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ABSTRACT

The Effect of Increasing the Early Retirement Age on Savings Behavior Before Retirement*

Facing a reduction in pension generosity, individuals can compensate the loss by working longer or saving more. This paper shows that the impact of changes in pension generosity on saving crucially depends on the possibility of prolonging future employment. Exploiting across cohort variation in expected pension wealth induced by a 3-year lift in early retirement age for women born after 1951 in Germany, we show evidence of a reduction in private savings rate and an increase in leisure consumptions in case of strong responses in future labor earnings.

JEL Classification: D14, J14, J26

Keywords: pension reform, early retirement age, savings, pension wealth

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1 Introduction

In response to demographic change, many countries are reforming their public pension systems to cope with insolvency. Those reforms typically reduce public pension generosity by introducing financial penalties to early claim and by increasing the early retirement age (ERA). Facing a cut in public pension wealth, households reassess retirement plans by changing saving and consumption decisions to provide a sustainable income in old age. This paper examines a 3-year lift in the ERA for women born after 1951 in Germany and estimates the response of private savings and consumption to the reform. In 1999, Germany abolished an early retirement program for women which allowed them to retire as early as age 60. After the reform, women can retire the earliest at age 63. This reform creates a strong negative shock to pension wealth as it reduces the length of time that women can receive pension benefits by three years. The sharp discontinuity in the ERA for women born after 1951 allows us to causally estimate the impact on of this reform using a regression discontinuity (RD) method.

The substitutability between public pension wealth and private saving is both theoretically and empirically ambiguous. Feldstein (1974) stresses that the overall effect of a pension on private savings relies on the magnitude of the employment effect. Depending on the level of corresponding changes in future labor earnings, private savings could decrease or increase when public pension wealth goes down. Recent empiric evidence almost always shows savings increase when public pension is less generous, despite a large variation in terms of the degree of substitution (Attanasio and Brugiavini 2003; Attanasio and Rohwedder 2003; Feng et al. 2011; Lachowska and Myck 2018; Lindeboom and Montizaan 2018). However, the exogenous pension reforms explored in those studies typically have small impacts on future employment. This paper explores a setting where the expected future labor earnings increase massively due to the sharp jump of the ERA. We show evidence of non-positive effects on monthly private savings rates of individuals in their 50s in anticipation of a longer working horizon. This paper provides direct empirical evidence of a reduction in private saving as a result of shrinking pension generosity when there are substantial future labor supply responses.

We begin by providing a simple three-period life cycle framework to illustrate the ambiguous effect on private saving in response to a lift of the ERA. Using fine-grained household savings data, we estimate the causal change in saving rates and consumption pattern of households with women aged from 45 to 59, before retirement. We explore the differences between households with women born before and after the reform threshold January 1st, 1952. The abolishment of women's early retirement program effectively increases the ERA from 60 to 63, and results in a reduction of pension wealth between 5% and 7%. The abolishment of the early retirement pathway studied in

this paper is particularly interesting because the employment effects of this reform is substantial. Geyer and Welteke (2019) study the same reform using an RD method, and find that workers prolong employment and delay retirement substantially. In line with their results, we find a reduction in the saving rates of the household with middle-aged women. Households adjust saving rates downwards in anticipate of a prolonged employment and a shortened retirement duration.

We find that households tend to react to the lift of the ERA by decreasing overall monthly saving rates. Particular, their monetary savings rates decrease by 2.3 percentage points with a significant level of 5%. Moreover, we find that their monthly consumption on leisure goods increase significantly by 33.63 euro. When separate the impacts by age groups, we find that the savings and consumption responses are driven mostly by households with women older than age 50. We also find that the reform affects different groups heterogeneously. Especially, individuals, who are more likely to adjust their expected retirement age upwards, are more likely to adjust their savings rate downwards and consumption upwards. We find households with married women, West Germans, higher income and high educated women are more responsive to the reform by reducing monetary savings rates and enjoying more leisure consumption.

This paper contributes and relates to three strands of studies. First, it builds on and is inspired by the findings of large retirement/future employment responses to pension reforms raising the legal retirement age (Geyer and Welteke 2019; Lalive and Staubli 2015; Manoli and Weber 2016; Mastrobuoni 2009; Staubli and Zweimüller 2013). Coping with less generous pension, it is easier for workers to prolong working life when the legal retirement age goes up, thus provide additional source of income. Particularly, Geyer and Welteke (2019) explore the same reform in this paper. They find that affected women delay retirement substantially.

Second, this paper belongs to the literature studying the relationship of public pension wealth and private savings using quasi-experiments. Those papers commonly find that households increase private savings rate when facing a reduction in benefit generosity(Attanasio and Brugiavini (2003), Lachowska and Myck (2018), and Lindeboom and Montizaan (2018)). A common feature of the exogenous pension reforms explored in those studies is that they do not explicitly change the legal retirement age. Those reforms typically have smaller impacts on future employment. For example, Lachowska and Myck (2018) study a reduction in pension wealth induced by a pension reform in Poland which had very little effect on retirement. They find a sizeable degree of substitution between pension wealth and saving. We contribute to this debate by studying a reform which explicitly changes pension generosity via a lift of the legal retirement age. We provide an a non-positive and close to zero measure of substitution between pension

wealth and saving, when the magnitude of future employment change is large. Individuals absorb the loss in pension wealth by working longer rather than by increasing savings.

Lastly, it relates to studies investigating the impacts of a longer distance to retirement on younger worker's behaviors before retirement, including labor and health outcomes. Generally, employment before retirement either increases (Carta and De Philippis (2019) and Hairault et al. (2010)) or remain unchanged (Engels et al. (2017a), Geyer and Welteke (2019), and Geyer et al. (2018)), while health outcomes improve (Bertoni et al. (2018) and Grip et al. (2011) when the expected distance to retirement increases. [1]

The rest of the paper is organized as follows. Section 2 describes in detail the abolishment of the women's pension pathway and the German pension system. In Section 3, we use a simple theoretical framework to show potential impact of a lift in the ERA. Data and the empirical setup are discussed in section 4. Section 5 describes the results. Section 6 discusses the findings and concludes.

2 Institutional Background

The German public pension scheme is an earnings-related points system financed on a pay-as-you-go basis. Participation is mandatory, except for civil servants and the self-employed. It insures 85% of the working-age population against the risk of aging. On average, the public pension replaces around 50% of pre-retirement wage, net of income and payroll tax. Pension benefit levels are closely tied to the lifetime wage incomes. Few exceptions aside, workers with longer contribution years or higher relative wage incomes will receive proportional higher pension points. In case of retirement at the normal retirement age (NRA), each year of contribution at an average wage renders around 30 euros per months of pension benefits (in 2018: €32.03 in West Germany, €30.69 in East Germany).

The age at which pension can be claimed is in the range of 60 and 67, depending on birth cohort and pension contribution history. Individuals with at least five years of contribution are qualified to claim the regular old age pension around age 65[2]. Several alternate pathways make retiring before normal retirement age possible. [3] However, retirement before NRA renders a 3.6%

[1] Hairault et al. (2010) show that French workers increase their job search efforts. Carta and De Philippis (2019) also confirms that in responses to a longer working horizon, Italian middle-aged females increase their labor force participation. Bertoni et al. (2018) examines an increase in distance to retirement and find that middle-aged Italian men exercise more and less likely to be overweight. **grip2011shattered** using a Dutch reform and show mental health has improved when workers anticipate an increase in legal retirement age.

[2] Starting from 2012, the statutory retirement age for cohorts younger than 1947 began increasing from 65, and it will reach age 67 for cohorts younger than 1964.

[3] The four alternative pathways to retirement were old-age pensions for long-term insured, old-age pensions for women, old-age pensions due to unemployment (and, later, part-time work) and old-age pensions for severely disabled persons (see (Börsch-Supan et al. 2004) for more details). Appendix Table A.1 documents the changes

benefit deduction for each year of early claiming (See Engels et al. (2017b) and the Appendix for more details). Deductions of 3.6% are low by international standards (Queisser and Whitehouse 2006) and not actuarially fair (Börsch-Supan et al. 2004). As a consequence, many individuals retire at the earliest day possible.

Notably, women can claim pension earlier via the old-age pensions for women pathway. Before the 1999 pension reform, the old-age pension for women pathway provided eligible women with an option to retire at age 60. The eligibility requirements for this pathway were: 1) at least 15 years of waiting periods[4], and 2) 10 years of contribution periods to be acquired after age 40.[5] According to Geyer and Welteke (2019), before the reform 60% of women were eligible for women's pension.

The abolishment of the old age pension for women pathway — The 1999 reform eliminates the possibility of claiming pension at age 60 for women born after 1951. This reform was announced in December 1997 and became effective in January 1999. [6] While women born before 1952 have the option to claim pension at age 60 via the women's pension, women born in and after 1952 can claim pension the earliest at age 63 via the pension for the long-term insured, or after age 65 via the regular old age pension. The pension for the long-term Insured is available for people with more than 35 year of contribution which include child raising periods. Around 90% women who are eligible for the women's pension also qualify for this pathway (Geyer and Welteke (2019)).[7] Figure 1 plots the statutory retirement age and the earliest possible retirement age for women as a function of birth cohort. Women actually eligible for women's pension face a sharp increase in their distance to retirement. The ERA effectively increases from age 60 to age 63 for the impacted cohorts. Thus, the reform created a strong negative shock to pension wealth as it reduces the length of time that women can receive pension benefits. This sharp shift of the ERA between cohorts allows us to estimate the causal impact on household private savings using a regression discontinuity (RD) method. Moreover, Geyer and Welteke (2019) and Geyer

in the ERA and normal retirement age, and the corresponding deductions when claiming at the ERA for cohort 1948 to 1955.

[4] Waiting periods are years of employment, unemployment, (up to 10) years of child rearing and certain periods of education.

[5] Contribution periods consist of employment periods, unemployment duration and (up to 3) years of child rearing.

[6] Reform details can be found in the relevant law, *Rentenreformgesetz 1999* (RRG 1999), announced on December 16, 1997. In 1998, during the federal elections, the green party and the social democrats promised to change the already announced RRG 1999. However, although they won the election and modified many aspects of the pension scheme in 1999, they did not reverse the abolishment of the women's pension pathway. Therefore, the abolishment became effective in 1999.

[7] For example, women born in 1951 can claim pension at age 60 with a penalty of 18% for early claiming via women's pension. However, for women born in 1952, unless they qualify for disability pension, the earliest possible retirement age is 63 with a 9% penalty for early claiming via the pension for the long-term insured. Otherwise, they can retire at the regular retirement age, which is 65 and 5 months. Appendix A.2 discusses the details of the penalties and different pathways.

et al. (2018) investigate the labor supply responses of this reform and find a large increase in the employment rate of women aged 60 and older due to the reform. This provides a setting where we can empirically show that the substitution between private savings and public pension wealth is zero or negative in case of strong future employment responses.

3 Simple Theoretical Framework

We analyze the impact of the raising the ERA in a three-period version of the life cycle model, following Feldstein (1974, 1976). It highlights that the effect of raising the ERA on the savings rate is ambiguous and depends on the corresponding employment effect.

We assume that an individual lives for three periods, dies afterwards and has no children. In the first period, she always works and in the third period, she is always retired. She has perfect foresight and smooths consumption over the life cycle. We assume the individual is single to avoid intra-household transfer decisions. She maximize the following life time utility:

$$U(c_1, c_2, c_3) = \sum_{t=1}^{3} \rho^{t-1} \frac{c_t^{1-\theta}}{1-\theta}, \tag{1}$$

where c_t is consumption in period t, The inter-temporal elasticity of substitution is $\frac{1}{\theta}$, and ρ is the discount factor.

