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QUANTILE TREATMENT EFFECTS OF RIESTER PARTICIPATION ON WEALTH*

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ABSTRACT

In numerous industrialized countries the demographic change erodes the financial basis of traditional pay-as-you-go pension systems. To compensate for decreasing statutory pensions, many governments incentivize private saving by means of subsidized retirement plans. In this context, Germany introduced the so-called Riester pension plans. To assess its effectiveness, this paper analyzes the effects of participation in Riester plans on wealth at different points of the distribution. We employ an instrumental quantile regression approach using Riester eligibility as instrument for Riester participation. The analysis is based on microeconomic survey data from the German Socio-Economic Panel of waves 2002 and 2012. Results suggest substantial heterogeneity in the effect of Riester participation on wealth. While Riester participation increases total net wealth in the lower tail of the conditional distribution, it does not have a significant effect on households in the middle part of the distribution. In the upper tail of the conditional asset distribution, we find negative treatment effects providing weak evidence in favor of a mere reallocation of households' asset portfolios.

KEYWORDS: Saving incentives, retirement, wealth distribution, instrumental quantile regression

JEL CLASSIFICATION: D31, D91, I38, J32

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1 Introduction

Demographic change is well-respected as one of the most important challenges for many industrialized countries. The ongoing rise in the share of elderly people in the populations due to low fertility rates and simultaneously increasing life expectancies erodes the financial basis of traditional pay-as-you-go pension systems (Corneo et al., 2010). Owing to concerns that individual savings for retirement are not sufficient to compensate for the reduction in public pillar replacement rates, many governments incentivize private saving by means of subsidized retirement plans. In this context, Germany introduced the so-called Riester pension plans in 2002. Due to the great importance of savings for the personal economic security in old-age as well as for the national economic performance (Bernheim, 1999), policymakers worldwide are highly interested in evaluating the effectiveness of retirement plans and - if necessary - to learn how to improve their design for stimulating thrift.

From a theoretical point of view, the effect of saving subsidies on asset accumulation behavior is ambiguous. According to the standard life cycle hypothesis going back to Modigliani and Brumberg (1954), the higher net return on retirement savings affects saving behavior of eligibles through three channels (Chetty et al., 2014). First, through a rise in the price of today's consumption, so that consumption is shifted towards the future and savings increase (substitution effect). Second, through the rise in the value of current resources, so that actual as well as future consumption are assumed to increase, thereby reducing savings (income effect). Third, an increase in the subsidy reduces the price of retirement savings relative to non-retirement savings, leading to substitution of non-subsidized to subsidized accounts (crowding-out effect). The overall effect on savings depends on the magnitude of these effects which is determined by individual preferences and thus is unclear (Corneo et al., 2010; Chetty et al., 2014). However, theory makes clear predictions about the effects of Riester subsidies along the wealth distribution: the higher wealth holdings are, the higher the crowding-out effect, letting overall savings largely unchanged. In addition, theory predicts that high-wealth households are more responsive to saving subsidies than households with lower wealth holdings (Lang, 1998; Wilke, 2012; Chetty et al., 2014). Accordingly, based on the life cycle hypothesis, we would expect qualitative and quantitative heterogeneity in responses across individuals with different levels of wealth.

Previous empirical research largely concerns the US experience with employer-sponsored occupational defined contribution plans, the so-called 401(k)s, and private pension plans, in particular, Individual Retirement Accounts (IRAs). Early empirical evidence regarding the effectiveness of saving subsidies is highly controversial (Corneo et al., 2010). While Engen et al. (1994; 1996a; 1996b) and Engen and Gale (1997) find substantial substitution between 401(k) plans and non-subsidized assets, Poterba et al. (1995; 1996a; 1996b) find that the majority of 401(k) and IRA savings represent net new savings. The substantial variation in their results can largely be explained by differences in the empirical strategy and identifying assumptions. Apart from Pence (2002) and Abadie (2003) who also find positive effects, more recent studies employing more sophisticated empirical methods, find that the effect of participation in subsidized retirement saving plans differs significantly across households. Results of Engen and Gale (2000) and Benjamin (2003) suggest that the effect of 401(k) participation varies by earnings level. For low-income households, 401(k) assets are more likely to increase overall net wealth, while for high-income households a displacement of assets from non-subsidized to subsidized retirement accounts is

more likely. Chernozhukov and Hansen (2004) and Engelhardt and Kumar (2011) both analyze the effects of pension plans along the wealth distribution using an instrumental variable quantile regression approach. Their results provide evidence that in the lower tail of the wealth distribution, they increase total net wealth, while at upper wealth quantiles, they are almost completely offset by reductions in other wealth components.

For the German Riester pension plans, empirical evidence is rather scarce. Coppola and Reil-Held (2009) and Pfarr and Schneider (2013), primarily focusing on analyzing the participation decision in Riester pension plans, find that the Riester scheme hardly generates any effect on savings. Corneo et al. (2008; 2009; 2010) evaluate the Riester scheme as a natural experiment and compare pre- and post-reform propensities to save. Their estimation results suggest that the Riester scheme induces a reallocation of private assets from existing non-subsidized to subsidized saving contracts. They conclude that the main economic effects of the Riester scheme depend on the distribution of the subsidies which represent windfall gains for their beneficiaries. Corneo et al. (2015) examine distributional effects of the Riester scheme. They analyze the subsidy volume and Riester participation along the income distribution and investigate the effects of the Riester scheme on income inequality and poverty. Their findings suggest that the Riester scheme is almost distributionally neutral regarding income, but that it might have greater effects on the wealth distribution. To the best of our knowledge, there is no study that examines heterogeneity in the effects of participation in Riester plans.

Against this background, this paper investigates the effects of participation in Riester pension plans at different points of the wealth distribution using microeconomic survey data from the German Socio-Economic Panel (SOEP) of waves 2002 and 2012. The SOEP is a yearly repeated panel survey of around 11,000 private households and 30,000 individuals from the Federal Republic of Germany aged 17 years and older. It provides detailed information on a wide range of asset categories, socio-demographic as well as household characteristics. The SOEP is especially suitable for analyses including wealth as wealth data are multiply imputed.

The main problem in determining the effect of participation in Riester plans on wealth is saver heterogeneity together with endogeneity of Riester participation. Households with higher unobserved preferences for saving are more likely to choose to participate in subsidized retirement saving plans than households with lower saving preferences, so that standard quantile regression estimates will be biased upwards (Chernozhukov and Hansen, 2004). Therefore, we employ the instrumental variable conditional quantile regression approach developed by Abadie et al. (2002). Quantile treatment effect estimation is a powerful and intuitive tool that allows to discover treatment effects on the entire distribution. Following a number of previous studies (e.g. Poterba et al. (1996a), Abadie (2003), Benjamin (2003), Chernozhukov and Hansen (2004), and Corneo et al. (2010)), we use eligibility as instrument for program participation.

To the best of our knowledge, this is the first study that investigates the effects of Riester participation along the entire wealth distribution. As theory predicts heterogeneous treatment effects, previous studies focusing solely on the mean do not reveal information about the effects on other points of the wealth distribution. However, from a policy perspective, it might be of particular interest to know the effects on low-wealth households, a target group of the Riester scheme, as they are less likely to being able to build up adequate financial reserves for old-age.[2] To assess the

[2]Given that occupational and private pension plans are much more important in the US than in Germany, evidence from the US can hardly be transferred. For detailed information on the German and the US pension systems see Bönke et al. (2017).

amount of potential crowding-out and to detect wealth components which are associated with potential sources of substitution, we study the effect of Riester participation on various components of wealth. We additionally contribute to the literature by evaluating the Riester scheme using more recent data and a relatively new method which has not been employed for estimating causal effects of Riester plans before.

Results suggest substantial heterogeneity in the effect of Riester participation on wealth. In the lower tail of the conditional distribution, we find that Riester participation increases total net wealth, among others due to positive spillover effects. It seems likely that participation in Riester plans sensitizes low-wealth households for the need to prepare privately for old-age, so that they additionally invest in other assets.[3] For households ranking in the middle part of the conditional wealth distribution, Riester participation does not have a significant impact on asset accumulation which is consistent with previous studies that investigated mean effects only. In the upper tail of the conditional asset distributions, we find negative treatment effects which provide weak evidence in favor of a mere reallocation of households' asset portfolios.

The remainder of the article is organized as follows. Sections 2 and 3 present the institutional respectively theoretical framework of the analysis. The empirical strategy including identifying assumptions and the data used are described in Sections 4 and 5 respectively. In Section 6, we provide the empirical results and check for their robustness. Section 7 summarizes, discusses the main results and derives policy implications as well as topics for further research.

