Welfare effects of alternative pension reforms: Assessing the transition costs for French socio-occupational groups

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Abstract

In order to assess the welfare costs and gains of different scenarios of pension reforms for French socio-occupational groups,we compute transition paths from the current situation to the steady states resulting from the ultimate effects of reforms.Accounting for different income and mortality risks,together with bequests,allows our model to better reproduce wealth inequality than standard life-cycle models do. Alternative pensions reforms are considered,combining:i)reduced generosity through lower replacement rates or postponing retirement;ii)alternative financing schemes:current balance vs.building a temporary smoothing fund or a permanent funded pillar. The consequences of these scenarios on macro aggregates,inequality measures and age/group specific welfare and consumption profiles are computed at the rational expectation equilibrium. We first show how the situation of young cohorts deteriorates in the no-reform case,with a passive adjustment in contribution rates.However,the intergenerational redistributive effects of reforms are found to be large,thus supporting the view that structural pension reforms are not Pareto-improving.We especially show that postponing the retirement age increases inequalities more than reducing replacement rates does and that alternative financing adjustements involve only modest intra-generational redistributive effects.

JEL : D31, H55, J26

Keywords : Occupational groups, Pareto optimalité, pensions reform, redistribution, retirement age.

1 Introduction

The problem with pension reform is now well documented. The need for fundamental reforms is widely recognized. Indeed, the parametric adjustments required to make the standard European pay-as-you-go systems sustainable would render these systems less attractive. The prospect of a modest growth of the wage bill keeps the expected rate of return of Payg low, thus increasing the efficiency gains associated to the introduction of a funded component as typically advocated by eg. Mc. Morrow and Roeger (2002). However, if the case for funding is unambiguous as far as comparisons bear on steady states, the issue is not so clear when transition costs are accounted for. As shown by Breyer (1989)[1], the cost of accumulating the social security fund during the transition period exactly offsetts the efficiency gain from a shift to funding. Thus it is not possible to design a Pareto improving scheme for implementing such a pension reform, except for the case where extra efficiency gains can be obtained from reducing distorsionary taxes (Breyer and Straub, 1993)[2]

The importance of these transition costs - as evaluated eg. by Miles (1999) led Boldrin et alii (1999) to a pessimistic view on the feasibility and the desirability of a fundamental pension reform in Europe. While the issue of pension reforms is now the matter of an active research program in political economy[3], this paper does not address directly the political approach to the feasibility of reforms. It will rather use a dynamic rational expectation general equilibrium model which is calibrated in order to compare the macroeconomic and welfare effects of alternative scenarios of pension reforms in France.

Our model is designed to cope with the heterogeneity between French socio-occupational groups, to allow for both inter-generational and intra-generational redistributive welfare effects. Further, this way of modeling heterogeneity greatly improves the capacity of general equilibrium life-cycle models to account for the huge concentration of wealth distribution and the variety of consumption profiles. (Weitzenblum, 2001). Income risk during working life is introduced in order to better account for saving behavior and asset distribution.

Assessments of pension reforms using overlapping generations general equilibrium models have followed the Auerbach and Kotlikoff (1987) initial

[1]See also Breyer (2001)

[2]However, Brunner (1996) expresses skepticism concerning the practical implementability of such a Pareto - improving scheme of pension reform.

[3]see e.g. Sinn and Uebelmesser (2001)

impulse. While Kotlikoff, Smetter and Walliser (1999) use a much elaborated deterministic model, uncertainty was introduced in a transition model by Huang et alii (1997), and De Nardi et alii (1999). Conesa and Krueger (1999) show that, in the presence of wage income risk, a PAYG system provides insurance and thus a welfare advantage which increases the number of workers opposing the shift to a privatized system.

This literature supports the view that fundamental pension reforms, including a shift to funding, generally hurt active generations at the benefice of younger ones, still to enter the labour market. The only reform which allows for Pareto improving scenarios to be designed is the one that strictly links benefits to earnings thus eliminating distortions from wage taxes (De Nardi et alii, 1999).

Like De Nardi et alii (1999) did for the US, we provide the first quantitative assessment of the effects of the expected demographic transition for the pension system on a European country, France, using a rational expectation general equilibrium model[4]. We consider alternative reform scenarios typical of the ones considered in the current debate[5]. These scenarios combine adjustments in pensions paid with alternative financing policies.

While the baseline scenario retains the assumption of replacement ratios frozen at their year 2000 level, we consider a scenario of reducing pensions rates, in line with the reform initiated in 1993. This extension of "Réforme 1993" mainly substitutes price indexation to wage indexation and retains a longer working period for computing the reference wage[6]. A second margin in pension adjustment is provided by the "postponed retirement age" reform (hereafter "PRA"). In line with the recommendation of the "Rapport Charpin", we assume that retirement age is gradually increased by one quarter every year from 2003 to 2022, from 60 to 65 years, i.e. from 40 to 45 years at work.

A third scenario of pensions adjustment results from the mere combination of replacement reduction, according to the "Reforme 93", with postponed retirement.

[4] In a recent contribution, Miles and Cerny (2002) provide calibrated measures of transition costs for pension reforms in Japan.

[5] However, assuming single homogenous pension system, we do not consider one crucial topic in the French situation, the existence of favoured "regimes speciaux" for public sector workers.

[6] A further, and large, additional effect in our "Réforme 1993" scenario is its extension to the whole economy, including the public sector. We however depart from the "Réforme 93" in controlling for net replacement rates rather than for gross replacement rates.

The pension system is financed through a proportional contribution levied on wages and gross pensions. In the baseline scenario, the contribution rate is set so as to balance the budget of the pension fund on a per-period basis. Two alternative financing strategies are considered: Either the contribution rate is first increased in order to accumulate a temporary reserve fund, with the purpose of smoothing the future path of this rate (the "Smoothing" scenario), or the path in contribution rate is set in order to accumulate a "funded pillar", covering in the long run a quarter of the pension expenditures, according to the Mc Morrow and Roeger (2002) proposal.

The papers is organized as follows. Section 2 introduces the demographic structure and the accounting framework of the study. In section 3, we set the model and characterize equilibrium. Section 4 describes the impact of alternative reform scenarios on replacement and contribution rates. Section 5 derives the macro implications of the reforms, from the path of equilibrium distributions. Section 6 presents results concerning the welfare and redistributive effects of the alternative scenarios. Section 7 is devoted to a few concluding remarks.

2 Demographic transition and accounting structure

2.1 Demographic structure

Our model economy consists of overlapping generations of agents, entering labor market at the age 20, and living a maximum of 32 model periods (80 years)[7]. For their whole life-cycle, they belong to one socio-occupational group, social mobility occurring only between generations. From their life period 12 (age 50), they face death hazard with probility m_i^{jt} conditional to their occupational group i and increasing with their age j. The m_i^{jt} probabilities regularly decrease during the transition period, up to 2030, the gains but not the ultimate level being common to all occupational groups. Similarly the flow of entry into the labour force-therefore in the economy - varies from 2000 to 2030 according to demographic data and projections from INSEE[8], and stabilizes after, allowing for a stationary demographic steady state.

The date of retirement is mandatory, thus exogenous. During their work-

[7] In order to limit the dimension of the transition problem, the period model is set to 2.5 years.

[8] Detailed data references are provided in the appendix to the working paper version of this article.

ing life, agents face a wage income risk parametrized as a two-state Markov process. The wage structure is fixed. For every group, the wage profile is calibrated on group specific data. Contribution to the pension fund are the only tax in the economy, paid on both wage and gross pensions. Pensions are computed through applying net replacement rates to the last wage (averaged for the realizations of the wage shock). Replacement rates are group specific, calibrated on French data for 1994. They are mildly regressive. Together with equal contribution rates, this feature expresses the basically Bismarckian nature of the French pension system.

To keep the solution of the transition equilibrium manageable, the French economy is represented as a small open economy, taking a given world interest rate. Assuming full capital mobility and wage flexibility, the average wage rate is given, following an exogenous Solovian productivity trend.

Together with mandatory retirement and fixed participation, the small open economy assumption allows the pension accounting to be separable from saving behavior and the resulting rational expectation equilibrium. We will therefore first present the accounting block, which determines the whole set of transfers resulting from the pension system.

2.2 The accounting block

Given the demographics, the productivity-wage structure and a mandatory retirement age, the gross wage bill WB_t obtains. Applying the replacement rates θ_i^{pjt} to cohorts of retirees of age j and group i with measures tc_i^{jt} under the reform scenario p we get the aggregate gross pensions RR_t^p. Hence the contribution rate τ_t^e balancing the current pensions follows

$$(1-\tau_t^{pe})\, RR_t^p = \tau_t^{pe} WB_t$$

Alternatively, when the pension agency is not constrained to currently balance its expenditures, its budget constraint governs the evolution of its asset position F_t^p

$$\widetilde{F}_{t+1}^p = (1+r)\, \widetilde{F}_t^p + \tau_t^p\, (WB_t + RR_t^p) - RR_t^p$$

Allowing for a constant productivity trend $(1+g)$, we redefine variables as time stationary deflated variables, i.e. $X_t = \widetilde{X}_t\, (1+g)^t$. The pension fund accumulation thus becomes

$$F_{t+1}^p = \frac{(1+r)}{(1+g)} F_t^p + \frac{\tau_t^p \left(WB_t + RR_t^p\right) - RR_t^p}{(1+g)}$$

There is, a priori, an infinity of paths for τ_t^p satisfying the intertemporal budget constraint

$$F_0^p + \sum_{t=0}^{\infty} \left[\frac{1+g}{1+r}\right]^t \left(WB_t + RR_t^p\right) \tau_t^p = \sum_{t=0}^{\infty} \left(\frac{1+g}{1+r}\right)^t RR_t^p$$

We construct the time-profile of the contribution rate for the temporary (smoothing) and permanent funding as follows. Consider first the case of the contribution tax smoothing. The long-run contribution rate is equal to that of the PAYG equilibrium τ_∞^p. We compute the unique 2-steps profile such that $\tau_t^p = \tau_1$ for $t < T_d$ (2060) and $\tau_t^p = \tau_\infty^p$ for $t \geqslant T_d$. The final profile is simply the average of the PAYG profile and the 2 steps one.

As for the permanent funding scenarios, the long-run contribution rate is given by the relation $\tau_\infty^{p,fund} = \left(1 - \left(1 - \frac{g}{r}\right) c_{fund}\right) \tau_\infty^{p,payg}$ where c_{fund} represents the size of the funding measured by the ratio of the fund income rF_∞^p and the total pension expenditures RR_t^p. Given the long-run reduction of the contribution rate $(\tau_\infty^{p,payg} - \tau_\infty^{p,fund})$, we translate downwards the PAYG profile from $t = T_d$ of this amount. We then determine the constant increase of the contribution rate to be added to the smoothing profile for the interval $[0; T_d[$ so that the whole path of the contribution rate verifies the intertemporal budget constraint.

3 The behavioural model and RE equilibrium

Under our assumptions, allowing for the transfers to be determined in a priori accounting model, agents faces given net labour and income profiles.

3.1 The model

For given income opportunities and mortality risk, individuals determine their consumption level for each period, and therefore their asset holding in order to maximise intertemporal utility, i.e. in recursive form

$$V(a,j,i,\ell,j',t) = \max_{w.r.t.\ C_{i,t}} \{u\left(C_{i,t},\kappa_{i,t}\right) +$$
$$\beta\left(1-m^{j}_{i+1,t+1}\right)\left[\left(1-m^{j'}_{i+i_{\bullet}+1,t+1}\right)E_{\ell'}V(a',j,i,\ell',j',t+1)+\right.$$
$$\left. m^{j'}_{i+i_{\bullet}+1,t+1}E_{\ell'}V(a',+\widehat{h}^{j'}_{i+i_{\bullet}+1,t+1},j,i',\ell',j'+1,t+1)\right]$$
$$+\beta m^{j}_{i+1,t+1}v\left(a',\overline{C}_{j,i}\right)\}$$
$$\text{s.t. } a' = (1+r)a + y^{j}_{i,l}\left(1-\tau_t\right) + f_t - C_{i,t}$$

$m^{j}_{i+1,t+1}$, $m^{j'}_{i+i_{\bullet}+1,t+1}$, i_p are respectively the death probability of the agent at date $t+1$, that of his ascendant and the age gap between the two generations. $\widehat{h}^{j'}_{i+i_{\bullet}1,t+1}$ stands for the expected bequest given that the ascendant is of type j', and will be aged $i+i_p+1$ at the next period $t+1$. $y^{j}_{i,l}$, represents the income (wage or pension) depending on the type j, the age i and, when at work, the markovian shock l. Finally, f_t is the lump-sum transfer all agents receive at each period, and which is derived from inheritance taxation.

Current utility is derived from consumption and leisure, with $\kappa_{i,t}$ an indicator of participation of the individual to the labour force

$$u\left(C_{it},\kappa_{it}\right) = \frac{C_{it}^{1-g}}{1-g} - \xi\kappa_{it}\left(W^{j}_{i,t}\right)^{1-g}$$

In order to preserve homogeneity, the leisure term includes an efficiency level, proportional to the individual's wage in the good state of the income process.

