Live Longer and Healthier: Impact of Pension Income for Low-Income Retirees*

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Abstract

We estimate the effect of additional pension income on mortality outcomes by exploring the eligibility criteria of a German program subsidizing the pensions of low-wage workers. Using administrative data on the universe of deceased pensioners and a DID design, we find that eligibility leads to a two-month delay in age at death, with effects concentrated among men. Complementary survey evidence points to a plausible mechanism: recipients report better mental and physical health, feel less financially constrained, and are more optimistic about their future.

JEL Codes: I10, I12, J14, J26
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1 Introduction

Old-age poverty has become an important policy concern in light of diminishing public pension generosity and increased longevity (Sarfati, 2017; Börsch-Supan and Coile, 2018). The trend of transitioning from a defined benefit to a defined contribution pension system has left a growing number of lower-income workers vulnerable to old-age poverty (World Bank, 2025). In an effort to support pensioners with lower benefits, many governments have introduced various forms of safety nets. However, little is known about how pension income affects mortality and health[1], although this is an important indicator of the social value of old-age income support programs. Moreover, whether additional pension income can increase longevity and improve people's quality of life can help understand the persistent and widening socioeconomic disparities in old-age mortality in many developed countries (Currie and Schwandt, 2016; Wenau et al., 2019; Haan et al., 2020). Therefore, the answer to this question can have considerable policy relevance, as old-age poverty is a growing and pervasive problem around the world.

This question remains understudied, in part due to the difficulty of isolating exogenous variations in the parameters of the public pension system, such as pension benefits or pension eligibility age. Existing papers on the mortality response to changes in pension systems mostly focus on reforms adjusting the pension eligibility age (see, e.g., Hernaes et al. (2013); Shai (2018); Belles et al. (2022)) or bundling changes in parameters (see, e.g., Saporta-Eksten et al. (2021); Bozio et al. (2021)).

In this paper, we investigate how a permanent increase in pension income affects mortality and health of low-income pensioners in the context of a German pension subsidy program. Several features of the program make it an ideal natural experiment. First, the subsidy amount is exogenous. It is determined from contributions made before the program's announcement in 1992. Second, individuals are eligible for the subsidy only if they fulfill two conditions at retirement: at least 35 years of contribution to the pension system and average earnings points accrued during working periods below a certain threshold.[2] As pension income is a function of average earnings points at retirement, the second condition identifies retirees with lower benefits, facing a higher risk of old-age poverty. These two eligibility criteria allow us to estimate the causal impact of additional pension income. Third, the reform introducing this subsidy does not affect other pension system parameters, such as the statutory retirement age. This enables us to isolate the causal effect of additional pension income from that of other characteristics of pension systems. Fourth, as Germany

[1]There is a small but growing literature studies the labor supply responses to the generosity of public pension (e.g., Stock and Wise (1990); Krueger and Pischke (1992); Snyder and Evans (2006); Gelber et al. (2017); Ye (2022)).
[2]Earnings points are closely related to earnings relative to the national average.

has universal health care, the implications of a change in pension income are not tied to access to (subsidized) health care, as, for instance, in the U.S. (Ayyagari, 2019). This feature allows us to decouple the effect of additional income on mortality from the effect of losing access to health care. Fifth, enrollment in the program is automatic, as the subsidy is added directly to pension benefits without any application process. This ensures that the subsidy reaches all eligible retirees, including those who might not have enrolled due to incomplete information or transaction costs (Bertrand et al., 2004; Finkelstein and Notowidigdo, 2019).

Our analysis is based on novel administrative data covering the universe of German pensioners who died between 1992 and 2024. The baseline sample consists of West German old-age pensioners who were born between 1934 and 1944. Using a difference-in-differences (DID) method, we find that eligibility for the pension subsidy increases pension income by 55€/month (around an 8% increase).[3] After establishing a sizable impact on pension income, we turn to the impact on mortality. We find that eligibility for the pension subsidy improves age at death by 2.4 months (around a 0.25% increase). Specifically, eligibility reduces the probability of dying before age 65, 70, 75, and 80 by 0.8 (20.5%), 1.5 (8.5%), 1.4 (3.9%), and 1 (1.7%) percentage points, respectively. These estimates imply intent-to-treat pension income - mortality elasticities of -2.56, -1.06, -0.49, and -0.21, respectively. On average, we find no significant effects on the age at claiming pension.

The estimates are robust to several tests that vary the sample restrictions and the set of controls. Moreover, we verify that there are no mortality effects when using placebo eligibility conditions in ineligible samples. We also rule out potential selection into treatments by investigating the densities around the eligibility cutoffs and by documenting the absence of pre-trends via event-study estimates.

Heterogeneity analysis indicates that mortality responses are driven by men, despite the fact that they receive a smaller subsidy on average. We gather a few empirical findings that help explain gender differences, supporting the conclusion that eligibility conditions might not identify truly poor women. Additional heterogeneity analysis reveals that childless women, who are more likely to rely on their own pension income, experience mortality gains similar to those of men. Moreover, we find that improvement in life expectancy is larger for people eligible for larger subsidies. In line with this explanation, we find evidence that women relying more heavily on their own pension income experience improvements over a range of health and well-being measures.

To better quantify and scale the effects and compare with the health outcomes below, we also report the impact of pension income on mortality by employing an instrumental variable approach.

[3] All monetary values are CPI adjusted and expressed in 2015 euros.

In particular, we use the two eligibility criteria as instruments for the pension income. We find that a permanent increase in monthly pension income of 100€ (about a 14% increase) increases the age at death by around 4.5 months.

Do people also live healthier with more pension income? To answer this question, we examine the responses in health outcomes using the SHARE-RV dataset, which links information from the *Survey on Health and Retirement in Europe* with active pension records from the *German Pension Register*. The survey sample contains a similar population of pensioners to the administrative sample. However, it is worth noting that the questions were asked when they were alive. Our analysis indicates that increases in pension income improve both mental and physical health. For example, additional pension income leads to improvements in self-reported health, reductions in the number of chronic diseases, and functional limitations. Optimism and perceived financial constraints appear to be relevant drivers of improved mental health. Additionally, we document an increase in physical activities, a reduction in alcohol consumption, and a decrease in the use of healthcare services (i.e. hospital, doctor visits, and professional home care), consistent with the overall improvement in health. Again, we find stronger effects for men than for women. We show that poorer men, proxied by lack of home ownership or higher share pension income over household income, are more affected by the additional pension income. They show stronger improvement in health and well-being, and additionally an increase in the monetary amount spent on food.

Overall, our findings suggest that the pension subsidy for low-income workers in Germany had beneficial effects on both life expectancy and health. In particular, male recipients live longer and healthier lives. We show that a stable increase in cash flow during retirement, despite being a relatively small amount, can have substantial improvements in health and life expectancy for poor retirees, even in a developed country with a universal healthcare system. Additional pension income can improve quality of life, improving both physical health and mental burden, reducing financial constraints, and ultimately decrease mortality.

Furthermore, the cost-benefit analysis suggests this policy is cost-effective. The net monetary benefits of the program are 489,550€per male recipient. A simple back-of-the-envelope calculation suggests that implementing a similar subsidy long-term would help to flatten the income-mortality gradient and reduce the gap in life expectancy at age 65 between the top and bottom income deciles in Germany by around 11%.

We contribute to the relatively small but growing literature on the causal impact of pension income on mortality. Most of the evidence is for developing countries (Case, 2004; Jensen and Richter, 2004; Barham and Rowberry, 2013; Huang and Zhang, 2021; Miglino et al., 2023) by exploring either non-contributory pension programs or conditional cash transfer programs. For

example, Miglino et al. (2023) study the effect of income on mortality by exploring the eligibility condition for the non-contributory pension program in Chile. They find the basic pension increases income by 72% and reduces four-year mortality by 28%. Huang and Zhang (2021) examine the implementation of China's New Rural Pension Scheme, which targeted vulnerable elderly in rural areas. They find that the pension scheme increased the household income by 18% and resulted in a reduction in one-year mortality by 2.2 percentage points. Consistent with our findings, they find that additional pension income saves lives.

However, the implication of additional pension income in developing countries might not necessarily apply to developed countries. To the best of our knowledge, there are only two papers studying the impact of pension income on mortality and health in the context of developed countries (Snyder and Evans, 2006; Johnsen and Willén, 2022). Johnsen and Willén (2022) show that negative shocks to pension income had no impact on both employment and health care use of pensioners in Sweden. Snyder and Evans (2006) examine a cut in social security wealth for the "notch" cohort in the U.S. and find that a reduction in pension income reduces mortality in the U.S. The effects of changes in pension income on mortality are not necessarily symmetric. Johnsen and Willén (2022) and Snyder and Evans (2006) estimates may not be generalizable to policies aimed at ensuring income support for older people at risk of poverty. In fact, in contrast to their findings, we show that higher pension income leads to lower mortality. Another important distinction is the indirect employment response. Pension income differs from other types of income in that it could affect mortality directly by improving physical and mental health and indirectly by influencing retirement choices. While higher income typically improves life expectancy, it can also induce earlier retirement, thereby increasing mortality (e.g., Fitzpatrick and Moore, 2018; Kuhn et al., 2020) or decreasing mortality (e.g., Hernaes et al., 2013; Hagen, 2018; Belles et al., 2022), depending on the subpopulation affected. The employment effect may offset or amplify the wealth effect on mortality. For example, the reduced mortality due to lower pension income in Snyder and Evans (2006) is explained by the beneficial effects of employment. On the one hand, this paper aligns with Ye (2022) and shows that eligible women claim a pension earlier. However, our evidence for women does not allow us to disentangle direct effects of income on mortality from those mediated through labor supply choices. On the other hand, in the case of men, this paper finds that men do not respond by retiring earlier, which pinpoints a positive pure wealth effect of additional pension income on mortality.

Moreover, our paper links to the broader literature examining the impact of income on mortality and health of older people by examining other social insurance programs (e.g., Eli, 2015; Bailey

and Goodman-Bacon, 2015; Black et al., 2024; Gelber et al., 2023; Becker et al., 2024).[4] In particular, Gelber et al. (2023) study the impact of more generous Disability Insurance benefits on mortality for low-income DI beneficiaries, who are a vulnerable population similar as in our setting. They show that $1,000 more in annual disability insurance payment in the U.S. reduces mortality of low-income beneficiaries by 0.18 to 0.35 percentage points. Their estimates imply an elasticity of mortality with respect to disability insurance income of around -0.6 to -1.0.

Previous studies have also investigated the pure wealth effect on mortality and health by exploring financial shocks, such as lotteries (e.g., Lindahl, 2005; Cesarini et al., 2016; Lindqvist et al., 2020) and stock market fluctuations (e.g., McInerney et al., 2013; Schwandt, 2018). Our paper differs from these studies in two important aspects: the population studied and the income variation. We focus on low-income pensioners, the population most affected by recent pension reforms. In addition, we examine a permanent increase in pension benefits, which provides a steady higher income stream, as opposed to a one-off windfall or transitory income fluctuations.

The rest of the paper proceeds as follows. Section 2 explains the main elements of the German Pension System and of the subsidy program. Section 3 describes the data and Section 4 delineates the empirical strategies. Section 5 reports the DID results, IV estimates and also provides some evidence on the mechanisms driving our results. Finally, Section 7 discusses and Section 8 concludes.

2 Institutional Setting

German Public Pension System The German Public Pension System is an earnings-related points system financed on a pay-as-you-go basis.[5] Participation is mandatory, except for civil servants and the self-employed. On average, the public pension replaces around 50% of pre-retirement wage, net of income and payroll tax. As of the end of 2024, the average monthly pension benefit of the insured was around 1,405 euros for men and 955 euros for women.

