Corneo, Giacomo; Keese, Matthias; Schröder, Carsten

Working Paper

The effect of saving subsidies on household saving: Evidence from Germany

School of Business & Economics Discussion Paper, No. 2010/3

Provided in cooperation with:
Freie Universität Berlin

Suggested citation: Corneo, Giacomo; Keese, Matthias; Schröder, Carsten (2010) : The effect of saving subsidies on household saving: Evidence from Germany, School of Business & Economics Discussion Paper, No. 2010/3, http://hdl.handle.net/10419/30318

Freie Universität Berlin

The Effect of Saving Subsidies on Household Saving

Evidence from Germany

Giacomo Corneo
Matthias Keese
Carsten Schröder

School of Business & Economics
Discussion Paper

Economics

2010/3

978-3-941240-15-5

The Effect of Saving Subsidies on Household Saving: Evidence from Germany

Giacomo Corneo[♦] Matthias Keese[♣] Carsten Schröder[♠]

February 2, 2010

ABSTRACT

Since 2002 the German government seeks to stimulate private retirement savings by means of special allowances and tax exemptions – the so-called Riester scheme. We apply matching and panel regression techniques to assess the impact of the Riester scheme on households' propensities to save in a natural experiment framework. Estimation results from both the German Socio-Economic Panel and the SAVE study indicate that private saving was hardly affected by the introduction of the Riester scheme.

JEL-Classification: D12, D14, H24, H31, I38

Keywords: Household saving, Saving incentives, Retirement, Riester scheme, Coarsened exact matching

[♦] Free University of Berlin, Department of Economics, Chair of Public Economics, Boltzmannstr. 20, 14195 Berlin, Germany.

[♣] Ruhr Graduate School in Economics, c/o University of Duisburg-Essen, Department of Economics, Chair of Public Economics (Prof. Dr. Reinhold Schnabel), 45117 Essen, Germany. Financial support by the Ruhr Graduate School in Economics is gratefully acknowledged.

[♠] Christian-Albrechts-University of Kiel, Department of Economics, Chair of Public Economics, Social Policy and Health Economics, Olshausenstr. 40, 24098 Kiel, Germany.

1 Introduction

A major ingredient of governmental responses to demographic changes eroding the financial basis of pay-as-you-go (PAYG) pension systems has been to favor household saving for retirement purposes. Currently, certified financial instruments for retirement saving are promoted by means of tax deductions and subsidies in several countries.[1] A crucial issue about such government-sponsored retirement plans is whether households finance their contributions with genuinely new saving – that would not have been done in the absence of those incentives - or with reductions in other assets, including increased borrowing. While new savings add to national wealth and raise future national income, a mere reallocation of financial assets has, if any, ambiguous effects on future national income. Hence, the evaluation of tax-favored retirement plans hinges upon their impact on households' saving behavior. Since 2002 also the German government supports private retirement saving plans by means of a saving incentive program called the *Riester scheme*. Meanwhile, generous incentives and pessimistic expectations about future pension benefits from the PAYG system have led a substantial fraction of the German population in working age to participate in the Riester scheme. This paper presents estimates of the effect of the Riester scheme on the saving propensities of German households.

The extent to which tax incentives and subsidies raise private saving is still an unresolved issue. For the eligible households, standard theory does not offer an unambiguous prediction because of countervailing income and substitution effects from a higher net return on saving. Further insights are offered by behavioral economics. Subsidized private pension schemes may increase households' savings if those schemes include penalties from early withdrawals that act as a valuable self-control device for savers. However, behavioral approaches may also predict that subsidized schemes reduce private saving. To the extent that households follow the rule of saving enough to replace a fixed percentage of their income in retirement, a higher net return on saving reduces the amount of saving necessary for that replacement. Furthermore, the savings of households not eligible for the subsidy may be affected. If the subsidy is financed by increased taxes on non-eligible households or by reducing the transfers that they receive, the saving by non-eligible households is likely to diminish.

Previous empirical research on the effectiveness of saving incentives has dealt overwhelmingly with the US experience (Antolín *et al*., 2004, Annex 2). In the United States, 401(k) has become the main vehicle for retirement saving and much attention has been

[1] See Antolín *et al*. (2004) and Yoo and de Serres (2004) for overviews.

devoted to evaluate its effectiveness. Early influential papers by Engen *et al*. (1994) and Poterba *et al*. (1995) presented results from median regressions and reached quite contradictory conclusions about the substitution between 401(k) assets and other type of savings. Recent papers, employing more sophisticated estimation techniques, have tended to find much heterogeneity in households' responses to 401(k)s and substantial crowding-out effects in the case of high-income households (Benjamin, 2003; Chernozhukov and Hansen, 2004).[2] For Germany, Corneo *et al*. (2009) have evaluated the Riester scheme as a natural experiment which affects the saving propensity of a treatment group relative to a control group. Their findings cast some doubts on the effectiveness of the Riester scheme in terms of mobilization of new savings.[3]

The current paper substantially extends the work presented in Corneo *et al*. (2009) along four main dimensions. First, we consider a broader set of treatment and control groups. In particular, we compare changes in the saving propensities of households eligible for Riester subsidies with the changes in saving propensities of non-eligible households, changes in the savings of households who benefit from high subsidies relative to those who receive low subsidies, and changes in the savings of eligible households having a Riester contract and those who do not. Second, we exploit statistical matching and panel regression techniques to address important issues of self-selection and unobserved heterogeneity. Third, in addition to the German Socio-Economic Panel we use the SAVE dataset, which has been explicitly designed to investigate the saving behavior of private households in Germany. Fourth, we provide not only an evaluation in a pre- *vs*. post-reform perspective but also an assessment of the impact of the so-called Riester steps, namely the stepwise increase in subsidies and required saving amounts over time.

In order to check the robustness of our empirical findings, we combine the two datasets mentioned above with three estimation methods. First, we use random-effects tobit panel models to regress saving rates before and after the reform on a dummy distinguishing treated and non-treated subjects, a post-reform dummy, an interaction of the two dummies, and a set of socio-economic characteristics. Size and sign of the interaction terms serve as indicators of a stimulating effect of the Riester scheme in the various approaches. Second, we take first differences of the savings ratio and other explanatory variables and run OLS regressions in first differences. Thereby, treatments effects are identified by sign and size of

[2] See also Duflo *et al*. (2007) who have evaluated the "saver's credit", a US federal program to encourage retirement savings, finding modest effects.

[3] Börsch-Supan *et al*. (2008b) and Pfarr and Schneider (2009) have investigated the determinants of participation in the Riester scheme. The uptake of Riester contracts offers circumstantial evidence of displacement effects.

the treatment coefficient. Third, we provide estimates for a subsample where treated and control subjects share the same socio-economic and demographic characteristics. We identify such statistical twins using a matching algorithm recently proposed by Iacus *et al*. (2008). Their algorithm ensures that treated and control units are approximately balanced on the matching variables. With the matched observations at hand, it is then possible to infer the average treatment effect on the treated.

We find insignificant treatment effects from the Riester scheme in almost all regressions, and the average treatment effects obtained from the matched datasets confirm the regression results. Our main conclusion is that in Germany household saving hardly responded to the introduction of that saving incentive program. Participation in the Riester scheme seems to largely substitute for other forms of saving.

The remainder of this paper is organized as follows. Section 2 describes the functioning of the Riester scheme. Our databases, the German Socio Economic Panel and the SAVE study, are presented in Section 3. The econometric modeling is described in Section 4. Section 5 presents our results, and Section 6 concludes.

2 The Riester scheme

The Riester scheme started operating in 2002. Beneficiaries receive allowances (a basic allowance and child allowances), and can lower their income tax liability by means of deductions. A minimum saving effort is requested from the beneficiaries. More precisely, the allowance and the personal saving effort must add up to a specific amount, which is proportional to the individual's income subject to social insurance contributions. The minimum saving amount is defined as a share of the income subject to social insurance contribution of the previous year, including the allowances. This share increased stepwise from one percent in the first year to four percent in 2008. These so-called *Riester-steps* are displayed in Figure 1. Also the level of allowances and the maximal amount of tax deductions have been increased stepwise since the introduction of the Riester scheme.[4] If the Riester scheme stimulated private savings, its mobilization effect should be visible in a pre- and post-reform comparison as well as along the Riester steps: the higher the required minimum savings amount and the subsidies granted, the higher the household savings.

Figure 1 about here

[4] Schulze and Jochem (2007) provide a detailed introduction to the German pension system and its recent reforms, including the Riester scheme. The political economy of the Riester reform has recently been analyzed by Kemmerling and Neugart (2009).