Consistently with a warmglow bequest motive (De Nardi, 2000) any agent facing a mortality risk values his heir's utility according to the approximate indirect utility function

$$v\left(a_i,\overline{C}_{j,i}\right) = \phi_1\left(\overline{C}_{j,i} + \frac{a_i - t\left(a_{it}\right)}{\phi_2}\right)^{1-\rho}$$

where $\left(a_{it} - t\left(a_{it}\right)\right)$ is the after tax bequested asset and $\overline{C}_{j,i}$ the average pre-bequest consumption of the heir.

The value function is indexed by the level of assets, a, the agent's socio-occupational group, j, and age, i, his current income status, ℓ, his ascendant socio-occupational position j', and the current date, t.

The actual resolution and computations are performed on stationnarized values, deflated by the growth factor $(1+g)^t$.

Solving the dynamic program, we recover decision rules which, together with demographic and accounting equations allows us to determine the evolution of the asset distribution. $\Lambda(a, j, i, \ell, j', t)$.

A steady state of the economy, for given demographic conditions and factor prices, is defined as an invariant $\Lambda\,()$distribution. In order to study transition, we have to rely on a more general concept of rational expectations dynamic equilibrium.

An R.E.D.E. is defined, for $t \geq 0$, as a vector of mortality rates m_t^{ij}, contribution rates τ_t, transfers f_t, asset distribution $\Lambda(a, j, i, \ell, j', t)$, and decision rule for accumulation $a'(a, j, i, \ell, j't)$, such as the following conditions are satisfied.

i) the time-profile of the contribution rates τ_t verifies the intertemporal budget constraint of the pension system.

ii) for given expectations of mortality rates, contribution rates, bequest, and average consumption of heirs $a'(a, j, i, \ell, j't)$ follows from decision rules solving the maximization problem ( )

iii) $\Lambda(a, j, i, \ell, j', t)$ is the unique family of distributions generated by the decision rules from the initial conditions

iv) the expectations of bequests (conditionally) and heirs average consumption are satisfied[9].

v) the revenues from inheritance tax are redistributed through lump-sum current transfers.

3.2 Calibration

In order to limit the size of the problem to be solved numerically, and due to the long horizon required to reach an accurate degree of convergence to the steady state (typically, the year 2185), the model period is set as 2.5 years. This implies a maximal "life time" of 32 periods (after entering the labour force) and a 12 period interval between generations. Mortality rates, entry flows and intergenerational mobility are calibrated from various INSEE sources.

[9]Rational agents should use all available information to form their expectations regarding their ascendant's bequests. We assume that agents only know the age and the occupational group of their ascendant. Rational agents would then consider the probability distribution of their ascendant conditional on these informations. For computational purpose, we assume that agents expect the average level of assets of this distribution.

Preference parameters have been calibrated consistently with the literature and in order to reproduce main ratios. The relative risk aversion coefficient ρ is fixed at 1.5 and the discount factor $\beta = 0.982$ in order to get an asset to income ratio $A/y = 2.5$. The indirect utility of bequest parameter ϕ_1 is set at 7 in order to reproduce the mean ratio of bequest to assets (1.5% in France) and $\phi_2 = 12$ in order to determine the extra permanent consumption allowed to the heirs. The labour disutility coefficient ξ is set at 2.95 as this value is the one for which retirement at the age 60 is optimal under the (stylized) demographic conditions prevailing in the late 90's.

The age-wage profile by socio occupational group is calibrated on INSEE data, with a resulting cumulative progression over the working life of 110% for executives, but only 20% for low-qualified workers.

4 Accounting for the pensions reform scenarios

In order to assess pension reforms, we had to look first at demographic trends. According to fig.1. our model in the "baseline case" reproduces, the currently accepted labour force projections (Bonnet et alii, 2001), peaking in 2007, and therefore decreasing by 20%. Postponing retirement to age 65, by a quarter each year, temporarily increases the labour force which ultimately comes back close to its initial (year 2000) level.

In the baseline case, the old age dependancy ratio increases from 40% to 70%, overshooting its asymptotic level from 2040 to 2090. It is important to notice that this ratio first decreases, for a few years, up to 2007-2008. PRA (Postponing retirement age) allows to keep this ratio close to 50% in the long run (57% at his mid-century peak).

The cost of demographic transition under the baseline scenario is shown on figure 4, as the contribution rate required to balance current pensions. This cost steeply increases from 2010 to 2040, peaking at 39% of the wage (a 62,3% increase from the initial 24% rate).

The profile of pension reduction implyied by the "reforme 93"[10] is reported on figure 3. From 2040, the replacement rate is stabilized at 50%,

[10] Notice that our scenario assumes that the "reforme 93" is extended to the public sector thus affecting all pension "regimes".

nearly 25% under their initial level. PRA marginally increases this rate, through composition effects.

Considered independently, PRA and the "reforme 93" have similar cost reduction impacts in the long run keeping the required contribution rate under 30%. However, the combination of both measures, PRA and the reduced replacement ratio, is needed to stabilize the long run cost of pension at the level experienced in year 2000.

The impact of financing reforms scenarios is depicted on figures 5. The "smoothing" scenarios, with "baseline" pension rights, is effective in limiting the contribution rate under 35% in the year 2040-2050, at the cost of an extra contributive effort peaking at 5 percentage points in the years 2010-2015. The EFL scenario, introducing a permanent funded pillar, illustrates the long rate efficiency gain from such a fundamental reform.

Assuming full funding and an interest to wage growth ratio of 4.5/1.8=2.5, the 39% cost under PAYG would be reduced to 15.6%. As we assume 25% of funding, our scenario implies a long run contribution rate equal to 33.%. The extra contribution levied to build up this pension fund between 2005 and 2050 is roughy 1.15 percentage point per year. Of course, the impact of financing alternative scenarios is reduced, when combined with a less generous pension plan.

When PRA and the "reforme 93" are implemented together, the pension system may be financed by a "super smoothed" EFSL constant reduced contribution rate set at roughly 22%.

The public asset accumulation resulting from the smoothing and funding scenarios are reported on figures 6a and 6b. Even limited to 25%, the funded pillar has to amount to one year of GNP, roughly three times the amount of the "smoothing" fund at its peak ca. 2035[11].

5 The macroeconomic effects of pension reforms

Through integrating over the equilibrium asset distribution at every date along the transition path, we may recover the value of aggregate consumption, asset level and interest income and therefore aggregate net income. In

[11] Our evaluation of the "smoothing fund" is twice as large as the "fonds de reserve" once considered in the French agenda, and it has to be planned over a longer horizon.

the following, we only consider normalized data measures, eliminating trend components in order to focus on the specific contribution of pension reforms to the profile of aggregate variables.

The first result from examining the consumption profiles is the noticeable decrease which happens under the baseline scenario, roughly by 10% at the 2075 horizon. The smoothing scenario provides a lasting gain by 2035, by slightly anticipating the decline before this date. The funding scenario, EFL, is very efficient in smoothing consumption over the century. Consumption gains from PRA are built in the model, which imposes the substitution of consumption for leisure. Long run consumption gains from the "reforme 93" are not so expected. In the first decades, the "reforme 93" reduces consumption by inducing larger saving from employees, while retirees face pension cuts. From 2030, income consumption is to exceed its baseline level.

Asset accumulation profiles reported on figures 8 show the importance of the demographic shock on saving, in every reform scenario. The 25% reduction in pensions implemented under the "reforme 93" would lead to double the assets held by households from 2000 to 2040, but nearly half this extra saving would occur even under the baseline scenario with maintained net replacement ratios.

On figure 9, which reports both private and total asset accumulation, we may observe that public accumulation under our smoothing or funding scenario exerts only a limited effect on private savings.[12] Crowding out amounts roughly to 10% of private saving, between 2020 and 2050 under the "smoothing" scenario, lasting until 2075 under the "funding scenario. However, in the long run, under EFL, public funding crowds in private saving.

As reported on figure 10, the pension reform effects on aggregate net income are large. Extra savings results in a temporary increase in every scenario, but this effect is dominated by the reduced activity rate under the baseline scenario. Only, the combined PRA and "Reforme 93" scenario allows for a long run gain in aggregate income, with respect to its initial level.

6 Redistributive welfare effects

A fundamental pension reform involves intergenerational redistributive effects first, but also intragenerational effects. Indeed, the attitudes towards

[12] Of course, crowding-out effects would have been greater allowing for an endogenous interest rate.

pension reforms are not only correlated with age, but also with one's respective concern for social redistribution versus economic efficiency.

6.1 Overall inequality measures

We first consider overall measures of inequalities by looking at the time profiles of Gini coefficients for both wealth and consumption. It is well known that wealth inequality is much larger than consumption inequality.

A first result illustrated on figures 11 and 12, is that aging will entail an increase in consumption inequality within the population, but a at least temporary-decrease in wealth inequality.

It is of special interest to notice that the baseline scenario, with a maintained pension generosity, is one of the most inequalitarian, mainly for consumption. The reduced generosity scenario "Reforme 93" performs much better on that issue. Surprisingly, postponing retirement age generates the largest consumption and wealth inequalities.

The equality increasing effect of reducing pensions generosity looks paradoxical. It rests on several robust mechanisms[13]. By allowing reduced contribution rates, it relieves especially the liquidity constrained young poor of mandatory forced savings. Furthermore, the implicit pension asset, earning a low rate of return is virtually the only wealth for the poor, while richer agents own a diversified portfolio including better remunerated financial assets. With reduced pensions compensated by extra private savings, the average return on total wealth for the poor increases much more than for the rich. The reduction in wealth inequality is the larger, as large replacement ratios weaken a basic motive for private saving, as noticed for Sweden by Domeij and Klein (2002). On the contrary, postponing retirement generates higher Gini coefficients, an important result as this measure lies at the core of most of the pension reform agenda. Several mechanisms contribute to this result. First, although basically Bismarckian, the French pension system is mildly redistributive. PRA increases the part of more inequal direct wage income within the total life-cycle income. Second, our model retains the actually observed differences in life expectancy. With later retirement, the relative inequality of the duration of pension benefits is increased.

We also notice that the "financing" scenarios introducing either "smoothing" or "funding" have a lesser impact on inequality measures.

[13]This effect is also obtained by Miles and Cerny (2002) and, at the steady state, by Hairault and Langot (2002) and Hénin and Weitzenblum (2002).

6.2 Intergenerational redistribution

Welfare measures are hardly comparable over different lifespans. So our first measure of the effect of pension reforms on welfare are only computed, for every cohort, when it enters the labor market at age 20.

According to this measure, as related on figure 13, the baseline scenario implies a decrease of welfare for cohorts born between 1980 and 2030. The smoothing scenario is efficient in bettering the welfare of future cohorts, thus compensating this spontaneous loss. Agains, we notice that a reduced generosity, following the "Reforme 93" is much more welfare improving than PRA. The best long run solution is the combination of funding and "Reforme 93", which in better for every cohort born after 1980.

However, this criterion does not allow us to assess the situation of cohorts actually working before 2000. We have used two distinct measures of gains and losses to assess the impact of the various scenarios on the welfare of agents belonging to different cohorts and different occupational groups. The first one consists in the utilitarian criterion, computed as the average of the intertemporal expected utility of agents of the same cohort, summing up all occupational groups. Fig. 14 plots the welfare variation (absolute gain or loss) of R93, PRA and PRA R93 as compared to the baseline case, in the PAYG financing scheme. This measures provides with information on intergenerational gains or losses.

Reducing generosity, according to the "Réforme 93", strongly benefits younger and future cohorts, but are costly for all cohorts born before 1965. PRA benefits to the cohorts who are retired or close to retirement in 2000 (those born before 1944), and to the young born after 1988, or still to be born. A further and less expected result is that the long-run gains from PRA are modest, in comparison to both the long-run gains from $R93$ and to the temporary losses from PRA for the cohorts born in the $60's$ and the $70's$. As previously noticed in the literature (Dolado and alii, 1999 and Miles and Cerny, 2002) this explains why it is so difficult to bring political support for such fundamental reforms[14]

Figure 15 illustrates the intergeneraional impact of different financing scenarios, for the baseline case. We notice the large ratio of gains for cohorts to be born after 2020, to the losses supported by these cohorts aged more

[14] It is interesting to notice that Conesa and Krueger (1999) obtain the same critical age (35) for their reform scenario "A" under moderate heterogeneity.

than 70 in 2000. Smoothing mainly benefits to cohorts to be born between 1995 and 2050 but is, as a temporary measure, neutral in the long run.

The second criterion provides finer results by distinguishing the gains or losses among the different occupational groups. Rather than pure welfare variations, we have computed the equivalent transfer (for a gain) or the compensatory transfer (for a loss) for the median agent of a given cohort-occupational group which makes him indifferent between the baseline and the alternative scenario considered. This transfer is expressed as a number of wage periods. By comparing the curves for the various occupational groups, we can shed light on the intragenerational redistribution entailed by the alternative reforms.

The profiles reported on figures 16 provide a more detailed view of the specific effects for every socio-occupational group. The relative advantage of "réforme 93" for workers and of PRA for executives is clearly apparent from the comparison of figures 16a and 16b.

