Deutsches Institut für
Wirtschaftsforschung

First publ. as: Discussion Papers / DIW ; 817 (2008). Berlin : Deutsches Institut für Wirtschaftsforschung, 2008

DIW BERLIN

Discussion Papers

817

Friedrich Breyer • Stefan Hupfeld

Fairness of Public Pensions and Old-Age Poverty

Berlin, November 2008

IMPRESSUM

DIW Berlin
German Institute for Economic Research
Mohrenstr. 58
10117 Berlin
Tel. +49 (30) 897 89-0
Fax +49 (30) 897 89-200
http://www.diw.de

ISSN print edition 1433-0210
ISSN electronic edition 1619-4535

Fairness of Public Pensions and Old-Age Poverty

Friedrich Breyer and Stefan Hupfeld

Corrected Version, November 27, 2008

Abstract

In several OECD countries, public pay-as-you-go financed pension systems have undergone major reforms in which future retirement benefit promises have been scaled down. A consequence of these reforms is that especially in countries with a tight tax-benefit linkage, the retirement benefit claims of low-income workers might not even exceed the minimum income guarantee which the government provides the aged. Recently, some German politicians have criticized this likely development because it was unjust that persons who have paid contributions over a long working life end up with no higher benefits than people who have never worked or paid any contributions. However, the government defended the current retirement benefit formula with the argument that every Euro paid as contributions had exactly the same value in generating future retirement benefits. But this logic has been questioned recently, e.g. by Breyer and Hupfeld (2009), since the value of a contributed Euro depends on the life expectancy of the individual, which is positively correlated with annual income. In that earlier paper, we introduced the concept of „distributive neutrality“, which takes income-group-specific differences in life expectancy into account.

The present paper estimates the relationship between annual earnings and life expectancy of German retirees empirically and shows how the formula that links benefits to contributions would have to be modified to achieve distributive neutrality. We compare the new formula to the benefit formulas in other OECD countries and analyze a data set provided by the German Pension Insurance Office on a large cohort of pensioners to find out how the old-age poverty rate would be affected by the proposed change of the benefit formula. Finally, we discuss other possible effects of a change in the benefit formula, especially on the labour supply of different earnings groups.

Keywords: social security, life expectancy, poverty, redistribution, *JEL*: H55, I38

Valuable comments by Normann Lorenz, Silke Übelmesser and Martin Werding are gratefully acknowledged. This research was supported by the Deutsche Forschungsgemeinschaft under grant BR 740/15-2.

Affiliation: Breyer: DIW Berlin and University of Konstanz, Hupfeld: University of Konstanz,

Corresponding Author: Friedrich Breyer, University of Konstanz, Fach 135, D-78457 Konstanz, Friedrich.Breyer@uni-konstanz.de.

1. Introduction

In several OECD countries such as Germany and Sweden, public pay-as-you-go financed pension systems have undergone major reforms. Essentially, future retirement benefit promises have been scaled down in order to keep contribution rates affordable for future generations. A negative consequence of these reforms is that especially in countries with a tight tax-benefit linkage, the retirement benefit claims of low-income workers might not even exceed the minimum income guarantee which the government provides every citizen including the aged. Recently, some German politicians have criticized this likely development for two reasons, an equity and an efficiency reason. First, they claim that it was unjust that persons who have paid contributions over a long working life end up with no higher benefits than people who have never worked or paid any contributions. Secondly, they argue that the social security contribution must be felt like a pure tax if the corresponding benefit does not exceed the amount that can be claimed by any citizen without any precondition.

The reaction of the government was only partly positive. While the problem was acknowledged in principle, the government refused to change the formula for calculating retirement benefits in the mandatory old-age pension system. Instead it proposed to top up small old-age pensions by a specific tax-financed supplement. This may not sound good news in the ears of future tax payers because they will have to bear the costs of regular pensions, pension supplements and social assistance payments to the aged combined.

The main argument of the German government for not interfering with the present pension formula is that it is claimed to be a specialty of the German system that every Euro paid as contributions has exactly the same value in generating future retirement benefits. But is this really the case? As has been shown by the present authors in Breyer and Hupfeld (2009), the value of a contributed Euro is not always the same but depends on the life expectancy of the individual, and there is now a wealth of evidence from many countries that life expectancy is positively correlated with annual income.[1] In that earlier paper, we introduced the concept of „distributive neutrality“, which is actually a generalization of the well-known concept of „Teilhabeäquivalenz“ (tax-benefit proportionality) and takes income-group-specific differences in life expectancy into account. We then analyzed whether distributive neutrality of the system could be achieved by reducing the discounts for early retirement.

The present paper extends the notion of distributive neutrality and asks how the formula that links benefits to contributions would have to be modified to make the ratio of total benefits to total lifetime contributions independent of the ability of the worker, which we

[1] See, for example, Attanasio and Emmerson (2003) for the UK, Deaton and Paxson (2004) and Duggan et al. (2007) for the United States, and Reil-Held (2000) and von Gaudecker and Scholz (2007) for Germany. Cutler et al. (2006) provide a comprehensive survey.

measure by his annual earnings. The new formula proposed in Section 2 will be proportional in the years of contributions but concave in annual earnings. Subsequently, in Section 3, we shall compare this formula to the benefit formulas in other OECD countries.

In Section 4, we then analyze a data set provided by the German Pension Insurance Office on a large cohort of pensioners to find out how the distribution of monthly pensions, in particular at the lower end, would be affected by the proposed change of the benefit formula. In Section 5, we discuss other possible effects of a change in the benefit formula, especially those on the labour supply of different earnings groups. Finally, Section 6 concludes.

