Reforming Long Term Care in Germany - A Simulation Study

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Summary

The present study quantifies the revenue and distributional effects of various reform options for the German long term care system. Starting from a baseline path of the economy which represents the existing public and private mixture of the German long term care system, we either switch to a pay-as-you-go financed citizen premium or alternative funded systems of long term care.
Our simulations indicate three central policy implications of the discussed reform models. First, the citizen premium model has negligible labor market effects while privatization improves employment significantly in the long run. Second, while the citizen premium model mainly redistributes within generations, all privatization models mainly redistribute across generations. Third, a delayed privatization as proposed by the Herzog commission might be preferred to an immediate privatization strategy since the former smoothes the short-run redistributive effects while keeping the long run gains of future generations.

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1. Introduction

This year, the German social long-term care (LTC) insurance (Soziale Pflegeversicherung) celebrates its 10th anniversary. Introduced after a heated debate on 1. January 1995, the system now provides nursing payments, outpatient benefits and inpatient non-cash benefits which in most cases had to be financed by social assistance before. While the system has improved the situation of infirm persons in Germany substantially, its future prospects are alarming. Since its introduction the number of nursing cases rose steadily and will further increase due to the demographic development in the coming decades. In addition, per capita outlays rise stronger than GDP growth which further compounds the financial problems. Consequently, various studies project a dramatic rise in contribution rates if the system is not fundamentally reformed.

Compared to these prospects, the recently introduced government adjustments seem to be fairly short-sighted. The latest reform of the LTC benefit scheme which was introduced in 2002 only aimed to improve the quality of the benefits for in-home care providers and dementia patients. In 2005 the government increased the contribution rate for insured persons without children, since the high court criticized the unequal treatment of families with children and individuals in the scheme. Finally, pensioners of the public pension system have to bear the full contributions in the future, while formerly half of their LTC contribution was financed by the pension system. Of course, this latest reform does not increase the revenues of the LTC scheme, it only shifts the LTC burden from the pension insurance to the individual pensioners. Since it is quite clear to everybody that these measures will not suffice to dampen the expected rise in contribution rates, various more ambitious reform proposals for the LTC insurance have been launched in the recent past.

The different proposals can be distinguished by the implied LTC financing (pay-as-you-go or funded), the individual contribution calculation (flat-rate premiums or wage-related contributions) and the compulsory membership structure (specific social groups or universal). A first reform model has been put forward by the council of economic experts (SVR, 2004). The so-called "citizen premium" (Bürgerpauschale) combines a pay-as-you-go financed flat-rate premium with a universal membership. Consequently, the currently funded private long term care system would be phased-out in the future. At least three other proposals intend to introduce a funded LTC system in the medium run. The so-called "Herzog commission" which was headed by the former German president Roman Herzog proposes to built up a capital stock first and then finance the smooth transition to a private system from these funds, see Herzog Kommission (2003). The "Freiburg model" (Fetzer et al., 2003) includes a transition to the private system where all cohorts older than 60 would remain in the public system. In contrast, the so-called Kronberger Kreis (Donges et al., 2005) argues in favor of a complete immediate privatization with risk-related premiums. Finally, some recent proposals plan to introduce a "citizen insurance" (Bürgerversicherung) where the statutory LTC scheme would be extended to individuals who are currently privately insured.

The present paper aims to compare the revenue and distributional consequences of the above premium and privatization proposals within a general equilibrium framework. We first describe the current situation of the LTC scheme and review the existing quantitative studies. Then we introduce our simulation model and discuss its baseline calibration. Finally, we explain the modelling of the reform proposals and present the simulation results.

2. The past, present and future of the German social LTC insurance

With an expenditure of 17.6 billion € in 2003 the social LTC insurance spends currently about 2.5 percent of the social budget, see SVR (2004, 722). Membership and financing are similar as in the other branches of the German social security system. The LTC scheme is mandatory for employees up to a certain insurance ceiling, contributions are wage-related and financed on a pay-as-you-go basis. Currently, about 88 per cent of the population are either mandatory or voluntarily members of the social LTC insurance. The remaining portion has either opted to enroll in a private LTC insurance or receives free governmental insurance. Since its introduction, LTC-contributions are fixed at 1.7 per cent of annual gross income up to the contribution ceiling and split between employees and employers. Benefit payments, on the other hand, were phased-in slowly so that the scheme was able to accumulate surpluses of about 5.5 billion € in 2000 as reserves.
As Table 1 clearly shows, the financial pressures from the revenue and the expenditure side were steadily increasing in the past. Due to the rising number of nursing cases the annual surpluses decreased and finally turned into deficits. While currently the contribution rate is still kept at the initial level, the system is expected to run out of assets already in the year 2007, see Donges et al. (2005). Consequently, the

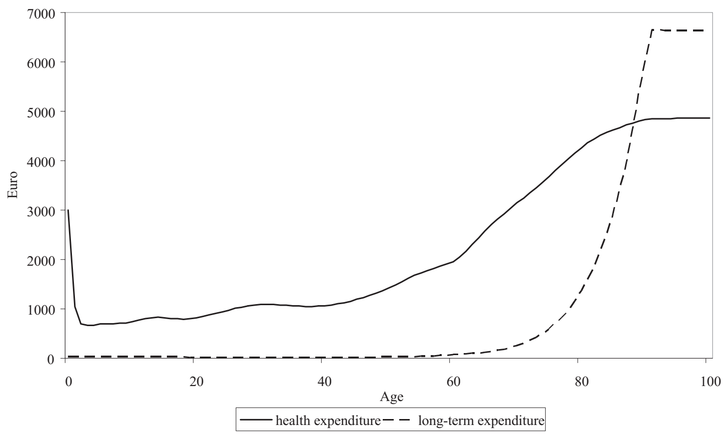
Table 1: Long-term care budget projection for Germany

Year	1995	1999	2003	2010	2020	2050
Receipts (in bill. €)	8.4	16.3	16.8	–	–	–
Expenditure	5.0	16.4	17.6	–	–	–
Funds	2.9	5.0	4.2	–	–	–
Nursing cases (in 1000)	–	1.929	–	2.382	2.935	4.728
Contribution rate (in %)	1.7	1.7	1.7	1.9-2.0	2.2-2.5	3.5-5.6

Source: Federal Ministry of Health and Social Security, Schulz et al. (2001), Hof (2001, 197)

system then has to change to an endogenous adjustment of the contribution rate. While nursing cases will more than double in the future, the contribution rates will increase even more due to the steep rise in the individual average cost profiles. Figure 1 compares the average LTC and health care profiles which are applied in our simulation model.