The overall conclusion from these figures is an illustration of Breyer's (1989) proposal, that a fundamental pension reform is not a priori Pareto improving.

A further view of the mechanisms underlying those welfare effects is provided by the consumption profiles, reported on figure 17a, which compares financing alternatives, and figures 17b which compares pensions generosity alternatives. As noticed below, the effects of alternative generosity levels are much more contrasted than the ones from alternative financing scenarios.

We notice that, under the baseline scenario, the consumption profile for the cohort to be born in 2000 is uniformly lower than the profile experienced by the currently active cohorts. We also see that the pension cut under the "Reforme 93" strongly hurts the current retirees, whose expected end of life consumption dramatically falls, for instance by 24% for a worker born in 1940 when aged 90.

7 Conclusion

From the computation of equilibrium distribution of assets within cohorts of heterogenous agents during the transition to a new demographic steady state and alternative pension systems, this paper has derived a series of quantitative results. We obtain both many results consistent with widely held views, but other less expected results.

A policy maintaining the current level of replacement rates at the price of an increase of contribution rates by 2/3, would not avoid a decrease in future consumption and a welfare loss for cohorts still to be born. Among the ways of reducing pension generosity and costs, a reduction in replacement rate is shown to entail less inequalities than postponing retirement age. It even reduces inequality in the long run, with respect to the baseline scenario.

With our calibration, the efficiency of "smoothing" and especially "funding" scenario is illustrated.

However, our results confirm that the redistributive effects of pension reforms are large. Far from being a menu of Pareto-improving solutions, our scenarios entail sizeable costs for many of the living cohorts, as well as large gains for the youngest or future cohorts. Again, the reduction in pension replacement rates offers a better trade-off between cohorts of workers, while postponing retirement age is better for executives.

Of course, some of these results are model dependant. For instance, introducing a choice in retirement age would allow for more efficient trade off between lifetime consumption and leisure. The robustness of results with respect to some crucial parameter choices still has to be checked. Some doubt may also be cast on the rational expectation life cycle paradigm as a fully satisfactory explanation of the profile of saving for retirement, at the risk of over evaluating the extent to which private saving would provide such an efficient substitute for public pensions.

Fig. 1 and 2 : Labour force and dependency ratio

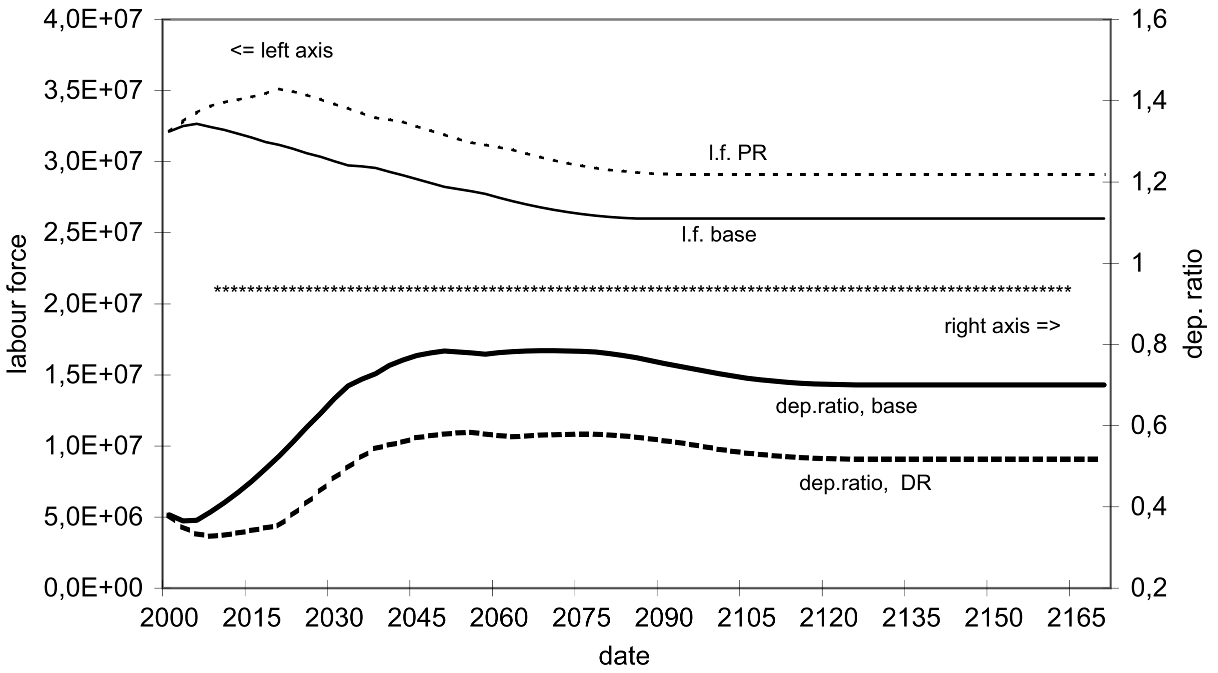
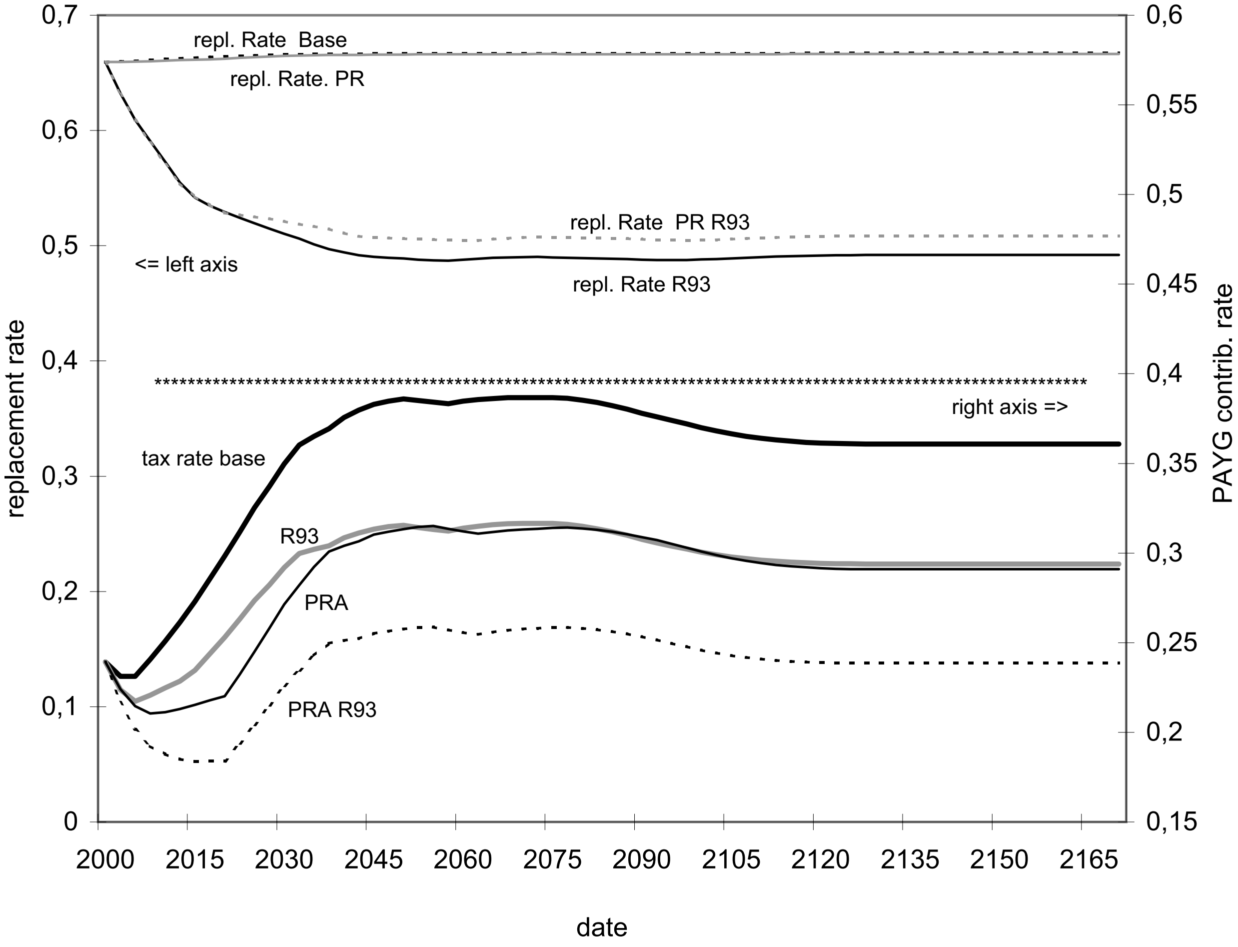


Fig. 3 and 4 : Average replacement rate and PAYG contribution rate



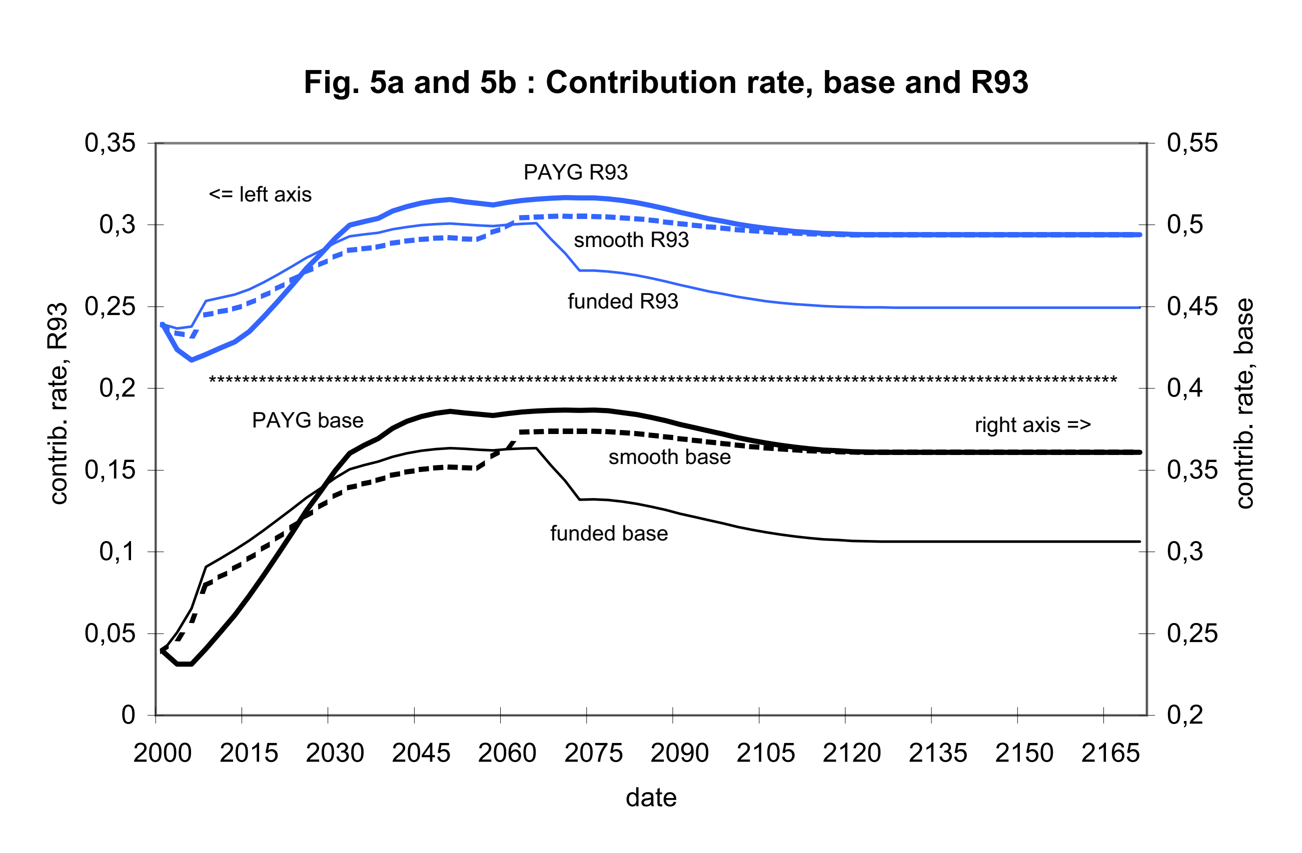


Fig. 5a and 5b : Contribution rate, base and R93
0,35
0,3
0,25
0,2
0,15
0,1
0,05
0
0,55
0,5
0,45
0,4
0,35
0,3
0,25
0,2
contrib. rate, R93
contrib. rate, base
<= left axis
PAYG R93
smooth R93
funded R93
PAYG base
smooth base
funded base
right axis =>
2000
2015
2030
2045
2060
2075
2090
2105
2120
2135
2150
2165
date

