Freie Universität Berlin

Distributional Effects of Subsidizing Retirement Savings Accounts: Evidence from Germany

Giacomo Corneo
Carsten Schröder
Johannes König

School of Business & Economics
Discussion Paper

Economics

2015/18

Freie Universität Berlin Berlin, June 15, 2015

Distributional Effects of Subsidizing Retirement Savings Accounts: Evidence from Germany

Abstract. We empirically investigate the distributional consequences of the Riester scheme, the main private pension subsidization program in Germany. We find that 38% of the aggregate subsidy accrues to the top two deciles of the population, but only 7.3% to the bottom two. Nonetheless the Riester scheme is almost distributionally neutral when looking at standard inequality measures. This is due to two offsetting effects: a progressive one stemming from the subsidy schedule and a regressive one from voluntary participation. Regressions of the participation decision suggest that a high level of household wealth significantly increases the probability of benefiting from the Riester scheme.

Keywords: saving subsidies, retirement plans, income distribution
JEL Classification: D31, H55, J32, D14, I38

Giacomo Corneo
Freie Universität Berlin
School of Business and Economics
giacomo.corneo@fu-berlin.de

Johannes König
Freie Universität Berlin
School of Business and Economics
j.koenig@fu-berlin.de

Carsten Schröder
DIW Berlin/SOEP & Freie Universität Berlin
School of Business and Economics
cschroeder@diw.de

1. Introduction

Since the mid-1990s, governments have developed programs that provide financial aid to encourage private saving for retirement purposes, especially among low- and middle income households. Such programs complement public pay-as-you-go (PAYG) pension systems and are often justified by the increasing difficulty of financing PAYG pension systems due to demographic change. Germany - the first country in the world to have a national public pension system - introduced its own program, called *Riester scheme*, in 2002. It promotes certified financial products for retirement saving by means of generous subsidies and tax deductions. Basically, all compulsorily insured employees in Germany, including public servants, are eligible for support under the Riester scheme.

In contrast with its goal of inducing people to save more, the existing empirical evaluations of the Riester scheme suggest that it hardly generates any effect on individual savings.[1] That is, the Riester scheme mainly displaces private savings from unsubsidized to subsidized assets, such that the subsidies translate almost one-to-one into windfall gains for their beneficiaries. Thus, the main economic effects triggered by the Riester scheme depend on how those windfall gains are distributed – rather than real behavioral responses. If low-income earners were the main beneficiaries, the Riester scheme would at least be likely to contribute to reduce old-age poverty in the future. Hence, assessing the distributional impact of the Riester scheme is an essential ingredient of a comprehensive evaluation of the policy.

At first glance, the Riester scheme is equality-enhancing. While the German PAYG system is of the Bismarckian variety and relies on the equivalence principle, the provisions of the Riester scheme entail distinctive elements of progressivity: a basic allowance that is equal for everybody and generous child allowances that favor multi-member households. But in spite of those provisions, the overall distributional impact of the Riester scheme is *a priori* unclear. Its opacity is mainly due to the way in which beneficiaries self-select into participation in the scheme. Eligible persons are entitled to the government's financial aid only if they invest a certain minimum amount in so-called Riester contracts, the amount being determined as a fixed fraction of a person's income liable to social security contributions. This boils down to requiring a minimum saving propensity in order to be able to shift the required amount into a Riester contract. If the saving propensity increases with income and poor households do not save enough to meet the participation requirement, self-selection in the program will generate a regressive effect. Furthermore, high income households have the possibility to opt for a special tax deduction provided by the Riester scheme instead of receiving the full allowance. Whether the progressive effect from the subsidy provisions outweighs

[1] See Coppola and Reil-Held (2009), Corneo et al. (2009), Corneo et al. (2010) and Pfarr and Schneider (2011) for analyses based on the German SOEP and the SAVE dataset. Strong displacement effects are often found also for similar programs in other countries. Engen et al. (1996) provide a plethora of arguments why the supposed stimulation effects of 401(k)s and IRAs are overstated or non-existent. A more recent example is Chetty et al. (2013) who find in the case of Denmark that each 1$ of government expenditure on saving subsidies increases savings by 1 cent.

the regressive effect from self-selection and tax deductions is an empirical issue that we address in the current paper.

Determining the distributional impact of the Riester scheme requires a dataset that is representative of the German population and contains the necessary information to compute the total subsidy received by each household. Such a dataset, the Panel of Household Finance (PHF) was released by the German central bank in 2012. It is constructed along similar lines as the Survey of Consumer Finances (SCF) in the U.S. Its key advantage over alternative datasets like the German Socio-economic Panel (SOEP) is that the PHF records the amounts individuals contribute to their Riester contract if they have one. We use that information in order to estimate the benefit received by each household and determine the distributional effects of the Riester scheme. A microsimulation model allows us to determine for each household whether it receives a direct subsidy or a tax deduction. We carefully distinguish between tax unit - which is key for determining the type and level of the subsidy - and household - which is the reference unit for the distributional analysis.

Our main results are as follows. First, we find that about 38% of the subsidies accrue to the top quintile of the income distribution, while only about 7% accrues to the lowest quintile. Second, we find that the effect from the progressive schedule of the subsidy is almost exactly offset by the regressive effect from self-selection into the program. As a result, measures of overall income inequality like the Gini coefficient are hardly affected by the Riester scheme. Its effect on measures of poverty is slightly worse, in particular on the share of the population below the poverty line: the Riester scheme increases that share by nearly one percentage point.

The issue that we analyze in this paper is relevant for a number of countries beyond Germany – countries with similar programs where participation is voluntary and behavioral responses are small. So far, the distributional effects of these programs have received scant attention from the literature. Important exceptions are 401(k)s – a type of defined contribution plan – and individual retirement accounts (IRA) in the U.S. Burman et al. (2004) examine the distribution of tax benefits from defined contribution plans and IRAs with data from the SCF and the SIPP (Survey of Income and Program Participation). When considering both defined contribution plans and IRAs, they find that 70% of the total tax benefit accrues to the top quintile and almost none to the lowest quintile. These results are also robust to excluding IRAs. The pattern of self-selection into the programs is close to the one we uncover for the Riester scheme: while only 3% of households in the bottom quintile participate, 41% of households in the top quintile do so. Joulfaian and Richardson (2001) investigate the demographics of the population participating in defined contribution plans, IRAs and other subsidized savings vehicles using income tax data. They also briefly report on the distribution of the tax benefits along the income distribution of wage-earning households. They note that the lower half of the distribution receives less than 10% of the overall expenditure, while almost 55% of the expenses accrue to the top 10%. When restricting for eligibility for any of the subsidized savings programs the bottom 50% receive 20% of the overall benefit and the top 10% receives 33%. Chernozhukov and Hansen (2004) use SIPP data to examine the impact of 401(k)-plans on wealth. Their findings indicate that the effect of 401(k)-participation is quite heterogeneous along the distribution; the largest positive effect is experienced by those in the upper tail of the wealth distribution. Even and Macpherson (2007) evaluate the impact of defined contribution plans on the distribution of pension wealth with SCF data. They suggest that the switch from defined benefit to defined contribution plans will widen the pension wealth gap between low and high earners.

We discuss our main empirical findings in Section 4, after having presented the institutional details of the Riester scheme in Section 2 and our data in Section 3. In Section 5 we further investigate the regressive effect from participation by searching for its main determinants. In line with what Chernozhukov and Hansen (2004) find for the US, we find that net wealth has a distinctive positive effect on the probability to participate in the Riester scheme.

2. Institutional Background

In Germany, any person in mandatory pension insurance is directly eligible to participate in the Riester scheme. The eligible population comprises dependent employees, civil servants, persons in vocational education, farmers, the unemployed receiving unemployment benefits and early pensioners under some conditions.[2] Individuals who are married to a directly eligible person and are not permanently separated, are also eligible (indirect eligibility). According to estimates by Fasshauer and Toutaoui (2009) from 2007, 71% (38.6 million) of individuals between 15-64 years are eligible. According to Stolz and Rieckhoff (2013), 10.2 million individuals received direct funding from the Riester scheme in 2010.

Beneficiaries receive allowances (a basic allowance and child allowances) and they can lower their income tax liability by means of deductions. A minimum saving effort of the beneficiaries is required. More precisely, the allowance and the personal saving effort must add up to 4% of an individual's income liable to social insurance contributions received in the last year (up to a maximum of 2,100€). Both must be invested into certified financial products called Riester contracts.

The minimum of the individual contribution is 60€ per year. The funding is proportionally reduced if the sum of the allowance and the personal saving effort is less than the required 4%.[3]

Within a tax unit, direct funding may only be received once – irrespective of the number of eligible persons or number of Riester contracts. In 2010, the basic funding was 154€ for singles and 308€ for couples with both parties eligible and participating. In addition, a child allowance of 185€ per child is granted (300€ if the child was born after the 31st of December 2007). The child allowance is granted if the child is entitled to the universal child benefits (*Kindergeld*).

[2]This refers to individuals classified as having a fully reduced earnings capacity (*voll erwerbsgemindert*). They are recipients of a pension, based on their diminished capacity to work due to illness.

[3]Formally:

$$OCN = max\left(60, min\left(0.04 \times Y_{LSC}, 2100\right) - MDF\right),$$

where OCN is the own contribution needed, Y_{LSC} is the income liable to social contributions, and MDF is the maximum direct funding.

The tax allowance is issued on the basis of a higher-yield test by the tax authority. The tax authority deducts the amount of own contributions including the sum of direct funding (up to a maximum of 2,100€ for singles/4,200€ for couples) from the personal income tax base and calculates an adjusted tax burden. It then adds the amount of direct funding to the adjusted tax burden and compares it with the regular tax burden. The difference between the two tax burdens is the subsidy due to the tax allowance. The tax allowance is not applied if the difference is negative.[4]

The sum of the direct funding received and the net tax savings due to the tax allowance, if any, give the overall Riester subsidy. As an example, suppose a childless single earns yearly income liable to social contributions of 60,000€ and the tax rate is 50%. The tax burden before Riester is 30,000€. The maximum subsidized saving amount is 2,100€, i.e. $min(60,000 \times 0.04, 2100)$. Therefore the direct subsidy with 1,946€ of individual contribution is 154€. The adjusted tax burden is $(60000€ - 2100€) \times 0.5 + 154€ = 29,104€$. Thus, the tax allowance amounts to $30,000€ - 29,104€ = 896€$, and the overall subsidy is $154€ + 896€ = 1,050€$.

3. Data

3.1. PHF and Tax Calculation

Our empirical analysis is mainly based on the Panel on Household Finances (PHF), a representative multiply-imputed survey dataset.[5] It covers the balance sheets, pension claims, savings, incomes, work histories and demographic characteristics of households living in Germany. The first wave of the PHF was collected in 2010 and 2011. Several variables were also asked retrospectively for 2009. Besides the surveyed variables, PHF provides 1,000 bootstrap weights to avoid problems of unresolved or unknown distributions for test statistics. By bootstrapping the variance estimates, users can rely on familiar routines for testing with (asymptotically) normally distributed random variables.

The PHF contains information on the amount an individual contributes to a Riester contract, but not on the financial support received by the same individual. We compute the subsidy by taking into account information about the household context and by comparing the hypothetical benefits from direct funding with those from tax deduction. Tax units are the reference unit for computing the hypothetical benefit from tax deduction. To apply the income tax law and calculate the complete Riester subsidies, we have constructed tax units from the PHF households. Afterwards, net incomes and subsidies are aggregated over all tax units forming a household.

[4] Formally:

$$TAS = max\,(0, TB_{NoRiester} - TB_{Riester})\,,$$

with TAS the subsidy due to the tax allowance, $TB_{Riester}$ the tax burden with Riester tax allowance, and $TB_{NoRiester}$ the tax burden without.

[5] See Kalckreuth, Schmidt, et al. (2013) and HFCN (2013) for details. See Appendix A.1 for detailed information on our treatment of the multiple imputations.

