Pension Reform in Germany and Redistribution Between Living Generations

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Abstract

Using a generational accounting framework, our paper focuses on the age-specific impact of pension reform among living generations. It extends the conventional generational account measures, and proposes a benchmark to compare alternative fiscal policy options by their intergenerational neutrality. We analyze three prominent reform concepts for the German pension system: a gradual pension cut via a demographic factor or price indexation, subsidization of payroll contributions financed by indirect (energy) taxes, and a long-term partial funding strategy. We find that the reforms do not only vary substantially by their impact on fiscal sustainability, but also by their redistributive effects *inter vivos*. A partial funding of pensions, while most suitable to reduce fiscal pressure on future generations, might markedly change the cohort distribution of consumption possibilities among the living. The policy could find stronger support by citizens if combined with additional measures counterbalancing the adverse redistributive effect.

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1 Introduction

Progressive population aging threatens public pension insurance in most OECD countries. As a consequence of declined fertility and ever-growing life-expectancy, the financial base of pay-as-you-go financed Social Security programs is predicted to deteriorate. Concern that public pension schemes could impose severe pressure on future public budgets in an aging society has fuelled the debate on Social Security reform. In Germany, where demographic aging will be particularly severe, numerous reform proposals, ranging from a tax financed minimum pension to advanced funding schemes, have been discussed that are aimed at improving the long-term fiscal viability of the Social Security system [cf. Besendorfer et al. (1998)].

In this paper, we investigate the redistributive impact among living generations of different policies to reform the German pay-as-you-go pension insurance, extending the generational accounting framework developed by Auerbach et al. (1991, 1992). The method which is based on the intertemporal budget constraint of the public sector has quickly developed into a standard tool to evaluate the intertemporal generational redistribution between living and future generations induced by current fiscal policy.[1] Conventionally, it is used to rank fiscal policy amendments by their impact on intertemporal generational balance.

From the viewpoint of generational accounting, fiscal reform is an intergenerational zero-sum game. Decreasing the fiscal pressure on cohorts born in the future demands to collect additional net taxes from living generations. The distribution of this burden among the living, and the corresponding change in personal welfare, has not attracted particular attention in the generational accounting literature. It has mainly been indicated by the cohort-specific absolute variations in rest-of-life net tax payments which, neglecting the pre-reform income position of different age groups, do not provide a really adequate measure. Generational equity among the living obviously matters in judging reforms directed at intertemporal fiscal balance. Selecting from reforms with a similar effect on long-term fiscal sustainability, policy-makers are likely to prefer the one that interferes the least with the current income distribution.

Therefore, our analysis casts the fiscal effects of pension reforms into perspective to living generations' initial rest-of-life consumption possibilities. This approach renders individuals at different stages of their life-cycle comparable. Inspired by the concept of

[1] The popularity of the approach is reflected by the fast growing number of available country studies. Kotlikoff and Raffelhüschen (1999) and Bonin and Raffelhüschen (1999) are the most recent surveys. Among others, CBO (1995), Diamond (1996), Raffelhüschen and Risa (1997), Buiter (1997) and Shaviro (1997) critically review the method's theoretical concept and its empirical realization.

equal relative sacrifice, we introduce an age-neutral benchmark reform that, imposing the same aggregate burden on the living, does not change cohorts' original net income position. Based on this reference, we suggest two summarizing indicators of redistribution between living generations which, controlling for variations in aggregate reform burdens, also permit to compare different reform alternatives. First, we measure the standard deviation of actual relative reform burdens from the equal relative burden required by the age-neutral reform. A second application of the benchmark policy yields political rejection quotas, assuming that individuals are generally prepared to unburden future generations but would oppose reform burdens exceeding the uniform benchmark.

For a case study, we apply our measurement approach to current concepts for reforming German pension insurance, the fundamental principles of which seem relevant beyond the specific horizon of our empirical application. In detail, we consider the introduction of a demographic factor which, partly offsetting the fiscal effect of trends in longevity, gradually reduces replacement rates, and the current government's plan to combine a quicker reduction of replacement rates with a green tax concept that subsidizes pension insurance by increased taxes on energy consumption. We show that neither of these policies is capable to significantly improve intertemporal generational imbalance. Finally, to investigate a more effective means to restore fiscal sustainability, we analyze the transition to a partially funded pension system.

Our findings indicate that redistributive effects on living cohorts vary quite substantially between the reforms. Strategies to cut replacement levels gradually impose rather balanced burdens on all living generations. Nevertheless, they could meet strong opposition as older working cohorts (whose share in the population is high) face a more than proportionate reform burden. The green tax concept, in contrast, highly discriminates among living cohorts. According to our analysis, it is a more effective means to redistribute *inter vivos*, rather than to relieve future generations. Current voter generations may still favor this policy, because it leaves the major burden to the generations too young to vote. Partial funding also shifts the highest burden to the young, distributing the transition cost quite disproportionately among living generations. Therefore, it could be advised to complement the transition with measures to smooth generational burdens.

The paper is organized as follows. Section 2 briefly exposes the generational accounting framework and presents the basic assumptions underlying the calculations. It also provides a baseline set of generational accounts for Germany. Section 3 introduces the reform proposals under investigation, and analyzes their intertemporal generational effect. Section 4 first develops the indicators for intergenerational redistribution *inter vivos*, which are applied to our German case study in a second part. Section 5 concludes.

2 Social Security and Fiscal Sustainability in Germany

Generational accounts measure the present value of net taxes, i.e., tax payments net of transfer receipts, that individuals of different age, given a specific fiscal policy, are expected to pay over their remaining life-cycle.[2] They are determined by the average net payments fiscal policy allocates to different age groups, in combination with mortality by age. A set of age-specific net taxes that, maintained indefinitely, does not violate the intertemporal budget constraint of the public sector is called sustainable. Under sustainable public finances, the aggregate present value of net taxes collected from current and future generations just recovers the initial public debt, plus the present value of aggregate government expenditure that is not considered as a personal transfer. In a general equilibrium without bequests, sustainable public finances are intergenerationally balanced, too. In terms of life-cycle income, government could allocate equal net tax rates to the present newborn and all subsequent birth cohorts.

Unsustainable fiscal policy, in contrast, accumulates intertemporal liabilities, also referred to as *sustainability gap*. If prospective tax revenue falls short of government's intertemporal spending commitments in present value terms, net taxes must be raised for at least one living or future generation. Unsustainable fiscal policy is intergenerationally imbalanced, because it fiscally discriminates against some cohorts. How the sustainability gap of public sector finances eventually translates into a change of personal tax burdens is unpredictable. As an informative counterfactual, generational accounting increases taxes uniformly so that all future birth cohorts forgo an equal share of their life-cycle income in present value. Though this policy is hardly realistic, the resulting difference in life-cycle net tax rates between current and future newborn individuals indicates the extent to which current fiscal policy may shift resources intertemporally from the living to cohorts not yet born.