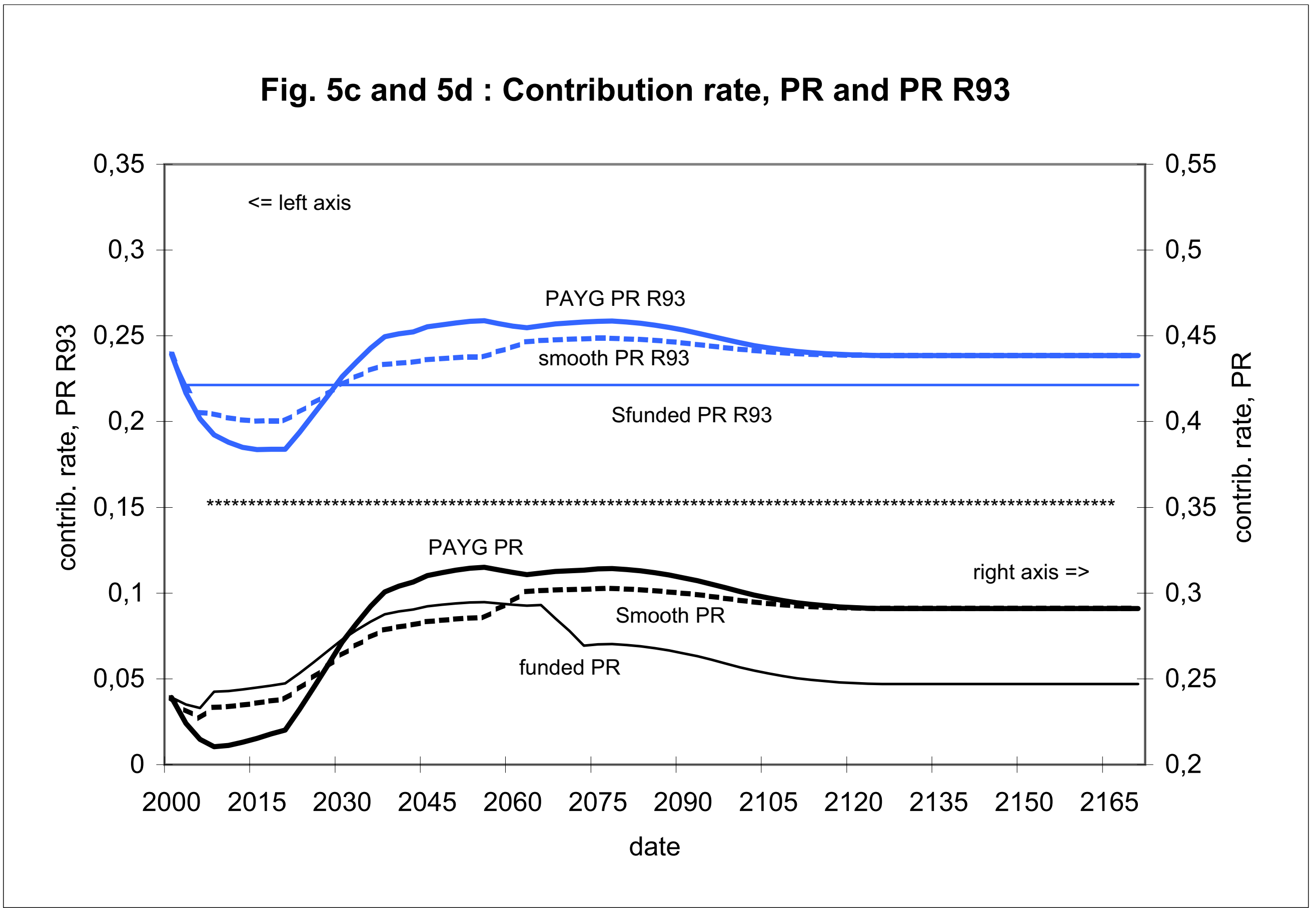


Fig. 5c and 5d : Contribution rate, PR and PR R93
0,35
0,3
0,25
0,2
0,15
0,1
0,05
0
0,55
0,5
0,45
0,4
0,35
0,3
0,25
0,2
contrib. rate, PR R93
contrib. rate, PR
<= left axis
PAYG PR R93
smooth PR R93
Sfunded PR R93
PAYG PR
Smooth PR
funded PR
right axis =>
2000
2015
2030
2045
2060
2075
2090
2105
2120
2135
2150
2165
date

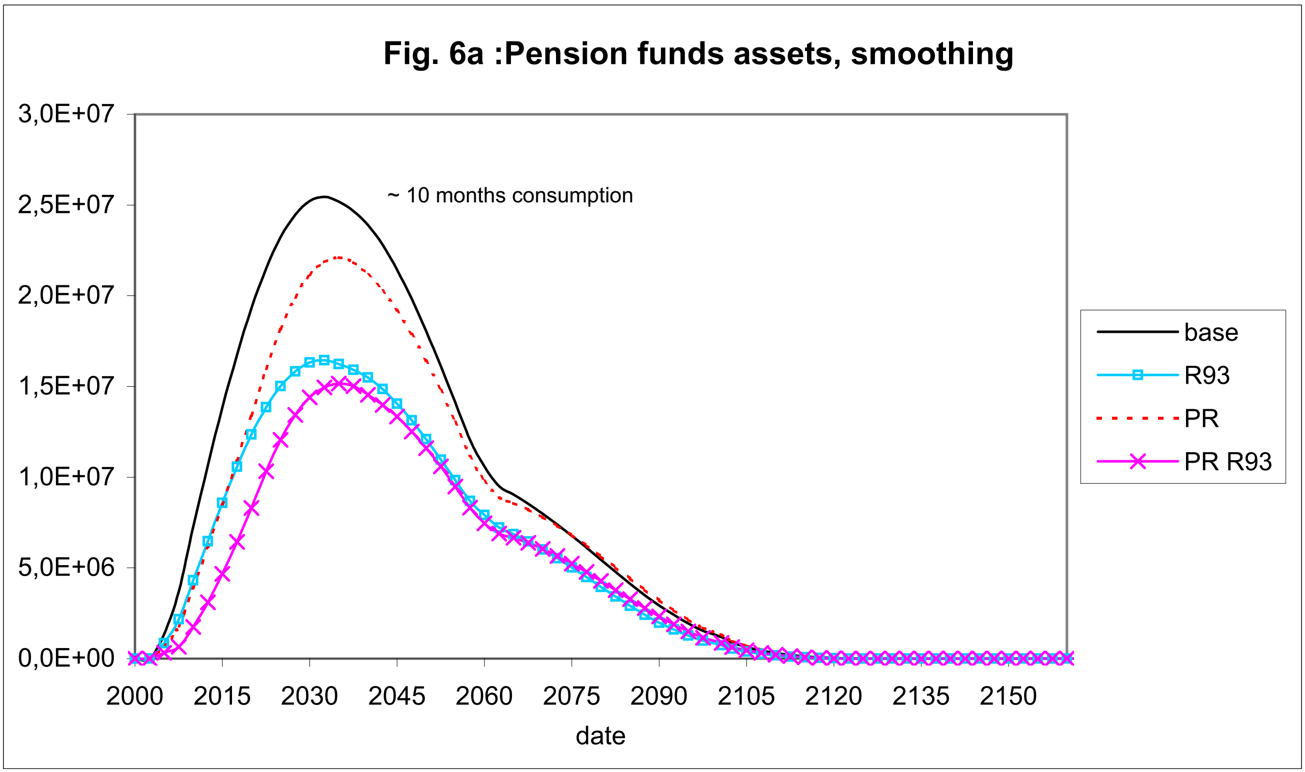


Fig. 6a :Pension funds assets, smoothing
3,0E+07
2,5E+07
2,0E+07
1,5E+07
1,0E+07
5,0E+06
0,0E+00
~ 10 months consumption
2000
2015
2030
2045
2060
2075
2090
2105
2120
2135
2150
date
base
R93
PR
PR R93

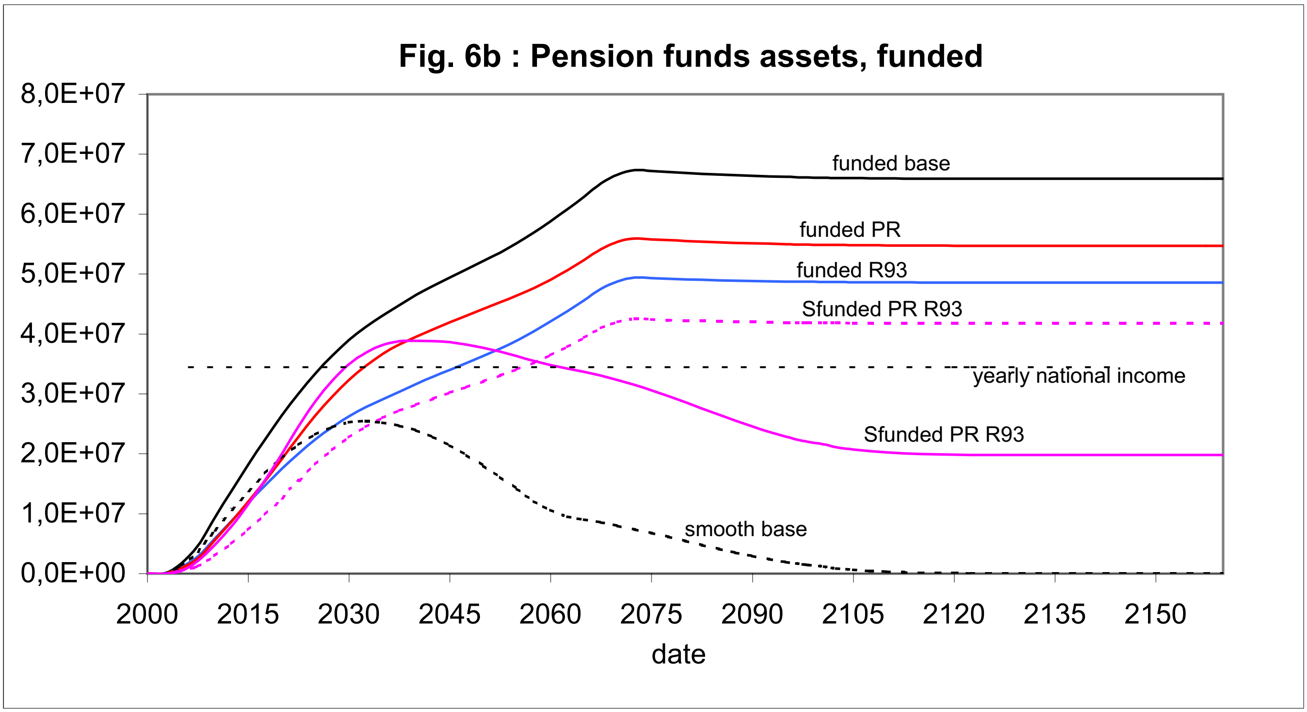


Fig. 6b : Pension funds assets, funded
8,0E+07
7,0E+07
6,0E+07
5,0E+07
4,0E+07
3,0E+07
2,0E+07
1,0E+07
0,0E+00
funded base
funded PR
funded R93
Sfunded PR R93
yearly national income
Sfunded PR R93
smooth base
2000
2015
2030
2045
2060
2075
2090
2105
2120
2135
2150
date

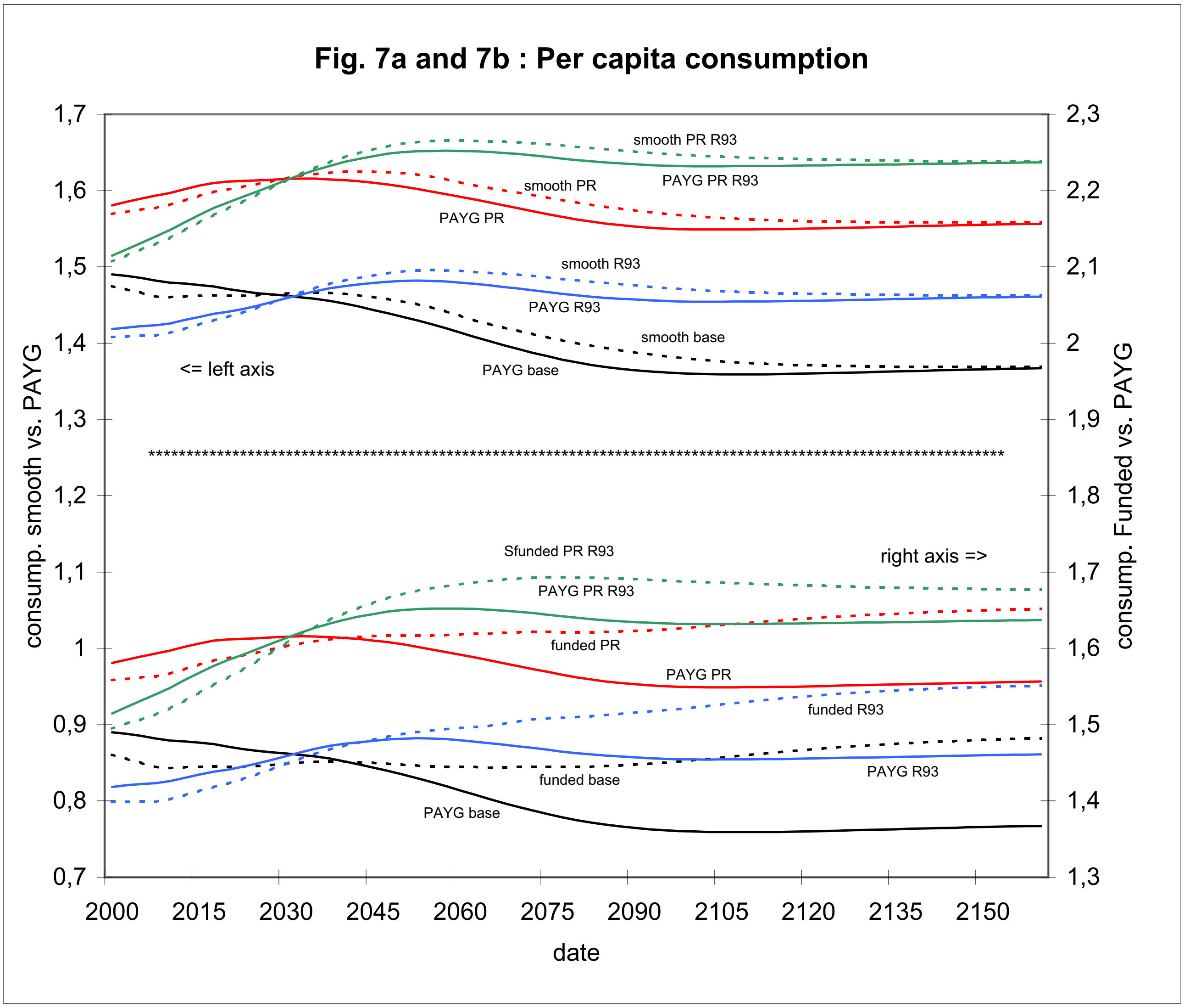


Fig. 7a and 7b : Per capita consumption
smooth PR R93
PAYG PR R93
smooth PR
PAYG PR
smooth R93
PAYG R93
smooth base
PAYG base
<= left axis
Sfunded PR R93
PAYG PR R93
funded PR
PAYG PR
funded R93
funded base
PAYG R93
PAYG base
right axis =>
consump. smooth vs. PAYG
consump. Funded vs. PAYG
date