We start with a baseline case which is characterized by one period of employment followed by two periods of non-employment. Retirement at the ERA, after period one, is assumed to be individually optimal. This corresponds to the regime for cohorts born before 1952. In period 1 the individual works, she earns a wage w and makes mandatory retirement contributions τ and privately saves the amount s. We assume no bequests and all wealth is consumed by the last period.

$$c_1 = w_1 - \tau_1 - s_1 \tag{2}$$

The saving rate (sr_t) for periods 1 to 3 (t = 1, 2, 3) is as follows

$$sr_1 = \frac{w_1 - \tau_1 - c_1}{w_1 - \tau_1} \tag{3}$$

Her contributes τ to finance pension benefits. In the baseline case, the individual's total public pension benefits equal total contributions made to the pension scheme.

$$\frac{ss}{(1+r)} + \frac{ss}{(1+r)^2} = \tau_1, \tag{4}$$

where r is the interest rate and ss is the per period social security benefits. When retired, the individual spends all private savings and social security benefits (ss).

$$\frac{c_2}{(1+r)} + \frac{c_3}{(1+r)^2} = s_1 + \frac{ss}{(1+r)} + \frac{ss}{(1+r)^2} = \tau_1 + s_1$$

We assume leisure and consumption are non-complementary, and the utility function is concave. For simplicity, we also assume a discount factor $\rho = 1$ and zero interest rates $r = 0$. According to the life cycle hypothesis, the individual smooths the marginal utility of consumption across periods to maximize utility over the life cycle. Accordingly, she saves an optimal amount s^* such that $c_1 = c_2 = c_3$. Using the implications of consumption smoothing, we have the optimal savings and consumption s^* and c^*:

$$s^* = \frac{2w_1 - 3\tau}{3} = \frac{2}{3}w_1 - \tau \tag{5}$$

$$\Leftrightarrow c^* = \frac{w_1}{3} \tag{6}$$

Now, let's consider the case where the earliest possible age to claim pension is increased by one period. This corresponds to the new regime for women born in and after 1952. In this simple model, this translates to restricting access to pension benefits to period three. An individual copes with this shock by choosing a new savings level and adjusting employment decisions. For simplicity, we distinguish two extreme scenarios to highlight the importance of changes in future labor earnings: first, she re-optimizes and does *not* prolong her career; second, she re-optimizes and works one period *longer*, denoted by n and l. The new optimal savings are denoted by s_n^* and s_l^*, respectively.

In the first scenario, the individual finds it optimal to *not* prolong her career. She still works only in period 1. In period 1 she earns a wage w_1, save s_n and pays contributions τ_1 – same as the baseline case. However, pension is no longer accessible in period 2 due to the lift of the ERA. She consumes a share ϕ of private savings in period 2. In period 3, she retires and consumes the remaining savings $(1-\phi)s_n$ and pension benefits. See Eqs. (7) to (9) for a formal notation.

We incorporate an adjustment factor $\gamma < 1$ to reflect the actuarial unfairness in the German pension system.[8] $\gamma < 1$ represents the situation that, if pension claiming is delayed, the sum of

[8] Benefits are often adjusted to account for the duration of benefit receipt, but this adjustment usually is not actuarially fair. Therefore, the incentives to continue employment after reaching the ERA are limited.

pension benefits is smaller than the sum of contributions. Early retirement is always preferred.[9] Therefore, $ss = \gamma\tau_1$ with the following per period consumption levels:

$$c_{1n} = w_1 - \tau_1 - s_n \tag{7}$$

$$c_{2n} = \phi s_n \tag{8}$$

$$c_{3n} = (1-\phi)s_n + \gamma\tau_1 \tag{9}$$

In optimum, she chooses c_n^* to smooth consumption. Since she lives for 3 periods, earns a wage w_1 in period 1, and loses the share $(1-\gamma)$ of contributions τ_1 due to the actuarial unfairness of the pension benefits, the new per period consumption and optimal savings are the following:

$$c_n^* = \frac{w_1 - (1-\gamma)\tau_1}{3} \tag{10}$$

$$s_n^* = \frac{2w_1 - (2+\gamma)\tau_1}{3} \tag{11}$$

The share of savings consumed in period 2 $\phi = \frac{w-(1-\gamma)\tau_1}{2w_1-(2+\gamma)\tau_1}$. Because $\gamma < 1$, it holds that $s_n^* > s^*$. In absence of an employment effect, we expect the lift of the ERA to increase savings and decrease consumption in period 1.

It is important to note that $\gamma < 1$ is not introduced by the reform but already embedded in the baseline case. The individual in the baseline case prefers to claim benefits as early as possible because of the actuarial unfairness of the public pension system. In the German context, it is reasonable to assume $\gamma < 1$, because a delay of pension claiming by 3 years results in slightly higher per period pension benefits but accrues a substantial loss in the net present value of pension wealth of 5% to 7% due to shortened pension duration. [10,11]

In the second scenario, we assume the individual works longer. The consumption pattern in this scenario is the following:

$$c_{1l} = w_1 - \tau_1 - s_{1l} \tag{12}$$

$$c_{2l} = w_2 - \tau_2 - s_{2l} \tag{13}$$

$$c_{3l} = \gamma(\tau_1 + \tau_2) + (s_{1l} + s_{2l}) \tag{14}$$

[9] Under reasonable assumptions of interest rates, life expectancy and time preferences, early retirement is financially beneficial in a net present value perspective. If it was not preferable, the incentive to claim as early as possible is smaller.

[10] Calculations are based on an individual with 30 years of employment at the average wage level. We assume a 3% internal discount rate, account for the 3.6% per year correction factor for postponing claiming, use current life expectancy tables, and a reasonable range of the expected future growth rate of pension benefits.

[11] Introducing borrowing constraints or concepts of uncertainty into the model leads to similar model implications as does actuarial unfairness.

Now the individual works one more period and has to finance one period of retirement less. The optimal consumption level changes substantially. Imposing the consumption smoothing condition $c_1 = c_2 = c_3$, and let $w_1 = w_2 = w$, $s_1 = s_2 = s$, $\tau_! = \tau_2 = \tau$, we find that, in comparison to the baseline case, consumption rises and savings per period declines, see Eqs. (15) and (16).

$$c_l^* = \frac{(w_1 + w_2 - 2(1-\gamma)t}{3} > c^* \tag{15}$$

$$s_l^* = \frac{w - (1+2\gamma)t}{3} < s^* \tag{16}$$

The need to save decreases because of additional wage income in period 2, higher per period pension benefits through a longer contribution period, and a shorter period of non-employment that needs to be financed.

This simple three-period life cycle framework illustrates the importance of employment responses. We highlight that the lift of the ERA can result in higher or lower savings rates depending on the individual's labor supply response.[12]

$$s_l^* < s^* < s_n^* \tag{17}$$

$$c_l^* > c^* > c_n^* \tag{18}$$

Therefore, the effect of a shift of the ERA on the savings rate is an empirical question. Whether the employment effect of a change to the eligibility age is large enough to reduce the savings rate will be tested in the empirical part of this study.

4 Data and Empirical Strategy

4.1 Data and Sample

Our data consist of a main and an auxiliary sample. The main sample is from the German Income and Consumption Survey (*Erwerbs- und Verbrauchsstichprobe*, EVS)[13]. The EVS is a representative repeated cross-sectional survey of 0.3% of all households in Germany, carried out every five years by the German Federal Statistical Office. The auxiliary sample is from the Survey of Health, Ageing and Retirement in Europe (SHARE), a panel survey of a representative sample of individuals aged 50 and older.

[12] Taking the life-time perspective on savings and benefit streams, the theoretical model can easily be extended to focus on the substitutability between pension wealth and overall private savings. Under stricter assumptions concerning γ, it can be shown that the effect of pension wealth on overall private savings is ambiguous, as well.

[13] For a short overview of the data set, see Statistische Ämter des Bundes und der Länder (2018).

The baseline sample uses four waves of EVS— 1998, 2003, 2008 and 2013. [14] The EVS contains detailed information of household income, consumption expenditures and savings, computed from diaries filled out by the household over at least one quarter of a year. Therefore, measures of consumption, income and savings are more precise and consistent than other household surveys, such as the SOEP (The German Socio-Economic Panel), which rely on retrospective recalls. The EVS has three features that make it well-suited for our analysis: First, it is the only available fine-grained micro data source for detailed household savings and consumptions in Germany. We can not only investigate the impact on the overall savings and consumption but also the impact on the detailed savings channel and consumption categories. In fact, the consumer price index for Germany is compiled in accordance to the consumption patterns in the EVS. Second, the sample size is large. Each wave contains around individuals from 60,000 households. It is the biggest data source of its kind in Europe. Third, the EVS also contains socio-demographic characteristics of all household members. This allows us to examine the heterogeneous impacts by marital status, household wealth level and also control for the spousal labor supply and characteristics.

The sample is restricted to households with women aged from 45 to 59 years old. Thereby, households are observed before women reach the ERA — no matter treated or untreated by the reform. In principal, any changes in future labor earnings and future pension wealth do not materialize before age 60. The impact on savings and consumption works via changes in expected future earnings and pension wealth. The women are too young to retire but old enough to price in future retirement options into household savings and consumption decisions. We further narrow the sample to households with women born in years 1946 to 1956, which is close to the threshold cohort[15]. Moreover, we drop households where the cohabiting partners of the women are older than age 60. This also serves to prevent materialization of pension benefits from the spouse. [16] To deal with multiple and contradicting treatment status, we also exclude 55 homosexual couples. The final sample comprises 12,635 households, among which 4,746 are female single households, that is, households of divorced, widowed or never-married women.

The overall household savings level is a defined variable in the EVS. It is roughly the same as the difference between after-tax labor income and consumption. Besides, we construct three savings categories by taking the difference between inflow and outflows of different types of savings activities. There are monetary savings (deposits to bank accounts, buying stocks), property savings (buying gold, houses etc.) and loan payback (mortgage and interest payments or the redemption of credits, etc.). The overall savings rate as well as savings rates of different categories

[14] We don't use earlier waves, because the earlier waves differ in terms of definitions and categorizations of savings and wealth. The 2018 wave has been conducted, however the data is not available yet.
[15] Both the age and birth cohort restrictions are relaxed in the robustness analysis
[16] We relax this restriction and include all spouses who are not yet retired.

are defined as the level of monthly household savings divided by monthly net income of the household. An observational period of 3 months is susceptible of producing extreme outliers due to valuable durable good purchases and sales. Therefore, we trim the savings (absolute savings as well as savings rates) so that the bottom and top 1% are dropped.

The monthly consumption level is also measured at household level. We can further look at three categories of household consumptions: basic consumptions, leisure consumptions and durable consumptions. We define basic consumptions as expenditures on clothes, household energy, food at home, nutritional supplements, medical services, education as well as rent and public transportation. We define leisure consumption as expenditures on leisure activities, such as attending concerts, taking hobby courses, buying equipment for sports, camping and musical instruments, and spending on hotels. Lastly, we define durable consumptions as expenditures on buying a car, TV and home appliances, etc[17].

The EVS includes variables we use as controls in our regression: age at the survey wave, marital status, age difference with the spouse, number of children, number of household members, household wealth, dummies indicating East Germans, Germans, education level and ownership of any dwelling. Other variables, such as labor earnings, number of working hours, part-time and full-time work are not controlled in the regression because they could be affected by the reform.

Table 1 shows the summary statistics of the main outcome variables and characteristics of the sample for married households, single households and full sample. On average, households save 700 euro per month and have an overall savings rate of 14%. Of total savings, 43% are in the form of monetary assets, 22% as property assets and 35% as redemption of credits and loan payments. Households consume around 3524 euro per month, among which 75% are spent on basic goods, 9% on leisure goods. 22% of the households own private pension insurance policies, spent around 40 euro each month on private pension insurances and around 1000 euro on durable goods. Women earn a monthly labor income of 1370 euro, and their partners (if existent) earn around 2670 euro per month. The women in our sample are on average 51 years old. Husbands are on average 1.5 years older than their wifes, 41% of households own a dwelling.