The computation of generational accounts and the associated sustainability gap applies a projection of average net tax payments by age to a long-term demographic forecast. Our analysis of German public finances starts from 1996, the most recent year for which all data required were available. To project government revenue and spending, we use a set of cross-sectional age profiles for tax payments and transfer receipts per capita mainly derived from the 1993 German Consumer Expenditure Survey.[3] In general, incidence is assumed to fall directly on the taxpayer or transfer recipient. Following the conventions of

[2] We limit our presentation to the basic principles of generational accounting. The reader unfamiliar with the concept is advised to consult the comprehensive introduction by Raffelhüschen (1999) which also gives the technical details.

[3] Additional profiles were generated from pension expenditure data published by the Social Security administration [VDR (1997)], and education enrolment data from the Ministry of Education [BBF (1998)].

generational accounting, tax and transfer profiles were revaluated to yield the corresponding public budget aggregates of year 1996, taking into account the observed population structure.[4] After the base-year, the initial personal tax and spending levels are subjected to productivity growth which we keep constant at an annual rate of 1.5 percent.[5] To arrive at a more precise estimate of government net tax revenue, we temporarily suspend this rule for some taxes and transfers. In particular, our projections incorporate the final maturing of the public pension insurance. At present, older pensioner cohorts still receive lower average pension transfers than younger retirees. Furthermore we follow Boll et al. (1994) to incorporate in the projection the prospective raise in legal retirement age enacted with the 1992 pension reform.[6]

For the baseline generational accounts, demographic assumptions are modelled after the central variant of the most recent population forecast conducted by the Federal Bureau of Census [cf. Sommer (1994)]. In detail, we account for a moderate decline in mortality rates that ends in year 2005. Then, life-expectancy at birth will have gained about one year, reaching 76.8 years. Total fertility in West Germany is maintained at the 1996 level (1.39) during the entire projection period. East German total fertility (0.88) is linearly increased to the Western value until 2005. Due to fertility rates permanently below replacement level and increasing life-expectancy, Germany experiences severe population aging over the next decades. We predict old-age dependency, defined as the number of persons aged 65 and above per cent of persons aged 20 to 64, to more than double from 23.9 in 1996 to 48.9 in 2040. Immigration which in our projection reaches a constant influx of 200,000 net migrants per year from 2010, is not sufficient to stabilize the dependency burden.

Under the above assumptions, and using a discount rate of five percent to take future payments back to the base-year, we find that public finances in Germany are severely imbalanced intertemporally. The sustainability gap amounts to 89.7 percent of the 1996 GDP. The intertemporal liabilities of the public sector markedly exceed the reported base-year debt of 60.4 percent. To meet the public sector's intertemporal budget constraint, life-cycle net tax rates for future generations need to be raised considerably. While current newborns face a generational account of \$109,400, equalling 32.2 percent

[4]The overall public sector budget which incorporates social insurance and all off-budget authorities was constructed following the conventions set by Raffelhüschen and Walliser (1999). We are gratefully indebted to Daniel Besendorfer and Christoph Borgmann who compiled the 1996 budget.

[5]Note that this standard procedure implies the accumulation of deficits within the pay-as-you-go financed social insurance system.

[6]Apart from pensions, we model the financial development of public long-term care insurance that had not been fully introduced in 1996, the elimination of the personal wealth tax from 1997, as well as the cut and elimination of the solidarity surcharge in 1998 and 2010, respectively. Finally, we control for the recovery of the East German economy, which we assume to catch up with the West by the year 2010.

of expected lifetime income in present value terms, the life-cycle net tax burden of future cohorts amounts to \$206,800.[7]

The intertemporal generational imbalance of German public finances is mainly attributable to the demographic aging process ahead which is going to strain social insurance finances, and the pay-as-you-go public pension system in particular, to the limits. This statement is supported by two counterfactual experiments. The first eliminates population aging, by indefinitely perpetuating the favorable base-year composition of the population.[8] In this scenario, the public sector accumulates intertemporal wealth amounting to 17.8 percent of GDP. Consequently fiscal policy is imbalanced to the advantage of future generations. They face a life-cycle net tax rate of 28.7 percent, 3.5 percentage points less than base-year newborns. To isolate the impact of Social Security on the sustainability gap, the second thought experiment removes public pension insurance from the public sector budget. Without Social Security, intertemporal public sector wealth would amount to 72.9 percent of base-year GDP. Life-cycle tax rates fall for both current and future newborn cohorts. For the average base-year born, the lifetime tax rate is reduced to 26.6 percent, because life-cycle contributions to Social Security currently exceed pensions received in present value terms. The intertemporal wealth accumulated outside Social Security unburdens future generations. They face a life-cycle tax rate of merely 3.4 percent.

The large extent of intertemporal generational imbalance reveals the urgent need to prepare Social Security finances in Germany for the demographic transition. Politics must decide how to distribute the inevitable fiscal burden of population aging between generations. The tax burdens of living and future generations are inversely related through the intertemporal public budget constraint: Any reform of the status quo that raises tax payments of the former reduces the sustainability gap, thereby extending the consumption possibilities of the latter. Reform measures can then be evaluated under two aspects. First, how does the reform affect the sustainability gap, changing the generational distribution *intertemporally*? Secondly, how is the burden caused by the intertemporal effect spread among living individuals of different age, affecting the generational distribution *inter vivos*? We aim at separating these two usually intermingled aspects. Although the central focus in our analysis is on the second question, we will first address the intertemporal aspect.

[7] The reported generational accounts limit transfers to cash benefits. We exclude public spending that does not directly increase personal consumption possibilities, but could add to individuals' utility. Cf. Raffelhüschen (1999) for a review of this issue. In 1996, one German mark was exchanged into \$0.67.

[8] Technically, this experiment endogenizes immigration to avoid inconsistent survival ratios.

3 Pension Reform and Intertemporal Redistribution

The intertemporal imbalance of the public pension system demonstrated above has been a long-known fact in Germany. Nevertheless governments have been timid to take measures stabilizing long-term Social Security finances. Not before 1998 the late Kohl administration introduced a so-called demographic factor into the pension formula, intended to restrain the increase in pension expenditure caused by rising life-expectancy. After the 1998 general election the demographic factor, which would have taken effect from 1999 on, was immediately suspended. The newly appointed Schröder cabinet favors the Riester plan (named after the Minister of Labor and Social Affairs) which includes a quicker reduction of the net replacement rate, achieved through temporary price indexation of pensions. Furthermore the public subsidy to pension insurance is scheduled to rise, using revenue from higher taxation of energy consumption.

Whether these amendments of pension finances will be complemented with a mandatory private savings scheme is yet open to debate. Transition to a partially funded pension system has indeed steadily gained support. The most prominent proposal for a partial funding was brought forward by the Advisory Council to the Ministry of Economic Affairs (AC). It recommends a scheme of time-variant mandatory savings rates that could, despite population aging, maintain current replacement rates for all pensioner cohorts.[9] In the remainder of this paper, we analyze the generational impact of these policies which govern the present debate on Social Security reform in Germany. As the basic ideas behind the reform options – lowering the net pension level, broadening the financial base of the pension system, and turning to a partially funded system – have entered the debate on Social Security reform in other countries, too, the insights gained from our analysis should be relevant beyond the horizon of our specific application.