2. Deriving a New Benefit Formula for Germany

2.1 The Principle of Distributive Neutrality

The principle of "Teilhabeäquivalenz", on which the German retirement benefit formula is based, states that within any cohort of individuals insured by the mandatory pension system, monthly benefit claims are proportional to lifetime earnings, which can be calculated as the product of years of contributions and average annual earnings. This principle is meant to express the absence of redistribution through the system of contributions and benefits. However, the creators of the formula have overlooked two things:

1. To measure redistribution, the right objects of comparison should be contributions and benefits rather than earnings and benefits. This distinction is important if both contribution rates and individual earnings (e.g. labour supply) vary over time because individuals with high earnings in periods of high contribution rates pay higher overall contributions than otherwise identical individuals with the reverse earnings pattern.
2. To avoid systematic redistribution it is not sufficient to fix *monthly* benefits if there are foreseeable differences in the expected period in which benefits are claimed, e.g. across socioeconomic groups. Thus, it would make much more sense to focus on *total expected benefits* instead.

The property of the German pension system mentioned in point 1 was criticized by one of the present authors in several earlier publications (e.g. Breyer et al. 2004) and will be ignored here. In contrast, the reasoning in point 2 lies at the heart of the concept of "distributive neutrality" proposed by Breyer and Hupfeld (2009):

> <u>Definition</u>: A social security system satisfies "distributive neutrality" if the ratio between total benefits and total contributions does not vary systematically with average annual earnings.

As total expected benefits are the product of monthly benefits and life expectancy after retirement, differences in life expectancy across income groups will have to be matched by inverse differences in monthly benefits to achieve equality in (expected) total benefits and thus distributive neutrality.

Suppose, e.g., that there is a linear relationship between remaining life expectancy at retirement (L_i) and annual income, measured by the individual's "pension points" per year, P_i,

(1) $$L_i = \alpha + \beta \cdot P_i, \qquad (\alpha, \beta > 0)$$

where the latter is simply the average over time of the ratio between the individual's earnings Y_{it} (up to a ceiling) and the mean contributable earnings of the period, $\overline{Y}_t$, such that

(2) $$P_i = \frac{1}{T}\sum_{t=1}^{T}\frac{Y_{it}}{\overline{Y}_t}.$$

For simplicity, suppose further that all income groups have the same length of working life (T) and thus total contributions paid by an individual (C_i) are roughly proportional to his annual points:

(3) $$C_i \approx c \cdot P_i \cdot T,$$

where c is a constant that reflects the contribution rate.

According to the existing benefit formula, annual retirement benefits in a given year (R_{it}) are proportional to total points, $P_i \cdot T$,

(4) $$R_{it}^{act} = R_t^{act}(T, P_i) = 12 \cdot V_t \cdot P_i \cdot T,$$

where V_t denotes the monthly "point value" in a given year, so that total expected benefits (B_i) are approximately given by

(5) $$B_i \approx R_{it}^{act} \cdot L_i = b \cdot P_i \cdot T \cdot L_i,$$

where b is a factor of proportionality that captures the time path of point values during the period of retirement. From (3) and (5) it is immediately clear that the ratio of total benefits to total contribution is an increasing function of life expectancy:

(6) $$\frac{B_i}{C_i} = \frac{b \cdot P_i \cdot T \cdot L_i}{c \cdot P_i \cdot T} = \frac{b}{c} \cdot L_i \mathrel{\hat{=}} L_i.$$

By (1), life expectancy in turn is an increasing function of points-per year P_i. Therefore, to neutralize the indirect effect of income on life expectancy, the formula for annual benefits, which is now linear in points-per year, must be redefined in the following way (where $\overline{L}$ denotes mean life expectancy over all earnings groups):

(7) $$R_{it}^{pot} = R_t^{pot}(T, P_i) = 12 \cdot V_t \cdot \frac{P_i \cdot T \cdot \overline{L}}{L_i} = 12 \cdot V_t \cdot \frac{P_i \cdot T \cdot \overline{L}}{\alpha + \beta \cdot P_i}.$$

By inserting (7) into (5), we immediately see that the ratio B_i / C_i becomes a constant and thus independent of P_i. We note that for positive values of β, the function R_t^{pot} is increasing and concave in P_i, while it is still linear in T.

2.2 Application to German Data

2.2.1 The Data Set

The data used in this analysis is a data set with pension discontinuations from 1994 to 2005, published by the Federation of German Pension Insurance Institutes (Deutsche Rentenversicherung Bund), see FDZ-RV (2007a). It contains a 10% sample of all discontinued public pensions due to the death of the beneficiary, which amounts to roughly 828,000 observations. However, each observation corresponds to a pension, and not to an individual retiree, who can benefit from more than one pension. This is the case for individuals who receive a pension due to the death of a spouse before they are eligible for their own pension, or individuals who receive a disability pension which is transformed to an old-age pension. Correcting this, we are left with 752,380 observations. The variables we use are described in detail below:

- Benefit claims: The sum of pension benefit claims, measured in points. One point corresponds to one year of contributions based on the average income of those who contribute to the social insurance schemes. Two years with average contributions or one year with income and contributions twice the average both yield two points, and so on.
- Years of contributions: The number of years in which own contributions have been paid.
- Age at death: The observed age at which a pensioner dies.
- Benefit Claims per Year: Constructed as average benefit claims earned per year of contribution.

2.2.2 Imputation of Missing Values, Weighting Scheme, and Descriptive Statistics

A major legislative change in 1992 (essentially the introduction of early retirement discounts) affects the calculation of pension benefit claims at retirement age. Among others, the variable 'years of contributions' has been adjusted, such that for any retirement before 1992 this variable is not feasible anymore (benefit claims were based on a different measure of years of contribution). Public pension administration based the pensions of all individuals who retired after 1992 on the new measure, which is included in the data set. Yet, years of contribution are highly relevant as they are necessary to compute average claims per year on which we base our income-life expectancy estimation.

