillar and utilized to service current expenditure of the government. We call this policy appropriation and in the remainder of the paper denote as Policy 2. Such changes have been implemented by Hungary, Bulgaria, Poland and Slovakia, although to a differing extent. In Hungary the nationalization of accumulated assets was immediate and complete, whereas in the other countries it is partial and gradual. Again, this policy change does not reduce directly the size of the pension system in the economy,[15] but it shifts assets from capital to current government expenditure. On the individual level, assets from the funded pillar are recorded in the PAYG pillar. This policy is transitory in a sense that while the accumulated assets are captured, accumulation resumes as of the next period

Third, in some of the countries, both Policy 1 and Policy 2 were implemented. Thus, in our setting a third policy option is the combination of the two, i.e. voters can express support for both shift of contributions and shift of pensions in the same voting. We call this Policy 3. Note that Policy 3 combines the permanent effects with the transitory effects.

Each of these policies has different effects on 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. With general government consumption fixed, reduction in $subsidy_t$ allows for a reduction in taxes, relative to the status quo scenario during the original transition period. However, once the original transition from PAYG DB to two-pillar DC system is complete, there are no more differences on the fiscal side. Meanwhile, since return in the PAYG pillar is lower than in the funded pillar this policy results in permanently lower future pension benefits. Policy 2 reduces immediately the debt of the government. This allows current and future taxes to be substantially reduced, because also the subsequent costs of servicing public debt are decreased. With the fiscal rule described in equation (14), taxes do not adjust immediately, but the reduction in consumption taxes is nonetheless large. Clearly, it is accompanied by lower pension benefits for agents. The more assets agents have the more they are affected by such a policy.

Only agents living at the times of voting can vote and they follow individual utility assessment. An

[13] Hence, the predictions of studies such as Browning (1975), Butler (2000) do not apply to our case (see also Congleton et al. 2013, for additional treatment).

[14] The considered proportions prior to the vote and subsequent the vote replicate the Polish case, but the analysis can easily be extended to any proportion of policy relevance.

[15] Some indirect effects come from the fact that PAYG pillar offers lower rate of return than the capital pillar, hence the accumulated pension obligations are lower. See e.g. Casamatta et al. (2001) for treatment.

agent is in favor of a given policy if her subsequent lifetime utility is higher than in the *status quo*. We express welfare effect of a policy change as a consumption equivalent in percentage of lifetime consumption from the policy change scenario. Agents with positive welfare gain are in favor of a given policy change. The order in which Policy 1, 2 and 3 are voted is irrelevant for the outcome.[16]

3 Calibration

We calibrate the model to match the features of the Polish economy as an example of a country which implemented the partial privatization of the social security and continued with essentially unchanged features of the pension system for over a decade. To avoid bias due to the cyclical effects, we rely on averages for a decade prior to the reform from 1999 which replaced the PAYG DB system with the two-pillar DC system. We use the detailed demographic projection released by the Aging Work Group (AWG) of the European Commission to reproduce the arrival of new cohorts to the economy as well as annual survival probabilities for each cohort. The projection is available until 2080. Subsequently, we assume the mortality rates and births constant. Consequently, the population declines at a rate of 1% in the final steady state.

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 moving average TFP growth obtained form the data for this period (to smooth out the cyclical fluctuations). The AWG scenario for productivity assumes gradual convergence to the average EU level of 1.54% *per annum* between 2010 and 2040 and a stable growth at this rate thereafter.

The retirement age $\bar{J}$ is calibrated to the data on effective retirement age collected by the OECD, thus it equals 61 in 1999 and remains constant throughout the projection.[17] These assumptions are used in all the scenarios. 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 replicate the pension system deficit as observed in the years prior to the reform at 0.8%. The split between τ^{PAYG} and τ^{F} follows the proportions set by Polish legislation.

We use the data on employment rate from the Labor Force Survey to calibrate the aggregate preference for leisure ϕ. Subsequently, we seek the discount factor δ and the capital depreciation rate d that would be consistent with the national saving rate of approximately 16% and the investment rate of approximately 21%, as observed on average in the economy between 1990 and 1999. We calibrate the global interest rate to 3%. In the spirit of Schmitt-Grohe and Uribe (2003) we introduce the coefficient governing the debt-elastic interest-rate premium so that the net foreign debt does not explode. We calibrate the premium rate over the world interest rate paid by the domestic residents ξ to 0.03.

Following the standard in the literature, we assume the elasticity of output with respect to capital equal to $\alpha = 30\%$. 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 revenue and the labor revenue in the national accounts, thus at its effective rather than nominal rate. With the calibrated value of the consumption tax τ_c to match the value added tax revenues over GDP. 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. To assure

[16] SeeDhami and al Nowaihi (2010) for the proof of transitivity.

[17] The eligibility retirement age was 55 for women and 60 for men. In 2009 the government eliminated early retirement for majority of the work force (few occupations remained entitled to early retirement). In 2012, government imposed a gradual increase of the eligibility age to 67 for both genders, but before this legislation effectively raised the bar, this policy was reversed in 2015 and the current eligibility age is 60 for women and 65 for men, with entitlement to claim partial benefits from the age of 58 for women and 63 for men.

Table 1: Calibrated parameters for the initial steady state

Macroeconomic parameters		Calibration	Target	Value (source)
ϕ	preference for leisure	0.5	average hours	56% (LFS)
δ	discounting rate	0.992	interest rate	6%
τ_l	labor tax	0.084	revenue as % of GDP	9.2% (OECD)
τ_c	consumption tax	0.220	revenue as % of GDP	3.8% (OECD)
τ_k	capital income tax	0.190	*de iure*	
ρ	replacement rate	0.228	benefits as % of GDP	5.0% (SIF)
τ	social security contr.	0.06	SiF deficit as % of GDP	0.8% (SIF)
α	capital share	0.300		
d	depreciation rate	0.035	investment rate	21% (NA)
r^*	world interest rate	3%		
ξ	premium over r^*	0.030	domestic investment as % of GDP	16% (NA)
	fiscal rule parameters			
ρ	tax rate persistence	0.800		
ρ_D	strength of debt-tax link	0.300		
D/Y	government debt to GDP ratio	0.450		45% (NA)

Notes: Tax shares in GDP obtained from the OECD Tax Revenue database. LFS stands for Polish Labor Force Survey and has been averaged over 1995-2000 period (prior to 1995 LFS was not collected in Poland). SIF stands for Social Insurance Fund (in Polish: Fundusz Ubezpieczen Spolecznych), annual reports. NA stands for National Accounts

smooth adjustment in the fiscal rule, we set $\rho = 0.9$ and $\rho_D = 0.065$. Finally, we obtain the necessary lump sum to match deficit to GDP ratio. The parameters are summarized in Table 1.

3.1 Calibrating the heterogeneity

There are three dimensions of intra-cohort heterogeneity: preference for leisure, time preference and individual productivity.[18] We calibrate this heterogeneity using individual level data (see for example Hénin and Weitzenblum 2005, McGrattan and Prescott 2013, Kindermann and Krueger 2014, for a discussion on the confounding of the estimates for the household rather than individual data).

Productivity endowment ω_κ We use linked employer-employee data to reduce the biases inherent in labor force surveys (rounding error and self-reporting bias). We use Structure of Earnings Survey, designed by the Eurostat and collected biennially by the central statistical offices.[19] This survey covers roughly 700,000 employees and all individual level characteristics such as age, gender, earnings, sector and occupation as well as actual hours worked are reported by the employer. Since in our model individual labor productivity is determined once for the entire lifetime, we use the early years in the career to obtain the distribution of these endowments. We estimate a standard Mincerian wage regression with education levels, occupation, industry and region controls, as well as the form of contract (fixed term or indefinite duration), form of employment (part-time, full-time, weekends, etc.). We use total hourly wage, including overtime and bonuses.

The Mincerian wage regression was estimated for all individuals in the sample, so we had controls for age and experience (both linear and squared). Subsequently, we use fitted value of log earned hourly wage against the mean of this prediction for the individuals up to five years after labor market entry. This yields the final distribution of individual productivities depicted in Figure A.2. We thus obtain, i.e. $\omega_\kappa \in \{0.70, 0.76, 0.84, 0.93, 0.98, 1.03, 1.08, 1.14, 1.20, 1.26\}$.[20]

[18] The three dimensions of heterogeneity are assume independent. Any conditional distribution is feasible in our setup, but empirical research identifying the potential correlation between dimensions of preference heterogeneity remains scarce.

[19] We use data from 1998 wave to calibrate the distribution of individual productivity endowment.

[20] We run a similar analysis if median fitted value was to be the metric of endowments, the distribution is similar. The results are available upon request.

Leisure preference ϕ_κ Agents' preference for leisure/consumption is directly responsible for the labor supply decisions, so we calibrate it to replicate the employment ratio in the decade prior to 1999. Individual preference for leisure is heterogeneous, with a fraction of population working part-time or not at all. We rely on reported hours actually worked in the Structure of Earnings Survey which range from 31% to 206% of the regular working time. We thus obtain the individual multipliers of the preference for leisure ϕ_κ, i.e. $\phi_\kappa \in \langle 0.0\phi, 0.5\phi, 1.0\phi, 1.5\phi \rangle$. The distribution scaled by the mean hours worked is depicted in Figure A.2.