2 Institutional Setting

The retirement system in Germany. Germany introduced the first formal national pension system worldwide in the late 19th century, the so-called Bismarckian system, which has been traditionally dominated by a generous public pay-as-you-go (PAYG) scheme (Börsch-Supan et al., 2015). The ongoing demographic change in most industrialized countries poses major problems to classical PAYG pension schemes, as more and more retirees must be financed by a shrinking number of employees. To cope with this development, the German pension system has been profoundly reformed over the last two decades.[4] Early reforms involved a rise in the statutory retirement age and a substantial reduction in public pillar replacement rates. Given that pre-retirement living standards are no longer protected by public pensions (Börsch-Supan et al., 2012), the Riester reform has been launched in 2001.[5] The idea of the reform is to partially substitute PAYG financed pensions by funded pensions. Therefore, the government transformed the monolithic public PAYG pension scheme into a three-pillar system which takes on the following form: The first pillar comprises the traditional government-organized statutory retirement insurance system based on PAYG (comparable to Social Security in the US). The second pillar comprises occupational pension plans where employers support employees to build up retirement reserves (comparable to 401(k) plans in the US). The third pillar comprises private pension plans where individuals themselves are responsible to provide for old-age (comparable to IRAs in the US) (Dolls et al., 2016). Both occupational and private pension plans are voluntary and highly subsidized.

Riester pension plans. For the third pillar, the so-called Riester pensions, which are the focus

[3] This reasoning is consistent with the findings of Dolls et al. (2016).
[4] See Börsch-Supan et al. (2015) for a detailed overview of the reform steps.
[5] The Riester reform became effective on January 1, 2002.

of the analysis at hand, have been introduced. The German Retirement Savings Act defines a number of certification criteria[6] that Riester pension products must fulfill. The main restriction is that the government only subsidizes investment vehicles that guarantee an annual payout plan from the date of retirement (Börsch-Supan and Wilke, 2004). Moreover, Riester pension subsidies are bound to eligibility criteria which are determined by the Federal Ministry of Labor and Social Affairs. Basically, everyone who is affected by the reduction in public pension benefits, that is every person in the mandatory pension insurance, is directly eligible to participate in the Riester scheme (Corneo et al. (2009; 2010)). Thus, the group of eligible persons includes dependent employees, recipients of wage compensation benefits (e.g. unemployment benefit or child benefit), self-employed people in the mandatory pension insurance, persons in vocational education, persons in military or social service, farmers and civil servants. The spouse of an eligible person is also allowed to participate in the Riester scheme and is designated as indirect eligible. The population of non-eligible persons comprises self-employees who are not compulsorily insured in the public pension system, self-employees who are voluntarily insured in the public pension system, (self-) employees in professional association pension schemes, recipients of social welfare, recipients of old-age pension, and students (Federal Ministry of Labor and Social Affairs, 2006).

The incentives offered by the state to contribute to a Riester retirement account comprise three elements. First, there is a direct basic subsidy that matches the participant's own contribution. Second, there is a fixed child subsidy for all eligible individuals with children. Third, Riester retirement savings can be deducted from the income tax as special allowances up to a maximum amount which has been fixed at €2,100 from 2008 and onwards. The overall saving incentive is the sum of direct subsidies and tax allowances (Börsch-Supan et al., 2012).

To receive the maximum direct subsidies, the beneficiary must save a specified percentage of his or her gross earnings of the previous year including the sum of direct subsidies (Börsch-Supan and Wilke, 2004).[7] This percentage increased stepwise from one percent in 2002 to four percent in 2008 and onwards. The corresponding basic subsidies were €38 and €154 and the child subsidies have been raised from €46 in 2002 to €185 in 2008 and onwards.[8] If the total contribution, i.e. own contribution plus direct subsidies, is below the required contribution for the maximum direct subsidies, the saving subsidy is reduced proportionally (Börsch-Supan et al., 2012). However, a certain minimum amount of contribution is necessary. As of 2005, it amounts to €90 without child, to €75 with one child and to €60 with two or more children (Börsch-Supan and Wilke, 2004).

Due to the complex eligibility and subsidy design of the Riester scheme and a lack of information, the demand for Riester products in the first two years after their introduction was rather low. However, after a simplification of the initial design in 2005, the demand increased significantly. Though with a slower growth rate, until today, the number of Riester contracts made is steadily

[6] For the full set of criteria, see the Certification of Retirement Pension Contracts Act ("AltZertG").

[7] This implies that low-income earners receive a relatively high basic subsidy for a relatively low saving effort as Riester pensions were specifically designed to incentivize low-income earners to privately build-up financial reserves.

[8] As direct subsidies themselves are counted as part of the Riester contribution, the contribution required for the full subsidy depends on the number of children (Börsch-Supan et al., 2012). For illustrative purposes, consider the following example: An eligible household with two adults but without children has gross income of €40,000. To receive the full subsidy in 2008, four percent of the household's income must be contributed (€1,600) minus the subsidy they receive, which is two times the basic subsidy (€308). Consequently, they must save €1,292. An eligible household with two children but otherwise equal characteristics must only invest €922 (€1,600-€308-€370, where the latter amount represents two times the child subsidy).

increasing (Börsch-Supan et al., 2012). According to the Federal Ministry of Labor and Social Affairs, in the third quarter of 2016, more than 16.5 million contracts[9] have been taken up and at the end of 2009, the coverage rate among eligible households amounts to roughly 40 percent (Coppola and Gasche, 2011). However, Börsch-Supan et al. (2015) show that there is substantial heterogeneity in Riester pension coverage rates along the income distribution. While in the upper income quintile 60 percent of households possess a Riester retirement account, in the bottom quintile the corresponding percentage amounts to 20 percent only.

In 2010, Riester pension savings totaled €9.4 billions (Börsch-Supan et al., 2012). The associated direct costs amount to €3.5 billions which is about 0.14 percent of gross domestic product (GDP)[10]. Thus, one euro of subsidies is associated with two euros of a household's own saving effort.

3 Theoretical Background

The common theoretical framework to analyze individual saving behavior is the life cycle hypothesis (LCH) going back to Modigliani and Brumberg (1954).[11] According to the LCH, individual lifetime utility is maximized if actual consumption equals permanent income[12]. Consequently, individuals adjust their saving behavior to keep utility of consumption constant over their life-time. Simply put, in each time period, fully rational and forward-looking individuals base their saving decision on a comparison of their actual and permanent incomes. Any income that exceeds permanent income will be saved (Wilke, 2012). In this simple version of the LCH, any individual life course saving decision is driven by the old-age provision motive which states that individuals save during working years to finance consumption during retirement, when no respectively less income is generated.

Prior to the Riester reform, lifetime consumption/saving has been automatically smoothed by the statutory pension scheme. With the launch of the Riester reform, a large part of the responsibility for old-age financial provision is shifted from the state to the individual (Wilke, 2012). To compensate for the cut in public pension benefits, according to the LCH, rational actors need to re-optimize their labor market and/or saving choices. More precisely, they need either to retire later, or to increase old-age saving provisions, or both (Börsch-Supan et al., 2015). As the focus of this paper lies on the effects of subsidies on private savings, in the following, we focus on changes in saving behavior and abstain from possible adjustments in retirement choices.

Model setup. In similar vein to Bernheim (1999), Prinz et al. (2003), and Chetty et al. (2014), we utilize a simple two-period life cycle model to illustrate the theoretical impact of Riester subsidies on saving behavior and therewith on wealth accumulation. Closely following Chetty et al. (2014), we suppose that households can adjust their saving between two periods: working life, $t = 1$, and retirement, $t = 2$. Labor supply is assumed to be fix. Moreover, earnings, Y, are fixed and

[9] The Federal Ministry of Labor and Social Affairs estimates the number of inactive contracts to be around one fifth. See http://www.bmas.de/DE/Themen/Rente/Zusaetzliche-Altersvorsorge/statistik-zusaetzliche-altersvorsorge.html

[10] See Federal Statistical Office. https://de.statista.com/statistik/daten/studie/1251/umfrage/entwicklung-des-bruttoinlandsprodukts-seit-dem-jahr-1991/

[11] The basic model of consumption behavior originally goes back to Fisher (1930). Harrod (1948) extended the initial two-period model by introducing life cycle stages and Modigliani and Brumberg (1954)'s contribution largely was to examine consumption behavior in response to changes in wealth.