The Demographic Factor

Our first policy experiment follows the 1998 pension reform enacted by the Kohl administration. This amendment reacted to the prolonged retirement period caused by decreasing mortality. Rather than raising legal retirement age, the reform complemented the formula used to adapt pension benefits annually to net wage movements with a demographic factor. This factor was determined to translate, with a lag of eight years, a relative increase in life-expectancy at age 65 into a half proportional reduction of the standard pension adjustment. According to the trend in longevity, the application of the demographic factor gradually decreases the net replacement rate guaranteed by the public pension insurance,

[9] Cf. BMF (1998). A slightly different institutional setting for partial funding that could even raise replacement rates in the long run was suggested by Besendorfer et al. (1998).

improving the relation of contributive revenue and pension expenditure.

Obviously, the effectiveness of this strategy crucially depends on the future gain in life-expectancy. Our baseline demographic projection is rather cautious in this respect. The assumed decrease in mortality merely adds 0.8 years to the initial life-expectancy of the 65-year-old (16.8 years) until year 2005. Under these conditions the application of the demographic factor beginning in year 2000 implies a net replacement rate of 67.5 percent from 2013 onward, as compared to a base-year rate of approximately 70 percent. The impact of the demographic factor on intertemporal generational redistribution remains small. As is shown in Table 1 which surveys the intertemporal effects of the different reform scenarios discussed in this section, the gradual cut in pension benefits burdens the cohorts alive in the base-year with an additional aggregate net tax payment amounting to eight percent of the 1996 GDP.[10] The reform burden imposed on the living augments the consumption possibilities of future cohorts. In comparison to the status quo, their life-cycle net tax rate falls by 2.3 percentage points. Nevertheless the fiscal imbalance remains substantial, as future generations face a tax rate exceeding that of current newborns by 26.1 percentage points.

Because of the conservative assumption on future mortality, the demographic factor in our baseline experiment reduces the net replacement rate by less than had been officially proclaimed. The vehement public debate that accompanied the reform started out from the supposition of a 64 percent net replacement rate from year 2030 onward. Therefore, we consider an alternative demographic projection. Maintaining the fertility and migration assumptions of the baseline, we steadily reduce mortality rates until year 2022. In that year, life-expectancy of the average 65-year-old reaches 19.7 years which would be consistent with the debated 64 percent replacement rate after year 2030.

In the light of evidence on cohort-specific mortality rates, this high life-expectancy scenario does not seem unlikely [cf. Dinkel et al. (1996)]. The resulting more pronounced aging process aggravates intertemporal generational imbalance. Under status quo fiscal conditions, as net transfers received by living generations grow, the sustainability gap to be financed by future generations rises to 122.4 percent of base-year GDP. The introduction of the demographic factor shifts parts of the fiscal burden from increased life-expectancy to the living. Their loss in pension benefits amounts to 16.4 percent of the 1996 GDP, which extends the consumption possibilities of future generations by 4.8 percent of life-cycle income. However, despite the stronger cut in replacement rates which doubles the reform burden on living generations, the demographic factor fails to shield public finances

[10]Note that the change in the sustainability gap does not equal the aggregate reform burden on living generations. As the net tax rate of the base-year newborn increases, so does the rate of all future newborns which further reduces the sustainability gap.

against the adverse impact of demographic aging. With high life-expectancy, the post-reform net tax rate of future generations remains almost seven percentage points higher than under the baseline demographic prospect.

The Riester Plan

The pension reform scheduled by the newly elected Schröder administration has abandoned the concept of a demographic factor. The current plan to stabilize Social Security finances consists of two separate reform elements. First, taxes on energy consumption – mineral oil, gasoline and electricity – are gradually increased over a period of five years (1999-2003). The yield of the tax increase is earmarked to expand the public subsidy to Social Security. Resulting surpluses in the pay-as-you-go pension budget are employed to reduce payroll contributions to the pension scheme. This so-called green tax reform could ensure a better pooling of demographic risk if it actually broadened the revenue base of the public pension insurance.[11]

Designing the impact of the green tax reform on the generational accounts, we use official estimates on aggregate revenue from the additional energy taxes. To be specific, we assume an initial revenue gain of $7.6bn in year 1999 and additional revenue increases by $4.3bn and $3.6bn in 2000 and in each year between 2001 and 2003, respectively. The forecasted green tax revenue is immediately transferred to the pension insurance budget, reducing payroll contributions. After 2003, the link between green taxes and the pension insurance subsidy is maintained. This proceeding lets the green-tax financed pension subsidy gradually decline in the long run, as the energy tax base shrinks in the course of the demographic transition.

Since the electricity tax is newly introduced, with the German electricity market being in a process of liberalization, our incidence assumption is necessarily rather tentative. To keep in line with our usual practice, we distribute the electricity tax revenue among age cohorts according to their share in household power consumption.[12] The isolated effect of the green tax reform on intertemporal fiscal balance, again reported in Table 1, remains small. The reform burden for living generations adds up to only 3.4 percent of base-year GDP. Consequently, the concept achieves little to expand the consumption possibilities of future generations. Their life-cycle net tax rate amounts to 58.6 percent, exceeding

[11] A necessary condition for this being possible is that the incentive effects unfolded by the increment in energy taxes are sufficiently small. In what follows, we suppose that the yield of the green taxes stays positive in the long run.

[12] It might be preferable to assume that part of the electricity tax is borne by firm holders. This has little impact on intertemporal generational imbalance, however, because the aggregate green tax revenue from living and future cohorts remains unchanged. As the redistributive impact of the green tax reform among living generations, on the other hand, is obviously affected by the incidence assumption, we will return to this issue in section 4.2.

the rate of a base-year newborn by 25.7 percentage points. This is only three percentage points less than before the reform.

The second element of the scheduled pension reform is to suspend net wage indexation in years 2000 and 2001, adjusting pension benefits only for consumer price inflation (CPI). Due to the impact of the green tax reform on Social Security contributions and several income tax amendments directed at the support of families, net wage growth is predicted to exceed price inflation considerably during this period. Therefore the policy achieves a fast reduction of the net replacement rate. Assuming wages to grow with labor productivity and taking into account the green-tax financed cut in pension contributions, we estimate the pension level to fall to 67.7 percent from year 2001 on.[13]

The intertemporal fiscal effect of this measure closely resembles that of the abolished demographic factor under baseline demographic conditions which would lead, though more gradually, to a very similar replacement rate (67.5 percent). Future cohorts are burdened with a tax rate 25.6 percentage points higher than that of the base-year newborn, as compared to 28.7 percentage points before reform, and 26.1 percentage points if the demographic factor had been maintained. It is mainly the green tax element which gains the scheduled reform bundle a stronger improvement of intertemporal fiscal balance. Combining the two elements of the Riester plan, the tax rate difference between current and future newborns falls to 22.7 percentage points, as living generations are burdened with an additional net tax payment amounting to 12.3 percent of the 1996 GDP.

Partial Funding

The generational accounts reveal that both the introduction of the demographic factor and the pension reform of the Schröder administration that replaces it do not eliminate the intertemporal fiscal imbalance caused by population aging. As a more effective means to protect Social Security finances against the demographic transition, partially funded pension schemes have become a standard recommendation, because of the potential efficiency gains. The transition to a partially funded pension system burdens some generations who will have to cover expiring pay-as-you-go pension claims while accumulating a capital stock for their own retirement. Alternative models for partial funding mainly differ in the way they distribute this adjustment burden during transition.