A large portion of the active population in Germany is eligible for Riester subsidies, estimates going from 30 to 36 million people. Basically, all compulsorily insured persons in the German public pension system are eligible for Riester contracts. In addition, public servants, trainees, individuals in the mandatory military or social service, and the recipients of some types of public transfers (e.g., unemployment benefits) may participate. Persons who are not statutorily insured in the mandatory public pension system are usually not eligible; those persons include several groups of self employees, marginal employees and students, social welfare recipients, senior citizens receiving a pension, and persons receiving disability benefits.[5]

The impact of the Riester scheme on national (private plus public) saving also depends on its effect on the public debt. An exact calculation of the fiscal burden from the Riester scheme can only be performed with some delay because the deadline of application for a certain contribution year is two years later. Table 1 provides an overview of the current fiscal costs of the Riester scheme. The non-italic figures show the actual allowances and tax deductions. Assuming a constant relation between allowances and tax deductions as well as a proportional relation of Riester contracts on the one hand and both allowances[6] and tax deductions on the other hand, our extrapolation (italic figures) yields annual direct costs of 2.8 billion euros for 2008 and in the following years, depending on how the uptake of Riester contracts develops. In addition, indirect costs for certification, administration, etc. have to be accounted for.

Table 1 about here

3 Datasets

Our investigation is based on two data sources, the German Socio-Economic Panel (SOEP) and the SAVE study. The SOEP is a longitudinal study, located at the DIW Berlin (German Institute for Economic Research). Starting in 1984, it surveys meanwhile more than 20,000 individuals in about 11,000 households every year.[7] The SOEP contains information on household savings; in some years it also reports whether a surveyed household member owns a Riester contract or not. The exact wording of the survey question about saving reads as

[5] However, eligibility regulations are very detailed and include a broad range of exemptions. See the publications by the Federal Ministry of Labour and Social Affairs (2006) for further details.
[6] The child allowance is notably higher for children born in 2008 and later (Federal Ministry of Labour and Social Affairs, 2006). Therefore, child allowances as a share of overall costs may increase in the next years.
[7] For details, see e.g. Wagner et al. (2007) and the SOEP homepage at http://www.diw.de/en/soep.

follows: “Do you usually have an amount of money left over at the end of the month that you can save for larger purchases, emergency expenses or to acquire wealth? If yes, how much?” (see SOEP online documentation: http://www.diw.de/english/questionnaires/33919.html). Hence, it is not asked to report accidental savings but to state usual amounts intended for savings, including savings to acquire wealth for old age.

The survey question reported above has extensively been used in econometric analyses of household saving decisions in Germany.[8] Nevertheless, one cannot rule out that savings may be under-reported in the SOEP data as Corneo *et al.* (2009) find that some respondents that claim to have a Riester contract declare zero savings. Concerns about the quality of the saving variable in the SOEP database motivate our analysis of a second German panel database, the SAVE study. Similarly to the SOEP, the SAVE data include a one-shot savings measure (overall amount saved in the previous year) and information on Riester contracts.[9] We focus on the SOEP-based estimates because the number of households repeatedly participating in the SAVE study is substantially smaller as compared to the SOEP. In particular, sample sizes are not sufficient to ensure reliable matching results for the SAVE database. Hence, we only report regression estimates obtained from the sample before matching. Another limitation of SAVE is that in the year 2000 - the year before the Riester reform - that database was still in its experimental stage. Hence, SAVE-based before-after reform comparisons cannot be taken seriously. Only an assessment of the impact of the so-called “Riester steps” on household savings is feasible; i.e., evaluations of the impact of the intertemporal rise in monetary incentives - higher allowances and tax deductions, but also higher required minimum savings efforts - on household savings.

4 Treatment strategy

We scrutinize the impact of the Riester scheme on households’ saving propensities by means of a treatment analysis. In order to assess the causal effect of the reform we compare pre- and post-reform propensities to save for two groups, a treatment group and a control group. Since people might have anticipated the Riester reform and correspondingly adjusted their pre-reform savings, we use the year 2000 and not 2001 as the pre-reform period. To cope with the possibility that people adjusted their savings with some delay, various post-reform years are considered, from 2004 to 2007. The 2000-2004 comparison is our preferred one because

[8] Among others, by Merkle and Zimmermann (1992) and Fuchs-Schündeln (2008).
[9] On the SAVE study see Börsch-Supan *et al.* (2008a). Essig (2005) discusses different savings measures and the reliability of the one-shot savings measure in the SAVE data. For further details, refer also to the SAVE questionnaires at the MEA homepage http://www.mea.uni-mannheim.de.

2005-2007 savings are likely to be affected by other factors as well, such as the introduction of so-called Rürup pensions in 2005.[10]

Various definitions of the treatment and the control group are considered. The most straightforward procedure is to assign households to the treatment group if they are eligible for a Riester contract, and non-eligible households to the control group. A second possibility exploits the differentiation of the subsidy rate according to household income. The target group of low income households, which benefits from above average subsidy ratios, is then defined as the treatment group. A third option is based on the fact that Riester subsidies are higher for households with more children, potentially creating an extra incentive to save. In a fourth scenario, we have selected all households eligible for a Riester contract, and have classified them conditioning upon whether they have signed a contract or not. The characteristics of the treatment and the control group for all these four approaches are summarized in Table 2.

Table 2 about here

When commenting upon our findings, we shall concentrate on the year combinations 2000-2004 and 2000-2005 for the approaches 1-3 as well as 2000-2004, 2000-2006, and 2000-2007 (since the uptake of Riester contracts was only surveyed in those years) for the Approach 4 using the SOEP data. In addition, we shall discuss results based on observations from the SAVE study as surveyed in 2003 vs. 2005, 2006, and 2007. The relevant observation points are displayed in Figure 1.

We proceed as follows: according to the characteristics displayed in Table 2, we assign a household to the various treatment and control groups. Then, we build subsamples for each year combination and keep only household observations that appear in both periods and that have the same treatment status in both years. Results from such an approach could be biased if excluded household observations have a different savings behavior compared to the considered household units. Then, the saving behavior of the considered households would not be representative for the entire population. For the approaches 1-3, we can rule out that household self-select into a different group between the two points of observation. In these approaches, treatment is linked to Riester eligibility (and, therefore, to employment and

[10] Rürup pensions are subsidized private retirement saving contracts especially targeting people that are not mandatorily insured in the German pension scheme, e.g. the self-employed. Contributions are tax-deductible, and the accumulated capital is repaid as a monthly annuity. For details, see e.g. the homepage of the Federal Ministry of Finance at http://www.bundesfinanzministerium.de/nn_39846/DE/BMF__Startseite/Service/Glossar/R/004__Ruerup-Rente.html.

marital status) and the number of children. It seems very unlikely that fundamental household decisions such as occupation, marriage, or birth of children are driven by Riester-related considerations. Approach 4 is immune to such complications as only households enter the sample if all adult members are eligible, and treated households are characterized by the household head having a contract in the later period. Therefore, over time, no observation switches between the treated and the control group.

Based on the aforementioned sample classifications, we evaluate the impact of the Riester scheme on household saving ratios, i.e., household savings divided by household net income. Since our dependent variable belongs to the unitary interval, and hence it is not normally distributed, and as our data exhibit a panel structure, we have chosen a random-effects tobit model, building on the form

$$(1) \qquad s_{i,t} = \alpha + \beta R_{i,t} + \mu N_{i,t} + \chi\left(R_{i,t} \cdot N_{i,t}\right) + \delta \mathbf{x}_{i,t} + \nu_i + \varepsilon_{i,t} .$$

In Eq. (1), i identifies a specific household, t denotes the observation period, ν_i the random effect, and $\varepsilon_{i,t}$ the error term. The random effect ν_i is assumed to be independent and identically distributed according to $N\left(0, \sigma_\nu^2\right)$. The vector of socio-economic characteristics characterizing i in t is denoted by $\mathbf{x}_{i,t}$. Among the control variables we include the number of adults and children living in the household, household income,[11] the employment status, as well as dummy variables on repayments for consumer credit and housing loans. The term R is a dummy variable taking the value one if a household belongs to the treatment group and zero otherwise. Hence its coefficient captures differences in the saving ratios of treated and non-treated households. N is another dummy variable, taking the value one if the observation refers to a post-reform year; its coefficient captures the evolution of saving ratios between two observation periods. Hence, the coefficient χ pertaining to the interaction term mirrors the mobilization effect from the Riester scheme. In particular, $\chi > 0$ would indicate that the Riester reform has stimulated savings among treated households.

Our second estimation method is a first-difference estimator of the following form,

$$(2) \qquad (s_{i,t+j} - s_{i,t}) = \alpha + (\mathbf{x}_{i,t+j} - \mathbf{x}_{i,t})'\beta + \chi\left(R_{i,t+j} \cdot N_{i,t+j} - R_{i,t} \cdot N_{i,t}\right)_i + (\varepsilon_{i,t+j} - \varepsilon_{i,t})$$

[11] Deflated with an index calculated from the average net household income in each year according to the Federal Statistical Office (2006) of Germany.

where $\left(s_{i,t+j} - s_{i,t}\right)$ denotes the difference in i's saving rates between periods $t+j$ and t. Similarly, the vector $(\mathbf{x}_{i,t+j} - \mathbf{x}_{i,t})$ stands for inter-temporal changes in the socioeconomic covariates. The time-invariant individual effect ν_i cancels out. Again, $\chi > 0$ would suggest a stimulation effect from the reform.