[12] Permanent income in this context represents an individual's average lifetime income.

received entirely in the first period. Earnings can either be used for consumption or can be saved in one of two accounts, both of which are risk-free: a (private) retirement savings account or a taxable savings account. For assets in the taxable savings account, individuals earn the interest rate r, and for savings in the retirement account they additionally earn a subsidy, denoted by θ. For ease of exposition, we assume θ to be net of taxes and fees. Besides, we neglect taxes on income and capital gains. Then, consumption in period one, C_1, and consumption in period two, C_2, are given by

$$\begin{aligned} C_1(S,P) &= Y - S - P \\ C_2(S,P) &= (1+r)S + (1+r+\theta)P, \end{aligned} \tag{3.1}$$

where P denotes voluntary individual contributions to the retirement account and S denotes non-retirement savings. Note that overall saving equals expenditure on second-period consumption. In this simple setting, owing to the higher net return on retirement savings, it would be optimal to set $S = 0$. However, households are assumed to derive utility from consumption in the two periods and from holding liquid assets which can be accessed before entering retirement. The value of asset liquidity, $\phi(S)$, is a concave benefit of saving in the non-retirement account (Chetty et al., 2014). Presuming time-separable additive preferences, household's utility is given by

$$U(C_1) + \beta * U(C_2) + \phi(S), \tag{3.2}$$

with $\beta = \frac{1}{1+\rho}$, where β is the discount rate and ρ represents time preferences. Fully rational, forward looking households choose S and P such that their utility is maximized.

Comparative statics. In this simple two-period life cycle setting, the Riester subsidy is associated with an uncompensated increase in the return on retirement savings. According to the standard LCH, an increase in the subsidy affects S and P of eligible households through three channels (Chetty et al., 2014).[13] First, the higher net return on saving raises the price of today's consumption. As a result, consumption is shifted towards the future, so that savings increase (substitution effect). Second, the subsidy raises the value of current resources, so that actual as well as future consumption are assumed to increase, thereby reducing savings (income effect). Third, an increase in the subsidy reduces the price of retirement savings relative to non-retirement savings, leading to substitution of non-subsidized to subsidized accounts (crowding-out effect). The overall effect on consumption and saving is unclear. It depends on the magnitude of the three effects which are determined by individual preferences with regard to intertemporal substitution and liquidity. If the elasticity of intertemporal substitution (EIS) for example is small, individuals have high preferences for today's consumption and would hardly increase savings. By contrast, if the EIS is sufficiently large, the substitution effect dominates, so that an increase in the Riester subsidy is likely to lead to an increase in total saving (Chetty et al., 2014).

While the effect on overall wealth remains unclear, theory predicts qualitative and quantitative heterogeneity in the effects along the wealth distribution (Lang, 1998; Wilke, 2012; Chetty et al., 2014). The higher wealth holdings are, the more likely is a displacement of assets from non-subsidized to subsidized savings accounts, with little or no effect on overall saving. First, high-

[13] Saving behavior of non-eligible households may also be affected by Riester subsidies if subsidies are financed through higher taxes on non-eligible households or by reducing their transfers (Corneo et al., 2010). Following Chetty et al. (2014), we assume these individuals to be outside of the model.

wealth households are likely to have a number of different wealth accounts, so that they have more possibilities to displace assets from one account to another. Second, wealth is positively correlated with financial literacy and attentiveness (e.g. Bucher-Koenen (2011) and Behrmann et al. (2012)), so that high-wealth households are likely to possess the necessary knowledge and information for optimizing their portfolio.[14]

Meanwhile, the simple version of the LCH has been modified and extended in a number of ways. Modifications comprise the modeling of uncertainty, the incorporation of several other saving motives such as bequest and precautionary saving as well as the inclusion of liquidity constraints.[15] Moreover, Shefrin and Thaler (1988) developed the so-called Behavioral Life Cycle (BLC) hypothesis that describes actual rather than rational behavior. The BLC incorporates problems of self-control, cognitive human limitations and a lack of information among others. Some of these variants suggest that individuals may be insensitive to saving incentives and thus could explain alternative saving outcomes.

4 Empirical Strategy

Identification approach. The key problem in estimating the effect of Riester participation on wealth is that we do not observe saving preferences which are heterogeneous across the population and are likely to affect selection into Riester participation. As participation in Riester plans is voluntary, it seems likely that individuals with higher tastes for saving are more likely to choose to participate in Riester plans than individuals with lower tastes for saving. Hence, differences in the distribution of assets between Riester program participants and non-participants may simply stem from differences in saving tastes instead of program participation itself and standard estimators are likely to be biased upwards. Therefore, we use an instrumental variable (IV) identification strategy to recover the true effects. In particular, we employ the IV conditional quantile treatment effects (CQTE) approach developed by Abadie et al. (2002).[16] We focus on conditional QTE as identifying assumptions are often more plausible conditional on covariates.

Notation and framework. To illustrate the CQTE identification approach, we introduce some notation based on Abadie et al. (2002). Let Y denote an outcome measure, D binary treatment, Z the binary instrument and X the controls. We define causal effects using potential outcomes and treatments. We denote potential outcomes which depend on D as Y_d and potential treatment states

[14] According to Carroll et al. (2009) and Chetty et al. (2014), individuals with higher saving rates and thus higher wealth are also expected to be more responsive with regard to price subsidies than households with lower wealth. In their studies, they distinguish between active and passive savers who differ in their responses to saving incentives. Active savers are defined as those individuals who respond in line with neoclassical predictions and are supposed to be those individuals with higher saving rates and higher wealth.

[15] Feldstein (1974) extended the life cycle model by formally incorporating the impact of availability and generosity of public pensions on individual retirement and saving behavior while making the event of retirement endogenous. More recent studies analyzing retirement and saving behavior present dynamic versions of the previously static life cycle models and include expectations over subjective longevity and changes in the public pension design among others (e.g. van der Klaauw and Wolpin (2008) and Haan and Prowse (2014)). See Börsch-Supan et al. (2015) for a detailed review of the literature.

[16] There are two possible CQTE estimators under selection on unobservables, the one developed by Abadie et al. (2002) and the one developed by Chernozhukov and Hansen (2005). The difference in these estimation approaches concerns the assumptions underlying the potential outcomes framework. There is no advantage of one estimation approach over the other and results are found to be very similar (Chernozhukov and Hansen, 2004). We decided to use the IV CQTE approach developed by Abadie et al. (2002) as it resembles the familiar local average treatment effect (LATE) approach.

which depend on Z as D_z. Accordingly, Y_1 and Y_0 are the values of an individual's outcome if $D = 1$ and $D = 0$, respectively. Similarly, D_1 and D_0 would be individual's treatment choice if $Z = 1$ and $Z = 0$, respectively. Quantile treatment effects measure the distance between the two potential outcome distributions. Conditional quantile treatment effects thus are defined as the conditional θ-quantiles of Y_1 minus the respective conditional θ-quantiles of Y_0, formally $Q_\theta(Y_1|X) - Q_\theta(Y_0|X)$. Depending on treatment choice, the population can be partitioned into four groups: compliers, never-takers, always-takers and defiers. The group of compliers consists of all individuals that choose treatment if the instrument value is one and choose no treatment if the instrument value is zero ($D_1 = 1$ and $D_0 = 0$). Never-takers never choose treatment independently of the instrument value ($D_1 = 0$ and $D_0 = 0$). Always-takers are the opposite and always participate in the program independently of the instrument value ($D_1 = 1$ and $D_0 = 1$). Finally, the group of defiers comprises individuals that choose treatment if the instrument value is zero and choose not to participate if the instrument value is one ($D_1 = 0$ and $D_0 = 1$).

Abadie et al. (2002) postulate four assumptions that underlie their IV approach. The first assumption is the "Independence" assumption stating that potential outcome and treatment choice are jointly independent from the instrument conditional on covariates, formally: $(Y_1, Y_0, D_1, D_0) \perp Z|X$. Independence of the outcome from the instrument represents an exclusion restriction and ensures that the instrument has no direct effect on potential outcomes. Independence of treatment choice from the instrument ensures that the effect of the instrument on treatment choice is causal. The second assumption, "Nontrivial assignment", states that the probability that the instrument takes on the value 1 conditional on X lies strictly between 0 and 1, formally: $P(Z = 1|X) \in (0, 1)$. Assumption three, "First-stage", formally: $(E[D_1|X] \neq E[D_0|X])$, makes sure that the instrument has an impact on treatment choice behavior. Furthermore, Abadie et al. (2002) impose monotonicity, which can be formalized as $P(D_1 \geq D_0|X) = 1$. This assumption implies that for all individuals, the probability of participation in treatment increases with higher values of the instrument and thus rules out the existence of defiers.