Discount factor δ_κ The aggregate discount factor is calibrated to replicate the interest rate, given the depreciation rate. Clearly, there are no empirical counterparts to calibrate the heterogeneity in the discount factor across agents. We assume symmetric departures from the average discount factor and calibrate it such that the wealth inequality in 1999 is replicated by our model. Davies et al. (2011) and a household wealth survey by the National Bank of Poland[21] yield the range for the wealth Gini coefficients between 65.7 in 2000 and 57.9 in 2014. We target the mid point of these two values assuming that 40% of agents have the average discounting and 30% of agents have lower or higher than the average discounting. This calibration yields the wealth Gini coefficient in the initial steady state of 62, hence $\delta_\kappa \in \langle 0.988\delta, 1.0\delta, 1.012\delta \rangle$.

3.2 Solving the model

We solve the consumer problem analytically. In order to reduce the dimensionality of the problem we use the implicit tax approach proposed by Butler (2002). i.e. pension system contributions are effectively split up into implicit savings (by construction age-specific) and implicit tax. In the DB system, the consumer sees no link between current labor supply and future pensions, hence the entire contribution is seen as tax. In the DC system, the link is embedded in the actuarial formulas given by equations (9)-(11).

Once the consumer problem is solved by each κ-type of agent at each age j, for a given set of prices and taxes, we apply the Gauss-Seidel algorithm to obtain the general equilibrium. Using the outcome of the consumer problem, the value of aggregate capital is updated, fiscal part and pension system are resolved. The procedure is repeated until the difference between the path of aggregate capital from subsequent iterations is negligible, i.e. L_1-norm of the difference between a capital vector in subsequent iterations falls below 10^{-12}. We set the length of 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.

4 Results

Before we move to the results, some intuitions are due. The major forces behind establishing the funded pillar and capturing assets in this pillar have already been introduced. Implementing funding causes a transitory fiscal gap, but increases the pension benefits. The transitory fiscal gap can be smoothed across generations via contemporaneous adjustments in taxes and public debt, thus making such reform acceptable from a political economy perspective. Previous literature emphasized typically immediate costs and delayed gains. Meanwhile, capturing assets accumulated in the funded pillar embodies the opposite: the generation which captures the assets has an immediate gain (in the form of lower taxes) and delayed cost (in the form of lower pension benefits). If captured assets are used to reduce public debt rather than immediately reduce taxation, consumers benefit from lower taxes anyway, because lower public debt makes it possible for the government to cut down the costs of servicing debt.

[21] A standardized tool developed within Household Finance and Consumption Network of the European System of the Central Banks.

This reasoning is further refined in the recognition that among the voting cohorts there may be heterogeneous preferences. In general, all agents prefer living in an economy with high levels of capital. For example, future generations benefit from current capital accumulation because marginal productivity of labor increases in capital stock. However, the benefits from further capital accumulation differ by age at the moment of voting. Older agents – retired or close to retirement – care more about interest rate than about wage growth, because their consumption depends more on the interest rate. In this situation, capturing assets lowers capital to labor ratio ($K \downarrow$ and $L \uparrow$) so it raises the interest rate, while raising also the labor supply among the younger generations. At the same time, their pension benefits will not be hurt much. Even if these effects are transitory, they further raise the support for asset capturing among the older cohorts. Meanwhile, younger agents – still expecting to work for many years at the time of voting – are mostly interested in the wage growth. Hence, they remain to be interested in maintaining the capital accumulation. Naturally, the decline in capital can be partially or fully offset by decline in taxes (consumption becomes cheaper, facilitating voluntary savings). Overall, older agents will typically be in support of asset capturing, while younger agents will be in favor if tax channel dominates the wage channel.

We verify these intuitions in the remainder of this section. For illustrative purposes, in Appendix B we discuss the macroeconomics and political economy of introducing the two-pillar DC system, which is the status quo alternative in our study. In a nutshell, we show that introducing a two-pillar DC system has sufficient political support at the moment of implementation. It also improves welfare in Kaldor-Hicks sense, with the aggregate consumption equivalent of 1.2% of lifetime consumption. The support comes mostly from old cohorts, which owes to the fact that introducing a DC system raises the incentives for labor supply, hence pension indexation is much more favorable under two-pillar DC system than if DB system continued (see Figure B.4). We also show that as the oldest cohorts pass away, share of population benefiting from a two-pillar DC system declines gradually and resumes only as the cohorts working at the time of the reform pass away. Hence, it again reaches majority of gaining agents as late as in 2060, i.e. when a sufficient share of newborn cohort populates the economy (see Figure B.5). Finally, we show, via a decomposition, that at about 2100 – i.e. a 100 years after two-pillar system is introduced – having the funded pillar is beneficial to all living cohorts. The conventional intuition states that at this point the funded pillar should become politically stable.

4.1 Capturing assets accumulated in the funded pillar

We report results for simulations with voting on policy reversal in 2012, 2052, 2092, 2132, 2172 and 2212.[22] As the time passes the initial costs of the reform fade away, while the age structure of population changes due to lower fertility and increased longevity. Overall, as of 2100 the funded pillar has positive welfare effects. Note that as of 2042 all of the initial retirees with pensions set by PAYG DB rules are already deceased. Overall, diverting funds away from the capital pillar to the PAYG pillar, as was the case in many European countries, ultimately reduces welfare in the long run. The static comparison of final steady states reveals welfare effect of Policy 1 is -0.59% of lifetime consumption. Since Policy 2 involves one-off appropriation, it has no long-term effects. Hence, Policy 3 is in the long run equivalent to Policy 1.[23] The results of consecutive voting rounds are displayed in Table 2.

While there appear to be some minor differences in timing, ultimately, the funded pillar never becomes politically stable. Indeed, agents always massively vote in favor of reducing the funded pillar. The

[22] We choose the 2212 as a year corresponding to the steady state, i.e. voting in subsequent periods yields the same results.

[23] Aggregate welfare for the winning scenario in the presented calibration amounts to 0.03% of permanent consumption, but the magnitude and the sign of this aggregate welfare measure depend crucially on fiscal adjustment and fiscal rule parameters. The long-term welfare effects are robust. Figures 3 and 2 illustrate the point.

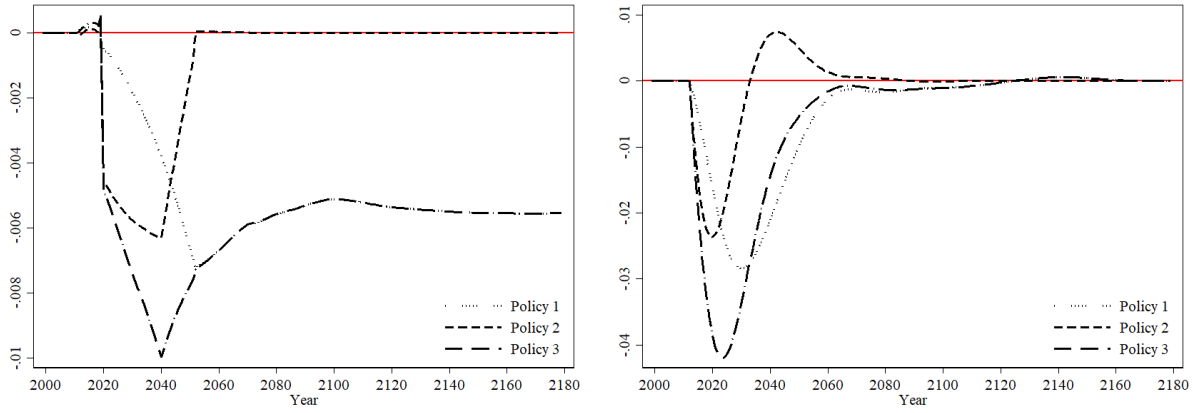
permanent shift of contributions from funded to PAYG pillar, denoted as Policy 1, is favored regardless the time of the policy change. Moreover, agents are in favor of permanent rather than one-off policy variants: Policy 2 (appropriation) is never preferred relative to *status quo* of two-pillar system with partial funding, but when combined with reduced size of the funded pillar, it always becomes favored (Policy 3). The aggregate welfare effects are negligible: depending on the parametrization of the fiscal rule, they are small positive or small negative, but orders of magnitude smaller than in the final steady state.

Table 2: Political support for the three analyzed policies

Year of voting	2012	2042	2072	2102	2132	2162	2192
Political support in % of the living cohorts	against *status quo*						
for Policy 1 - shifting contributions (permanent)	99	99	99	99	99	99	99
for Policy 2 - capturing assets (one-off)	52	62	64	61	61	62	62
for Policy 3 - combination of Policy 1 and 2	99	90	94	94	90	94	94
Political support in % of the living cohorts	against policy with the highest support						
for Policy 1 - shifting contributions (permanent)	48	35	36	40	39	38	38
for Policy 2 - capturing assets (one-off)	1	1	2	1	0	0	0
for Policy 3 - combination of Policy 1 and 2	-	-	-	-	-	-	
Winning policy	3	3	3	3	3	3	3

Notes: Voting in 2212 is equivalent to voting in the final steady state. Long term welfare effects refer to the final steady state. Results for all consecutive votes available upon request. In Policy 1 the share of contributions going to the funded pillar is reduced, overall contribution rate stays the same. In Policy 2 assets accumulated in the funded pillar are captured. Policy 3 denotes combination of these two policies (permanent reduction of the contributions going to the funded pillar and one-off appropriation of assets).