The statutory retirement age for a regular old-age pension remained 65 years old for the cohorts in our baseline sample; the only prerequisite being at least five years of contributions. Several alternate pathways make retiring before 65 years of age possible.[6] For example, workers with

[4] A large literature examines the health and mortality effects of income by looking at transfer programs and social insurance such as cash transfers(e.g., Aizer et al., 2016, 2020), the Earned Income Tax Credit (e.g., Evans and Garthwaite, 2014; Dow et al., 2020), health insurance (e.g., Bitler et al., 2005; Ziebarth, 2018).

[5] The pension system is mainly financed via mandatory contribution payments, which are normally shared equally by employers and employees. In 2024, the total mandatory contribution rate was 18.6%.

[6] Starting from 2012, the statutory retirement age for cohorts born after 1947 began increasing from 65, and this will reach age 67 for cohorts born after 1964. There are four main early retirement pathways: old-age pensions for long-

at least 35 years of contributions can claim their pension at age 63 via the old-age pensions for long-term insured. Furthermore, women born before 1952 can retire from age 60 via the so-called women's old-age pension pathway. Almost all female recipients of the subsidy program born before 1952 are eligible for this pathway.[7]

Pension benefit levels are closely tied to lifetime wages. The main determinant of pension benefits is the sum of the individually accumulated earnings points (Entgeltpunkte, EP). Essentially, for each year of contributions, a worker accumulates some earnings points, which are determined by the individual wage in that year relative to the average wage of all the insured. For example, a worker whose wage is half of the average wage will accumulate 0.5 points in that year.[8] Aside from a few exceptions, workers with few contribution years or low relative wages are more likely to face old-age poverty. This is one of the reasons that the majority of the subsidy recipients are women, as they have shorter employment periods and lower wages over their life cycle. Pensioners can work while claiming their pensions; however, they face a stringent earnings test.

Pension Subsidies for Low-wage Workers The pension subsidy program studied in this paper was introduced during the German pension reform in 1992.[9] The primary policy consideration of this subsidy program is to ensure adequate old-age income, which credits additional earnings points to eligible individuals. The target recipients are workers with low lifetime pension contributions.[10]

This subsidy program ensures an adequate pension for people with two characteristics: individuals with a long pension contribution history and low wages. Specifically, individuals need to fulfill two criteria to become eligible for the subsidy. First, a worker should have at least 35 contribution years. Contribution years are a combination of full-value and reduced contribution periods. Full-value contribution periods are months during which compulsory contributions are paid according to the social security regulation, typically periods of gainful employment. Reduced contribution periods are months during which contributions are not or only partially paid. This could be, for instance, child-raising, education, unemployment, or long-term sick leave periods. These periods count towards retirement and subsidy eligibility but have a limited or no impact on the determination of pension benefits and the amount of subsidy received.[11] Second, the average

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 Börsch-Supan et al. (2004).

[7]The eligibility requirements for the women's pension pathway were: 1) at least 15-years of pension insurance contributions; and 2) at least 10 of the 15 years of pension insurance contributions need to have been acquired after age 40.

[8]See Appendix B.1 for more details on the pension benefit calculation.

[9]See Appendix B.2 for a summary of other reforms implemented in 1992.

[10]The German name of this subsidy program is "Mindestentgeltpunkte bei geringem Arbeitsentgelt". See German Social Law, vol. 6 clause 262 (SGB VI § 262) for the exact definition.

[11]See Online Appendix B.4 for more details of the composition of contribution periods.

EPs from full-value contribution years (aep) at the time of retirement are below 0.75. This criterion means that only individuals in the bottom 37.5 percentile of the income distribution at the time of retirement are eligible. It identifies workers with the lowest pension benefits and more at risk for old-age poverty. According to the statistics from the Research Data Center of the German Pension Insurance, in December 2015, 14% of old-age pensioners — 4% of all male pensioners and 26% of all female pensioners — were recipients of this subsidy program. In 2015, the total payments for this subsidy program were approximately 3 billion euros.

The amount of subsidy eligible individuals receive is a function of contribution years and the earning points accumulated before 1992. In particular, subsidy size is determined as:

$$Subsidy_i = min\left(0.5 \times \sum_{\tau<92} EP_{i\tau}, 0.75 \times T_i^{92} - \sum_{\tau<92} EP_{i\tau}\right) \quad where\ EP_{i\tau} = \frac{\omega_{i\tau}}{\overline{\omega}_\tau} \tag{1}$$

where, for each individual i and each year of contribution τ, $EP_{i\tau}$ indicates accumulated earnings points, T_i^{92} indicates years contributed before 1992, $\omega_{i\tau}$ indicates earned wage τ and $\overline{\omega}_\tau$ indicates (West or East) German average wage in τ. The formula implies the subsidy size has a kinked relationship with pre-1992 average earning points (aep^{92}), and Figure A.1 depicts this relationship in the case of an individual who contributed 19 years to the pension system prior to 1992. Monthly subsidy is linearly increasing with aep^{92} for positive values until $aep^{92} = 0.5$, and decreases linearly afterwards, until reaching 0 for $aep^{92} = 0.75$. Furthermore, given aep^{92}, subsidy size is linearly increasing in T^{92}. See Ye (2022) for more details and Appendix B.3 for examples illustrating the calculation of the subsidy amounts. The subsidy size formula implies that only individuals with $aep^{92} < 0.75$ receive a positive amount of subsidy. Hence, the program has a pre-determined expiration date, in that only individuals who started contributing before 1992 and were relatively poor in 1992 can receive a positive amount of subsidy. Furthermore, it prevents workers from manipulating the amount of subsidy they receive, and reduces incentives to manipulate aep at retirement. We discuss extensively potential margins of manipulation through labor supply choices in Section 5.3.3.

Once the subsidy size in terms of EPs is determined, this is added to the accumulated lifetime EPs of individual i, which are then used to compute pension income. The process is automatic for eligible pensioners, who do not need to apply to receive the subsidy. Pension income, inclusive of the subsidy amount, is directly credited into the recipients' accounts.

3 Data

3.1 Main Data and Sample

The analysis is based on a novel administrative dataset covering the universe of retirees who left the German public pension system between 1992 and 2024, provided by the German State Pension Fund (FDZ-RV). The dataset is a non-public version of the Discontinued Pension Records (RTWF, Rentenwegfälle), which contains the universe of individuals who were active in the German public pension system at some point in their lives (workers and pensioners) and who left the pension system (mostly due to death) at the time of data collection. The main dataset is assembled from 33 years of cross-sectional waves (1992 to 2024). It includes time-invariant information (such as cumulative pension points, gender, birth month, number of children, and age at claiming pension) at the time when individuals fall out of the pension system. We refer to this sample as the RTWF sample throughout the paper.

Several important advantages of the data are worth noting. First, this data contains accurate information on average pension points from full-value contribution and contribution years, which are necessary for us to determine the treatment status. Moreover, the data provides an accurate measure of the amount of pension subsidy and pension income, which are crucial for testing the relevance of the instruments. Third, we observe the exact dates of their birth and death and the universe of the German inactive pension accounts, which help us measure the mortality responses accurately. Lastly, our data includes information on marital status at the time of fall out. Unfortunately, other potentially useful information is lacking due to the cross-sectional nature of the dataset; for example, biographical information such as pension points accumulated before 1992[12] or household information, such as links to spouses. In addition, we only have information on occupation and education level of retirees if they fell out of the system after 2011.

Our baseline sample includes individuals who left the pension system due to death. We focus on German nationals residing in West Germany at the time of death[13], in order to abstract from migration patterns and German reunification effects. Moreover, East Germans face different pension rules, which make comparison with West Germans harder. Then, we consider retirees who claimed old-age pension, as the subsidy is an old-age pension benefit. Furthermore, we restrict the sample to cohorts born between 1934 and 1944. The lower bound (1934) is chosen to include

[12] Because we do not observe the pension points accumulated before 1992, we cannot perform a regression kink design using aep^{92} as running variable, and exploiting the kink at 0.5 or 0.75 (see Figure A.1 for an illustration). Instead, Ye (2022) uses aep^{92} as running variable and the kink at $aep^{92} = 0.5$. It relies on a different dataset, including employment histories, from which aep^{92} can be computed, but with no information on death dates.

[13] Unfortunately, we do not observe place of residence at earlier points in time.

individuals who were at most 58 in 1992. The upper bound (1944) is chosen to include people who are at least 80 years old in 2024. This ensures uncensored estimates of the probability of dying before ages up to 80, as all cohorts in the sample could have at least reached that cut-off.Finally, we restrict symmetrically around the eligibility conditions. We keep individuals within a 24-month bandwidth around the 35-contribution years cut-off, and within a 0.30 points bandwidth around the aep cut-off. That is, individuals in the baseline sample contributed more than 33 and strictly less than 37 years to the pension system, and whose aep at retirement is between 0.45 and 1.05 (approx. between 1200 and 3000 euro of gross monthly wage). In the robustness analysis, we vary the choice of sample selection around the birth cohorts, aep, and the contribution year eligibility conditions, both restricting and widening each bandwidth. Our results are robust to each of these changes. Additionally, we verify that being eligible for the subsidy is not correlated with fulfilling the baseline sample restrictions. Table A.1 shows the impact of eligibility conditions on being included in the baseline sample (column 1) and by gender (columns 2 and 3).

Table A.2 reports the summary statistics for West Germans who claimed an old-age pension between 1992 and 2024 (*West German pensioners*), for those born between 1934 and 1944 in the *West German pensioners* sample (*1934-1944 sample*), and finally those fulfilling the 33-36 contribution years and 0.45-1.05 aep at retirement restrictions, the *baseline sample*.

The baseline sample contains 213,637 individuals, of whom 36% satisfy both conditions with aep below 0.75 and more than 35 contribution years. Age at death (censored at age 80) is on average around 75.69. As we only observe deaths that occurred between 1992 and 2024, our baseline cohorts were at least 80 years old in 2024. For this reason, we construct a measure of age at death that considers everyone who died after age 80 as if they had died at 80. Using this variable would at most lead to an underestimation of the real effects of the subsidy on longevity. Throughout the paper, we use censored age at death and age at death interchangeably. Our main mortality outcomes are age at death and probability of dying before age 65, 70, 75 and 80. We show in Section 7 that these outcomes imply similar longevity gains. Individuals in the baseline sample have an average probability of dying before age 65, 70, 75, and 80 of 4%, 18%, 36% and 60%, respectively. They have a pension income of 695€/month, and have a 30% probability of being subsidy recipients. Conditional on being a recipient, they receive a subsidy of about 77€/month. They are on average age 54 in 1992, 70% female, and 64% married. Female pensioners have on average 2.1 children. Furthermore, they started to claim their current pension type shortly before age 63, on average.

Overall, the baseline sample is comparable to the West German Pensioners and 1934-1944 samples, except for the share of women. The baseline sample is 70% female, while the *West German*

Pensioners and *1934-1944* samples have 45% and 42% women, respectively. The higher share of women can be explained by two characteristics: lower wages and more child-raising periods. On the one hand, women have lower wages, thus lower aep and higher chances of $aep < 1$. On the other hand, women are granted a generous number of contribution years through child-raising periods, which makes them more likely to reach a higher number of contribution years.[14]

3.2 Survey Data on Health Outcomes

To provide suggestive evidence on the impact of additional pension income on health and to better understand the mechanisms behind the reduction in mortality, we examine an auxiliary dataset: SHARE-RV. This dataset links the German subsample of the Survey on Health Ageing and Retirement in Europe (SHARE) with administrative pension records provided by FDZ-RV.[15] SHARE collects data on a representative sample of individuals aged 50 and over. We take the following waves: wave 1 (interview years 2004 and 2005), wave 2 (2006 and 2007), wave 4 (2011 and 2012), wave 5 (2013), wave 6 (2015), wave 7 (2017–2018), wave 8 (2019-2020), and wave 9 (2021–2022).[16]

Our SHARE-RV sample contains West German old-age pensioners who were born after 1934.[17] To ensure a reasonable sample size for the analysis, we take a larger bandwidth around the 35-year contribution eligibility and the 0.75 aep cutoff than the RTWF sample. The SHARE-RV sample contains people who contributed at least 15 and at most 55 years and had an aep between 0.25 and 1.25. We end up with 4,421 observations, of which 62% are women and 19% are eligible for the subsidy.

