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Abstract

Presuming an ageing population, every introduction of a pay-as-you-go scheme causes intergenerational redistribution in favor of the *first generations* and to the burden of young and future generations. Using the concept of internal rates of return we want to examine the extent to which the first generations drew an *introductory benefit* from the implementation of the German statutory long-term care insurance as an unfunded system. Furthermore, a comparison between the internal rates of return will show firstly to what extent different generations are burdened by having to redeem the implicit debt, and secondly which generations are involved in paying back the *introductory gain*.

JEL classification: I18; J10

Keywords: Long-Term Care Insurance, Internal Rate of Return, Demography

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1 Introduction

In contrast to the introduction of a fully funded system, every implementation of a pay-as-you-go (PAYG) type social security system encompasses an introductory benefit for the old, especially the oldest, generations. This fact can be exemplified by the German statutory long-term care insurance (LTCI) which was established as an unfunded system in the year 1995. It constitutes the fifth pillar of German social security following pension, unemployment, health and accident insurance systems.

Unlike in a fully funded system, where benefits are only granted after an upfront period of capital accumulation, an unfunded system uses the contribution payments for financing the benefits of the same period. Hence, at the time of implementing the PAYG scheme, long-term care coverage for those already or soon in need of such care on account of their age is ensured. A PAYG system is thus in favor of all those generations who – at the time of implementation and in the years thereafter – are already receiving benefits without ever having contributed to the system.

However, this advantage for the first generations generates an overall advantage of the PAYG system only in case of a reasonable demographic development or economic growth and labor market situation. Only if the implicit rate of return from the unfunded scheme exceeds the one resulting from the alternative fully funded system (dynamically inefficient case), the implementation of a PAYG system effectively renders a benefit for all generations. In the opposite case, i.e. in the dynamically efficient case, every implementation of an unfunded system induces both winning and losing generations, the latter losing according to the extent to which the population ages. Hence, the greater the proportion of the old population in relation to the young working population, the more the working population has to contribute to LTCI to finance those in need of long-term care. Despite the "revenue-orientated expenditure policy" as specified in the Social Code, Book XI (*Sozialgesetzbuch XI*), this inevitably leads to an increase in the contribution rate. Whilst the PAYG system on the one hand solves the problem of financing those already or soon in need of care on account of their age, it on the other hand simultaneously imposes an implicit debt onto the system.

For the purposes of this paper, the intergenerational redistributive effects for all living and future cohorts through the enactment of the German LTCI are illustrated using the concept of internal rates of return. The internal rate of return of LTCI for a representative agent of a respective generation thus provides information concerning the share of contribution payments to long-term care benefits. In this context, the so-called *introductory benefit* of the old and oldest generations resulting from short or non-existent net contribution phases as well as the implicit indebtedness of the system resulting therefrom is to be determined. Furthermore, we want to trace the question of who has to pay for the *windfall* or *introductory gain* of the first generations.[1] In a dynamically efficient economy, the introductory gain, i.e. the initial transfer payments to the old and oldest generations at the introduction of LTCI, equals the present value of the perpetual implicit taxes on all subsequent generations. The implicit tax payment is given by the differences in internal rates of return of an alternative fully funded system and the unfunded system (see Feldstein (1995)).

This paper is organized as follows: Section 2 illustrates the concept and the method of measuring the internal rate of return. The implicit rates of return of the respective generations affected differently by LTCI on account of their age are specified in section 3. In this context, it is presumed that the contribution rate of 1.7 percent is maintained at a constant level over time.[2] This allows to determine the introductory benefit resulting from the implementation of the LTCI as intended by the legislator in a first step. In a second step, the share of implicit debt each cohort has to redeem can be pinpointed. Section 4 accounts for the necessary adjustments in the contribution rate due to the demographic development, thereby yielding the actual internal rates of return of living and future cohorts. A comparison with the internal rates of return of an alternative funded scheme further shows which generations have to bear the costs of the windfall gain of the first generations.

2 Method, projecting net benefits and the internal rate of return

The implicit interest rate of LTCI can be expressed as the internal rate of return of a series of cash outflows and inflows. Since the introduction of the PAYG system strikes individuals at different points in time of their life-cycle, all payment-streams flowing from a representative individual of a respective cohort, as well as the LTCI over the remaining life-cycle have to be determined in order to be able to compute the corresponding internal rates of return. For simplicity we stipulate an average individual, differentiating only between male and female.

For the following calculations, the year 1995 serves as the base year, whereby all contribution and transfer payments that have flown from the time of the introduction of LTCI are taken into account. The average payment-flows of every single cohort over the whole life-cycle can be expressed as the present value of the net payments (NPV),

[1]Whilst the term *introductory benefit* is not a fixed expression, the notion *windfall gain* is well defined in economic literature. The latter goes back to Feldstein (1995) and Sinn (2000), both giving a formal proof for it.

[2]In the German statutory LTCI the contribution rate is fixed to 1.7 percent of contribution income.

i.e. the difference between contribution and transfer payments. This net present value of an individual of generation k in the birth year k can formally be defined as follows, with the index j serving as a means of differentiate between a male ($j = m$) and a female ($j = f$) individual:[3]

$$NPV(z)_{k,k}^{j} = \sum_{s=k}^{k+D} z_{s,k}^{j} c_{s,k}^{j} (1+r)^{k-s}. \tag{1}$$

$z_{s,k}^{j}$ represents the average net payment of an individual of generation k in the year s, and $c_{s,k}^{j}$ stands for the cohort-specific survival rate of an individual, with the latter satisfying $0 \leq c_{s,k}^{j} \leq 1$ and $c_{k+D+1,k}^{j} = 0$.[4] The maximum life is set to $D = 100$, and the average net payment is discounted to the base year with the exogenous and constant interest rate r.