"Independence" is the crucial assumption in this setting. It implies that for the group of compliers, treatment status conditional on covariates does not depend on potential outcomes ($(Y_1, Y_0) \perp D|X$).[17] Thus, for compliers, given X, the effect of D on Y is causal.

The CQTE model. The linear model for conditional QTE developed by Abadie et al. (2002) can be formalized as

$$Q_\theta(Y|X, D, D_1 > D_0) = \alpha_\theta D + X'\beta_\theta. \tag{4.3}$$

The left-hand side of Equation 4.3 represents the conditional θ-quantiles of Y for compliers and α_θ gives the CQTE, i.e. the difference in the conditional θ-quantiles of Y for treated and non-treated compliers. When considering low wealth quantiles, the CQTE can be interpreted as the effect of individuals with low wealth conditional on X, i.e. low wealth relative to those with similar characteristics, although the absolute value of wealth might be high. When considering high wealth quantiles, the CQTE measures the effect of individuals with high wealth in relation to those with the same X, while their absolute wealth might be low (Frölich and Melly, 2010).[18]

[17] This results from the fact that for compliers we have $D = Z$, so that Z in the independence assumption can be replaced by D.

[18] Note that unconditional QTE measure the effect of individuals with absolute low respectively absolute

The parameters of the conditional QTE model can be written as the solution of the following minimization problem

$$(\alpha_\theta, \beta_\theta) = \arg\min_{(\alpha,\beta)} E[\kappa * \rho_\theta(Y - \alpha D - X'\beta)], \tag{4.4}$$

where $\rho_\theta(\lambda)$ is the classical check function[19] and $\kappa(D, Z, X)$ is a weighting function that identifies compliers in expectation. It can be written as

$$\kappa(D, Z, X) = 1 - \frac{D(1-Z)}{1 - P(Z = 1|X)} - \frac{(1-D)Z}{P(Z = 1|X)}. \tag{4.5}$$

Since κ is negative if $D \neq Z$, the sample objective function is not convex. For this reason, the following non-negative weighting function with conditional expectation given $U = (Y, D, X)$ is used

$$\kappa_\nu = E[\kappa|U] = 1 - \frac{D(1-\nu_0(U))}{1 - P(Z = 1|X)} - \frac{(1-D)\nu_0(U)}{P(Z = 1|X)}, \tag{4.6}$$

where $\nu_0(U) = E[Z|U] = P(Z = 1|Y, D, X)$.

Application. In the context of Riester pension plans, Y is a wealth measure, D is Riester participation and Z is Riester eligibility. The assumptions of non-trivial assignment and relevance of the instrument are clearly satisfied. Monotonicity is also satisfied in our context as individuals only are allowed to participate in Riester plans if they are eligible, so that $D_0 = 0$ for everyone. The independence assumption is the most controversial one.[20] In line with Poterba et al. (1995; 1996a), Abadie (2003), Benjamin (2003), Chernozhukov and Hansen (2004), and Corneo et al. (2010), we argue that, given covariates, eligibility for Riester pension plans is exogenous. First, eligibility for Riester pension plans is based on legal definitions. Second, we assume that elementary household decisions concerning employment type, marital status or birth of children are not driven by considerations with regard to Riester participation. Third, we condition on a number of covariates and thus control for numerous factors that might be correlated with unobserved determinants of wealth. Accordingly, we conclude that the assumptions underlying the approach of Abadie et al. (2002) are met. As compliers in our setting are those individuals who participate in Riester plans if they are eligible and who do not participate if they are not eligible, estimation results apply to the whole group of treated individuals.

5 Data, Variables and Summary Statistics

Data set. The empirical analysis uses data drawn from the German Socio-Economic Panel (SOEP) which is a yearly repeated panel survey of around 11,000 private households and 30,000 individuals from the Federal Republic of Germany aged 17 years and older.[21] The SOEP provides detailed information on a wide range of asset categories as well as household characteristics. In addi-

high wealth.

[19] The check function is defined as $\rho_\theta(\lambda) = (\theta - 1)\lambda$ for $\lambda < 0$ and $\rho_\theta(\lambda) = \theta\lambda$ for $\lambda \geq 0$ (Bassett and Koenker, 1982).

[20] There is a large debate on whether eligibility for occupational 401(k) pension plans in the US is exogenous or not (Engen et al. (1994; 1996a; 1996b), Poterba et al. (1995; 1996a), Bernheim (1999)).

[21] For a detailed description of the SOEP see Wagner et al. (2007).

tion, in several years, it surveys whether individuals have a Riester contract or not.[22] We employ household level data as we assume that savings decisions are agreed upon within households. We combine the household questionnaire with individual data referring to the head of the household. Household wealth data is available for the years 2002, 2007 and 2012. The SOEP is especially suitable for analyses including wealth as wealth data are multiply imputed. Thus, the SOEP accounts for measurement errors, item-non responses as well as partial unit-non-responses, which are likely to affect wealth data in population surveys. Our empirical analysis is conducted with the newest wealth data from wave 2012 and is augmented by information from wave 2002. All euro amounts are in 2012 euros.

Instrument and treatment variable. The binary instrument variable in the analysis is Riester eligibility. A household is classified as eligible if the head of the household is eligible for a Riester contract. A household is classified as non-eligible otherwise. The eligibility status is assigned according to the legal requirements determined by the Federal Ministry of Labor and Social Affairs (2006). Accordingly, common with Corneo et al. (2010), we define households as eligible if the head of the household corresponds to one of the following groups: blue-collar workers, white-collar workers, civil servants, trainees, persons in military or social service, persons in childcare leave, farmers, registered unemployed, persons having a mini or a midi job, recipients of disability benefits, recipients of subsistence allowance and old-age transition benefits. A household is defined as non-eligible if the head of the household corresponds to one of the following groups: free-lancers and other self-employed (with dependent employees), recipients of old-age pension, recipients of social welfare and income support, non-working persons and students.[23] The spouse of an eligible person is also defined as eligible. The binary treatment variable is Riester participation. A household is classified as Riester participant if the household head has a Riester pension contract and as non-participant otherwise.[24]

Outcome variables. We study the effect of Riester participation on various measures of wealth. In line with Chernozhukov and Hansen (2004), the focus lies on the effect on total net wealth, net financial assets and net financial assets excluding private insurances which include Riester pensions in the SOEP.[25] To detect wealth components which are associated with potential sources of substitution, we also study the effect on net housing wealth and business assets.[26] Net financial assets are defined as the sum of saving accounts, bonds, shares, investments, building loan agreements, private pensions comprising life insurance policies and private retirement plans including Riester or Rürup pensions less non-mortgage debt. Net housing wealth is the sum of owner-occupied and

[22] Corneo et al. (2008; 2009; 2010) for example use the same data source to study the effect of Riester participation on savings.

[23] Due to data limitations, this definition of eligibility status implies the following three assumptions: First, free-lancers and other self-employed are not compulsorily insured in the statutory pension system. Second, dependent employees are not in professional association pension schemes, nor voluntarily insured in the statutory pension scheme. Third, marginal employees have not been exempted from the mandatory pension insurance.

[24] Note that we do not have information on the amount that is saved in the Riester contract. Hence, it is possible that a household who is classified as participant does not actively save in Riester investment vehicles.

[25] Net financial assets minus private insurances are denoted by "non-PI assets" hereafter.

[26] Engen and Gale (1997) for example find substitution between housing wealth and private pension plans in the US and Engelhardt and Kumar (2011) find that the majority of estimated crowd-out in the upper wealth quantiles in the US is associated with business equity.

other property[27] less mortgage debt. Business assets comprise all forms of commercial enterprises, that is companies, shops, offices, practices or farms. Total net wealth is the sum of net financial assets, net housing wealth, business assets and tangible assets[28].