The SHARE-RV sample allows us to gain insights into how health conditions, financial constraints, and psychological feelings are affected by additional pension income. Furthermore, it helps explore channels in which the additional income could be used. We consider the following health measures: an index of overall well-being (*CASP*), a self-reported health index, the number

[14] In particular, the time of raising a child up to age 10 counts in the number of contribution years. The package is 10 years for one child, 15 years for two children and 20 years for more than two children. See Online Appendix B.4 for more details.

[15] Specifically, SHARE-RV links SHARE with *Versichertenkostenstichtprobe* (VSKT) and *Versichertenrentenbestand* (RTBN). VSKT is a longitudinal dataset and contains monthly information on respondents' employment histories. RTBN is a cross-sectional dataset that summarizes respondents' benefits accumulated during retirement and information on the amount of paid pensions. SHARE-RV is based on direct linkage, meaning that the records of the same SHARE respondents were linked using the respondents' social security number as a unique identifier. See SHARE-RV website and Börsch-Supan et al. (2020) for more information on SHARE-RV.

[16] See SHARE website for further information on SHARE.

[17] We do not set an upper bound (1944) as we did in the mortality data sample, because health variables are not subject to censoring biases and including more cohorts increase the sample size.

of diagnosed chronic diseases, a measure of depression symptoms (*EURO-D*), and an index of functional limitations. Moreover, we use a set of variables to measure psychological well-being. Specifically, we exploit self-reported measures of optimism based on responses to the questions, "how often do you feel like your life is full of opportunities" and "how often do you feel like the future looks good".We also use responses to the question "how often did you feel like money stopped you from participating in generally defined activities" as an indicator for perceived financial constraints. In addition, we examine measures of food expenditures and physical activity to explore potential uses of the subsidy. Finally, we analyze measures of healthcare utilization, including hospital stays, doctor visits, and professional home care, to investigate potential spillover effects on the healthcare system.[18]

Table A.4 shows that the baseline SHARE-RV sample is generally comparable to the West German Pensioners sample. The baseline sample receives 124€/month less in pension income, and is in slightly worse health.[19] Table A.5 further shows the characteristics of pensioners in the baseline survey sample by gender. The pattern is similar to the administrative data set. Women are overall healthier, except for the depression index, but their pension income is on average a smaller share of the total household income.

4 Empirical Strategy

Estimating the causal effects of income on mortality is challenging for various reasons. First, unobserved factors affecting both income and mortality might lead to spurious correlation between the two. Second, while income might affect health status, the reverse could also be true. For instance, pre-retirement health status might have affected earnings, leading to lower pension income in retirement and eventually affecting mortality. Third, changes in pension income might ultimately affect mortality directly, by affecting consumption, or indirectly, through labor supply choices. This paper exploits the eligibility conditions for an exogenous pension subsidy program to estimate the causal effect of pension income on mortality. First, we estimate the intent-to-treat effect of the pension subsidy program on mortality using a Difference-in-Differences (DID) method. Second, we use an instrumental variable (IV) approach to report the causal effect of pension income on mortality and health outcomes.

[18] See Table A.3 for an overview of how these variables are constructed and their scale.

[19] We also compare the baseline sample with a restricted sample if we impose the same restrictions as in the mortality data sample. The baseline and so-called restricted sample are generally comparable. However, sample size drops to 383 in the restricted sample.

4.1 Difference-in-Differences Method

We use the two eligibility criteria of the subsidy program to obtain a DID estimate. The first difference is having aep at retirement below 0.75, and the second is having more than 35 years of contributions. We measure the change in the difference between the treatment and control groups before and after 35 years of contributions. The treatment group consists of individuals with aep at retirement below 0.75. The control group consists of individuals with aep at retirement above 0.75.

Individuals with aep below 0.75 and more than 35 contribution years could still receive no subsidy if their wages were high before 1992, as $aep_{92} > 0.75$ renders the amount of subsidy zero. Because the RTWF data does not provide information on average earning points before 1992, our DID estimator measures an Intent-To-Treat (ITT) effect. In practice, most eligible individuals receive a positive amount of subsidy, i.e., are subsidy recipients. Table A.15 shows that 77% of eligible pensioners are also recipients. This can be ex-ante explained mainly by two reasons. First, Ye (2022) reports that aep at retirement and aep^{92} are highly correlated for higher numbers of contribution years before 1992. As the youngest cohort in the sample is 48 in 1992, it is reasonable to assume most of their contribution years were indeed accrued before 1992. Second, eligible individuals do not need to apply for the subsidy. The pension office automatically adds the amount to their pension account, independently of its size and the actual person's interest in the additional monetary amount.

The estimation equation for the DID design is the following:

$$Y_i = \alpha + \theta D_i \times Above35_i + \delta_1 D_i + \beta X_i + \tau + \lambda + \epsilon_i \tag{2}$$

Y_i represents the outcome variable of individual i with aep. The treatment indicator D_i is defined as $D = \mathbb{1}(aep_i < 0.75)$. τ indicates contribution quarters fixed effects. $Above35_i$ is a dummy that takes the value one for individuals with 35 or more contribution years, and zero for those with less than 35 contribution years. θ measures the reduced-form effect of being eligible for pension subsidy on pension income and mortality.

X_i contains the demographic characteristics, such as a male indicator, having children[20], and pension benefits without subsidy. In the robustness analysis, we show the estimates are robust by expanding the controls to additionally include indicators for being married, type of health insurance, and type of long-term care insurance. λ is the birth month-year fixed effect. τ is the

[20]This variable is based on whether the individual has claimed child benefit. As it is usually women who do this, this variable is a poor measure of the number of children for men. Instead, for men this variable is a proxy for being a man who is more involved in caring for children at home.

contribution quarters fixed effect. The standard errors are clustered at the birth month-year level [21]. We also report the wild bootstrap p-values, clustered at birth year-month level, in brackets in all tables. Reported significance stars always refer to the bootstrapped p-values.

The DID analysis identifies the impact of additional pension income under the assumption that, had the subsidy program not existed, the evolution of mortality over the contribution year (from 33 to 36) for people with aep between 0.45 and 0.75 (pension benefits between 500 and 850€/month) would have been similar to trends in outcomes for pensioners with aep between 0.75 and 1.05 (pension benefits between 700 and 1200€/month). Because we look at people very close to the 0.75 earnings threshold and compare them across a narrow window of only two years around the 35 contribution years, it is more plausible that our identification assumption will be fulfilled. In the robustness checks, we verify that results also hold around narrower and wider aep and wider contribution years windows. The event-study analysis in section 5.2 provides support for the common-trend assumption, and the placebo analysis on groups with $aep > 0.75$ in Section 5.3.2 further supports the causal interpretation of our estimates. We also discuss in detail the DID assumptions in Section 5.3.3.

4.2 Instrumental Variables Strategy

The purpose of the instrumental variable approach is twofold. First, it helps us to investigate the broader question: what is the effect of pension income on mortality? Second, it facilitates the investigation of health outcomes. Because of the sample size limitations of the SHARE-RV data, we need to rely on the IV analysis to explore the health consequences of having more pension income. We use the interaction between the two subsidy eligibility conditions as an instrument for pension income (PB_i). The first-stage and second-stage equations are as follows:

$$PB_i = \gamma_0 + \gamma_1(D_i \times Above35_i) + \gamma_2 Above35_i + \gamma_3 D_i + \beta X_i + \lambda + \tau + \mu_i \tag{3}$$

$$Y_i = \pi_0 + \pi_1 \widehat{PB_i} + \pi_2 Above35_i + \pi_3 D_i + \theta X_i + \lambda + \tau + \epsilon_i \tag{4}$$

PB_i indicates the amount of total pension income received by individual i. γ_1 measures the average treatment effect of the eligibility conditions on pension income. If the RTWF sample is used, X contains the individual characteristics, including gender, having children, pension income

[21] It is crucial to include cohort fixed effects because there has been a series of pension reforms in Germany during the sample periods. The cohort fixed effects account for the incentive changes caused by raising the statutory retirement age, which was implemented gradually by cohorts.

without subsidy, and age at claiming pension. When using the SHARE-RV sample, X contains gender, being married, having children, pension income without subsidy, being in contact with at least one of their children at least once a week, years of schooling, being a house owner, indicator for being interviewed after Covid-19, quadratic age polynomial, and age at claiming pension. If the RTWF sample is used, we also control for contribution quarters fixed effect τ and birth month-year fixed effect λ, and report standard errors clustered at cohort level and wild-bootstrapped p-values. If the SHARE-RV sample is used, in addition to the variables in X, we also control for wave fixed effects, and contribution years fixed effects, and report standard errors clustered at individual level. Using the predicted value of pension income ($\widehat{PB}_i$), we obtain the causal effect of pension income on mortality or well-being outcomes (π_1). We discuss the key assumptions for a valid IV estimate in Appendix section C.

5 Impact of Pension Income on Mortality

In this section, we first present graphical evidence and estimation results under the DID framework. We show both the pension income and mortality responses to eligibility for the subsidy program. After establishing the robustness of our results, we estimate heterogeneous results to better understand the mechanisms. Lastly, we quantify the impact of additional pension income on mortality using the IV method, which facilitates connecting with the survey evidence on health in Section 6.

5.1 Effects on Pension Income

First, we examine graphically the impact on the probability of receiving the subsidy and the amount of the subsidy received. Figure A.2(a) plots average subsidy size against contribution quarters for the control ($aep \geq 0.75$) and treatment ($aep < 0.75$) groups. We observe a sharp increase in the subsidy received after 35 years of contributions for the treatment group. In contrast, no change is observed for the control group. The empirical pattern is similar to the policy schedule depicted in Figure A.3. A similar pattern is observed when we look at the probability of receiving subsidies (Figure A.2(b)).

Furthermore, Figure A.4(a) shows pension benefits without subsidies by number of contribution years, for the treated and control groups. In the absence of the subsidy, pension benefits increase approximately linearly with the number of contribution years. Pension benefits without subsidies of the treated group move in parallel with those of the control group, although they are of a lower benefit level. In contrast, Figure A.4 (d) shows that the pension benefits with subsidies of the

treated group entail a permanent upward shift of the trajectory, decreasing the difference in pension benefits between the two groups. The patterns are similar when we look at men and women separately.

Panel A of Table 1 shows the first-stage DID estimates, i.e., the impact on the probability of receiving a subsidy, subsidy amount, and total pension income. We progressively control for contribution quarter fixed effects (column 1), birth month-year fixed effects (column 2), individual characteristics (column 3), and finally pension income without subsidy (column 4). Our preferred specification is column 4. Subsidy eligibility increases the probability of receiving the subsidy by 68%, the amount of subsidy received, and pension income by 55€/month. While the estimates on the probability of being a recipient and subsidy amount are not sensitive to varying controls, these matter for the effect on pension income. However, this is not surprising as the two groups differ in their lifetime earnings. Our identifying exogenous variation comes from a reduction in the difference in pension income between the treated and control group. Thus, to isolate this change, it is crucial to add pension income without subsidy as a control variable. Figure 1 and panel A of Table A.6 show the event-study results. We observe non-significant or precisely zero estimates before the 35 contribution years cutoff and a sharp increase in subsidy amount, pension income and probability of being a recipient afterwards, supporting the parallel trend assumption.