In the third place, we provide estimates of the average treatment effect on the treated, ATT, by using matching methods. We construct a sample such that the distributions of several characteristics are similar in the groups of treated and control units, so as to cope with the issue of selection bias (Iacus *et al.*, 2008). For the sample of matched units, the ATT is elicited through a simple ordinary least square regression of the form

$$(3) \qquad (s_{i,t+j} - s_{i,t}) \equiv \alpha + \beta R_i + \varepsilon_i .$$

Table 3 summarizes the matching variables: household net income, age of the household head, number of adults, and number of children living in the household. The selection of the matching variables is guided by previous literatures on household saving suggesting that these variables have a prominent effect on the saving behavior of households. An extension of the set of matching variables would have reduced post-matching sample sizes too much: the more variables are considered for matching, the lower is the number of observations in the treatment and in the control group that have characteristics similar in *all* dimensions.

Table 3 about here

We employ a monotonic imbalance bounding class of matching methods called "Coarsened Exact Matching" (CEM), as recently suggested by Iacus *et al.* (2008). Matching is done without replacement. To assess the quality of the matching outcome, we compare, before and after matching, descriptive statistics of the matching variables in both the treatment and the control group. In addition, we provide two measures of imbalance suggested by Iacus *et al.* (2008). The first measure,

$$(4) \qquad L_1(f,g) = \frac{1}{2} \times \sum_{l_1 \ldots l_k} \left| f_{l_1 \ldots l_k} - g_{l_1 \ldots l_k} \right| ,$$

gives the sum of absolute differences over all cells of a multivariate histogram. In Eq. (4), $f_{l_1 \ldots l_k}$ denote the relative frequencies of the categorical variables l_j for the treated households, and $g_{l_1 \ldots l_k}$ for the control households. These frequencies are obtained in three steps. First, the number of categories for each (continuous) variable is chosen. Then, the discretized variables are cross-tabulated separately for the treated and the control group. Finally, the k-dimensional relative frequency is computed. Perfect balance across all variables is achieved if $L_1(f,g)=0$, whereas $L_1(f,g)=1$ indicates perfect separation. Let the relative frequencies of the matched dataset be denoted by f^m and g^m; one hopes to find $\Delta L_1 = L_1(f,g) - L_1(f^m, g^m) > 0$, and the difference can be interpreted as the increase in balance achieved as a result of matching.[12] The measure defined by (4) can also be quantified for each variable j separately, which we then denote by $L_1^{(j)}$. $L_1^{(j)}$ allows an assessment of the variable-specific imbalance.

Our second measure,

$$(5) \qquad I_1^{(j)} = \overline{X}^{(j)}_{m_T,w} - \overline{X}^{(j)}_{m_C,w}, \qquad j = 1,\ldots,k,$$

is the difference in the means of variable j for the group of treated (m_T) and control units (m_C) matched, weighted by the matching weights assigned to each unit.[13]

5 Results

5.1 Panel regressions

5.1.1 Estimates from random-effects tobit models

Random-effects tobit model regression results are displayed in Table 4. For each of our four approaches and intertemporal comparisons, three model specifications are estimated. The model specifications differ by the set of control variables that they include. For each intertemporal comparison, the first column contains the estimates pertaining to a regression specification without any further control variable. The second column reports estimates when

[12] See Blackwell *et al*. (2009, p. 6).
[13] We implemented the CEM in Stata using the command *cem*. For details, see Blackwell *et al*. (2009) and http://gking.harvard.edu/cem/.

basic socio-demographic household characteristics are included as controls, while the third column exhibits the estimates of a specification with additional dummies that capture the employment status and the household's financial position.

Table 4 about here

The coefficient of the *interact* variable is of special interest for our purposes. Variable *interact* refers to the interaction term of the treatment dummy and the post-reform dummy. The reference year is always the earliest year in the dataset. In twenty-five out of twenty-seven regressions the estimated coefficient on the interaction term is statistically insignificant, suggesting that the Riester incentives produced a negligible effect on household saving.

The treatment dummy *treat* is statistically insignificant in most regressions: the treatment groups do not show a higher propensity to save.[14] The socio-economic control variables *household size* (captured by the number of adults and children) and *income* have instead a robust effect on saving rates. The saving rate increases with household income, whereas a larger household size decreases the saving rate. Unemployment and repayments of credits and housing loans have a robust and negative influence on saving rates. The other control variables have no robust effect.

5.1.2 Estimates from first-differences

First-differences results are shown in Table 5. They are similar to those from the random-effects tobit models. Only in two specifications for the first approach a significant treatment effect in one year combination (2000-2004) can be observed. This effect disappears after one year. When the sample is confined to low- and middle-income households (Approach 2), a stimulating effect of the Riester subsidies is not visible any more.

The influence of the control variables is as expected: an increase in household size lowers the savings ratio and the same is true for debt repayments. Increases in household income between two observational points significantly raise the household's propensity to save.

[14] However, in our Approaches 1 and 2, marginally significant and positive *treat* coefficients for the comparisons 2000 vs. 2006 and 2000 vs. 2007 suggest higher savings in the treatment groups. Here, we only report results for year combinations that offer enough observations for the later matching. Unfortunately, this is not the case for the years 2006 and 2007 in most of the approaches. Results for these year combinations are available from the authors on request.

Table 5 about here

5.2 Matching approach

As mentioned above, our regression analysis is not immune to the problem of selection bias. To illustrate this problem, some comments about the degree of imbalance in the original unmatched data and the data after matching are in order. For each of our four approaches, Table 6 reports summary statistics allowing, for each matching variable, an assessment of the degree of imbalance before and after matching.

Table 6 about here

By way of an example, consider Approach 1 when the inter-temporal comparison refers to periods 2000 and 2004. For each of the matching variables, the columns entitled $L_1^{(j)}$ and $I_1^{(j)}$ give the estimates of the variable-specific imbalance measures after and before matching. In the adjacent columns, imbalances between the treated and controls, the minimum, the three quantile means, and the maximum are reported. Thus, the value 0.074 appearing in column "$L_1^{(j)}$, after" for the variable "age" indicates a moderate imbalance between the treat and control units matched, which is substantially lower than the estimate 0.311 for the non-matched observations that appears in column "$L_1^{(j)}$, before". Also the second measure, "$I_1^{(j)}$", points to a substantial decrease of imbalance for the variable "age" – as shown by the value -0.312 for the matched units as compared to -4.837 for the units before matching. Next to the variable-specific imbalance measures, is reported the change in the global imbalance measure, ΔL_1, which indicates that the matching algorithm was effective in increasing the balance over all the matching variables.

It is transparent that the matching procedure has been effective in reducing the global imbalance across all variables as well as variable specific imbalances. This applies to all four approaches. In particular, it applies to Approaches 1 and 2 where imbalances before matching were relatively large.

We are now in a position to inspect whether our previous conclusions on the effectiveness of the Riester scheme hold for the units matched. The results are summarized in the column *Average treatment effect* in Table 7. The treatment effect is insignificant in seven out of nine cases. In two cases the treatment effect is weakly significant but it fails to carry the

correct sign. Hence, also for the units matched, where selection bias should not play a role, we cannot identify a stimulating effect of the Riester scheme on the propensity to save.

A limitation of the matching approach is that it leads to small sample sizes. Small samples raise the question whether the conclusions drawn from the matching approach are representative for the underlying overall population. This explains why it was useful to combine the matching approach with a panel regression analysis, so as to assess the robustness of the empirical results.

Table 7 about here

As shown by Dehejia and Wahba (2002), ATT estimates after matching may be sensitive to the choice of the matching algorithm. We have checked for robustness of our results by applying matching methods other than CEM. In particular, we have implemented propensity score matching techniques implemented in the STATA package *psmatch2*, encompassing, amongst others, *nearest neighbor* or *within caliper*, *radius*, *kernel*, and *Maholanobis matching*. The obtained results are in line with those of Table 7.[15]

5.3 Results from SAVE

As mentioned above, the SOEP saving variable is an imperfect measure of a household's savings. Therefore, we have conducted a regression analysis using a second dataset, the SAVE study. While the SAVE study was explicitly designed to investigate saving behavior, it only allows for an analysis of the effectiveness of the so-called Riester steps, i.e. the increase of the subsidy rate after 2003. The results from random-effects panel regressions based on the SAVE data are exhibited in Table 8. Those results are in line with those obtained applying the same methodology to the SOEP data (Table 4). As shown by Table 8, in twenty-two out of twenty-seven regressions the coefficient on the interaction term is statistically insignificant. In the five remaining regressions, it carries the wrong sign and is not strongly significant.

Table 8 about here

In Approach 4, the *treat* dummies are always significantly positive while the interaction terms yield a significantly negative sign in some year combinations. This suggests that households with a Riester contract have a higher propensity to save, but the additional incentives

[15] Results are available from the authors on request.

generated by the Riester steps did not raise or even lowered those households' saving rate. The positive *treat* coefficient in the 2000-2006 comparison in case of the SOEP data (Table 4) supports this presumption. In any case, the findings indicate that comparisons of eligible households having a Riester contract and those which have not may suffer from severe self-selection problems, since households with a high propensity to save are more likely to sign a Riester contract. This confirms the usefulness of complementing panel regressions with a matching approach.