Figure 1: LTC and health care cost profiles



Since rising contribution rates further increase the existing labor market distortions, the sustainability of the current LTC system will be further undermined. Consequently, proponents of funded and unfunded premium systems point out the likely positive labor market effects of such a reform. In order to reduce the severe distributional consequences of premiums, such a reform has to be supplemented by a compensation scheme which reduces the burdens for low income and elderly households. Various previous studies have already quantified the revenue requirements and the distributional implications of such reform proposals.

Of course, politicians are mostly interested in the future cost of the system with and without reforms. Hof (2001) as well as the IWG Bonn (Ottnad, 2003) have estimated the future financial burdens of the LTC system for different scenarios with and without reforms. Their estimates show dramatically increasing annual costs which they try to equalize across generations with their reform proposals. Applying the generational accounting technique, Fetzer et al. (2003), Häcker and Raffelhüschen (2004) as well as Raffelhüschen and Häcker (2004) either compare the implicit debt levels which are implied by different scenarios or compute the changes in cohort specific generational accounts which would result from the proposed reforms. Without going into the details, these calculations have at least two central shortcomings. First, due to their static nature, they do not include the effects from the reduced labor market distortions. This is at least surprising since the reduced marginal tax burden is a central element in favor of premiums. Second, and maybe even more important, they do not distinguish the effects of the reforms for different income classes within a specific cohort. Since the distributional consequences of premiums (compared to wage-related contributions) are mainly within cohorts, a comprehensive distribution analysis has to include intergenerational as well as intragenerational effects of various reforms.

The present paper tries to extend existing quantitative studies by considering the labor market as well as the intra- and intergenerational consequences simultaneously. In the following section, we develop a general equilibrium simulation model, which will be applied to LTC reform analysis in the fourth section.

3. The Simulation Model

Our model follows the overlapping generation tradition of Auerbach and Kotlikoff (1987). Recent studies, such as Fehr (2000) or Kotlikoff et al. (2001) introduce a demographic transition and disaggregate various income classes within each cohort. The present model builds on Fehr et al. (2004) as well as Fehr and Halder (2005)[1] and allows for age-dependent fertility rates, accounts for immigration and includes unintended bequests. Since it focuses on Germany, it includes a detailed structure of the German tax and social security system. In the following, we introduce the general

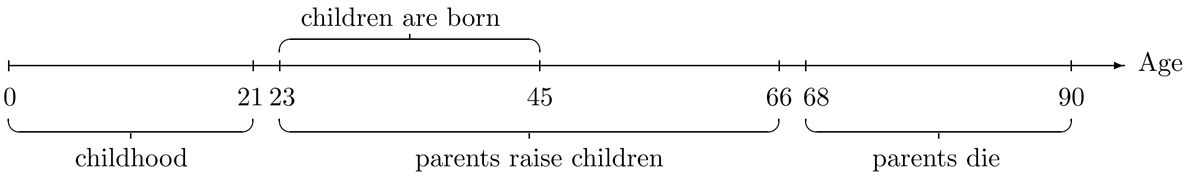
[1]Note, however, that we have adjusted the baseline path of the model.

structure of our model, explain its calibration and present some key characteristics of the baseline path.

3.1. Basic Structure

Households in our model can live up to a maximum age of 90. Consequently, we distinguish up to 91 generations within each period i. The individual life-cycle of a representative agent is described in Figure 2.

Figure 2: The individual life-cycle



Between age 0 and 20 our households are children, who earn no money and are fed by their parents. At age 21 our agents leave their parents and start working. Between ages 23 and 45 our agents give birth to children at the beginning of each period, i.e. children are age 0 when the parents are 23 and age 20 when the parents are 43. Between ages 46 and 66 our agents continue to raise their children. The last children who were born to age 45 parents leave their parents when the latter are age 66. Our agents die between ages 68 and 90. The probability of death is one at age 91. Consequently, the youngest child (born when the parents were 45) of parents who die early at age 68 has already reached adulthood while the oldest child (born when the parents were 23) of parents who die at age 91 is 68, i.e. parents always outlive grandparents.

We distinguish between the native population and foreigners who have identical life-cycle characteristics as natives. However, foreigners do not receive inheritances and arrive without any assets when they enter the country. Finally, we distinguish three income classes within each native and foreigner cohort. The income class is identified by a specific human capital endowment which determines the individual wage level. Households of different income classes have the same preferences, but they differ according to their demographic characteristics, i.e. life expectancy increases with income (see Reil-Held, 2000).

The following table reports the development of our model population between the years 2004 and 2100 in comparison to official population projections. Assuming a constant fertility and net immigration rate, our models demographic transition matches the official projections until 2050 quite well.

Table 2: Population Projection for Germany

Year	2004	2010	2020	2030	2040	2050	2100
Demographic assumptions							
Life expectancy (m.c.)	80.0	81.6	81.7	82.5	83.4	84.4	84.4
Fertility rate	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Net-immigrants (in 1000)	164.2	164.2	164.2	164.2	164.2	164.2	164.2
Total Population (in mio.)							
Official[a]	(82.4)	83.1	82.8	81.2	78.5	75.1	–
Model	81.5	82.4	82.4	80.5	77.7	73.0	59.6
Dependency Ratio (60+/20-59)							
Official[a]	(43.9)	46.0	54.8	70.9	72.8	77.8	–
Model	41.8	44.4	54.5	72.2	74.4	76.2	68.8

[*] Data in parenthesis refer to the year 2001 or 2002, m.c. middle class.
[a] Federal Statistical Office of Germany (2003).