Figure 1: The effect of reducing the funded pillar on pensions and taxes



(a) Average pensions: relative to baseline

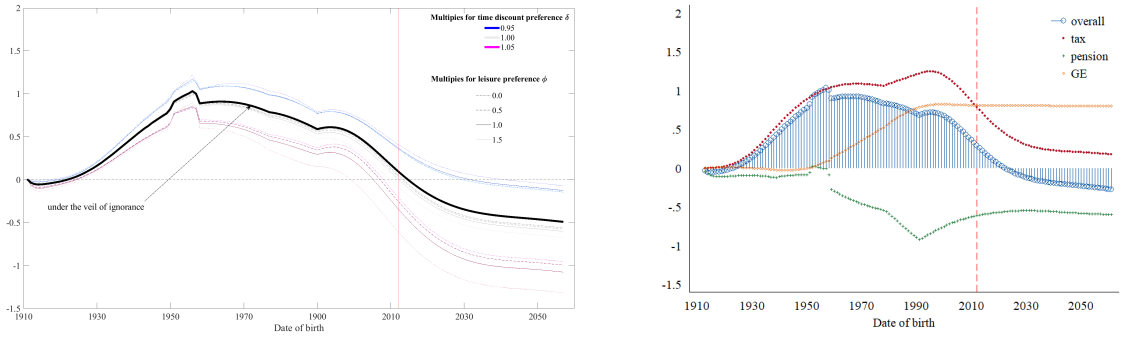
(b) Consumption taxes: relative to baseline

Note: results from a voting round in 2012, results for the other rounds available upon request. Differences relative to baseline expressed in percentage points. Policy 1 denotes permanent shift of the contributions from the capital pillar to the PAYG pillar. Policy 2 denotes one-off capturing of the assets accumulated in the capital pillar. Policy 3 combines Policy 1 and Policy 2. Levels of pensions and taxes as well as debt adjustments reported in Figure C.7 in Appendix C.

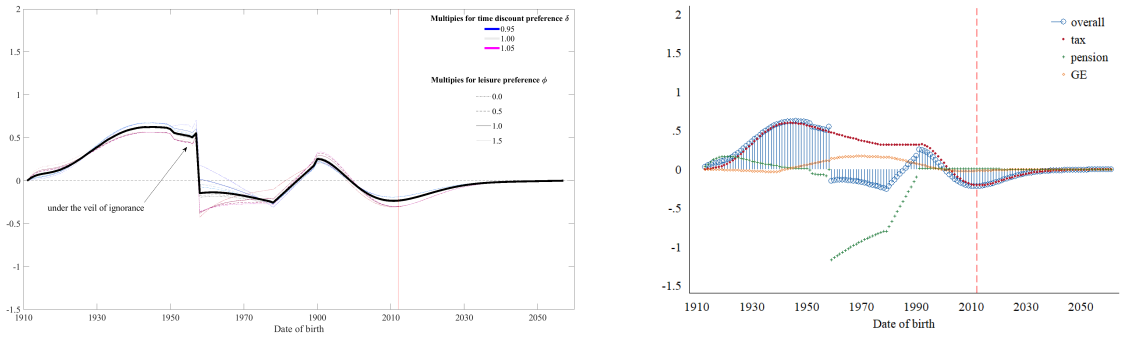
To understand the sources of political support, we look at the heterogeneity of the welfare effects, as well as the relative role of fiscal adjustments and pension adjustments (both are reported in Figure 1). To portray the former, we display the disaggregated welfare effect, for κ subcohorts. To portray the latter, we resort to the decomposition techniques: the welfare effects are computed as if taxes remained unchanged or if pensions remained unchanged. Both are displayed in Figure 2, for the voting round of 2012.

Figure 2: Welfare effects with voting in 2012: intra-cohort distribution and sources.

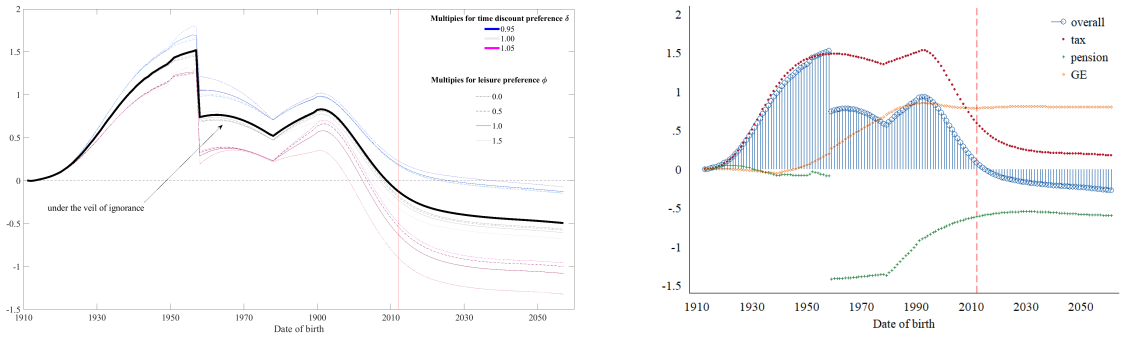
(a) Policy 1: shifting contributions (permanent)



(b) Policy 2: capturing assets (one-off)



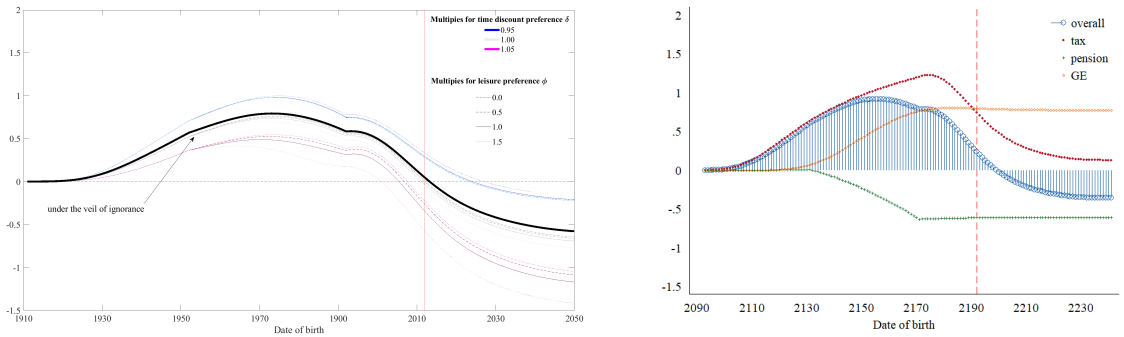
(c) Policy 3: combination of Policy 1 and Policy 2



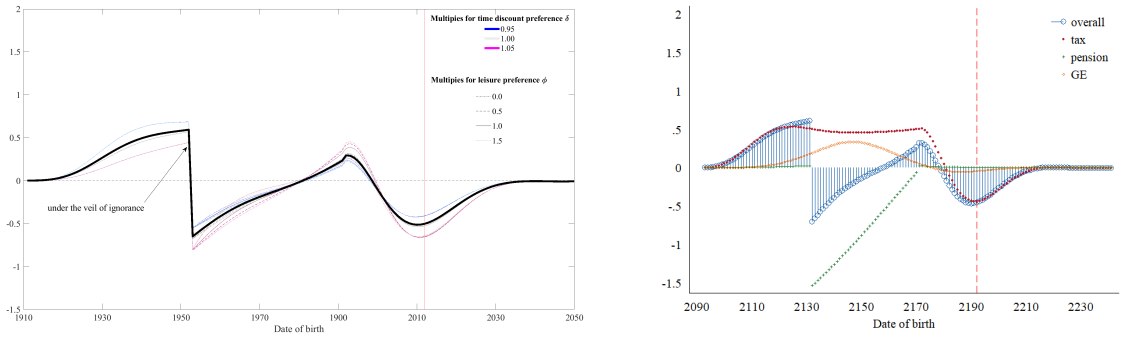
Note: both panels display welfare effects expressed as % of permanent consumption in policy change scenario. The driving force behind differences in policy change evaluation is the multiplier for time discount preference δ_κ (distinguished by color). The multiplier for leisure ϕ_κ brings some diversity in the results (distinguished by the line style). Individual productivity endowment ω_κ has nearly no effects on welfare, the lines for cohorts distinguished only by different endowments mostly overlap. We additionally report the consumption equivalents from simulation behind the veil of ignorance (black line). In the right panel we portray results from a decomposition to the tax, benefits and price components via partial equilibrium. To extract the effects of taxes, we use the consumption taxes from the scenario for a given policy and we use all other macroeconomic aggregates from the status quo scenario. With these prices and quantities, consumers choose again, yielding new utilities and thus welfare measures. This is depicted as the "tax" component. To obtain "pensions" component we use the pension benefits from the scenario for a given policy and we use all other macroeconomic aggregates from the status quo scenario. To obtain "GE" component we use the interest rate and wages from the scenario for a given policy and we use all other macroeconomic aggregates from the status quo scenario. Notice that you cannot add these three channels to obtain overall effect due to the curvature of the utility function.