6 Concluding remarks

The Riester scheme is the central pillar of governmental promotion of private retirement saving in Germany. In this paper, we have conducted a comprehensive treatment analysis of the Riester scheme so as to assess its effectiveness in raising private household savings. The introduction of the Riester allowances and tax deductions has been interpreted as a natural experiment and we have investigated how the savings of treated household have evolved as compared to the savings of control households. In order to check the robustness of our results, we have employed panel regressions and matching methods to reduce problems of unobserved heterogeneity and sample selection bias. Several model specifications as well as time periods have been examined and two datasets used, the German SOEP and the SAVE study.

Despite the variety of estimation methods and datasets, the obtained results are fairly stable: in general, no statistically significant effect of the Riester scheme on private saving can be detected. Apparently, many private households that would have saved also in the absence of the Riester scheme simply allocated some of their savings to Riester contracts. In this way, those households can improve their future living standards without the pain of reducing current consumption. The likely counterpart of those windfall gains is an increase in public debt, which calls for larger primary surpluses in the future. This suggests that a major effect of the Riester scheme is to substitute future increases in social security contributions with future tax increases.

The ineffectiveness of saving incentives may be more pronounced in Germany than in other countries. German households traditionally display a relatively high saving rate. Furthermore, all compulsorily insured persons regularly receive notification about the likely amount of pension benefit that they are going to receive as a retiree. Alternative long-term financial instruments, e.g. life insurance, are common and well known by the population. In

such a situation, the rationale for subsidizing certified retirement plans is rather weak. Our empirical results corroborate the view that there may be better uses of taxpayer money for old-age provision than the Riester scheme.

References

Antolín, P., A. de Serres, and C. de la Maisonneuve, 2004. Long-Term Budgetary Implications of Tax-Favoured Retirement and Saving Plans, OECD Economic Studies, 39.

Benjamin, D.J., 2003. Does 401(k) Eligibility Increase Saving? Evidence from Propensity Score Subclassification, *Journal of Public Economics*, 87(5-6), 1259-1290.

Blackwell, M., S. Iacus, G. King, and G. Porro, 2009. cem: Coarsened Exact Matching in Stata, downloaded from http://gking.harvard.edu/files/cem-stata.pdf.

Börsch-Supan, A., M. Coppola, L. Essig, A. Eymann and D. Schunk, 2008a. The German SAVE study - Design and Results, Mannheim Research Institute for the Economics of Aging (MEA), University of Mannheim.

Börsch-Supan, A., A. Reil-Held and D. Schunk, 2008b. Saving Incentives, Old-age Provision and Displacement Effects: Evidence from the Recent German Pension Reform, *Journal of Pension Economics and Finance* 7, 295-319.

Chernozhukov, V., and C. Hansen, 2004. The Effects of 401(k) Participation on the Wealth Distribution: An Instrumental Quantile Regression Analysis, *The Review of Economics and Statistics*, 86(3), 735-751.

Corneo, G., M. Keese and C. Schröder, 2009. The Riester Scheme and Private Savings: An Empirical Analysis Based on the German SOEP, *Schmollers Jahrbuch* 129 (2), 321-332.

Dehejia, R.H., and S. Wahba, 2002. Propensity Score-Matching Methods for Nonexperimental Causal Studies, *The Review of Economics and Statistics*, 84(1), 151-161.

Duflo, E., W. Gale, J. Liebman, P. Orszag and E. Saez, 2007. Savings Incentives for Low- and Moderate-Income Families in the United States: Why is the Saver's Credit Not More Effective?, *Journal of the European Economic Association*, 5(2-3), 647-661.

Engen, E.M., W.G. Gale and J.K. Scholz, 1994. Do Saving Incentives Work?, *Brookings Papers on Economic Activity*, 25(1994-1), 85-180.

Essig, L., 2004. Measures for Savings and Saving Rates in the German SAVE Data Set, MEA Discussion Papers, 086-05.

Federal Ministry of Labour and Social Affairs (ed.), 2006. Zusätzliche Altersvorsorge (BMAS, Referat Information, Publikation, Redaktion, Bonn).

Federal Statistical Office (ed.), 2006. Volkswirtschaftliche Gesamtrechnungen, Nettoeinkommen und Zahl der Haushalte nach Haushaltsgruppen, - Je Haushalt, Haushaltsmitglied und Verbrauchereinheit - 1991 bis 2005, Wiesbaden.

Fuchs-Schündeln, N., 2008. The Response of Household Saving to the Large Shock of German Reunification, *American Economic Review*, 98(5), 1798-1828.

Iacus, S.M., G. King and G. Porro, 2008. Matching for Causal Inference Without Balance Checking, Harvard University Working Paper, downloaded from: http://gking.harvard.edu/files/cem.pdf.

Kemmerling, A., and M. Neugart, 2009. Financial Market Lobbies and Pension Reform, *European Journal of Political Economy*, 25(2), 163-173.

Merkle, L., and K.F. Zimmermann, 1992. Savings, Remittances, and Return Migration, *Economics Letters*, 38(1), 77-81.

Pfarr, C., and U. Schneider, 2009. Demand Inducement, Crowding In and the German Riester Pension Scheme, MPRA Paper, 17759.

Poterba, J.M., S.F. Venti and D.A. Wise, 1995. Do 401(k) Contributions Crowd Out other Personal Saving?, *Journal of Public Economics*, 58(1), 1-32.

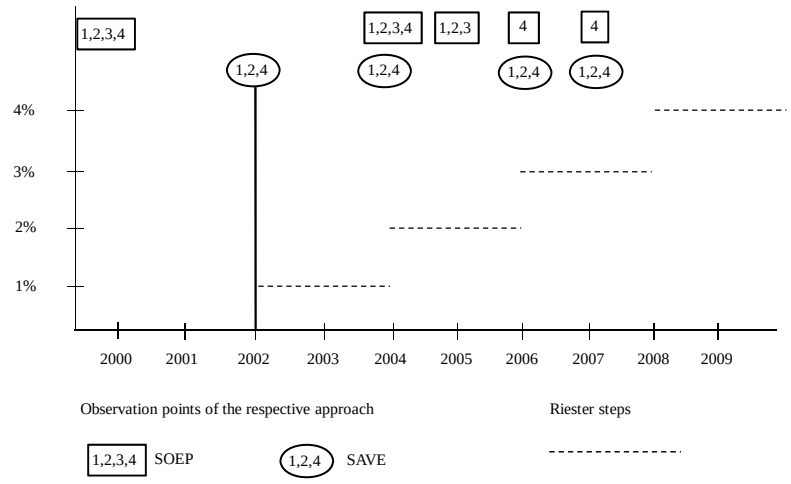
Schulze, I., and S. Jochem, 2007. Germany: Beyond Policy Gridlock, in: Immergut, E., Anderson, K., and I. Schulze (eds.), The Handbook of West European Pension Politics, Oxford University Press, Oxford, pp. 660-710.

Wagner, G.G., J.R. Frick and J. Schupp, 2007. The German Socio-Economic Panel Study (SOEP): Scope, Evolution and Enhancements. *Schmollers Jahrbuch* 127 (1), 139-170 .

Yoo, K.-Y., and A. de Serres, 2004. Tax Treatment of Private Pension Savings in OECD Countries and the Net Tax Cost Per Unit of Contribution to Tax-Favoured Schemes, OECD Economics Department Working Papers 406, OECD Economics Department.

Figure

Figure 1. The Riester scheme and used observation points in the datasets



Own illustration.

Tables

Table 1. Fiscal costs of the Riester scheme

	2002	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
# Riester contracts (in mio.)	3.37	3.92	4.19	5.63	8.05	10.76	12.15
Allowances (in mio. Euro)	146.8	173.9	384.9	521.9	*1,114.3*	*1,488.9*	*2,241.8*
Tax deductions (in mio. Euro)	38.5	53.5	107.8	*147.2*	*314.3*	*420.1*	*632.4*
Total subsidies (in mio. Euro)	185.3	227.4	492.7	*669.1*	*1,428.6*	*1,909.0*	*2,874.2*

Italic figures are own extrapolation based on the figures of the previous years. Source: Number of Riester contracts: Federal Ministry of Labour and Social Affairs (www.bmas.bund.de); allowances/tax deductions: Kriete-Dodds/Vorgrimler (2007), Kriete-Dodds (2008), and Federal Statistical Office (2009).