To show the first stage impact of the increasing the ERA on expected retirement age, we utilize an auxiliary sample — the Survey of Health, Ageing and Retirement in Europe (SHARE). SHARE collected data on a representative sample of individuals aged 50 and over. We take five waves of the survey, wave 1 (interview years 2004–2005), wave 2 (2006–2007), wave 4 (2011–2012), wave 5 (2013) and wave 6 (2015), drop individuals older than age 60 at the survey and only look at Germany. The outcome variable we explore is age of expected retirement.

[17] For more details of the variable construction, please see Appendix A.1.

4.2 Empirical Strategy

The increase of the ERA only affects eligible women born after the threshold date, January 1^{st}, 1952, creating a discontinuity. Women born before 1952 can retire the earliest at 60 while women born in and after 1952 can retire the earliest at age 63. We explore this discontinues jump in the ERA and use a RD design to estimate the causal effect of the ERA on private monthly savings rates and consumption. Because only women eligible for the women's pension are affected by the reform, we measure the Intention-to-Treat (ITT) effect. The estimation equation is the following:

$$Y_i = \alpha + \beta X_i + \gamma D_i + \delta_1(S_i - c) + D_i\delta_2(S_i - c) + \epsilon_i \tag{19}$$

The running variable S is defined as the birth cohort, the threshold value is set to $c = 1952$ with the treatment indicator D being defined accordingly as $D = \mathbb{1}(S \geq c)$. Y_i are the savings rates and monthly consumption levels. The general cohort trend is captured by δ_1, the diverging component of the treatment group is captured by δ_2. Socio-demographic characteristics are denoted as X, including age, education, region, homeownership and marital status. A bandwidth of 5 birth years to both sides of the birth threshold is used. We use a rectangular kernel, but results are robust to the use of a triangular kernel.

To test the validity of the RD design, we check both smoothness of the predetermined covariates around the cohort cutoff. Figure A1 plots the covariates of women around the birth threshold of the ERA reform after subtracting an age trend, household composition and a constant term. We see that the probability of owning a house, female employment rates, share of women with higher education, the share of widowed or divorced women, the share of married women evolve smoothly around the threshold. Figure 2 further plots the estimated changes in those predetermined covariates at the cohort cutoff based on a linear specification for bandwidths of 5 years. We also find none of the impacts are statistically significant from zero. The regression outcomes are shown in Table 2.

5 Results

5.1 First stage effect of reform on expected retirement age

To back our research design, we use the data from SHARE to estimate the relationship between birth cohorts and expected retirement age. Table 3 reports the linear estimates of Eq. (1) with expected retirement age as the outcome. We find suggestive evidence that treated cohorts update their expectations of retirement age by around 8 months. The estimates are only statistically significant for bandwidths wider than 48 months around the cutoff pointing at a sample size

issue with SHARE. Nevertheless, we are confident that younger cohorts update their perceived retirement age and, hence, adjust their household savings and consumption pattern.

5.2 Intention-To-Treat effects on savings and consumption behaviours: baseline results

We first look at the graphical evidence of impacts on two sets of outcomes: monthly savings rate and monthly consumption level. Figure 3 shows the binscatter plots of savings rate along birth cohorts after subtracting the age trend, household composition and a constant term. It is necessary to control for age and household composition because older cohorts are disproportional older than younger cohorts in our sample[18] Since saving behaviour is strongly correlated with age, it is necessary to control for the age trend. Furthermore, the share of married households is the higher the older the female birth cohort. This is because couples are excluded from the sample if male partners are born before 1949. This restriction leads to relatively more single households among older female birth cohorts [19]. With those two technicalities in mind, nevertheless, we see a slight decrease in total savings rates, an increase in property savings rate and a decrease in loan savings rates for cohorts 1952 and onwards. Figure 4 shows the scatter plots for consumption levels. We do not see any apparent jump or drop at the 1952 cohort cutoff.

Savings responses— Table 4 shows the estimated impact of a lift in the ERA on the monthly savings rate and three subcategories of savings rates. The results are obtained from the linear regression as Equation 4 with a bandwidth of 5 years and control for a larger set of covariates, including age, cohort, home ownership, household composition, marital status, region and education. Similar as the graphical analysis, the birth cohort trend is allowed to differ between treated and untreated cohorts. Overall, households tend to react to the lift of the ERA by decreasing overall monthly saving rates. Column 1 shows the point estimate of the reform on overall savings rate is -1.0 percentage points with a significant level of 10%. Column 3 shows the monetary savings rate decreases by 2.3 percentage points with a significant level of 5%. We find the monthly savings level decrease by 72 euro however the impact is not significant. The decrease in the savings rate could work through two channels: First, consumption smoothing as an reaction to an increase in expected future earnings; Second, an indirect effect from a reduction in current labor earnings. We rule out the second channel, as we find no significant impact on current log labor earnings. We estimate the changes in log labor earnings at the cohort cutoff

[18] The EVS is only conducted every 5 years. Therefore, cohorts differ by mean age in a systematic manner. The low survey frequency in combination with the age restriction of the sample mechanically translates into an unsteady and asymmetric age pattern.

[19] The reason for the restriction of male birth cohorts is the phase-out of the old-age pension for the unemployed. This type of pension was only relevant for men, and had been phased out for male born between 1946 and 1948. Table A4-5 also show the our results are robust when relaxing the restrictions on partners' birth cohorts.

and find no significant changes. Additionally, Geyer et al. (2018) show that for the age group 58 to 59, anticipatory effects on employment are negligible. Table 11 further splits the sample by age groups: women aged 45 to 49, aged 50 to 54 and aged 55 to 59. We find that the savings responses of women aged 55 to 59 respond the most to the reform. The overall savings rate decreases by 2.5 percentage points. The reduction in monetary savings is mostly driven by women older than 50. The monetary savings rate of the 50-54 age group declines by 4.5 ppts. However, we do not see any significant changes in savings rates for the younger group, women aged 45 to 49. One explanation is that workers only start planning for retirement when they are older. Therefore, the impact of changes in future expected retirement gains importance while women get older.

Table 5 shows the estimated impacts on total monthly consumption, consumption of basic goods, leisure goods and durable goods. The only significant effect we find, is the effect on the consumption of leisure goods. Spending on leisure goods includes, among others, expenditures for concerts, dining out and travel related expenses. This is reasonable because the consumption of leisure goods is relatively elastic and easier to adjust. We find that the monthly consumption on leisure goods increases by 33.63 euro with a significance level of 5%. Table 12 shows the impact on consumption by age groups. The reduction in leisure goods consumption is driven by households with women aged 50 to 54. This is consistent with the negative effect on the monetary savings rate for women aged 50 to 54 in Table 11.

Several exercises further establish the robustness of the estimates. We have tested the robustness of the estimation results by bandwidth, by polynomial orders (Table A2-3) and by different sample restriction (Table A4-5). We further test the robustness of the RD estimates by showing estimates at placebo cutoffs (Table A1)

5.3 Heterogeneous Effects

In this section, we split our samples into subgroups. Based on the heterogeneous effects by groups, we reinforce the notion that the substitution between private savings and public pension wealth is zero or even negative in case of strong future employment responses.

Heterogeneous impacts on expected retirement age — Table 6 shows the impact of the reform on expected retirement age by subgroups using the SHARE sample. We notice that single women increase their expected retirement age by around 1 year, more than the respective response of married women. Women with a high individual income respond statistically different from women with low individual income. Women with higher incomes expect their retirement age to increase by 1.3 year while low income women do not update their expectation. We also look at

heterogeneous impacts by household income. Women in the low household income group shows a non-significant effect of 0.6 years. Women with high household income show an effect of 0.7 year, statistically significant at the 99% level.

Two other interesting subgroups are West/East Germany and high/low education. Unfortunately, we cannot directly test the differential impacts on expected retirement age for these two groups using SHARE because of data limitations. We rely on findings of two existing papers to infer the possible heterogeneous effects on expected retirement age/ expected future earnings. In terms of differences between West and East, Geyer and Welteke (2019) show that the unemployment rates of 60-to-62-year-old women increase more in East than in West Germany. This suggests that the savings and consumption behavior or women in West Germany are more responsive because their future labor earnings are more likely to increase. In terms of education, Geyer et al. (2018) show that women with higher education are more likely to prolong employment in comparison to women with low or medium education.

To sum up, based on the above evidence, we expect to see single women, high individual income women, West Germans and women with higher education and higher household income to respond to the reform by reducing their savings more and increasing their consumption more.

Heterogeneous impacts on savings and consumption—Table 7-8 show the heterogeneous impacts on savings and consumption, respectively. We find that single households reduce the monetary savings rate by 3.3 ppts, but do not change their consumption patterns. Single households include women who are never-married, divorced and widowed. We also find a positive effect on property savings. The property savings rate increases by 9 percentage points, significant at the 10%-level of significance. This seems to suggest that single women change their savings portfolio in response to the reform while keeping their total savings rate constant and not adjusting their consumption pattern. They invest more in illiquid assets as houses or gold while decreasing savings in liquid assets. Meanwhile, married households reduce their overall savings rate by 1.3 ppts while increasing their consumption of leisure goods by 46.19 euro per month.

As we expected, we indeed find that women in West Germany reduce their monetary savings rate (minus 2.4 ppts), and increase their consumption on leisure goods (56.12 euro). Meanwhile, women in East Germany do not change their savings and consumption patterns.

We find that households of high educated women reduce their monetary savings rate by 4.3 percentage points while increasing the consumption of leisure goods by 46.40 euro. As expected for households of low educated women, the effects on savings and consumption are not significant and of small magnitude. The effect heterogeneity is intuitive and consistent with predictions based on concepts of financial literacy. The less educated are probability less aware of the reform

or less capable to adjust their household finances to cope with the reform. Another explanation could be that the employment prospects of less educated individuals are low in Germany once they reach age 55. Thus, low educated individuals cannot as easily delay their exit from employment.

With regard to household wealth, we do not find significant differences in savings responses between women in households with higher wealth and lower wealth. However, we find that women in households with higher wealth reduce their leisure good consumption by 70.08 euro while consumption patterns of women in low wealth households remain unchanged.

Moreover, we find that women with higher income do not change their household savings rate and consumption patterns while women with low individual income reduce their monetary savings by 2.4 ppts and do not change their consumption patterns. It is common knowledge, that education and income are strongly positively correlated. Against this backdrop, opposite findings for the groups of high individual income women and high educated women suggest that not only financial literacy but also employment prospects seem to play a role.

6 Conclusion and Discussion

This paper analyzes the effect of raising early retirement age on household savings and consumptions. Specifically, it explores a 3-year lift in the ERA for women born after 1951 in Germany to estimate the responses to less generous public pension. We use a simple three-period life cycle framework to illustrate the ambiguous effect on private saving of the reform. This paper highlights the importance of future employment responses when study the relationship of pension wealth and private savings. The simple model shows that sign depends on whether the workers prolong working or not. Even though workers face a reduction in pension generosity, the lift in the ERA made it easier for individuals to increase future labor earnings and compensate the loss. Therefore, household savings might decrease and consumption might increase when the rise in expected future labor earnings surpasses the loss in public pension.

Using German Income and Consumption Survey, we exploit across cohort variation in expected pension wealth induced by the 1999 pension reform in Germany. The 1999 pension reform abolished an early retirement program for women which allowed them to retire as early as age 60. After the reform, women born after 1951 can retire the earliest at age 63. The sharp discontinuity in the ERA for women born after 1951 allows us to causally estimate the impact on of this reform on household private savings using a RD method. We show that a one percentage point reduction of the overall household savings rate as a result of the reform. We also find the affected cohorts reduce their monetary savings rate while increase their leisure consumption. The effect is concentrated on workers older than 50, who are more likely to start planning for retirement.

Moreover, we find groups whose expected retirement age are more affected are more likely to reduce savings and increase leisure consumption at the same time, such as the West Germans.