The average net payment in period s of an agent born in $k \leq s$, is the sum of the different types i of long-term care payments and transfers:

$$z_{s,k}^{j} = \sum_{i=1}^{I} h_{s-k,i,s}^{j} \quad . \tag{2}$$

Concerning the average age-specific net payments $I = 9$ different contribution and transfer types are considered: on the side of the contribution payments we distinguish between payments from unemployment support, payments from retirees and payments from employees.[5] On the side of long-term care benefits, the transfers are detailed into the care levels 1 to 3 as well as into the categories out-patient and in-patient benefits.[6] $h_{s-k,i,s}^{j} > 0$ (< 0) stands for the corresponding contribution payment (the corresponding transfer payment) of an individual of age $s-k$. The following restriction must hold for the base year t as well as for all the following years up to the projection year τ, with the latter corresponding to the year 2003 (the last year for which the requisite macroeconomic data can be obtained). The sum of age-specific individual payments, weighed with cohort size, must equal the corresponding macroeconomic

[3]The following notation and methodical description is derived from Bonin (2000). Small letters express per-capita variables, capital letters denote aggregate variables.

[4]For calculating the cohort-specific survival rate, the mortality table 2001/2002 of the Federal Statistical Office has to be adapted for all living and future generations subject to a higher life expectancy. The latter is adjusted according to the 5th variant of the 10th coordinated population projection of the Federal Statistical Office (see Statistisches Bundesamt (2003a)). The demographic aging process is thus adequately illustrated over time.

[5]Concerning the contribution payments we consider the employer's as well as the employee's share of payments. Furthermore, we account for the *Kinderberücksichtigungsgesetz* enacted on January 1^{st}, 2005 which raises the share of long-term care contribution payment by 0.25 percentage points for all childless employees.

[6]This classification in benefits as determined in the Social Code, Book XI is supposed to give consideration to the different degrees of the need of long-term care.

contribution or transfer aggregate $H_{i,s}$. Hence,

$$H_{i,s} = \sum_{k=s-D}^{s} h^m_{s-k,i,s} P^m_{s,k} + \sum_{k=s-D}^{s} h^f_{s-k,i,s} P^f_{s,k}, \quad \text{for} \quad t \leq s \leq \tau, \tag{3}$$

must hold, with $P^j_{s,k}$ $j \in (m, f)$, denoting the number of male, respectively female, survivors of the corresponding cohort in period s.[7]

The individual net payments for the projection year τ as well as for all subsequent years s remain to de determined. For this purpose, the age-specific contribution payments and transfer receipts have to be extrapolated with the annual growth rate of the economy g, whereby we assume the latter to be 1.5 percent p.a. in all our calculations. This especially means, that the nominal specified long-term care benefits as legislated in 1995 are adjusted annually by 1.5 percent. On the basis of this constant and time invariant productivity growth rate we presume that all agents who reach the age $s - k$ will experience the same long-term care policy as the representative $(s - k)$-year-old in the projection year, uprated for annual economic growth:

$$h^j_{s-k,i,s} = h^j_{s-k,i,\tau}(1 + g)^{s-\tau}, \quad \text{for} \quad s > \tau. \tag{4}$$

Hence, all information necessary for determining past and future payment-flows among a representative individual of generation k and the LTCI are at hand. The internal rate of return is the discount rate that balances the present value of long-term contribution payments and transfer receipts, i.e. the interest rate that sets equation (1) zero.

$$NPV(z)^j_{k,k} = \sum_{s=k}^{k+D} z^j_{s,k} c^j_{s,k} (1 + i^j_k)^{k-s} \equiv 0. \tag{5}$$

The internal rate of return of a respective cohort is thus computed by an iterative algorithm. All internal rates of return listed in the following sections are referred to in real value terms.

[7]Methodically, the fulfillment of this restriction is achieved as follows: In a first step, the relative age-specific contribution and transfer position of a representative agent $\zeta^j_{s-k,i,s}$ of the corresponding contribution type, respectively transfer type, i is determined on micro level. In a second step, this profile of relative per-capita contribution payments and transfer receipts by age is multiplied by a non-age-specific benchmarking factor, denoted by λ_i, thus assuring that equation (3) is satisfied. Formally, we have: $h_{s-k,i,s} = \lambda_{i,s} \cdot \zeta_{s-k,i,s}$, with $\lambda_{i,s} = \frac{H_{i,s}}{\sum_{j=m}^{f} \sum_{k=s-D}^{s} \zeta^j_{s-k,i,s} \cdot P^j_{s,k}}$ for $s \leq \tau$.