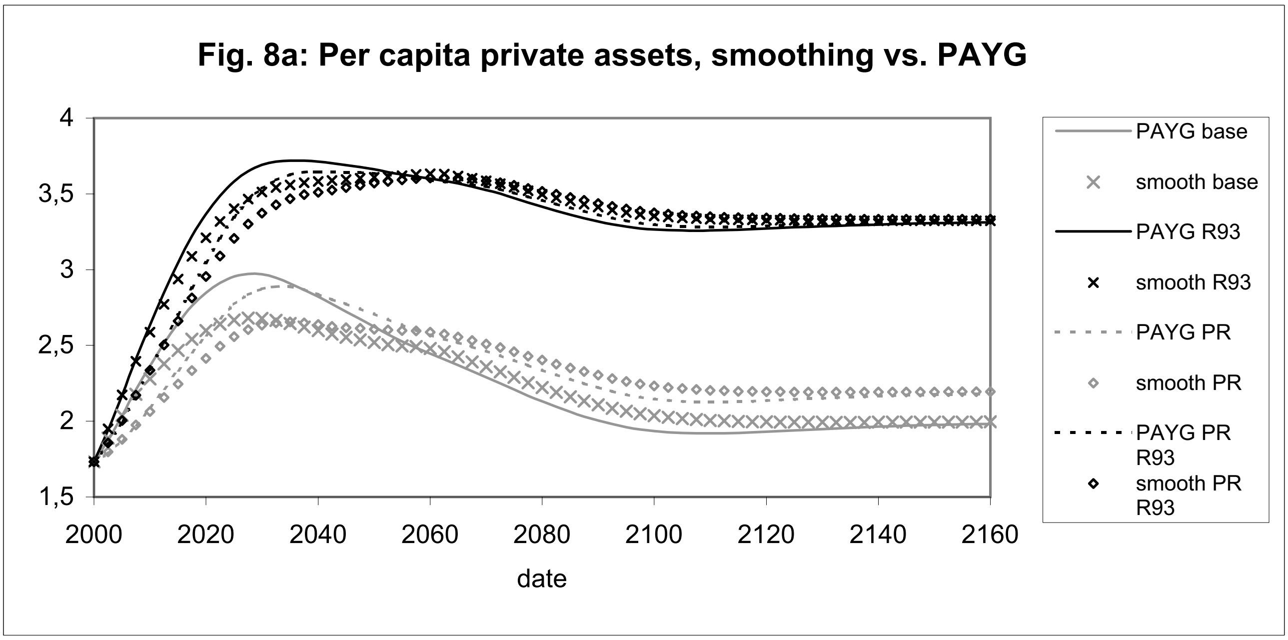


Fig. 8a: Per capita private assets, smoothing vs. PAYG
PAYG base
smooth base
PAYG R93
smooth R93
PAYG PR
smooth PR
PAYG PR R93
smooth PR R93
date

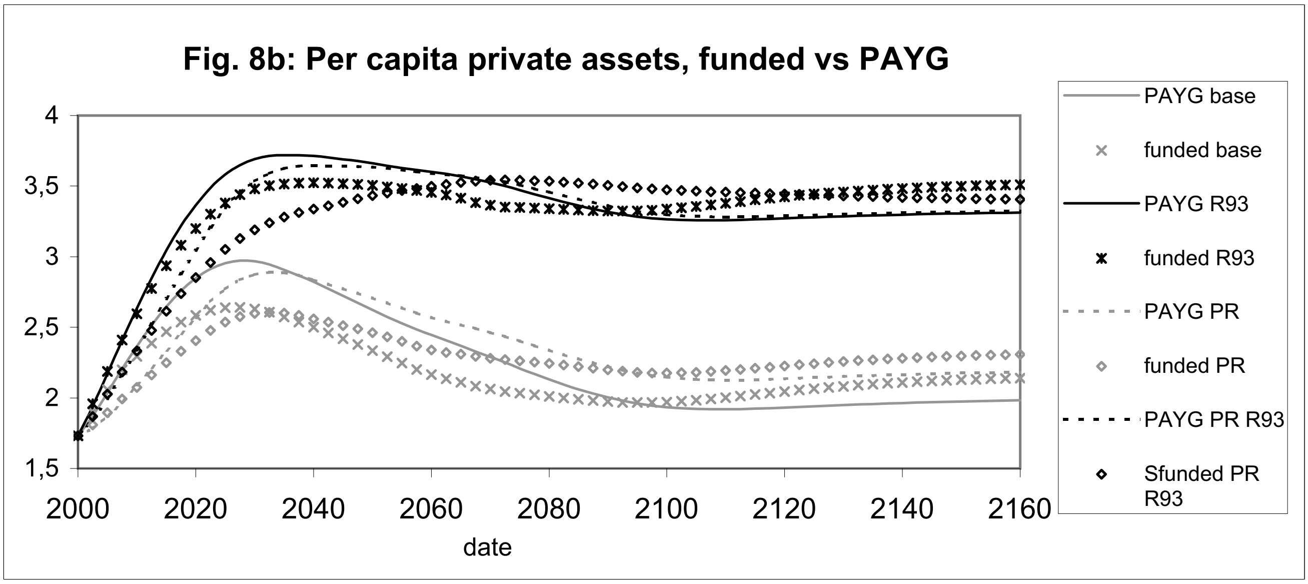


Fig. 8b: Per capita private assets, funded vs PAYG
4
3,5
3
2,5
2
1,5
2000
2020
2040
2060
2080
2100
2120
2140
2160
date
PAYG base
funded base
PAYG R93
funded R93
PAYG PR
funded PR
PAYG PR R93
Sfunded PR R93

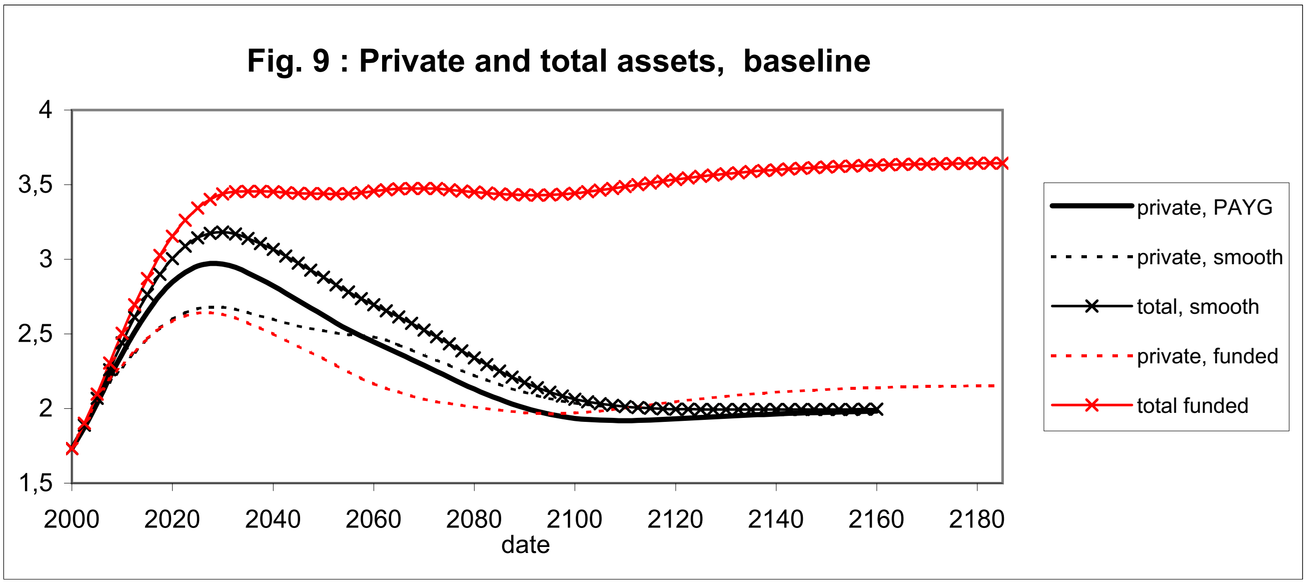


Fig. 9 : Private and total assets, baseline
4
3,5
3
2,5
2
1,5
2000
2020
2040
2060
2080
2100
2120
2140
2160
2180
date
private, PAYG
private, smooth
total, smooth
private, funded
total funded

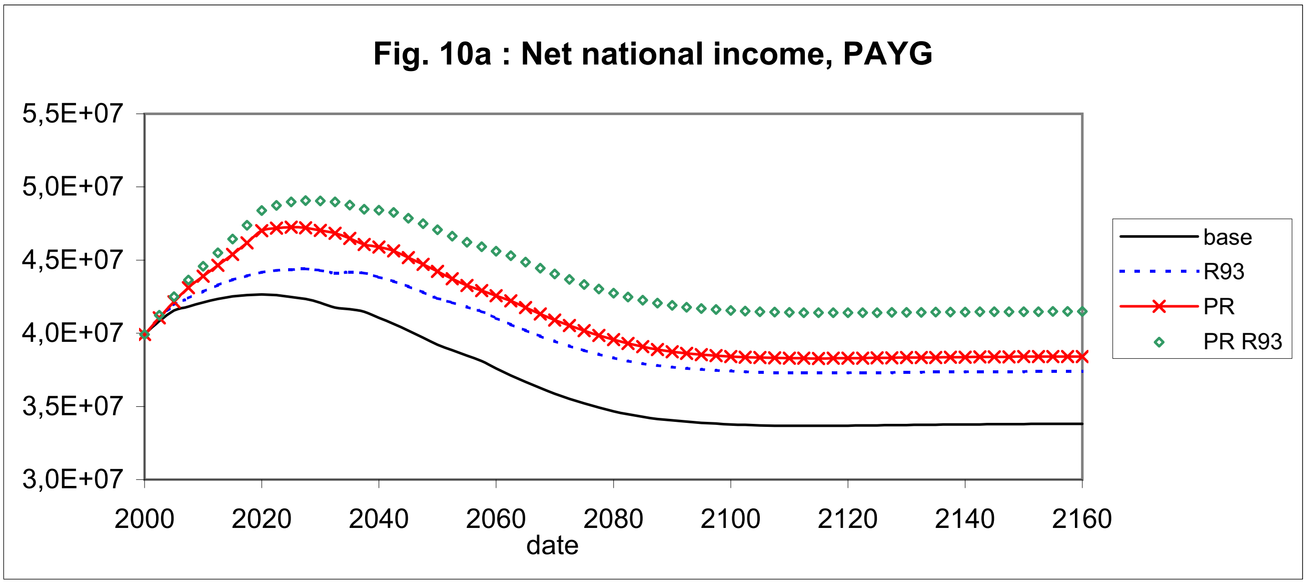


Fig. 10a : Net national income, PAYG
5,5E+07
5,0E+07
4,5E+07
4,0E+07
3,5E+07
3,0E+07
2000
2020
2040
2060
2080
2100
2120
2140
2160
date
base
R93
PR
PR R93