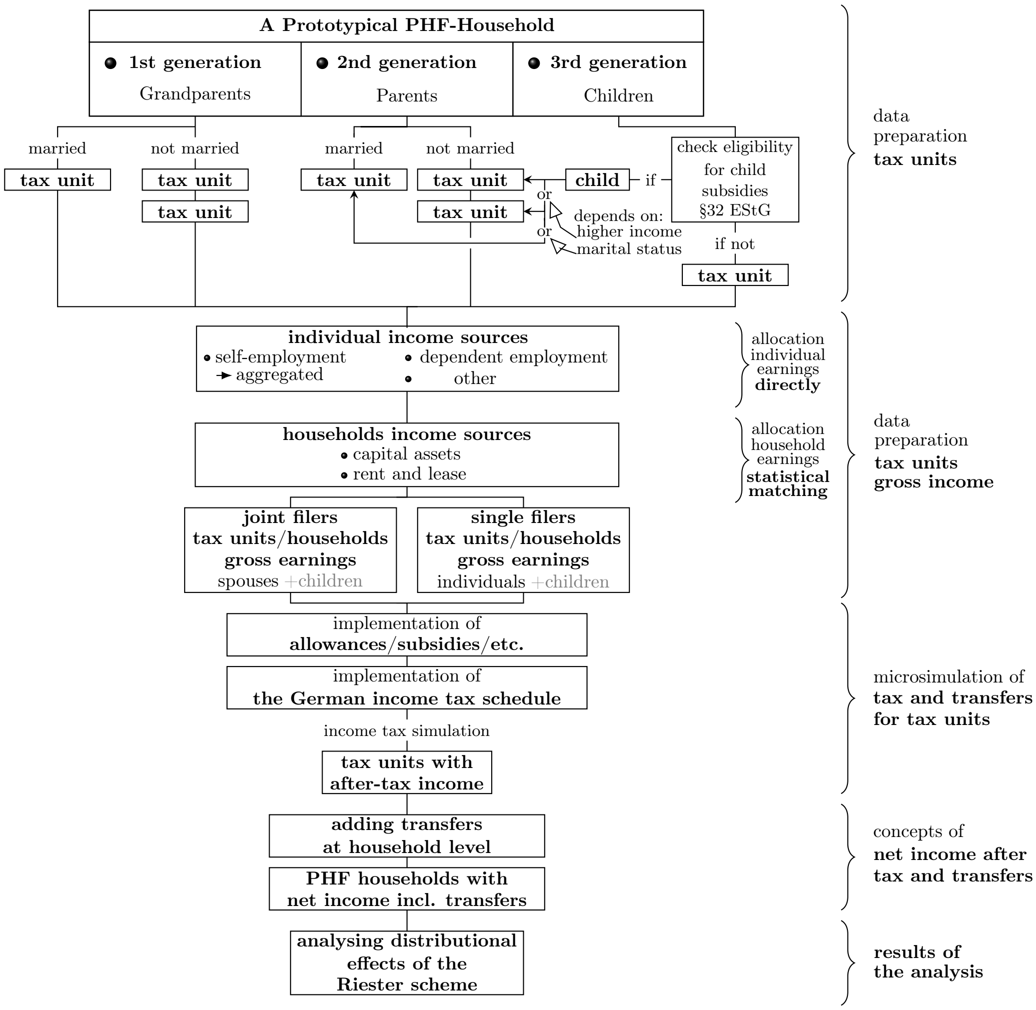

Figure 1. Data Preparation and Microsimulation

Note. EStG is the abbreviation for the German income tax code.

Our technique of tax unit assignment is depicted in the first brace of Figure 1. Our assignment method is equipped to deal with all household configurations of the PHF. There are two elementary types of tax units: single adults and couples (with respective children). Single adults are treated as complete tax units. Married couples are treated as a single tax unit, who files jointly. Non-married couples are treated as two separate tax units. In multi-generational households, we draw on the PHF relationship matrix to recover the above elementary types. Children are distinguished from adults by eligibility for child subsidies.

In order to compute the tax liability we aggregate all the taxable incomes at the tax unit level. One can verify from Figure 1 (second brace) that information on income from self-employment, employment and other income is provided at the individual level and can thus be assigned directly to the tax units. However, capital income and income from renting and leasing are provided at the household level. In households containing multiple tax units, assignment to each unit is not straightforward because information on individual ownership of the underlying assets is not available. To overcome that problem we exploit the information contained in another dataset, the German Socio-Economic Panel (SOEP).[6] In 2012 the SOEP asked individuals about the distribution of assets within their household. SOEP thus provides the relevant information on the within-household allocation of capital income and income from renting and leasing. We transfer this information to the PHF through statistical matching. The criterion for a match is the Mahalanobis distance measure.[7] We calculate the Mahalanobis distance measure based on certain covariates and assign a SOEP observation to each PHF observation according to this distance.[8]

After the match is complete and the ownership percentages are assigned, data on ownership of relevant assets is at the level of the individual in our dataset. Since the ownership percentages from the match do not necessarily sum to 100% in each household, we perform reweighting to achieve consistency. We employ the following reweighting factor,

$$p_{jk} = \frac{\sum_{i=1}^{I} p_{ijk}}{\sum_{j=1}^{J} \sum_{i=1}^{I} p_{ijk}}, \tag{1}$$

where p_{ijk} is the percentage of ownership recovered from the match, k indexes the household, j the tax unit and i the individual in that tax unit. Both the household level capital income and income from renting and leasing are then assigned to the tax units according to the reweighted percentages.[9]

The calculation of the income tax liability relies on an adapted version of the microsimulation model STSM that was designed to calculate income tax liabilities for the SOEP.[10] Since the design of the PHF is very similar to the SOEP, adapting the STSM for the PHF is straightforward.[11]

[6]For detailed information on the Socio-Economic Panel, see Wagner et al. (2007).

[7]$D_M(x,y) = \sqrt{(x-y)'CV^{-1}(x-y)}$,where (x,y) may be points or vectors and CV is the covariance matrix of (x,y). We use the following variables in the calculation of the distance: household income variable to be assigned, individual-level income variables, number of household members, age. We restrict matches to certain slices of the data, wherein certain variables are in total agreement across matchable observations. These slicing variables are: filing jointly, gender and geographical region (north, east, south, west). The match is performed with replacement.

[8]The theory of statistical matching requires the two datasets to follow a joint distribution process. Then variables missing from either one or the other data set can be taken as independent. Missing information then does not play a role for matching the two datasets and matches are consistent with the joint distribution process. This paradigm for matching datasets has been termed the Conditional Independence Assumption (D'Orazio et al. (2006)).

[9]Thereby we implicitly assume that each tax unit earns the same return on the assets.

[10] See Steiner et al. (2008).

[11]We detail exceptions in Section A.2.

3.2. Descriptive Statistics

We investigate the redistributive effects of the Riester subsidy with respect to the overall population in Germany and the subset of the population eligible for the Riester scheme.[12] We are mainly interested in the impact of those subsidies on the distribution of equivalent net household income.[13]

Table 1. Descriptive Statistics for the Overall Population

	mean	std. error	min	max	obs.
equivalent gross household income with transfers without Riester subsidy	28957	450.756	850	324800	3565
equivalent net household income with transfers without Riester subsidy	25274	334.426	518	221772	3565
number of household members	2.044	0.005	1	8	3565
married[c]	0.495	0.008	0	1	3565
age[c]	52.28	0.127	18	90	3565
female[c]	0.350	0.006	0	1	3565
completed vocational training[c]	0.518	0.011	0		3565
completed extended vocational training[c]	0.178	0.009	0	1	3565
completed university degree[c]	0.135	0.007	0	1	3565
access to tertiary education[c]	0.295	0.003	0	1	3565
estimated subsidies and subsidy rates					
fraction of households participating in the Riester scheme[a]	0.170	0.009	0	1	3565
level of Riester subsidy[b]	70.375	4.547	0	1764	3565
ratio of subsidy to net household income in %	0.184	0.017	0	17.111	3565

Note. PHF 2010. Own calculations. 1,000 bootstrap replicate weights used to compute standard errors.
[a] The participation variable is a dummy variable that indicates whether at least one household member currently pays into a Riester contract.
[b] The sum of the Riester subsidies of all tax units within a household.
[c] Variable refers to the household head.

Our data show that 61.3% of households include at least one person who is eligible to participate in the Riester program. The fraction of households with at least one participating individual is 17%. In weighted terms this means to 24,081,123 eligible households and 6,750,514 participating households. The average level of the Riester subsidy per household is only 70.38€, but 36.7% of

[12] Results for the participating population are shown in the Appendix, Section A.3.

[13] To cope with outliers at the very bottom and top of the distribution and to limit biasing effects from multiple imputation or measurement error, we employ 98% Winsorization. This entails setting incomes below the first percentile (above the 99th percentile) to the value of the first (99th) percentile. See Hastings Jr. et al. (1947). In the distributional analysis we will rely on needs-adjusted equivalent income. Equivalent income is household income divided by the household's OECD modified equivalence scale,

$$ES^{OECD} = 1 + 0.5 \times (n_{adults} - 1) + 0.3 \times n_{children}.$$

the beneficiaries receive a subsidy in excess of 500€. Riester subsidies may increase household incomes by as much as 17%.

We use two criteria to determine the eligible population. First, households must contain at least one Riester eligible person; second at least one household member must be below the age of 64. We impose the second criterion because older individuals had little incentive to enter into a Riester contract at the time of the reform or after.[14] Compared to the overall population, the eligible population is younger, has more married household heads and higher income. The fraction of households participating in the Riester scheme rises to 28% and the average subsidy received is worth 115.94€. Tables 1 and 2 summarize the key statistics pertaining, respectively, to the overall population and the one eligible for the Riester subsidies.

Table 2. Descriptive Statistics for the Eligible Population

	mean	std. error	min	max	obs.
equivalent gross household income with transfers without Riester subsidy	32168	644.275	850	324800	2106
equivalent net household income with transfers without Riester subsidy	27533	454.152	518	221772	2106
number of household members	2.364	0.018	1	8	2106
married	0.538	0.013	0	1	2106
age	43.29	0.210	18	90	2106
female	0.311	0.010	0	1	2106
completed vocational training	0.545	0.013	0	1	2106
completed extended vocational training	0.177	0.012	0	1	2106
completed university degree	0.146	0.010	0	1	2106
access to tertiary education	0.330	0.007	0	1	2106
estimated subsidies and subsidy rates					
fraction of households participating in the Riester scheme	0.280	0.014	0	1	2106
level of Riester subsidy	115.940	7.419	0	1764	2106
ratio of subsidy to net household income in %	0.303	0.028	0	17.111	2106

Note. PHF 2010. Own calculations. 1,000 bootstrap replicate weights used to compute standard errors. All previous notes on variables in Table 1 apply.