The AC proposal is characterized by an immediate and permanent rise in the payroll contribution rate to Social Security, in combination with a defined total benefit plan. For each pensioner cohort, the pay-as-you-go system guarantees the portion of the defined benefit not supplied by annuitized personal savings. In each year, contributions not

[13] Official projections predict a replacement rate between 66 and 67 percent. The pension cut appears less marked in our calculations, as we do not model the effects of the income tax reform.

required to finance the pay-as-you-go fraction of pensions are transferred to a privately organized funded pension scheme. Since the total contribution rate to Social Security is fixed, the private savings rate varies annually. Consequently the share of pay-as-you-go benefits in retirement pensions varies among cohorts, too.

When the AC proposal was published, the demographic factor reform had just been enacted. The original recommendation was therefore based on a total replacement rate gradually declining to 64 percent until year 2030. Since this is not a realistic policy option any more, our main partial funding scenario is instead based on the currently debated Riester reform. With CPI indexation, and assuming that the green tax is employed to increase the subsidy to the remaining pay-as-you-go part of the pension scheme, we find that a constant payroll contribution of 23 percent (as compared with 20.3 percent today) is enough to guarantee the envisaged 67.7 percent total replacement rate for all pensioner cohorts. For comparison, we also report an alternative scenario implementing the partial funding strategy into the base-year status quo setting, maintaining the 70 percent replacement level. In this case the necessary overall contribution to the pension scheme must be fixed at 25.8 percent of the payroll. The marked difference in total contribution rates between the two scenarios is not only attributable to replacement rates, but also to the increased public pension subsidy under the Riester plan which accelerates private capital accumulation.

Since the AC concept recommends a private organization of personal savings, the resulting generational accounts neither incorporate the forced savings nor the corresponding funded pensions. In terms of generational accounting partial funding merely shows as a gradual cutback of the pay-as-you-go system, although a quite sophisticated one. Though not fully eliminating the sustainability gap, the funding strategy moves public finances significantly closer to intertemporal generational balance, as can be seen in Table 1. In comparison with the reforms analyzed before, the extent to which future generations' consumption possibilities are expanded is much larger. Supposed that the Riester plan is combined with partial funding, the reform burden on living generations amounts to 42.6 percent of base-year GDP. Because of reduced pay-as-you-go benefits and increased contributions to public pension insurance, the net tax difference between base-year and future newborns falls from 28.7 to 12 percentage points. Correspondingly, compared with the status quo, life-cycle consumption possibilities of future generations are enhanced by 13.6 percent of their lifetime income. If the partial funding strategy was implemented into a base-year status quo setting instead, the aggregate reform burden on living generations (36.3 percent of base-year GDP) remains somewhat smaller. Note that the isolated reform burdens from the Riester Plan and from partial funding do not add up, as the two

elements are not independent. The green tax element accelerates capital accumulation in the funding scheme, allowing the pay-as-you-go share of pensions to decline faster. Contribution rates to finance these pensions are lower, which more than compensates living generations for this reduction in benefits.

4 Redistribution Between Living Generations

4.1 Measuring Generational Redistribution Inter Vivos

Generational accounting is not limited to the assessment of intertemporal fiscal imbalance. The method is increasingly used to judge the impact of policy reforms on living generations as well. Given the forward-looking perspective of generational accounting, all net payments captured in generational accounts are present or future ones. So are the effects of non-anticipated policy measures, which renders reform effects comparable across cohorts. Provided that income effects dominate, the absolute changes in generational accounts hint at the corresponding change in personal welfare.[14] Still, they provide only an incomplete measure of the actual burdens imposed on the living, and their distribution by age. For a more purposeful evaluation of the redistributive effect of policy reform among the living, three additional aspects seem relevant.

First, to assess the actual impact of policy amendments on individual welfare, it is essential to view any change in rest-of-life net taxes in proportion to the respective cohort's status quo consumption possibilities. Absolute reform burdens by themselves reveal little about changes in individual well-being. For a given absolute increment in generational accounts, the welfare loss of a cohort will be the higher the lower their remaining lifetime income. Therefore, to provide comparability between generations, forgone consumption possibilities per capita need to be related to age-specific rest-of-life net income.

Secondly, the absolute sizes of the cohorts affected by a specific policy should be taken into account. Per capita measures ignore this aspect which is obviously relevant to assess the political feasibility of fiscal reforms if, for example, government cares about the median voter's reform burden. Thirdly, actual reform proposals differ not only in their extent of intergenerational redistribution *inter vivos* but at the same time in their effect on future generations. Comparisons between alternative reforms focusing on the former therefore have to control for the extent of aggregate redistribution between living and future generations. A policy imposing a comparatively high aggregate reform burden on

[14]The actual dominance of the income effect of net tax changes on individual welfare has been shown by Fehr and Kotlikoff (1997) for a variety of policy measures within a general equilibrium framework.

the living ceteris paribus implies high relative changes in generational accounts as well, which might distract from the reform's purely redistributive effect among the living.

The concept to measure intergenerational redistribution *inter vivos* employed in this paper is intended to take into account these different aspects. Starting as usual from the absolute changes in generational accounts induced by a reform policy, we first calculate the corresponding age-specific percentage change in the present value of rest-of-life net income. To obtain pre-reform lifetime income by age, the generational accounts under status quo conditions are subtracted from the present value of cohorts' gross rest-of-life income. Gross income consists of expected revenue from labor and capital which can be estimated, in analogy to the generational accounts, from consumer data.

The relative changes in rest-of-life income measure the actual reform impact felt by different living cohorts. Since we investigate reforms to the advantage of future generations, current generations in general suffer a loss in consumption possibilities, and hence in individual welfare. The observed set of age-specific relative reform burdens lacks a yardstick, however, by which to judge the extent of generational redistribution among the living tolerated by a policy to relieve future generations. To provide the missing benchmark, we introduce a hypothetical age-neutral reform that imposes the same aggregate reform burden on the living as the original reform, thus leaving the fiscal position of future generations unchanged. Asking for an equal relative burden, we define a reform as age-neutral if it affects rest-of-life net income of all living cohorts in the same proportion.[15]

By adopting this reference, we implicitly assume that the policy measure under investigation is intended only to improve intertemporal fiscal sustainability, and not a deliberate means to alter the current after-tax income distribution among age-groups. The redistributive impact of a reform among the living can then be assessed by comparing, for each cohort, the induced relative net tax burden with the corresponding age-neutral relative burden. The standard deviation of cohorts' relative reform burdens from the equal relative burden of the age-neutral reform (which is their arithmetic mean), denoted by σ, summarizes the extent of a reform's generational redistribution *inter vivos*:

$$\sigma \equiv \sqrt{\sum_{i=0}^{D} n_i (RB_i - \overline{RB})^2} \ ,$$

where n_i stands for the share of the i-year-old in the population, D for the maximum age (100 years in our calculations), RB_i for the actual relative burden imposed on the cohort of age i, and $\overline{RB}$ for the uniform relative burden imposed by the neutral reform.