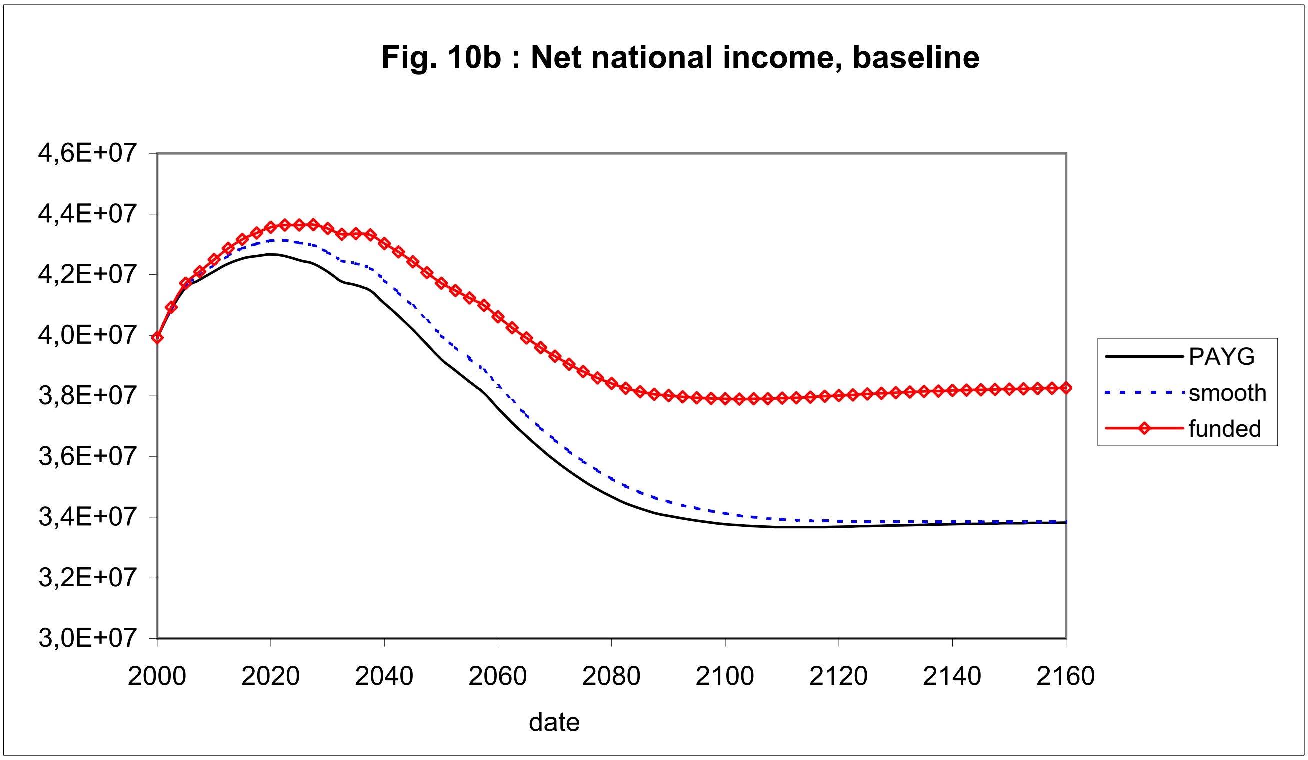


Fig. 10b : Net national income, baseline
4,6E+07
4,4E+07
4,2E+07
4,0E+07
3,8E+07
3,6E+07
3,4E+07
3,2E+07
3,0E+07
2000
2020
2040
2060
2080
2100
2120
2140
2160
date
PAYG
smooth
funded

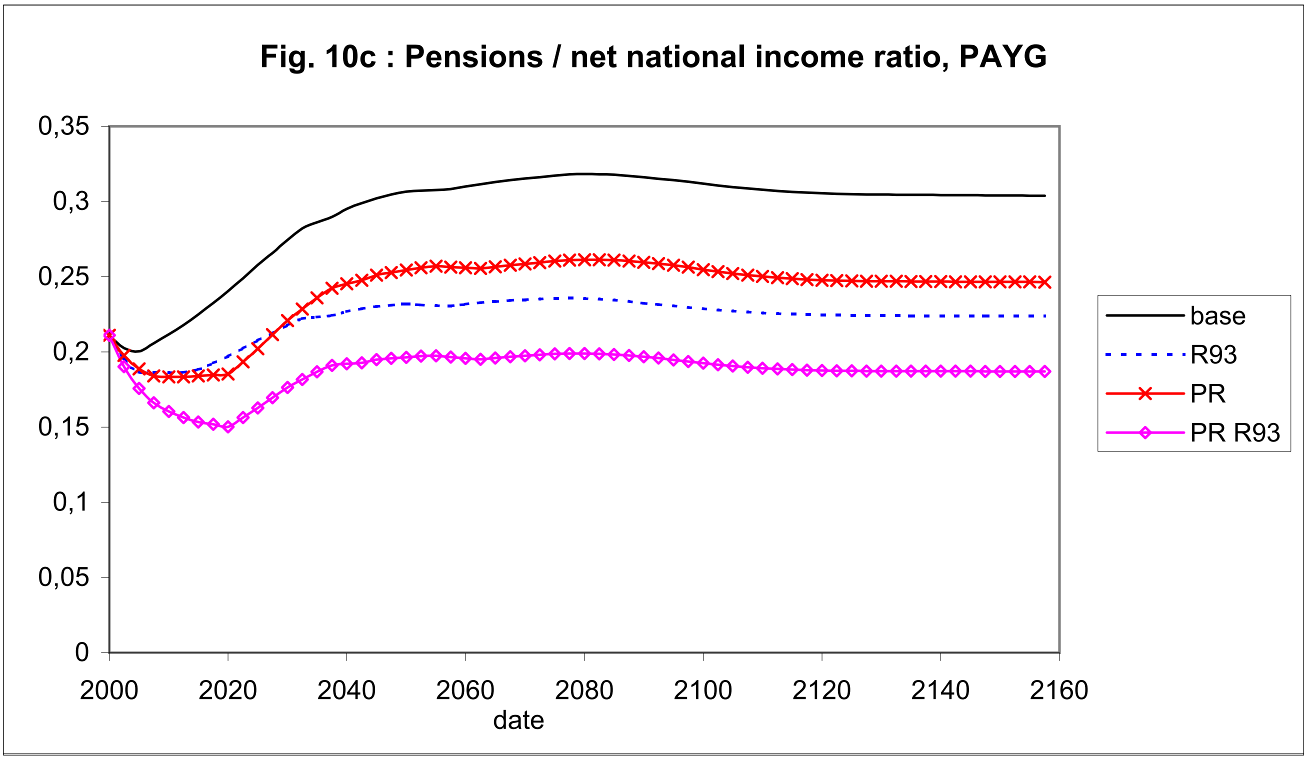


Fig. 10c : Pensions / net national income ratio, PAYG
0,35
0,3
0,25
0,2
0,15
0,1
0,05
0
2000
2020
2040
2060
2080
2100
2120
2140
2160
date
base
R93
PR
PR R93

Fig. 11 : Path of the Gini index, consumption

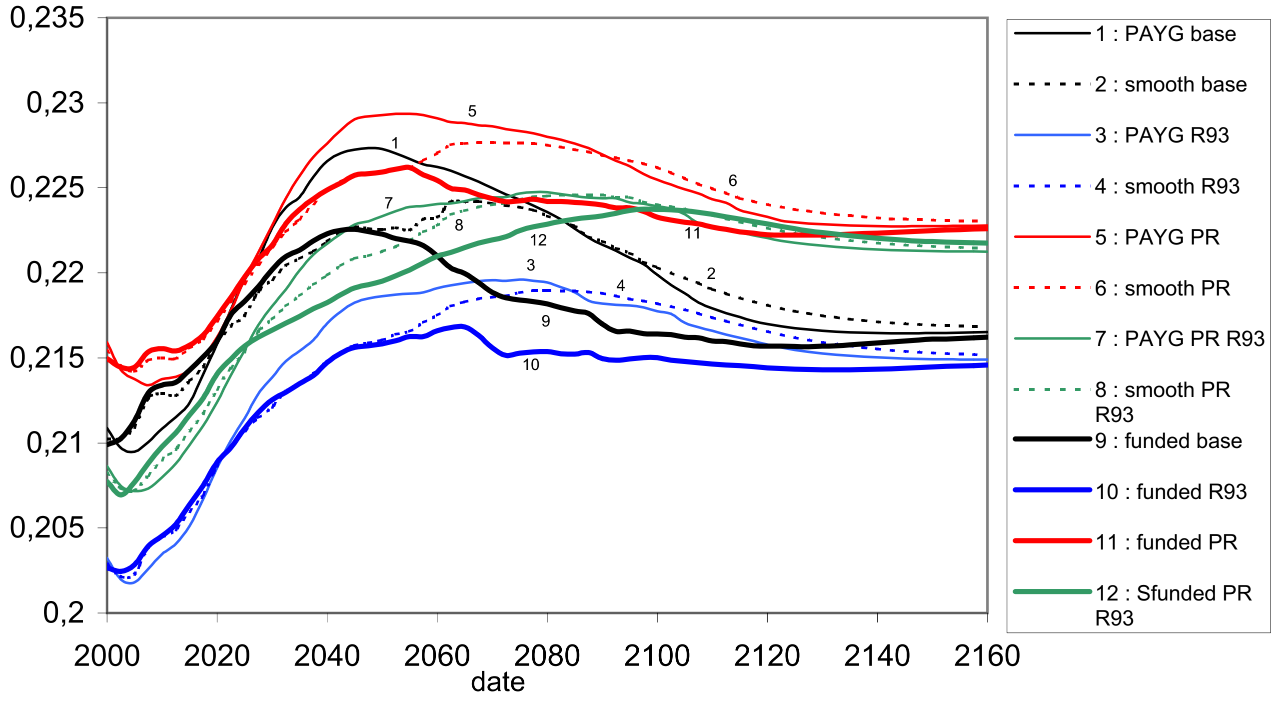
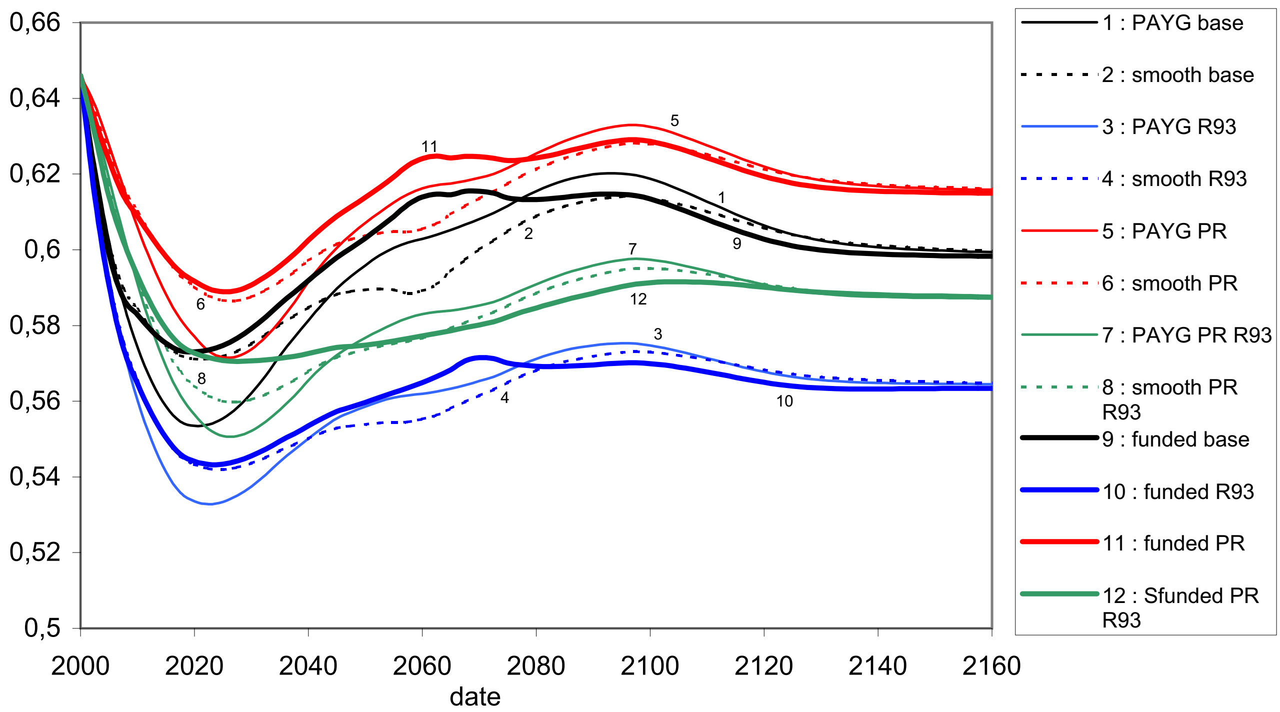