3 Results from measuring the internal rate of return and the introductory benefit

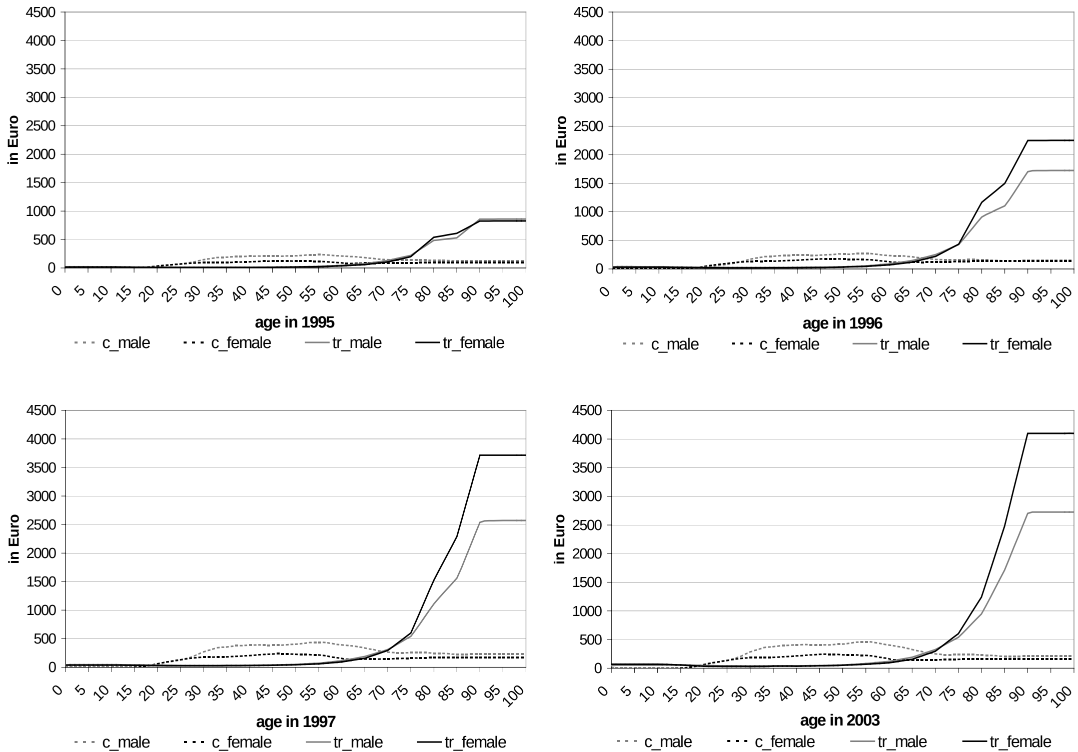
Calculations concerning the internal rate of return will be carried out for the cohort born in 1895, i.e. at the time of the enactment of LTCI in 1995 the 100-year-olds, up to the cohort born in 2025. Yet, it is only the generation born in 1975, i.e. the 20-year-olds in 1995, whose payment-flows actually comprise the whole of the life-cycle.[8] This generation is the first one not to have an introductory benefit through the enactment of the PAYG system, as this generation has to complete the full contribution and transfer phase. Consequently, the 20-year-olds in 1995 constitute the benchmark case to which all other implicit rates of return must be compared. As this section is to quantify the introductory benefit induced by the legislator, we assume that the contribution rate of 1.7 percent equally applies for all generations in all future years.[9] In the next step, this enables us to illustrate the share of implicit debt with which each generation is burdened. As mentioned earlier on, LTCI induced an introductory benefit for all generations already belonging to the circle of potential recipients of long-term care transfers, as well as all those generations who did and do not have to pass through the entire net contribution phase. On average, men of an age of 69 years, women of an age of 64 years belong to net transfer recipients. Compared to the men, women only pay about half of the contribution payments, yet they receive considerably more long-term care benefits. The latter is due to a higher life-expectancy and the more extensive transfers resulting therefrom. Figure 1 displays the age- and sex-specific contribution payments and transfer receipts of the years 1995, 1996, 1997 and of the projection year 2003 in current prices.[10] Conditional on the fact that the contribution rate of LTCI was 1 percent in the period from January, 1^{st} 1995 to June, 31^{st} 1996, the contribution payments for the years 1995 and 1996 are relatively low. Only when the long-term entitlements were extended to cover in-patient benefits on July, 1^{st} 1996,

[8]For simplicity, we neglected the fact that the 0- to 19-year-olds are – although only to a small extent – net recipients. Only considering the payment-flows from an age of 20 has the advantage that the stream of payment-flows over the remaining life-cycle changes sign just once. Multiple rates of return are thus ruled out.

[9]The nominal long-term care benefits as legislated in 1995 are adjusted annually by the growth rate of the economy, i.e. 1.5 percent. See also equation (4). This leads to an equal treatment of all generations on the expenditure side and thus to an adequate comparison of the internal rates of return of different cohorts.

[10]In order to generate the age- and sex-specific profiles macro data stemming from the national accounts 2001 and 2003, see Statistisches Bundesamt (2001) and (2003b) as well as micro data are necessary. The age-specific transfer profiles are generated through data we received on request from the Federal Ministry of Health and Social Security. The profiles for the contribution payments of employees and the unemployed are derived from the German Income and Expenditure Survey (Einkommens- und Verbrauchsstichprobe) 1998. The contribution profiles for the retirees are taken from the Association of German Retirement Insurance Organizations (Verband Deutscher Rentenversicherer) in VDR 1995 to 2001.

Figure 1: Age- and sex-specific contribution and transfer profiles of the years 1995, 1996, 1997 and of the projection year 2003 (at current prices)



the contribution rate was raised from 1 to 1.7 percent.