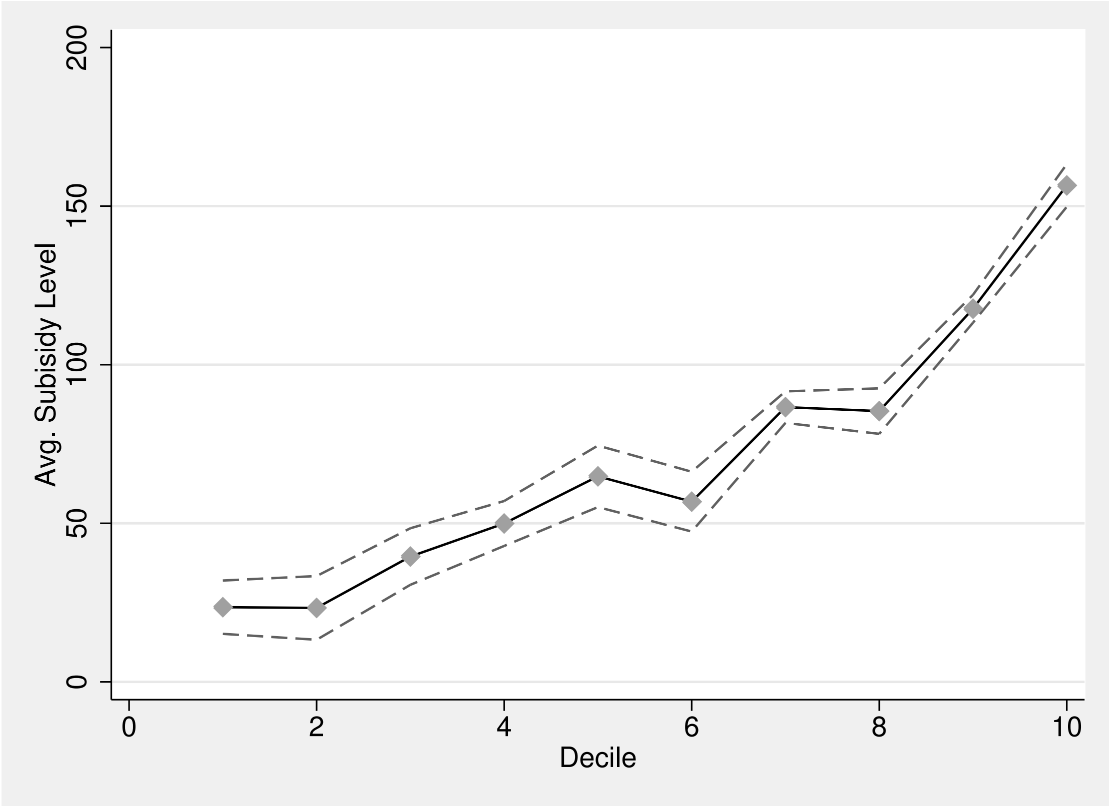

Figure 2. Subsidy Level by Decile of the Overall Population

4. Main Results

4.1. Subsidization along the Income Distribution

Figure 2 shows the decile-specific average subsidy levels for the overall population in Germany. Individuals are assigned to deciles according to their equivalent net household income before Riester subsidies. We find that the average subsidy increases over the deciles and the increase is sizable. In the bottom decile, the average subsidy is 23.56€. Up to the 6th decile, we find a moderate increase of the subsidy level to about 56.83€. Over the top four deciles, the subsidy level increases to 156€ in the top decile.

By far the largest share of the total subsidy volume accrues to the upper part of the distribution. This can be seen from the concentration curve in Figure 3. The concentration curve of the Riester subsidy is the cumulative share of the Riester subsidy for the centiles of the cumulative distribution function (CDF) of equivalent net income.[15] The concentration curve, unlike the

[14] According to Table 4 in Stolz and Rieckhoff (2013), only 0.06% of the Riester recipients in 2010 were born before 1946.

[15] Lambert (2001, p. 268 pp.) gives an account of how to construct concentration curves for subsidies.

Lorenz curve, can cross the forty-five degree line, yet a concentration curve resting on the forty-five degree line would still imply equal distribution of the subsidy among the population.[16] We find that about 38% of the aggregate subsidy accrues to the top two deciles of the population, while only 7.3% accrues to the bottom two deciles.[17] Hence, the Riester scheme mainly subsidizes high-income households rather than the working poor.

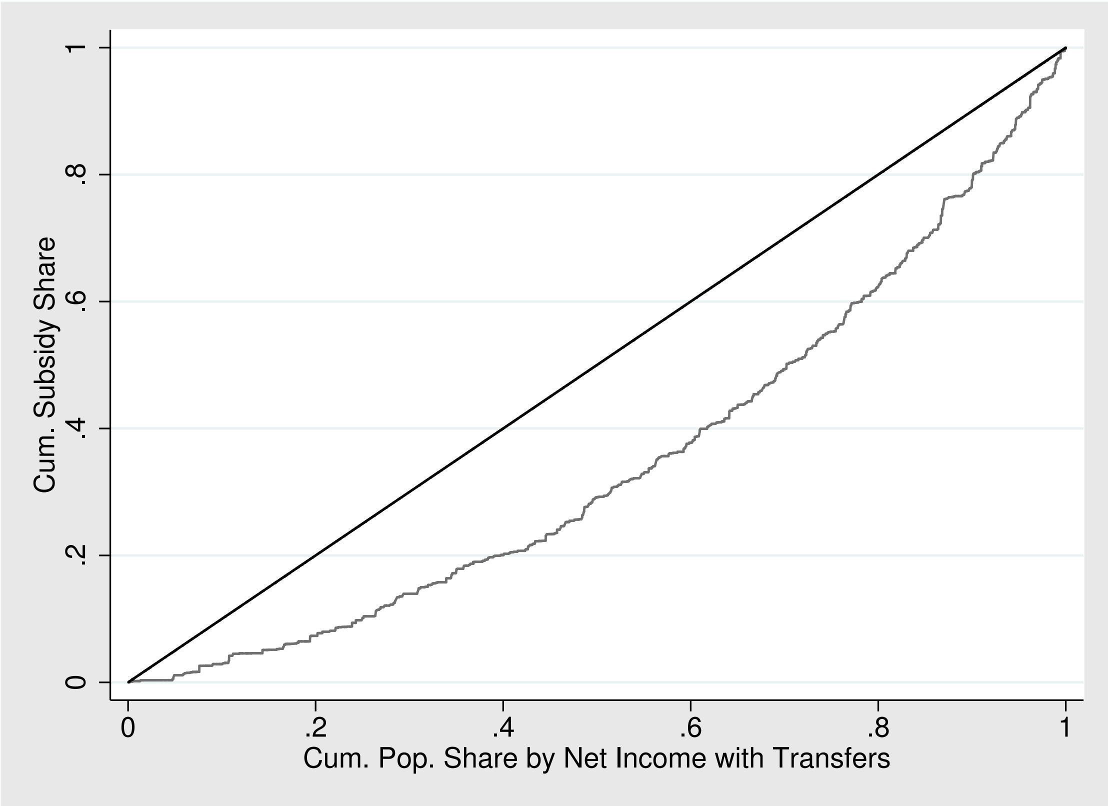

Figure 3. Concentration Curve for the Overall Population

Note. This curve gives the cumulated subsidy volume channeled to the poorest x% of households, sorted by equivalent household income before Riester-induced transfers.

4.2. Effects on Income Inequality and Poverty

In order to evaluate the redistributive effect of the Riester scheme, we now compute inequality and poverty indices before and after Riester subsidies. Our distributional analysis relies on four inequality indices: the Gini index and three members of the generalized entropy class, namely the

[16]To determine a household's position in the income distributions over the five imputations we calculate the average location of the household in the CDF of income and the average amount of Riester subsidy received.
[17]In Appendix A.5 we also calculate the decile graphs for other statistics like the average subsidy rate and the participation fraction, which are computed analogously to the average subsidy level.

Table 3. Effects on Inequality and Poverty

Overall Population				
Measure	woR	$wR - woR$	wD	$wR - wD$
Gini	32.960	-0.014*	32.899	0.048*
	(0.173)	*(0.002)*	*(0.173)*	*(0.002)*
MLD	20.516	-0.025*	20.377	0.114*
	(0.347)	*(0.006)*	*(0.342)*	*(0.009)*
Theil	18.534	-0.018*	18.461	0.054*
	(0.234)	*(0.002)*	*(0.233)*	*(0.003)*
GE2	21.738	-0.029*	21.657	0.053*
	(0.509)	*(0.003)*	*(0.508)*	*(0.004)*
HCR	12.237	0.798*	12.052	0.983*
	(0.166)	*(0.158)*	*(0.196)*	*(0.124)*
IGR	35.589	-2.144*	35.692	-2.248*
	(1.172)	*(0.382)*	*(1.232)*	*(0.291)*
Sen	6.236	0.153*	6.145	0.244*
	(0.205)	*(0.036)*	*(0.202)*	*(0.032)*
Eligible Population				
Measure	woR	$wR - woR$	wD	$wR - wD$
Gini	31.750	-0.031*	31.693	0.026*
	(0.112)	*(0.003)*	*(0.112)*	*(0.003)*
MLD	18.647	-0.050*	18.533	0.064*
	(0.299)	*(0.008)*	*(0.295)*	*(0.010)*
Theil	17.131	-0.035*	17.067	0.029*
	(0.173)	*(0.003)*	*(0.172)*	*(0.004)*
GE2	19.947	-0.046*	19.876	0.025*
	(0.604)	*(0.005)*	*(0.603)*	*(0.005)*
HCR	10.444	0.253	10.301	0.396*
	(0.286)	*(0.167)*	*(0.328)*	*(0.117)*
IGR	33.010	-0.875	33.030	-0.895*
	(2.155)	*(0.491)*	*(2.258)*	*(0.344)*
Sen	4.943	0.035	4.871	0.107*
	(0.216)	*(0.037)*	*(0.214)*	*(0.031)*

Note. PHF 2010. Own calculations. Statistical significance of the differences at the 5%-level is indicated by *. 1,000 bootstrap replicate weights used to compute standard errors. Standard errors are displayed in parentheses. The measures Gini, MLD, Theil, GE2 and Sen and their respective standard errors were multiplied by 100. The HCR and IGR have been left as originally computed.
woR refers to the income distribution without Riester subsidies. wR refers to the income distribution with Riester subsidies. wD refers to the income distribution with demogrant.

Theil index, the mean logarithmic deviation (MLD) and half the squared coefficient of variation ($GE(2)$). These entropy measures imply different levels of inequality aversion, with the $GE(2)$

putting the smallest weight on high incomes and comparatively the Theil the highest, with the MLD lying in-between. Furthermore, we make use of three poverty indices: the headcount ratio (HCR), the income gap ratio (IGR) and the Sen Index (Sen). The HCR is the percentage of individuals under the poverty line, while the IGR gives the average relative distance to the poverty line of poor individuals. Accordingly, HCR ignores the severity of poverty, while IGR ignores the number of poor individuals, and both are uninformative about the extent of inequality among the poor. Since the Riester scheme may influence all of these dimensions, we additionally make use of the Sen Index, $S = H\,[I + (1 - I)\,G_{y_i<Z}]$, where H is the HCR, I is the product of HCR and IGR, and $G_{y_i<Z}$ is the Gini coefficient for individuals with income y_i smaller than the poverty line Z. The poverty line is set at 50% of the median of equivalent net income in Germany. Without Riester subsidies, the poverty line as computed from the PHF is 10,965€, while it is 11,007€ with Riester subsidies.

All our inequality and poverty estimates are provided in Table 3. Column woR shows the statistics for the baseline distribution, the income distribution without Riester subsidies. The adjacent column $wR - woR$ gives the change in the index when the Riester subsidies are taken into account. A positive (negative) difference indicates a regressive (progressive) effect of the Riester program.

As shown by the upper panel of Table 3, the Riester scheme decreases income inequality. Despite the subsidies mainly accruing to the upper part of the distribution, the Gini coefficient and the GE-indices decline after taking the Riester scheme into account. The effects are small: -0.00014 for the Gini, -0.00025 for the MLD, -0.00018 for the Theil, and -0.00029 for the $GE(2)$.

The effects of the Riester scheme on poverty are ambiguous. The HCR indicates a rise in the incidence of poverty by 0.798 percentage points; the IGR a lowering of the poverty intensity by 2.144 percentage points, the most sizable reaction among the measures. These findings are intelligible when considering that the poverty line rises while no subsidized person leaves the poverty range. Individuals who now have fallen under the poverty line and those under it, who are subsidized, are necessarily closer to the poverty line than before, causing the IGR to drop. However, our "overall" poverty index, the Sen Index, increases by 0.00153, pointing out that, while the effect of the Riester scheme on some of the poor is beneficial (as indicated by a lower IGR), it is offset by the changes in its two other components (HCR and $G_{y_i<Z}$).