3.2 Household preferences and budget constraints

As already explained above, we distinguish between natives and immigrants in the model. Both household types leave bequests when they die since they are imperfectly annuitised. However, only native households receive inheritances per definition. In addition, immigrants have no assets when they arrive. While natives start to make their own economic decisions at age 21, adult immigrants make their decisions when entering the country.

As usual, our model assumes a preference structure that is represented by a time-separable, nested CES utility function. In the following we concentrate on native households. Within each generation we have to distinguish different income classes and parents' ages at birth. Consequently, $U(j,t,s,k)$ defines remaining lifetime utility of a generation of age j at time t from income class k, who's parents were age s at time of birth. Remaining lifetime utility takes the form

$$U(j,t,s,k) = V(j,t,s,k) + H(j,t,s,k), \qquad (1)$$

where $V(j,t,s,k)$ denotes the utility parents receive from their own goods and leisure consumption and $H(j,t,s,k)$ denotes the utility they receive from their children's consumption. The two sub-utility functions are defined as follows:

$$V(j,t,s,k) = \frac{1}{1-\frac{1}{\gamma}} \sum_{a=j}^{90} (1+\theta)^{j-a} P(a,i,k) \left[c(a,i,s,k)^{1-\frac{1}{\rho}} + \alpha \ell(a,i,s,k)^{1-\frac{1}{\rho}} \right]^{\frac{1-\frac{1}{\gamma}}{1-\frac{1}{\rho}}}$$

$$H(j,t,s,k) = \frac{1}{1-\frac{1}{\gamma}} \sum_{a=j}^{90} (1+\theta)^{j-a} P(a,i,k) KID(a,i,k) c_K(a,i,s,k)^{1-\frac{1}{\gamma}}.$$

where $c(\cdot)$ and $\ell(\cdot)$ denote consumption and leisure respectively and $i = t + a - j$. The variable $c_K(\cdot)$ defines the consumption of income class k children whose parents are a years old in year i and whose grandparents were age s at the time of birth (of the parents). The $KID(\cdot)$ function denotes the number of children agents have at a certain age. Since future life is uncertain, consumption in future periods is weighted with the survival probability $P(\cdot)$ which multiplies the conditional survival probabilities from birth up to year i. The parameters θ, ρ, α and γ represent the "pure" rate of time preference, the intratemporal elasticity of substitution between consumption and leisure at each age a, the leisure preference and the intertemporal elasticity of substitution between consumption of different years, respectively.
The budget constraint of a 21-year old native who starts to make his own economic decisions in income class k in year i and who's parents were age s at his birth is

$$\sum_{a=21}^{90} \Big[W(a,i,s,k) + (1+r(i))I(a,i,s,k) - T(a,i,s,k) - c(a,i,s,k) - KID(a,i,k)c_K(a,i,s,k) \Big] (1+r^*)^{21-a} = 0, \quad (2)$$

The gross labor income of the respective agent is defined by

$$W(a,i,s,k) = \frac{w(i)E(a,k)[h(a,i) - \ell(a,i,s,k)]}{1 + 0.5\bar{\tau}^{ss}(a,i,s,k)}$$

where $w(i)$ is the employers' gross wage rate in period $i = t + a - 21$ and $\bar{\tau}^{ss}(\cdot)$ is the aggregate individual social security contribution rate. In Germany, the employers' labor costs include half of social security contributions. Consequently, the gross individual labor income is lower than labor cost for the employers.
Similar as Kotlikoff et al. (2001) we assume that technical progress causes the time endowment $h(\cdot)$ of each successive generation to grow at the rate λ, i.e.

$$h(a,i) = (1+\lambda)h(a,i-1).$$

The age- and income-class-specific earnings ability profile

$$E(a,k) = e^{\kappa_0^k + \kappa_1^k (a-20) - \kappa_2^k (a-20)^2} (1+\lambda)^{a-21}$$

is identical for natives and foreigners, includes the income-class-specific parameters κ and is steepened by the rate of technological progress λ.
The inheritance of a native agent in income class k who is age a in year i and who's parents are s years older than himself is denoted by $I(a,i,s,k)$. Before parents' age 68 (i.e. $a+s < 68$), the probability of death is zero and, consequently, there are no bequests. Between age 68 and 90, a fraction of a parents cohort dies and leaves bequests which are split between their (native) children.
The net-taxes $T(a,i,s,k)$ of an agent age a in year i consist of consumption, inheritance, capital and labor income taxes as well as social security contributions (or premiums) net of pensions and lump-sum transfers for children. Tax rates for consumption and inheritances are proportional, capital and labor income is taxed progressively. Since we model Germany as a small open economy, the gross discount factor is computed from the given annual world market interest rate r^*.
Foreigners have a very similar budget constraint. However, they receive no inheritances and start to make their economic decisions when they enter the country at age $21 \leq s \leq 43$ in year t.

3.3 Production

The economy is populated by a large number of competitive firms. We assume that all investment is financed via retained earnings. The firm's output in year i, $Y(i)$, is computed applying the Cobb-Douglas function

$$Y(i) = \phi K(i)^{\varepsilon} L(i)^{1-\varepsilon}, \tag{3}$$

where $K(i)$ and $L(i)$ are aggregate capital and labor in period i, respectively, ε is capital's share in production, and ϕ is a technology parameter. The firm employs labor and capital up to the point where the marginal product of labor equals the employer's wage rate $w(i)$ and the net marginal product of capital equals the world interest rate r^*.