Following the taxonomy of Little and Rubin (2002, pp.4, 12), the missing data problem we face is univariate and the data is missing-at-random, since the mechanism driving the 'missingness' is based on observables (namely the year of retirement) only. Note that the mechanism is not random, which would imply independence from all variables we observe. We apply 'best-subset' regression imputation based on the following list of variables: sum of benefit claims, year of birth, year of first pension benefit payment, first year of actual pension benefit payment, and dummies for manually calculated pensions, for public health insurance, for old-age pension, and for each federal state (or foreign residence). Regressing the non-missing subset of the variable `years of contribution' on the above mentioned variables (or a subset of them, once the regressors themselves suffer from missing values) yields parameters which allow a prediction by which we replace the missing values. If we find this prediction to be smaller than 1 (which is unreasonable), we replace it with 1. The censoring is only necessary for 1.3% of the observations and the results are robust against the application of other procedures, e.g. the simple exclusion of unreasonably low values.

Additionally, observed life expectancy is biased downwards because it has been increasing with the year of birth, but the present sample only partially accounts for this increase. Especially individuals from younger birth cohorts (whose ex ante life expectancy should be higher) only appear in the sample if they died relatively young. The approach to correcting the selection bias is the following. As the relationship between increased life expectancy and year of birth is empirically linear (Statistisches Jahrbuch 2007, p.54, Human Mortality Data Base 2005), a linear weighting function, which decreases with the year of birth, corrects the bias. The choice parameter is the slope of the weighting function, while the intercept serves as a normalizing constant that limits the range of the potential slopes in order to ensure the non-negativity constraint. If y denotes the year of birth (normalized to zero for the earliest birth cohort), the weighting function ω has the following form, with s being the slope parameter:

(8) $$\omega(y) = 1 - s \cdot y$$

We select the weighting function such that the weighted mean life expectancy across all individuals corresponds to the mean age-at-death of the pensioners with the average year-of-birth of 1922. This is the case at $s = .00205$. To include the effect of rising life expectancy over time, the regression could also include dummies for each birth cohort or the year of birth as additional regressor; this way, however, life expectancies would be biased downwards, as selection due to both rising life expectancy and observed early death in our death cohort could not be distinguished. In Table 1, we present descriptive statistics of the weighted data set, including imputed values for ‘years of contribution’.

Table 1: Descriptive Statistics of Data Set "Pension Discontinuations"

Variable	Mean	St. Dev.
Age at Death	75.16	10.55
Sum of Benefit Claims	41.21	17.24
Years of Contribution	32.79	10.72
Benefit Claims per Year	1.23	.35
No. Of Observations	382,262 (male population only)	

A simple least squares regression with "benefit claims per year" as the only regressor then gives the parameters α and β we define in Equation (1); see Table 2, column 1 for the regression results, which corroborate the positive relationship between income (as measured in average benefit claims) and life expectancy for the male population. As an alternative, we estimated a quadratic relationship between life expectancy and benefit claims per year (Table 2, column 2), but the results were very similar, in particular the inclusion of the quadratic term contributes very little to the goodness of fit. Here the life-expectancy curve is slightly concave, and its slope decreases from 4.48 to 3.55 as we move from the lower end of the distribution of benefit claims per year (P=.5) to its upper end (P=2). Due to the slight differences, we chose to base the further analysis on the linear relationship, which is easier to interpret.

Table 2: Regression Results, Dependent Variable: Age at Death

Variable	(1)	(2)
Constant	70.17*** (.07)	69.78*** (.22)
Benefit Claims per Year	4.05*** (.06)	4.79*** (.10)
Benefit Claims per Year, squared	-	-.31*** (.12)
R^2	.01819	.01825
No. Of Observations	382.262 (male population only)	

(robust standard errors in parentheses; *** denotes significance on the .99 level)

The results can be interpreted as follows: if the average benefit claims earned per year increase from 1 to 2, life expectancy increases by 4.05 years. Starting from life expectancy of 70.17 years for the poorest individuals, the average pensioner with 1.23 points per year has the average life expectancy of 70.17 + 4.05*1.23 years = 75.15 years. The size of the difference in life expectancy between the lower and the upper end of the earnings distribution is entirely in line with the results from previous studies such as Reil-Held (2000) and von Gaudecker and Scholz (2007).

3. Impact on the Distribution of Retirement Benefits

3.1 The Data Set

To compute the actual and potential distribution of retirement benefits, we use a data set similar to the one we describe in Section 2 (see FDZ-RV 2007b). In this case, we observe a 10% sample of pensioners who are alive and receive a benefit payment during 1993 to 2004. The total number of pensioners we observe is 1,885,355, of which 770,510 are men living in Germany. In order to capture a complete birth cohort we have to ensure that in the year for which we calculate the distribution of benefits, everybody belonging to this cohort has already retired, which is at the age of 65. We restrict our analysis to observations from the year 2004, because in this year, we cover the greatest amount of birth cohorts. We are finally left with 39,754 male pensioners. The value of each point of benefit claims was 26.13 € in West Germany and 22.97 € in East Germany. See Table 3 for descriptive statistics of the variables of interest, which are

- The year of birth: We present the distribution of benefit payments for single cohorts in order to rule out macroeconomic/demographic effects.
- Sum of Benefit Claims: The same variable as defined in Section 2. We use the sum of points to calculate the actual benefit payments.
- Years of contributions: The number of years in which own contributions have been paid, as defined in Section 2.