[15] With constant marginal income utility, this corresponds to the well-known equity concept of equal relative sacrifice.

In order to compare different reforms, when focusing on redistribution among living cohorts one has to eliminate variations in aggregate redistribution between living and future generations that distinguish the policy options. The above defined standard deviation is not invariant with respect to intertemporal generational redistribution, as it tends to increase with the aggregate reform burden levied on the living. This can easily be avoided by rescaling alternative reforms such as to yield a uniform aggregate reform burden on living generations. The standardization ensures that the impact of different reforms on the consumption possibilities of future generations is identical, which effectively separates the intertemporal and *inter vivos* aspects of generational redistribution. The size of the reform burden chosen for standardization is of course arbitrary. To achieve a straightforward interpretation of the corresponding standard deviation, we take an amount of one percent of living generations' consumption possibilities for a reference. Our indicator for comparing reforms, the standard deviation of standardized relative burdens, thus measures the extent of redistribution *inter vivos* tolerated by a reform, given that the aggregate burden on the living amounts to one percent of their remaining lifetime net income.

An additional application of our age-neutral benchmark is to calculate political rejection quotas for the reform measures under investigation. Naturally, if current voters based their decisions on gains or losses in consumption possibilities alone, most reforms aimed at relieving future generations would never stand a chance. However, the members of the present median voter generation are likely to have a certain interest in Social Security reforms even without necessarily being altruistic. Not having accumulated personalized wealth as in a funded system, they could well be ready to forgo part of their remaining lifetime net income to unburden future generations, if that helped to ensure the stability of the pension scheme to their own benefit.

The assumption that citizens are generally prepared to accept reforms that fiscally relieve future generations, but oppose a specific policy if it burdens them more than required by the corresponding age-neutral reform, allows to condense the *inter vivos* redistribution effect into the fraction of negative votes in the population of voting age, or, alternatively, in the total population. This concept, despite neglecting the extent of deviations from the equal relative burden, seems useful to highlight the relative size of cohorts that are more than proportionally burdened by a reform proposal. The rejection quota approach is invariant to changes in aggregate reform burdens as long as the age structure of burdens imposed on the living is unaffected. If the extent to which living generations are burdened varies, so does the age-neutral reform's uniform relative burden which serves as the benchmark for the voting decision.

4.2 The Redistributive Impact of Pension Reform in Germany

The empirical application of the measurement concept developed in the previous section requires to estimate the gross remaining lifetime incomes of all living cohorts. Deriving the age distribution of personal wealth before government intervention, we keep to the generational accounting standard practice of relating cross-sectional micro data to a corresponding base-year macroeconomic aggregate. The available age-related data, taken from the German Consumer and Expenditure Survey, allow us to distinguish between three sources of income: gross wage income, household net capital wealth, and ownership of enterprises (or stocks).[16] Per capita gross labor income is subjected to annual productivity growth and age-specific mortality rates in order to determine the present value of rest-of-life wage revenue by cohort. Capital assets, in contrast, enter into the cohorts' remaining lifetime consumption possibilities with their base-year market value, reflecting the present value perspective of the generational accounting framework, and the implicit assumption of perfect capital markets.

Figure 1a presents our estimates on gross consumption possibilities by age. In present value terms, the life-cycle gross labor income of base-year newborns (who do not own any capital assets as we abstract from bequests) amounts to \$342,000. Up to age 30, rest-of-life consumption possibilities gradually increase, as the period of active labor-force participation is less heavily discounted, and accumulated assets become available for consumption. For older cohorts in the labor force, the decline in remaining wage income is not compensated by increased capital holdings which reach a maximum at age 50, averaging \$200,000. In retirement, when wage income falls to zero, assets available to current generations show a pattern consistent with moderate decumulation. Nonetheless, the oldest-old still dispose of assets worth \$110,000.[17]

The current tax and transfer system, projected into the future for all living generations, markedly changes the original cohort distribution of remaining lifetime consumption possibilities. Subtracting the baseline generational accounts from generations' gross wealth lets the distribution of rest-of-life consumption possibilities by age become more even, as can be seen in Figure 1b. Cohorts younger than 55 bear a positive net tax burden, which indicates a loss in personal welfare. The tax and transfer system leaves the highest consumption possibilities to cohorts aged 30 to 50 whose rest-of-life net income is almost constant around \$500,000. Older cohorts, in contrast, are net transfer recipients, which

[16] To upscale gross wage income, we rely on the aggregate non-entrepreneurial income measured by the national accounts statistics. Household and enterprise assets are revaluated to their 1996 market value according to estimates taken from Deutsche Bundesbank (1999) and DIW (1996), respectively.

[17] This last figure should be taken with a grain of salt. The data for the oldest age cohorts are subject to high variance, and involve extrapolation.

expands consumption possibilities beyond personal assets. In the maximum at age 65, the present value of expected public transfers net of taxes ($186,000) almost equals individuals' personal wealth ($198,000).

As noted before, we do not question the generational distribution resulting from status quo fiscal policy. Therefore the derived cohort profile of *net* rest-of-life consumption possibilities displayed in Figure 1b sets the reference for the age-neutral policy suggested above. We can now apply our measurement concept to the scenarios of German pension reform presented in section 3. After discussing the age-specific relative burdens imposed on the living by the different policy measures, we will compare the main reform variants with respect to their overall redistributive effect *inter vivos*, making use of the standardized standard deviation measure.

Figure 2 displays, for all living cohorts, the actual and equal relative burdens associated with the main scenarios of the different reforms. All burdens are expressed as a percentage of remaining lifetime net income before reform. Note that the reported reforms have not been standardized, so that they still reflect the original aggregate burdens on the living.

The Demographic Factor

Figure 2a shows that the reduction of pension replacement rates by a demographic factor burdens all living generations, who expect lower rest-of-life transfers.[18] The reform burden on current retirees, however, remains comparatively moderate, since the pension cut is introduced gradually. Under baseline demographics implying a replacement rate of 67.5 percent from year 2012 on, the highest burden is imposed on generations that will just have retired when the demographic factor takes sizable effect. Individuals in their mid-fifties lose almost 0.9 percent of their rest-of-life consumption possibilities. Like all cohorts aged 39 to 70 in the base-year, they are burdened more heavily than the age-neutral benchmark reform would require. An age-neutral reform with a uniform relative burden amounting to 0.54 percent of rest-of-life income could raise the same additional net payments by living cohorts (8 percent of the 1996 GDP, cf. Table 1) as the demographic factor reform. If individuals more than necessarily burdened vote against the reform, the demographic factor meets strong opposition. As reported in Table 2, it is rejected by 49 percent of base-year voters. The rejection quota is smaller if the entire population is asked to decide. For the youngest cohorts, the demographic factor turns out rather favorable, as they apply a higher discount to the cut in their expected pensions. Their approval lets the rejection quota fall to 39 percent.

[18] To be exact, individuals aged 97 and above in the base-year are not burdened at all. They are dead when the reform comes into effect in year 2000. This observation holds for most analyzed policies.