3.4 The Government Sector

The government sector in the model represents the consolidated budget of the central, state and local governments as well as the budgets of the pension, health and long-term care system.

The central government issues new debt $\Delta B(i)$ and collects taxes and insurance contributions net of pensions from households and employers $T^G(i)$ in order to finance the public good $G(i)$ and the interest payments on its debt:

$$\Delta B(i) + T^G(i) = G(i) + r(i)B(i). \tag{4}$$

The variable $T^G(i)$ sums up the individual net-tax payments and the employer's social security contributions in year i. With respect to public debt, we assume that the government keeps an exogenously fixed ratio of debt to output. The public good expenditures $G(i)$ consist of government purchases of goods and services (including government investments) and education, health and long-term care outlays. Expenditures for government purchases are identical per capita, education outlays are age-specific and only spent for children. As already shown in Figure 1, health and long-term care outlays are also age-specific. While education transfers depend on the number of children but are not paid directly to the households, parents receive an exogenously specified benefit payment per child (the so-called *Kindergeld*) in each year i. The aggregate child related transfers to natives and immigrant households depend on the number of children under age 21.

We model a PAYGO-pension system in Germany, where the pension benefits in year i are computed from the product of the so called "adjustment factor" for pension type and retirement age, the sum of "individual earning points" and the "actual pension value" which defines the value of one earning point in €. The adjustment factor deviates from one only if the individual retirement age deviates from the statutory "normal" retirement age of 65. In the baseline path individual "effective" retirement ages rise discretely from 60 to 62 between 2019 and 2035. The model distinguishes work-related, foreign-income-related and child-rearing-related earning points. Finally, the actual pension value is adjusted according to the adjustment formula introduced by the Riester Reform in 2001 and the so-called "sustainability factor" of the most recent reform in 2004, see Börsch-Supan et al. (2003).

With respect to the health care system, the age-specific health costs from Figure 1 above represent the consumption of health services financed by the health care system in year i. It is assumed that health care costs increase by 1.5 percent annually until 2050. Afterwards, this figure is reduced to the growth rate of the economy of 1 percentage point. Whereas middle and low-income class households are members of the public system, households in the top income class are insured in the private system. Contributions to the public system are proportional to income and children are automatically insured with their parents' contributions. Contributions to the private system are lump-sum and children have to be insured separately.

Similarly to the health care system, the age-specific LTC costs $[lc(a,i)]$ from Figure 1 represent the consumption of long-term care services. Since all agents in the top income class are insured in the private system, we distinguish between public (LCB^g) and private (LCB^p) long term cost:

$$
\begin{aligned}
LCB^g(i) &= \sum_{k=2}^{3}\sum_{a=0}^{90} lc(a,i)[N(a,i,k)+M(a,i,k)] \\
LCB^p(i) &= \sum_{a=0}^{90} lc(a,i)[N(a,i,1)+M(a,i,1)],
\end{aligned}
$$

where $N(\cdot)$ and $M(\cdot)$ denote specific cohorts of the natives and foreigners. Again we assume that LTC costs grow by 0.5 percent faster than the economy until 2050. In contrast to the public health care system, the public LTC system accumulates assets $AP(i)$ if the contribution rate $\tau^{ltc}(i)$ in year i is kept constant. With $PY^h(i)$ as contribution base, future LTC assets are computed from

$$
AP(i+1) = AP(i)[1+r(i)] + \tau^{ltc}(i)PY^h(i) - LCB^g(i). \tag{5}
$$

If $AP(i+1)$ turns negative we set $AP(i+1)=0$ and compute the contribution rate $\tau^{ltc}(i)$ endogenously.
The outlays of the private system are fully financed by lump-sum payments, i.e.

$$
z^{ltc}(i)\sum_{a=21}^{90}[N(a,i,1)) + M(a,i,1)] = LCB^p(i). \tag{6}
$$

This explains the main elements of the model's tax and transfer system. While the outlays are computed given per capita public goods consumption and the exogenously set parameters of the social security system, the budget is balanced by adjusting the consumption tax rate in each period.

In equilibrium supply has to equal demand on the labor, capital and goods markets in all periods.

4. Calibration and baseline path

In order to solve our model, we need to specify the preference, technology and policy parameters. The respective values are reported in Table 3. The preference and technology parameters are taken from Auerbach and Kotlikoff (1987). The time endowment in the year 2004 is set to 4000 hours. The technology level ϕ is then specified in order to yield a realistic gross annual income level in the lowest income class (see below).

Table 3: Parameter values of the model

Utility function		
Time preference rate	θ	0.02
Intertemporal elasticity of substitution	γ	0.25
Intratemporal elasticity of substitution	ρ	0.7
Leisure preference parameter	α	1.2
Production function		
Technology level	ϕ	5.5
Capital share in production	ε	0.3
Technical progress	λ	0.01
Policy parameters		
Debt (in % of GDP)	B/Y	0.6
Retirement age in 2004		60
Average Pension Value (per month) in 2004 (in €)		30

On the policy side age-specific education, health care and LTC costs were provided by Bernd Raffelhüschen. The original data was slightly adjusted in order to get realistic GDP shares and contribution rates. With respect to the pension system, the applied actual pension value from the year 2004 is sufficient to yield a realistic contribution rate and GDP share in 2004 (see below).
Our model also requires an initial distribution of assets by age and income class. These profiles are generated by an artificial steady state simulation. In addition, we also had to specify the initial capital stock in the base year 2004. Capital stock and asset endowments were adjusted in order to yield a realistic capital coefficient in the base year.

Table 4 shows the initial equilibrium of year 2004 in our model economy and the respective reference values in the year 2003/2004. The government indicators show realistic aggregate tax revenues and social security expenditures in our initial equilibrium. Regarding the tax structure, the income tax revenue (which consists of wage, interest and corporate income taxes) is fairly high, since we neglect unemployment. The consumption tax rate is adjusted in order to balance the budget. Finally, the world interest rate is set at 4.5 percent.