Table 2. Alternative definitions of treatment and control group

Approach	Treatment group	Control group
1	Households eligible for Riester	Households not eligible for Riester
2	Households eligible for Riester, income below mean in the respective year	Households not eligible for Riester, income below mean in the respective year
3	Two adults, married, income below mean, two children	Two adults, married, income below mean, one child
4	Household head with a Riester contract [A]	Household head without a Riester contract but eligible household members [A]

[A] *For the SOEP. The results are qualitatively unchanged when comparing households with and without Riester contract but eligibility as implemented with the SAVE data. Own illustration.*

Table 3. Matching variables and their coarsened categories

Matching variable	Approach 1	2	3	4
Income	<1,000; 1,000-2,000; 2,000-3,000; 3,000-4,000; 4,000-5,000; 5,000-6,000; 6,000-8,000; 8,000-10,000; 10,000-12,000; 12,000-14,000; 14,000-16,000	<500; 500-1,000; 1,000-1,500; 1,500-2,000; 2,000-2,500, 2,500-3,000; >3,000	<1,000; 1,000-2,000; 2,000-3,000; >3,000	500-1,000; 1,000-1,500; 1,500-2,000; 2,000-2,500, 2,500-3,000
age of the household head	20-30, 30-35, 35-40, 40-45, 45-50, 50-55, 55-60	20-30, 30-35, 35-40, 40-45, 45-50, 50-55, 55-60	20-30, 30-35, 35-40, 40-45, 45-50, 50-55, 55-60	20-30, 30-35, 35-40, 40-45, 45-50, 50-55, 55-60
number of adults	1, 2	1, 2	---	1, 2
number of children	0, 1, 2, 3+	0, 1, 2, 3+	---	0, 1, 2, 3+

Own illustration.

Table 4. Random-effects panel regressions (tobit), full sample

Approach 1	2000 vs 2004			2000 vs 2005		
Treat	0.005	0.015	0.015	0.028	0.028	0.022
	(0.017)	(0.016)	(0.016)	(0.018)	(0.017)	(0.018)
After reform	-0.116***	-0.123***	-0.125***	-0.105***	-0.112***	-0.115***
	(0.017)	(0.017)	(0.017)	(0.020)	(0.020)	(0.020)
Interact	0.026	0.029*	0.036**	0.021	0.022	0.025
	(0.018)	(0.018)	(0.017)	(0.021)	(0.021)	(0.020)
Age		-0.001***	-0.001**		-0.001***	-0.001**
		(0.000)	(0.000)		(0.000)	(0.000)
Children		-0.041***	-0.037***		-0.042***	-0.037***
		(0.003)	(0.003)		(0.003)	(0.003)
Adults		-0.011	0.000		-0.017**	-0.007
		(0.007)	(0.007)		(0.007)	(0.007)
Income		0.056***	0.051***		0.060***	0.054***
		(0.003)	(0.003)		(0.003)	(0.003)
Unemployed			-0.121***			-0.126***
			(0.011)			(0.011)
Self-employed			-0.021			-0.039***
			(0.013)			(0.013)
Civil servant			0.013			0.016
			(0.011)			(0.011)
Credit			-0.071***			-0.075***
			(0.005)			(0.006)
Housing loan			-0.021***			-0.025***
			(0.006)			(0.007)
Constant	0.096***	0.048**	0.067***	0.076***	0.041*	0.074***
	(0.016)	(0.023)	(0.022)	(0.018)	(0.024)	(0.024)
Sigma u	0.139***	0.120***	0.110***	0.130***	0.111***	0.102***
	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)
Sigma e	0.133***	0.133***	0.133***	0.139***	0.138***	0.137***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
Rho	0.522	0.448	0.408	0.467	0.390	0.354
Wald Chi2	568.03	1,127.53	1,420.35	411.87	981.05	1,268.94
Log-likelihood	-556.35	-272.07	-113.02	-496.95	212.75	-56.30
Number of households		2,963			2,611	
Treatment households (%)		0.95			0.95	

Random-effects panel model (tobit). Standard errors in parentheses. Rho is the percent contribution to the total variance of the panel-level variance component. If it is zero, the panel estimator is not different from the pooled estimator. Sigma u: panel-level standard deviation; Sigma e: standard deviation of ε_{it}. *** p<0.01, ** p<0.05, * p<0.1; Source: SOEP.*

Table 4 continued

Approach 2	2000 vs 2004			2000 vs 2005		
Treat	0.028	0.018	0.025	0.053**	0.040*	0.044*
	(0.023)	(0.021)	(0.021)	(0.025)	(0.023)	(0.023)
After reform	-0.104***	-0.096***	-0.097***	-0.079***	-0.058**	-0.059**
	(0.025)	(0.025)	(0.024)	(0.028)	(0.027)	(0.027)
Interact	0.024	0.013	0.017	0.003	-0.023	-0.023
	(0.025)	(0.025)	(0.025)	(0.028)	(0.028)	(0.027)
Age		-0.001	-0.000		-0.001*	-0.001
		(0.000)	(0.000)		(0.000)	(0.000)
Children		-0.058***	-0.054***		-0.061***	-0.057***
		(0.005)	(0.005)		(0.005)	(0.005)
Adults		-0.083***	-0.067***		-0.088***	-0.073***
		(0.010)	(0.010)		(0.010)	(0.010)
Income		0.160***	0.149***		0.173***	0.161***
		(0.009)	(0.009)		(0.009)	(0.009)
Unemployed			-0.092***			-0.089***
			(0.013)			(0.013)
Selfemployed			-0.039*			-0.041*
			(0.021)			(0.022)
Civil servant			-0.030			-0.022
			(0.022)			(0.022)
Credit			-0.078***			-0.084***
			(0.008)			(0.008)
Housing loan			-0.015			-0.023**
			(0.010)			(0.010)
Constant	0.018	-0.051*	-0.030	-0.000	-0.071**	-0.038
	(0.022)	(0.030)	(0.029)	(0.025)	(0.033)	(0.032)
Sigma u	0.143***	0.121***	0.113***	0.140***	0.115***	0.107***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Sigma e	0.141***	0.138***	0.138***	0.146***	0.140***	0.139***
	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.004)
Rho	0.507	0.435	0.401	0.479	0.401	0.371
Wald Chi2	214.02	622.61	761.03	159.34	621.49	750.43
Log-likelihood	-658.84	-439.84	-355.77	-578.08	-331.19	-255.41
Number of households		1,746			1,498	
Treatment households (%)		0.94			0.94	

Random-effects panel model (tobit). Standard errors in parentheses. Rho is the percent contribution to the total variance of the panel-level variance component. If it is zero, the panel estimator is not different from the pooled estimator. Sigma u: panel-level standard deviation; Sigma e: standard deviation of ε_{it}. *** p<0.01, ** p<0.05, * p<0.1; Source: SOEP.*

Table 4 continued

Approach 3	2000 vs 2004			2000 vs 2005		
Treat	-0.013	-0.019	-0.017	-0.009	-0.020	-0.019
	(0.017)	(0.016)	(0.016)	(0.019)	(0.018)	(0.018)
After reform	-0.080***	-0.091***	-0.086***	-0.071***	-0.096***	-0.092***
	(0.013)	(0.015)	(0.015)	(0.016)	(0.017)	(0.017)
Interact	-0.000	-0.001	-0.003	-0.003	0.000	0.002
	(0.018)	(0.018)	(0.018)	(0.019)	(0.019)	(0.019)
Age		-0.00143	-0.002		-0.000	-0.000
		(0.001)	(0.001)		(0.002)	(0.002)
Income		0.095***	0.098***		0.105***	0.098***
		(0.015)	(0.015)		(0.016)	(0.017)
Unemployed			-0.084***			-0.077***
			(0.024)			(0.028)
Selfemployed			-0.003			-0.051
			(0.043)			(0.047)
Civil servant			0.008			-0.021
			(0.033)			(0.039)
Credit			-0.052***			-0.052***
			(0.012)			(0.013)
Housing loan			-0.038***			-0.031**
			(0.013)			(0.014)
Constant	0.085***	-0.073	-0.034	0.082***	-0.143**	-0.082
	(0.013)	(0.057)	(0.056)	(0.015)	(0.066)	(0.066)
Sigma u	0.112***	0.105***	0.096***	0.113***	0.108***	0.105***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Sigma e	0.109***	0.109***	0.110***	0.101***	0.099***	0.097***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Rho	0.511	0.479	0.435	0.555	0.543	0.536
Wald Chi2	85.42	126.35	155.44	60.01	101.49	126.86
Log-likelihood	7.33	29.21	47.28	22.63	44.77	58.10
Number of households		396			299	
Treatment households (%)		0.59			0.62	

Random-effects panel model (tobit). Standard errors in parentheses. Rho is the percent contribution to the total variance of the panel-level variance component. If it is zero, the panel estimator is not different from the pooled estimator. Sigma u: panel-level standard deviation; Sigma e: standard deviation of ε_{it}. *** p<0.01, ** p<0.05, * p<0.1; Source: SOEP.*