Taking into account the criticism of Engen and Gale (2000) and Pence (2002) on previous US studies about the effects of 401(k) plans on wealth, the dependent variables are not used in levels, but in first differences.[29][30] More precisely, as dependent variable, we use the value of an asset component in 2012 minus the value of the respective asset component in 2002 to control for differences in the initial asset position of eligibles and ineligibles and thus for remaining differences in tastes for saving between these two groups.[31]

Covariates. The set of covariates is largely consistent with that used in previous studies examining the effect of subsidized pension plans on wealth (e.g. Abadie (2003), Benjamin (2003), Chernozhukov and Hansen (2004), and Corneo et al. (2010)). Specifically, we control for age, income, family size, marital status, education, homeownership status and risk preferences. Risk preferences have been neglected in previous studies so far. However, we argue that risk preferences are a good indicator for saving preferences and are likely to affect long-term wealth accumulation behavior. Besides, it is especially important to control for it in the German context, where Riester eligibility is linked to the employment status of an individual, so that risk preferences are likely to affect a household's eligibility status. Apart from income, which represents net household income, and family size, all variables refer to the head of the household. Marital status and homeownership status are binary variables. Following the pension literature, in order to control for age, income, education, family size and risk preferences, we use categorical variables. Age is classified in five age groups. The age intervals are as follows: 17-25, 26-35, 36-45, 46-55, 56-65 years. Income is also categorized into five groups: $\leq$€20,000, €20,000-30,000, €30,000-40,000, €40,000-50,000, and >€50,000. Education is measured by the number of years of educational training completed by the head of the household. For the analysis, we have categorized this variable into the following four groups: 7-10, 11-13, 14-16, >16 years. Family size measures the number of persons in the household and is divided into the following three categories: 1-2, 3-4, >4 persons. Self-assessed risk preferences are measured on a scale from 0 to 10, where 0 means "not at all willing to take risks" and 10 represents "very willing to take risks". Risk preferences are divided into four categories: 0-2, 3-5, 6-8, 9-10.

Sample selection. Due to differences in the saving behavior of older retired people, following Abadie (2003) and Chernozhukov and Hansen (2004) among others, we restrict the sample to households in which the head of the household is less than 65 years old. After deleting observations with missing information on one of the relevant variables in wave 2012 or with missing asset

[27] Other property contains all forms of real estate apart from own-occupied property such as apartment buildings, vacation homes or undeveloped land.

[28] Tangible assets contain assets in form of gold, jewelry, coins or valuable collections.

[29] Note that the natural logarithm of the dependent variables cannot be used due to negative asset values. An exclusion of those households with negative net wealth would give biased results and would discard too many observations.

[30] It is likely that macroeconomic trends such as the decrease in the interest rate during that time did not affect eligibles and non-eligibles differently. Even if they would have done so, results are likely not to be biased. Many macroeconomic trends are reflected in income which is one of the most important determinants of wealth accumulation and which is controlled for in the analysis.

[31] Following Bernheim (1999), average tastes for saving are thus likely to be eliminated under the assumption that average tastes for saving do not change systematically through time.

values in 2002, we end up with a sample consisting of 2,761 observations.

Summary statistics. Tables 1 and 2 report summary statistics of the variables used in the analysis respectively of wealth measures in levels for the entire sample as well as by Riester participation and eligibility status.

Table 1 About Here

Table 2 About Here

We see that 85 percent of the sample are eligible for Riester contracts and that 24 percent participate in Riester plans. Regarding eligible households only, the participation rate amounts to 28 percent. While Riester participants are less wealthy in 2002 and 2012, the values of overall net wealth as well as of the considered wealth components have increased significantly more than that of non-participants in between these years. The average participant is younger, is more likely to be married, has more children and has been in education for a longer time. Additionally, on average, he is more likely to be homeowner, has higher income and is a bit more risk averse. Eligibles are less wealthy than non-eligibles in both years 2002 and 2012 and in between these years, their wealth holdings have grown to a lesser extent. However, the value of net financial assets including private insurances and Riester pensions increased more than twice as that of non-eligibles. While the groups of eligibles and non-eligibles are very similar with regard to education, homeownership and risk preferences, they are rather different with regard to age, family size, marital status and income: Eligibles are younger, have more kids, are more likely to be married and have higher income.

6 Empirical Results

OLS and 2SLS results. Table 3 reports ordinary least squares (OLS) and conventional IV, i.e. two-stage-least-squares (2SLS), estimates for the effect of Riester participation on mean wealth measures[32] which primarily serve as a benchmark for the quantile regression (QR) and CQTE results presented later. However, they are interesting on their own and would be sufficient if treatment effects along the wealth distribution would be constant (Chernozhukov and Hansen, 2004). While 2SLS estimates account for endogeneity and are likely to have a causal interpretation, OLS estimates rather provide a descriptive comparison of mean earnings for Riester participants and non-participants conditional on covariates.

Table 3 About Here

First-stage estimates for Riester participation, which are reported in the bottom of Table 3,[33]

[32] The specifications of the OLS and 2SLS regressions are analogous to the empirical specifications used for estimating the CQTEs.

[33] The first stage of 2SLS is a regression of Riester participation on covariates conditional on Riester eligibility. With regard to the covariates in the first-stage regression, the estimated coefficients on age, education and size of the household are positive and highly significant for most of the wealth measures. This means that conditional on eligibility, these variables raise participation in Riester pension plans.

show a highly significant positive correlation of Riester eligibility and participation, thus confirming the relevance of the instrument. Given the relatively small first-stage estimate, one might be concerned about having a weak instrument. Whether an instrument is weak can be assessed by an F-test.[34] As the test-statistic amounts to 328.457 and thus is significantly larger than the critical value of 10, the test strongly rejects the hypothesis of a weak instrument.

As expected, the 2SLS coefficients of Riester participation are uniformly smaller than the corresponding OLS estimates, thus confirming the expectation of a positive bias of OLS estimates due to unobserved preferences for saving. While OLS estimates show a positive relation between Riester participation and wealth measures, apart from the estimate for financial wealth, 2SLS estimates are all negative.[35] Both OLS and 2SLS estimates, the latter with the exception of the estimate for business assets, are not significantly different from zero and standard errors are quite large. Overall, 2SLS results suggest that the increase in net financial assets from 2002 to 2012 can be largely attributed to substitution from net non-financial assets and more importantly from housing and business assets. The negative effect on total net wealth confirms this evidence: The increase in financial assets does not lead to an increase in overall wealth, but decreases the value of total assets which is counter-intuitive. However, as already mentioned, nearly all estimates are insignificant.

With regard to the effect of covariates on the differences in asset measures between 2002 and 2012, OLS and 2SLS estimates exhibit quite similar patterns of results and have the expected signs. While the differences (gains) in wealth measures largely increase with increasing income and education and are higher for home-owning households, they decrease with family size and are lower for households where the head of the household is married. The effects of age respectively risk preferences largely differ across asset measures. Though the 2SLS estimates of age are all positive for total net wealth and business assets, the differences in these two asset measures decrease with age, suggesting that the gains in total wealth as well as business wealth in the period from 2002 to 2012 are relatively larger for younger households. The remaining wealth components show the conventional hump-shaped age-wealth profile. With regard to risk preferences, we find that the differences in financial and non-financial assets are all negative. Moreover, the negative differences in financial and non-financial assets are highest for households with the highest risk affinity. However, we also find that the positive differences in the remaining wealth measures are highest for households with the highest risk affinity.

QR and CQTE results. The estimates presented so far provide the effects of Riester participation on the mean of the respective wealth measure, but do not give any information on the effects along the wealth distribution in the case of heterogeneous treatment effects. Therefore, in Table 4, we report standard QR results and results from the IV conditional quantile regression approach of Abadie et al. (2002) for the 15th, 25th, 40th, 50th, 60th, 75th and 85th quantiles.[36] Owing to non-

The rest of the covariates, i.e. income, marital status, homeownership status and risk preferences, are insignificant given eligibility. Results of the first-stage regression are available upon request from the author.

[34] The F-test tests the significance of the instrument in the first-stage.

[35] Note that the magnitude of the 2SLS estimates differs substantially across wealth measures with unreasonably large estimates for total net wealth and business assets.

[36] To implement the CQTE estimator, we have non-parametrically estimated (instrument) propensity scores to calculate the weights κ. In a second step, we used these weights for non-parametric estimation of the non-negative weighting function κ_ν. In both steps, the choice of the optimal smoothing parameters was guided by cross-validation. For more details on the implementation of the CQTE

negligible idiosyncratic variation of characteristics of eligibles and non-eligibles with extremely low or high conditional wealth, identification at the tails of the conditional asset distributions is troublesome. Thus, in line with Abadie et al. (2002), we abstain from presenting estimates for quantiles smaller than the 15th and larger than the 85th quantile and have this in mind when interpreting the results at the margins of the conditional asset distributions.

Table 4 About Here

The results provide a number of interesting insights. A comparison of QR and CQTE results reveals substantial differences with regard to the magnitude of estimates. For almost all wealth measures, CQTE estimates are larger for quantiles smaller or equal the 60th quantile. For higher quantiles, conventional QR estimates are larger. This seems to be reasonable as people with high wealth in relation to those with similar characteristics are likely to have higher preferences for saving, so that the upward bias of QR estimates is especially pronounced in the upper part of the asset distributions. In the lower part, unobserved saving preferences appear to be less important.