The above assessment of the distributional consequences of the Riester scheme neglects the fact that the income distribution without the Riester scheme is associated with an improvement of the public budget equal to the total amount of the subsidies. The fiscal costs of the Riester scheme are sizable: at the current rate of participation (17%) we estimate its total volume to be 2,790 million € (SD: 180 mil. €).[18] Neglecting the change in the budget allows one to avoid making assumptions about the way the government would use the resources made available by scrapping the Riester scheme. Now we consider a counterfactual where budget neutrality holds

[18] Stolz and Rieckhoff (2013) report the total of direct subsidies for 2010 to be 2,559 mil. €. Since the net gains from tax deductions can be imagined as resting on top of the direct subsidies that households have already received, we see rough agreement with our estimates.

and public expenditure is shifted from the Riester scheme to a hypothetical demogrant. More precisely, we assume that every household in the overall population receives the same amount of equivalized subsidy (48.23 €), with no regard shown to eligibility for the Riester scheme. The ensuing distribution (wD) is then compared with the distribution with the Riester scheme.[19] We view such a demogrant as a rough approximation of additional public expenditures on a vast array of publicly provided services that are rather uniformly consumed by the population. The same justification is usually offered when using a demogrant in theoretical models of income redistribution.

The result of our analysis is displayed in the fourth column of Table 3. The Riester scheme turns out to be less progressive than a demogrant. In absolute terms, these differences are about two to four times larger than the baseline differences for the Riester scheme, $wR - woR$. This shows that even an untargeted instrument like a demogrant – or a general increase in the provision of public services – would redistribute income in a more egalitarian way than does the Riester scheme.

The lower panel of Table 3 shows our results for the eligible population. As explained above, the eligible population is younger, has more married household heads and higher income than the overall population. It is thus no surprise that both inequality and poverty indices for the baseline distribution woR are always lower. Because only eligible households remain in the sample, the progressive effect of the Riester scheme without budget balance is stronger. The differences $wR - woR$ for the inequality indices are about twice as large as those for the overall population. The differences for the poverty indices keep their signs, yet get smaller and insignificant. Part of this result is due to the definition of the sample which leads to a relatively strong exclusion of low-income households. Part is also due to the construction of the poverty line, which is determined by the income distribution in the overall population. When using the demogrant as the alternative tool for redistribution, our previous conclusions are confirmed, but the effects are smaller in absolute terms.

To sum up, the Riester scheme has rather mixed effects on income inequality and poverty that depend on the benchmark used for comparison. At first glance, this finding may seem to be at odds with the results from the incidence analysis, i.e. that most of the overall subsidy volume is channeled to the top of the distribution. But inequality measures are relative: equi-proportional changes of income leave the measured inequality unchanged. Thus, a progressive effect may obtain even if households at the bottom of the distribution receive markedly below-average subsidies. Key for the distributional impact is not how the subsidy *level* varies over the various deciles of the distribution but how the *ratio* of the subsidy to the income level (i.e. the subsidy rate) changes along the income distribution.

[19] The poverty line is recalculated for the demogrant income distribution, amounting to 10,990€.

5. Proximate Causes

5.1. Decomposition

To better understand the drivers of the distributional impact of the Riester scheme, we break the subsidy rate of a given decile of the income distribution, σ, into its basic components. The subsidy rate is,

$$\sigma = \frac{\sum_{i=1}^{N} s_i}{\sum_{i=1}^{N} y_i},$$

where s_i is the amount of subsidy received by each individual i with income y_i and N is the number of individuals in a decile. Let the members of the decile be ordered so that the first $M \leq N$ participate in the Riester scheme and the remainder does not. Accordingly, we can rewrite the subsidy rate as,

$$\sigma = \underbrace{\frac{\sum_{i=1}^{M} s_i}{\sum_{i=1}^{M} y_i}} \times \underbrace{\frac{M}{N}} \times \underbrace{\frac{N}{\sum_{i=1}^{N} y_i} \times \frac{\sum_{i=1}^{M} y_i}{M}} \tag{2}$$

$$= \quad \sigma_M \quad \times \quad \mu \quad \times \quad \frac{\bar{Y}_M}{\bar{Y}}. \tag{3}$$

The intensity of subsidization among the group of the M subsidized individuals is captured by σ_M. Participation is reflected in the participation rate, $\mu = \frac{M}{N}$, and $\frac{\bar{Y}_M}{\bar{Y}}$ is the ratio of the average income of the beneficiaries to the average income of the entire decile. Thus, equation (3) shows that the magnitude of the average relative income increase entailed by the Riester program for a given decile can be decomposed as the product of three terms: the average subsidy rate of those who participate, the share of participants within the decile, and the relative income of the participants.

Table 4 provides all four statistics and their standard errors for each decile of the income distribution. We first comment on the overall population. The subsidy rate of the decile, σ, displays a non-monotonic pattern along the income distribution and exhibits relatively small variations across deciles. As we saw in the previous section, this profile entails a small negative effect on inequality if budget neutrality is neglected. In turn, this effect is mainly driven by two opposing patterns concerning σ_M and μ. This is shown by the second and the third column of Table 4. The subsidy rate of the beneficiaries, σ_M, is highest in the lowest decile and decreases over the income deciles. The participation rate, μ, displays the opposite pattern, i.e. it tends to increase over the deciles. As it turns out, in terms of overall inequality, the progressive effect from σ_M slightly dominates the regressive effect from μ.

These results allow us to qualify our previous statement that the Riester scheme is an imprecise tool for redistribution: participation increases over the deciles, explaining why most of the total subsidy is channeled to the upper part of the distribution (Figures 2 and 3), despite higher subsidy rates at the bottom for those who participate. For the eligible population the same basic pattern

Table 4. Decomposition of Subsidy Rates

Decile	Overall Population				Eligible Population			
	σ	σ_M	μ	$\bar{Y}_M/\bar{Y}$	σ	σ_M	μ	$\bar{Y}_M/\bar{Y}$
1	0.449	4.982	0.077	1.160	0.712	4.652	0.147	1.038
	(0.081)	*(0.599)*	*(0.006)*	*(0.043)*	*(0.095)*	*(0.313)*	*(0.012)*	*(0.034)*
2	0.215	3.166	0.066	1.021	0.505	2.749	0.182	1.013
	(0.048)	*(0.292)*	*(0.011)*	*(0.011)*	*(0.054)*	*(0.125)*	*(0.018)*	*(0.009)*
3	0.280	2.153	0.127	1.020	0.610	2.132	0.286	1.003
	(0.032)	*(0.108)*	*(0.013)*	*(0.007)*	*(0.055)*	*(0.136)*	*(0.024)*	*(0.004)*
4	0.294	2.049	0.144	0.998	0.493	1.742	0.282	1.001
	(0.023)	*(0.131)*	*(0.014)*	*(0.006)*	*(0.054)*	*(0.130)*	*(0.013)*	*(0.004)*
5	0.324	1.914	0.168	1.007	0.507	1.489	0.341	0.998
	(0.024)	*(0.120)*	*(0.005)*	*(0.003)*	*(0.025)*	*(0.055)*	*(0.012)*	*(0.004)*
6	0.242	1.286	0.191	0.984	0.417	1.352	0.306	1.008
	(0.022)	*(0.069)*	*(0.011)*	*(0.003)*	*(0.025)*	*(0.062)*	*(0.013)*	*(0.002)*
7	0.318	1.312	0.243	0.999	0.328	1.085	0.302	0.999
	(0.010)	*(0.051)*	*(0.005)*	*(0.002)*	*(0.020)*	*(0.056)*	*(0.003)*	*(0.002)*
8	0.267	1.187	0.224	1.004	0.423	1.261	0.336	0.998
	(0.012)	*(0.038)*	*(0.009)*	*(0.003)*	*(0.025)*	*(0.035)*	*(0.019)*	*(0.004)*
9	0.298	1.272	0.237	0.991	0.402	1.323	0.305	0.997
	(0.008)	*(0.065)*	*(0.014)*	*(0.005)*	*(0.020)*	*(0.058)*	*(0.020)*	*(0.003)*
10	0.247	1.098	0.225	1.000	0.337	1.068	0.317	0.996
	(0.007)	*(0.044)*	*(0.004)*	*(0.018)*	*(0.010)*	*(0.038)*	*(0.011)*	*(0.018)*
Average	0.293	2.042	0.170	1.018	0.473	1.885	0.280	1.005

Note. PHF 2010. Own calculations. There are slight deviations from the formula due to rounding errors. Both σ, σ_M and their standard errors have been multiplied by 100. 1,000 bootstrap replicate weights used to compute standard errors. Standard errors displayed in parentheses. The row "Average" gives column-averages of the respective point estimates. The decomposition does not apply to that row.

holds true. Accordingly, the trend in σ and the underlying causes of that trend are the same as in the overall population.[20]

5.2. Drivers of Participation

If the Riester scheme puts cash on the table for the eligible households, why do so many of them – about 70% – refrain from taking it? While a comprehensive analysis of participation in the Riester scheme is beyond the scope of this paper, we close it by offering an econometric exploration of potential drivers in a simple multivariate framework.

[20] Alternative forms of subsidization would be far superior to the Riester scheme, which we show in Appendix A.4. There we equally distribute the whole subsidy volume only among the participating population. The results indicate that the demogrant still achieves more progressive outcomes than the Riester scheme, even though everyone in the population already receives subsidies under Riester.

We model the participation decision, C_i with $C_i \in \{0,1\}$ (i indexes the household), by means of a logit model. The model builds on the form,

$$P(C_i = 1|\mathbf{X_i}) = \Lambda\left(\alpha + \boldsymbol{\gamma} \times \mathbf{X_i} + \epsilon_i\right), \tag{4}$$

where Λ is the logistic cumulative density function, $\mathbf{X_i}$ is a set of control variables, and ϵ is the error term.

Our first variable of interest for explaining participation is *net income*. Higher household income is expected to bring about a higher saving propensity and, hence, make it easier to surmount the hurdle of the 4% personal saving effort for full direct funding according to the Riester scheme. Furthermore, higher income implies a higher marginal tax rate and, hence, a larger benefit from tax deductions. Therefore, we expect income to be a key driver of participation in the Riester scheme. This expectation is borne out by the estimation, as shown by the first row of Table 5.[21] The coefficient on log income carries a positive sign and is strongly significant in all specifications.

When controlling for the *age* group, we find that people in the highest age bracket (56-64) are significantly less likely to participate in the Riester scheme. This can be explained by the fact that those individuals were relatively old when the Riester scheme was introduced – in 2002 – and had little to gain from entering the program because their accumulation period was short. The presence of *children* in the household increases the probability to participate in the Riester scheme – something that is expected in light of its generous child allowance. Neither the *gender* of the household head nor the *location* of the household in the western or the eastern part of Germany significantly affect the probability of benefiting from the Riester scheme.

In addition to the previously mentioned covariates, Specification (2) of Table 5 includes dummies for the educational attainment of the household head. *A priori*, it is unclear how *education* should affect participation. While the better educated are more likely to diversify their portfolios and to be aware of the specific benefits offered by Riester scheme, it is also possible that the less educated are more easily taking up Riester contracts because they were heavily advertised. As it turns out, the coefficients of the education dummies are insignificant, meaning that we cannot reach any clear-cut conclusion.

Finally, Specification (3) adds a dummy for households that belong to the top quintile of the wealth distribution. The coefficient of the dummy is strongly significant and positive.[22] Its marginal effect at sample means is 0.122 (S.E.: 0.043). With other covariates at their means, belonging to top quintile of the net wealth distribution raises the probability of participating in the Riester scheme from 26% to 38%.[23]

[21] We also run specifications with income-decile dummies. After testing, we determine that there is only a significant difference in trend between the third and fourth decile, while all higher deciles (4-10) appear to have the same effect.

[22] We have tested down from the full set of net wealth decile dummies. We could not reject that all other dummies are jointly zero and a further test could not reject the equivalence of the coefficients for deciles 9 and 10. Results are available upon request.