5.2 Effects on Mortality

We now examine the effect of subsidy eligibility on mortality outcomes, first through descriptive graphical evidence and then through the DID analysis.

Figure A.5 plots the mean mortality outcomes for the control ($aep \geq 0.75$) and treatment ($aep < 0.75$) groups by contribution quarters. We observe three patterns. First, we observe that the gap in age at death between treated and control widens after the 35 years cutoff (Figure A.5a). The slope of age at death for the eligible individuals becomes flatter after the cutoff, suggesting an improvement of life expectancy due to additional pension income. Second, the probability of dying before 65 notably increases exactly at 35 years of contributions, particularly among men (Figure A.5d,e,f). This pattern emerges probably because 35 years of contributions qualify individuals for an early retirement option - the old-age pension for the long-term insured, which allows earlier retirement at age 63. The discontinuous increase in mortality is likely due to the negative association between retirement and mortality, which has been shown in the U.S. context (Fitzpatrick and Moore, 2018). Third, although the probability of dying before age 65 spikes at 35 years of contribution for both groups, the gap widens after the cutoff. Similarly, we observe a similar evolution of mortality outcomes before the 35-year cutoff and a change in the trajectory in favor of the poorer

group, likely due to additional pension income. This evidence suggests that the improvement in life expectancy for the poorer group partly comes from offsetting the harmful impact of retirement. As income and consumption drop at retirement (e.g., Hurst (2008); Battistin et al. (2009)), additional pension income could help low-income retirees better cope with the transition from work to retirement. However, these are raw scatter plots that do not control for important covariates. For example, without controlling for either birth cohorts or pension income without subsidy, the mortality rates of the poorer group are lower than those of the richer group. Therefore, we will turn to the regression results, which allow for a more precise analysis. We also show that our regression results are robust when dropping individuals with exactly 35 years of contribution.

Panel B of Table 1 shows the estimated effects of being eligible for additional pension on mortality. We find significant decreases in the probability of dying before 65, 70, 75 and 80 by 0.8, 1.5, 1.4 and 1 percentage points, respectively. These correspond to 20.5%, 8.5%, 3.9% and 1.7% decreases with respect to the sample average. Age at death is delayed by 2.4 months. The estimates are not sensitive to varying controls. Corresponding event study results are depicted in Figure 2 and reported in Panel B of Table A.6. For each outcome, we find non-significant and close to zero point estimates before the 35-year cutoff, supporting the parallel trends assumption. We show the 95 percent CI in Figure 2.

When we use alternative measures of mortality, the results are similar. Table A.7 shows the impacts on the probability of dying between age 65 and 70, between 70 and 75, between 75 and 80, and the probability of dying within 5, 10, and 20 years of claiming an old-age pension (hence also 5, 10 and 20 years after receiving the subsidies, respectively). Eligibility for the subsidy decreases the probability of dying between 65 and 70, and the probability of dying within 5, 10, and 20 years from retirement by 0.8, 0.8, 1.2 and 1.1 percentage points, respectively. Figure A.6 further plots the impact on the cumulative probability of dying by each year. We can see that the additional income yield improvement effects start from the third year after retirement for men, while for women the improvement shows up later, close to 10 years after retirement, and are smaller in magnitude.

5.3 Validity Checks

5.3.1 Robustness Checks: Varying Sample Selection

Several exercises further establish the robustness of the estimates. First, we reproduce the DID estimates after varying sample selection criteria. Results are reported in Table A.8. In Column (2) and (3), we ensure the mortality results are robust to the exclusion of individuals who retired at exactly 35 years of contribution or with aep$\in$[0.74-0.76], respectively. In Column (4), we exclude

deaths after 2020, to verify our estimates are robust to the Covid-19 shock. In Column (5), we show the estimates remain similar when we narrow the bandwidth of aep to be even closer to the 0.75 cutoff, i.e., between 0.6 and 0.9. This tackles the concern raised by pension income in our baseline control group still being substantially higher than in the treatment group. Column (6) shows results are also maintained when expanding the contribution year to 30 and 40 years. In Column (7), we further show our results are also robust to a widening of the aep bandwidth, to 0.25 - 1.25, and the contribution years bandwidth, to 20-50, close to the restrictions we will impose later on when exploring effects on health outcomes with survey data. Finally, estimates remain similar if younger cohorts are included in the sample, i.e., adding individuals born between 1945 and 1954, or if we restrict to cohorts born between 1934 and 1938, i.e., the cohorts born before the Second World War. The estimated impacts are similar to the baseline results.

5.3.2 Placebo Tests

We conduct two placebo exercises by using a sample of ineligible individuals to further support the credibility of our estimates. First, we take the two placebo samples that consist of people of aep_i higher than 0.75: $aep_i \in [0.8, 1.25]$ and $[1, 1.4]$ (columns (2) and (3) of Table A.9). These individuals are not eligible for the subsidies. We take a hypothetical cutoff in aep in these placebo checks. Even though we find some positive effect on pension income, the size is an order of magnitude smaller (at most 3 euros more per month). We do not find any significant impact on mortality. Estimated event study coefficients for the $aep_i \in [0.8, 1.25]$ sample are depicted in Figure A.7. This exercise also helps to rule out the possibility that the estimated mortality impact is driven by differences in mortality responses to early retirement across income levels.

Second, we consider two placebo samples of people with lower or higher number of contribution years than in the baseline sample: $CY \in [28, 31]$, $CY \in [38, 41]$ (columns (4) and (5) of Table A.9). These individuals are not eligible for the subsidies. We take a hypothetical cutoff in CY (30 and 40, respectively) in these placebo checks. Again, we find none or small positive effects on pension income (at most 7€/month). We do not find significant effects on mortality. These tests rule out the possibility that other confounding factors are driving our reduced-form estimates.

5.3.3 DID Assumptions

Rule out Manipulation: Our empirical strategy relies on the assumption of absence of manipulation and self-selection into eligibility. If, instead, the existence of the subsidy and the knowledge of its eligibility conditions were to induce individuals to manipulate either one of aep^{92}, aep, or the number of contribution years, our estimates would be biased. In particular, our estimates would be

downwardly biased if healthier retirees self-selected into treatment, and would be upwardly biased in the opposite scenario. In the following, we argue that manipulation is rather unlikely and not supported by empirical evidence.

To receive a positive subsidy amount, one must in practice fulfill three conditions: (1) have more than 35 years of contributions, (2) have $aep < 0.75$ at retirement, and (3) have $aep^{92} < 0.75$ (otherwise the amount of subsidy is zero). In the following, we will refer to aep at retirement directly as aep.

First, because the subsidy amount is computed from aep^{92}, which in turn is fully determined by full-value contribution periods and wages before 1992, the subsidy size is as good as exogenous. Thus, selective behavior could only come from manipulating aep or changing labor supply decisions.

Second, we discuss the possibility of selection into the aep condition. After 1992, those with aep^{92} below 0.75 might closely monitor their aep to ensure they do not lose the subsidy entitlement. In practice, this would mean accepting lower-paid jobs in the years after 1992. We mentioned earlier that aep is highly correlated with aep^{92}, and that the higher the number of contribution periods before 1992, the closer aep^{92} will be to aep (Ye, 2022). Therefore, manipulation might be profitable only for somebody with aep^{92} below but close to 0.75 and aep before retirement above but close to 0.75. Only a small share of pensioners fall into this group.[22] Moreover, the kinked subsidy schedule implies that such an individual would receive a relatively low monthly subsidy, approximately lower than 10€/month. That is, the monthly subsidy would be less than 2% of their pension income and less than 1% of their pre-retirement wage. This makes it unlikely to be profitable for anyone to lower their wages to manipulate subsidy eligibility. It is also worth noting that for manipulation to be possible, people would need to know about the subsidy well in advance and fully understand the complicated formula by which the subsidy is allocated and calculated, which is likely to be a strong requirement. Finally, if individuals were to accept lower wages at the end of their careers in order to qualify for the subsidy, we should observe bunching of individuals with more than 35 years of contributions around the 0.75 aep cutoff. Figure A.8 shows the density of aep distinguishing between those with more (red bars) and less (blue bars) than 35 years of contributions in the baseline sample (panel (a)) and the differences between these two densities (panel (b), above minus below 35 group). Panels (c) and (d) show the distribution for women and men. Overall, we observe a smooth density around the cutoff for both groups. Therefore, we rule out the possibility of strategic behavior around the 0.75 cutoff.

[22] Using the VSKT sample, we find that only 3% of pensioners with aep at retirement higher than 0.75 have aep^{92} lower than 0.75.

Finally, we discuss the possibility of selection into the 35 years of contributions condition. Individuals with aep^{92} and aep below 0.75 might be tempted to postpone retirement and reach 35 years of contributions in order to receive the subsidy. If this were the case, we would observe bunching from the left at 35 contribution years in the density of individuals with $aep < 0.75$. Figure A.9 plots the distribution of contribution periods by aep group (panel (a)) and the difference in densities between the two groups (panel (b), below 0.75 minus above 0.75). Although we observe bunching at 35 years of contributions, this sharp bunching exists for both groups. One possible explanation is that 35 years of contributions is also the eligibility requirement for the old-age pension for the long-term insured. In particular, the long-term insured path allows people to retire at 63 instead of waiting until the statutory retirement age of 65.

Figure A.9 (b) shows that the $aep < 0.75$ group bunches more than the $aep \geq 0.75$ group. This could be problematic. However, when we further examine the distribution of contribution years, we can see that compared with the $aep \geq 0.75$ group, the excess mass for the $aep < 0.75$ group seems to primarily come from people with more than 36 years of contributions. This suggests that relatively poorer individuals are retiring earlier (reducing the years of contributions) than they would have otherwise. This is most likely driven by the incentives to retire via the long-term insured pension pathway once they reach the 35-year threshold. This seems reasonable in light of the intuition that poorer people are more likely to be blue-collar workers with a more physically demanding job, which may give them a greater incentive to retire as early as possible. In the robustness test, we show that our results remain unchanged when we drop those who retire exactly at 35 years of contribution (Table A.8).

Parallel Trends Figure 2 and Table A.6 report the event study coefficients for the main outcomes. For each outcome, we find non-significant and close to zero point estimates before the 35-year cutoff, supporting the parallel trends assumption. The fact that we do not observe any pre-trend further rules out the possibility of selection into treatment.

No Contemporaneous Shock: The parallel trends assumption implies that, in the absence of the subsidy program, there would not have been a contemporaneous shock (along the contribution year dimension) that would have affected the treatment and control groups differentially. Because the pre-trends analysis examines outcomes before the 35 years of contribution, it cannot rule out a contemporaneous shock at the 35 years cutoff. The fact that retirees in the treatment group are of lower income raises the risk that contemporaneous shocks coinciding with the policy, such as eligibility for the long-term insured pathway (access to early retirement), may affect the treatment

and control groups in different ways.

However, we do not believe that this is a threat to our identification strategy. We show that our estimate is robust when augmenting our baseline specification with interactions between predetermined characteristics and contribution quarter fixed effects (Table A.10). By interacting predetermined characteristics with the contribution quarter fixed effects, we allow outcome trends to differ by observable characteristics, thereby mitigating the risk that differential exposure to contemporaneous shocks—operating through these characteristics—drives the estimated treatment effect.