Figure 3: Welfare effects with voting in 2192: intra-cohort distribution and sources.

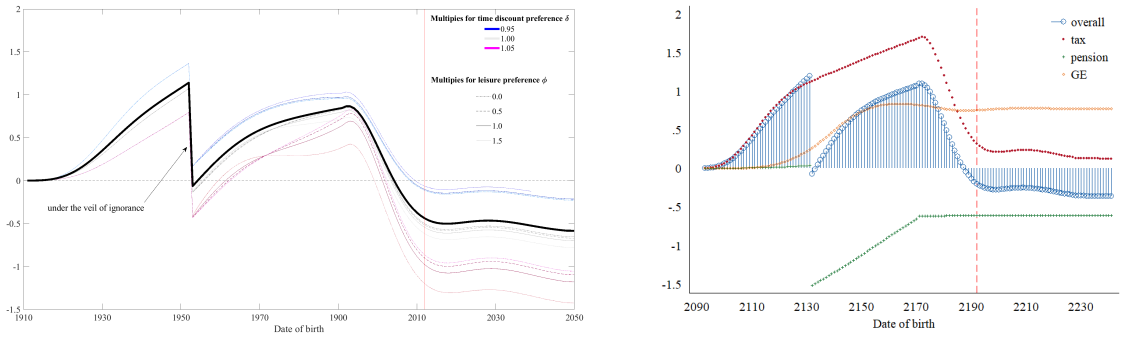
(a) Policy 1: shifting contributions (permanent)



(b) Policy 2: capturing assets (one-off)



(c) Policy 3: combination of Policy 1 and Policy 2



Note: see Figure 2.

For newborn cohorts, despite heterogeneity in productivity endowment, leisure preference and time preference, capturing the assets from the funded pillar invariably leads to negative welfare effect. These cohorts see little decrease of taxes by the time they are born, but at the same time economy grows slower and pensions are lower due to lower indexation rates in the PAYG pillar than would have been the return rate in the funded pillar. Policy 1 improves welfare of almost all living cohorts, almost solely by the tax channel. By contrast, the one-off appropriation in Policy 2 benefits mostly retirees and agents who are not affected by the initial 1999 reform and do not have assets in the funded pillar. Also in this case, reduced taxation is the only source of gains. The losses of welfare are the most pronounced for cohorts with largest funded pillar assets who are close to retirement (and younger than 40 in 1999). The two policies add up in Policy 3 in terms of welfare, revealing why this combination of Policy 1 and Policy 2 is usually preferred to Policy 1 in early years.

While the results portrayed in Figure 2 can explain the phenomena observed in the recent decade, the same approach may permit answering the question why (partial) funding of social security actually never becomes politically stable. In Figure 3 we portray the welfare effects if voting occurs in a period close to the final steady state. The distributions of a consumption equivalent across subcohorts are similar, i.e. there is no room to form inter-generational coalitions for or against a given policy. The future cohorts loose from permanent policy change (Policy 1) and are neutral to one-off policy changes (Policy 2). Whether contemporaneous taxes are reduced due to shift of contribution (Policy 1) or capturing of assets (Policy 2), cohorts retired at the moment of voting benefit. Comparing to the voting in 2012, the currently working generation has less debt to finance, hence accumulates more financial assets, also in the DC funded pillar. As a result, the appropriation is more harmful. Naturally, close to the final steady state the the benefits from the shift of contributions are not sufficient to compensate for the welfare loss from lower return on assets in funded pillar, because the difference between them is stable and relatively large. As a consequence, political support for Policy 3 declines, but still provides for majority of the voters, see Table 2.

The long run welfare effects of reducing the funding of the social security are negative with the exception of one-off appropriation (Policy 2), where by construction we make the effects transitory. Nevertheless, the political support for these policies is warranted by the welfare gains of the living cohorts. Even though the winning policy reduces welfare in the long-run, it improves the situation of the sufficient fraction of agents living at the period of voting at the expense of future generations to warrant the majority political support. For the voting cohorts, the gains from lower consumption taxes dominate welfare losses from lower pension benefits. The future generations, by contrast, have no fiscal gains, but the pension system permanently delivers lower pensions and higher taxation of private assets. Thus, for these cohorts the losses dominate gains, despite mechanics being the same. This result comes partly due to the fact that agents have access to the saving technology and can use perfect foresight to smooth consumption via private voluntary savings. Note, that this is suboptimal mode of smoothing – both in our design and in real world cases – because contributions to the funded pillar are permanently exempt from capital income taxation, whereas private voluntary savings are not. Yet, the effects associated with declining debt and taxes dominate the increase in capital income tax distortion.

We test validity of our results to some of the exogenous assumptions in the model. First, we analyze if the demographic path is relevant and we find that even with a growing population, introducing a funded pillar gets political support, but so does capturing of the accumulated assets afterwards. Second, we test if the results are susceptible to the share of asset capture which is used to reduce taxes (as opposed to reducing public debt) and we find that even if majority of the assets captured is used to reduce public debt, political support for the three policies continue because lower debt eventually translates to lowering taxes at some point during their life time. Finally, we also analyze the role of the rate of technological progress and here too the results remain unaffected.

The above analysis demonstrates that the capturing assets accumulated in the funded pillar always finds political support, even once the economy is populated only by agents who benefit from having a funded pillar. The key mechanism is related to the fact that voting generations can reduce taxation during their lifetime, at the expense of the future generations: the young and yet unborn cohort will live in the world with lower pensions and higher capital tax distortion while the reduction in taxation is only transitory, concentrated among the voting cohorts. This result is reinforced by the fact that previously accumulated capital raises wages, while asset capture raises interest rates – both yield benefits to retired cohorts and cohorts relatively close to retirement.

The low aggregate welfare effects stem from the fact that costs are indeed delayed, hence heavily discounted. In order to explain this result, in Appendix C we present detailed analysis of macroeconomic

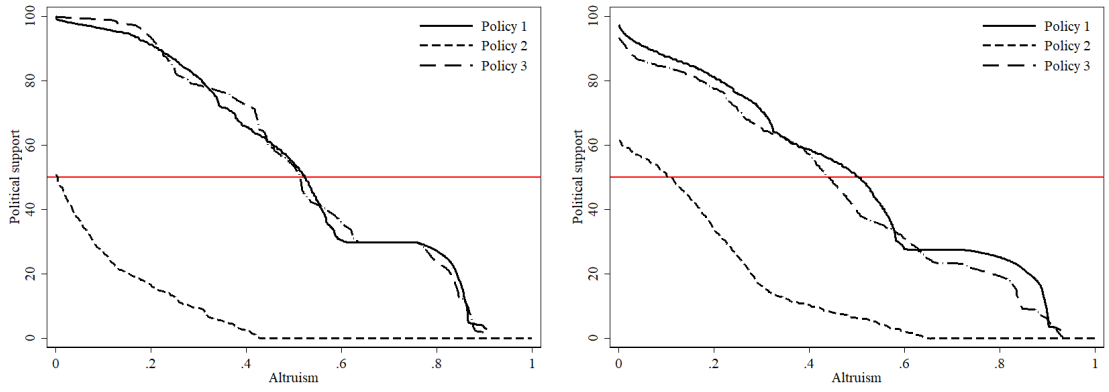
and pension effects of reducing the funded pillar for 2012 round of voting.

The intra-cohort heterogeneity permits analyzing also the effects on poverty, which we do in Appendix D. The original reform, replacing high DB pensions with lower DC pensions raises poverty, see Figure D.10. This is because pensions for many agents decline and private voluntary savings are insufficient to maintain consumption above the poverty line. Policies which capture assets – Policy 2 and Policy 3 – lead to similar poverty rates in absolute terms, whereas lower poverty rates in relative terms follow from higher poverty threshold due to overall lower consumption. Naturally, capturing assets is only effective in the short run, because in the long run the key mechanism is related to the value of pension benefits and tax reduction is transitory. Detailed discussion of mechanism behind changes in poverty measures is referred to Appendix D.

There are several caveats to be discussed. First, voting is costless in our setup, hence essentially all individual preferences matter for the final outcomes. Recent literature pays increasing attention to participation and cost of voting (e.g. Borgers 2004, Ghosal and Lockwood 2009, Chakravarty et al. 2018), but it appears that in our setup, if welfare effects arise at all, they tend to be relatively large. Hence, introducing the cost of voting is not likely to change the results.

Second, our model has no social assistance to the working poor, neither do we model the presence of minimum pension benefit guarantees. With these social transfers, it is likely that the social security would be permanently unbalanced. Increasing the share of the public pillar in total pension system raises the share of imbalance that would have to be financed with taxes. Hence, the materialized gains from capturing assets could be lower in the real world, where these additional redistribution instruments exist.

Figure 4: Support for reducing funded pillar as a function of altruism: voting in 2012 (left) and 2212 (right) voting



Notes: Decision rule during voting is based on altruistic utility function, where both individual and children utility is taken into account: $U^a_{\kappa,t} = U_{\kappa,t} + \mathcal{A}U_{\kappa,t+19}$. Parameter $\mathcal{A}$ measures how altruistic consumers are, $\mathcal{A} = 0$ refers to standard voting, $\mathcal{A} = 0.5$ refers to a situation when parents care about children's utility half as much as about their own. The red line refers to 50% of political support.