Table 4 continued

Approach 4	2000 vs 2004			2000 vs 2006			2000 vs 2007		
Treat	0.0003	0.013	0.019	0.015	0.021	0.028**	0.007	0.015	0.019
	(0.015)	(0.014)	(0.013)	(0.015)	(0.013)	(0.013)	(0.014)	(0.013)	(0.013)
After reform	-0.084***	-0.093***	-0.090***	-0.087***	-0.089***	-0.088***	-0.088***	-0.094***	-0.099***
	(0.005)	(0.006)	(0.006)	(0.007)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Interact	-0.011	-0.010	-0.009	-0.007	-0.003	-0.013	0.005	0.003	-0.001
	(0.015)	(0.015)	(0.015)	(0.017)	(0.016)	(0.016)	(0.016)	(0.015)	(0.015)
Age		0.000	0.000		-0.001***	-0.001**		-0.001	-0.000
		(0.000)	(0.000)		(0.001)	(0.000)		(0.001)	(0.001)
Children		-0.046***	-0.044***		-0.053***	-0.048***		-0.045***	-0.043***
		(0.005)	(0.005)		(0.005)	(0.005)		(0.005)	(0.005)
Adults		-0.084***	-0.071***		-0.098***	-0.080***		-0.091***	-0.072***
		(0.010)	(0.010)		(0.011)	(0.011)		(0.011)	(0.011)
Income		0.129***	0.126***		0.150***	0.138***		0.138***	0.127***
		(0.008)	(0.008)		(0.008)	(0.009)		(0.009)	(0.009)
Unemployed			-0.075***			-0.109***			-0.094***
			(0.013)			(0.016)			(0.016)
Selfemployed			-0.072***			-0.052**			-0.048**
			(0.022)			(0.023)			(0.023)
Civil servant			-0.040**			-0.015			-0.005
			(0.020)			(0.020)			(0.020)
Credit			-0.082***			-0.074***			-0.086***
			(0.007)			(0.008)			(0.009)
Housing loan			-0.026***			-0.029***			-0.020**
			(0.009)			(0.010)			(0.010)
Constant	0.073***	0.000	0.022	0.076***	0.043*	0.057**	0.080***	0.024	0.043*
	(0.005)	(0.021)	(0.020)	(0.006)	(0.024)	(0.023)	(0.007)	(0.025)	(0.024)
Sigma u	0.135***	0.117***	0.107***	0.125***	0.105***	0.097***	0.121***	0.105***	0.094***
	(0.005)	(0.004)	(0.004)	(0.006)	(0.005)	(0.005)	(0.006)	(0.005)	(0.006)
Sigma e	0.131***	0.129***	0.128***	0.146***	0.140***	0.139***	0.143***	0.138***	0.138***
	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Rho	0.518	0.450	0.410	0.422	0.362	0.327	0.417	0.366	0.316
Wald Chi2	278.10	634.64	811.00	191.39	579.98	690.19	172.01	460.90	583.05
Log-likelihood	-401.54	-214.77	119.51	-400.10	-201.08	-132.85	-310.25	-163.23	-95.50
Number of households		1,691			1,320			1,168	
Treatment households (%)		0.13			0.18			0.23	

Random-effects panel model (tobit). Standard errors in parentheses. Rho is the percent contribution to the total variance of the panel-level variance component. If it is zero, the panel estimator is not different from the pooled estimator. Sigma u: panel-level standard deviation; Sigma e: standard deviation of ε_{it}. *** p<0.01, ** p<0.05, * p<0.1; Source: SOEP.*

Table 5. First-differences regressions (OLS), full sample (SOEP)

Approach 1	2000 vs 2004			2000 vs 2005		
Treatment	0.017	0.020*	0.023**	0.008	0.012	0.013
	(0.012)	(0.012)	(0.012)	(0.014)	(0.013)	(0.013)
Children		-0.029***	-0.026***		-0.030***	-0.027***
		(0.005)	(0.005)		(0.005)	(0.005)
Adults		0.010	0.013		0.003	0.007
		(0.008)	(0.008)		(0.008)	(0.008)
Income		0.010***	0.011***		0.015***	0.015***
		(0.003)	(0.003)		(0.003)	(0.003)
Unemployed			-0.008			-0.018**
			(0.008)			(0.009)
Credit			-0.025***			-0.033***
			(0.005)			(0.005)
Housing loan			-0.038***			-0.039***
			(0.007)			(0.007)
Constant	-0.089***	-0.090***	-0.091***	-0.079***	-0.082***	-0.082***
	(0.011)	(0.011)	(0.011)	(0.013)	(0.013)	(0.013)
R-squared	0.001	0.016	0.033	0.000	0.022	0.047
Number of households		2,963			2,611	
Treatment households (%)		0.95			0.95	

Standard errors in parentheses. *** *p<0.01,* ** *p<0.05,* * *p<0.1*
Source: SOEP.

Approach 2	2000 vs 2004			2000 vs 2005		
Treatment	0.007	0.005	0.005	-0.006	-0.011	-0.012
	(0.014)	(0.014)	(0.014)	(0.015)	(0.015)	(0.015)
Children		-0.021***	-0.021***		-0.027***	-0.027***
		(0.006)	(0.006)		(0.006)	(0.006)
Adults		-0.017	-0.016		-0.024**	-0.023**
		(0.010)	(0.010)		(0.010)	(0.010)
Income		0.043***	0.047***		0.0551***	0.058***
		(0.007)	(0.008)		(0.008)	(0.008)
Unemployed			0.0014			-0.0047
			(0.009)			(0.0095)
Credit			-0.027***			-0.033***
			(0.006)			(0.007)
Housing loan			-0.010			-0.032***
			(0.010)			(0.010)
Constant	-0.064***	-0.063***	-0.062***	-0.052***	-0.047***	-0.047***
	(0.013)	(0.013)	(0.013)	(0.015)	(0.015)	(0.015)
R-squared	0.000	0.024	0.035	0.000	0.045	0.067
Number of households		1,746			1,498	
Treatment households (%)		0.94			0.94	

Standard errors in parentheses. *** *p<0.01,* ** *p<0.05,* * *p<0.1*
Source: SOEP.

Table 5 continued.

Approach 3	2000 vs 2004			2000 vs 2005		
Treatment	-0.002	-0.003	-0.004	-0.005	-0.005	-0.003
	(0.012)	(0.012)	(0.012)	(0.013)	(0.013)	(0.012)
Income		0.0220	0.023		0.035**	0.036**
		(0.014)	(0.015)		(0.015)	(0.015)
Unemployed			-0.004			-0.009
			(0.019)			(0.020)
Credit			0.0004			-0.012
			(0.012)			(0.011)
Housing loan			-0.015			-0.042***
			(0.015)			(0.014)
Constant	-0.061***	-0.064***	-0.063***	-0.052***	-0.059***	-0.055***
	(0.009)	(0.009)	(0.009)	(0.010)	(0.010)	(0.010)
R-squared	0.000	0.006	0.009	0.000	0.019	0.049
Number of households		396			299	
Treatment households (%)		0.59			0.62	

Standard errors in parentheses. *** *p<0.01,* ** *p<0.05,* * *p<0.1*
Source: SOEP.

Approach 4	2000 vs 2004			2000 vs 2006			2000 vs 2007		
Treatment	-0.0063	-0.006	-0.006	-0.006	-0.003	-0.005	-0.0013	-0.001	-0.001
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Children		-0.017***	-0.016**		-0.026***	-0.022***		-0.028***	-0.027***
		(0.006)	(0.006)		(0.006)	(0.006)		(0.006)	(0.006)
Adults		-0.024**	-0.025**		-0.043***	-0.044***		-0.035***	-0.029***
		(0.011)	(0.011)		(0.011)	(0.011)		(0.011)	(0.011)
Income		0.036***	0.041***		0.064***	0.071***		0.055***	0.057***
		(0.007)	(0.008)		(0.008)	(0.008)		(0.009)	(0.009)
Unemployed			0.0025			0.002			-0.008
			(0.010)			(0.011)			(0.012)
Credit			-0.028***			-0.027***			-0.024***
			(0.006)			(0.008)			(0.008)
Housing loan			-0.023**			-0.051***			-0.0330***
			(0.010)			(0.010)			(0.010)
Constant	-0.064***	-0.065***	-0.065***	-0.067***	-0.070***	-0.070***	-0.068***	-0.070***	-0.070***
	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)
R-squared	0.000	0.018	0.033	0.000	0.052	0.077	0.000	0.044	0.061
Number of households		1,691			1,320			1,168	
Treatment households (%)		0.13			0.18			0.23	

Standard errors in parentheses. *** *p<0.01,* ** *p<0.05,* * *p<0.1*
Source: SOEP.