Table 3: Descriptive Statistics of Data Set "Current Pensions"

Variable	Mean	St. Dev.
Year of Birth	1932.98	5.28
Sum of Benefit Claims	51.56	11.14
Years of Contribution	42.72	3.31
Benefit Claims per Year	1.21	.24
No. of Observations	39,754 (male population in 2004 with at least 35 years of contributions only)	

3.2 The Current Distribution of Retirement Benefits: Implications for Old-Age Poverty

For the given data and benefit formula, we present the means and standard deviations of the benefit payments in Table A1 in the Appendix for different cohorts observed in the year 2004, together with the fraction of pensioners with a monthly pension below the social assistance income achievable without any benefit claims. We define this threshold as the unconditional payments to the elderly (the so-called 'Grundsicherung im Alter') in the year 2004. The average entitlement of a single was 589 EUR, including housing subsidies and health insurance (the latter are subject to a discrete decision; see Statistisches Bundesamt

2005, Table 3.1).[2] By concentrating on this threshold we commit two possible errors: first we ignore additional household members, e.g. a spouse, and secondly we ignore additional household income, e.g. the spouse's pension, private pensions and capital income. These two types of error bias the results in opposite directions. While additional household members would increase the poverty risk, extra income would decrease it. As we can not observe either of these data, our results can only be taken as tentative. It can, however, be conjectured that the first error will be somewhat larger than the second one so that the share of pensioners below the social assistance threshold will be, if anything, slightly underestimated.

We report all figures for birth cohorts between 1919 and 1939 in order to ensure that everybody is at least 65 and therefore eligible for pension benefits. We exclude earlier birth cohorts, because the respective number of observations declines rapidly the older the pensioners are.

It is striking that the average male pension is (almost monotonically) decreasing in the birth year, starting with 1462.3 Euro for the birth cohort of 1919 and ending at 1245 Euro for those born in 1939. This is partly a consequence of the fact discussed above that life expectancy is an increasing function of earnings and thus the older birth cohorts are a positive selection by earnings and consequently the average retirement benefit of the survivors is higher than the mean value for the whole birth cohort when it was still complete at age 65. In addition, the formula for calculating the period of benefit claims was more generous for the earlier cohorts.

As a further consequence, the share of pensions below a threshold (in particular the social assistance payment for singles, TS) must be increasing in the birth year, a fact that is clearly observable in lines 3 and 4 of Table A1. We find that in total 1.2 per cent of all benefit payments to individuals with at least 35 years of contributions are below the social assistance level for singles.[3] It must be emphasized that for the reasons given above, this share can not be interpreted as old-age poverty rate but only as a rough proxy for it.

3.3 The Potential Distribution of Retirement Benefits and Potential Old-Age Poverty

Applying our adjusted benefit formula, we calculate the potential distribution of benefit payments. We utilize the results of Table 2 and subtract 65, such that our new benefit formula adjusts for remaining life expectancy after 65. In order to preserve the original level of benefits, we rescale the benefit formula by the mean of the remaining life expectancy, such that Equation (7) applied to real data becomes

[2] The respective figure for a couple was 1060 EUR, which corresponds to 180% of the former figure, according to the applicable equivalence scale.

[3] 19.3 per cent of all payments to members of this group are below the social assistance level for couples.

$$(9)\quad R_t^{pot}(P_i) = \frac{12 \cdot V_t \cdot P_i \cdot T \cdot \left((\overline{\alpha + \beta \cdot P}) - 65\right)}{(\alpha + \beta \cdot P_i) - 65} = \frac{12 \cdot V_t \cdot P_i \cdot T \cdot (75.16 - 65)}{70.17 + 4.05 \cdot P_i - 65} = \frac{12 \cdot V_t \cdot P_i \cdot T \cdot 10.16}{5.17 + 4.05 \cdot P_i}.$$

As an additional constraint, we scale all pensions of a birth cohort by the same factor in order to ensure that the total amount of benefits paid to this specific cohort remains constant, i.e. our proposal is neutral with respect to the budget constraint of the public pension system. In Table A1, a scaling factor below 1 indicates that our hypothetical pension is higher on average than the actual pension and all hypothetical pensions have to be scaled down by this factor, and vice versa for a scaling factor above 1. Interestingly, for the majority of birth cohorts the respective scaling factor is greater than one, hence after application of our new benefit formula, all pensions can – on average – be increased by 1%.

The results of these calculations are presented in Figure 1 and in lines 5 and 6 of Table A1. We find that our new benefit formula (9) shifts probability mass from the very poor to the right, as can be seen in the density curves in Figure 1, where we plot the density of the actual pensions against hypothetical pensions (scaled) for the birth cohorts of 1920, 1925, 1930, and 1935. The decreasing number of very low pensions is accompanied by a decrease of the amount of very high pensions.