At first glance, the non-positive effects seem in conflict with previous studies. For example, Attanasio and Brugiavini (2003) show that a decrease of pension generosity increased savings rates of affected cohorts by 9 to 17 percentage points. Yet, the qualitative difference between the large positive impacts in Attanasio and Brugiavini (2003) and the non-positive results of this paper could be due to the specific nature of the different pension reforms — a reduction of benefit levels v.s. an explicit increase of the legal retirement age. For example, the reform in Attanasio and Brugiavini (2003) and the ERA reform in this paper have very different employment implications. Bottazzi et al. (2006) examines the retirement responses of the middle-age population analyzed by Attanasio and Brugiavini (2003), and find that they expect to retire on average 2.5 years later in response to a benefit cut of up to 35%. In comparison, the ERA reform in this paper induces the treated women increase their retirement age by 3 years and employment exit is prolonged by 1.8 years, while the pension wealth of individuals who otherwise would retire at age 60 by 5% to 7%, all else equal. [20] Therefore, the differences between the estimated savings responses might be rooted in the varying responses of the retirement timing. This is also consistent with Feldstein (1974)'s emphasis on the importance of the future employment channel.

In a related setting, Lindeboom and Montizaan (2018) analyze a Dutch reform where the prolonged working life was emphasised in the political debate, despite the reform changed many aspects of the pension system.[21]Lindeboom and Montizaan (2018) find that individuals mainly compensate the 9% cut in pension wealth by prolonging employment by 10 months. The magnitude of the increase in savings found in their paper is much smaller, by an amount worth 3 months of earlier retirement. Lindeboom and Montizaan (2018)'s finding suggests that when the increase of working horizon is salient, workers tend to cope by working longer rather than saving more. In the extreme, it is completely plausible that savings rates goes down, as we find in our setting.

Overall, our estimates suggest that private savings rate could decrease and consumption could increase when facing less generous pension. The salience and possibility of prolonging working horizon of a pension reform is crucial to households' reactions. Households expect to increase future labor earning by working longer, therefore they can afford to reduce current savings rate and enjoy more leisure consumption. Our findings open important avenue for future research.

[20] Calculations based on Geyer and Welteke (2019). To obtain the average impact on women, these numbers need to be multiplied by the share of actual eligible women and by the share of initial compliers among the eligible women.

[21] While de jure the reform was a reduction of pension benefits, the political debate and information letters stressed the possibility to work 13 months longer to exactly compensate for the loss in benefit levels through additional contributions and actuarial premiums.

For example, future studies can provide empirical evidence in other contexts/countries where pension reforms vary by their impacts on expected future labor earnings.

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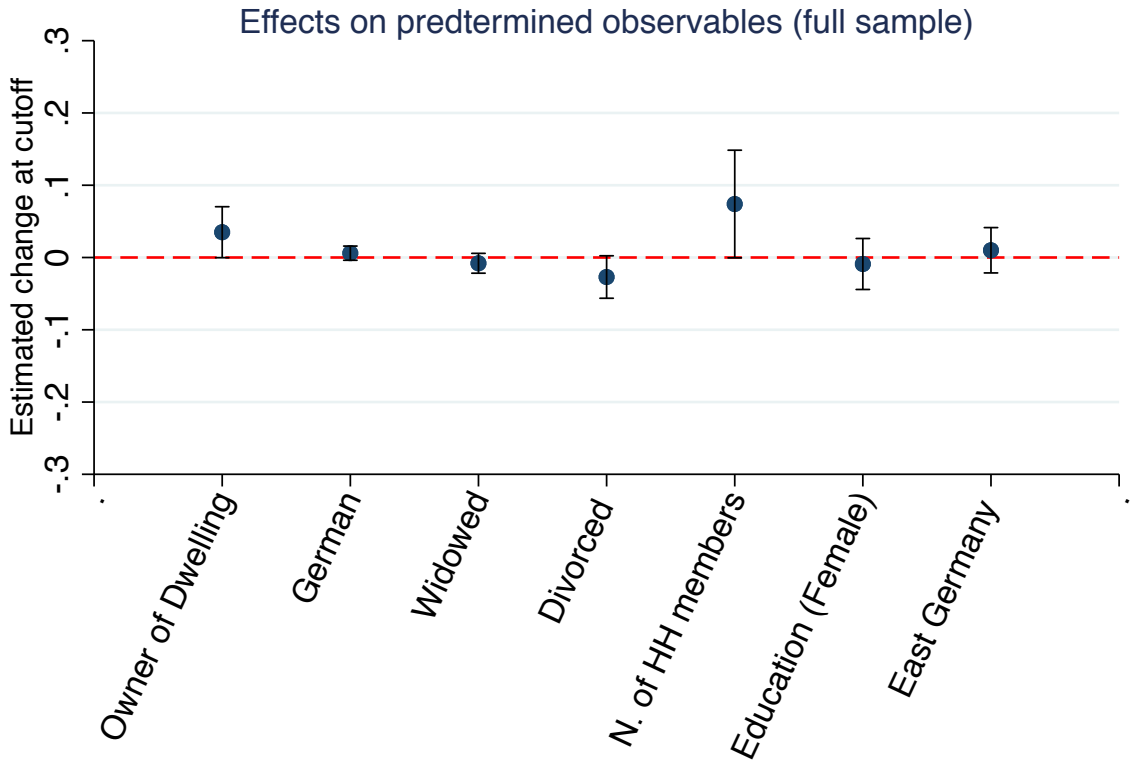
Tables and Figures

Figure 1: Earliest possible claim age for women as a function of birth cohort

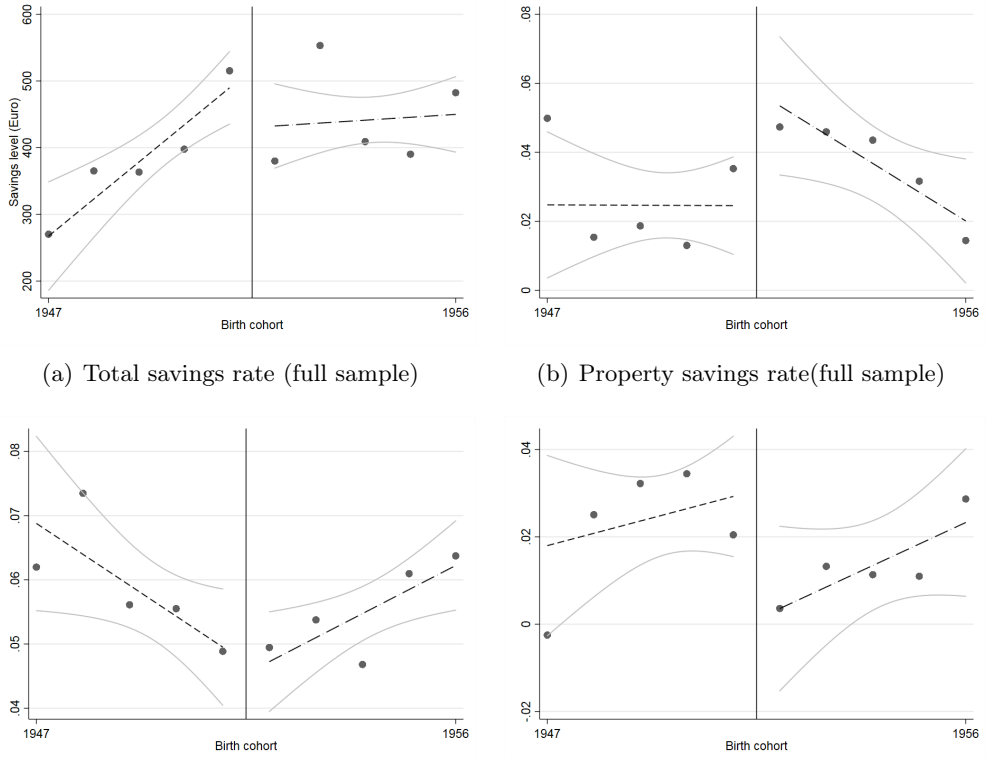
Notes: Note: Figure 1 plots the earliest possible claim age for women as a function of birth cohorts.
Source: Authors' own construction according to SGB VI.

Figure 2: Smoothness of the predetermined covariates



Notes: Figure 2 plots the estimated change in predetermined covariates at the RD cutoff.

Figure 3: Savings rate as a function of birth cohort



(a) Total savings rate (full sample)

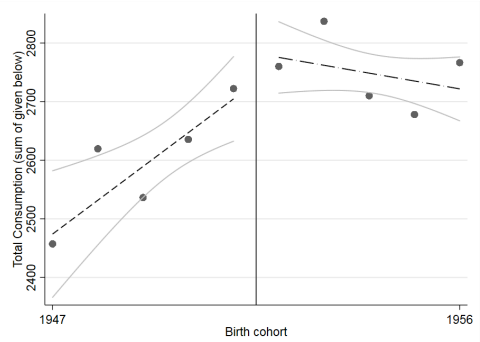
(b) Property savings rate(full sample)

(c) Monetary savings rate(full sample)

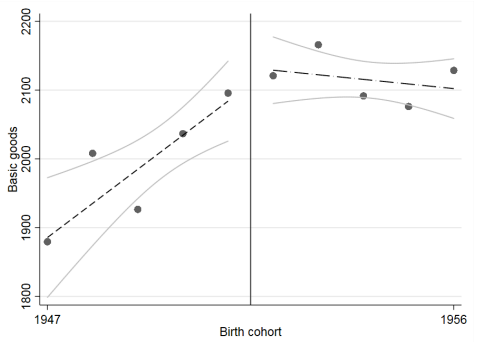
(d) Loan payments(full sample)

Notes: Figure 3 plots the binscatter plots of savings rate by birth cohorts after subtracting an age trend, household composition and a constant term.

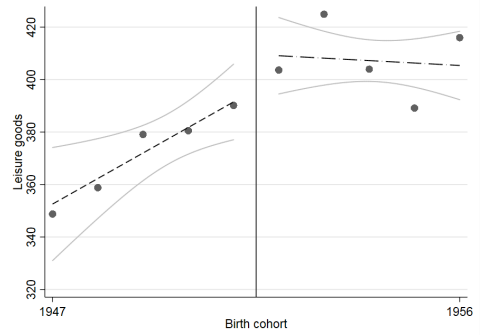
Figure 4: Consumption level as a function of birth cohort



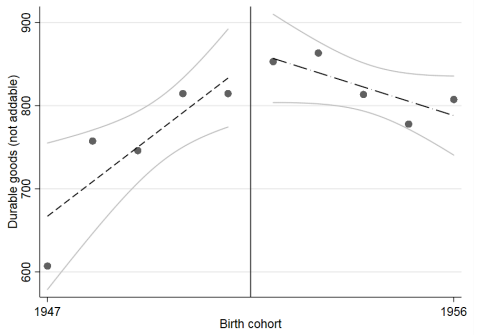
(a) Total consumption (full sample)



(b) Basic goods (full sample)



(c) Leisure goods (full sample)



(d) Durable goods (full sample)

Notes: Figure 4 plots the binscatter plots of consumptions by birth cohorts after subtracting an age trend, household composition and a constant term.