According to the average contribution and transfer profiles of the respective years, all men born in 1925 and older and all women born in 1930 and older were already net transfer recipients over their remaining life-cycle at the time of implementing LTCI. As the long-term care benefits overcompensate the contribution payments, these cohorts all possess an infinite rate of return:

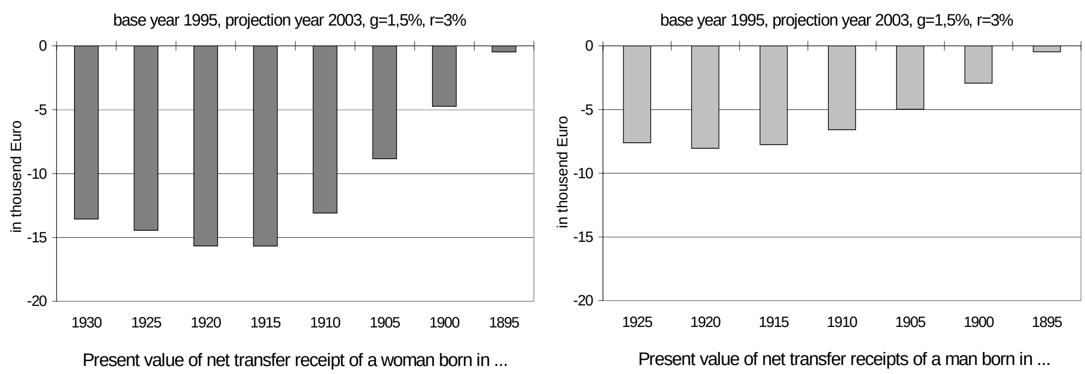
$$i_k^m = \infty \quad \text{for} \quad 1895 \leq k \leq 1925,$$
$$i_k^f = \infty \quad \text{for} \quad 1895 \leq k \leq 1930.$$

Nevertheless, in order to indicate the extent of the introductory benefit due to the LTCI, the present values of the net transfers of the respective cohorts are specified in the following. The net present value of the payment-flows for the respective generations, differentiated by sex, are determined according to equation (1) with the base year t now serving as the period to which all payment-flows are discounted to:

$$NPV(z)_{t,k}^j = \sum_{s=t}^{k+D} z_{s,k}^j c_{s,k}^j (1+r)^{t-s}. \qquad (1')$$

A woman born in 1930 receives net long-term care benefits of about 13,600 Euro without ever having made a net contribution. A woman of birth year 1925 is in similar position. Comparing a male agent of the same cohort clearly shows that he is only benefited by about half of the net transfer receipts, namely 8,000 Euro. The introductory benefit of the 100-year-old agent in 1995 can be computed in the same way. With advanced age of the individuals the net present values decrease. This is due to a shorter remaining lifetime and thus to lower transfer receipts in absolute terms. The introductory benefit of the oldest living generation in 1995 amounted to 470 Euro of out-patient net long-term care transfers.

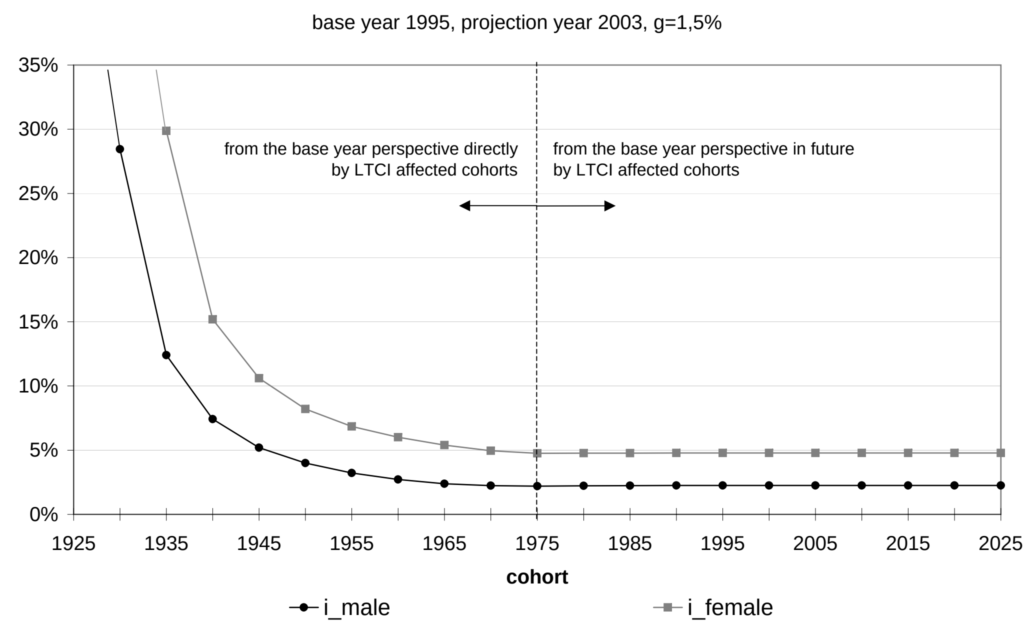
Figure 2: Present value of the net transfers for the cohorts born in 1930, and 1925 respectively, down to the cohort born in 1895 (in prices 2003)



All cohorts belonging to the net contribution payers in 1995, which did not undergo the whole of the net contribution phase, also enjoy an introductory benefit. This applies to all generations born in 1970 and older, since the net contribution phase is only completely traversed by the cohort born in 1975 and younger. The closer a cohort is to the end of its net contribution phase, the more it draws an advantage from the implementation of the PAYG financed LTCI. This can be illustrated by comparing the internal rates of return of the oldest generation that still made a net contribution in 1995, i.e. the male generation 1930 and the female generation 1935, up to the youngest net contributing cohort, i.e. the benchmark cohort 1975 (see Fig. 3). The *introductory benefit* thus results as the difference in the internal rate of return of the respective cohort k to the benchmark rate of return, i.e. the internal rate of return of a 20-year-old agent in 1995: $(i_k^j - i_{1975}^j)$.