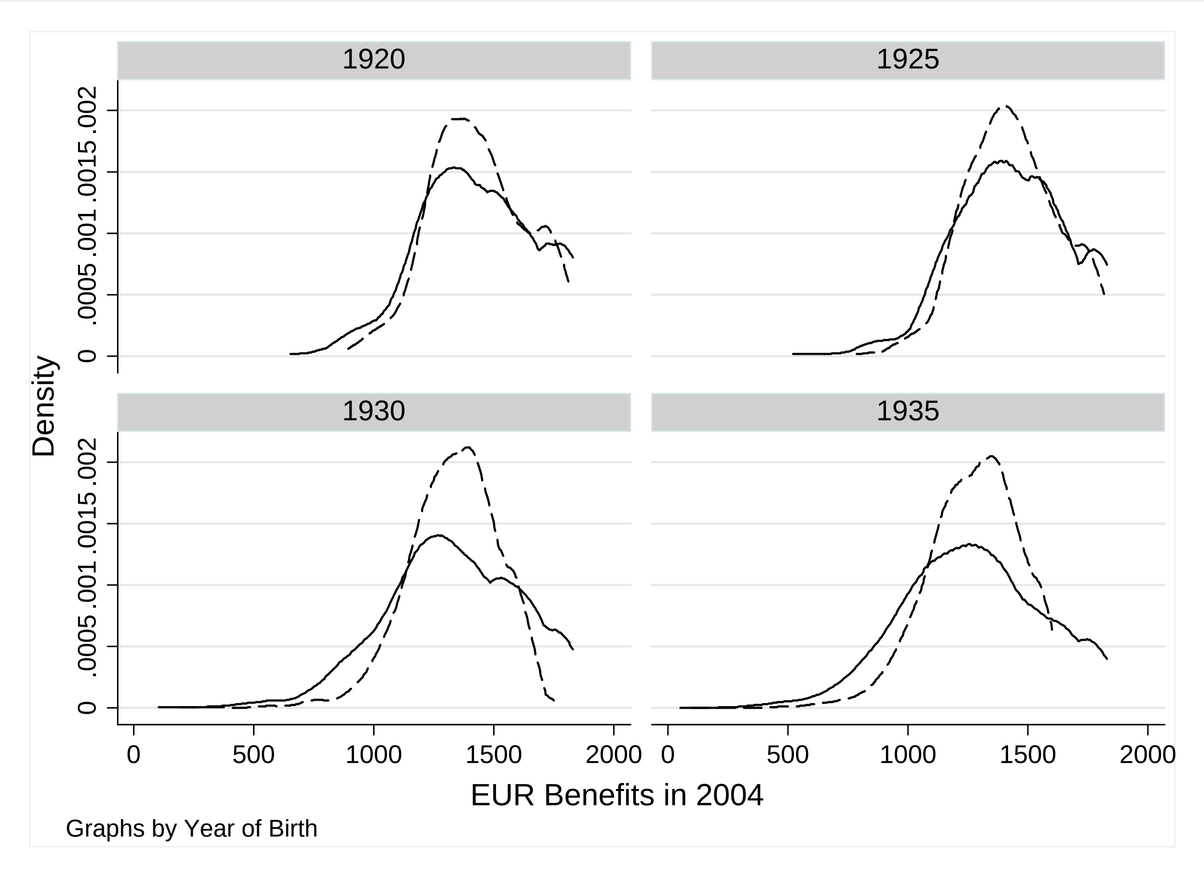

Figure 1: Density of Actual Pensions (solid) and Hypothetical Pensions (dashed)

Turning to Table A1, we find that the fraction of pensioners with benefits below the threshold TS decreases considerably. The most important result can be found in the last column which contains summary information. With the new formula, the fraction of pension payments to long-term contributors which is below the social assistance level for singles, TS, drops to .26 per cent, a reduction by 78% from the current figure. Thus the potential for old-age poverty would be greatly reduced if this new benefit formula were implemented.

While the absolute size of the poverty rate appears to be very low at present, old-age poverty is predicted to increase over the next decades, as replacement rates are scheduled to adjust to the increasing old-age dependency ratio. While the current (2007) replacement rate in the German public pension system is 51%, this rate will decrease to 46% in 2020 and to 43% in 2030, following a report of the German federal government (Bundesministerium für Arbeit und Soziales 2007). This is necessary in order to limit the inevitable increase of contribution rates, which should not exceed 22% in the year 2030. So under the current regime, a uniform decrease of all pensions from the current to the future replacement rate (hence, a decrease of 15.7%) will push more individuals below the threshold TS than under our potential formula. See also Table A1 for the respective fractions of pensioners below the threshold under both pension regimes. We find again that our potential benefit formula significantly diminishes the fraction of pensioners below the threshold.

In the comparison of current and potential benefit formulae, we only include pensioner with at least 35 years of contributions. If we reduce this minimum period of contributions to 30 years, the fraction of pensioners increases, indicating a more severe impact of old-age poverty on this group; see Table A2.

Table 4: Percentage of Pension Payments below Social Assistance Threshold (at least 30/35 Years of Contributions, all Birth Cohorts in 2004)

Years of Contributions	Replacement Rate	Benefit Formula		Percentage Decrease
		Current	Potential	
35	0.51	1.23	.26	78.44
35	0.43	2.41	.56	76.93
30	0.51	1.77	.47	73.33
30	0.43	3.33	1.04	68.87

Table 4 presents an overview of the results. We can summarize our findings by stating that as long as only single male pensioners with at least 30 years of contributions are considered, the share of persons with retirement benefits below the social assistance line is currently small and will remain rather small (at most a little over 3 per cent) even if benefit rates are cut to their 2030 levels and everything else remains constant. However, with the benefit formula proposed here, the "poverty rate" can be further reduced by a considerable fraction (between two-thirds and four-fifths) to 1 per cent or less.

4. Contribution-Benefit Linkage in other OECD Countries

In the OECD, there is a wide variety of ways in which retirement benefits depend upon lifetime contributions of the retiree, ranging from no link at all (uniform benefits) to perfect proportionality. In the following overview (Table 5) we shall focus on those pensions that are 1) mandatory and 2) unfunded because this is the only branch of the pension system in which redistribution could play a role. We chose to form four groups of countries which are characterized by the following properties:

I. Uniform basic pension: The retirement benefit is either the same for every pensioner or depends exclusively on parameters unrelated to income, such as length of citizenship.

II. Benefits degressively rising with contributions.

III. Benefits proportional to contributions subject to a minimum (and perhaps also a maximum) pension.

IV. Benefits proportional to contributions with or without an income ceiling above which marginal contributions are zero.