5.4 Heterogeneous Mortality Effects

In this section, we study the mortality effects by gender, marital status, income distribution and type of health insurance. Table 2 reports the DID estimates and Table A.11 shows the p-values testing the hypothesis that the coefficients by subgroup are equal.

By Gender Columns (2) and (3) of Table 2 show the DID estimates by gender. Unsurprisingly, women in our sample receive more than twice the amount of subsidy than men. This is because, on average, women have a lower lifetime earnings profile than men and are therefore more likely to be entitled to a higher level of subsidy.[23] However, despite a larger first-stage impact on pension income, we find stronger effects on mortality for men than women. Men's probability of dying before 70 and 75 decreases by 3.6 and 3.7 percentage points, respectively, while the effects for women are close to zero and insignificant. Age at death increases by 0.4 years (4.8 months) for men, while there is no effect for women. Table A.12 further splits the treatment group by gender and by subsidy size. We show that the improvement in mortality for men is driven by the group entitled to more subsidies. In the following paragraph, we explore whether marital status and children lead to the gender difference. Section 7.1 provides a more in-depth discussion of gender differences, combining evidence on health outcomes with the survey data.

By Marital Status and Children Columns (4) and (5) of Table 2 show the impacts by marital status; however, we do not find any significant differences in mortality. In Table A.13, we further investigate the effects by gender. This is because another possible explanation for the lack of impact on women could be related to the actual standard of living of the treated women. It is possible that the program subsidises women in relatively well-off households, since the subsidy is a function of individual rather than household income. However, their actual standard of living may be determined not only by their own income but also by the income of their husbands or

[23] Women's aep^{92} are distributed centering 0.5, which grants the highest amount of pension subsidy, all else equal.

children. Unfortunately, in the pension administrative dataset, we cannot link households and do not know about their household wealth. We explore differences by household wealth later using survey data in Section 7.1 and indeed find that a slightly larger impact on women more heavily relying on their own pension income.

Here, we use marital status and presence of children to proxy for dependency on own income. We expect married women to benefit less from the subsidy, as they are not the sole earners in the household. However, Table A.13 shows that the mortality outcomes of neither married nor the not married women are affected (columns (1) and (2)). Table A.11 shows the p-values testing the hypothesis that the coefficients by subgroups within the female sample are equal.[24] As women with children are more likely to be married at some point in their lives and possibly have other income sources from their partners and children, we would expect the effects to be smaller for them. Indeed, columns 3 and 4 of Table A.13 show that women without children experience a gain in life expectancy, while women with children are not affected. The differences are statistically significant. Their age at death is delayed by 4.5 months and the probability of dying before 70 and 75 is reduced by around 3 percentage points. The effects are of similar magnitude to those experienced by men. Childless eligible women are more similar to eligible men also because they need to have worked more years to reach the 35-year threshold compared to women with children, because years spent caring for children count towards the 35-year requirement.

Columns (5) and (6) of Table A.13 show heterogeneous effects by marital status for men. Here, we estimate significant mortality improvements for both married and unmarried men, and we do not find any significant difference between these two groups.

By Subsidy Size Although pensioners in our treatment group are all poor, with below-average monthly wages, it would be interesting to see if very poor and relatively poor pensioners react differently. Columns (6) and (7) of Table 2 split the treatment group into ones with lower and higher aep, while keeping the control group unchanged. Because the subsidy size is correlated with aep, essentially we compare individuals with varying subsidy size. Those with aep between 0.45 and 0.61 on average receive 82 euro additional monthly pension income, while those with aep between 0.61 and 0.75 receive 28 euros additional pension income per month. We find that those with more subsidy gain 0.30 years of life expectancy compared with 0.09 years for those with less subsidy. The estimated changes in the probability of dying before 65, 70 and 75 are also larger for the former group. Table A.11 shows that the differences across groups are also statistically

[24] Marital status is recorded at the time of pension claim application. The not married group includes widowers, divorcees, and the ones who have never married. There are around 9% with missing marital status, which we do not include in this heterogeneity analysis. We suspect that those with missing status are widowers.

significant. This result is consistent with the results by subsidy size by gender discussed above.

By Health Insurance Status Finally, we investigate the heterogeneous effects by health insurance status. In Germany, the majority of people have public health insurance. Only people with a higher labor income (or who are a dependent of a private health insurance policy holder) or the self-employed can enroll in private health insurance.[25] As those with private health insurance have higher household incomes and better healthcare coverage, we expect that additional pension income has little impact on their well-being. We find that the first-stage estimates are smaller for those with private health insurance. The age at death is postponed by 2.3 months for those with public health insurance, while the effect is insignificant and small for those with private health insurance.

In summary, we find that the effects are primarily driven by men and are more pronounced among individuals receiving larger subsidies and those covered by public health insurance. Childless women experience benefits similar to those observed for men.

5.5 Effects on Pension Claiming

Additional pension income can also change pension claiming behaviors, which could be a mediating factor for the mortality impacts. In this subsection, we explore the impact on pension claiming behaviors to better understand these adjustment margins. Table 3 reports the impact of eligibility on age at claiming pension. We do not find any significant effects for the full sample. However, when we split the sample by gender, we find that an increase of 61 euro/month in pension income induces women to claim their pensions 1.2 months earlier. The response is smaller but in the same ballpark as the claiming responses estimated in Ye (2022) for female recipients. [26]

[25] Although the majority of the German population is covered by generous statutory health insurance, out-of-pocket payments for healthcare services remain and account for 13% of total healthcare expenditure in Germany (WHO, 2023). Bock et al. (2014) shows that the top three highest amounts of out-of-pocket payment for elderly German public health insurance beneficiaries are medical supplies, dental prostheses, and payments for pharmaceuticals (co-payments for prescribed drugs and non-prescribed drugs). This is mainly driven by the fact that costs for glasses, medical devices that went beyond pure medical necessity, such as an electric wheelchair, dental prostheses, and non-prescribed drugs are not covered by health insurance. See here for a detailed description of the co-payment regulations of the statutory health insurance in Germany. Privately insured individuals could have better coverage and incur less out-of-pocket payment. Unfortunately, we cannot test the impact on out-of-pocket payments using survey data due to sample size limitations.

[26] Ye (2022) shows that a 100 euro increase in the monthly subsidy induces female recipients to claim their pensions six months earlier. Our sample includes both recipients and non/recipients and we measure the intent-to-treat effect. This is probably why we find a smaller effect on age at claim for women in this paper. Note that we cannot use the same regression kink method as in Ye (2022) to examine the impact on recipients because we don't observe aep_{92} in our data.

Panel B of Table 3 further explores the impact of different early retirement pathways. First, we show that eligibility does not affect the probability of claiming regular disability insurance, before starting to claim old-age pension. This is reassuring and further supports the validity of our design, as it implies that the eligible individuals are not different in this severe health indicator. Second, when we look at early retirement pathways, we find that subsidy eligibility leads to an increase in the probability of claiming pension for the unemployed and claiming pension for the long-term insured and a decrease in claiming disability pension. This is reasonable given the strict requirements for claiming disability insurance (rigorous medical examinations) and the greater stigma associated with being labeled as disabled (Celhay et al., 2025). Pensioners with additional income can now afford to opt for other early retirement pathways, although claiming disability insurance at the same age entails fewer financial penalties.[27] When examining the impact by gender, we see a different pattern. Eligible women are more likely to use women's pension and the pension for long-term insured as early retirement pathways, rather than relying on the unemployed pathway. For eligible men, they substitute disability pension pathway with the pension for the unemployed and the pension for the long-term insured when additional income becomes available.

5.6 IV to Scale the Effect

To quantify the impact of an additional 100€of pension income on mortality and to compare it with the health outcomes using Survey data, we also estimate the impacts in an IV framework. Table A.14 reports the effect of having more pension income on mortality and the age at which the pension is claimed. We show the estimates for the overall sample (columns (1) and (2)) and by gender (columns (3)-(6)). Odd columns do not control for age at claiming pension, while even columns do. One concern of the exclusion restriction is that eligibility for the subsidy also affects retirement choices. Our preferred specification is to control for age at claiming pension (including pension pathways) to abstract from possible labor supply effects.

Panel A shows the first-stage estimates. Eligibility for a pension subsidy increases pension income by around 55€/month (61€/month for women, and 22€/month for men, on average). F-statistics are above the rule-of-thumb threshold of 10 in all specifications.

The IV estimates in Panel B of Table A.14 indicate that more pension income has a statistically significant positive effect on age at death and a significant negative effect on the probability of dying before 65, 70 and 75. These estimates are in line with DID results. We find that 100€ per month of additional pension income causes a decrease of 1.4, 2.9 and 2.7 percentage points in the

[27] This is because disability insurance has a lower normal retirement age.

probability of dying before 65, 70 and 75, respectively, in the full sample. The age at death increases by 4.5 months. Similar to the DID estimates, results on mortality are predominantly driven by men, who experience substantially larger improvements in mortality outcomes than women. Moreover, the inclusion of a control for the age at which a pension was claimed does not affect the magnitude of the estimates.

To interpret the IV results, it is important to understand who the compliers are. In our setting, the compliers are those individuals whose pension income increases when they fulfill the two eligibility conditions. Because the pension subsidy amount is computed by applying a built-in formula and is credited directly to the recipient's pension account by the pension office, almost all eligible individuals are compliers. The only exception is people with a zero subsidy amount because their aep^{92} is above 0.75, therefore, according to the subsidy formula, they receive a zero subsidy amount even though they fulfill both eligibility conditions. In practice, there are very few never-takers. These are people with higher average wages before 1992 but lower average wages when they retire. Table A.15 compares the characteristics of individuals in the baseline sample with those of the eligible individuals, the compliers (subsidy recipients in the eligible group, 77% of all eligible individuals) and the never-takers (individuals who received no subsidy despite of general subsidy eligibility, 23% of all eligible individuals). Compared to the never-takers, the compliers are less likely to be male, married and more likely to be covered by public health insurance. They also have fewer years of schooling. Compliers are poorer overall — they have lower pension incomes without the subsidy and are less likely to own a home.

6 Survey Evidence: Impact on Health Outcomes

To better understand the mechanisms behind the reduction in mortality, we explore the changes in health outcomes by exploiting the SHARE-RV data.[28] First, we examine the effects on health outcomes, including measures of overall health, self-assessed health, the depression index, the number of chronic diseases, and a functional limitation index. To further investigate the relationship between income and mental health, we examine measures of perceived financial constraints and optimism. To better understand the behavioral mechanisms underlying health improvements, we also analyze outcomes related to spending, physical activities, and risky behaviors. See Section

[28] It is worth noting that we can only observe the survey responses of surviving individuals. Since we find a reduction in mortality due to higher income using the administrative dataset, older pensioners who survive to participate in the survey without the subsidy may be healthier than those with the subsidy. Therefore, the survey sample in the treatment group may be less healthy compared to the control group. In this case, our health estimates likely provide a lower bound on the health impact of additional pension income.

3.2 and Table A.3 for descriptions of these outcome variables. We present the IV estimates in this section.