Whereas the magnitude and the sign of the QR and CQTE estimates differ, results from both estimators provide strong evidence in favor of highly non-uniform effects of Riester participation on asset measures. In the following, we concentrate on the interpretation of the CQTE results as they allow for a causal interpretation. The effects of Riester participation on total net wealth, financial and non-financial assets decrease monotonically in the quantile index. For all three wealth measures, the CQTE coefficient is positive for quantiles below the 75th quantile and becomes negative for the 75th and 85th quantile. This indicates that households who rank in the lower and upper part of the conditional distributions are more affected than those ranking in the middle part. The effects on the 25th to the 60th quantile of the conditional housing wealth distribution and up to the 75th quantile of the conditional business assets' distribution are even zero.[37] Moreover, all treatment effects in the middle part of the conditional asset distributions are insignificant.

A comparison of the effects of Riester participation on financial assets relative to the effects on other wealth measures, in particular on total net wealth, also reveals interesting insights. For financial wealth, we observe positive highly significant estimates for the 15th to the 40th quantile. The effect for the 15th quantile for example is estimated to be 24,519 euro, whereas that for the 40th quantile is estimated to be 10,482 euro. Hence, Riester participation increased net financial assets from 2002 to 2012 by 24,519 euro for households who rank in the 15th quantile of the conditional financial asset distribution and by 10,482 euro for households in the 40th quantile. The effect on total net wealth is also positive and significant for the 15th quantile. Thus, the increase in net financial wealth at the very low end of the conditional asset distribution can be interpreted as an increase in overall wealth.

The quantile treatment effects on total net wealth are even larger than those on financial assets. This suggests that Riester participation leads to positive spillover effects for households who rank in the lower part of the conditional wealth distribution. It seems that participation in Riester plans sensitizes low-wealth households for the need to prepare privately for old-age. So, they do not

estimator see Frölich and Melly (2010).

[37] This might be explained by the fact that only a small percentage of households in the sample have these assets in their portfolio. When looking at the intensive margin only, i.e. restricting the sample on households who have housing respectively business wealth, treatment effects of Riester participation are non-zero.

only conclude Riester contracts, but also invest in other financial products and acquire business or housing equity. This explanation is supported by positive estimates on the remaining asset components under consideration, though the estimate on net housing wealth is not significantly different from zero. Further, it is in line with Dolls et al. (2016) who find that both an increase in the level of information about pensions and in the salience of the issue of retirement savings increase contributions to a private retirement account. Notwithstanding, the estimates on total net wealth remain very large at the tails of the conditional wealth distribution, in particular at its lower tail.

In the upper part of the conditional asset distribution, in particular for the 75th and the 85th quantile, we find a negative effect of Riester participation on net financial assets. The treatment effect for the 85th quantile is also significant on the 10 percent level. Negative estimates for financial wealth are at odds with our intuition. Due to the financial crisis and therewith price fluctuations of financial assets, results for financial wealth should be interpreted with caution.[38] For the other asset measures considered in the analysis, we also find negative estimates in the upper part of the respective conditional distributions. For the 85th quantile, estimated coefficients of net non-financial, housing and business assets are also significantly different from zero, thus providing weak evidence of a crowding-out of other assets. As the estimate for total net wealth is insignificant however, results suggest that there is solely a reallocation of the asset portfolio, but no significant effect on overall wealth.

Overall, results provide evidence that restricting the analysis on mean effects is not sufficient to fully characterize the effects of Riester participation on wealth.

Robustness checks. We examined the robustness of our CQTE results in a number of ways. First, following Frölich and Melly (2010), we tried a number of different combinations of smaller smoothing parameters than those values suggested by cross-validation. Results for one combination of smaller smoothing parameters are presented in Table 5.[39]

Table 5 About Here

Qualitatively, results are largely consistent with estimates from Table 4. Second, according to Imbens (2014), we trimmed the sample at a propensity score value of 0.1 to avoid giving very high weights to single observations. Accordingly, observations with extreme values of the propensity score, in particular, observations with an estimated propensity score less than 0.1 or larger than 0.1 are trimmed and not used further in the estimation procedure. CQTE estimates using the trimmed sample are shown in Table 6.

Table 6 About Here

Apart from smaller estimates at the upper tail of the conditional wealth distribution, estimates are largely found to be insensitive to the trimming. Third, we ran regressions with alternative

[38] The negative coefficients may also result from the fact that those households who possess a Riester contract and who have relatively high wealth belong to the group that does not actively save in their Riester account.

[39] Results with other smaller than optimal smoothing parameters are similar. They are available upon request from the author.

sets of covariates. None of the alternative specifications changed results significantly. The largest difference appeared when the homeownership dummy was excluded. In this case, estimates for the 60th and the 75th quantile of the conditional housing wealth distribution became significant. Summarizing, we conclude that our results are largely robust. Notwithstanding, results at the tails must be interpreted with caution.

7 Discussion and Conclusion

In numerous industrialized countries the demographic change erodes the financial basis of traditional PAYG pension systems. Owing to concerns that individual savings for retirement are not sufficient to compensate for the reduction in public pillar replacement rates, many governments incentivize private saving by means of subsidized retirement plans. Due to the great importance of savings for the personal economic security in old-age as well as for the national economic performance (Bernheim, 1999), policymakers worldwide are highly interested in evaluating the effectiveness of retirement plans and - if necessary - to learn how to improve their design for stimulating thrift. Against this background, this paper examines the effects of participation in Riester plans on several measures of wealth at different points of the respective conditional distribution. We employ the instrumental quantile regression approach by Abadie et al. (2002) using Riester eligibility as instrument for Riester participation. The analysis is based on microeconomic survey data from the SOEP of waves 2002 and 2012.

Results suggest that the effects of Riester participation on asset measures are quite heterogeneous and decrease monotonically in the quantile index. In the lower tail of the conditional distribution, the quantile treatment effects on financial assets are positive and highly statistically significant, providing evidence that Riester participation increases financial assets at the lower tail of the distribution. The effect on overall wealth for the 15th quantile is also positive and significant, indicating that the increase in financial assets can be interpreted as an increase in total net wealth for the lowest conditional wealth quantile under consideration. Owing to the fact that the estimate for total net wealth is even larger than that for net financial assets, we are tempted to conclude that Riester plans trigger positive spillover effects. This reasoning is in line with Dolls et al. (2016) who show that information and salience about pensions have a positive impact on private retirement savings. The presence of the Riester scheme seems to increase the awareness of relatively low-wealth households for the rising need of private old-age provision. For households ranking in the middle part of the conditional asset distributions, treatment effects are close to zero and Riester participation does not have a significant impact on asset accumulation as it was found in previous analyses which investigated mean effects only (e.g. Corneo et al. (2008; 2009; 2010)). In the upper tail of the conditional asset distributions on the contrary, we find negative treatment effects. However, the estimated coefficient for total net wealth is not significantly different from zero. Thus, results provide weak evidence in favor of a mere reallocation of the asset portfolio of households in the upper tail of the conditional distributions which is consistent with theoretical predictions.[40]

Previous analyses which investigated the effects of Riester participation on savings focused on mean effects. However, our findings clearly indicate that mean effects are not sufficient to fully

[40] In spite of differences in the US and German pension systems and the design of retirement plans, our results are also largely in line with recent findings on the effects of participation in 401(k) pension plans on wealth in the US (e.g. Chernozhukov and Hansen (2004)).

characterize the effect of the Riester scheme on the wealth distribution. In contrast, it obscures treatment effects on those parts of the distribution which are most important from a policy perspective. Contrary to previous findings and beliefs in the German population, our results suggest that Riester pension plans are effective in raising private savings for relatively low-wealth households, among others due to positive spillover effects. This is of great importance for public policy as households in the lower part of the financial asset distribution are likely to be those households who are least prepared for retirement.

Given that the percentage of low-wealth households who participate in Riester plans still is relatively low, only a small percentage of Germans benefits from the positive effects. This stresses once more the claim to increase the awareness of low-wealth households for the need to prepare privately for old-age and in particular for Riester pension plans. Against this background, it could also be worth thinking about policies that change default which have recently been proposed by Chetty et al. (2014) who investigate the effects of retirement saving policies on wealth for Denmark. They argue that policies such as automatic payroll deductions or savings defaults are less costly, generate less crowding-out and most importantly, are likely to have the largest impacts on individuals who are least prepared for retirement.