The first internal rate of return based on a net contribution phase of four years is that of a male agent born in 1930 and lies at about 28.4 percent. This is reduced to 12.4 percent for a male representative of the cohort 1935, who – compared to the agent

Figure 3: Internal rate of return through implementing LTCI in 1995 under a constant contribution rate



born in 1930 – goes through ten years of net contribution payments. A women also born in 1935 – with, however, only a net contribution phase of five years – achieves an internal rate of return of 30 percent through the enactment of LTCI. Due to the longer net contribution phase, every subsequent generation yields a lower return on their contribution payments and thus has a lower introductory benefit. A man (a woman) born in 1945 still receives an internal rate of return of 5.2 (10.6) percent, but this is reduced to 2.4 (5.4) percent for a man (a woman) of cohort 1965. This, again, is almost the return on contribution payments that the benchmark-cohort yields, which amounts to 2.2 percent for a man and 4.8 percent for a woman.

Given that the contribution rate and the real term transfer level are carried forward in all future periods as assumed here, all cohorts subsequent to the generation born in 1975 are faced with the same internal rate of return as in the benchmark case: $i_k^j = i_{1975}^j, \forall\ k \geq 1975$. This is evident, since the constant contribution rate keeps the return on the contributions on a fixed level. Hence, implicitly assuming a static population, no shifting in burdens takes place as all generations are confronted with an identical contribution rate for the same expected long-term care benefits.

However, reality is entirely different: As the proportion of the old population in relation to the young working population is increasing, the working population has to contribute more to LTCI in order to finance those in need of long-term care. This leads to continuously rising contribution rates, the rise in the contribution rate reflecting no more than the cost of ageing. In the following section the extent to which the respective generations are involved in redeeming the implicit debt of LTCI can be specified with the help of the internal rates of return. At this point, we want to refer to Häcker and Raffelhüschen (2005), who numeralize the implicit debt of the LTCI as a sustainability gap.[11] According to Häcker and Raffelhüschen (2005), the sustainability gap amounts to 32.1 percent of GDP 2003. In absolute terms, this corresponds to an implicit dept of LTCI of almost 0.7 trillion Euro.

4 The internal rate of return of LTCI taking into account the demographic development

In order to calculate the internal rate of return resulting from LTCI under the given demographic development, the equations mentioned in section 2 have to be modified in parts. The modification is thus based on the budget restriction of LTCI. Despite the fact that LTCI is subject to a revenue-orientated expenditure policy as defined in the Social Code, Book XI, the annual deficits have to be balanced through adjustments in the contribution rate. The adjustment factor for the contribution rate is determined for the respective year by setting the expenditure into relation to the revenue. In the following, the indices 1 to 3 relate to the contribution types mentioned above(contribution payments from unemployment support, contribution payments from retirees, and contribution payments from employees) and the indices 4 to 9 relate to the six different types of transfer benefits (out-patient transfers of the care levels 1 to 3 and in-patient transfers of the care levels 1 to 3):

$$q_s = \frac{\sum_{i=4}^{9} \sum_{k=s-D}^{s} \sum_{j=m}^{f} h_{s-k,i,s}^{j} P_{s,k}^{j}}{\sum_{i=1}^{3} \sum_{k=s-D}^{s} \sum_{j=m}^{f} h_{s-k,i,s}^{j} P_{s,k}^{j}} = \frac{\sum_{i=4}^{9} H_{i,s}}{\sum_{i=1}^{3} H_{i,s}}. \tag{6}$$

If $q_s > 1$ this implies a rise in the contribution rate of $100 \cdot (q_s - 1)$ percent compared to the projection year. Formally this means that the contribution rate of the projection year τ for all years $s > \tau$ has to be multiplied with a factor q_s. Hence, the age-specific contribution payments $h^{*}_{s-k,i,s}$ are now given by:

$$h^{*j}_{s-k,i,s} = q_s h^{j}_{s-k,i,s} (1+g)^{s-\tau} \quad \text{for} \quad s > \tau \quad \text{and} \quad i = 1, 2, 3, \tag{7}$$

[11] The sustainability gap identifies the deficit in the intertemporal LTCI budget constraint arising from continuation of current LTC policy. It measures the present value of all future revenues that are lacking to cover the implicit LTC spending commitments.

and consequently the average net payments are:

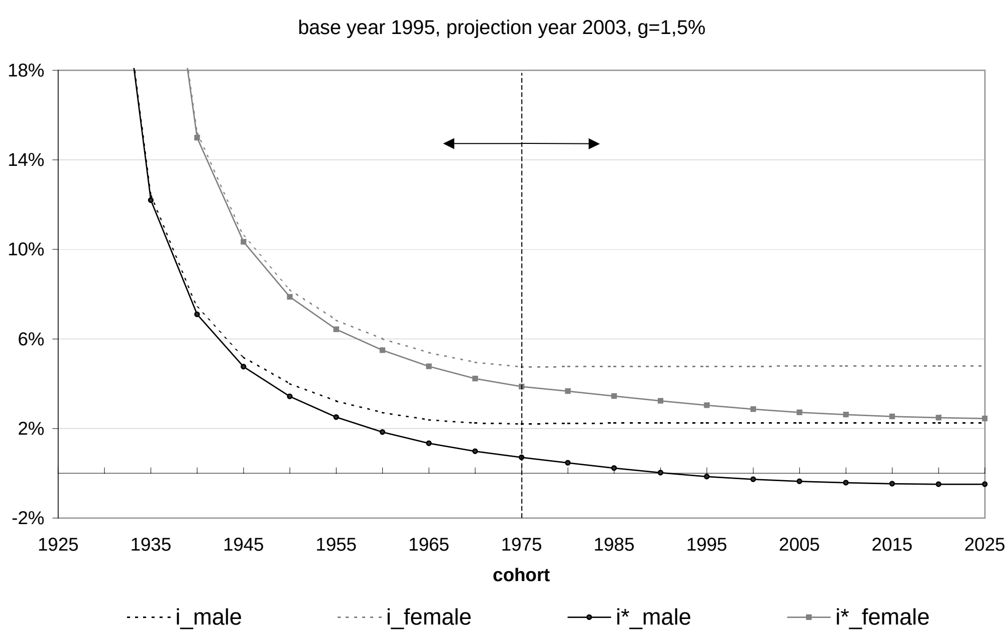
$$z^{*j}_{s,k} = \sum_{i=1}^{I} h^{*j}_{s-k,i,s} \quad . \tag{8}$$

The internal rate of return is in turn the discount rate that sets equation (1) – now under incorporation of equation (7) – equal to zero:

$$NPV(z^*)^j_{k,k} = \sum_{s=k}^{k+D} z^{*j}_{s,k} c^j_{s,k} (1 + i^{*j}_k)^{k-s} \equiv 0. \tag{9}$$

A comparison of the internal rate of return (i^j_k) under a constant contribution rate and the internal rate of return under consideration of the deficit-reassessed contribution rate adjustment of a cohort k shows that a decrease in the implicit rates of return of LTCI evolves (see Fig. 4). The deviation in the internal rates of return resulting therefrom is solely due to the demographic development and thus due to the fact of having to finance the cost of ageing. Hence, the share of *implicit debt* with which a generation is confronted with can be derived from the difference ($i^j_k - i^{*j}_k$).

Figure 4: Internal rate of return of LTCI taking into account the adjustments in the contribution rate



All cohorts born 1955 and older are barely affected by the increases in the contribution rate occurring for the first time in 2009.[12] Hence, in 1995 a 40-year-old man is confronted with a reduction in his internal rate of return of 0.72 percentage points, a woman of the same age-group only has to take a reduction of 0.41 percentage points, which must be ascribed to lower contribution payments. The younger a cohort the bigger the impact of (future) increases in contribution rates on the internal rate of return. The respective generations not only have to pass through a longer phase of higher contribution rates, but these contribution rates also carry on rising over time: starting from 1.7 percent until 2008 the contribution rate rises continuously to its maximum value of 3.9 percent in 2055. Hence, young and future cohorts are particularly affected by the contribution rate adjustments.

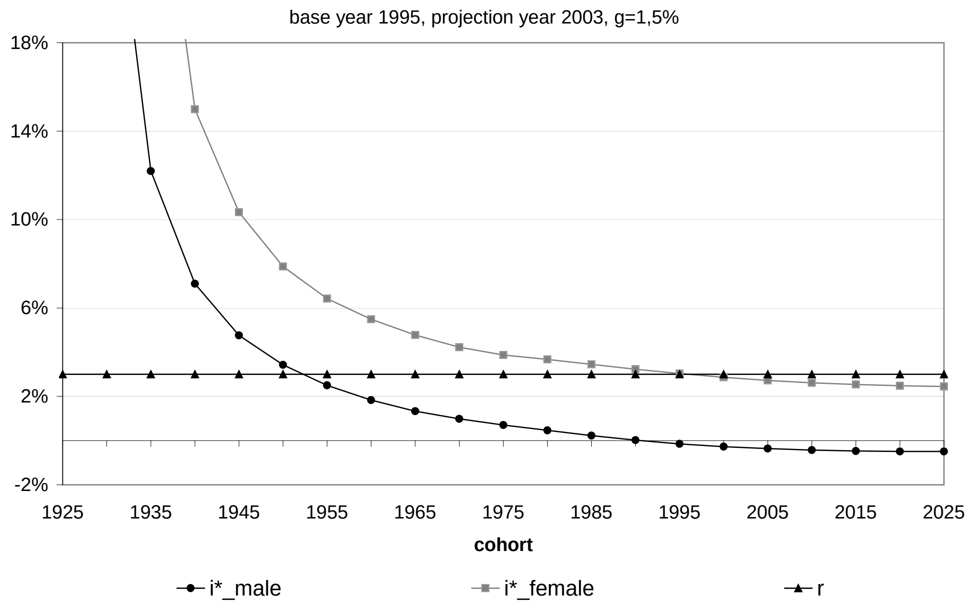
Compared to the hypothetical internal rate of return in the scenario of a constant contribution rate, the internal rate of return of a man of the benchmark-cohort is now reduced by almost 68 percent, namely from 2.2 percent to 0.7 percent. In contrast to this, a woman of the same generation only has a reduction in her internal rate of return of 18 percent, i.e. from 4.6 to 3.9 percent. The further this comparison is taken into the future, the more significant the impact of the rises in the contribution rate on the level of the internal rate of return. Especially all the generations born after 1975 ($k > 1975$) have substantial drawbacks in their implicit rates of return compared to the benchmark-case. The internal rate of return is so far reduced that it becomes negative for men of cohort 1995, namely from 2.25 under the constant contribution rate to -0.15 percent when the necessary adjustments in the contribution rate are made. Although the internal rate of return of a woman born in the same year, all adjustments made, still amounts to 3 percent. This nevertheless constitutes a reduction in the implicit interest rate of 37 percent compared to the benchmark interest rate. In contrast with the constant returns to the contribution payments for all cohorts subsequent to the benchmark-cohort – as illustrated in the previous section –, the demographic development now has a clear impact on the implicit interest rates. It provides an estimate for the share of implicit debt each generation has to redeem. By means of comparing the internal rates of return of a respective generation, it is not only obvious that the implicit rate of return diminishes according to demographic development, it also becomes evident that every generation has to carry part of the demographic aging burden – yet to different degrees. Future generations are particularly burdened by the demographic effect, having to bare the implicit debt to a greater extent.