Table 5: Country Groups by Contribution-Benefit Linkage[4]

Group	Properties	Countries
I	Uniform basic pension	Australia, Canada, Denmark, Ireland, Netherlands, New Zealand, UK
II	Benefits degressively rising with contributions	Iceland, Japan, Korea, Luxemburg, Mexico, Norway, Switzerland, USA
III	Benefits proportional to contributions subject to a minimum pension	Belgium, Czech Rep., Finland, France, Sweden
IV	Benefits proportional to contributions with/without income ceiling for contr.	Austria, Germany, Greece, Hungary, Italy, Poland, Slovak Rep., Spain, Turkey

Thus, while Germany presently belongs to a group of countries characterized by a relatively strong contribution-benefit linkage (Group IV), the reform discussed here would move her to Group II, which exhibits a somewhat weaker linkage. However, whereas a degressive relationship between monthly benefits and lifetime contributions is usually seen as a method of income redistribution towards lower income groups, the benefit function

[4] Sources: OECD (2007), Döring (2007).

proposed in Section 2.2 is so designed as to eliminate systematic income redistribution towards higher income groups on a lifetime basis.

To see the difference, consider two typical representatives of Group II, Switzerland and the U.S.

1. In the first, unfunded pillar of the Swiss public pension system, the linkage between average annual income (*Y*) and *annual* retirement benefit (*R)* can be described by the equation (all figures in CHF)

$$(10) \qquad R(Y_i) = \begin{cases} 13,260 \quad \textit{if} \quad Y_i \le 13,260 \\ 13,260 + 0.2 \cdot (Y_i - 13,260) \quad \textit{if} \quad 13,260 < Y_i \le 79,560 \\ 26,520 \quad \textit{otherwise} \end{cases},$$

   which implies that over a wide range of incomes (between 13,260 and 79,560 CHF), an additional CHF in annual income yields an additional retirement benefit of only 0.2 CHF, whereas below and above this range, the retirement benefit becomes entirely flat.

2. As a second example take the U.S. Here the retirement benefit is determined from the average annual income of the best 35 years using the formula (all figures in USD)

$$(11) \quad R(Y_i) = \begin{cases} 0.9Y_i \quad \textit{if} \quad Y_i \le 8,532 \\ 7,679 + 0.32 \cdot (Y_i - 8,532) \quad \textit{if} \quad 8,532 < Y_i \le 51,456 \\ 21,415 + 0.15 \cdot (Y_i - 51,456) \quad \textit{otherwise} \end{cases}$$

In Figure 2 (in the Appendix), we plot the graphs of the actual and potential German benefit formulae (4) and (9) for the year 2007 together with the U.S. and Swiss formulae, (10) and (11), where CHF and USD values were converted to Euro values according to the exchange rates as of July 2008. If annual earnings are above EUR 63,000, the German pension system restricts additional contributions and therefore additional benefits, which we take into account in Figure 2.[5] The maximum amount of benefit claims per year is therefore 2.14 points, providing an annual pension of EUR 26,334 in the current benefit formula, and EUR 19,365 following our potential benefit formula. The graphs present the relationships between annual income and annual retirement benefits.

We observe that while the Swiss benefit formula is clearly redistributive, due to the co-existence of a minimum and a maximum benefit with contribution schedule, which is a proportional income tax, the potential German benefit schedule looks very similar to the U.S. schedule, the main difference being the somewhat arbitrary bend points in the U.S. curve, which are avoided in the formula proposed in this paper. Apart from this peculiarity, it can be

[5] For Germany, we assume the average number of years of contributions to be 39.1, an average annual income of EUR 29,488, and the current point value of EUR 26.27 (figures of 2007).

conjectured that the U.S. social security system, although seemingly redistributive, comes in fact very close to distributive neutrality, provided that the relationship between earnings and life expectancy is similar in the U.S. as in Germany.[6] In terms of annual benefit payments, individuals with annual earnings greater than EUR 36,332 would lose, while all others would gain from the new benefit formula (the exact amount of redistribution can be measured by the area between the actual and potential retirement benefit formula).

5. Indirect Effects

While the results reported in Section 3 deal exclusively with distributional effects, it must be considered that a reform of the retirement benefit formula can also have important incentive effects and may therefore influence the efficiency of resource allocation. In particular, in a dynamically efficient economy (where the interest rate exceeds the growth rate) any unfunded mandatory pension system induces an implicit tax on labour supply because the present value of future retirement benefits (for an increase of labour supply by one hour) falls short of the corresponding contributions.

While this implicit tax typically varies along the life cycle (Fenge, Uebelmesser and Werding 2006), in the German public pension system it should not vary across income groups because of the tight contribution-benefit linkage. Now changing the formula in the way described above would change the size of the implicit tax in a predictable way: for low income groups, the tax rate would fall, but for high income groups, it would rise. How would that affect the size of the total excess burden from pension contributions? Of course, the answer depends upon the labour supply elasticities of the respective income groups.

There have been only a few attempts at estimating labour supply elasticities by income groups. Aaberge and Colombino (2004) in a data set for Norway and Italy find own-wage elasticities for male labour supply strictly declining with income that range between .32 and .05 for most wage deciles (except for the first two deciles in Norway where they find values of 1.77. and 1.17). Immervoll et al. (2007), quoting an empirical work by Blundell (1995), distinguish between participation elasticities and hours-of-work elasticities. While they propose values for the former declining from 0.4 in the first quintile to 0 in the last quintile, they set the latter equal to .1 for all income groups. So the common result of these studies is that male labour supply reacts very little to changes in the effective wage except perhaps at the very low end of the wage distribution and that, if anything, this reaction is declining with the wage.

[6] Hurd and Shoven (1986) find that – despite the progressive elements in the US pension system – the ratio between benefits and contributions is almost constant over different wealth groups, because the non-proportional elements are offset by mortality differences. In a careful study of the tax-benefit schedule, Coronado et al. (2000) even find that the U.S. social security system might on the whole redistribute from the poor to the rich.

Hence, raising the retirement benefit at low incomes and lowering it at high incomes would on the whole increase (uncompensated) labour supply and decrease the excess burden from taxation. Thus the allocative effects of the proposed reform of the retirement benefit formula would, if anything, be advantageous.