Though we think that this paper provides interesting insights in the effects on Riester participation on the wealth distribution, the analysis has some limitations. First, identification at the tails of the conditional asset distributions is troublesome. While eligibles and non-eligibles are similar in the middle-lower and middle-upper parts of the distribution, they are less so in its tails. Due to idiosyncratic variation of their characteristics, there might still be endogeneity at the tails of the distribution. Second, non-parametric estimation used in the analysis has some drawbacks, most importantly the need to choose smoothing parameters. Estimates of the treatment effects at the tails of the distribution appear to be slightly sensitive to the choice of smaller than the optimal parameters. Against this background, we want to recommend caution in interpreting our results and to stress that our conclusions have to be confirmed by further analyses.

In our opinion, it could be useful to investigate treatment effects of Riester participation for different income groups as it has been done in a number of US studies before. We think that this could reduce identification problems at the tails of the distribution given that the independence assumption may be more plausible within income intervals (Chernozhukov and Hansen, 2004). Moreover, one could test the hypothesis of positive spillover effects in the lower part of the conditional wealth distribution. A confirmation of this hypothesis would provide further evidence for the robustness of our results. Both of these research issues require adequate wealth data with a sufficiently large number of observations and controls especially at the tails of the wealth distribution. A further extension of the analysis at hand could be to analyze the effects of Riester participation for different socio-demographic groups such as gender, age and education among others. Thus, policy makers would get deeper insights in the effectiveness of reaching certain socio-demographic groups and therewith the need for improvements with regard to the design of the Riester scheme.

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Tables

Table 1: Summary statistics: Means, standard deviations, medians

		By Riester Participation		By Riester Eligibility	
	Entire Sample	Participants	Non-Participants	Eligibles	Non-Eligibles
Treatment:					
Participation in Riester	0.24			0.28	0.00
	(0.43)			(0.45)	(0.00)
Instrument:					
Eligibility for Riester	0.85	1.00	0.80		
	(0.36)	(0.00)	(0.40)		
Outcome variables:					
Δ Total wealth	32,493	62,710	23,114	31,604	37,529
	(653,449)	(248,871)	(734,860)	(687,142)	(414,039)
	[9,246]	[19,266]	[5,918]	[12,178]	[0]
Δ Financial assets	10,641	15,436	9,152	11,537	5,556
	(114,924)	(133,479)	(108,513)	(100,328)	(176,225)
	[2,036]	[8,261]	[57]	[3,707]	[-509]
Δ Non-PI assets	15,491	20,127	14,052	15,591	14,928
	(103,951)	(127,968)	(95,264)	(86,491)	(172,396)
	[3,619]	[6,603]	[3,000]	[4,450]	[0]
Δ Housing wealth	22,827	25,675	21,944	21,092	32,665
	(237,624)	(184,636)	(251,846)	(244,788)	(191,976)
	[0]	[0]	[0]	[0]	[0]
Δ Business assets	51	9,699	-2,944	-3,586	20,669
	(444,548)	(198,977)	(496,668)	(468,295)	(272,880)
	[0]	[0]	[0]	[0]	[0]
Covariates:					
Net income	39,763	42,670	38,861	41,035	32,556
	(50,987)	(23,855)	(56,807)	(53,820)	(29,292)
	[34,800]	[38,400]	[33,600]	[36,000]	[23,520]
Age	49.79	46.47	50.82	48.83	55.27
	(8.86)	(7.31)	(9.04)	(8.45)	(9.13)
Family size	2.65	3.08	2.52	2.77	1.96
	(1.25)	(1.26)	(1.21)	(1.24)	(1.05)
Married	0.65	0.71	0.64	0.70	0.41
	(0.48)	(0.45)	(0.48)	(0.46)	(0.49)
Years education	12.77	13.12	12.66	12.79	12.65
	(2.73)	(2.71)	(2.73)	(2.71)	(2.86)
Home owner	0.56	0.60	0.55	0.56	0.54
	(0.50)	(0.49)	(0.50)	(0.50)	(0.50)
Risk preferences	4.83	4.69	4.88	4.83	4.84
	(2.13)	(2.00)	(2.16)	(2.10)	(2.28)
Observations	2,761	654	2,107	2,347	414

Standard deviations are in parentheses and medians for asset measures and income are in brackets. Source: SOEP v29, own calculations.

Table 2: Means, standard deviations and medians for asset measures in levels for 2002 and 2012

	2002					2012				
		By Riester Participation		By Riester Eligibility			By Riester Participation		By Riester Eligibility	
	Entire Sample	Participants	Non-Participants	Eligibles	Non-Eligibles	Entire Sample	Participants	Non-Participants	Eligibles	Non-Eligibles
Total wealth	190,432	154,771	201,501	183,875	227,607	222,925	217,481	224,614	215,479	265,136
	(1,476,567)	(369,969)	(1,677,602)	(1,590,208)	(451,910)	(978,585)	(425,830)	(1,094,886)	(1,030,838)	(601,179)
	[42,213]	[50,450]	[40,984]	[38,665]	[75,779]	[88,300]	[103,120]	[80,440]	[87,467]	[91,932]
Financial assets	39,628	38,200	40,071	36,263	58,700	50,268	53,636	49,223	47,801	64,256
	(118,078)	(161,869)	(100,733)	(105,957)	(170,213)	(142,318)	(116,185)	(149,513)	(102,293)	(275,112)
	[14,901]	[17,564]	[14,286]	[14,599]	[17,564]	[20,000]	[27,220]	[17,242]	[21,320]	[11,258]
Non-PI assets	13,052	9,754	14,075	10,395	28,113	28,543	29,881	28,127	25,985	43,041
	(93,939)	(128,204)	(80,400)	(78,944)	(152,655)	(126,701)	(100,738)	(133,757)	(81,016)	(264,100)
	[0]	[2,871]	[0]	[0]	[0]	[6,770]	[10,000]	[5,280]	[7,500]	[1,865]
Housing wealth	56,325	43,951	60,166	53,162	74,256	79,152	69,626	82,109	74,254	106,921
	(303,529)	(179,362)	(332,720)	(315,983)	(219,423)	(245,798)	(220,446)	(253,127)	(244,199)	(253,188)
	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[10,000]
Business assets	45,594	26,579	51,496	46,462	40,672	45,645	36,278	48,552	42,876	61,341
	(1,145,403)	(223,376)	(1,305,276)	(1,239,888)	(186,766)	(803,206)	(214,335)	(911,703)	(863,461)	(275,604)
	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]

Standard deviations are in parentheses and medians are in brackets. Source: SOEP v29, own calculations.

Table 3: OLS and 2SLS estimates of Riester participation

	Δ Total wealth		Δ Financial assets		Δ Non-PI assets		Δ Housing wealth		Δ Business assets	
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
Riester participation	12,136	-179,981	1,307	347	5,474	-6,815	643	-58,336	3,102	-182,431*
	(16,517)	(145,424)	(5,450)	(39,208)	(5,000)	(36,660)	(9,354)	(56,968)	(11,394)	(102,439)
Net income										
≤€20K					baseline category					
€20-30K	-6,904	2,777	8,270**	8,319*	6,265*	6,884	-3,528	-556	-7,021	2,328
	(12,697)	(13,874)	(3,835)	(4,956)	(3,413)	(4,627)	(7,307)	(8,127)	(7,473)	(8,640)
€30-40K	-534	10,022	14,121***	14,173**	12,304**	12,980**	-1,497	1,744	-8,055	2,140
	(17,846)	(18,199)	(5,181)	(6,397)	(4,820)	(6,130)	(11,789)	(12,485)	(9,828)	(10,292)
€40-50K	44,862*	57,633**	19,991***	20,055***	13,814***	14,631**	12,360	16,280	10,819	23,152
	(26,732)	(25,688)	(5,845)	(7,329)	(5,016)	(6,635)	(11,256)	(12,262)	(20,278)	(19,441)
>€50K	39,610	48,595	45,442***	45,487***	40,604***	41,179***	32,216	34,974	-23,892	-15,214
	(72,062)	(68,737)	(9,629)	(10,661)	(8,861)	(9,956)	(21,703)	(21,275)	(49,081)	(47,049)
Age										
17-25					baseline category					
26-35	63,827*	12,4011*	3,153	3,454	-1,555	2,295	-9,283	9,193	45,127	10,3247*
	(36,700)	(75,102)	(7,942)	(14,605)	(7,032)	(12,787)	(14,963)	(26,150)	(29,384)	(56,496)
36-45	48,566	106,268	2,744	3,033	-954	2,737	-4,692	13,022	22,163	77,887
	(37,905)	(74,463)	(8,592)	(15,030)	(7,445)	(12,767)	(14,083)	(25,575)	(28,092)	(52,300)
46-55	27,596	84,617	7,336	7,621	5,319	8,967	10,974	28,479	19,408	74,475
	(42,501)	(76,760)	(6,499)	(133,589)	(5,260)	(11,250)	(15,086)	(26,331)	(29,020)	(52,648)
56-65	-22,733	3,954	414	547	7,571	9,278	10,729	18,921	-3,771	22,002
	(25,385)	(38,367)	(7,836)	(10,999)	(6,927)	(9,907)	(12,873)	(16,239)	(19,362)	(27,400)
Family size										
1-2					baseline category					
3-4	37,282	51,440	-178	-107	-6,495*	-5,590	15,108	19,454	16,417	30,089
	(33,446)	(40,819)	(4,782)	(5,678)	(3,565)	(4,433)	(12,115)	(13,462)	(22,302)	(27,823)
>4	27,044	47,981	13,231	13,336	2,096	3,435	-14,025	-7,598	45,809	66,027
	(91,557)	(94,918)	(15,989)	(16,584)	(15,059)	(15,695)	(28,294)	(29,171)	(63,893)	(66,230)