Third, the agents in our model are not altruistic, i.e. when deciding about the policies to be implemented they are not concerned about the welfare of the future cohorts (e.g. Fisman et al. 2017). We analyze the role of this potential mechanism, by changing the rule for voting. While our agents remain egoistic when optimizing lifetime utility, they consider the utility of their children when voting on policy. Figure 4 reports how potential magnitude of altruism relates to the political support for the three policies analyzed in our study. This analysis portrays that if agents value the welfare of their children as half their own or more – reducing the funded pillar is no longer politically viable.[24]

[24]In this analysis the agents decide after their draw of productivity and preferences is realized, but before the draws of their

5 Conclusions

Political stability of the social security is derived from the assumption that a generation which refuses to finance the pensions of their elderly is permanently penalized with no pension benefits for themselves. This framing of the policy choices is plausible with pay-as-you-go systems, but it cannot be applied to the funded pension systems. The conventional wisdom in the literature on introducing funding to the pension system states that pre-funding eventually raises welfare of all the future cohorts (improves welfare in Kaldor-Hicks sense), but the cohorts living at the time of this change incur a welfare loss: the working cohorts need to finance the pensions of their elderly and at the same time accumulate assets for their own retirement. The gains from introducing the funded pillar are related to the direct effects of faster capital accumulation and the indirect effects through general equilibrium. Consequently, introducing funding is typically portrayed as delayed gains and immediate costs. The literature on the effects of privatization of social security with aging population is extensive. It mostly finds that even if such a reform improves welfare in Kaldor-Hicks sense, it benefits the future generations while cohorts working during transition usually incur a welfare loss. It suggests 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 with time and at some point (partially) funded pension systems should become politically stable. In our paper we show that this intuition is actually not true.

We contribute to the literature by exploiting a new aspect of the pension system reform and political economy: we ask whether the pension system reforms are politically stable. We show that in fact, privatization of the pension system is may be unsustainable even if it has political support at the moment of introduction. The policy relevance of our study is immediate. Since the privatization of the pension system implies an unequal distribution of costs and benefits of the reform across cohorts it is crucial for such a reform to be politically stable. Otherwise it may be the case that before societies start enjoying the benefits of the privatization itself, the reform is reversed implying a massive inefficiency: costs without gains. As evidenced by the recent wave of changes to the pension systems, such risks are not theoretical, but have already materialized in a number of countries. If privatization of the pension systems is eventually to be reversed, then there is no point in incurring the initial cost of the reform.

To analyze this point, we develop an OLG model of an economy undergoing an exogenous and beneficial partial privatization of the pension system. The reform involves introduction of 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 cohorts already retired (or close to retirement) are honored, the reform generates fiscal costs, being detrimental to the welfare of the living cohorts. Allowing public debt to partially accommodate for the fiscal costs of this reform, helps attaining political support in excess of 50% in favor of partial privatization of the social security. As time passes the reform becomes beneficial to all living cohorts: it allows for faster accumulation of capital and thanks to the funded pillar, the decline in pension benefits is lower relative to PAYG DB. On selected dates we allow agents to vote over shifting the contributions and/or appropriation of the assets accumulated in the funded pillar towards the PAYG pillar, while maintaining the obligatory contributions unchanged. We gradually shift the date of the voting more and more towards the future. We find that the privatization of the pension system never becomes politically stable: even when the transition costs are fully completed, the contemporaneously living cohorts always benefit immediately from capturing the resources accumulated in the funded pillar, while shifting the costs of this appropriation to the future generations. Hence, there is stable political support for "unprivatizing" pension systems, even many decades after the privatization.

children are realized, i.e. under the veil of ignorance about the future generations. The results are the same if we assume children inherit parents preferences and productivity endowments.

One possible interpretation of our findings is that the share of contributions addressed to the capital pillar has been set at excessively high level, so rational agents adjust it downwards to the preferred levels, in the spirit of Browning (1975) or Cooley and Soares (1999b). However, we show a new source of the political support: welfare effects do not come from improving the alignment of forced pension savings with the preferred profile of savings, but rather from distributing welfare from the future cohorts to the living cohorts. It is only the transitory fiscal adjustments that yield welfare gains. In fact, with reducing the share of contributions accruing to the funded pillar the scope of distortions in the economy increases: implicit taxation embedded in the pension system contributions grows. There are also second order effects associated with the fact that higher share of capital is subjected to capital income taxation, hence effective capital income tax rate increases.

In a broader context, our findings should be interpreted as evidence that property rights protection is key in maintaining multi-pillar state-run pension system. Indeed, the long-run credibility issues need to be addressed explicitly and ex ante, because the risk of "unprivatizing" is permanent. Notably, if pensions and/or contributions may be shifted in future away from the capital pillar, there is a risk that such an unstable reform will generate only welfare costs, because there will be no enough time for the welfare gains to materialize. In some of the advanced economies, the capital pillars are usually an element of a tripartite agreement between the employer, the pension fund and the worker. Consequently, property rights are set at par with other financial instruments. By contrast, the 1990s wave of privatizations usually involved also governments, even if only in the role of entity collecting and transferring contributions from workers to pension funds. The presence of the government in this contractual agreement makes funded pillars an element of social contract rather than a purely financial instrument.

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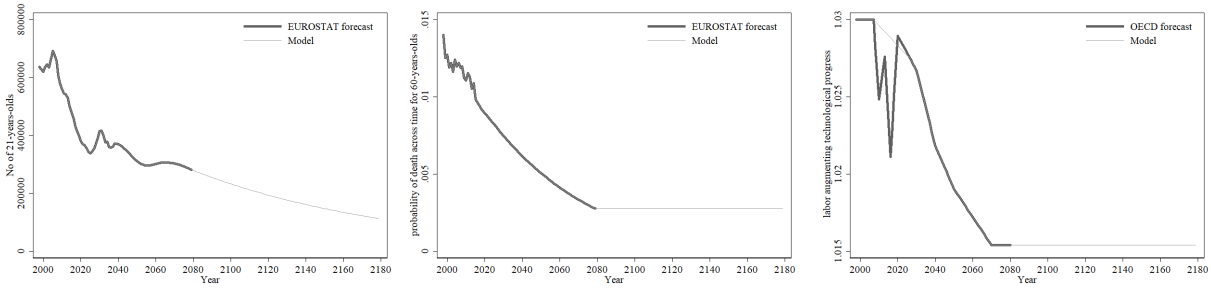
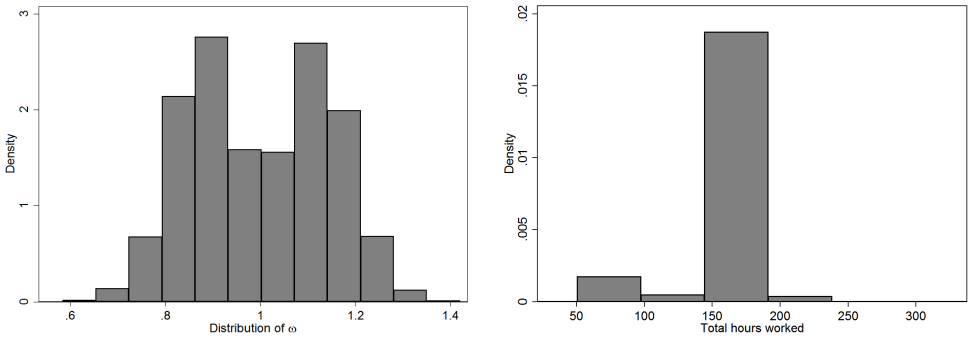
A Calibration

Figure A.1: No of 20-year-olds arriving in the model in each period (left) mortality rates across time for a selected cohort (middle) and labor augmenting technological progress (right).



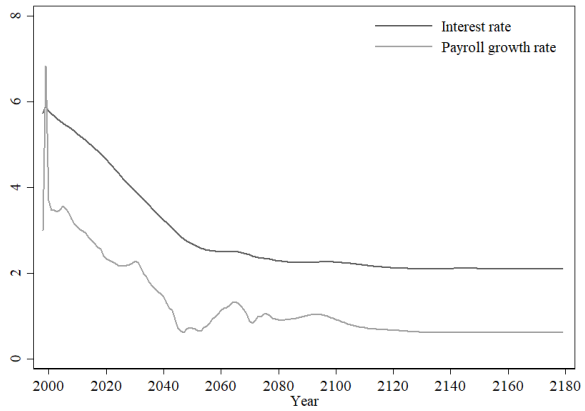
Source: EUROSTAT demographic forecast until 2080, technological progress rate following the forecasts of the Aging Work Group of the European Commission, historical TFP data displayed in solid thick line based on OECD.

Figure A.2: Distribution of ω multipliers (left) and ϕ multipliers (right).



Notes: Estimates of the distribution obtained with the use the data from Structure of Earnings Survey, wave of 1998.

Figure A.3: Interest rate and payroll growth rate in no policy change scenario.