In the alternative scenario with higher gains in life-expectancy decreasing the replacement rate to 64 percent until year 2030, the relative burdens are markedly higher. Reflecting the doubled aggregate reform burden on living generations (16.4 percent of the 1996 GDP), the age-neutral reference levies a 1.07 percent tax on generations' pre-reform net income. The age pattern of actual relative burdens broadly resembles that under baseline demographic conditions. Again, particularly high relative burdens fall on individuals in their mid-fifties, the maximum net income loss for the 54-year-old reaching 1.38 percent.[19] However, since the replacement rate reduction via the demographic factor evolves over a longer period, the reform exhibits a stronger relative impact on younger cohorts in the labor force. Generations aged 31 to 64 face a higher burden than required by the age-neutral reform. Accordingly the rejection rates among voters and the entire population increase to 57 and 46 percent, respectively.

The Riester Plan

The age-specific burdens induced by the Riester plan, reported in Figure 2b, form a rather peculiar pattern: Cohorts younger than 12 or between 45 and 78 bear a burden considerably exceeding the neutral reform's 0.83 percent of remaining lifetime consumption possibilities. The highest relative burden, imposed on the cohort aged 57, makes up 1.76 percent. Separating the two components of the reform helps to understand this pattern. The temporary CPI adjustment of pension benefits (Figure 2c), leading to a replacement rate very close to that implied by the demographic factor, has also quite similar effects on living generations. In comparison with the demographic factor, however, the CPI component of the Riester plan comes into full effect earlier. This implies a shift of burdens to older and therefore smaller cohorts. Cohorts aged 44 to 78 are burdened more than required by the age-neutral reform. Correspondingly the share among voters of cohorts rejecting CPI adjustment (47 percent) is somewhat lower.

The green tax element of the pension reform scheduled by the Schröder administration, financing a reduction in payroll contributions to Social Security by indirect taxes, results in a distinctly different age pattern. In Figure 2d, two peculiarities are observable. First, the age profile of relative reform burdens has two local maxima. Quite expectedly, cohorts aged 55 to 65, who do not significantly benefit from the cut in payroll contributions but whose energy consumption is still important, bear a comparatively high burden. Still, the youngest cohorts face an even higher relative burden, approaching almost one percent of life-cycle income for the base-year newborns. As mentioned above, aggregate green tax revenue declines over time when the favorable age-composition of the base-year

[19] This scenario exemplifies how absolute changes in generational accounts may misrepresent the actual reform burden. In absolute terms, the income loss is highest for the 45-year-old.

population, implying a particularly broad tax base for green taxes in the introduction period, worsens. Therefore younger cohorts, from a life-cycle perspective, profit less from the increase in public subsidies to pension insurance than older base-year generations, while bearing the full burden of energy taxation.

Secondly, in contrast to the scenarios analyzed so far, the isolated green tax strategy does not impose burdens on all living generations. The reform actually extends the consumption possibilities of most cohorts aged 20 to 40. For these age-groups, the gain from the reduction of payroll contributions to Social Security more than compensates the burden of the green tax increase. This provides an explanation why the intertemporal generational impact of the green tax remains small. The sizeable energy tax revenue collected from the living is not fully transferred to future generations. In the light of this observation (and considering only fiscal effects), the green tax reform appears mainly as a means to redistribute consumption possibilities between living generations, rather than to stabilize pension finance in the long term.

Because of the uncertainty regarding the incidence of the newly introduced tax on electrical power consumption, we have analyzed an alternative scenario with incidence partly falling on enterprises and stock holders. The assumption that the aggregate present value of the electricity tax formally paid by enterprises (about 52 percent of the tax yield) reduces profits and thereby the market value of stocks and enterprises has considerable impact on the cohort pattern of relative burdens. Since share holdings and enterprise ownership are concentrated among older cohorts, all generations aged over 47 now face a higher burden than required by the age-neutral reference reform. Correspondingly, younger cohorts are better off than under our standard incidence assumption.

If firms manage to shift their portion of the energy tax to consumers, the green tax reform is rather well supported by current voter generations: 62 percent of voters would approve of it as a policy to unburden future generations, because it burdens them less than an age-neutral reform. This is only true, however, as long as voters do not take into consideration the relative burden of their children. Moreover, since the pension reform scheduled by the Schröder administration comes as a bundle of two components, voters could not decide independently on the green tax strategy. As displayed in Figure 2b, the total reform is dominated by the CPI adjustment element, whose intertemporal fiscal impact is almost three times as high as that of the green tax reform. Still, the high burdens imposed on the youngest cohorts by the green tax reform carry over to the reform bundle. Both components concentrate burdens on cohorts aged 45 to 75. As these add up, the Riester plan is accepted by a narrower margin. 43 percent of voters, or 47 percent of the total population would reject it.

Partial Funding

Since the intertemporal effect of the partial funding strategy proposed by the AC is much stronger than the effect of the Riester plan, the peculiar pattern of relative burdens induced by the latter is almost invisible in Figure 2e.[20] The main burden of a partial funding policy added to the Riester plan rests on young cohorts. Funded pensions not considered, the generations aged 10 to 15 lose about 5 percent of their pre-reform lifetime consumption possibilities, with the age-neutral reform requiring an equal relative burden of 2.85 percent. While privately saving for the funded share of their own pensions, they are forced to guarantee pay-as-you-go pensions for older base-year cohorts in the labor force who do not have the chance to accumulate personalized pension wealth. For older cohorts, reform burdens, mainly caused by reduced pay-as-you-go pensions, steadily decrease but remain positive. Accordingly all base-year generations older than 37 fare better than under the age-neutral benchmark reform. This age pattern of relative burdens gives a partially funded pension system whose pay-as-you-go element is reformed according to the Riester plan the highest rate of approval among the analyzed reforms. Supposed that voters are prepared to bear a considerable aggregate reform burden to move public finances closer to a state of intertemporal generational balance, only 35 percent of voters reject this policy.

At 48 percent, the rejection quota is markedly higher if cohorts under voting age are taken into account. However, they are still better off than if the partial funding strategy would be implemented into the base-year status quo. The age-specific impact of this scenario is displayed in Figure 2f. It turns out that in a partial funding scenario, the Riester plan is actually beneficial for young cohorts, whereas the combination of green-tax financed contribution cuts and CPI indexation of pensions alone imposes high burdens on the youngest (cf. Figure 2b). As capital accumulation accelerates due to the increased public subsidy to the pension budget, they experience lower average life-cycle contribution rates to the reduced pay-as-you-go pension system. Cohorts at the beginning of their working career profit directly from the green tax subsidy. Retiree cohorts, on the other hand, would not be affected at all in the partial funding scenario without the Riester reform.

The Reforms in Comparison

As the reform scenarios discussed above differ in their intertemporal redistributive effects, comparisons with respect to the extent of overall redistribution *inter vivos* must control for this. Table 2 reports the standard deviation measures for the policy measures after

[20]Note that the scaling is different in Figures 2e and 2f. The high aggregate reform burden sets the funding scenarios apart from the previous policies.

standardization. The demographic factor reform which finds the least acceptance among voters according to rejection quotas has the most balanced effect among living generations. Actual relative burdens, on average, deviate from the age-neutral one percent relative burden by 0.36 percentage points under baseline demographics. Given a continued increase in life-expectancy, the demographic factor would interfere even less with the original distribution of rest-of-life income.