Overall Health Measures Table 4 shows the effect of additional pension income on overall health. Columns (1) and (2) show results for the baseline sample, (3) and (4) for women, and (5) and (6) for men. The estimated coefficients are reported in terms of standard deviations from the mean. Even columns control for age at claiming pension. Generally, adding the age at claiming pension control does not substantially affect the estimates. In the following, we focus on the results when controlling for age at claiming pension. Panel A shows that all estimated first-stage coefficients are positive and highly significant and F-statistics are above 10. Different to the RTWF sample, eligibility for the subsidy program increases the pension income by 39€/month for women, and 60€/month for men in the SHARE-RV sample.[29]

Table 4 Panel B reports the IV estimates. For the full sample, we find a positive impact on overall well-being, as measured by the CASP well-being indicator, and an improvement in self-reported health status. An additional 100€ monthly pension income increases CASP by 54 percent of a standard deviation and self-reported health by 67% of a standard deviation (both significant at the 5% level). Furthermore, the number of chronic diseases decreases by 45% of a standard deviation. The results are consistent with existing evidence, which has shown that the number of chronic diseases is strongly correlated with a worse quality of life and excess mortality (Adamson et al., 2005; Kahneman and Krueger, 2006). When distinguishing between genders, we find the improvements in health measures are driven by men, which is consistent with the finding that men drive the improvement in mortality outcomes.

Long-term Care Dependency We also examine the impact of additional income on long-term care dependency, measured by an Anderson (2008) indicator of two standard measures: difficulties with Activities of Daily Living (ADLs, including dressing, bathing, going to bed, eating, walking across a room), difficulties with Instrumental Activities of Daily Living (IADLs, including shopping, preparing meals, taking medication, managing money, using the telephone). These measures are also good indicators of cognitive decline, which can have a negative impact on financial decision-making (Mazzonna and Peracchi, 2020), in addition to the need for long-term care services (Li et al., 2023). We find an additional 100€/month of pension income reduces men's functional limitations index by 69% of a standard deviation, significant at 5% level. These findings

[29] Because of the wider aep restrictions we use in the SHARE-RV sample, treated men are poorer than treated women, on average. The treated men in the SHARE-RV sample have a pension income of around 715€/month without subsidy, while treated women have 760€/month of pension income without subsidy.

suggest that additional pension income may reduce pensioners' long-term care dependency, which can alleviate considerable financial burdens on the healthcare system. We do not find significant effects for women.

Financial Constraints and Optimism In addition, we explore the impacts on perceived financial constraints and optimism in Table 5. Both measures can be underlying causes of stress, depression, and poor mental health, consequently affecting mortality (Mendes de Leon et al., 1994; Gardner and Oswald, 2004; Ridley et al., 2020). All coefficients are expressed in standard deviations from the mean. For the full sample, we find a significant improvement in "future looks good", by 0.62 standard deviations. When we split by gender, men experience significant improvements in both "feel full of opportunities" and "future looks good", while women report a significant reduction in feeling a "lack of money stops them from participating in activities". These factors could contribute to the improvement in self-perceived health for men.

Spending and Activities Additional income might improve health through changes in consumption patterns. We find suggestive evidence that there is an increase in food expenditure, although the effects are only marginally statistically significant for women and not statistically significant for men. When we examine the healthcare use index, which combines measures of overnight hospital stays, time spent in hospitals, frequency of doctor visits, and home care utilization à la Anderson (2008), we find a reduction in healthcare use, driven primarily by men. These results suggest that increased longevity may not impose an additional burden on the public healthcare system; rather, the corresponding improvements in health could serve to alleviate existing pressures.

Moreover, medical studies have shown a positive correlation between different causes of mortality risk and the switch from a sedentary to a moderately active lifestyle (Richardson et al., 2004; Baade et al., 2011). Therefore, we also study whether additional income enables eligible individuals to engage in more health-promoting activities, such has moderate to vigorous physical activities. We find evidence that additional income increases the participation in such activities, with results again driven by men, in line with the results on improved health.

Risky Behaviours Finally, we examine risky behaviours, such as smoking and alcohol consumption, which are important risks that can lead to poorer health.[30] Table 5 shows that an additional 100€ of monthly pension income reduces the days of alcohol consumption in the last 6 months by 69% of a standard deviation for men (significant at 10% level).We do not find significant effects

[30]These variables are unfortunately only available for some respondents in the SHARE-RV baseline sample. Therefore, we report the minimum number of observations and value of first-stage F-statistics.

on the probability of smoking at the time of the interview, even though the estimated coefficients are negative. Reduction in drinking habits is consistent with lower stress levels resulting from additional income, in line with our finding of an overall well-being improvement.

All in all, these findings suggest that the reduction in mortality is driven by an improvement in overall health and general well-being. In particular, more pension income leads to a reduction in chronic diseases, and increased participation in physical activities. We also show that better health outcomes may partly be due to a better mental health status, as indicated by reduced stress about money, a more optimistic view of the future, and a reduction in frequent alcohol consumption.

7 Discussions

7.1 Gender Differences

We find stark differences in responses to additional pension income by gender. On the one hand, men benefit from a decrease in mortality and improvement in health and general life quality, without changes in their labor supply. On the other hand, women anticipate retirement, but their health and longevity remain unaffected.

One explanation is that the composition of eligible women is more heterogeneous than that of men, even after controlling for marital status. Women with more than 35 contribution years and low average earnings can include, on the one hand, mothers with low attachment to the labor market but who are rewarded more pension contribution years due to childcare needs and, on the other hand, women who have worked for many years in low-paid jobs. The finding that childless women benefit similarly as men (Section 5.4) partly supports this argument.

Another potentially complementary explanation is household wealth. Since men are the primary earners in most West German families, women with a low pension entitlement and low wage can either come from truly low-income families or from actually well-off families. In the following, we use two measures to proxy for truly low-income families: a higher share of pension income in household income and non-homeowners households.[31]

Table A.16 shows the heterogeneous effects by the share of pension income in household income. We compare the results for people with a share of pension income above and below 40% of

[31] The correlations between these two measures and marital status are not very high, suggesting that marital status does not capture these characteristics. The correlation between the share of pension income in total household income and being married is -0.24. And the correlation between one of the household members being a home owner and being married is 0.04. These two measures also capture different families, as the correlation between one of the household members being a home owner and the share of pension income is -0.17.

total household income.[32] Although suggestive, we find that poor women experience marginally significant improvements in overall health, perceived financial constraints and optimism, are less likely to be smokers.

Table A.17 shows the heterogeneous effects on the list of health outcomes by home ownership status, which is an indicator of household wealth. Home ownership is defined by whether any household member owns the household's primary home. We find that women who are not home owners feel more optimistic about their future, less financially constraints, and even significantly increase food consumption.

These findings suggest that varying levels of reliance on pension income may explain the observed gender differences. Specifically, aep at retirement serves as an accurate proxy for poverty only among individuals who are financially dependent on pension income, whereas its explanatory power diminishes for those who rely more heavily on alternative revenue streams. Given that this dependency is more prevalent among men, subsidy eligibility criteria are effective at accurately identifying the targeted male demographic, while proving less precise for women.

7.2 Comparisons with Existing Literature

In Table 1, we show that eligibility for the pension subsidy increases pension income by 8.0% (55/695) and reduces the probability of dying before age 65, 70, 75, and 80 by 20.5% (0.008/0.039), 8.5% (0.015/0.177), 3.9% (0.014/0.358), and 1.7% (0.010/0.604) respectively. Therefore, we estimate ITT pension income-mortality elasticities of -2.56, -1.06, -0.49, and -0.21 which represent the percentage change in the probability of dying before age 65, 70, 75, and 80 due to a 1% increase in pension income.[33]

To understand the estimated mortality and health responses, we compare our results with the existing literature. The effect of an increase in pension income on mortality is not necessarily symmetric with the effect of a decrease in pension income, therefore, we make separate comparisons between studies which focus on studying increases or decreases in pension income.

First, we compare our estimates with evidence on mortality responses to an increase in pension income (Case, 2004; Barham and Rowberry, 2013; Huang and Zhang, 2021; Miglino et al., 2023), the majority of which explore the non-contributory pension in developing countries. Our

[32] Note that the sample size is almost halved as we only observe household income for some of the respondents. If we further divide it by income share and by gender, the sample size becomes even smaller, with the result that some first-stage F-statistics for men fall below the rule-of-thumb threshold of 10.

[33] The IV estimates in Table A.14 show monthly pension income increase by 100 euro (around 14 percent increase) leads to a decrease in the probability of dying before age 65, 70, and 75 of 35.9% (0.014/0.039), and 16.4% (0.029/0.177), and 7.5% (0.027/0.358), respectively. The pension income-mortality elasticities calculated using the IV estimates are similar: -2.49, -1.14, and -0.52.

pension income-mortality elasticity of -1.06 (probability of dying before age 70) is at the higher end compared to these studies. For example, Barham and Rowberry (2013) study the phasing-in of the Mexican conditional cash transfer program, Progresa, between 1997 and 2000, which led to an increase in average beneficiary income levels of 22% in rural areas. They find a 4% decline in average municipality-level mortality for people aged 65 and above. This translates to an income-mortality elasticity of -0.18. Miglino et al. (2023) study the effect of income on mortality by exploring the eligibility condition for the non-contributory pension program in Chile. They find the basic pension increases income by 72% and reduces four-year mortality by 28%, leading to an income–mortality elasticity of -0.386. In comparison, our estimated pension income-mortality elasticity is closest to the findings of Huang and Zhang (2021), which find an income-mortality elasticity of -0.67. Huang and Zhang (2021) examine the implementation of China's New Rural Pension Scheme, which increased the household income by 18%. They find that the pension scheme reduced one-year mortality by 2.2 percentage points (12%) among the treated group.

Second, we compare our estimates with evidence on mortality responses to decreases in pension income (Jensen and Richter, 2004; Snyder and Evans, 2006; Johnsen and Willén, 2022). While Jensen and Richter (2004) find lower income leads to higher mortality by exploring a crisis in Russia in 1996, during which many pensioners were not paid for an extended period, Snyder and Evans (2006) show lower pension income leads to reduced mortality by examining a variation in social security wealth for the U.S. "notch" cohort. In addition, Johnsen and Willén (2022) shows negative income shocks had no impact on both employment and health care utilisation of pensioners in Sweden. Specifically, Jensen and Richter (2004) finds an income-mortality elasticity of -0.20. They find that the crisis decreased household income by 24% for these pensioners and they were 5% more likely to die in the two years following the crisis. Snyder and Evans (2006) find an income-mortality elasticity of 0.5, and that lower pension income leads to reduced mortality, which they attribute to beneficial effects of employment. They find a 4% drop in income leads to a reduction in five-year mortality by 2%.

The relatively large income-mortality elasticities suggested by our findings are likely due to the fact we study the impact on low-income retirees, who are likely the most vulnerable among the population with limited resources. For example, Gelber et al. (2023) study the impact of more generous Disability Insurance (DI) benefits on mortality and find a large impact on low-income DI beneficiaries. They show $1,000 more in annual disability insurance payment in the U.S. reduces mortality of low-income beneficiaries by 0.18 to 0.35 percentage points, implying an elasticity of mortality with respect to DI income of around -0.6 to -1.0. The magnitude of their elasticity is similar to ours.

Interestingly, Becker et al. (2024) find no mortality effects of increased DI benefits in Germany for DI recipients below age 60. However, the populations at study are clearly different. Becker et al. (2024) focus on mortality effects of younger people with severe health conditions, while we focus on older people with low income.