In addition, there could be an indirect effect of the change in size of retirement benefits on mortality, especially in the lower income groups. If low retirement income is by itself a factor which increases mortality, then the proposed shift in retirement income in favor of low-income households may increase life expectancy in these groups and thereby weaken the empirical relationship between ability and life expectancy reported in Section 2.2. This effect is also ignored in our analysis. However, we suppose that it is rather small.

6. Conclusions

Old-age poverty is a topic that will certainly emerge on the political agenda of many OECD countries within the next few decades when pension replacement rates will have decreased due to reforms enacted recently in response to demographic change. This will be a particular problem in public pension systems with a strong tax-benefit linkage such as the German one, which is usually interpreted as absence of intra-generational redistribution of the pension system.

In an earlier paper (Breyer and Hupfeld 2009) we have questioned this view and proposed a new concept of "distributive neutrality" that takes income-group-specific differences in life expectancy into account and focuses on expected total rather than monthly or annual benefit claims. In the present paper, we have derived a new formula for calculating retirement benefits which accounts for differences in expected length of the retirement period and thus achieves distributive neutrality. In this formula, the relationship between annual earnings and annual retirement benefits is concave and looks similar to the respective function in the U.S. social security system. The main differences lies in the justification: while the U.S. system pretends to be redistributive in favour of low-income people, our formula explicitly tries to avoid any income redistribution on a lifetime basis.

We have also shown that the new formula has the potential to greatly reduce old-age poverty among long-term contributors to the system, as measured by the share of pensions below the social assistance levels for singles. Admittedly, this share is predicted to stay relatively low even with the current benefit formula. Nevertheless it can still be lowered to a large extent by the proposed benefit formula. Thus it might be an ideal candidate for solving an apparent conflict between two important political goals: maintaining a non-redistributive public pension system ("Teilhabe-Äquivalenz") and keeping old-age poverty low, at least among the long-term contributors. Additionally, our proposal is neutral with respect to the budget of the German pension system and might even be superior in allocative terms.

A caveat may be in order, though. Based on the traditional view of comparing annual incomes and *annual* retirement benefits, Krieger and Traub (2008) found in a recent paper a (weak) trend towards a lower degree of redistribution in public pension systems within the OECD, whereas the reform proposed here would amount to an opposite move. Nevertheless it appears likely that the proposed reform might find a majority in the political arena.

References

Aaberge, R. and U. Colombino (2004), A Microeconometric Model for Analysing Efficiency and Distributional Effects of Tax Reforms. A Review of Results for Italy and Norway, unveröff. Manuskript, University of Torino.

Attanasio, O. P. and C. Emmerson (2003), Mortality, Health Status, and Wealth, *Journal of the European Economic Association*, 1, 821-850.

Blundell, R. (1995), The Impact of Taxation on Labor Force Participation and Labor Supply, in: *OECD Job Study: Taxation, Employment, and Unemployment*, Chapter 3, Paris.

Bundesministerium für Arbeit und Soziales (2007), *Rentenversicherungsbericht 2007*, http://www.bmas.de/coremedia/generator/22472/property=pdf/rentenversicherungsbericht__2007.pdf (accessed on Oct. 6, 2008)

Breyer, F. et al. (2004), *Reform der Sozialen Sicherung*, Berlin et al.

Breyer, F. and S. Hupfeld (2009), On the Fairness of Early Retirement Provisions, *German Economic Review*, forthcoming.

Coronado, J.L., D. Fullerton and T. Glass (2000), The Progressivity of Social Security, NBER Working Paper No. 7520, February.

Cutler, D., A. Deaton, and A. Lleras-Muney (2006), The Determinants of Mortality, *Journal of Economic Perspectives*, 20, 97-120.

Deaton, A. and C. Paxson (2004), Mortality, Education, Income, and Inequality among American Cohorts, *NBER Working Paper*, No. 7140.

Döring, D. (2007), *Sozialstaatsstrategie und Beschäftigung im europäischen Vergleich*, WISO-Diskurs, Friedrich-Ebert-Stiftung, Bonn.

Duggan, J. E., R. Dillingham, and J. S. Greenlees (2007), Mortality and Lifetime Income: Evidence from U.S. Social Security Records, *IMF Working Paper*, No. 07/15.

FDZ-RV (2007a), Scientific Use File Demografiedatensatz Rentenwegfall 1993-2005, SUFRTWFjjXVSTDemo, Data Set from Deutsche Rentenversicherung Bund.

FDZ-RV (2007b), Scientific Use File Demografiedatensatz Rentenbestand 1993-2005, SUFRTBNjjXVSTDemo, Data Set from Deutsche Rentenversicherung Bund.

Fenge, R., S. Uebelmesser and M. Werding (2006), On the Optimal Timing of Implicit Social Security Taxes over the Life Cycle, *Finanzarchiv* 62, 68-107.

Gaudecker, H.-M., and R. D. Scholz (2007), Differential Mortality by Lifetime Earnings in Germany, *Demographic Research*, 17, 83-108.

Human Mortality Database (2005), Life Expectancy at Birth, University of California, Berkeley (USA), and Max Planck Institute for Demographic Research (Germany). Available at www.humanmortalitydata.de (data downloaded on Jan. 10, 2008).

Hurd, M. D.and J. B. Shoven (1986), The Distributional Impact of Social Security, NBER Working Paper, No. 1155.

Immervoll, H., H.J Kleven, C.T. Kreiner and E. Saez. (2007), Welfare Reform in European Countries: A Microsimulation Analysis, *Economic Journal* 117, 1-44.

Krieger, T. and S. Traub (2008), Back to Bismarck? Shifting Preferences for Intragenerational Redistribution in OECD Pension Systems, Working Paper No. 2008-06, Center for International Economics, University of Paderborn.

Little, R. J. and D. B. Rubin (2002), Statistical Analysis with Missing Data, Hoboken, New Jersey: John Wiley & Sons.