Table 4: The initial year on the baseline path

	Model	Official*
Government indicators (in % of GDP)		
Aggregate pension benefits	11.5	12.5
Pension in top income class (in € p.m.)	1980	-
Pension in middle income class (in € p.m.)	1080	-
Pension in low income class (in € p.m.)	645	-
Aggregate health benefits	6.4	7.8
Aggregate long-term care benefits	0.7	0.8
Interest payments on public debt	2.7	3.3
Total tax revenue	18.7	23.6
Income taxes	9.4	8.6
Consumption tax	9.1	12.5
Macroeconomic indicators		
Capital coefficient	3.1	3.5
Interest rate (in %)	4.5	-

*Source: Institut der deutschen Wirtschaft (2004)

Table 5 indicates that gross labor earnings are lower than officially, while disposable income is higher than in reality. Again, this is due to government programs which are not included in the model. In general, however, the model reproduces the relative income distribution in the base year quite well.

Due to the demographic transition, the economy will change in the years after 2004. Therefore, the reference solution of the model is not a steady state equilibrium but a baseline path of the economy between the initial year 2004 and the final steady state which is computed under the assumption that the current long term care system is not removed in the future. Table 6 presents the dynamics of some central economic variables in the baseline path of the economy. The first column shows the dynamics of GDP/capital/employment compared to the base year. On first sight it might seem surprising that employment increases throughout the transition although the

Table 5: Income distribution in the initial equilibrium

	Disp. income (in €)		Fraction (in %)	
	Model	Official*	Model	Official*
1. Quintile	9.390	8.272	9.2	8.5
2. Quintile	15.582	13.857	15.3	14.3
3. Quintile	19.639	17.669	19.1	18.2
4. Quintile	22.332	22.425	21.9	23.1
5. Quintile	35.307	34.714	34.5	35.9
Average disposable income (in €)	20.456	19.388		
Average gross income (in €)	25.872	28.518		

*Source: Grabka et al. (2003).

Table 6: Baseline path of the model

Year	GDP/Capital/ Employment index	Consumption tax	Contribution rates Pension	Health care	LTC	LTC premium (in €p.a.)
2004	1.00	16.0	19.5	14.3	1.7	326
2010	1.11	15.9	19.1	14.5	1.7	394
2020	1.19	18.5	21.2	16.6	2.4	514
2030	1.20	20.0	24.1	19.5	3.0	602
2040	1.30	20.8	24.1	21.2	4.1	822
2050	1.37	21.4	24.8	22.2	4.7	988
2075	1.58	22.6	23.6	21.5	4.4	957
2100	1.89	23.4	21.9	21.1	4.1	896

population ages. Note, however, that we measure employment in efficiency units which rise due to the assumed technological progress. During the first phase of the transition employment (in efficiency units) rises quite strongly. After 2020, however, the baby boom generations of the 1960s retire which reduces employment growth significantly. Starting in 2005 employees will subtract a rising share of their pension contributions from their tax base while a the same time a rising share of pension benefits is taxed. Since the former effect is much stronger than the latter one, the average labor income tax rate falls. In addition, the labor income tax base declines due to population ageing. Consequently, the consumption tax rate has to increase in order to balance the budget. In line with the official projections, contribution rates of the public pension system will almost remain at their current level until 2020.

Afterwards, however, they rise significantly until 2050 although we have already taken into account the latest reforms. Public health care and LTC contribution rates rise even stronger from currently 14.3 and 1.7 percent up to about 22 and 4.7 percentage points in 2050, respectively.[2] Note that LTC premiums in the private sector also rise strongly throughout the transition.
This suffices to explain the baseline path of the model economy.

5. Simulating alternative LTC reforms

In this section we introduce the various reform alternatives right after the initial year. For each reform we first discuss our modeling approach and then present the resulting macroeconomic and welfare consequences.

5.1 The citizen premium model

The so-called citizen premium model for long term care, which is proposed by the Council of economic advisers (SVR, 2004) keeps the pay-as-you-go financing but switches to premiums instead of income related contributions. Similar as the councils proposal for health care reform, the LTC proposal consists of three central elements. First, the current employers' share of LTC contributions is transferred to the employee and taxed. In our context this simply means that the allowances of a provident nature are reduced by the employers' share of LTC contributions. Second, current contributions to the statutory LTC system are transformed into premiums, which are identical for all employees. The experts expect that the annual premiums would rise due to ageing from currently 300 € up to about 600 € in 2050 (SVR, 2004, 418). Third, low income households receive a tax-financed compensation which restricts their premium burden to 2 percent of annual income. Of course, the citizen premium model would also phase-out the current private long term care system so that finally all households would be covered by the new statutory system. Since the private insured rich households in the model are already covered by unfunded premiums, our model only captures this effect partially.
Consequently, we first compute the LTC premiums without compensation $z^{SVR}(i)$ from the LTC budget. Starting in year 2005 the budgets (5) and (6) are aggregated

[2] Partly this is due to the fact that outlays grow faster than output until 2050. After 2050 expenditure growth is the same as output growth in order to reach a steady state equilibrium in the long run.

so that $\bar{z}^{SVR}(i)$ is computed from

$$\bar{z}^{SVR}(i)\sum_{k=1}^{3}\sum_{a=21}^{90}[N(a,i,k)+M(a,i,k)] = LCB^p(i)+LCB^g(i) \qquad (7)$$

after all assets from the previous system are eliminated. Note that the cost of children are now financed by the tax system. The compensation scheme ensures that no household has to pay premiums which are above the pre-specified maximum share of 2 percent of gross income. Consequently, if the compensation scheme is included, individual contributions of an age-a agent from income class k $z^{SVR}(i,a,k)$ are computed from

$$z^{SVR}(i,a,k) = \begin{cases} \bar{z}^{SVR}(i) & \text{if} \quad \bar{z}^{SVR}(i) < 0.02\ [W(\cdot)+Pen(\cdot)] \\ 0.02\ [W(\cdot)+Pen(\cdot)] & \text{otherwise.} \end{cases} \qquad (8)$$

The principle idea is that no employee should pay higher premiums than 2 percent of his annual income. Consequently, the maximum payment is fixed at 2 percent of gross income which in the future includes the employers' share of previous LTC contributions. Note, however, that we fix the maximum premium relative to gross wage income and pensions, i.e. no capital income is included in the base.[3] Table 7 shows the macroeconomic effects of the reform.