Lastly, comparing our findings to studies in the medical literature, our results are unsurprising. Compared with studies on patients cutting back high-value drugs (e.g., statins, antihypertensives for cardiovascular and steroids, inhalers for respiratory) (Brot-Goldberg et al., 2017; Chandra et al., 2021), our estimates show a similar size of the impacts on mortality. For example, Chandra et al. (2021) find that an exogenous 100$/month decrease in Medicare's drug coverage, a 24.4% change) causes mortality to increase by 0.016 percentage points per month (13.9%). Although the majority of the German population is covered by statutory health insurance, out-of-pocket payments for healthcare services remain and account for 13% of total healthcare expenditure in Germany (WHO, 2023).[34] One possible channel of our results could be that additional income allows recipients to pay out-of-pocket for additional drugs and medical supplies. Unfortunately, the out-of-pocket payments are poorly recorded in SHARE, we can not test this possibility empirically. Moreover, when compared with studies on correlation between different causes of mortality risk and the switch from a sedentary to a moderately active lifestyle, our estimated effects on mortality rates imply similar benefits to regularly engaging in moderately intensity physical activity, which is consistent with our estimated positive effect on physical activities.[35]

7.3 Policy Implications

Over the past few decades, there is a large and widening gap in life expectancy across income groups in many countries, including Germany (Tarkiainen et al., 2012; Wenau et al., 2019; Haan et al., 2020). The improvement in mortality is the largest in the high-income group and the smallest in the low-income group. Haan et al. (2020) shows that for West German men born in 1935-1937, the gap in life expectancy at age 65 between the top and bottom of the earnings decile is just above 5 years; while for cohorts born in 1944-1946, this gap increased to close to 7 years.[36] At

[34] Bock et al. (2014) shows that the top three highest amount of out-of-pocket payments for elderly German public health insurance beneficiaries are medical supplies (such as electrical wheelchair), dental prostheses and payments for pharmaceuticals. See here for a detailed description of the co-payment regulations of the statutory health insurance in Germany.

[35] Various studies have shown a correlation between different causes of mortality risk and the switch from a sedentary to a moderately active lifestyle. For example, Richardson et al. (2004) show that regular physical activity can reduce overall mortality of U.S. adults aged between 51 and 61 by 38% compared with sedentary individuals. Baade et al. (2011) find that colorectal cancer patients engaging in some level of physical activity after the diagnosis had a 25% to 28% lower risk of all-cause mortality within five years of diagnosis than sedentary participants in Australia.

[36] Figure 2 of Haan et al. (2020)

the same time, younger cohorts receive less subsidy as this subsidy program is gradually being phased out.[37] From a policy perspective, it would be interesting to know how this life expectancy gap would change if the subsidy level remained at a high level. Our IV estimates imply that if men born between 1944-1946 had received the equivalent subsidy as those born between 1935-1937, their life expectancy at age 65 would have increased by around nine and a half months. This adjustment would consequently narrow the gap by around nine and a half months, constituting approximately 11% of the overall disparity. This simple exercise suggests that providing additional pension income to low-income pensioners would help to flatten the income-mortality gradient.

We also perform a simple cost-benefit analysis by computing the associated increase in the value of a statistical life when receiving an additional 100€ pension benefits per month. Using the value of a statistical life year at age 60 implied by Aldy and Viscusi (2007) and life tables for the average German (Destatis, 2023), we show that for each 100€ subsidy, the mortality improvements for men are worth 533,726€.[38] The fiscal cost of providing the subsidy for men is about 44,176€ per male subsidy recipient (assuming they retire at age 60). Compared with the fiscal cost of providing the subsidy, we show that the pension subsidy program was cost-effective in increasing the life expectancy of male recipients. See Appendix D for more details.

8 Conclusion

This paper estimates the impact of pension income on mortality and health for low-income pensioners by exploiting a German pension subsidy program. The specific feature of the program allows us to identify the effect of additional pension benefits on mortality in an environment where the statutory pension eligibility ages remain unchanged and also the retirement timing responses are limited.

By utilising novel administrative data covering the universe of retirees who died between 1992 and 2024, we find that eligibility leads to a permanent increase in monthly pension income of 8% (about 55€) and a 2.4-month delay in age at death (censored at 80). The IV analysis shows that a 100€ increase in monthly pension income (about 14% increase) reduces the probability of dying before age 65, 70, and 75 by 35.9%, 16.4%, and 7.5% respectively. The heterogeneity analysis suggests that the mortality responses are driven by men. The analysis using survey data suggests

[37] This is because low-income workers who never contributed to the pension system before 1992 will not benefit from this subsidy program. Eligible West German men born in 1935-1937 received, on average 117€/month, of pension subsidy, while this number is reduced to 78€/month for younger cohorts.

[38] Our calculation of improvement in life expectancy at age 60 is a lower bound because the gain in life expectancy is benchmarked to the life tables for an average German, rather than the poorest German pensioners, who likely experience higher-than-average mortality rates.

that additional pension income also leads people to live healthier lives. Again, we find that men's health improves while women's health is less responsive. Feeling less financially constrained, feeling more optimistic about the future and life chances, increased physical activity, and reduced alcohol consumption are possible drivers of improved men's mental and physical health.

The external validity of the results could be questioned given that the subsidy recipients consist of pensioners with lower-than-average earnings in Germany. However, the recent trend of lowered public pension generosity to incentivize later retirement has left a growing number of lower-income workers vulnerable to old-age poverty risk in many developed countries (see e.g., Engelhardt and Gruber (2004); Cribb and Emmerson (2019); Morris (2022)). People with lower incomes have greater health risks and are the ones most in need of income support. Our findings can be used to consider the beneficial effects of providing safety nets for low-income pensioners in countries with similar contexts.

The main policy implication is that additional pension income improves life expectancy and leads to better physical and mental health for low-income pensioners. The findings further support income support programs for the elderly, as the social value is greater than the fiscal costs. Moreover, additional pension income for low-income retirees could flatten the income-mortality gradient and narrow the socioeconomic disparities in old-age mortality.

An interesting extension will be to further unpack the gender differences in responses to additional pension income. A caveat of this paper is that we cannot link household members and further explore the differential gender responses in mortality and health, which may be a fruitful avenue for future research.

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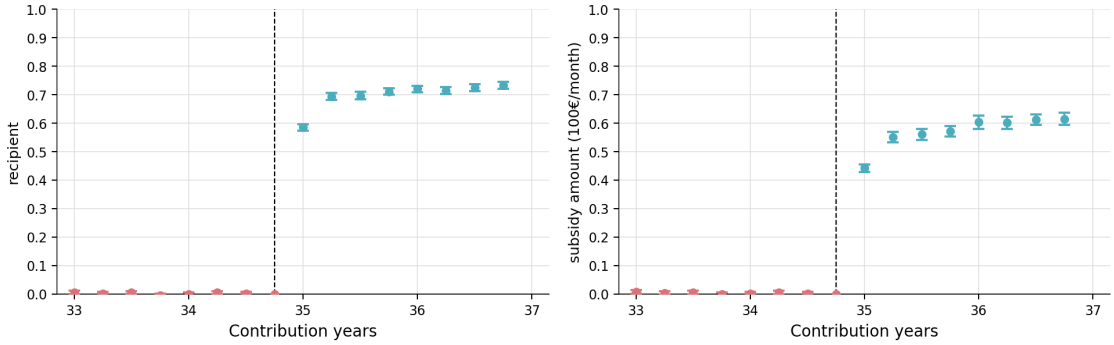
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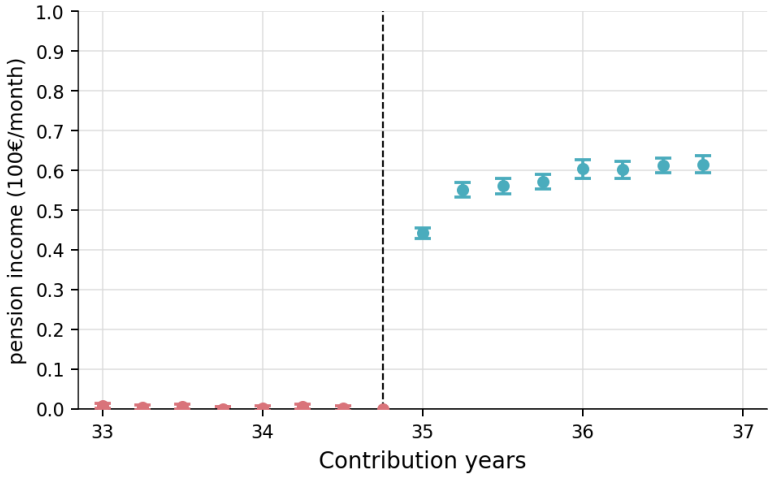
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Tables and Figures



(a) Probability of being a subsidy recipient

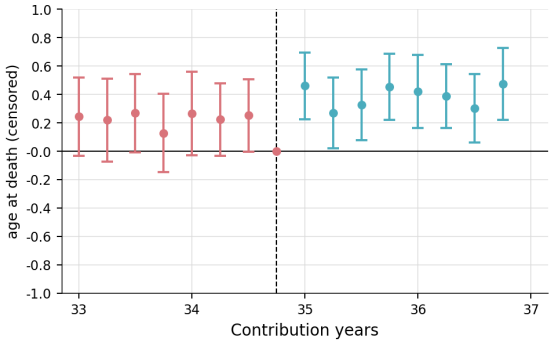
(b) Subsidy amount (100€)



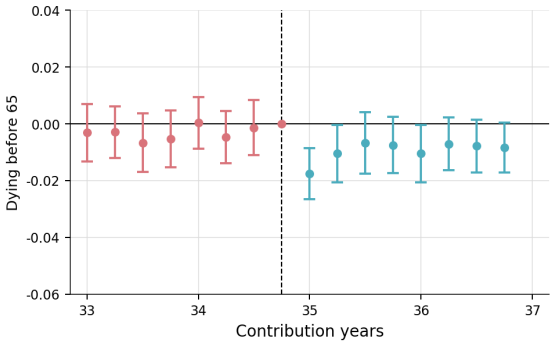
(c) Pension income (100€)

Figure 1: Event study coefficients in the baseline sample, first stage.

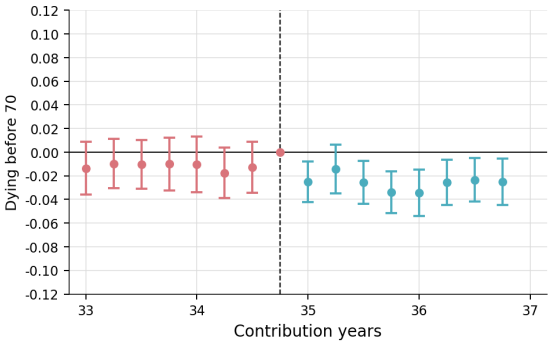
Notes: Figure 1 displays the event study coefficients for first-stage outcomes in the baseline sample. Time dimension are contribution quarters. All subfigures plot the 95 percent CI.



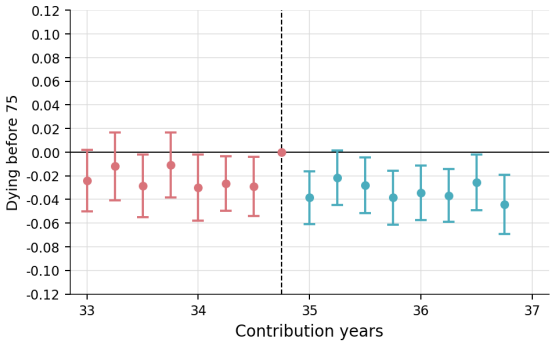
(a) Age at death



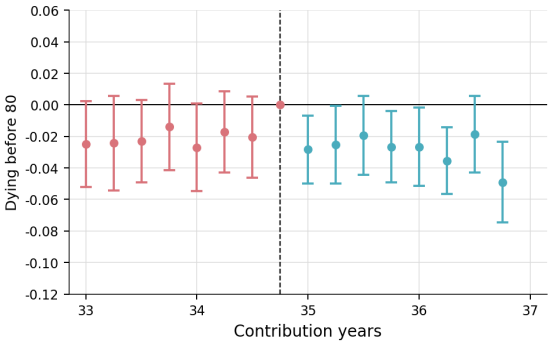
(b) Probability of dying before 65



(c) Probability of dying before 70



(d) Probability of dying before 75



(e) Probability of dying before 80

Figure 2: Event study coefficients in the baseline sample.