The last question to be answered refers to who is to pay back the *introductory gain*. Provided the economy is dynamically efficient, the difference in the internal rate of return of an alternative funded system – the market interest rate r – and the implicit rate of return of the PAYG system i_k^{*j} is to be made out as an implicit tax, which is

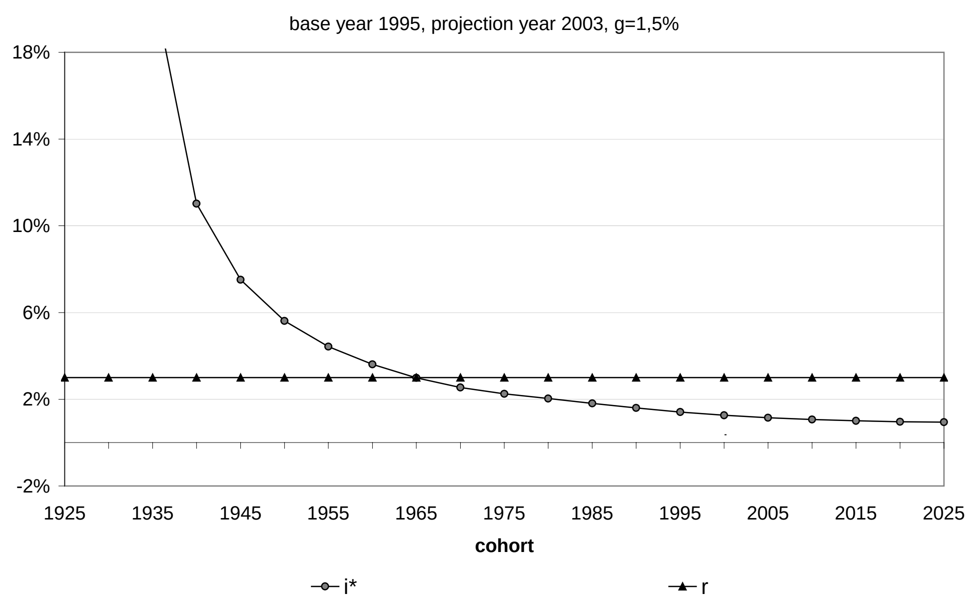
[12] For the projection of the contribution rate, see Häcker and Raffelhüschen (2005).

Figure 5: The redemption of the introductory gain

5a: Internal rate of return of a male and female agent



5b: Average internal rate of return



imposed on all generations through the introduction of the PAYG scheme: $(r - i_k^{*j})$. According to Sinn (2000), who provides a formal illustration, the introductory gain of the first generations is exactly equal to the perpetual implicit tax payments.[13] Thus, the redemption of the introductory gain is left to all generations for whom $r > i_k^{*j}$ applies.

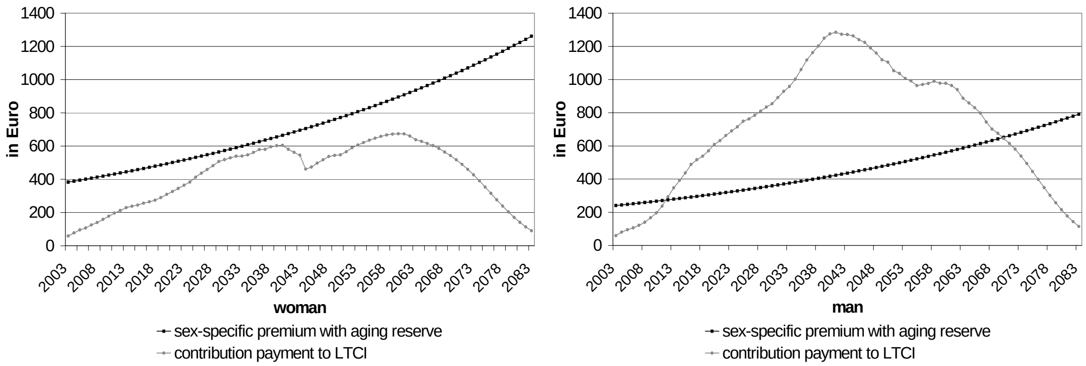
Assuming a real market interest rate of 3 percent,[14] the redemption of the introductory gain is mainly undertaken by men of cohort 1955 and younger – except for a marginal share paid by women of cohort 2000 and younger. This effect becomes stronger, the more the internal rate of return drops within the scope of the PAYG system. While the male cohort of 1955 only pays back only a relatively small share of the introductory gain, the share is already much higher for the subsequent generations. Thus, the implicit tax rises with an increase in aging of the population and only levels off from the cohort 2015 onwards (see Fig. 5a). The fact that the male cohorts born 1955 up to 1970 are participating in paying off the introductory gain, however, also means that (although they still achieve the above mentioned introductory benefit resulting from shorter net contribution phases) they do not stand to make a real gain any longer. Compared to an alternative funded system with a market interest rate r, they can only achieve an internal rate of return of i_k^{*m} within the scope of the unfunded LTCI, thus being effectively worse off, as $i_k^{*m} < r$ $(\forall\ k \geq 1955)$.