Table 6. Measures of imbalance in the distributions of treated and control units after matching

		Year	$L_1^{(j)}$		$I_1^{(j)}$		Between-group differences by quantiles				
	Variables		after	before	After	Before	0	25	50	75	100
Approach 1	Age	2000	0.074	0.311	-0.312	-4.837	0.000	0.000	-1.000	0.000	0.000
2000 vs 2004	Income	2000	0.139	0.208	-0.002	-0.003	-0.237	0.052	-0.021	0.052	0.409
$\Delta L_1 = 0.169$		2004	0.109	0.224	0.013	0.082	0.123	0.053	0.097	-0.094	0.090
	Number of	2000	0.000	0.068	0.000	0.068	0.000	0.000	0.000	0.000	0.000
	adults	2004	0.000	0.078	0.000	0.078	0.000	0.000	0.000	0.000	0.000
	Number	2000	0.000	0.201	0.000	0.334	0.000	0.000	0.000	0.000	0.000
	of children	2004	0.000	0.267	0.000	0.455	0.000	0.000	0.000	0.000	0.000
Approach 1	Age	2000	0.083	0.307	-0.330	-4.980	0.000	1.000	0.000	-1.000	0.000
2000 vs 2005	Income	2000	0.237	0.221	0.022	0.167	-0.237	0.068	0.000	0.044	-0.036
$\Delta L_1 = 0.201$		2005	0.171	0.284	0.008	0.320	0.121	0.071	0.029	-0.096	-0.333
	Number of	2000	0.000	0.100	0.000	0.100	0.000	0.000	0.000	0.000	0.000
	adults	2005	0.000	0.110	0.000	0.110	0.000	0.000	0.000	0.000	0.000
	Number of	2000	0.000	0.197	0.000	0.298	0.000	0.000	0.000	0.000	0.000
	children	2005	0.000	0.297	0.000	0.509	0.000	0.000	0.000	0.000	0.000
Approach 2	Age	2000	0.108	0.369	-0.542	-4.701	0.000	0.000	0.000	0.000	0.000
2000 vs 2004	Income	2000	0.097	0.209	0.019	0.223	-0.237	0.036	0.063	0.047	0.010
$\Delta L_1 = 0.322$		2004	0.129	0.295	0.032	0.347	0.123	0.020	0.094	0.097	0.053
	Number of	2000	0.000	0.055	0.000	0.055	0.000	0.000	0.000	0.000	0.000
	adults	2004	0.000	0.089	0.000	0.089	0.000	0.000	0.000	0.000	0.000
	Number of	2000	0.000	0.231	0.000	0.436	0.000	0.000	0.000	0.000	0.000
	children	2004	0.000	0.314	0.000	0.565	0.000	0.000	0.000	0.000	0.000
Approach 2	Age	2000	0.106	0.366	-0.589	-5.783	0.000	-1.000	-1.000	-1.000	0.000
2000 vs 2005	Income	2000	0.065	0.250	-0.002	0.216	-0.237	-0.022	0.027	0.000	-0.010
$\Delta L_1 = 0.383$		2005	0.122	0.287	-0.018	0.433	0.121	-0.048	-0.106	-0.106	0.033
	Number of	2000	0.000	0.083	0.000	0.083	0.000	0.000	0.000	0.000	0.000
	adults	2005	0.000	0.088	0.000	0.088	0.000	0.000	0.000	0.000	0.000
	Number of	2000	0.000	0.211	0.000	0.356	0.000	0.000	0.000	0.000	0.000
	children	2005	0.000	0.340	0.000	0.606	0.000	0.000	0.000	0.000	0.000
Approach 3	Age	2000	0.095	0.154	0.059	-0.026	2.000	0.000	0.000	0.000	0.000
2000 vs 2004	Income	2000	0.116	0.092	0.003	0.053	-0.142	-0.027	-0.001	0.063	-0.041
$\Delta L_1 = -0.030$		2004	0.164	0.144	0.032	0.093	0.086	0.046	-0.011	-0.016	-0.001
Approach 3	Age	2000	0.086	0.140	-0.079	-0.773	1.000	0.000	0.000	0.000	-3.000
2000 vs 2005	Income	2000	0.135	0.136	0.007	0.082	-0.121	0.015	0.021	0.076	-0.027
$\Delta L_1 = 0.019$		2005	0.129	0.144	0.001	0.080	-0.324	-0.066	0.056	-0.045	-0.012
Approach 4	Age	2000	0.065	0.128	0.007	-1.978	0.000	0.000	0.000	0.000	0.000
2000 vs 2004	Income	2000	0.109	0.121	-0.004	0.082	0.009	0.027	0.008	-0.014	-0.106
$\Delta L_1 = 0.191$		2004	0.090	0.148	0.000	0.117	0.070	-0.041	0.000	-0.003	-0.014
	Number of	2000	0.000	0.088	0.000	0.088	0.000	0.000	0.000	0.000	0.000
	adults	2004	0.000	0.084	0.000	0.084	0.000	0.000	0.000	0.000	0.000
	Number of	2000	0.000	0.182	0.000	0.343	0.000	0.000	0.000	0.000	0.000
	children	2004	0.000	0.193	0.000	0.416	0.000	0.000	0.000	0.000	0.000
Approach 4	Age	2000	0.044	0.157	-0.061	-3.052	0.000	0.000	1.000	0.000	-2.000
2000 vs 2006	Income	2000	0.105	0.126	0.003	0.068	0.018	0.000	0.033	-0.084	0.010
$\Delta L_1 = 0.180$		2006	0.109	0.135	0.008	0.134	0.009	0.006	0.049	0.003	0.000
	Number of	2000	0.000	0.069	0.000	0.069	0.000	0.000	0.000	0.000	0.000
	adults	2006	0.000	0.096	0.000	0.096	0.000	0.000	0.000	0.000	0.000
	Number of	2000	0.000	0.139	0.000	0.217	0.000	0.000	0.000	0.000	0.000
	children	2006	0.000	0.210	0.000	0.449	0.000	0.000	0.000	0.000	0.000
Approach 4	Age	2000	0.128	0.124	0.138	-2.526	0.000	0.000	1.000	1.000	0.000
2000 vs 2007	Income	2000	0.078	0.092	-0.001	0.049	0.000	0.000	-0.010	0.035	0.052
$\Delta L_1 = 0.205$		2007	0.107	0.120	0.007	0.137	0.002	-0.018	-0.009	-0.035	-0.011
	Number of	2000	0.000	0.073	0.000	0.073	0.000	0.000	0.000	0.000	0.000
	adults	2007	0.000	0.047	0.000	0.047	0.000	0.000	0.000	0.000	0.000
	Number of	2000	0.000	0.119	0.000	0.215	0.000	0.000	0.000	0.000	0.000
	children	2007	0.000	0.212	0.000	0.446	0.000	0.000	0.000	0.000	0.000

Own calculations. Source: SOEP.

Table 7. Treatment effects for matched units

Approach	Waves	Number of observations		Average treatment effect	Standard error
1	2000 vs. 2004	treat control	830 127	0.012	0.013
	2000 vs. 2005	treat control	552 101	0.012	0.015
2	2000 vs. 2004	treat control	339 81	-0.005	0.017
	2000 vs. 2005	treat control	205 66	0.010	0.016
3	2000 vs. 2004	treat control	228 158	0.000	0.012
	2000 vs. 2005	treat control	176 107	-0.008	0.013
4	2000 vs. 2004	treat control	150 476	-0.022*	0.013
	2000 vs. 2006	treat control	149 315	0.008	0.013
	2000 vs. 2007	treat control	142 281	-0.025*	0.014

*** $p<0.01$, ** $p<0.05$, * $p<0.1$
Source: SOEP.

Table 8. Random-effects panel regressions (tobit), full sample (SAVE)

Approach 1	2003 vs 2005			2003 vs 2006			2003 vs 2007		
Treat	0.040	0.031	0.040	0.045	0.036	0.043	0.040	0.036	0.057
	(0.029)	(0.030)	(0.030)	(0.040)	(0.039)	(0.040)	(0.041)	(0.040)	(0.040)
After reform	-0.010	-0.012	-0.020	-0.011	-0.013	-0.019	-0.015	-0.008	-0.015
	(0.033)	(0.033)	(0.033)	(0.045)	(0.046)	(0.046)	(0.048)	(0.050)	(0.051)
Interact	-0.040	-0.041	-0.035	-0.012	-0.009	-0.005	-0.006	-0.013	-0.014
	(0.035)	(0.035)	(0.036)	(0.050)	(0.048)	(0.048)	(0.050)	(0.052)	(0.053)
Age		0.001	0.001		0.001	0.001		0.001	0.001
		(0.001)	(0.001)		(0.001)	(0.001)		(0.001)	(0.001)
Children		-0.008	-0.007		-0.013	-0.011		-0.007	-0.005
		(0.007)	(0.007)		(0.008)	(0.008)		(0.008)	(0.008)
Adults		0.053***	0.053***		0.040*	0.042*		0.039*	0.032
		(0.020)	(0.020)		(0.023)	(0.024)		(0.022)	(0.022)
Income		0.001	0.000		0.018***	0.016***		0.017***	0.017***
		(0.002)	(0.002)		(0.006)	(0.006)		(0.006)	(0.005)
Unemployed			-0.058***			-0.051**			-0.072***
			(0.021)			(0.024)			(0.022)
Self-employed			0.035			0.006			0.028
			(0.034)			(0.040)			(0.042)
Civil servant			0.100***			0.045			0.013
			(0.030)			(0.031)			(0.029)
Credit[A]			-0.020			-0.025			-0.017
			(0.015)			(0.017)			(0.016)
Constant	-0.002	-0.130**	-0.126**	-0.015	-0.129*	-0.130**	-0.010	-0.140**	-0.134**
	(0.027)	(0.059)	(0.056)	(0.038)	(0.066)	(0.065)	(0.039)	(0.066)	(0.064)
Sigma u	0.093***	0.090***	0.077***	0.097***	0.084***	0.081***	0.080***	0.062***	0.051***
	(0.010)	(0.010)	(0.011)	(0.012)	(0.012)	(0.013)	(0.012)	(0.014)	(0.017)
Sigma e	0.127***	0.127***	0.130***	0.124***	0.127***	0.127***	0.115***	0.121***	0.123***
	(0.007)	(0.007)	(0.007)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Rho	0.349	0.333	0.262	0.376	0.303	0.285	0.324	0.206	0.147
Wald Chi2	16.26	25.97	48.46	4.27	22.58	31.98	3.68	22.09	35.30
Log-likelihood	-34.99	-29.90	-18.39	-16.00	-6.89	-2.05	10.92	19.80	26.31
Number of households		298			223			191	
Treatment households (%)		0.86			0.90			0.92	

[A] *Captures different kinds of loan repayments. Random-effects panel model (tobit). Random-effects panel model (tobit). Rho is the percent contribution to the total variance of the panel-level variance component. If it is zero, the panel estimator is not different from the pooled estimator. Sigma u: panel-level standard deviation; Sigma e: standard deviation of* ε_{it}. *Standard errors in parentheses.* *** *p<0.01,* ** *p<0.05,* * *p<0.1*
Source: SAVE.