Table 1: Summary Statistics

	(1) Married		(2) Single		(3) Full sample	
	Mean	s.d.	Mean	s.d.	Mean	s.d.
A. Monthly Savings						
Savings level (Euro)	700.27	925.92	15.71	771.46	699.85	925.96
Overall savings rate	0.14	0.15	0.05	0.20	0.14	0.15
Share of monetary assets	0.43	12.11	1.01	0.69	0.43	12.11
- Share of monetary assets- bank accounts etc.	0.25	17.78	0.85	0.62	0.25	17.78
- Share of monetary assets- financial vehicles	0.18	11.51	0.14	0.52	0.18	11.50
Share of property assets	0.22	9.31	0.17	0.41	0.22	9.31
Share of loan payback	0.35	11.27	-0.19	0.49	0.35	11.26
B. Monthly Consumption/Expenditure						
Total Consumption (sum of given below)	3524.07	1687.74	3586.77	2923.95	3524.11	1688.51
Basic goods	2608.47	1290.77	2934.63	2549.68	2608.67	1291.68
Leisure goods	567.64	462.49	366.90	284.86	567.52	462.42
Durable goods (not addable)	1069.27	1507.56	1743.29	2647.60	1069.68	1508.37
Share basic goods	0.75	0.11	0.80	0.09	0.75	0.11
Share leisure goods	0.09	0.07	0.06	0.04	0.09	0.07
Share insurance consumption	0.16	0.09	0.14	0.12	0.16	0.09
C. Monthly Labor Incomes						
Labor Income (Female)	1373.19	1477.37	1505.91	1476.19	1373.27	1477.30
Labor Income (Male partner)	2672.90	2030.21	180.24	441.49	2671.38	2030.54
Household Income	4046.08	2515.19	1686.14	1541.52	4044.65	2515.34
D. Characteristics						
Age (Female)	50.85	3.81	51.00	4.56	50.85	3.81
Age wife - age husband (years)	1.45	2.46	2.33	4.97	1.45	2.46
N. of HH members	2.91	1.00	2.17	0.41	2.91	1.00
Married	0.97	0.18	0.00	0.00	0.97	0.18
Single	0.00	0.00	1.00	0.00	0.00	0.02
Education (Female)	0.38	0.49	0.67	0.52	0.38	0.49
German	0.98	0.13	1.00	0.00	0.98	0.13
East Germany	0.25	0.43	0.33	0.52	0.25	0.43
Owner of Dwelling	0.79	0.41	0.33	0.52	0.79	0.41
Observations	8,887	8,887	4,949	4,949	12,162	12,162

Note: EVS waves 1998-2013, Household with women age 45 - 59. Standard errors are in parentheses. Education stands for the percentage of having at least a colleague degree.

Table 2: RD Assumptions —the Impact on predetermined covariates

Predetermined variables	Owner of Dwelling (1)	German (2)	Widowed (3)	Divorced (4)	N. of HH members (5)	Education (Female) (6)	East Germany (7)
Full Sample Treated	0.035†	0.006	-0.008	-0.027†	0.074†	-0.009	0.010
	(0.018)	(0.005)	(0.007)	(0.015)	(0.038)	(0.018)	(0.016)
	[-0.001; 0.070]	[-0.004; 0.015]	[-0.022; 0.005]	[-0.056; 0.001]	[-0.000; 0.149]	[-0.043; 0.026]	[-0.021; 0.040]
Observations	12,300						
R-squared	0.013	0.001	0.023	0.034	0.186	0.001	0.003
Mean	0.652	0.983	0.0444	0.220	2.308	0.435	0.265
St.Dev.	0.516	0.127	0.206	0.414	1.158	0.496	0.441
Single Households							
Treated	0.010	0.004	-0.011	0.029	0.024	-0.005	0.010
	(0.030)	(0.008)	(0.017)	(0.028)	(0.041)	(0.028)	(0.024)
	[-0.049; 0.068]	[-0.012; 0.019]	[-0.045; 0.022]	[-0.027; 0.084]	[-0.058; 0.105]	[-0.060; 0.051]	[-0.038; 0.057]
Observations	4,949						
R-squared	0.002	0.001	0.014	0.001	0.112	0.004	0.001
Mean	0.431	0.981	0.110	0.537	1.435	0.470	0.237
St.Dev.	(0.523)	(0.137)	(0.313)	(0.499)	(0.740)	(0.499)	(0.426)
Couple Households							
Treated	0.002	0.003	-	-0.003	-0.067†	-0.009	0.010
	0.018	0.006	-	0.003	0.038	0.020	0.018
	[-0.032; 0.037]	[-0.008; 0.014]	-	[-0.009; 0.003]	[-0.141; 0.007]	[-0.048; 0.030]	[-0.025; 0.045]
Observations	8,685						
R-squared	0.003	0.002	-	0.000	0.184	0.001	0.007
Mean	0.808	0.985	-	0.0059	2.893	0.403	0.273
St.Dev.	0.442	0.123	-	0.0772	1.008	0.491	0.445

Note: EVS waves 1998-2013, Household with women age 45 - 59. Standard errors in parentheses*** p<0.01, ** p<0.01, * p<0.05, † p<0.1. Standard errors are in parentheses and 95%-Confidence interval are in brackets. The estimated results are from linear specification.

Table 3: The Impact of a Shift of the ERA on the Expected Retirement Age

Variables	Expected Retirement Age							
Bandwidth	24 months		36 months		48 months		60 months	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treated	0.415	0.517	0.502	0.563	0.591*	0.599*	0.696**	0.697**
	(0.353)	(0.348)	(0.287)	(0.288)	(0.251)	(0.261)	(0.225)	(0.237)
Birth cohort	-0.00361	0.00155	-0.0117	-0.00338	0.00120	0.0101	-0.00453	0.00393
	(0.0186)	(0.0191)	(0.0104)	(0.0107)	(0.00759)	(0.00777)	(0.00576)	(0.00591)
Birth cohort × Treated	0.0375	0.0240	0.0419**	0.0264	0.0133	-0.0000237	0.0180**	0.00643
	(0.0243)	(0.0242)	(0.0136)	(0.0138)	(0.00948)	(0.00979)	(0.00693)	(0.00706)
Age		1.722		1.658		1.706		1.888*
		(1.720)		(1.385)		(1.212)		(0.955)
Age^2		-0.0145		-0.0139		-0.0142		-0.0159
		(0.0156)		(0.0126)		(0.0110)		(0.00866)
Observations	602	602	866	866	1157	1157	1387	1387
R-squared	0.049	0.077	0.058	0.091	0.056	0.095	0.061	0.102

Note: Table2 shows the impact of the reform on expected retirement age using the SHARE wave 1, 2, 4, 5, 6. We drop individuals older than age 60 at the survey and only look at women in Germany. Standard errors in parentheses ***p<0.001,**p<0.01, * p<0.05. The estimated results are from linear specification.

Table 4: The Impact of Shift of ERA on Monthly Savings Rate

Variables	(1) Total savings rate	(2) Property savings	(3) Monetary savings	(4) Loan payments	(5) Savings level (Euro)
Treated	-0.010†	0.036	-0.023*	-0.024	-72.417
	(0.006)	(0.023)	(0.009)	(0.023)	(71.226)
Age	-0.003**	-0.000	-0.002**	-0.000	10.986*
	(0.000)	(0.001)	(0.001)	(0.001)	(4.461)
Birth cohort	-0.003	0.008	-0.011†	0.001	10.028
	(0.002)	(0.008)	(0.006)	(0.006)	(15.275)
Birth cohort × Treated	0.003	-0.017†	0.018**	0.002	0.168
	(0.002)	(0.010)	(0.006)	(0.008)	(22.417)
Sample Mean	0.111	0.0268	0.0613	0.0232	455.6
	(0.154)	(0.469)	(0.273)	(0.438)	(1979)
Observations	11,022	11,022	11,022	11,022	12,162
R-squared	0.051	0.001	0.005	0.003	0.022

Note: EVS waves 1998-2013, Household with women age 45 - 59. Standard errors in parentheses*** p<0.001, ** p<0.01, * p<0.05, † p<0.1. Standard errors are in parentheses and 95%-Confidence interval are in brackets.

Table 5: The Impact of Shift of ERA on Monthly Consumption

Variables	(1) Total consumption	(2) Basic goods	(3) Leisure goods	(4) Durable goods
Treated	37.326	1.739	33.633*	49.258
	(58.051)	(49.026)	(15.516)	(57.201)
Age	-28.774**	-14.353**	-5.840**	-31.604***
	(3.663)	(3.028)	(1.255)	(3.605)
Birth cohort	-33.630†	-11.861	-8.143*	-5.052
	(18.079)	(15.289)	(4.103)	(18.362)
Birth cohort × Treated	4.306	-2.277	-0.177	-35.616
	(21.766)	(18.440)	(5.318)	(22.575)
Sample Mean	2894	2203	441	891
	(1911)	(1511)	(486)	(1700)
Observations	12,162	12,162	12,162	12,162
R-squared	0.338	0.274	0.147	0.103

Note: EVS waves 1998-2013, Household with women age 45 - 59. Standard errors in parentheses*** p<0.001, ** p<0.01, * p<0.05, † p<0.1. Standard errors are in parentheses and 95%-Confidence interval are in brackets.

Table 6: The Impact on Expected Retirement Age by Subgroups

Variables	Expected Retirement Age		
Subgroup	Married	Single	p-value
Treated	0.585*	1.102*	0.4652
	(0.263)	(0.523)	
Observations	1144	243	
R-squared	0.108	0.093	
Subgroup	High individual Income	Low individual income	p-value
Treated	1.324**	0.490	0.0763
	(0.454)	(0.394)	
Observations	341	500	
R-squared	0.117	0.123	
Subgroup	High Household income	Low Household income	p-value
Treated	0.700**	0.627	0.29
	(0.254)	(0.655)	
Observations	1095	292	
R-squared	0.096	0.089	

Note: SHARE wave 1, 2, 4, 5, 6. We drop individuals older than age 60 at the survey and only look at Germany and women. Standard errors in parentheses ***p<0.001,**p<0.01, * p<0.05. The estimated results are from linear specification. Bandwidth of 60 months around 1952 is used in the specification. We control for age, age squared, household size and allow differential linear trend before and after the cohort cut-off. The bandwidth is 60 months (5 years around the cutoff).

Table 7: Heterogeneous Impacts on Savings

Variables	(1) Total savings rate	(2) Property savings	(3) Monetary savings	(4) Loan payments	(5) Savings level (Euro)
Full sample	-0.010†	0.036	-0.023*	-0.024	-72.417
	(0.006)	(0.023)	(0.009)	(0.023)	(71.226)
Observations	11,022	11,022	11,022	11,022	12,162
Single households	-0.008	0.096†	-0.033*	-0.071	-70.278
	(0.009)	(0.053)	(0.015)	(0.054)	(67.56)
Observations	4,529	4,529	4,529	4,529	4,949
Married household	-0.013*	-0.019	-0.009	0.014	-117.120
	(0.007)	(0.019)	(0.012)	(0.017)	(92.391)
Observations	7,819	7,819	7,819	7,819	8,685
West Germany	-0.010	0.026	-0.024*	-0.012	-115.030
	(0.007)	(0.020)	(0.010)	(0.020)	(92.232)
Observations	8,123	8,123	8,123	8,123	8,941
East Germany	-0.011	0.061	-0.018	-0.054	42.573
	(0.011)	(0.061)	(0.017)	(0.060)	(83.463)
Observations	2,899	2,899	2,899	2,899	3,221
High Education	-0.016†	0.038	-0.043**	-0.011	-168.612
	(0.009)	(0.033)	(0.016)	(0.033)	(121.723)
Observations	4,747	4,747	4,747	4,747	5,302
Low Education	-0.006	0.034	-0.007	-0.033	0.660
	(0.007)	(0.032)	(0.010)	(0.031)	(84.714)
Observations	6,275	6,275	6,275	6,275	6,860
High Household Wealth	-0.009	0.023	-0.027†	-0.00	-94.339
	(0.009)	(0.016)	(0.015)	(0.016)	(127.572)
Observations	5,479	5,479	5,479	5,479	6,205
Low Household Wealth	-0.011	0.051	-0.015	-0.047	-47.765
	(0.007)	(0.042)	(0.009)	(0.042)	(52.802)
Observations	5,543	5,543	5,543	5,543	5,957
High Income (Female)	-0.012	0.063	-0.020	-0.055	-8.893
	(0.008)	(0.041)	(0.013)	(0.040)	(102.493)
Observations	5,657	5,657	5,657	5,657	6,228
Low Income (Female)	-0.006	0.010	-0.024*	0.007	-127.742
	(0.008)	(0.023)	(0.012)	(0.023)	(98.002)
Observations	5,365	5,365	5,365	5,365	5,934

Note: EVS waves 1998-2013, Household with women age 45 - 59. Standard errors in parentheses*** p<0.001, **p<0.01, * p<0.05, † p<0.1. Standard errors are in parentheses and 95%-Confidence interval are in brackets.