[23] Due to the complex survey design and multiple imputation, assessing goodness of fit is non-standard. McFadden's R^2 is unavailable, making us resort to Efron's R^2, which is not based on the log-likelihood. Efron's R^2 is

Table 5. Logit Models of Participation

	Specification (1)	Specification (2)	Specification (3)
log of equivalent net income	0.5778***	0.5419***	0.4679***
	(0.1347)	(0.1429)	(0.1430)
age: 36-45	-0.2373	-0.2140	-0.2340
	(0.1955)	(0.1951)	(0.1954)
age: 46-55	-0.3157	-0.2978	-0.3355
	(0.2084)	(0.2091)	(0.2103)
age: 56-64	-1.2090***	-1.1800***	-1.2930***
	(0.2229)	(0.2244)	(0.2336)
single w/ children	0.5783	0.6016*	0.5886*
	(0.3525)	(0.3492)	(0.3470)
couples	0.0672	0.0938	0.0807
	(0.2229)	(0.2229)	(0.2226)
couples w/ children	0.6289***	0.6585***	0.6561***
	(0.2091)	(0.2130)	(0.2115)
more than two adults	0.2943	0.3774	0.3194
	(0.2654)	(0.2635)	(0.2650)
female	0.1004	0.0802	0.0774
	(0.1683)	(0.1705)	(0.1730)
east	0.1700	0.2031	0.2337
	(0.1989)	(0.2044)	(0.2074)
sec. educ. completed		0.3011	0.2627
		(0.1985)	(0.1978)
tertiary educ. completed		-0.2079	-0.2165
		(0.2347)	(0.2320)
top quintile of net wealth			0.6262***
			(0.2230)
constant	-7.0285***	-6.7657***	-6.0048***
	(1.3835)	(1.4415)	(1.4400)
observations	2043	2043	2043
Efron's R^2	0.065	0.066	0.069

PHF 2010. Own Calculations. 1000 bootstrap replicate weights used to compute standard errors. Standard errors in parentheses. (***) statistically significant at the 1%-level, (**) at the 5%-level, (*) at the 10%-level. We report the average of Efron's R^2 over all imputations, which may not be statistically appropriate when the statistic is not normally distributed.

calculated as

$$R_E^2 = 1 - \frac{\sum(y_i - \hat{p_i})^2}{\sum(y_i - \bar{y})^2},$$

with y_i the observed values, $\bar{y}$ their average and $\hat{p_i}$ the predicted probabilities from the model.

6. Conclusion

The Riester scheme is the main tool used by the German government to subsidize retirement saving. As suggested by previous empirical studies, the Riester scheme largely fails to generate more savings. Rather, it generates windfall gains for a subset of the population. In this paper, we empirically investigate the distributional impact of the Riester scheme. We estimate that 38% of the subsidy volume accrues to the top quintile of the income distribution, but only 7.3% to the bottom quintile. The share of the population below the poverty line increases by nearly one percentage point. Nevertheless, the Riester scheme is almost distributionally neutral with respect to overall inequality measures like the Gini coefficient. Distributional neutrality results from two mutually offsetting effects: a progressive one stemming from the subsidy schedule, and a regressive one from voluntary participation. Participation is quite sparse in the lower deciles of the distribution, but, due to the low incomes at the bottom of the distribution, relative subsidization is high. In the upper part of the distribution participation is more widespread; yet, due to the rapid rise of incomes, subsidy rates cannot keep pace and fall off. We also show that uniformly redistributing the amount spent by the government on the Riester scheme by means of a demogrant would generate a significantly more equal distribution of income.

A simple multivariate regression analysis of take-up behavior of Riester subsidies confirms its correlation with the income of households, even when controlling for the presence of children in the household – another significant driver of participation. On top of that, take-up behavior is significantly explained by high household wealth: belonging to the top quintile of the distribution of net household wealth increases the probability to participate in the Riester scheme by about 12 percentage points.

Our analysis focuses on the distribution of annual income and how the distribution is affected by the Riester scheme. However, this program is also affects the distribution of long-term incomes, which depends on the future pay-outs from Riester contracts and how they will be handled by the tax-transfer system. In particular, the long-term distributional effects will depend on the extent to which those pay-outs will be credited against old-age assistance for the poor. Extending the distributional analysis of the Riester scheme to a lifetime framework is a promising avenue for future research.

A. Appendix

A.1. Multiple Imputation

Typical phenomena in survey data are unit and item non-response. The PHF exhibits a high unit non-response rate and a low item non-response rate.[24] Data on wealth and income is assessed as highly reliable by the data providers, as respondents were willing to answer sensitive questions concerning these items.

[24]See Kalckreuth, Eisele, et al. (2012) and Tiefensee and Grabka (2014).

To deal with item non-response, the dataset was multiply imputed, both for discrete and continuous variables.[25] If a variable is missing, five values are imputed. Otherwise the observed value is recorded in all imputations.

Multiple imputation entails that imputed values may differ across imputations. This is because an imputed value is the prediction of a regression model specific to that variable. In each imputation after the first, random noise is added to the prediction. This holds also for categorical variables. Accordingly, as an example, a person's status may be employed in one imputation and unemployed in another. Further, the framework of the imputation is hierarchical, meaning that the imputation of some variable depends on the imputed values of others. For example, work status is imputed before employment earnings. Non-uniformity of imputed variables across imputations complicates our analysis. For example, eligibility for Riester subsidies is determined by the employment status, but the employment status need not be the same across imputations. As a result, a household may appear as "eligible" in one imputation and "ineligible" in another. In such cases, we follow the guidelines of Rubin (2004) and define the status as ineligible.

Our analysis of the multiply imputed dataset follows the statistical procedures outlined in Rubin (2004). The point estimate of a variable is computed as the average of the point estimates over all imputations,

$$\bar{Q} = \frac{1}{m} \sum_{r=1}^{m} \hat{Q}_r, \tag{5}$$

for any desired point estimate $\bar{Q}$ and any within-imputation point estimate, $\hat{Q}_r$, with the number of imputations $r \in \{1, \ldots, m\}$.

The variance of the point estimate is the weighted sum of two components: the *between-imputation* and the *within-imputation* component. The between component is defined as,

$$B = \frac{1}{m-1} \sum_{r=1}^{m} \left(\hat{Q}_r - \bar{Q} \right)^2. \tag{6}$$

The within component, $\bar{U}$, is the average of the *within-imputation* variance estimates, $\hat{U}_r = SE_r^2 = {}^{1}/_{N_r} \sum_{i=1}^{N_r} \left(q_{ri} - \hat{Q}_r \right)^2 / N_r$. The term q_{ri} is the variable of interest for observation i, and N_r is the number of observations in imputation r. Formally,

$$\bar{U} = \frac{1}{m} \sum_{r=1}^{m} \hat{U}_r. \tag{7}$$

The estimate of the total variance is,

$$T = \bar{U} + \left(1 + \frac{1}{m} \right) B, \tag{8}$$

[25] See Zhu and Eisele (2013) for details.

which will conform to the Student's t-distribution with ν degrees of freedom,

$$\frac{\bar{Q} - Q}{\sqrt{T}} \sim t_\nu, \text{with } \nu = (m-1)\left[1 + \frac{\bar{U}}{1 + \frac{1}{m}B}\right]. \tag{9}$$

Since our samples are adequately large and item-nonresponse is generally low, making ν adequately large, we can use the simplifying assumption of the t-distribution approximating the Standard Normal. Thus we calculate 95% confidence intervals as $CI = \left(\bar{Q} \pm 1.96 \times \sqrt{T}\right)$.

A.2. Details on Tax Calculation

Taking into account the logic of the German income tax law, the simulation proceeds in the following steps:

1 Calculating the sum of incomes.

2 Deducting allowances and calculating the taxable income.

3 Implementing progression reservation.

4 Calculating the tax.

5 Testing the higher yield of child allowance and adjusting tax liability.

6 Testing the higher yield of the Riester allowance and adjusting tax liability.

7 Calculating the withholding capital tax.

8 Calculating the solidarity tax.

9 Calculating net income.

10 Aggregating to household level and adding transfers.

Due to the great overlap between the SOEP and the PHF, we can restrict ourselves to two types of notable implementation differences concerning the tax calculation.

Omissions

Firstly, in calculating the sum of incomes (point 1), we collect all incomes relevant for the calculation of the tax base. Here we are incapable of performing loss-compensation[26], since negative incomes have not been recorded. This is also generally the case for the STSM, but in the PHF operating costs from rent and lease have also not been recorded. Therefore we cannot deduct these costs from the rent and lease incomes. Secondly, due to lack of adequate information,

[26] A procedure that deducts losses - either across income sources or across periods - from earnings to lower the tax base.

the calculation of the sum of incomes omits rents of widows and orphans. Thirdly, for the same reason, we cannot deduct the *Entfernungspauschale*.[27]

Concerning the deduction of allowances (point 2), we are unable to implement the assessment of child care costs[28] as a special expense, since there is no data on this expense in the PHF.

Furthermore, we disregard progression reservation (point 3), as it is unlikely to affect individuals relevant to our analysis.

Improvements

Concerning point 1, we impute *Werbungskosten*[29] with aggregate statistics[30] by grouping individuals on income from dependent employment. Considering point 10, a feature of the PHF data is its household-level variable on transfers. We simply add transfers to net or gross household income and do not need to model them.

Otherwise the simulation follows exactly the scheme of the STSM tax calculation.

A.3. Sample 3: Participating Population

The third sample in use is the eligible population holding an active Riester contract, meaning at least one actively contributing person in the household, see Table A1. Compared to the previous samples, these households receive considerably higher average income. The average number of household members and married household heads is also higher. The level of the Riester subsidy is sizably larger than in the other samples, about 413.60€ on average. About 53% of the households in the participating population benefit from the tax deduction associated with the Riester scheme.

A.4. Targeted Demogrant

We only consider the participating population and redistribute the entire subsidy volume among this particular group. The amount of the equivalent demogrant rises to 239.85€. Call this new distribution the targeted demogrant. With it we reveal, whether the mechanisms of subsidization, meaning allowances and tax deduction, have a progressive or regressive effect, since in this scenario we do not redistribute to a broader sample and only the intensity of the subsidization counts. Results are presented in Table A2.

The reaction of the inequality measures is again unanimous: all indicate greater inequality due to the Riester scheme. Considering the effect sizes seen before, these are also relatively large. The results also show an increase in the incidence of poverty and the Sen Index, while the IGR shows a negative change due to the Riester scheme. The changes in absolute value are very small in comparison to those seen before, yet it is still clear that a more favorable distribution of the subsidy for the poor is reached by the targeted demogrant. From these results we can determine that the form of subsidization chosen in the Riester scheme is still being outperformed by a

[27] A deduction of costs arising from commutes to one's workplace.
[28] See § 10 S. 1 Nr. 5 EStG.
[29] A deduction of costs that derive from expenses to maintain earnings. See § 9 EStG.
[30] Statistisches Bundesamt (2008), also with data from 2009 and 2010, which came from a special report on request.

Table A1. Descriptive Statistics for the Participating Population

	mean	std. error	min	max	obs.
equivalent gross household income with transfers without Riester subsidy	34844	1209	1133	324800	628
equivalent net household income with transfers without Riester subsidy	29721	855.418	600	221772	628
number of household members	2.738	0.062	1	7	628
married	0.600	0.026	0	1	628
age	41.26	0.504	18	90	628
female	0.282	0.023	0	1	628
completed vocational training	0.554	0.025	0	1	628
completed extended vocational training	0.208	0.025	0	1	628
completed university degree	0.168	0.020	0	1	628
access to tertiary education	0.388	0.025	0	1	628
Estimated subsidies and subsidy rates					
level of Riester subsidy	413.593	15.427	0	1764	628
ratio of subsidy to net household income in %	1.082	0.080	0	17.111	628
receiving Riester tax allowance	0.534	0.029	0	1	628

Note. PHF 2010. Own calculations. 1,000 bootstrap replicate weights used to compute standard errors.