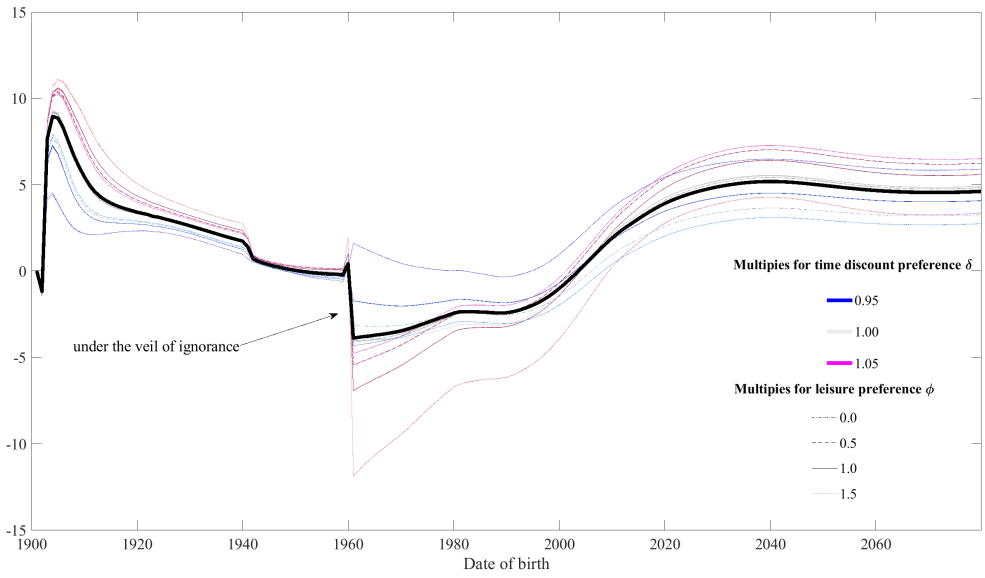


B Introducing the two-pillar DC system

Replacing a DB PAYG pension system with a DC system with partial funding has by construction differentiated effects across cohorts and within subcohorts. Based on welfare evaluations, which account for direct and general equilibrium effects we can demonstrate which subcohorts are in support of turning the pay-as-you-go Beveridge'an system into a Bismarckian one with partial funding. This result stems from the fact that linking pension benefits to individual labor supply boost payroll growth rate and thus their benefits are indexed more favorably.

This result prevails regardless of the individual preferences and productivity endowment. Among the transitory cohorts (i.e. those younger than 40 years in 1999), nearly all subcohorts observe decline in welfare due to lower pension benefits and higher taxation. The exception from this rule concerns the most patient transitory subcohorts. In fact, there appears to be no room for the coalition based on individual productivity endowments, because the general equilibrium effects as well as fiscal effects swamp the direct effects for both the initially old cohorts and the transition cohorts. In the long run all subcohorts gain due to significantly lower taxation. Overall, aggregate welfare effect expressed as consumption equivalent amounts to 1% of lifetime consumption. It implies that if all losers were compensated by the winners, there would still be welfare gain left (i.e. Kaldor-Hicks welfare improvement). The results are portrayed in Figure B.4

Figure B.4: Cohort distribution of welfare effects from introducing two-pillar DC system



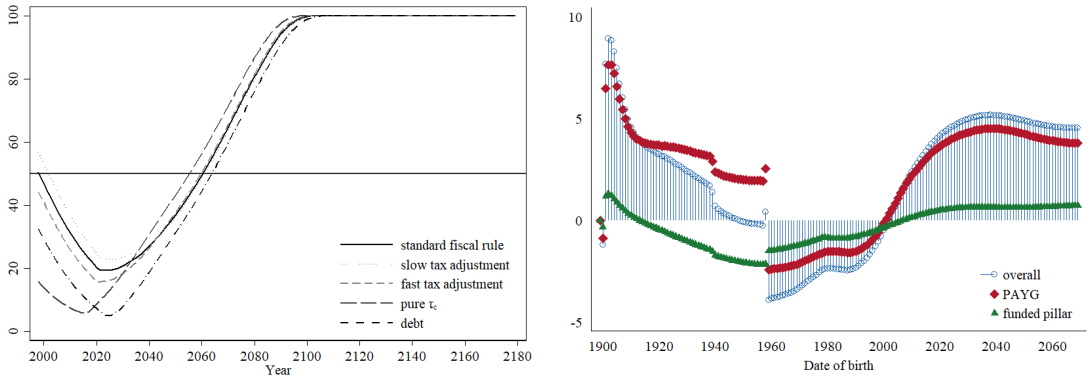
Note: Expressed in % of permanent consumption from the two-pillar DC scenario. Evaluation relative to the scenario of continuing with the PAYG DB system. The driving force behind differences in reform evaluation is the multiplier for time discount preference δ_κ (distinguished by color). The multiplier for leisure $\phi_\kappa$brings some diversity in the results (distinguished by line style). Initial productivity endowment nearly does not affect reform evaluation (lines for subcohorts with a given δ_κ and ϕ_κ overlap for all ω_κ). We additionally report the consumption equivalents from simulation without intra-cohort heterogeneity (the black line).

In principle, the DC system is much less redistributive than the DB system. Earlier literature hinted that the older cohorts (retired at the moment of pension system privatization) should have incentives to form a coalition with the working-age low productivity agents. We observe that this is not the case, because fiscal adjustments accompanying the reform affect welfare of agents to a greater extent than the potential

gains from the redistribution. Indeed, the models of Cooley and Soares (1999a) and subsequent abstract from fiscal adjustment (often, also labor supply is assumed inelastic), hence the general equilibrium effects have less relevance in the stylized setups than in our setup. Note, that agents in our setup have access to savings technology, hence retirement system is not necessary for consumption smoothing. This explains why the reception of the substantial change from the DB to the DC system is relatively similar across cohorts.

This result is interesting not only because it is counter-intuitive, but also because it points to the relevance of the fiscal adjustments accompanying the pension system reforms: if lump sum taxes were used to finance the transition costs of the reform, the utility of the elderly cohorts would be harmed, thus revealing their strong opposition to the reform. However, the fiscal rule portrayed in equation (14) partly raises consumption taxes but mostly smooths the costs of the reform to the future generations via public debt. Overall, the cohort distribution of these welfare effects is such that in 1999 approximately 54.7 % of the population living at the moment of reform would support it, see the left panel of Figure B.5. To obtain this decomposition, we subtract the welfare effects of PAYG DC from the total welfare effects, i.e. run an additional simulation, where $\tau^{PAYG} = \tau \wedge \tau^F = 0$ and we compare it to the welfare from the scenario with partial privatization as described above. The effects of having the funded pillar are actually universally negative until app. 2100, when they become universally positive across cohorts, see the right panel of Figure B.5. This implies that eventually the gains from faster capital accumulation exceed the costs of financing the additional transitory gap in the public pension system.

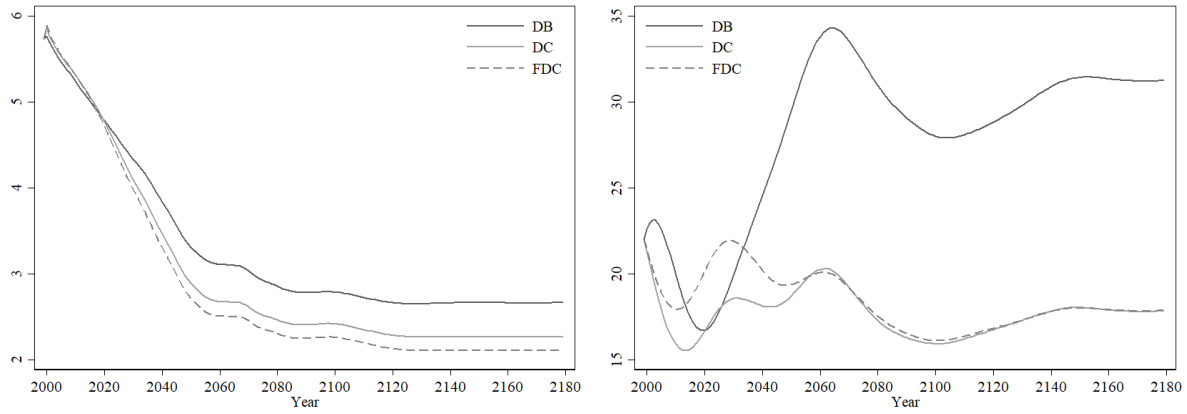
Figure B.5: Political support for two-pillar system (left) and gains from the funded pillar (right)



Note: The left panel depicts the percent of subcohorts living in every period which gain from introducing the two-pillar DC pension system, as described above. The solid black line, denoted as 'standard fiscal rule' refers to the fiscal rule as described by equation (14) and parametrized in Table 1. Alternative specifications include instantaneous consumption tax adjustment (denoted as 'pure τ_c), full accommodation through public debt with subsequent reduction of debt after the transition is over, via fiscal rule described in equation (14) (denoted as 'debt'), slower tax adjustment in parametrization of fiscal rule than described in Table 1 (parameter ϱ_D is set to 0.03). Line denoted as 'fast tax adjustment' has tax autoregression set to 0.75.