Table 7: Macroeconomic effects of the citizen premium model

Year	GDP/ Capital/ Employment index	Contribution rates: Pension	Contribution rates: Health care	LTC Premiums with compensation, income class: top	middle	low	Consumption tax: with compensation	Consumption tax: without compensation
2005	1.01	19.2	14.1	283	283	218	15.9	15.9
2010	1.12	19.1	14.3	324	324	218	15.9	15.7
2020	1.19	21.1	16.4	419	419	225	18.8	18.0
2030	1.20	24.1	19.2	492	492	228	21.0	19.4
2040	1.29	24.1	21.1	676	558	230	22.8	19.7
2050	1.36	24.8	21.8	789	560	231	24.1	20.5
2075	1.58	23.7	21.2	771	574	233	25.3	21.6
2100	1.88	22.0	20.9	725	577	231	25.8	22.4

Overall, the switch from contributions towards premiums has negligible effects on aggregate macro variables. Due to the taxation of the employers' share of LTC

[3]This assumption was mainly made for technical reasons.

contributions, wage tax revenues rise so that the consumption tax rate falls slightly initially. During the transition, compensation payments increase and the consumption tax rate rises above the level from the baseline path. Note that premiums for the top class (which receives no compensation) now rise much slower compared to the baseline path from Table 6. On the one side, life expectancy of the whole population is lower than in the top income class. In addition, children LTC cost are now financed by general taxes. In order to isolate the effects of compensation payments, we simulate a reform without compensation in a separate simulation. If all households have to pay the LTC premiums $\bar{z}^{SVR}(i)$ of the top income class, the consumption tax rate rises much less throughout the transition as shown in the last column of Table 7.

Table 8: Welfare effects of the citizen premium model*

	With compensation			Without compensation		
Birth year	top	middle income class	low	top	middle income class	low
1920	0.20	0.16	0.25	0.21	0.10	-0.45
1930	0.17	0.14	0.23	0.23	0.10	-0.36
1940	0.16	0.14	0.23	0.27	0.12	-0.35
1950	0.05	0.16	0.02	0.26	0.17	-0.28
1960	-0.02	0.12	-0.02	0.26	0.20	-0.47
1970	-0.07	0.10	-0.04	0.24	0.28	-0.48
1980	-0.06	0.05	-0.02	0.23	0.30	-0.60
1990	-0.13	-0.03	0.01	0.25	0.37	-0.75
2000	-0.24	-0.04	0.06	0.29	0.52	-0.87
2010	-0.35	-0.02	0.06	0.32	0.60	-1.07
2020	-0.39	0.00	0.08	0.33	0.55	-1.32
2030	-0.41	-0.06	0.01	0.30	0.48	-1.42

*In percent of remaining lifetime resources.

Table 8 shows the welfare effects of the citizen premium model. All welfare changes are expressed in percent of remaining lifetime resources. With compensation, only some middle-aged low income households are hurt by the reform slightly since they paid lower contributions to the previous system. In the middle income class all currently working households gain slightly while future generations will lose slightly. Finally, older rich households may benefit from the reduced consumption taxes. In the long run, however, rich households clearly lose since their reduced premiums are compensated by higher consumption tax payments.

The right part of Table 8 clearly demonstrates that the reform would redistribute from poor to rich households in all cohorts without compensation. The losses of poor households would even rise in the future if the redistributive elements of the current LTC system are removed.

5.2 The Herzog commission model

In contrast to the citizen premium model, the proposal of the Herzog commission suggests a switch to a privatized system but only after 2030. In order to finance compensation payments after future privatization, the LTC contribution rate is increased immediately in order to built up LTC assets. While the original proposal intends to increase the LTC contribution rate from currently 1.7 to 3.2 percent, we only raise it to 2.95 percent in our simulation. This rate suffices to generate a capital stock which finances the compensation payments after 2030. After the switch to the funded system in 2030, the capital stock finances the limitation of the private premiums up to a maximum of 600 € per year.[4] High income class households are not affected by the reform directly. They remain in the private system they belonged to before the reform and don't receive any compensation.
Consequently, after 2030 premiums in the funded system are computed from

$$z^{HC}(j,t,k) = \min \left[\sum_{a=j}^{90} P(a,i,k)\ lc(a,i)(1+r^*)^{j-a} \Big/ \sum_{a=j}^{90} P(a,i,k)(1+r^*)^{j-a}; 600 \right]. \tag{9}$$

These cohort-specific premiums are derived for all middle and low income class generations. With respect to children cost we assume again that they are all covered by general taxes.
Table 9 reports the resulting macroeconomic effects of the reform. When the contribution rate increases to 2.95 percent, LTC assets rise substantially until 2030.[5] In the short run the increased LTC contributions distort labor supply which results in slightly higher pension and health care contributions as well as consumption taxes. When the existing LTC system is completely abolished and replaced by a funded system in 2030, labor supply, capital stock and GDP increase significantly and social

[4]The Herzog commission suggest a limit of $12 \times 66 = 792$ € in 2030. Since we do not consider inflation in our model, we reduce the limit to 600 € like in the other reform proposals below.

[5]In the last years before 2030 the capital stock mainly increases due to the returns from LTC assets.