Table 8: Heterogeneous Impacts on Consumptions

Outcomes	(1) Total consumption	(2) Basic goods	(3) Leisure goods	(4) Durable goods
Full sample	37.326	1.739	33.633*	49.258
	(58.051)	(49.026)	(15.516)	(57.201)
Observations	12,162	12,162	12,162	12,162
Single households	-31.556	-33.129	4.380	91.449
	(64.979)	(55.803)	(15.644)	(68.752)
Observations	4,949	4,949	4,949	4,949
Married households	69.677	17.837	46.186*	1.207
	(75.969)	(64.539)	(20.135)	(73.464)
Observations	8,685	8,685	8,685	8,685
West Germany	96.497	40.574	56.118**	118.411†
	(71.173)	(59.756)	(19.550)	(70.442)
Observations	8,941	8,941	8,941	8,941
East Germany	-135.374	-107.277	-31.651	-142.853
	(94.285)	(82.387)	(21.874)	(89.594)
Observations	3,221	3,221	3,221	3,221
High Education	130.602	87.681	46.403*	140.655
	(88.647)	(73.980)	(22.645)	(90.922)
Observations	5,320	5,320	5,320	5,320
Low Education	-36.056	-65.678	24.282	-21.444
	(76.820)	(65.429)	(21.275)	(73.23)
Observations	6,860	6,860	6,860	6,860
High Household Wealth	89.830	17.740	70.081**	60.679
	(96.150)	(81.109)	(26.224)	(98.950)
Observations	6,205	6,205	6,205	6,205
Low Household Wealth	-17.879	-14.363	-4.461	30.158
	(61.478)	(53.012)	(15.150)	(54.068)
Observations	5,957	5,957	5,957	5,957
High Income (Female)	58.887	12.394	32.597†	73.161
	(78.553)	(69.306)	(18.558)	(82.807)
Observations	6,228	6,228	6,228	6,228
Low Income (Female)	42.796	13.530	40.320	32.658
	(84.562)	(68.623)	(24.609)	(77.860)
Observations	5,934	5,934	5,934	5,934

Note: EVS waves 1998-2013, Household with women age 45 - 59. Standard errors in parentheses*** p<0.001, ** p<0.01, * p<0.05, † p<0.1. Standard errors are in parentheses and 95%-Confidence interval are in brackets.

Table 9: Heterogeneous Impacts on Savings

Variables	(1) Total savings rate	(2) Property savings	(3) Monetary savings	(4) Loan payments	(5) Savings level (Euro)
Full sample	-0.010†	0.036	-0.023*	-0.024	-72.417
	(0.006)	(0.023)	(0.009)	(0.023)	(71.226)
Sample mean	0.111	0.0268	0.0613	0.0232	455.6
	(0.154)	(0.469)	(0.273)	(0.438)	(1979)
Observations	11,022	11,022	11,022	11,022	12,162
Age 45-49	-0.013	0.041	-0.002	-0.051†	40.463
	(0.010)	(0.026)	(0.012)	(0.026)	(102.72)
Sample mean	0.124	-0.019	-0.009	0.014	550.5
	(0.152)	(0.019)	(0.012)	(0.017)	(2191)
Observations	4,054	4,529	4,529	4,529	4,449
Age 50-54	-0.002	0.011	-0.045**	0.033	6.739
	(0.011)	(0.039)	(0.016)	(0.039)	(109.194)
Sample mean	0.113	0.0243	0.0671	0.0214	489.1
	(0.155)	(0.495)	(0.350)	(0.390	(1864)
Observations	3,807	3,807	3,807	3,807	4,239
Age 55-59	-0.025*	0.068	-0.029	-0.064	-310.651*
	(0.012)	(0.055)	(0.018)	(0.053)	(153.988)
Sample mean	0.0933	0.0273	0.0433	0.0227	293.8
	(0.156)	(0.545)	(0.267)	(0.547)	(1813)
Observations	3,161	3,161	3,161	3,161	3,474

Note: EVS waves 1998-2013, Household with women age 45 - 59. Standard errors in parentheses*** p<0.001, ** p<0.01, * p<0.05, †p<0.1. Standard errors are in parentheses and 95%-Confidence interval are in brackets.

Table 10: Heterogeneous Impacts on Consumptions

Outcomes	(1) Total consumption	(2) Basic goods	(3) Leisure goods	(4) Durable goods
Full sample	37.326	1.739	33.633*	49.258
	(58.051)	(49.026)	(15.516)	(57.201)
Sample mean	2894	2203	441.2	891.4
	(1911)	(1511)	(486.1)	(1700)
Observations	12,162	12,162	12,162	12,162
Age 45-49	52.428	34.960	17.785	117.308
	(108.658)	(92.896)	(27.414)	(108.053)
Sample mean	3349	2509	525.9	1131
	(2052)	(1653)	(551.9)	(1867)
Observations	4,449	4,449	4,449	4,449
Age 50-54	90.134	13.356	66.036**	128.660
	(115.828)	(100.902)	(24.827)	(115.566)
Sample mean	2865	2188	425.5	876.3
	(1910)	(1498)	(407)	(1713)
Observations	4,239	4,239	4,239	4,239
Age 55-59	51.159	-9.956	61.158	-80.143
	(94.316)	(76.210)	(37.692)	(91.166)
Sample mean	2349	1833	352.4	603.9
	(1544)	(1224)	(466.9)	(1384)
Observations	3,474	3,474	3,474	3,474

Note: EVS waves 1998-2013, Household with women age 45 - 59. Standard errors in parentheses*** p<0.001, ** p<0.01, * p<0.05, † p<0.1. Standard errors are in parentheses and 95%-Confidence interval are in brackets.

The Effect of Increasing the Early Retirement Age on Savings Behavior Before Retirement

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Online Appendix

A.1 Data Appendix

The Sample Survey of Household Income and Expenditure in Germany (Einkommens- und Verbrauchsstichprobe – EVS). is a large cross-sectional survey of about 40,000 households conducted by the German Federal Statistical Office. It takes place every five years. The latest wave of the EVS corresponds to the year 2013. Participation in the EVS is voluntary. The survey gathers information about household income, wealth and expenditures. To this aim, the EVS disposes of four different components: a traditional survey part with general information about the household, its members, the housing situation and household endowment with durable goods; a second traditional survey element focusing on wealth; thirdly, a housekeeping book where household members are asked to write down their revenues and expenditures over a three-month period; and finally an even more fine-grained booklet for a detailed recording of expenditures for food, drink and tobacco. Income and wealth, savings and expenditures are collected in great detail. The before-mentioned housekeeping book is of major importance for our analyses, since household savings are deducted from the information provided therein.

All income, consumption and savings variables are calculated in annual terms of the same year. These variables are determined by means of a household diary. The time-frame over which the diary is kept has changed over the years. Specifically, the diary used to be an annual diary until 1993 and has been switched to a quarterly one since the 1998 cross-section. For our purpose we use however only quarterly data since the wave of 1998 and converse them into monthly variables. All household characteristics are questioned at the beginning of the year and refer to the same year. We report all monetary variables in Euros and prices of 2003. To do so, we use separate CPIs for East and West Germany.

Savings and consumption The main savings variable is supplied as a constructed variable by Statistical Office. We also define three main savings categories: monetary savings (paying into bank accounts, buying a stock), property savings (buying gold, a house ect) and loan payback (paying interest ect.). Savings are then the sum of differences of these categories with their counterparts. For example, the counterpart of monetary savings is taking money from the bank, the counterpart of property savings is selling gold, the counterpart of loan payback is taking on new loans. We further divide monetary savings into a category called financial vehicles (buying a stock or bond) vs more conservative savings (putting money in a bank account). The savings rate for overall savings as well as different categories are defined as savings divided by monthly net income of the household. Savings (absolute savings as well as savings rates)variables are trimmed so that the bottom and top 1% are dropped.

As consumption is captured in much detail in the EVS we can construct several subcategories that however partly overlap. We build the category private consumption (clothes, energy, food, health expenditures, communication, expenditures for services and education as well as rent and transport), leisure expenditures (hotels and ect.) as well as expenditures for insurances. The sum

of these expenditures compose the overall expenditures variable. Taxes and other expenditures are excluded. We further construct a variable including private pension insurance expenditures. At last, we use the broad set of variables fro EVS to construct a variable including only durable consumption (buying a car, TV, home appliances ect.).

Wealth and education For heterogeneity analysis we define a variable giving an individual's educational attainment. High education is defined as anything above an apprenticeship (professional master, any kind of university degree). Further we differentiate between wealthy and non-wealthy households. For this purpose we define within each sub sample the percentiles of the wealth distribution and separate the sample in a sample having below the median wealth and one above the median. The wealth variable is constructed from a set of questions on a variety of different individual assets. Again, the actual questionnaire has changed over the years as certain asset categories have been regrouped. In all cross-sections, the wealth questions refer to the wealth position at the beginning of the same year. Wealth here is composed of property wealth, monetary wealth minus debt and capital property.

A.2 Additional Background on German Pension System

The laws implementing the pension reforms mentioned in this paper include the *Rentenreformgesetz 1992*[22], the *Wachstums- und Beschäftigungsförderungsgesetz 1996*[23], the *Rentenreformgesetz 1999*[24], and the *RV-Nachhaltigkeitsgesetz 2004*[25].

Table A2.1 below list the earliest possible retirement age via different retirement pathways. Cohorts younger than 1952 can no longer retire through the women's pension pathway and the unemployment pathway. Unless they are qualified for disability pension, the earliest possible retirement age for them is age 63 with a 9% penalty for early claiming via the pension for long-term insured. Otherwise, they can retire at the regular retirement age, which is 65 and 5 months.

Table A2.1: Impact of Pension Reform by Birth Cohort

	1948	1949	1950	1951	1952	1953	1954	1955	Reform Year
Regular retirement age	$65\frac{2}{12}$	$65\frac{3}{12}$	$65\frac{4}{12}$	$65\frac{5}{12}$	$65\frac{6}{12}$	$65\frac{7}{12}$	$65\frac{8}{12}$	$65\frac{9}{12}$	2007
Pension for women (ERA^w)	60	60	60	60	-	-	-	-	1997
Deductions at ERA^w	18%	18%	18%	18%	-	-	-	-	1992
Pension for unemployed (ERA^u)	62	63	63	63	-	-	-	-	1997
Deductions at ERA^u	10.8%	7.2%	7.2%	7.2%	-	-	-	-	1992
Pension for long-term insured (ERA^l)	63	63	63	63	63	63	63	63	
Deductions at ERA^l	7.2%	7.5%	8.4%	8.7%	9.0%	9.3%	9.6%	9.9%	1992
Pension for severely disabled (ERA^d)	60	60	60	60	$60\frac{6}{12}$	$60\frac{7}{12}$	$60\frac{8}{12}$	$60\frac{9}{12}$	2007
Deductions at ERA^d	10.8%	10.8%	10.8%	10.8%	10.8%	10.8%	10.8%	10.8%	1996

Note: Own calculation according to the SBG VI.

[22] Abbr. as RRG 1992, http://pdok.bundestag.de/extrakt/ba/WP11/1183/118320.html
[23] Abbr. as WFG 1996, http://pdok.bundestag.de/extrakt/ba/WP13/629/62941.html
[24] Abbr. as RRG 1999, http://pdok.bundestag.de/extrakt/ba/WP13/656/65676.html
[25] http://pdok.bundestag.de/extrakt/ba/WP15/380/38047.html

A.3 Placebo and Robustness Tests

Using placebo cohorts as cutoffs - 1951 and 1953

We test the impacts by using placebo cut-offs at 1951 cohort and 1953 cohort.