The gradual introduction of the partially funded DC pension system is the baseline scenario for all the subsequent simulations. Figures B.4 and B.5 suggest that pension system privatization eventually universally improve welfare, i.e. all cohorts benefit. The losing cohorts pass away whereas the newborn benefit from increased overall efficiency and lower taxation. The two-pillar DC system gradually obtains 100% support and thus should also be politically stable. Moreover, partial funding raises the welfare gains from having the DC system instead of PAYG DB system.

Figure B.6: Interest rates (left) and tax rates (right) with DB and DC pension systems



Notes: FDC denotes DC system with funding, DC denotes a DC system financed entirely at a pay-as-you-go basis. DB denotes a defined benefit system with pay-as-you-go financing. The initial steady state is always a PAYG DB system. Each line denotes a separate simulation, on an economy with the same initial steady state calibration. In the scenarios of change to DC (with or without funding) the reform is introduced unexpectedly in the first period of the transition path. Transition is gradual, as described in section .

C Macroeconomic effects of reducing funded pillar

We discuss the effects of capturing assets in 2012 as an example. This year is suitable for illustration purposes, because around this date most of the countries which introduced partially funded DC systems, reduced the funded pillars. Results for any other timing of voting are available upon request. Reducing the funded pillar improves fiscal stance in the short run, which is translates in to lower taxes over the medium run. This comes at the expense of lower pensions and slower capital accumulation, hence lower output and slightly higher taxation in the long run.

The impact of the three analyzed policies on pensions differs. Policy 1 redirects contributions from the funded pillar to the PAYG pillar. This shift lowers pension benefits for two reasons. First, the indexation in the PAYG pillar equals to the payroll growth, which is lower than the interest rate in the funded pillar. Second, since pensions are indexed according to the same rules as pillars they are paid from, pensions from the PAYG pillar are indexed at a lower rate than the ones from the funded pillar. Both differences are depicted in Figure A.3 and the left panel of Figure B.6. In addition to direct effects on pensions, there are also indirect effects through taxes. Shift of contributions reduces the deficit in the public pension fund and results in lower consumption taxes.

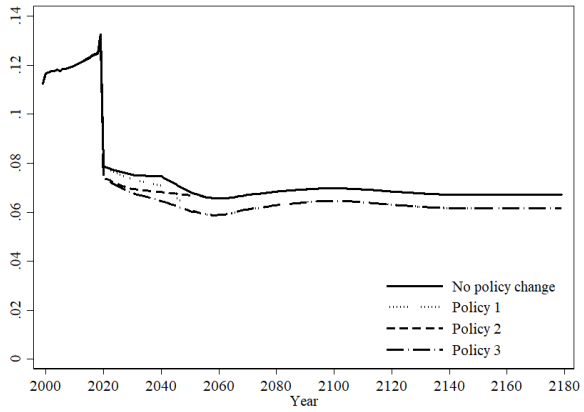
Policy 2 means that accrued contributions in the funded pillar are shifted to the PAYG system and used to finance current government expenditure. Similarly to Policy 1, the deficit is reduced in the PAYG pillar, which benefits current generations as it allows to reduce consumption tax rates. Ultimately, the fiscal cost of implicit debt is lower than the explicit debt, because there is no interest to pay on the implicit debt. It comes at the cost of lower benefits for cohort working during the capturing of the assets. Unlike Policy 1, appropriation is one-off thus Policy 2 has no long-run effect.

The effects of Policy 1 and Policy 2 add up to Policy 3. Pension benefits are lower, but the decline in taxes is even larger. In the long run, the effects of Policy 1 and Policy 3 are by construction the same.

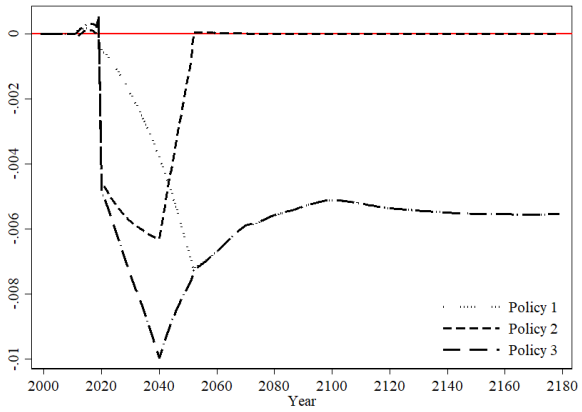
We portray the quantification of these intuitions in Figure C.7. The direct effects on consumption taxes are combined with indirect effects on overall capital taxation as depicted in Figures C.7c and C.7d). Lower pensions due to removal of funded pillar result in higher voluntary savings. But, since voluntary savings are taxed and cannot be converted into annuity at retirement age, this increase does not counterweight the initial effect of funded pillar abolition, see Figure C.9. Nevertheless, with the reaction of private voluntary savings, there is an increase in the overall capital income taxation.

The impact on labor supply is twofold. First, lower consumption taxes distort less the intra-temporal choice between consumption and leisure, which tends to increase labor supply together with lower pensions. Second, a s contributions translate into lower pensions, the distortions generated by a contribution rates increase which tends to lower labor supply (labor taxation implicit in the social security contribution rises). Depending on which effect is stronger, we obtain increase or decrease in labor supply. In Policy 1 the second effect dominates. First, labor supply drops rapidly at the time of introducing the policy change. In case of Policy 2 the first effect is stronger, as consumption becomes less expensive compared to leisure, labor supply increases. In case of Policy 3 it seems that the effect of lower consumption taxes dominates initially (as a decline in taxes is the largest in first years after the reform reversal), but over time is being overtaken by higher distortions associated with the contribution rate, see Figure C.9.

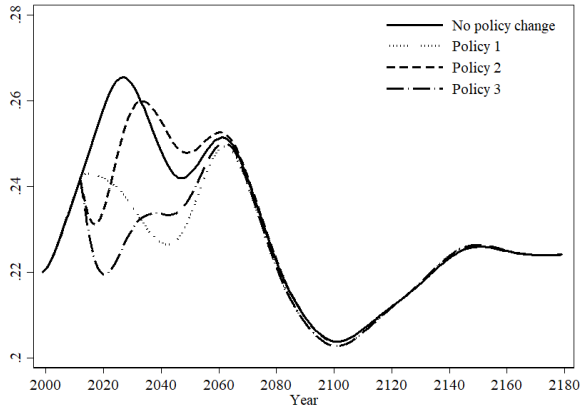
Figure C.7: The effect of reducing the funded pillar on pensions and fiscal variables



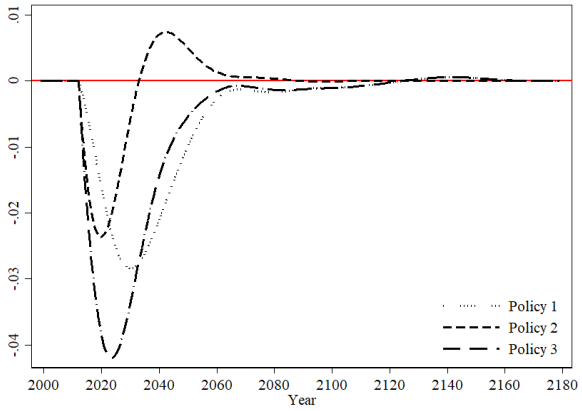
(a) Average pensions: level



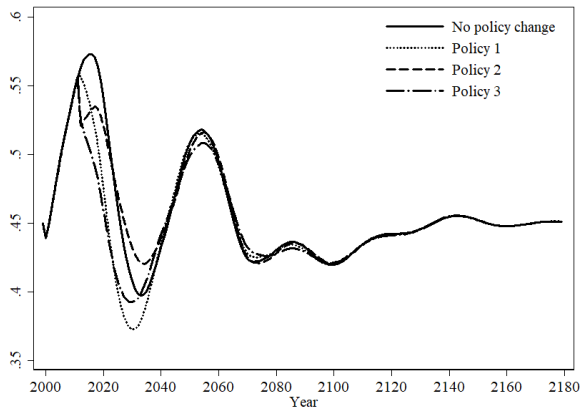
(b) Average pensions: relative to baseline