Table 9: Macroeonomic effects of the Herzog commission model

Year	GDP/Capital/ Employment index	LTC assets *	Contribution rates Pen-sion	Health care	LTC	Consump-tion tax
2005	1.00	0.2	19.7	14.4	2.95	16.4
2010	1.11	3.9	19.2	14.7	2.95	16.3
2020	1.18	10.9	21.2	16.8	2.95	18.8
2030	1.23	18.2	23.1	18.7	0.00	19.6
2040	1.33	6.1	23.9	20.3	0.00	20.0
2050	1.38	0.7	24.7	21.3	0.00	20.9
2075	1.59	0.0	23.9	21.0	0.00	21.9
2100	1.89	0.0	22.2	20.6	0.00	22.7

* in percent of GDP.

security contribution rates begin to fall. Note that LTC assets reache a maximum level in the year 2030 and then decline to zero until year 2050.[6]

Table 10: Welfare effects and premiums of the Herzog commission model

Birth Year	Welfare effects top	middle (income class)	low	Premiums* middle	low (income class)
1920	-0.19	-0.57	-0.85	–	–
1930	-0.17	-0.40	-0.61	–	–
1940	-0.15	-0.35	-0.54	600	600
1950	-0.01	-0.29	-0.40	600	600
1960	0.09	-0.28	-0.47	600	600
1970	0.12	-0.27	-0.48	600	600
1980	0.05	-0.24	-0.53	600	600
1990	0.05	0.13	-0.12	492	432
2000	0.08	0.85	0.64	309	271
2010	0.11	1.41	1.23	210	184
2020	0.07	1.40	1.17	211	185
2030	0.02	1.27	0.99	211	185

* in € per year.

Table 10 reports the resulting cohort-specific premiums as well as the welfare consequences of the Herzog commission proposal. Consider first the premiums in the

[6]For technical reasons the remaining compensation payments are financed by consumption taxes.

right part of Table 10. Households who die before 2030 do not pay premiums at all. The cohort born in 1940 is the oldest cohort alive in 2030. With compensation their premiums amount to 600 €. For younger cohorts the premiums are falling dramatically since LTC cost mainly arise in old age, see Figure 1. Cohorts in the middle income class pay higher premiums than low income households due to the differences in life expectancy. Cohorts born after 1980 don't receive compensation payments any more. Finally, premiums for agents who enter the labor market in and after 2030 amount to 185 to 211 € per year. Of course, this is much smaller than the estimates of the Herzog commission which amount to $12 \times 52 = 624$ € (Herzog Kommission, 2003, 32). The difference is mainly due to our assumptions regarding inflation, mortality, productivity growth and discounting.

The welfare effects in the left part of Table 10 show that the privatization strategy of the Herzog commission only slightly affects those cohorts which are covered by the private system. Elderly households which are covered by the public system will lose while younger and future households in the low ind medium income class will gain. Note that low income households lose more in the short run and gain less in the long run compared to households in the middle income class. The latter is due to the regressive nature of the consumption tax and the reduction of the (implicit) redistribution of the former public system.

5.3 The Freiburg model

In this section, we simulate a reform proposal which was developed at the University of Freiburg (Fetzer et al., 2003). Similar as the Herzog commission model it implies that in the medium run all households would be insured in a private fully funded system with individual risk adjusted premiums. However, the transition to such a system is organized quite differently. The funded system is now introduced already in year 2005 for all cohorts younger than 60 years. These cohorts have to pay premiums to the private system, but they also have to finance partially the deficits of the public system which remains for the elderly. Following Häcker and Raffelhüschen (2004) we assume that employees have to pay LTC contributions on labor income which amount to 0.7 percent. Those aged 60 and older in 2005 remain in the public system, but their contributions are transformed to premiums which amount to 600 € per year.

Consequently, the premiums of households who switch to the private system (i.e. $j < 60$ and $t = 2005$ or $j = 21$ and $t > 2005$), are computed similar as in the Herzog commission model:

$$z^{FR}(j,t,k) = \sum_{a=j}^{90} P(a,i,k)\ lc(a,i)(1+r^*)^{j-a} \bigg/ \sum_{a=j}^{90} P(a,i,k)(1+r^*)^{j-a} \,. \quad (10)$$

Those older than 60 years in 2005 (i.e. $j \geq 60$) have to pay $z^{FR}(j, 2005, k) = 600$ €. In the Freiburg model elderly who remain in the public system are now financed from their own premiums (of 600 €) and the contributions from those insured in the private system. The latter are constant at 0.7 percent in the initial years of the reform and then adjusted endogenously in order to balance the budget of the public system.

Table 11: Macroeconomic effects of the Freiburg model

Year	GDP/Capital/ Employment index	Contribution rates Pen- sion	Health care	LTC	Consump- tion tax
2005	1.01	19.0	14.0	0.7	15.9
2010	1.12	19.1	14.4	1.0	16.0
2020	1.19	21.2	16.5	1.3	18.4
2030	1.21	24.0	19.0	0.3	19.4
2040	1.32	23.9	20.5	0.0	19.8
2050	1.38	24.7	21.4	0.0	20.6
2075	1.58	23.9	21.0	0.0	21.7
2100	1.89	22.2	20.6	0.0	22.4

As Table 11 reveals, the Freiburg model induces a slightly stronger employment and capital accumulation effect during the initial years of the transition as the Herzog commission model. Consequently, social security contributions and consumption tax rates are lower compared to the previous case. Whereas Fetzer et al. (2003) compute a constant contribution rate of 0.7 percent in order to finance the expenditures of the LTC system, the latter has to be increased up to 1.3 percent in 2020 in our simulations. After 2020, LTC contribution rates fall again until the system is completely eliminated in 2035. Of course, the long run equilibrium is the same in both scenarios.