Table A2. Inequality and Poverty Measures with Targeted Demogrant in the Participating Population

	wD			$wD - wR$		
	low CI	Point	upp CI	low CI	Point	upp CI
Gini	27.124	28.184	29.244	-0.113	-0.097	-0.082
MLD	12.773	14.030	15.288	-0.172	-0.141	-0.109
Theil	12.422	13.597	14.772	-0.110	-0.094	-0.077
GE2	13.079	15.935	18.791	-0.148	-0.119	-0.090
HCR	4.725	5.459	6.194	-0.099	-0.099	-0.099
IGR	19.928	27.993	36.058	-0.198	0.100	0.397
Sen	1.698	2.216	2.733	-0.063	0.039	-0.014

Note. PHF 2013. Own calculations. 95% confidence intervals are shown for each statistic. 1,000 bootstrap replicate weights used to compute standard errors. The measures Gini, MLD, Theil, GE2 and Sen were multiplied by 100. The HCR and IGR have been left as originally computed. wD indicates the distribution with demogrant, wR the distribution with Riester induced transfers.

demogrant and cannot claim to specifically favor the poor or to distribute the subsidy volume rather evenly.

A.5. Graphs

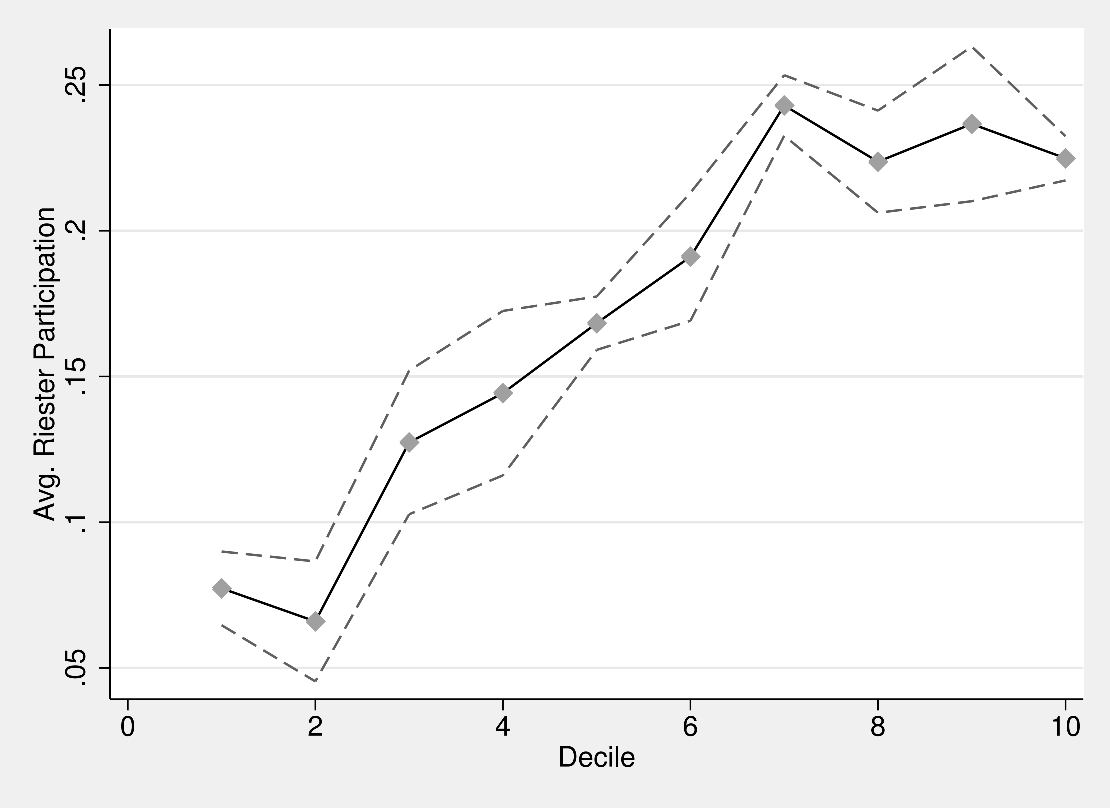

Figure A1. Participation Fraction by Decile in the Overall Population

Note. For each decile of the distribution, three statistics are provided: the point estimate of the participation rate together with the upper and lower bound of the 95% bootstrap confidence interval. Much like the average subsidy level, the point estimate is the average share of participating households in a given decile.

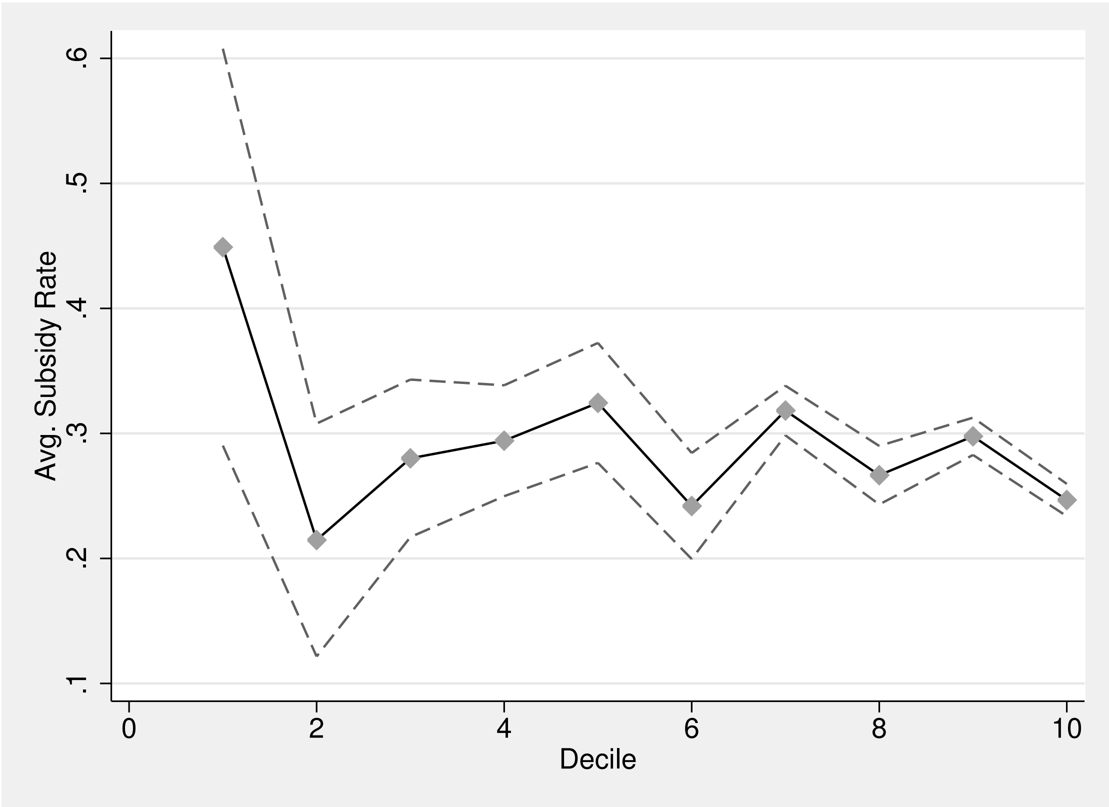

Figure A2. Subsidy Rate by Decile of the Overall Population

*Note.*We define the subsidy rate as the sum of the subsidies divided by the sum of the incomes over all households in each decile, multiplied by 100. In that sense, we do not compute an average of the subsidy rates, but rather the subsidy rate of the decile.