OECD (2007), Pensions at a Glance – Public Policies across OECD Countries, url: www.oecd.org/els/social/ageing/PAG.

Reil-Held, A. (2000), Einkommen und Sterblichkeit in Deutschland: Leben Reiche länger?, *Beiträge zur angewandten Wirtschaftsforschung*, 580-00.

Statistisches Bundesamt (2005), Sozialleistungen: Grundsicherung im Alter und bei Erwerbsminderung, Fachserie 13, R 8, Wiesbaden: Statistisches Bundesamt.

Statistisches Bundesamt (2007), Statistisches Jahrbuch 2007 für die Bundesrepublik Deutschland, Wiesbaden: Statistisches Bundesamt.

Appendix: **Table A1: Actual and Potential Distribution of Benefit Payments in 2004/2030, at least 35 Years of Contributions**

line	Birth Cohort	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929
1	Observations	359	545	691	738	767	852	1091	1274	1412	1673	1818
	Actual Distribution of Benefits											
2	Mean Pension	1462	1433	1443	1435	1422	1435	1432	1402	1376	1370	1342
3	% below TS (589 €)	0	0	.29	0	.39	.35	.27	.39	1.06	.84	.72
4	% below TS in 2030	.28	.37	.29	.14	.78	.70	.37	.71	1.42	1.49	1.87
	Potential Distribution of Benefits											
5	% below TS	0	0	0	0	.13	0	0	0	.01	.36	.22
6	% below TS in 2030	0	0	0	0	.26	.12	0	0	.28	.48	.28
7	% Reduction below TS	-	-	100	-	66.67	100	100	100	93.33	57.14	69.23
8	% Red. below TS 2030	100	100	100	100	78.22	83.33	100	100	80.00	68.00	85.29
9	Scaling Factor	1.06	1.05	1.05	1.05	1.05	1.05	1.05	1.04	1.04	1.03	1.02

Table A1 (cont.)

line	Birth Cohort	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	total
1	Observations	2110	1902	1976	2253	2765	3090	3160	3545	3738	3995	39754
	Actual Distribution of Benefits											
2	Mean Pension	1330	1312	1287	1281	1283	1272	1278	1252	1251	1245	1309
3	% below TS (589 €)	1.18	1.47	1.67	1.20	1.19	1.26	1.33	1.81	1.79	1.78	1.23
4	% below TS in 2030	1.75	2.16	2.89	2.49	2.64	2.49	2.78	3.58	3.50	4.03	2.41
	Potential Distribution of Benefits											
5	% belowTS	.33	.47	.46	.27	.36	.26	.25	.31	.35	.30	.26
6	% below TS in 2030	.57	.79	.86	.49	.61	.68	.47	.79	.96	.72	.56
7	% Reduction below TS	72.00	67.86	72.73	77.78	69.70	79.49	80.95	82.81	80.60	83.10	78.44
8	% Red. below TS 2030	67.57	63.41	70.18	80.35	76.71	72.72	82.95	77.95	72.52	81.99	76.93
9	Scaling Factor	1.02	1.01	1.00	1.00	1.00	1.00	1.00	.99	.99	.98	1.01

Table A2: Actual and Potential Distribution of Benefit Payments in 2004/2030, at least 30 Years of Contribution

line	Birth Cohort	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929
1	**Observations**	436	659	845	907	946	1060	1277	1495	1620	1915	2016
	Actual Distribution of Benefits											
2	**Mean Pension**	1393	1369	1377	1365	1350	1361	1373	1347	1332	1324	1306
3	**% below TS (589 €)**	0	0	.24	0	.42	.38	.39	.40	1.30	.99	1.29
4	**% below TS in 2030**	.23	.30	.36	.22	.74	.66	.47	.87	1.98	2.35	2.68
	Potential Distribution of Benefits											
5	**% below TS**	0	0	0	0	.11	0	0	0	.31	.52	.55
6	**% below TS in 2030**	0	0	0	0	.32	.09	.08	0	.56	.68	.79
7	**% Reduction below TS**	-	-	100	-	75.00	100	100	100	76.19	47.37	57.69
8	**% Red. below TS 2030**	100	100	100	100	57.14	85.71	83.33	100	71.88	71.11	70.37
9	**Scaling Factor**	1.06	1.05	1.05	1.05	1.04	1.04	1.04	1.03	1.03	1.03	1.02

Table A2 (cont.)

line	Birth Cohort	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	total
1	**Observations**	2325	2106	2134	2434	2987	3305	3376	3799	4044	4325	44011
	Actual Distribution of Benefits											
2	**Mean Pension**	1297	1280	1259	1256	1258	1249	1256	1233	1227	1221	1278
3	**% below TS (589 €)**	1.85	2.14	2.76	2.05	2.28	1.91	2.07	2.32	2.35	2.59	1.77
4	**% below TS in 2030**	2.84	3.23	4.40	3.99	4.12	3.72	3.85	4.47	4.82	5.25	3.33
	Potential Distribution of Benefits											
5	**% belowTS**	.60	.71	.84	.58	.77	.57	.53	.50	.47	.51	.47
6	**% below TS in 2030**	1.12	1.33	1.87	1.27	1.51	1.30	1.16	1.24	1.43	1.29	1.04
7	**% Reduction below TS**	67.44	66.67	69.49	72.00	66.18	69.84	74.29	78.41	80.00	80.36	73.33
8	**% Red. below TS 2030**	60.61	58.82	57.45	68.04	63.41	65.04	70.00	72.35	70.26	75.33	68.87
9	**Scaling Factor**	1.02	1.01	1.00	1.00	1.00	1.00	1.00	.99	.99	.99	1.01

Figure 2: The Potential German Retirement Benefit Formula and the Current German, the Swiss, and the U.S. Benefit Formulae