Fig. 12 :Path of the Gini index, private assets



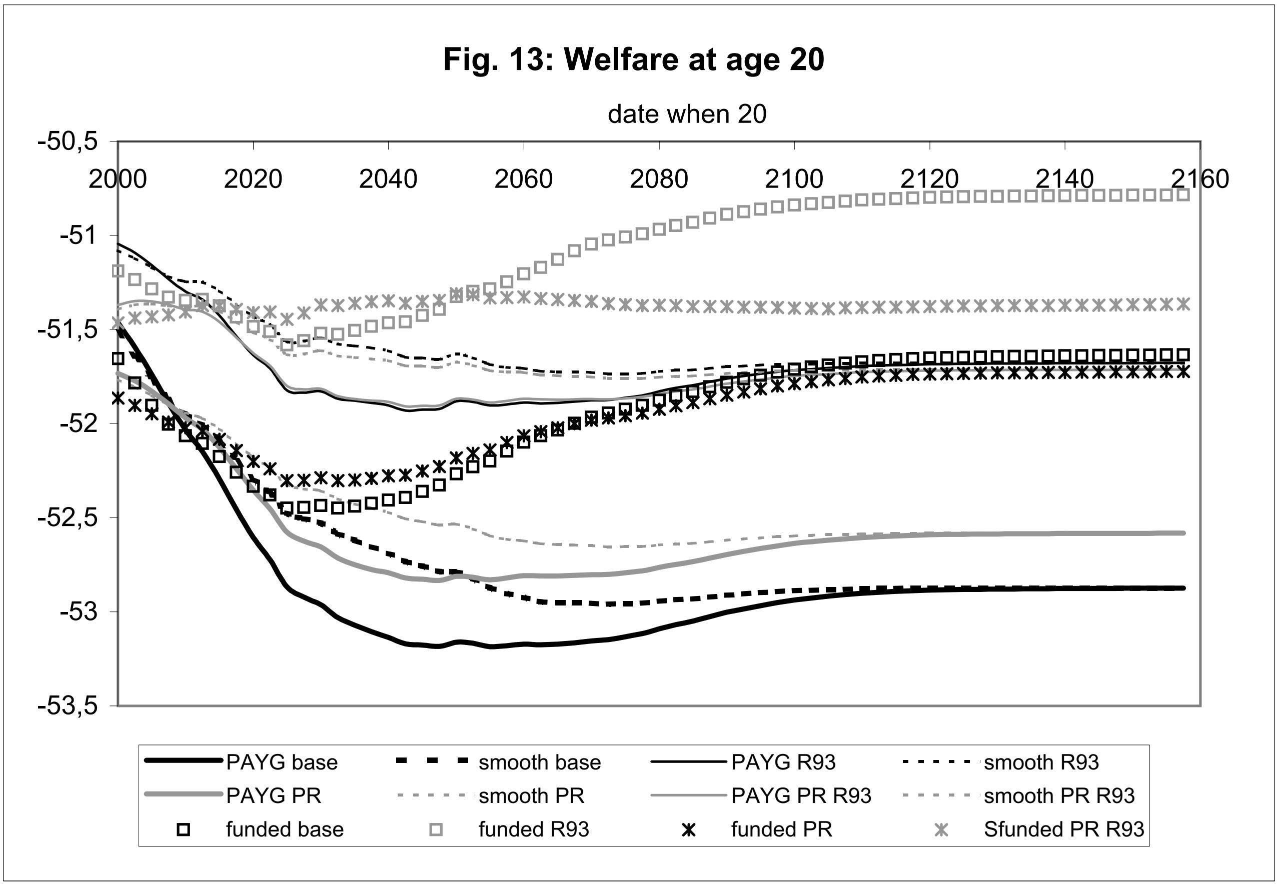


Fig. 13: Welfare at age 20
date when 20
-50,5
-51
-51,5
-52
-52,5
-53
-53,5
2000
2020
2040
2060
2080
2100
2120
2140
2160
PAYG base
smooth base
PAYG R93
smooth R93
PAYG PR
smooth PR
PAYG PR R93
smooth PR R93
funded base
funded R93
funded PR
Sfunded PR R93

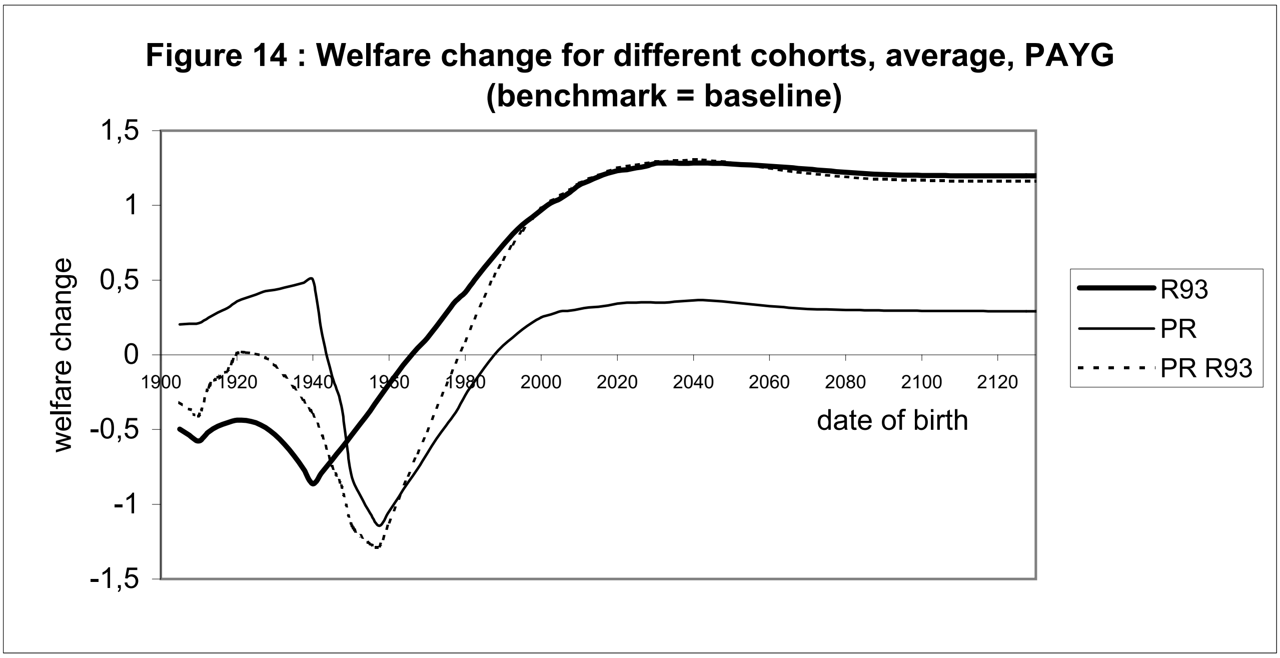


Figure 14 : Welfare change for different cohorts, average, PAYG
(benchmark = baseline)
1,5
1
0,5
0
-0,5
-1
-1,5
welfare change
1900
1920
1940
1960
1980
2000
2020
2040
2060
2080
2100
2120
date of birth
R93
PR
PR R93

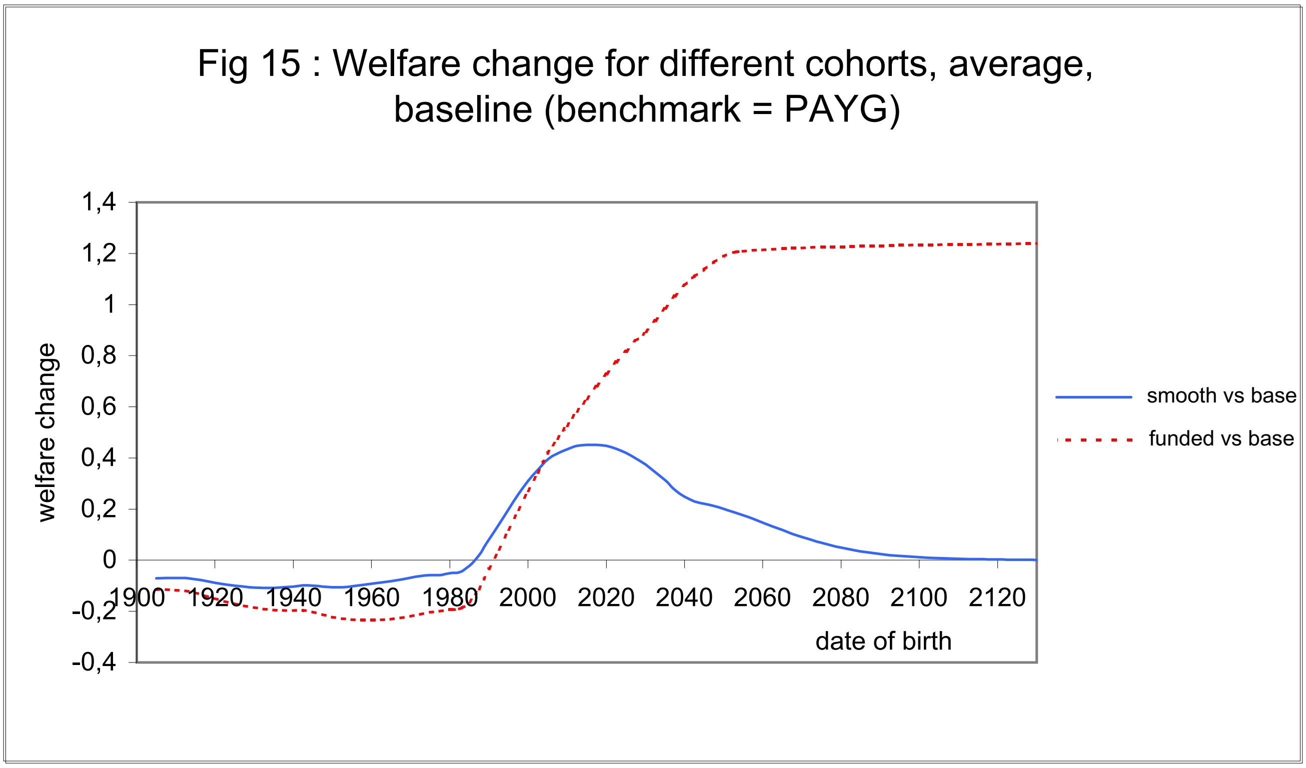


Fig 15 : Welfare change for different cohorts, average, baseline (benchmark = PAYG)
1,4
1,2
1
0,8
0,6
0,4
0,2
0
-0,2
-0,4
welfare change
1900
1920
1940
1960
1980
2000
2020
2040
2060
2080
2100
2120
date of birth
smooth vs base
funded vs base