(Continued)

(Table 3 *Continued*)

	Δ Total wealth		Δ Financial assets		Δ Non-PI assets		Δ Housing wealth		Δ Business assets	
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
Married	-42,188**	-41,648**	-9,268	-9,265	-2,488	-2,453	-13,725	-13,560	-15,796	-15,275
	(17,876)	(17,874)	(6,889)	(6,792)	(6,596)	(6,494)	(8,652)	(8,639)	(10,367)	(10,757)
Years education										
7-10					baseline category					
11-13	-3,582	5,695	5,910	5,956	4,340	4,933	-8,916	-6,068	-344	8,615
	(17,788)	(16,552)	(4,862)	(5,193)	(3,537)	(3,882)	(10,483)	(10,215)	(12,183)	(12,007)
14-16	29,485	45,878	8,198	8,280	555	1,603	4,451	9,484	17,700	33,531
	(26,448)	(34,329)	(6,193)	(6,882)	(4,547)	(4,825)	(14,494)	(15,382)	(16,718)	(22,922)
>16	44,027	60,598	21,668**	21,751	9,179**	10,239	12,366	17,454	11,622	27,626
	(52,595)	(59,581)	(9,387)	(10,710)	(8,149)	(9,905)	(21,725)	(22,130)	(30,263)	(36,442)
Home owner	56,415**	57,250**	2,430	2,434	8,170***	8,223***	33,494***	33,750***	4,535	5,341
	(22,513)	(22,677)	(3,724)	(3,752)	(3,065)	(3,142)	(9,002)	(9,060)	(11,688)	(12,007)
Risk preferences										
0-2					baseline category					
3-5	5,909	9,738	-6,278	-6,258	-4,503	-4,258	7,507	8,682	1,056	4,753
	(12,331)	(13,539)	(4,075)	(4,146)	(3,030)	(3,134)	(8,729)	(8,927)	(7,182)	(8,774)
6-8	-19,250	-21,958	-3,689	-3,703	-319	-492	2,452	1,620	-18,737	-21,353
	(29,916)	(31,158)	(5,870)	(5,654)	(5,197)	(4,954)	(11,974)	(12,181)	(19,252)	(20,389)
9-10	160,091	147,337	-13,033	-13,097	-12,150	-12,966*	11,658	7,743	148,802	136,486
	(155,751)	(155,880)	(9,126)	(9,354)	(7,379)	(7,678)	(16,173)	(16,657)	(154,887)	(154,838)
Constant	-34,344	-64,246	-11,360	-11,510	-7,146	-9,059	-8,431	-17,610	-11,735	-40,612
	(25,861)	(41,438)	(7,303)	(10,306)	(5,681)	(8,532)	(15,759)	(18,851)	(15,780)	(27,494)
First stage					0.213***					
					(0.012)					
F-statistic					328.457					

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard deviations are in parentheses. Source: SOEP v29, own calculations.

Table 4: QR and CQTE estimates of Riester participation

Quantile	Estimator	Δ Total wealth	Δ Financial	Δ Non-PI	Δ Housing	Δ Business
15th	QR	6,094	-549	482	8,354	0
		(4,434)	(4,138)	(2,080)	(8,850)	(1,066)
	CQTE	168,706*	24,519***	46,195***	9,663	9,721***
		(96,236)	(9,226)	(15,988)	(12,772)	(3,451)
25th	QR	4,095	-217	739	0	0
		(3,547)	(2,292)	(964)	(2,553)	n.a.
	CQTE	79,601	18,756***	23,569**	0	0
		(80,133)	(6,019)	(11,025)	(8,821)	(2,683)
40th	QR	2,204	2,581**	919	0	0
		(2,223)	(1,245)	(728)	(1,081)	n.a.
	CQTE	29,682	10,482**	5,349	0	0
		(32,616)	(4,858)	(5,872)	(9,965)	(2,837)
50th	QR	1,767	3,036**	2,072***	0	0
		(1,782)	(1,330)	(795)	(2,374)	n.a.
	CQTE	15,778	7,620	3,591	0	0
		(28,368)	(4,803)	(6,352)	(9,813)	(3,055)
60th	QR	2,523	3,738***	2,725***	0	0
		(2,355)	(1,240)	(986)	(17,043)	n.a.
	CQTE	7,429	6,253	1,057	0	0
		(29,659)	(5,045)	(7,056)	(11,356)	(3,344)
75th	QR	3,685	4,244***	3,735**	-321	0
		(3,079)	(1,400)	(1,860)	(4,591)	n.a.
	CQTE	-888	-5,067	-13,709	-27,680	0
		(35,234)	(6,449)	(8,344)	(21,073)	(3,876)
85th	QR	-778	2,602	4,933**	-6,144	0
		(4,423)	(2,730)	(2,027)	(8,717)	(15,523)
	CQTE	-89,255	-14,630*	-28,959*	-60,685**	-25,000***
		(240,151)	(8,074)	(17,042)	(27,949)	(4,781)

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard deviations are in parentheses. Source: SOEP v29, own calculations.

Table 5: CQTE estimates of Riester participation with smaller smoothing parameters

Quantile	Δ Total wealth	Δ Financial	Δ Non-PI	Δ Housing	Δ Business
15th	61,099***	16,014**	15,190***	-1,222	12,564***
	(18,289)	(6,775)	(4,628)	(4,681)	(3,379)
25th	31,473**	14,307***	3,833	0	0
	(12,208)	(4,773)	(2,805)	(4,928)	(2,506)
40th	15,318	9,831**	1,931	0	0
	(10,049)	(4,107)	(2,880)	(4,696)	(2,697)
50th	9,135	7,567*	3,776	0	0
	(10,043)	(4,086)	(2,953)	(5,111)	(2,943)
60th	-279	5,956	3,893	0	0
	(10,425)	(4,206)	(3,076)	(5,404)	(3,260)
75th	-6,178	266	165	0	0
	(11,605)	(5,087)	(3,759)	(5,718)	(3,830)
85th	-22,893	-9,666	-1,100	-16,159***	-20,000***
	(13,969)	(6,159)	(4,640)	(5,761)	(4,151)

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard deviations are in parentheses. Source: SOEP v29, own calculations.

Table 6: CQTE estimates of Riester participation with 0.1 trimming

Quantile	Δ Total wealth	Δ Financial	Δ Non-PI	Δ Housing	Δ Business
15th	161,613*	30,334***	36,205**	15,891	642
	(93,660)	(8,718)	(17,187)	(18,908)	(2,659)
25th	66,230	13,417**	10,264	0	0
	(84,909)	(6,324)	(7,483)	(15,725)	(2,593)
40th	26,233	11,847*	4,629	0	0
	(35,416)	(6,102)	(7,486)	(14,872)	(2,802)
50th	13,650	8,945	4,201	-5,302	0
	(30,604)	(6,193)	(8,236)	(15,268)	(3,059)
60th	12,690	4,834	-1,683	-14,004	0
	(32,846)	(6,694)	(8,251)	(14,872)	(3,387)
75th	-1,064	-1,640	-17,882*	-46,398	0
	(35,536)	(7,018)	(9,110)	(32,905)	(3,768)
85th	-17,215	-14,485*	-24,736**	-56,206	0
	(41,191)	(8,182)	(10,608)	(37,816)	(4,830)

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard deviations are in parentheses. 1,355 observations are left after trimming. Source: SOEP v29, own calculations.