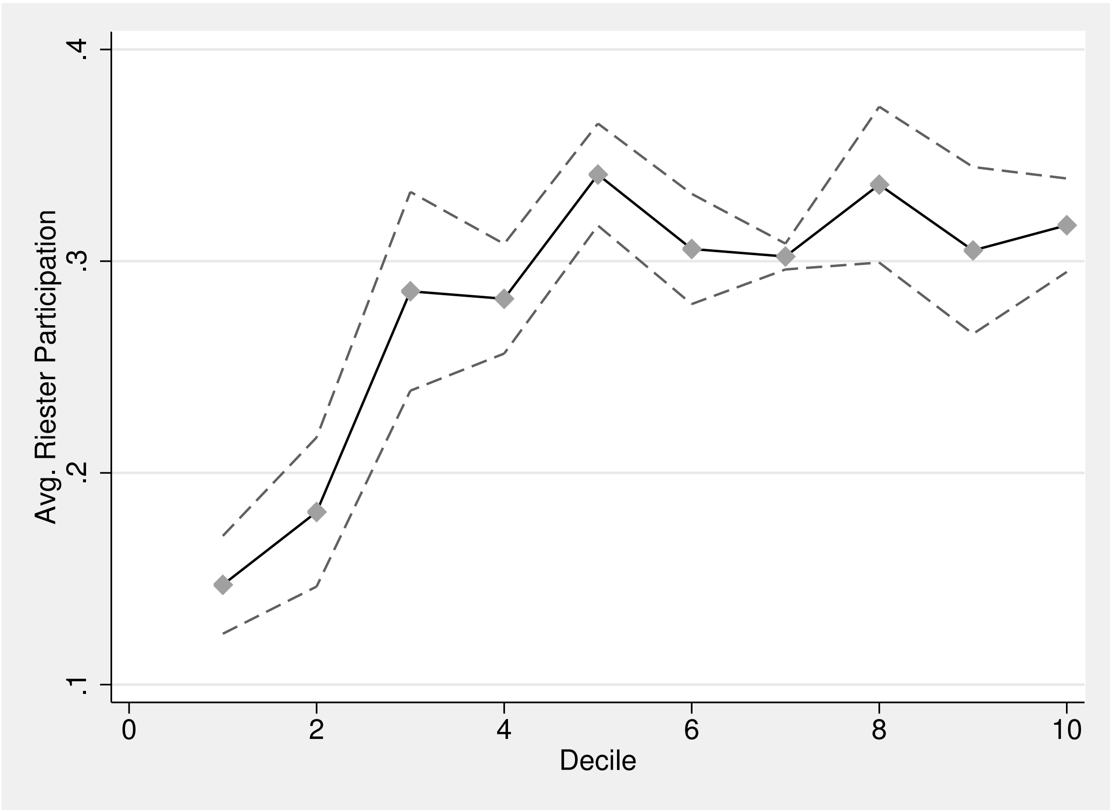

Figure A3. Participation Fraction by Decile in the Eligible Population

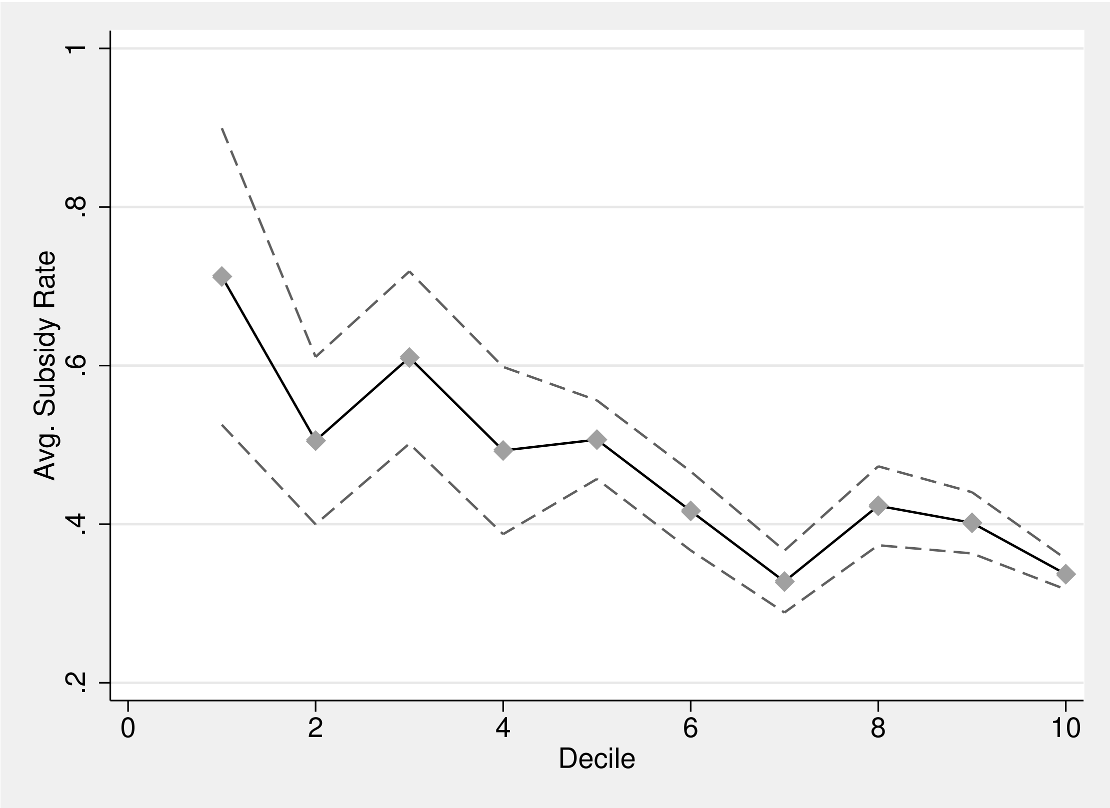

Figure A4. Subsidy Rate by Decile of the Eligible Population

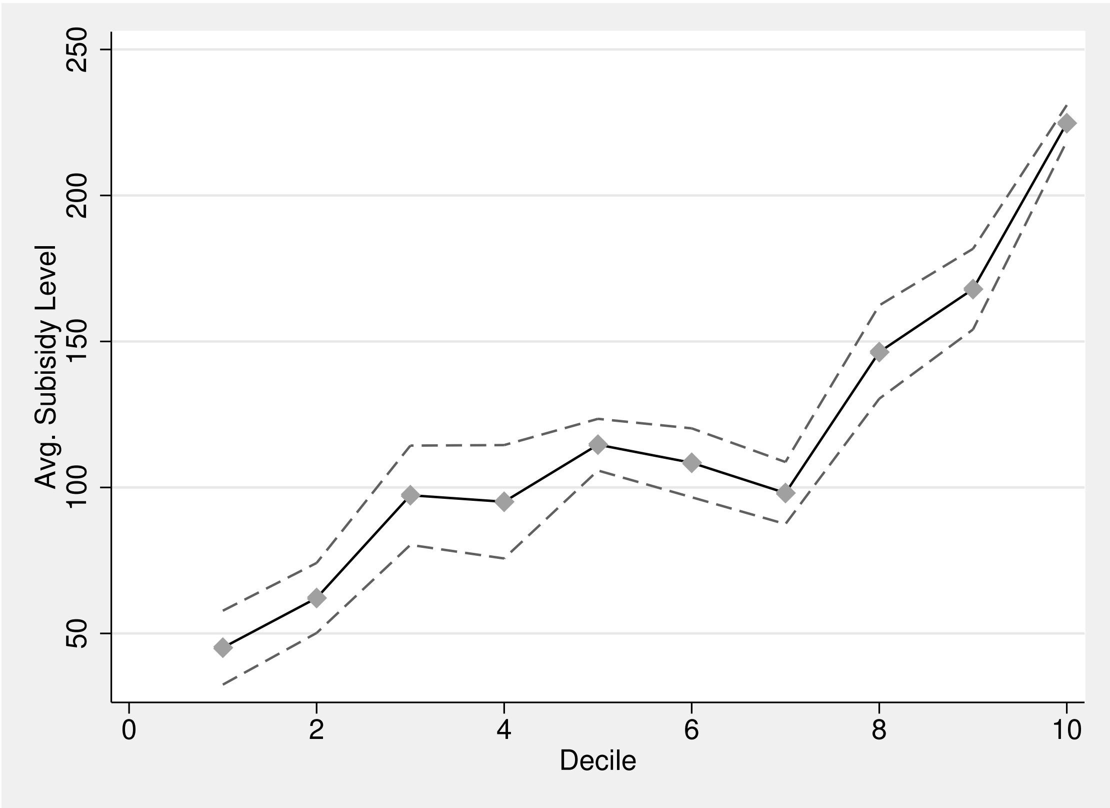

Figure A5. Subsidy Level by Decile of the Eligible Population

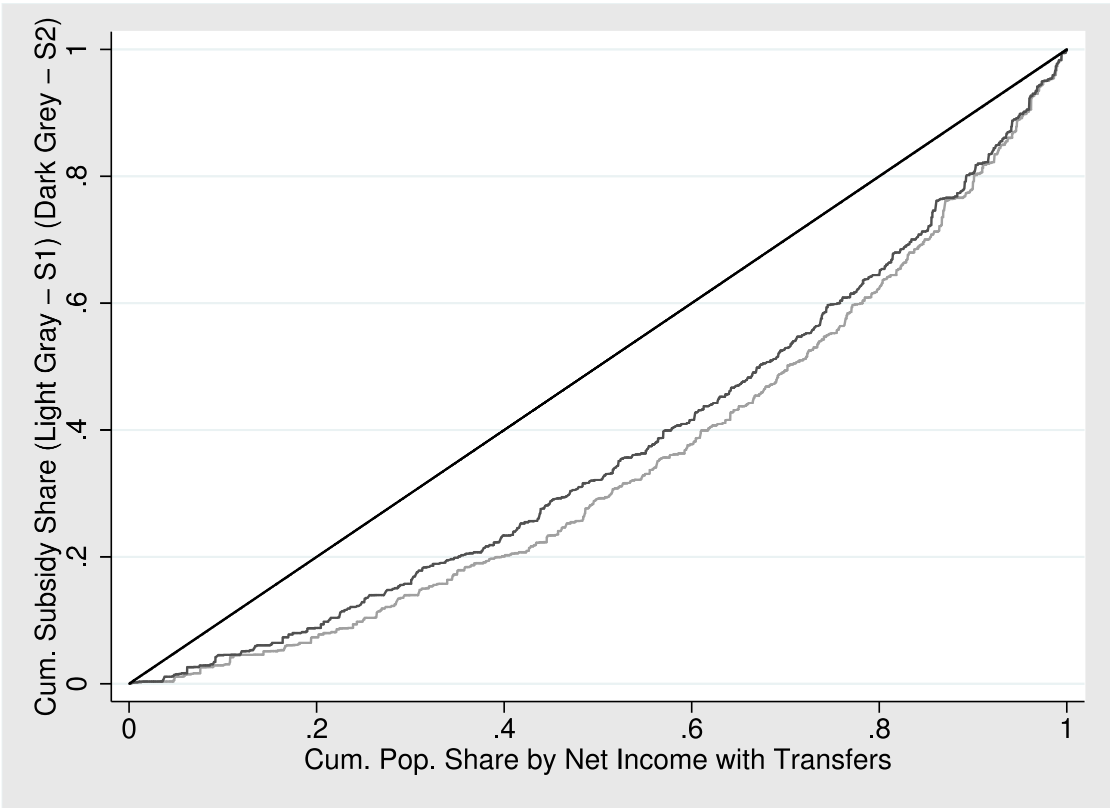

Figure A6. Concentration Curves for Overall and Eligible Population

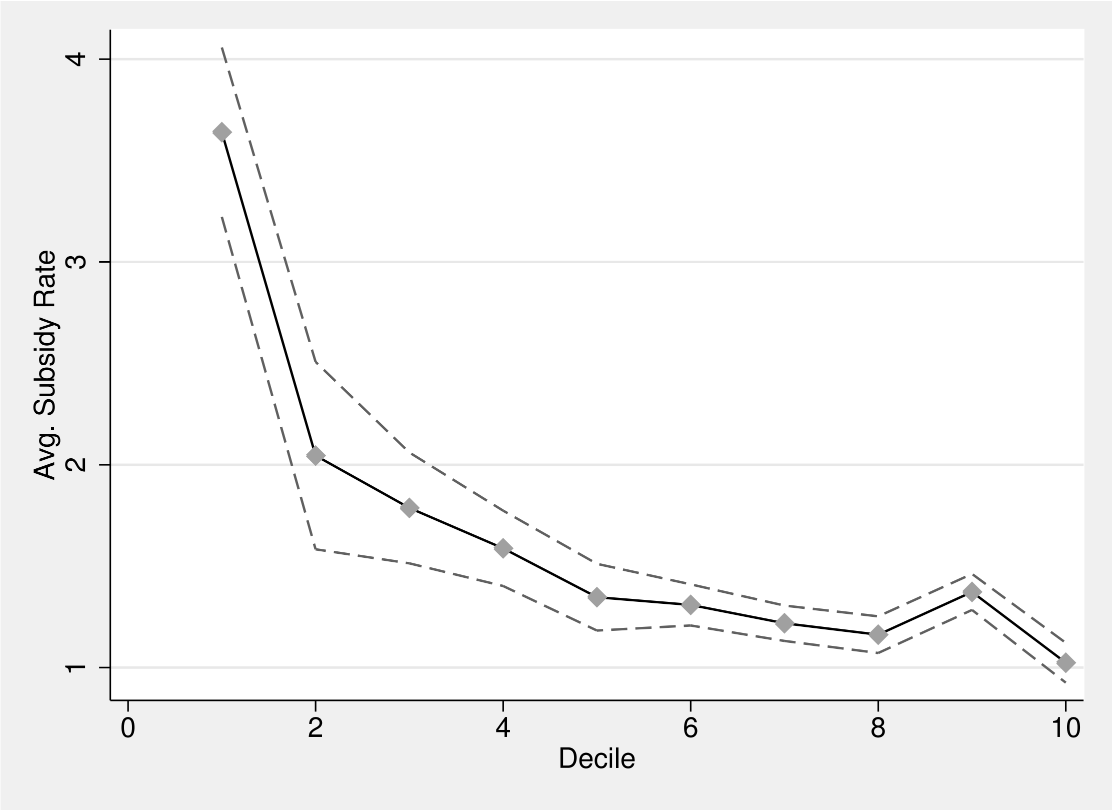

Figure A7. Subsidy Rate by Decile of the Participating Population

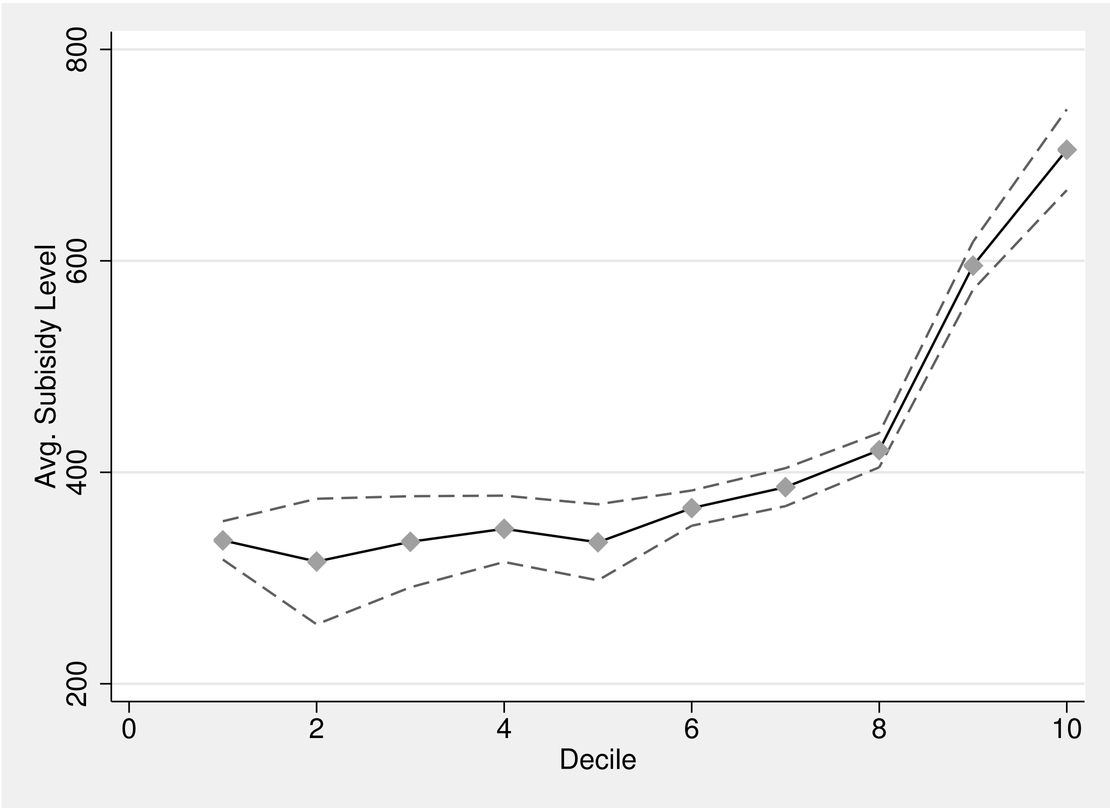

Figure A8. Subsidy Level by Decile of the Participating Population

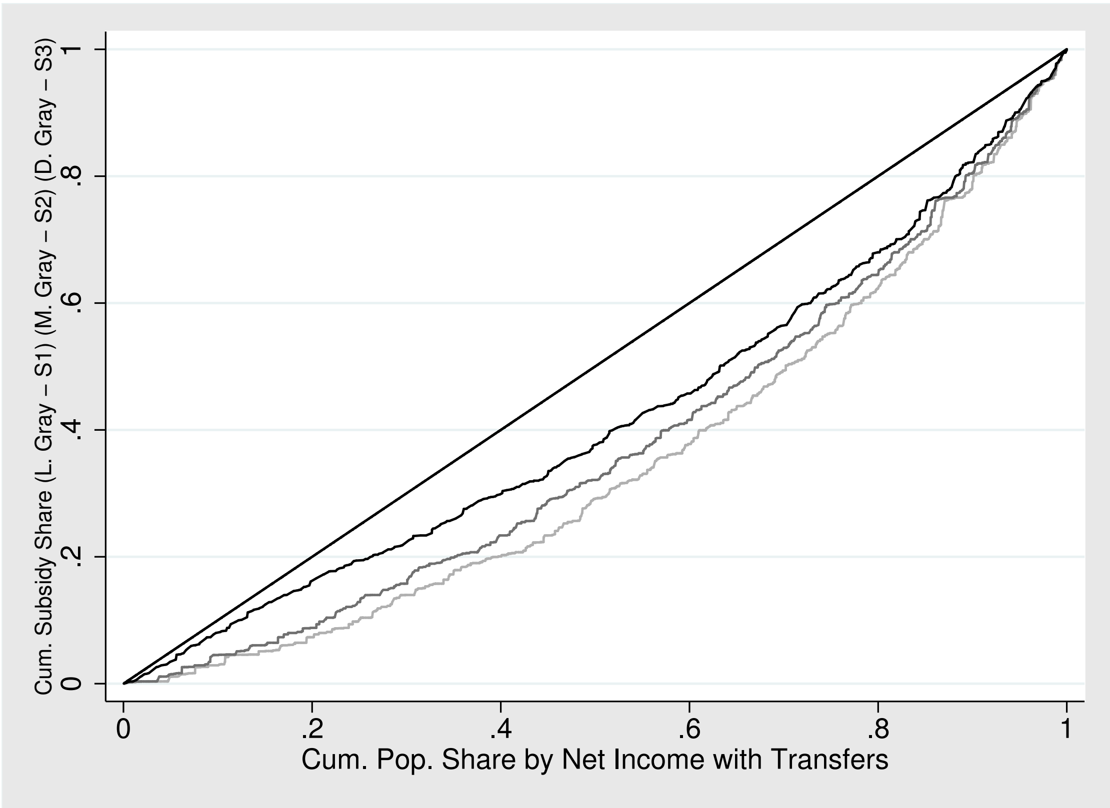

Figure A9. Concentration Curves for Overall, Eligible and Participating Population

References

Burman, Leonard E., William G. Gale, Matthew Hall, and Peter R. Orszag (2004). "Distributional effects of defined contribution plans and individual retirement arrangements". In: *National Tax Journal*, pp. 671–701.

Chernozhukov, Victor and Christian Hansen (2004). "The effects of 401 (k) participation on the wealth distribution: an instrumental quantile regression analysis". In: *Review of Economics and Statistics* 86.3, pp. 735–751.

Chetty, Raj, John N. Friedman, Soren Leth-Petersen, Torben H. Nielsen, and Tore Olsen (2013). *Subsidies vs. Nudges: Which Policies Increase Saving the Most?* Tech. rep. Center for Retirement Research.

Coppola, Michela and Anette Reil-Held (2009). *Dynamik der Riester-Rente: Ergebnisse aus SAVE 2003 bis 2008.* Mannheim Research Institute for the Economics of Aging.

Corneo, Giacomo, Matthias Keese, and Carsten Schröder (2009). "The Riester scheme and private savings: an empirical analysis based on the German SOEP". In: *Schmollers Jahrbuch: Journal of Applied Social Science Studies/Zeitschrift für Wirtschafts-und Sozialwissenschaften* 129.2, pp. 321–332.

– (2010). "The Effect of Saving Subsidies on Household Saving–Evidence from Germany". In: *Ruhr economic paper* 170.

D'Orazio, Marcello, Marco Di Zio, and Mauro Scanu (2006). *Statistical Matching: Theory and Practice.* John Wiley & Sons.

Engen, Eric M., William G. Gale, and John K. Scholz (1996). "The illusory effects of saving incentives on saving". In: *The Journal of Economic Perspectives*, pp. 113–138.

Even, William and David Macpherson (2007). "Defined contribution plans and the distribution of pension wealth". In: *Industrial Relations: A Journal of Economy and Society* 46.3, pp. 551–581.

Fasshauer, Stephan and Nora Toutaoui (2009). "Die Anzahl des foerderberechtigten Personenkreises der Riester-Rente - eine Annaeherung". In: *Deutsche Rentenversicherung.*

Hastings Jr., Cecil, Frederick Mosteller, John W. Tukey, and Charles P. Winsor (1947). "Low moments for small samples: a comparative study of order statistics". In: *The Annals of Mathematical Statistics*, pp. 413–426.

HFCN, (Household Finance and Consumption Network) (2013). "The Eurosystem Household Finance and Consumption Survey - Methodological Report for the First Wave". In: *Statistics Paper Series No. 1 / April 2013.*

Joulfaian, David and David P. Richardson (2001). "Who takes advantage of tax-deferred saving programs? Evidence from federal income tax data". In: *National Tax Journal* 54.3, pp. 669–88.

Kalckreuth, Ulf von, Martin Eisele, Julia Le Blanc, Tobias Schmidt, and Junyi Zhu (2012). "The PHF: A comprehensive panel survey on household finances and wealth in Germany". In: *Discussion Paper Deutsche Bundesbank No. 13/2012.*

Kalckreuth, Ulf von, Tobias Schmidt, and Martin Eisele (2013). *Panel on Household Finances.* DOI: 10.12757/PHF.01.01.01.STATA.

Lambert, Peter (2001). *The distribution and redistribution of income.* Manchester University Press.