The reason for this seemingly exclusive redemption of the introductory gain through men has to be ascribed to the fact that women benefit by their in average lower contribution payments to LTCI. A comparison to the risk-equivalent premiums, which would result within the scope of a fully funded insurance scheme (given identical transfer receipts), shows that for women this would always lie above the contribution payments to LTCI. The reason for this is that in the funded strategy, women have to pay exactly the "price" for LTC transfers, corresponding to their risk profile. Men, on the other hand, would tend to be disburdened within the funded system. While they would have to pay a risk equivalent premium, this would lie substantially beneath their contribution payments to LTCI. This comparison also reveals the intragenerational redistribution taking place within the LTCI between men and women. Figure 6 illustrates the expected development of the premium and contribution payments for a 20 year-old male

[13] See Sinn (2000), S. 394 ff.

[14] For comparison, the calculation of the age- and sex-specific premiums with aging reserve underlies a minimum nominal interest rate of 3.5 percent. See Bundesgesetzblatt (1996), Kalkulationsverordnung, §4. This prescribed minimum interest rate, based on a precautionary principle, ensures a return on premium payments of 3.5 percent even if the economy is in recession. Looking at the average effective nominal net interest rate of the private health care insurers of the last 15 years shows, however, that the nominal interest rate amounted to almost 7 percent in average, see Verband der privaten Krankenversicherung e.V. (2004). The assumption of a long-run real interest rate of 3 percent made here therefore seems legitimate.

Figure 6: Comparison of the annual sex-specific premium and the annual contribution payment to LTCI of a 20-year-old female and male individual in the projection year (in prices 2003)



and female individual in 2003.[15] Over time, the premium – like the contribution payment to LTCI – rises by 1.5 percent according to the adjustment rate of the long-term care transfers. Moreover, in the course of determining the contribution payments to LTCI, the necessary adjustments in the contribution rate were taken into account.

The redistribution occurring in the unfunded LTCI can be exposed by looking at average internal interest rates. This allows us to determine which generations are actually involved in paying back the introductory gain, disregarding any intragenerational redistribution elements. An examination of the average internal rates of return (see Fig. 5b) shows that all generations born in 1965 and younger are burdened with the implicit tax payment. It is only the redistribution within LTCI that produces the effect that women – despite the aging of the population – barely come out worse with LTCI than with the alternative funded system (compare Fig. 5a). Thus, intragenerational redistribution to large parts overcompensates the implicit tax that would actually have to be paid by women. Men, on the other hand, are burdened with a higher implicit tax by the redistribution taking place in unfunded LTCI.

[15] All values are expressed in real purchasing power of the year 2003. For calculation of the sex-specific premium it was assumed that the present value of all expected long-term care receipts over the remaining life-cycle corresponds to the present value of all expected future premium payments. The expected value of the transfer expenditures for every subsequent year results when the age-specific transfers of a respective year are multiplied with the age-specific survival rates. The share, which exceeds the running costs, the so-called aging reserve, was considered with a real interest rate of 3 percent. Basis for these calculations is the transfer profile of the projection year.

5 Conclusion

Considering the example of the introduction of the German statutory long-term care insurance, the intergenerational distribution effect arising under an aging population by the implementation of an unfunded system were illustrated using the concept of internal rates of return. While the introduction of LTCI is to the benefit of the old and oldest generations, thus solving the problem of those already receiving long-term care and those soon in need of such care on account of their age, it at the same imposes an implicit debt onto the system. This is due to the demographic development. This implicit debt has to be redeemed by all succeeding generations who have to put up with increasing contribution rates.

By calculating internal rates of return for the respective cohorts, all redistributive effects through implementing LTCI could be clearly exposed. We distinguished between the redemption of the implicit debt and the implicit tax for paying off the introductory gain of the first generations: while the cost of aging $(i_k^j - i_k^{*j})$ is financed by everyone, though to a large extent by future generations (and this independent of whether the individual is of male or female sex), the repayment of the introductory gain $(r - i_k^{*j})$ is apparently undertaken almost exclusively by men. This, however, is only due to the fact of substantial sex-specific redistributive elements within the LTCI.

We thus find a significant intragenerational redistribution in LTCI to the benefit of women. The extent of this is such that, despite the demographic development, female individuals of today's young and future generations are only marginally worse off within the unfunded LTCI than in an alternative funded system. Through this redistribution, women are disburdened to such an extent that they barely net contribute to paying back the introductory gain. Young and middle-aged men clearly lose through the implementation of the LTCI on a PAYG basis. They not only have to put up the *inter*generational redistribution towards their parent generation, but also with the *intra*generational redistribution towards the female sex.

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