Fig. 16a : Gains and losses, PAYG R93 vs. PAYG baseline

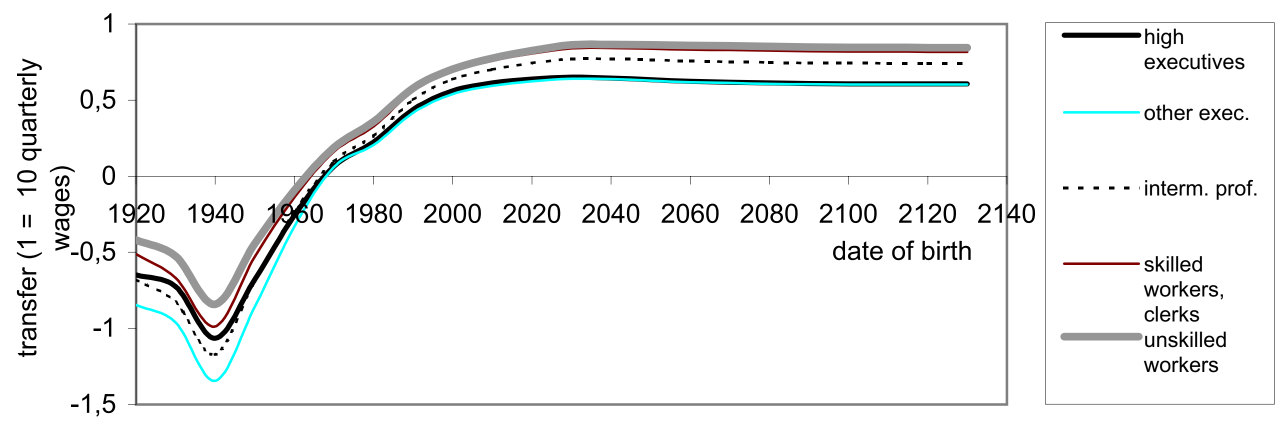


Fig. 16b : Gains and losses, PAYG PR vs. PAYG baseline

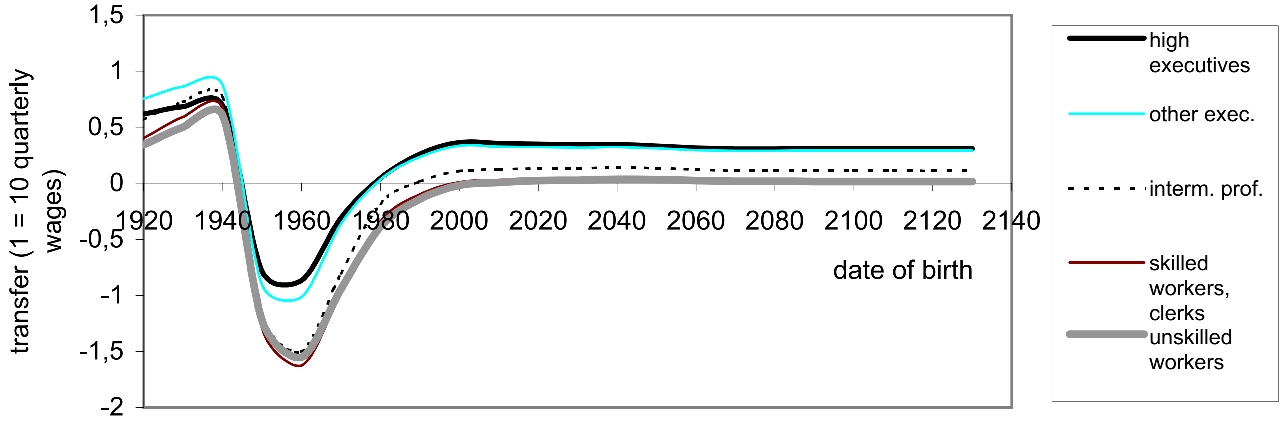
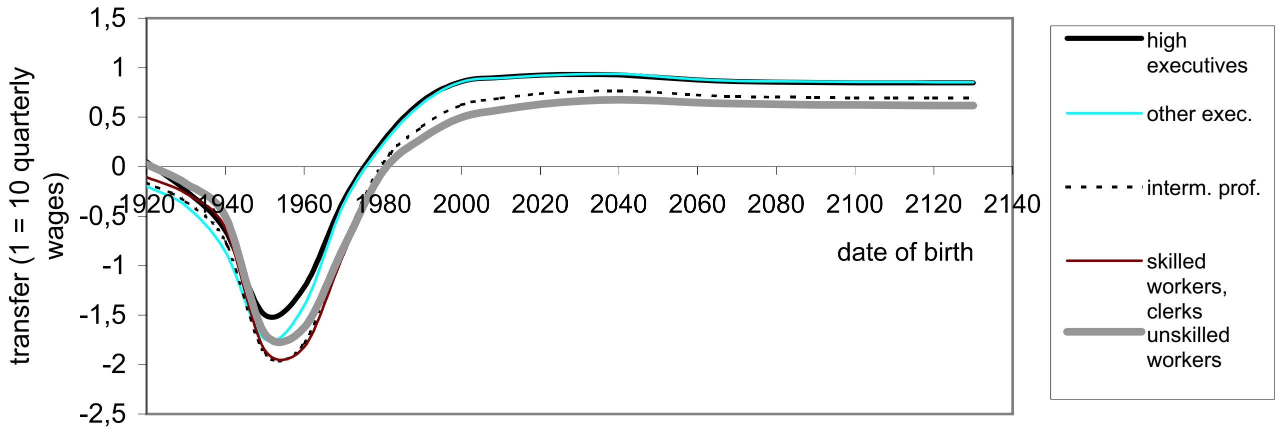


Fig. 16c : Gains and losses, PAYG PR R93 vs. PAYG baseline



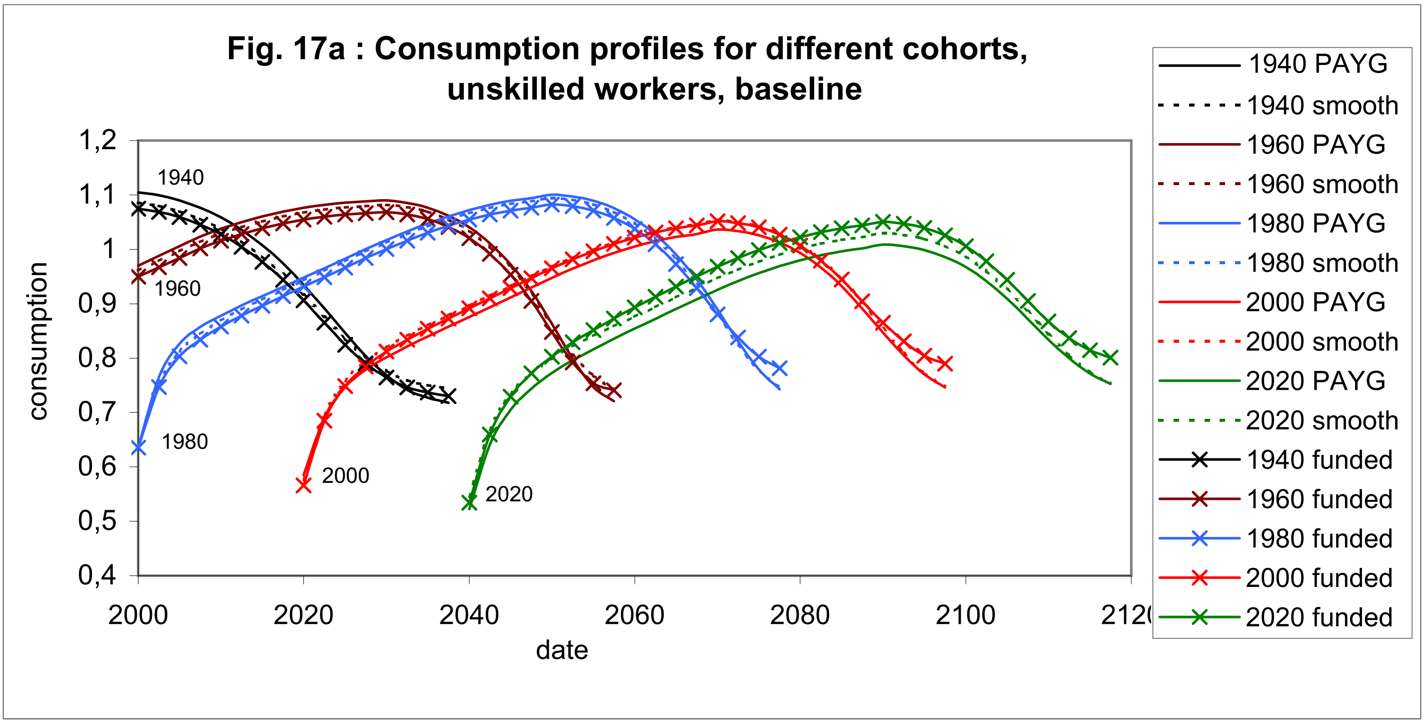


Fig. 17a : Consumption profiles for different cohorts, unskilled workers, baseline
consumption
date
1,2
1,1
1
0,9
0,8
0,7
0,6
0,5
0,4
2000
2020
2040
2060
2080
2100
2120
1940
1960
1980
2000
2020
1940 PAYG
1940 smooth
1960 PAYG
1960 smooth
1980 PAYG
1980 smooth
2000 PAYG
2000 smooth
2020 PAYG
2020 smooth
1940 funded
1960 funded
1980 funded
2000 funded
2020 funded

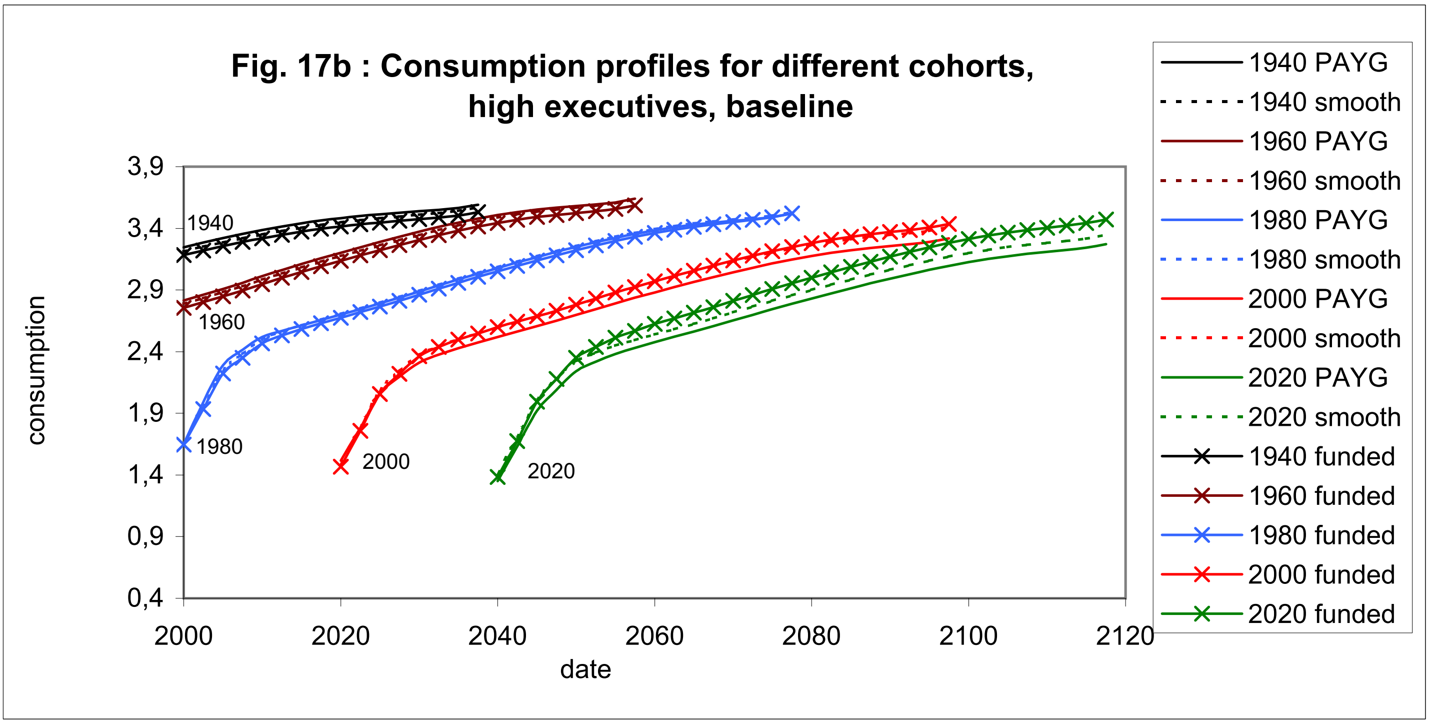


Fig. 17b : Consumption profiles for different cohorts, high executives, baseline
consumption
date
3,9
3,4
2,9
2,4
1,9
1,4
0,9
0,4
2000
2020
2040
2060
2080
2100
2120
1940
1960
1980
2000
2020
1940 PAYG
1940 smooth
1960 PAYG
1960 smooth
1980 PAYG
1980 smooth
2000 PAYG
2000 smooth
2020 PAYG
2020 smooth
1940 funded
1960 funded
1980 funded
2000 funded
2020 funded

Fig. 18a : Consumption profiles for different cohorts, unskilled workers, PAYG

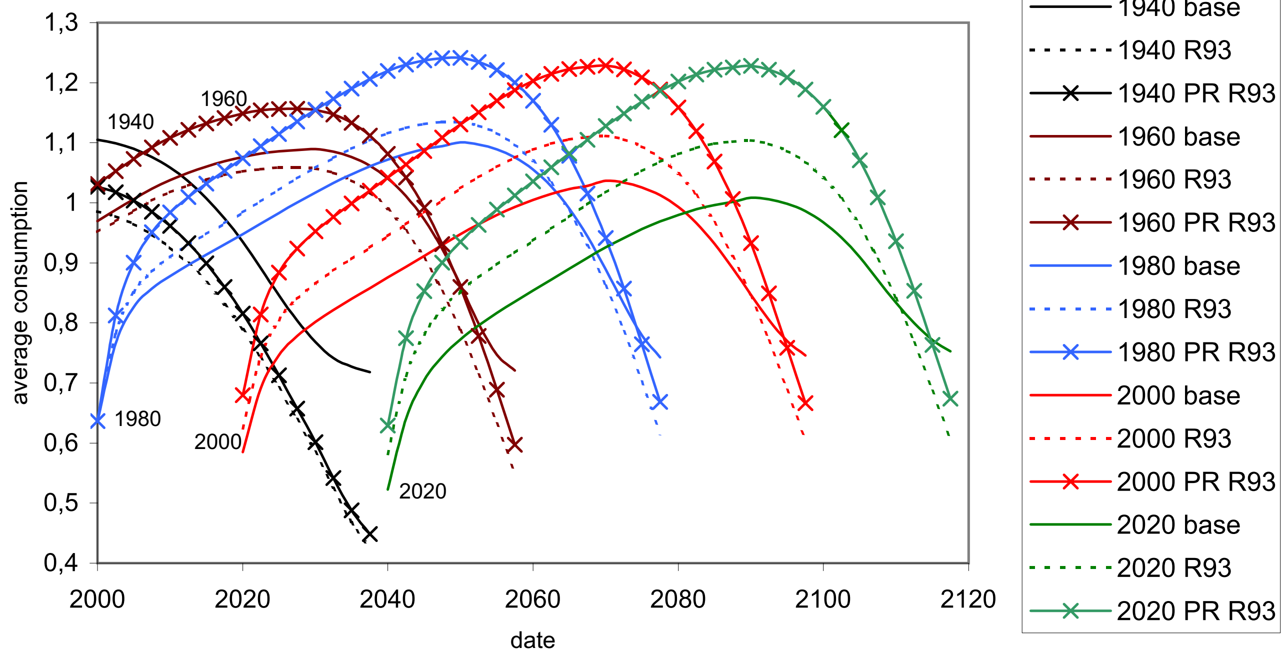


Fig. 18b : Consumption profiles for different cohorts, high executives, PAYG