Pfarr, Christian and Udo Schneider (2011). "Anreizeffekte und Angebotsinduzierung im Rahmen der Riester-Rente: Eine empirische Analyse geschlechts-und sozialisationsbedingter Unterschiede". In: *Perspektiven der Wirtschaftspolitik* 12.1, pp. 27–46.

Rubin, Donald B. (2004). *Multiple imputation for nonresponse in surveys.* Vol. 81. John Wiley & Sons.

Statistisches Bundesamt (2008). "Jährliche Einkommensstatistik Sonderthema Werbungskosten". In: *Fachserie 14 Reihe 7.1.1 Finanzen und Steuern.*

Steiner, Viktor, Katharina Wrohlich, Peter Haan, and Johannes Geyer (2008). *Documentation of the Tax-Benefit Microsimulation Model STSM - Version 2008.* Tech. rep. DIW Berlin, German Institute for Economic Research.

Stolz, Ulrich and Christian Rieckhoff (2013). "Die Riester-Rente im Beitragsjahr 2010: Zulageförderung erstmals für mehr als 10 Millionen Berechtigte". In: *RVaktuell 12/2013.*

Tiefensee, Anita and Markus Grabka (2014). "Comparing Wealth - Data Quality of the HFCS". In: *DIW Discussion Papers.*

Wagner, Gert G., Joachim R. Frick, and Jürgen Schupp (2007). "The German Socio-Economic Panel study (SOEP)-evolution, scope and enhancements". In:

Zhu, Junyi and Martin Eisele (2013). "Multiple imputation in a complex household survey - the German Panel on Household Finances (PHF): challenges and solutions". In: *PHF User Guide.*

Diskussionsbeiträge - Fachbereich Wirtschaftswissenschaft - Freie Universität Berlin
Discussion Paper - School of Business and Economics - Freie Universität Berlin

2015 erschienen:

2015/1 GÖRLITZ, Katja und Christina GRAVERT
The effects of increasing the standards of the high school curriculum on school dropout
Economics

2015/2 BÖNKE, Timm und Clive WERDT
Charitable giving and its persistent and transitory reactions to changes in tax incentives: evidence from the German Taxpayer Panel
Economics

2015/3 WERDT, Clive
What drives tax refund maximization from inter-temporal loss usage? Evidence from the German Taxpayer Panel
Economics

2015/4 FOSSEN, Frank M. und Johannes KÖNIG
Public health insurance and entry into self-employment
Economics

2015/5 WERDT, Clive
The elasticity of taxable income for Germany and its sensitivity to the appropriate model
Economics

2015/6 NIKODINOSKA, Dragana und Carsten SCHRÖDER
On the Emissions-Inequality Trade-off in Energy Taxation: Evidence on the German Car Fuel Tax
Economics

2015/7 GROß, Marcus; Ulrich RENDTEL; Timo SCHMID; Sebastian SCHMON und Nikos TZAVIDIS
Estimating the density of ethnic minorities and aged people in Berlin: Multivariate kernel density estimation applied to sensitive geo-referenced administrative data protected via measurement error
Economics

2015/8 SCHMID, Timo; Nikos TZAVIDIS; Ralf MÜNNICH und Ray CHAMBERS
Outlier robust small area estimation under spatial correlation
Economics

2015/9 GÖRLITZ, Katja und Marcus TAMM
Parenthood and risk preferences
Economics

2015/10 BÖNKE, Timm; Giacomo CORNEO und Christian WESTERMEIER
Erbschaft und Eigenleistung im Vermögen der Deutschen: eine Verteilungsanalyse
Economics

2015/11 GÖRLITZ, Katja und Marcus TAMM
The pecuniary and non-pecuinary returns to voucher-financed training
Economics

2015/12 CORNEO, Giacomo
Volkswirtschaftliche Bewertung öffentlicher Investitionen
Economics

2015/13 GÖRLITZ, Katja und Christina Gravert
The effects of a high school curriculum reform on university enrollment and the choice of college major
Economics

2015/14 BÖNKE, Timm und Carsten SCHRÖDER
European-wide inequality in times of the financial crisis
Economics

2015/15 BÖNKE, Timm; Beate JOACHIMSEN und Carsten SCHRÖDER
Fiscal federalism and tax enforcement
Economics

2015/16 DEMMER, Matthias
Improving Profitability Forecasts with Information on Earnings Quality
FACTS

2015/17 HAAN, Peter und Victoria PROWSE
Optimal Social Assistance and Unemployment Insurance in a Life-cycle Model of Family Labor Supply and Savings
Economics