Table A1: The impact on savings using actual and placebo cutoffs , full sample

Outcomes	Savings level (Euro)			Savings rate		
	(1)	(2)	(3)	(4)	(5)	(6)
Placebo cutoffs cohort	1951	1952	1953	1951	1952	1953
Treated	58.195	-72.417	-39.903	-0.007	-0.010†	0.003
	(59.938)	(71.226)	(69.425)	(0.005)	(0.006)	(0.005)
	[-59.290; 175.681]	[-212.031; 67.197]	[-175.983; 96.176]	[-0.017; 0.003]	[-0.021; 0.001]	[-0.006; 0.013]
Observations	14,382	12,162	16,475	12,992	11,022	14,928
R-squared	0.024	0.022	0.022	0.045	0.051	0.048
Mean	505.3	455.6	502.1	0.117	0.111	0.116
	(2001)	(1979)	(2008)	(0.156)	(0.154)	(0.154)

Note: EVS waves 1998-2013, Household with women age 45 - 59. Standard errors in parentheses*** p<0.001, ** p<0.01, * p<0.05, † p<0.1. Standard errors are in parentheses and 95%-Confidence interval are in brackets.

Robustness test: quadratic specification

We test the the robustness of the RD estimates by varying the polynomial order and bandwidth.

Table A2: The Impact on savings using quadratic specification

Outcomes	(1) Total savings rate	(2) Property savings	(3) Monetary savings	(4) Loan payments	(5) Savings level (Euro)
Full sample					
Treated	-0.015†	0.070†	-0.027*	-0.058	-49.524
	(0.008)	(0.038)	(0.012)	(0.038)	(96.264)
	[-0.031; 0.001]	[-0.005; 0.144]	[-0.050; -0.004]	[-0.132; 0.016]	[-238.216; 139.169]
Observations	11,022	11,022	11,022	11,022	12,162
R-squared	0.050	0.001	0.005	0.003	0.025
Mean	0.111	0.0268	0.0613	0.0232	455.6
St.Dev.	(0.154)	(0.469)	(0.273)	(0.438)	(1979)
Single household					
Treated	-0.029*	0.147†	-0.055**	-0.121	-81.559
	(0.012)	(0.087)	(0.017)	(0.087)	(80.650)
	[-0.052; -0.006]	[-0.023; 0.317]	[-0.088; -0.023]	[-0.291; 0.049]	[-239.668; 76.550]
Observations	4,529	4,529	4,529	4,529	4,529
R-squared	0.038	0.003	0.005	0.004	0.020
Mean	0.0821	0.0234	0.0482	0.0105	202.1
St.Dev.	(0.150)	(0.598)	(0.332)	(0.553)	(1157)
Married household					
Treated	-0.007	-0.005	-0.000	-0.001	-71.195
	(0.009)	(0.022)	(0.018)	(0.016)	(140.647)
	[-0.025; 0.011]	[-0.048; 0.038]	[-0.035; 0.034]	[-0.032; 0.029]	[-346.897; 204.506]
Observations	7,819	7,819	7,819	7,819	8,685
R-squared	0.022	0.001	0.002	0.002	0.012
Mean	0.129	0.0311	0.0693	0.0323	626.7
St.Dev.	(0.156)	(0.364)	(0.260)	(0.323)	(2290)

Note: EVS waves 1998-2013, Household with women age 45 - 59. Standard errors in parentheses*** p<0.01, ** p<0.05, * p<0.1. Standard errors are in parentheses and 95%-Confidence interval are in brackets. The estimated results are from quadratic specification.

Table A3: The Impact on consumption using quadratic specification

Outcomes	(1) Total consumption	(2) Basic goods	(3) Leisure goods	(4) Durable goods
Full sample				
Treated	-49.550	-36.728	14.026	17.189
	(79.670)	(66.334)	(21.131)	(76.216)
95% CI	[-205.716; 106.616]	[-166.753; 93.298]	[-27.395; 55.446]	[-132.206; 166.584]
Observations	12,162	12,162	12,162	12,162
R-squared	0.338	0.274	0.147	0.103
Mean	2894	2203	441.2	891.4
St.Dev.	(1911)	(1511)	(486.1)	(1700)
Single household				
Treated	-101.560	-47.495	-34.453*	103.664
	(87.816)	(77.006)	(17.513)	(91.533)
95% CI	[-273.718; 70.597]	[-198.462; 103.472]	[-68.786; -0.119]	[-75.781; 283.108]
Observations	4,949	4,949	4,949	4,949
R-squared	0.259	0.217	0.107	0.086
Mean	1900	1496	272.2	447
St.Dev.	(1252)	(1021)	(316.9)	(1152)
Married household				
Treated	9.232	-24.366	49.907†	-53.637
	(105.777)	(90.053)	(29.447)	(103.860)
	[-198.116; 216.580]	[-200.891; 152.159]	[-7.815; 107.630]	[-257.227; 149.952]
Observations	8,685	8,685	8,685	8,685
R-squared	0.176	0.126	0.073	0.052
Mean	3587	2698	556.8	1198
St.Dev.	(1999)	(1621)	(535.3)	(1928)

Note: EVS waves 1998-2013, Household with women age 45 - 59. Standard errors in parentheses*** p<0.001, ** p<0.01, * p<0.05, † p<0.1. Standard errors are in parentheses and 95%-Confidence interval are in brackets. The estimated results are from quadratic specification.

Robustness test: different sample specifications

We test the the robustness of the RD estimates by using different sample specifications.

Table A5: The Impact on savings using different sample specifications

Outcomes	Total saving rate				Property saving				Monetary saving				Loan payment			
	Baseline	Widen Sample Age	Drop Widows	Relax Partner's Cohort	Baseline	Widen Sample Age	Drop Widows	Relax Partner's Cohort	Baseline	Widen Sample Age	Drop Widows	Relax Partner's Cohort	Baseline	Widen Sample Age	Drop Widows	Relax Partner's Cohort
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Full sample																
Treated	-0.010†	-0.011*	-0.012*	-0.010*	0.036	0.020	0.022	0.020	-0.023*	-0.014†	-0.015†	-0.014†	-0.024	-0.016	-0.019	-0.016
	(0.006)	(0.005)	(0.006)	(0.005)	(0.023)	(0.019)	(0.019)	(0.019)	(0.009)	(0.008)	(0.009)	(0.008)	(0.023)	(0.018)	(0.019)	(0.018)
Observations	11,022	13,488	10,545	14,023	11,022	14,023	10,545	14,023	11,022	14,023	10,545	14,023	11,022	14,023	10,545	14,023
R-squared	0.050	0.050	0.051	0.050	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.003	0.003	0.002	0.002	0.002
Mean	0.111	0.115	0.113	0.117	0.0268	0.0328	0.0311	0.0310	0.0613	0.0614	0.0640	0.0632	0.0232	0.0258	0.0236	0.0233
St.Dev.	(0.154)	(0.154)	(0.154)	(0.155)	(0.469)	(0.484)	(0.518)	(0.511)	(0.273)	(0.273)	(0.285)	(0.282)	(0.438)	(0.444)	(0.471)	(0.466)
Single households																
Treated	-0.008	-0.008	-0.013	-0.008	0.096†	0.087†	0.109†	0.096†	-0.033*	-0.027†	-0.036*	-0.033*	-0.071	-0.068	-0.087	-0.071
	(0.009)	(0.009)	(0.009)	(0.009)	(0.053)	(0.050)	(0.053)	(0.058)	(0.015)	(0.015)	(0.017)	(0.015)	(0.054)	(0.051)	(0.058)	(0.054)
Observations	4,529	5,133	4,052	4,529	4,529	5,133	4,052	4,529	4,529	5,133	4,052	4,529	4,529	5,133	4,052	4,529
R-squared	0.037	0.036	0.040	0.037	0.003	0.002	0.003	0.002	0.005	0.004	0.005	0.005	0.004	0.003	0.004	0.003
Mean	0.0821	0.0828	0.0821	0.0821	0.0234	0.0249	0.0228	0.0234	0.0482	0.0461	0.0491	0.0482	0.0105	0.0118	0.0101	0.0105
St.Dev.	(0.150)	(0.149)	(0.150)	(0.150)	(0.598)	(0.586)	(0.626)	(0.598)	(0.332)	(0.326)	(0.346)	(0.332)	(0.553)	(0.542)	(0.579)	(0.553)
Married households																
Treated	-0.013*	-0.013*	-0.013*	-0.008	-0.019	-0.015	-0.019	-0.013	-0.009	-0.005	-0.009	-0.004	0.014	0.006	0.014	0.009
	(0.007)	(0.006)	(0.007)	(0.006)	(0.019)	(0.019)	(0.019)	(0.016)	(0.012)	(0.012)	(0.012)	(0.010)	(0.017)	(0.017)	(0.017)	(0.014)
Observations	7,819	9,818	7,819	10,414	7,819	9,818	7,819	10,414	7,819	9,818	7,819	10,414	7,819	9,818	7,819	10,414
R-squared	0.026	0.021	0.021	0.020	0.001	0.001	0.001	0.001	0.002	0.001	0.002	0.001	0.003	0.002	0.003	0.002
Mean	0.129	0.135	0.133	0.134	0.0311	0.0353	0.0311	0.0344	0.0693	0.0665	0.0693	0.0683	0.0323	0.0330	0.0323	0.0310
St.Dev.	(0.156)	(0.155)	(0.154)	(0.154)	(0.364	(0.253)	(0.364)	(0.455)	(0.260)	(0.260)	(0.260)	(0.261)	(0.323)	(0.350)	(0.323)	(0.404)

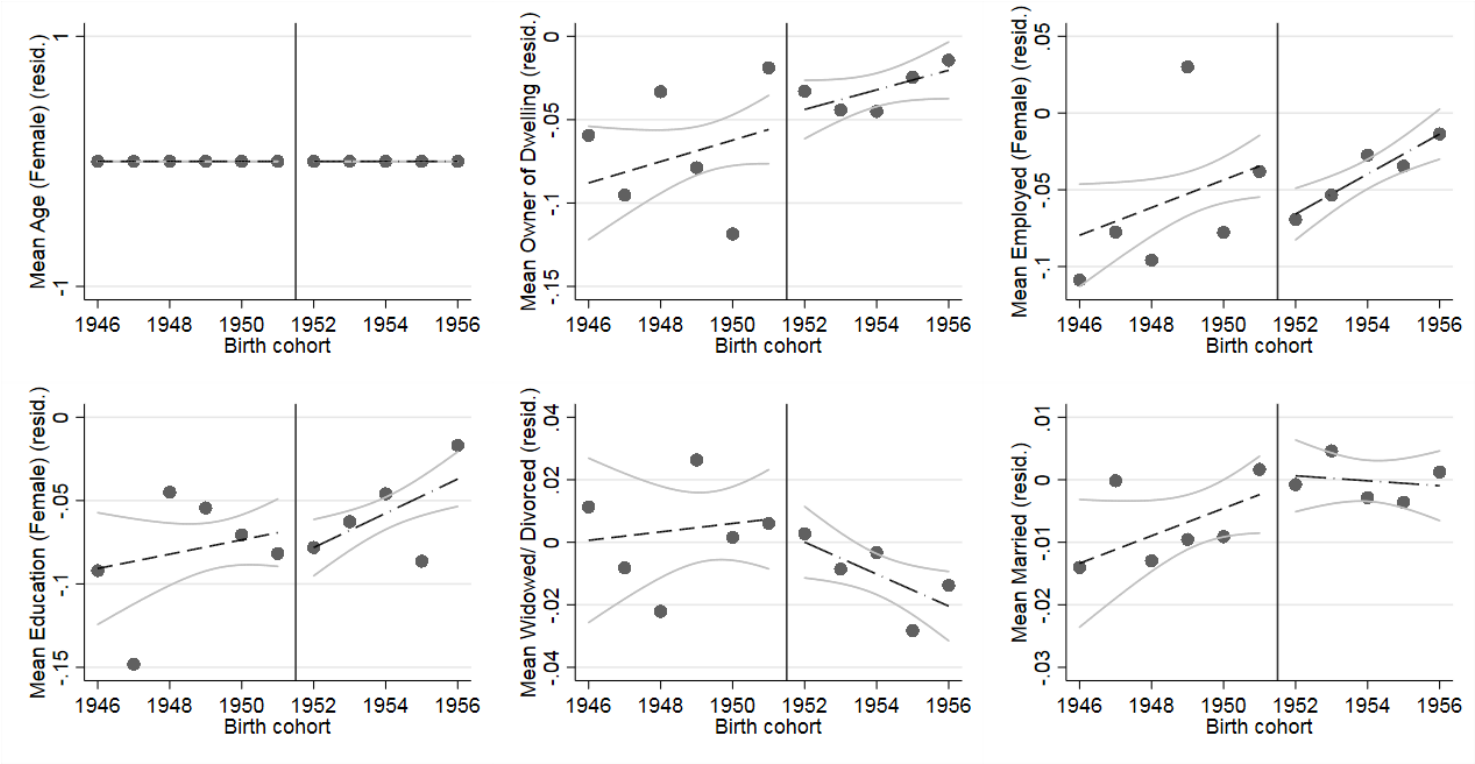
Note: EVS waves 1998-2013, Household with women age 45 - 59. Standard errors in parentheses*** p<0.001, ** p<0.01, * p<0.05, † p<0.1. Standard errors are in parentheses. The estimated results are from quadratic specification. We use three additional sample specifications to test the robustness of the results. The "widen sample" includes households with women age 40 to 59; the "drop widows" sample takes away widows from the baseline sample as we expect they are less relied on their own pension; the "relax partner's cohort" sample doesn't restrict the partners to be be born in years 1949 to 1956. The only restriction on the partners is that they are aged from 40 to 60.