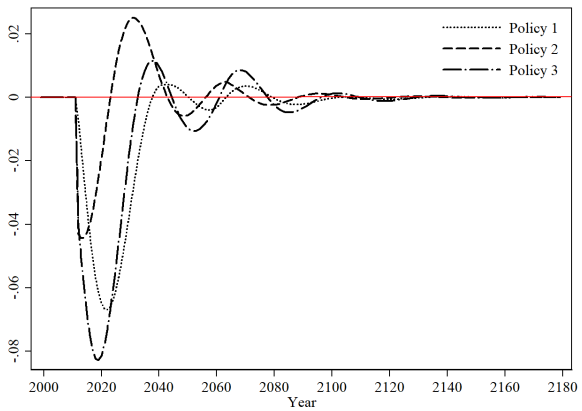
(c) Consumption taxes: level



(d) Consumption taxes: relative to baseline



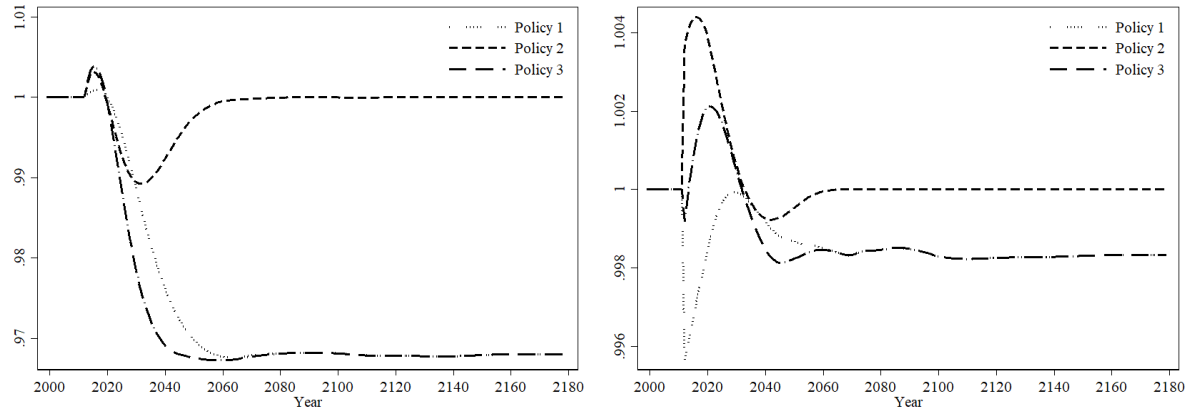
(e) Debt share in GDP: level



(f) Debt share in GDP: relative to baseline

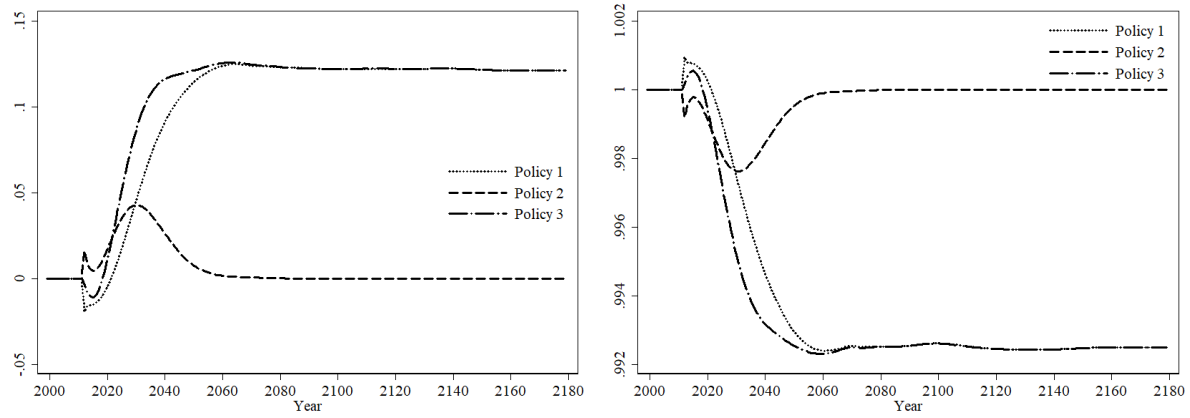
Note: results from a voting round in 2012, results for the other rounds available upon request. Differences relative to baseline expressed in percentage points. Policy 1 denotes permanent shift of the contributions from the capital pillar to the PAYG pillar. Policy 2 denotes one-off capturing of the assets accumulated in the capital pillar. Policy 3 combines Policy 1 and Policy 2.

Figure C.8: Adjustments in capital K_t (left) and labor supply L_t (right)



Notes: measures expressed in terms of ratio relative to baseline. Reported are results from voting round in 2012, results for other voting rounds available upon request.

Figure C.9: Adjustments in intrest ratel r_t (left) and wages w_t (right)

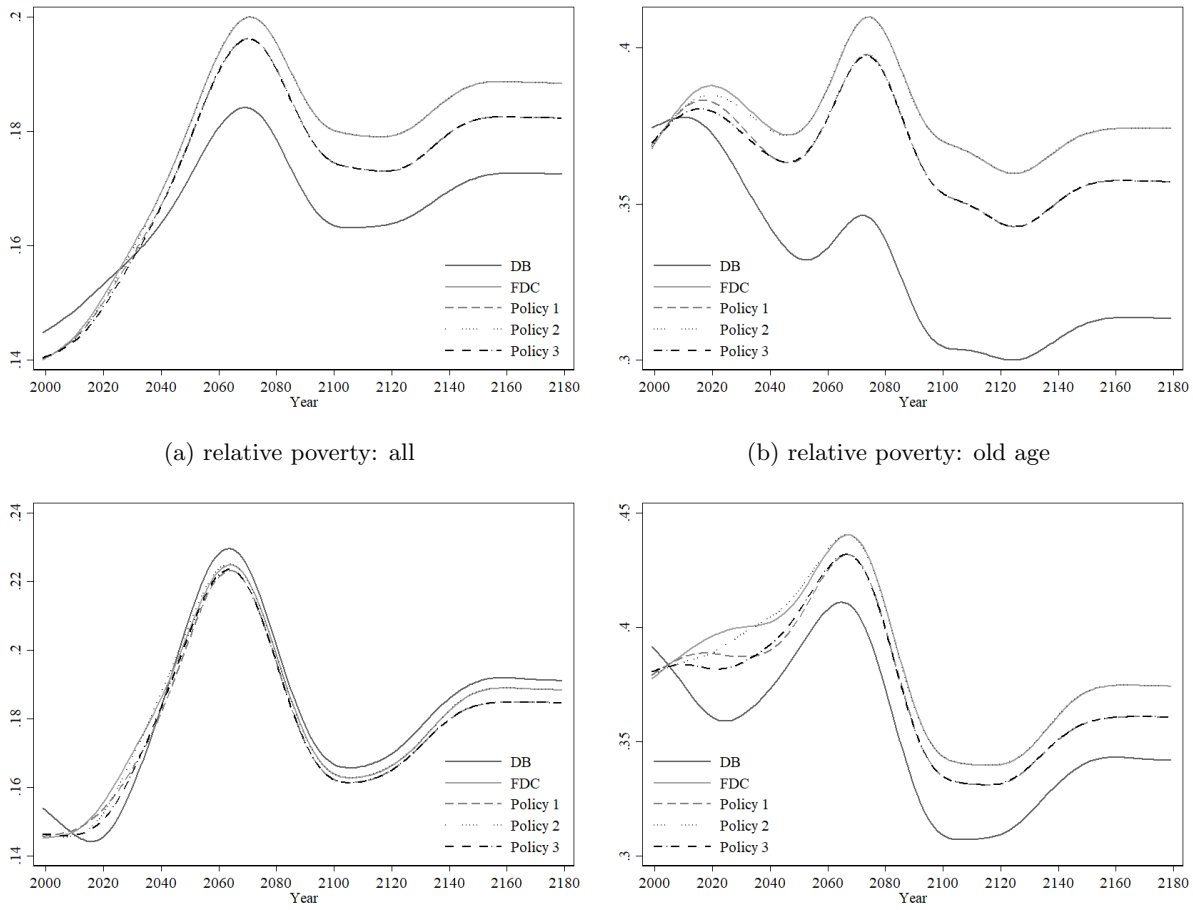


Notes: interest rate expressed as difference relative to baseline (in percentage points), wages expressed as ratio relative to baseline. Reported are the results from voting round in 2012, results for other voting rounds available upon request.

D The effects on poverty

We also show the aggregate effects on poverty: absolute and relative. We define relative poverty as consumption below 60% of the current median consumption. We define absolute poverty as consumption below 60% of consumption from the initial steady state (all the variables in the model are stationarized, so this measure is not affected by population change and the exogenous technological progress). The evolution of the poverty measures is displayed in Figure D.10.

Figure D.10: Poverty



(a) relative poverty: all

(b) relative poverty: old age

(c) absolute poverty: all

(d) absolute poverty: old age

Note: relative poverty defined as percentage of population with consumption below 60% of median consumption; absolute poverty defined using the 60% relative marker from the initial steady state (absolute value obtained as 60% of median consumption in initial steady state). Old age poverty reports the poor old age as a share of old age. Policy 1 denotes permanent shift of the contributions from the capital pillar to the PAYG pillar. Policy 2 denotes one-off capturing of the assets accumulated in the capital pillar. Policy 3 combines the two.

Poverty would increase the least if DB PAYG system was continued. This is because the majority of poor households are old-age: with higher pension benefits, more of the old-age households can afford sufficient consumption level. Moreover, with more expensive consumption (due to higher consumption taxes), overall consumption level declines, which means that less households fall below the threshold consumption. Naturally, as longevity stops increasing, pensions level off, and no further tax adjustment is needed. Hence, also poverty levels off.

Lowering of the pensions due to replacing the DB pension formula with a DC pension formula raises the

share of old-age households that cannot afford consumption above 60% of the median. Moreover, DC allows pension systems to be balanced and hence lowers taxation of consumption. The rising level of consumption further raises the share of old-age households that cannot afford consumption above threshold.

The direct consequence of asset capture is the decline of overall consumption, relative to the no asset capture scenario. This yields a decline in poverty measures. However, this decline is mostly driven by lowering the threshold above which a household is no longer defined as poor, not by increased consumption among these households.