A similar cut of pension benefits by temporary CPI indexation as included in the Riester plan implies a standard deviation of 0.49 percentage points, as the reduction in the replacement rate is achieved in only two years. Although the main burden rests on somewhat older and therefore smaller cohorts, the extent to which middle-aged and older generations are burdened is larger, which accounts for the rise in distributive variance. The age-specific redistribution induced by the green tax element is by far more marked. Supposed that one percent of living generations' consumption possibilities are to be transferred to future generations through the green tax reform, actual burdens on the living deviate from the age-neutral burden by 1.28 percentage points on average. With incidence partly on shareholders and owners of enterprises, the extent of redistribution *inter vivos* is even higher, indicated by a standard deviation of 1.43 percent of rest-of-life income.

Since after standardization the generational effect of the total Riester reform represents a weighted average of its two components (the weights given by the respective aggregate reform burden on living generations), it is not surprising that our indicator for age-specific redistribution is dominated by the CPI component too. Despite the considerable *inter vivos* redistribution induced by the green tax reform, the standard deviation of the total reform does not exceed 0.58 percentage points. Yet, compared with the demographic factor, the Riester plan redistributes more strongly between living generations.

Supplementing the reform with a partial funding strategy partly offsets the extent of generational redistribution among living generations associated with the Riester plan. The standard deviation of relative burdens falls to 0.47 percentage points, which is 0.11 percentage points less than before. However, partial funding by itself interferes considerably with the original cohort distribution of consumption possibilities. Implementing the partial funding strategy into the base-year status quo setting results in an almost doubled standard deviation of relative reform burdens, amounting to 0.85 percentage points. Combining partial funding with the Riester plan achieves a considerable improvement for future generations while tolerating only a moderate degree of redistribution *inter vivos*. The burden on younger generations from partially funding Social Security is moderated by the green-tax subsidy. Besides, it meets a counterpart in the burden on older generations induced by the combination of green tax payments and CPI indexation of pension

benefits. From the perspective of intergenerational equity, the current reform therefore opens a favorable opportunity for the transition to a partially funded pension system.

5 Conclusions

In Germany, as in most OECD countries, politicians have good reasons to fear for the long-term viability of public finances. Demographic aging calls the sustainability of the pay-as-you-go Social Security scheme fundamentally into question, imposing overwhelming tax burdens on future generations (and, most likely, on the current young). In debating pension reform, it would nonetheless be inappropriate to judge the measures at hand by their impact on intertemporal generational imbalance alone. Politicians searching support for reforms that, in order to unburden future generations, must impose higher net payments on the living, need to be concerned about the associated redistributive impact among current generations. Citizens possibly refuse policies which they perceive as generationally unfair because they interfere with the cohort distribution of rest-of-life net consumption possibilities.

The tools developed in this paper measure the redistributive effect of policy reforms on living generations. Separating intertemporal generational redistribution from redistribution among living cohorts, they allow meaningful comparisons between different policy measures to improve fiscal sustainability. The application of our measurement concept to a range of reform options currently debated in Germany reveals that these do not only vary in their impact on intertemporal generational balance, but also significantly in terms of redistribution *inter vivos*. Reforms that gradually cut replacement rates place high reform burdens on older working cohorts. When pre-reform consumption possibilities are taken into account, they appear generationally rather well-balanced nonetheless. The redistributive impact on the living increases, however, the faster the pension cut is set into effect. Policies to subsidize payroll contributions by revenue from indirect (energy) taxation, however, seem markedly more imbalanced. They redistribute resources from current young and old generations to those at the beginning of their working life. Furthermore, because the reform effect *inter vivos* dominates, the concept contributes little to improve the intertemporal generational imbalance. In contrast, partial funding strategies to guarantee defined pension benefit plans are a powerful tool to unburden future generations. Since, according to our findings, they might be considered as generationally imbalanced by younger living generations, it seems advisable to combine partial funding policies with additional measures to counterbalance their adverse redistributive effect *inter vivos*. A quick reduction of defined benefits, or moderate subsidies to working generations to re-

duce the transition burden, may increase the political feasibility of this intertemporally desirable concept.

This paper has attempted an overdue step beyond the measurement of living cohorts' absolute reform burdens that dominates the empirical generational accounting literature. Still, our approach to intergenerational redistribution among the living could turn out rather inadequate. There seems to be ample scope for future research. First, the question of data availability notwithstanding, the underlying estimate on the distribution of rest-of-life gross consumption possibilities by age (and preferably by cohort) clearly needs to be improved. Secondly, it might be misleading to adopt rest-of-life income as a measure of personal welfare as long as bequests are left out of consideration. Our rest-of-life income estimate does not capture bequests or *inter vivos* transfers to be received in the future. More importantly, we implicitly assume that the oldest cohorts, who obviously leave significant portions of their wealth to heirs, derive the same utility from the bequest as from own consumption. A generation model incorporating the possibility of accidental bequests might therefore indicate a rather different age-distribution of personal welfare. Finally, the measurement of redistribution between living generations would ideally take into account intragenerational effects. If disaggregated generational accounts are available, the extension of our standard deviation indicator to incorporate variance within age groups should not be too difficult, however.

Table 1: Pension Reform and Intertemporal Generational Balance

Scenario	Sustainability Gap (% of GDP)	Reform Burden[a] (% of GDP)	Net Tax Rate[b] Base-year Newborn	Future Newborn	Difference
		Base-year Status Quo			
Baseline Population	89.7	—	32.2	60.9	28.7
High Life-Expectancy	122.4	—	31.5	70.3	38.8
		Demographic Factor			
Baseline Population	81.0	8.0	32.5	58.6	26.1
High Life-Expectancy	104.0	16.4	32.1	65.5	33.4
		Riester Plan			
Total Reform	72.0	12.3	33.1	55.8	22.7
– CPI Adjustment	80.2	8.9	32.4	58.0	25.6
– Green Tax Reform	81.5	3.4	32.9	58.6	25.7
		Partial Funding			
Riester Plan	37.5	42.6	35.6	47.3	12.0
Base-year Status Quo	43.8	36.3	35.4	49.4	14.0

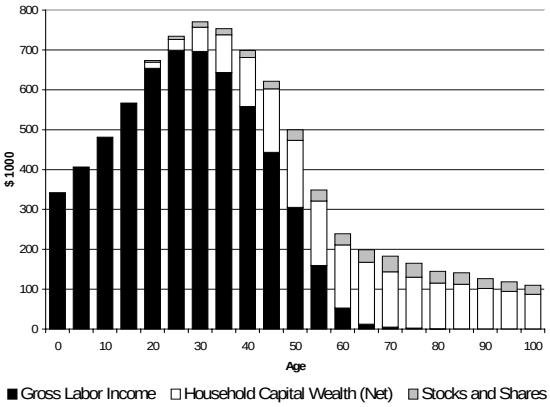
[a]Aggregate payment made by living cohorts.
[b]Generational Account as a fraction of present value life-cycle income.