Table A6: The Impact on consumptions using different sample specifications

Outcomes	Total consumption				Basic goods				Leisure goods				Durable goods			
	Baseline	Widen Sample Age	Drop Widows	Relax Partner's Cohort	Baseline	Widen Sample Age	Drop Widows	Relax Partner's Cohort	Baseline	Widen Sample Age	Drop Widows	Relax Partner's Cohort	Baseline	Widen Sample Age	Drop Widows	Relax Partner's Cohort
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Full sample																
Treated	37.326	93.810†	36.914	15.468	1.739	43.769	0.666	-9.795	33.633*	40.626**	34.371*	23.044*	49.258	48.906	49.918	3.096
	(58.051)	(56.515)	(59.904)	(51.776)	(49.026)	(47.613)	(50.606)	(43.308)	(15.516)	(15.019)	(15.980)	(13.762)	(57.201)	(56.460)	(59.134)	(50.304)
Observations	12,162	14,870	11,616	15,508	12,162	14,870	11,616	15,508	12,162	14,870	11,616	15,508	12,162	14,870	11,616	15,508
R-squared	0.338	0.328	0.334	0.312	0.274	0.263	0.272	0.244	0.147	0.151	0.143	0.147	0.103	0.103	0.103	0.095
Mean	2894	3001	2926	3076	2203	2280	2223	2330	441.2	459.8	447.7	469.4	891.4	958.3	905.8	962.1
St.Dev.	(1936)	(0.154)	(1925)	(1997)	(1511)	(1542)	(1522)	(1596)	(486.1)	(476.3)	(491.8)	(486.5)	(1700)	(1785)	(1715)	(1749)
Single households																
Treated	-31.556	2.879	-36.973	-31.556	-33.129	- 5.680	-34.997	-33.129	4.380	8.559	2.464	4.380	91.449	87.506	100.814	91.449
	(64.979)	(62.817)	(68.759)	(64.979)	(55.803)	(53.929)	(59.246)	(55.803)	(15.644)	(14.852)	(16.210)	(15.644)	(68.752)	(67.154)	(73.926)	(68.752)
Observations	4,949	5,600	4,403	4,949	4,949	5,600	4,403	4,529	4,949	5,600	4,403	4,529	4,949	5,600	4,403	4,949
R-squared	0.259	0.256	0.244	0.259	0.217	0.215	0.203	0.217	0.107	0.108	0.094	0.107	0.086	0.089	0.087	0.086
Mean	1900	1925	1862	1900	1496	1513	1461	1496	272.2	278.2	268.5	272.2	447	455.8	430.3	447
St.Dev.	(1252)	(1244)	(1225)	(1252)	(1021)	(1017)	(997.4)	(1021)	(316.9)	(310.3)	(317.3)	(316.9)	(1152)	(1142)	(1131)	(1152)
Married households																
Treated	69.677	121.424	69.677	46.295	-17.837	52.027	17.837	2.571	46.186*	53.388**	46.186*	35.792*	1.207	10.539	1.207	26.541
	(75.969)	(74.363)	(75.969)	(65.064)	(64.539)	(63.085)	(64.539)	(54.524)	(20.135)	(19.558)	(20.135)	(17.440)	(73.464)	(72.861)	(73.464)	(68.747)
Observations	8,685	10,883	8,685	11,588	8,685	10,883	8,685	11,588	8,685	10,883	8,685	11,588	8,685	10,883	8,685	11,588
R-squared	0.178	0.166	0.178	0.170	0.131	0.120	0.131	0.120	0.070	0.070	0.070	0.075	0.058	0.057	0.058	0.052
Mean	3587	3657	3587	3642	2698	2749	2698	2730	556.8	568.7	556.8	564.4	1198	1256	1198	1223
St.Dev.	(1999)	(1999)	(1999)	(2047)	(1621)	(1635)	(1621)	(1677))	(535.3)	(517.9)	(535.3)	(518.1)	(1928)	(2002)	(1928)	(2001)

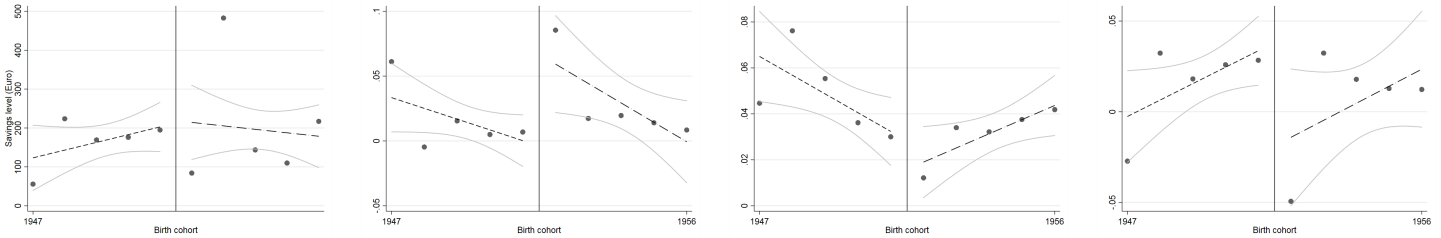
Note: EVS waves 1998-2013, Household with women age 45 - 59. Standard errors in parentheses*** p<0.001, **p<0.01, * p<0.05, †p<0.1. Standard errors are in parentheses. The estimated results are from quadratic specification. We use three additional sample specifications to test the robustness of the results. The "widen sample" includes households with women age 40 to 59; the "drop widows" sample takes away widows from the baseline sample as we expect they are less relied on their own pension; the "relax partner's cohort" sample doesn't restrict the partners to be be born in years 1949 to 1956. The only restriction on the partners is that they are aged from 40 to 60.

Figure A1: Predermined covariates as a function of birth cohort (controlled for age trend)



Notes: Figure A1 plots the binscatter plots of predertmined covariates by birth cohorts after taking away linear age trend.

Figure A2: Savings rate as a function of birth cohort by martial status

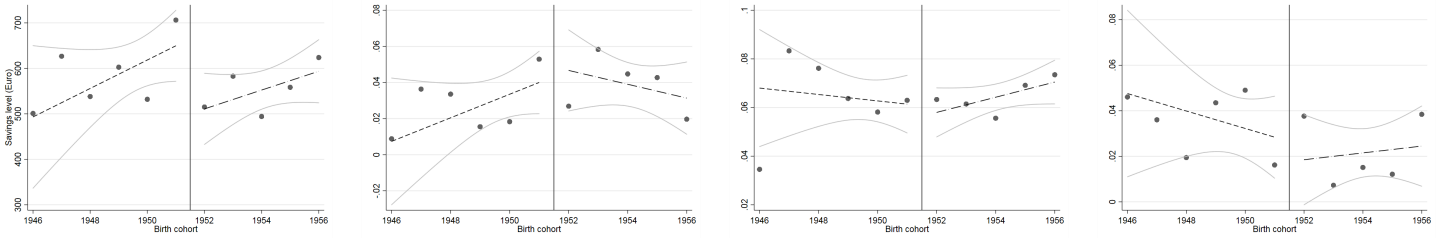


(a) Total savings rate (single household)

(b) Property savings rate (single household)

(c) Monetary savings rate(single household)

(d) Loan payments (single household)



(e) Total savings rate (couple household)

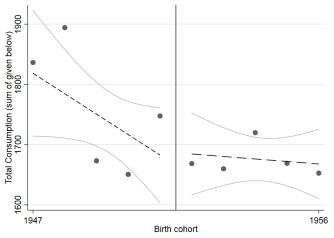
(f) Property savings rate(couple household)

(g) Monetary savings rate(couple household)

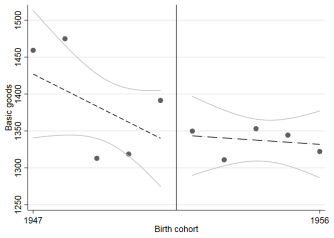
(h) Loan payments(couple household)

Notes: Figure A2 plots the binscatter plots of savings rate by birth cohorts by martial status.

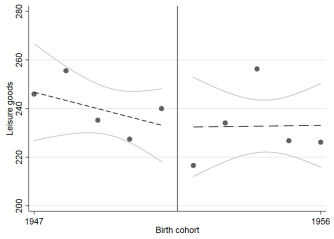
Figure A3: Consumption level as a function of birth cohort by martial status



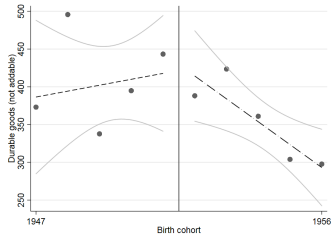
(a) Total consumption (single household)



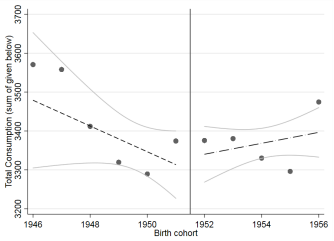
(b) Basic goods (single household)



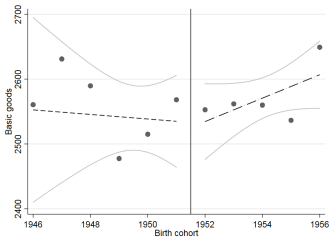
(c) Leisure goods (single household)



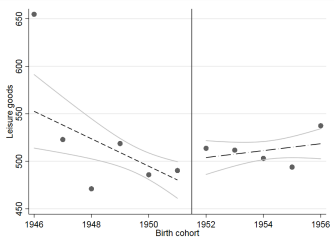
(d) Durable goods (single household)



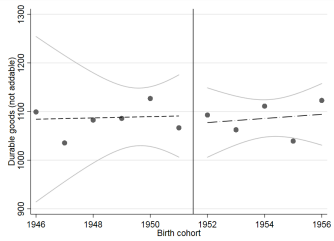
(e) Total consumption (couple household)



(f) Basic goods (couple household)



(g) Leisure goods (couple household)



(h) Durable goods (couple household)

Notes: Figure A3 plots the binscatter plots of consumptions by birth cohorts by martial status.