Table 8 continued.

Approach 2	2003 vs 2005			2003 vs 2006			2003 vs 2007		
Treat	0.027	0.043	0.044	0.143**	0.129**	0.115*	0.141*	0.095	0.092
	(0.037)	(0.037)	(0.037)	(0.065)	(0.065)	(0.067)	(0.075)	(0.072)	(0.074)
After reform	-0.051	-0.038	-0.041	0.042	0.037	0.029	0.010	0.009	0.024
	(0.042)	(0.044)	(0.044)	(0.077)	(0.078)	(0.078)	(0.096)	(0.096)	(0.097)
Interact	0.002	-0.018	-0.012	-0.104	-0.096	-0.086	-0.040	-0.048	-0.066
	(0.046)	(0.047)	(0.047)	(0.081)	(0.081)	(0.082)	(0.099)	(0.100)	(0.100)
Age		0.001	0.001		0.001	0.001		0.002	0.002
		(0.001)	(0.001)		(0.001)	(0.001)		(0.002)	(0.002)
Children		-0.024**	-0.022**		-0.017	-0.017		-0.026*	-0.025*
		(0.010)	(0.010)		(0.015)	(0.017)		(0.014)	(0.014)
Adults		-0.045*	-0.045*		-0.063*	-0.050		-0.009	-0.005
		(0.026)	(0.027)		(0.035)	(0.037)		(0.032)	(0.033)
Income		0.099***	0.100***		0.098***	0.103***		0.098***	0.098***
		(0.021)	(0.022)		(0.025)	(0.029)		(0.025)	(0.028)
Unemployed			-0.007			0.016			-0.021
			(0.025)			(0.037)			(0.032)
Self-employed			0.021			-0.021			-0.108
			(0.050)			(0.062)			(0.091)
Civil servant			0.015			0.067			0.017
			(0.044)			(0.061)			(0.055)
Credit[A]			-0.038*			-0.015			-0.020
			(0.020)			(0.027)			(0.027)
Constant	-0.031	-0.139**	-0.134*	-0.147**	-0.225**	-0.243**	-0.149**	-0.308***	-0.305***
	(0.034)	(0.071)	(0.070)	(0.063)	(0.098)	(0.099)	(0.074)	(0.104)	(0.105)
Sigma u	0.090***	0.069***	0.066***	0.088***	0.074***	0.073***	0.073***	0.000***	0.000***
	(0.015)	(0.016)	(0.017)	(0.022)	(0.023)	(0.024)	(0.024)	(0.000)	(0.000)
Sigma e	0.122***	0.124***	0.124***	0.146***	0.146***	0.146***	0.148***	0.156***	0.155***
	(0.011)	(0.011)	(0.011)	(0.014)	(0.014)	(0.014)	(0.015)	(0.013)	(0.0124)
Rho	0.355	0.234	0.218	0.265	0.206	0.198	0.197	0.000	0.000
Wald Chi2	9.71	35.07	38.96	10.69	25.62	26.93	6.09	25.50	28.28
Log-likelihood	-45.00	-31.33	-29.33	-43.59	-34.82	-34.01	-35.72	141.97	144.83
Number of households		163			125			108	
Treatment households (%)		0.83			0.89			0.91	

[A] *Captures different kinds of loan repayments. Random-effects panel model (tobit). Random-effects panel model (tobit). Rho is the percent contribution to the total variance of the panel-level variance component. If it is zero, the panel estimator is not different from the pooled estimator. Sigma u: panel-level standard deviation; Sigma e: standard deviation of* ε_{it}. *Standard errors in parentheses.* *** *p<0.01,* ** *p<0.05,* * *p<0.1*
Source: SAVE.

Table 8 continued.

Approach 4	2003 vs 2005			2003 vs 2006			2003 vs 2007		
Treat	0.128***	0.116**	0.145***	0.131**	0.129***	0.150***	0.154***	0.154***	0.158***
	(0.048)	(0.047)	(0.047)	(0.051)	(0.049)	(0.049)	(0.048)	(0.046)	(0.046)
After reform	-0.036*	-0.043**	-0.036*	-0.072***	-0.072***	-0.070***	-0.003	-0.003	-0.008
	(0.018)	(0.019)	(0.019)	(0.020)	(0.020)	(0.021)	(0.021)	(0.022)	(0.022)
Interact	-0.114*	-0.120**	-0.140**	-0.094	-0.103*	-0.106*	-0.088	-0.092	-0.088
	(0.060)	(0.061)	(0.060)	(0.058)	(0.058)	(0.058)	(0.059)	(0.060)	(0.059)
Age		-0.000	0.000		0.001	0.001		-0.000	-0.000
		(0.001)	(0.001)		(0.001)	(0.001)		(0.001)	(0.001)
Children		-0.026**	-0.021		-0.022	-0.020		-0.023	-0.020
		(0.013)	(0.013)		(0.016)	(0.016)		(0.015)	(0.015)
Adults		-0.027	-0.017		-0.001	0.015		-0.017	-0.015
		(0.032)	(0.033)		(0.037)	(0.038)		(0.031)	(0.031)
Income		0.075***	0.074***		0.071***	0.073***		0.059***	0.060***
		(0.022)	(0.024)		(0.023)	(0.025)		(0.020)	(0.022)
Unemployed			-0.005			0.009			-0.018
			(0.028)			(0.033)			(0.029)
Self-employed			0.086			-0.006			-0.718
			(0.053)			(0.064)			(81.42)
Civil servant			0.068			0.082			0.035
			(0.047)			(0.059)			(0.048)
Credit[A]			-0.058***			-0.054**			-0.026
			(0.022)			(0.025)			(0.025)
Constant	-0.007	-0.056	-0.071	0.011	-0.129	-0.156*	-0.009	-0.043	-0.040
	(0.016)	(0.076)	(0.076)	(0.018)	(0.083)	(0.083)	(0.018)	(0.072)	(0.073)
Sigma u	0.085***	0.073***	0.068***	0.105***	0.092***	0.088***	0.067***	0.051**	0.053***
	(0.015)	(0.016)	(0.016)	(0.017)	(0.016)	(0.017)	(0.018)	(0.021)	(0.020)
Sigma e	0.113***	0.115***	0.113***	0.106***	0.107***	0.107***	0.112***	0.114***	0.110***
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.012)	(0.012)	(0.012)
Rho	0.360	0.286	0.268	0.496	0.425	0.404	0.262	0.166	0.190
Wald Chi2	14.41	28.05	37.87	26.47	36.64	41.84	11.30	24.16	26.45
Log-likelihood	-19.65	-11.96	-6.55	-9.167	-2.74	0.16	-1.68	4.59	8.21
Number of households		120			100			84	
Treatment households (%)		0.17			0.20			0.21	

[A] *Captures different kinds of loan repayments. Random-effects panel model (tobit). Random-effects panel model (tobit). Rho is the percent contribution to the total variance of the panel-level variance component. If it is zero, the panel estimator is not different from the pooled estimator. Sigma u: panel-level standard deviation; Sigma e: standard deviation of* ε_{it}. *Standard errors in parentheses.* *** *p<0.01,* ** *p<0.05,* * *p<0.1*
Source: SAVE.

Diskussionsbeiträge
des Fachbereichs Wirtschaftswissenschaft
der Freien Universität Berlin

2010

2010/1 BÖNKE, Timm / Sebastian EICHFELDER
Horizontal equity in the German tax-benefit system
Economics

2010/2 BECKER, Sascha / Dieter NAUTZ
Inflation, Price Dispersion and Market Integration through the Lens of a Monetary Search Model
Economics

2010/3 CORNEO, Giacomo / Matthias KEESE / Carsten SCHRÖDER
The Effect of Saving Subsidies on Household Saving
Economics