The right part of Table 12 shows the cohort-specific premiums of the Freiburg model. They can be directly compared with the respective figures in the right part of Table 10. However, since the cohort-specific premiums are paid for quite different time periods, the resulting welfare consequences in the left part are more complicated to analyze.

Table 12: Welfare effects and premiums in the Freiburg model

Birth Year	Welfare Effects top	middle	low	Premiums middle	low
	income class			income class	
1920	0.21	-0.39	-1.82	600	600
1930	0.12	-0.34	-1.45	600	600
1940	0.12	-0.31	-1.36	600	600
1945	0.03	-0.16	-0.77	600	600
1946	0.05	-0.93	-2.22	1027	888
1950	0.05	-0.80	-1.93	796	686
1960	0.10	-0.30	-1.02	516	444
1970	0.11	0.06	-0.35	346	300
1980	0.09	0.29	-0.01	233	204
1990	0.10	0.56	0.27	207	181
2000	0.13	1.05	0.76	208	183
2010	0.16	1.42	1.14	208	183
2020	0.15	1.47	1.20	210	184
2030	0.11	1.38	1.10	210	184

In the short and medium run there are three central differences compared to the Herzog commission model. First, top income class households benefit since their consumption tax payments decrease. Second, especially low income elderly are much worse off since they have to pay much higher premiums to the public LTC scheme. Finally, the redistribution from old to young is much stronger, since younger and future generations pay lower contributions to the public LTC system. Table 12 also shows that the welfare effects are most dramatic for those cohorts which are forced into the private system. While the cohort born in 1945 still remains in the public system, the cohort born in the next year has to switch to the private system. Due to the sharp increase in premiums the loss of the younger cohort rises significantly.

5.4 The immediate privatization model

In this section we simulate a privatization strategy which builds on the proposal of the Kronberger Kreis (Donges et al., 2005). In contrast to the Herzog commission and the Freiburg model, the social LTC scheme is eliminated immediately and a private fully funded system is installed for all households insured previously in the public system already in 2005. In order to compare the proposal with the other alternatives we assume that a tax financed social compensation scheme is installed for those whose premiums would exceed 600 €.[7] Consequently, premiums are calculated as in the previous section, but the compensation is not restricted to already retired households. Therefore the premiums are almost identical with those of the Freiburg model in the right part of table 12. Apart from the difference in the compensation scheme, the immediate privatization model also differs from the Freiburg model since compensation payments are financed from consumption taxes instead of wage contributions from medium and low income households.[8]

Since the macroeconomic effects are quite similar as in the previous section, we do not report them in a separate table. The only difference is that now LTC contributions are zero already in the short run and consumption tax rates increase until 2020 above the previous levels by about 1-2 percentage points. After 2020 the rates are identical again.

Table 13: Welfare effects and premiums of the immediate privatization model

	Welfare Effects			Premiums	
Birth Year	top	middle income class	low	middle income class	low
1920	-0.15	-0.87	-2.42	600	600
1930	-0.06	-0.58	-1.74	600	600
1940	0.01	-0.47	-1.54	600	600
1950	-0.04	-0.44	-1.46	600	600
1960	-0.04	-0.26	-0.95	516	444
1970	-0.04	0.14	-0.30	346	300
1980	-0.02	0.42	0.11	233	204
1990	0.06	0.76	0.49	207	181
2000	0.13	1.13	0.85	208	183
2010	0.17	1.40	1.13	209	183
2020	0.16	1.48	1.21	210	184
2030	0.13	1.40	1.12	210	184

The welfare effects of the immediate privatization model are reported in the left part of Table 13. Due to the higher consumption taxes, all elderly are worse off in the immediate privatization model compared to the Freiburg model. On the other

[7]The Kronberger Kreis does not explicitly propose such a compensation scheme but argues in favor of an expenditure cut for people whose long-term care costs exceed a certain limit.

[8]Of course, in the Freiburg model and the Herzog commission model the social and the private system coexist during the transition, while in the privatization model the public system is immediately eliminated. This institutional difference, however, is not relevant for the simulation.

hand, middle-aged households who were previously insured in the public system are better off than before since they have to pay lower contributions now. Of course, the welfare losses of middle-aged rich households are due to higher consumption payments. The long run effects are basically the same as before.

6. Conclusions

Our simulations indicate two central qualitative results. First, a switch to funded LTC premiums will affect the labor market and, therefore, a general equilibrium analysis is necessary. Second, the reform proposals differ not only with respect to their intergenerational consequences but also with respect to their intragenerational effects. Consequently, a comprehensive analysis of the distributional impact of the reform proposals has to disaggregate cohorts according to specific income classes and occupational types which are insured in the public and private system.

Which reform proposal should be favored according to our analysis? Our quantitative results clearly show that the citizen premium model has negligible labor market effects and mainly redistributes from high to low income households and less across generations. Since future generations only benefit slightly from the citizen premium model one could argue that the implied redistribution across income classes should be targeted with other instruments. Future generations benefit mostly from privatization models since they mainly redistribute resources across generations towards the future. In the short run this redistribution is much stronger in the Freiburg model and the immediate privatization model. In addition, the losses rise sharply for low income households despite the compensation payments. Therefore, the Herzog commission model does a better job since it smoothes the short-run losses of elderly middle and low income households as well as the welfare gains of younger households while keeping the long run gains of future generations.

Of course, our analysis could be extend in various directions. For example one could combine the Herzog commission model with a compensation scheme that guarantees a maximum burden proportional to income. In addition one could also model a funded private system in the initial equilibrium and simulate its elimination when the citizen insurance model is implemented. However, one specific shortcoming of the model has to be kept always in mind. It only quantifies the incentive effects of different financing schemes, but we are not able to capture the expected cost reductions from an improved competition in the LTC sector. As argued by Donges et al. (2005), these effects are the most important for an economic evaluation of different reform options. Consequently, our study is only a small step towards a more comprehensive evaluation of the economic effects of LTC reform.

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