Table 2: Pension Reform and Generational Balance *Inter Vivos*

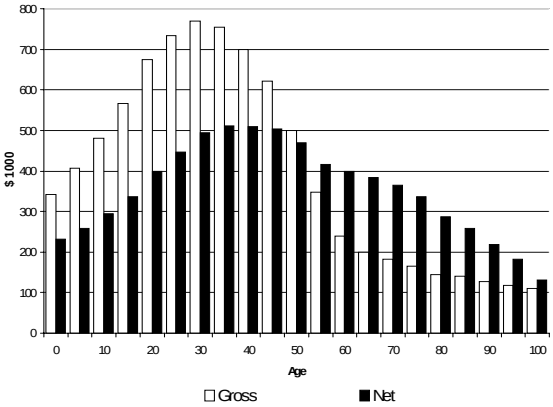
Scenario	Equal Relative Burden[a]	Rejection Quota Voters	Population	Standard Deviation
		Demographic Factor		
Baseline Population	0.54	49.0	39.4	0.36
High Life-Expectancy	1.07	57.2	46.0	0.26
		Riester Plan		
Total Reform	0.83	42.9	47.4	0.58
– CPI Adjustment	0.60	46.7	37.6	0.49
– Green Tax Reform	0.22	38.0	49.0	1.28
		Partial Funding		
Riester Plan	2.85	35.1	47.8	0.47
Base-year Status Quo	2.44	42.6	53.8	0.85

[a]Percent of pre-reform rest-of-life consumption possibilities.

Figure 1: Rest-of-Life Consumption Possibilities



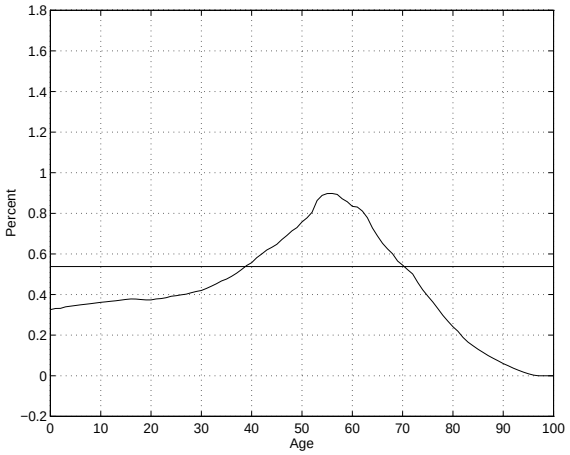
(a) Composition of Gross Rest-of-Life Wealth



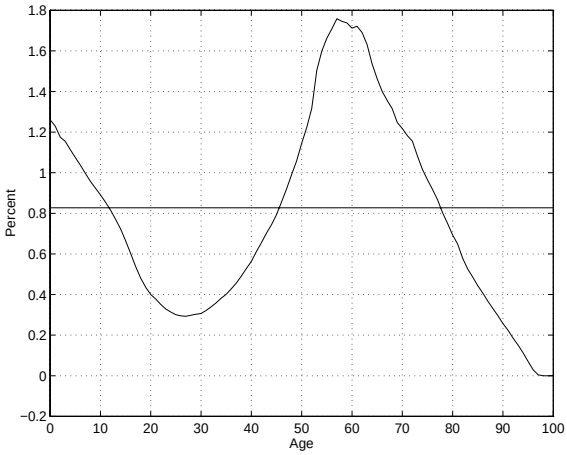
(b) Gross and Net Consumption Possibilities

Figure 2: Actual and Equal Relative Burdens of Pension Reform Proposals

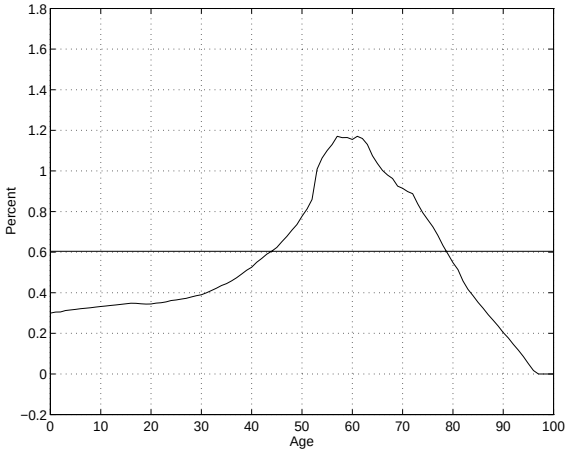
Percentage of Rest-of-Life Consumption Possibilities



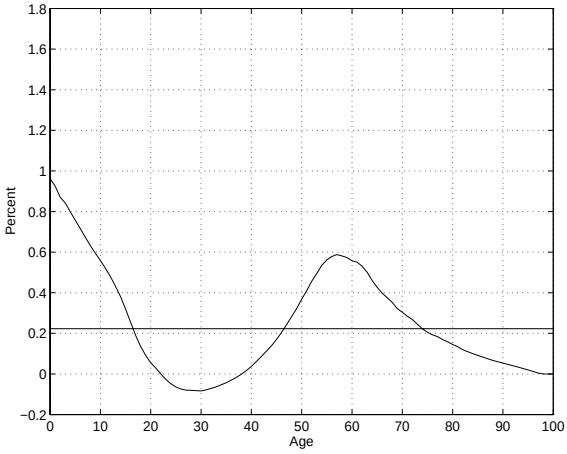
(a) Demographic Factor



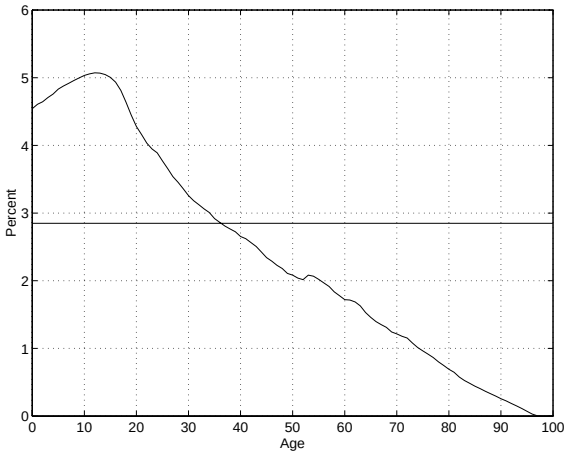
(b) Riester Plan



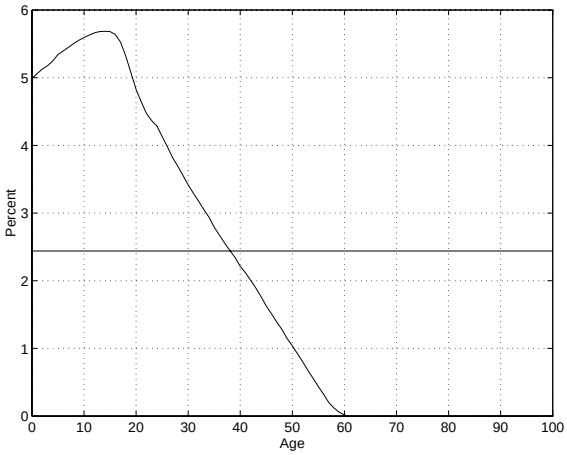
(c) CPI Indexation



(d) Green Tax Reform



(e) Partial Funding – Riester Plan



(f) Partial Funding – Status Quo

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