Notes: Figure 2 displays the event study coefficients for main mortality outcomes in the baseline sample. All subfigures plot the 95 percent CI.

Table 1: Impact of subsidy eligibility (DID estimates)

	(1)	(2)	(3)	(4)	Mean
Panel A: First stage					
Recipient	0.689***	0.688***	0.683***	0.684***	0.302
	(0.003)	(0.004)	(0.003)	(0.003)	(0.459)
	[0.000]	[0.000]	[0.000]	[0.000]	
Subsidy	0.560***	0.558***	0.554***	0.553***	0.234
	(0.007)	(0.007)	(0.007)	(0.007)	(0.462)
	[0.000]	[0.000]	[0.000]	[0.000]	
Pension income	0.253***	0.250***	0.280***	0.553***	6.948
	(0.019)	(0.019)	(0.016)	(0.007)	(2.216)
	[0.000]	[0.000]	[0.000]	[0.000]	
Panel B: Impact on mortality					
Age at death	0.305***	0.261***	0.214***	0.198***	75.691
	(0.044)	(0.044)	(0.045)	(0.045)	(5.157)
	[0.000]	[0.000]	[0.000]	[0.000]	
Dying before 65	-0.009***	-0.009***	-0.008***	-0.008***	0.039
	(0.002)	(0.002)	(0.002)	(0.002)	(0.193)
	[0.000]	[0.000]	[0.000]	[0.000]	
Dying before 70	-0.020***	-0.019***	-0.016***	-0.015***	0.177
	(0.003)	(0.003)	(0.003)	(0.003)	(0.381)
	[0.000]	[0.000]	[0.000]	[0.000]	
Dying before 75	-0.023***	-0.019***	-0.015***	-0.014***	0.358
	(0.004)	(0.004)	(0.004)	(0.004)	(0.479)
	[0.000]	[0.000]	[0.000]	[0.000]	
Dying before 80	-0.022***	-0.015***	-0.011**	-0.010**	0.604
	(0.004)	(0.004)	(0.004)	(0.004)	(0.489)
	[0.000]	[0.000]	[0.003]	[0.013]	
Obs	213,637	213,637	213,637	213,637	213,637
Contribution Quarter FE	✓	✓	✓	✓	-
Birth month-year FE		✓	✓	✓	-
Individual Characteristics			✓	✓	-
PI without subsidy				✓	-

Notes: This table shows the impact of being eligible for the pension subsidy on a list of first-stage, and mortality outcomes. Sample: RTWF baseline sample. Columns 1, 2, 3, and 4 show the results with contribution quarters fixed effects, adding birth month-year fixed effects, adding a control for male and having at least one child, and adding a continuous control for monthly pension income (PI) without subsidy, respectively. Sample means are reported in Column 5. Age at death is censored at 80 and expressed in years. Monetary values are expressed in hundred 2015 euro. Standard errors clustered at birth month-year level are in parentheses, bootstrapped p-values are in brackets. With respect to bootstrapped p-values: *** p<0.01, ** p<0.05, * p<0.1.
Source: Authors' calculations from the RTWF data.

Table 2: Heterogeneous effects (DID estimates)

		Gender		Marital status		Subsidy size		Health insurance	
	Baseline	Women	Men	Married	Not married	High	Low	Public	Private
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: First stage									
Recipient	0.684***	0.710***	0.394***	0.653***	0.742***	0.742***	0.621***	0.721***	0.365***
	(0.003)	(0.003)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.007)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Subsidy	0.553***	0.606***	0.224***	0.556***	0.547***	0.814***	0.280***	0.590***	0.256***
	(0.007)	(0.007)	(0.004)	(0.007)	(0.009)	(0.011)	(0.003)	(0.007)	(0.007)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Pension income	0.553***	0.606***	0.224***	0.556***	0.547***	0.814***	0.280***	0.590***	0.256***
	(0.007)	(0.007)	(0.004)	(0.007)	(0.009)	(0.011)	(0.003)	(0.007)	(0.007)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Panel B: Impact on mortality									
Age at death	0.198***	0.039	0.404***	0.172**	0.235**	0.299***	0.089*	0.194***	-0.038
	(0.045)	(0.052)	(0.097)	(0.058)	(0.071)	(0.049)	(0.048)	(0.048)	(0.161)
	[0.000]	[0.459]	[0.000]	[0.005]	[0.001]	[0.000]	[0.060]	[0.000]	[0.827]
Dying before 65	-0.008***	-0.001	-0.007**	-0.006**	-0.011***	-0.008***	-0.007***	-0.006**	-0.008
	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.007)
	[0.000]	[0.694]	[0.042]	[0.008]	[0.000]	[0.000]	[0.000]	[0.002]	[0.223]
Dying before 70	-0.015***	-0.003	-0.036***	-0.014**	-0.017**	-0.020***	-0.010**	-0.015**	-0.003
	(0.003)	(0.004)	(0.008)	(0.005)	(0.006)	(0.004)	(0.004)	(0.004)	(0.012)
	[0.000]	[0.484]	[0.000]	[0.003]	[0.002]	[0.000]	[0.008]	[0.001]	[0.816]
Dying before 75	-0.014***	-0.003	-0.037***	-0.014**	-0.013*	-0.023***	-0.004	-0.015***	0.007
	(0.004)	(0.005)	(0.009)	(0.005)	(0.007)	(0.005)	(0.005)	(0.005)	(0.014)
	[0.000]	[0.582]	[0.000]	[0.007]	[0.066]	[0.000]	[0.320]	[0.000]	[0.639]
Dying before 80	-0.010**	-0.005	-0.014	-0.007	-0.014**	-0.020***	0.000	-0.011**	0.013
	(0.004)	(0.004)	(0.008)	(0.005)	(0.006)	(0.004)	(0.004)	(0.004)	(0.015)
	[0.013]	[0.225]	[0.101]	[0.202]	[0.022]	[0.000]	[0.967]	[0.012]	[0.408]
Obs	213,637	148,985	64,652	135,666	77,924	176,927	173,578	186,383	19,950
Contribution Quarter FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Birth month-year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Individual Characteristics	✓	✓	✓	✓	✓	✓	✓	✓	✓
PI without subsidy	✓	✓	✓	✓	✓	✓	✓	✓	✓

Notes: This table shows heterogeneous effects of being eligible for pension subsides. Column 1 shows the impact for the baseline RTWF sample. Columns 2 and 3 show the results by gender. Columns 4 and 5 show the results by marital status observed at time of death. Columns 6 and 7 compare the impacts on individuals with aep between 0.45 and 0.61 with the impacts on individuals with aep between 0.61 and 0.75. Columns 8 and 9 show results by health insurance status. Age at death and at pension are expressed in years. Monetary values are expressed in hundreds of 2015 euro. P-values on significance in differences of point estimates for heterogeneous effects are reported in Table A.11.Standard errors clustered by birth month-year are in parentheses, bootstrapped p-values in brackets. With respect to bootstrapped p-values: *** p<0.01, ** p<0.05, * p<0.1.
Source: Authors' calculations from the RTWF data.

Table 3: Impact of subsidy eligibility on pension claiming pathways (DID estimates)

	All (1)	**Women** (2)	**Men** (3)
Panel A: Age at pension claim			
Age at claiming pension	0.004	-0.099**	0.022
	(0.020)	(0.026)	(0.033)
	[0.870]	[0.002]	[0.508]
Panel B: Pension Pathway			
Disability insurance	-0.003	-0.003	0.000
	(0.002)	(0.002)	(0.003)
	[0.139]	[0.280]	[0.934]
Disability pension	-0.017***	0.014***	-0.024***
	(0.003)	(0.003)	(0.005)
	[0.000]	[0.000]	[0.000]
Pension for unemployed	0.020***	-0.004*	0.028***
	(0.002)	(0.002)	(0.007)
	[0.000]	[0.069]	[0.000]
Women pension	-	0.017**	-
	-	(0.006)	-
	-	[0.005]	-
Pension for long-term insured	0.003*	0.005**	0.053***
	(0.002)	(0.002)	(0.006)
	[0.094]	[0.046]	[0.000]
Obs	213,637	148,985	64,652
Contribution Quarter FE	✓	✓	✓
Birth month-year FE	✓	✓	✓
Individual Characteristics	✓	✓	✓
PI without subsidy	✓	✓	✓

Notes: This table shows the impact of being eligible for the pension subsidy on retirement age (age at claiming current pension) and pension claiming pathways. All specifications control for contribution quarter fixed effects, birth month-year fixed effects, individual characteristics (male, having children) and monthly pension income without subsidy. Standard errors clustered by birth month-year are in parentheses, bootstrapped p-values in brackets. *** p<0.01, ** p<0.05, * p<0.1.
Source: Authors' calculations from the RTWF data.

Table 4: Impact of pension income on health outcomes (IV estimates)

	All		Women		Men	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: First stage						
Pension income (100€)	0.399***	0.422***	0.382***	0.393***	0.584***	0.602***
	(0.050)	(0.049)	(0.055)	(0.055)	(0.105)	(0.107)
Panel B: IV						
CASP	0.560**	0.541**	0.208	0.222	0.921*	0.852*
	(0.279)	(0.265)	(0.319)	(0.311)	(0.497)	(0.492)
Self-reported health	0.749***	0.671**	0.188	0.166	1.508***	1.408***
	(0.288)	(0.269)	(0.332)	(0.323)	(0.558)	(0.535)
Depression index†	−0.272	−0.249	0.345	0.320	−0.648	−0.582
	(0.273)	(0.260)	(0.338)	(0.329)	(0.429)	(0.420)
Number of chronic diseases	−0.501*	−0.449*	−0.119	−0.113	−1.435**	−1.311**
	(0.280)	(0.264)	(0.312)	(0.304)	(0.583)	(0.554)
Functional limitations index	−0.189	−0.189	0.278	0.265	−0.719**	−0.691**
	(0.208)	(0.201)	(0.244)	(0.237)	(0.323)	(0.326)
Observations	4,421	4,421	2,746	2,746	1,675	1,675
First stage F-stat	63.583	73.198	47.603	51.871	30.809	31.795
Contribution Year FE	✓	✓	✓	✓	✓	✓
SHARE Wave FE	✓	✓	✓	✓	✓	✓
Birth year FE	✓	✓	✓	✓	✓	✓
PI without subsidy	✓	✓	✓	✓	✓	✓
Individual Characteristics	✓	✓	✓	✓	✓	✓
Retirement age		✓		✓		✓

Notes: This table shows the effect on health outcomes of an increase in pension income of 100 euros per month. Panel A reports first-stage estimates and panel B reports the IV estimates. The instrument for pension income is an indicator for eligibility for the pension subsidy. Pension income is calculated based on total earning points at retirement. Estimates are based on standardised outcomes and thus measure effects in percent of the standard deviation from mean. All columns control for contribution year, birth year, share wave fixed effects, pension income without subsidy, and the following individual characteristics: school years, male, married, having children, interaction between having children and being in contact with them at least once a week, being a house owner. Columns (2), (4), and (6) add a retirement age control. Columns (1)-(2) show results for the baseline sample. Columns (3)-(4) and (5)-(6) show results for women and men, respectively. Monetary values are expressed in hundred 2015 euro. Standard errors clustered at individual level are in parentheses, *** p<0.01, ** p<0.05, * p<0.1.
Source: Authors' calculations from the SHARE-RV data.
† Sample size is lower for this outcome. Number of observations is 3,804 (women: 2,383), first-stage F = 62.098 (women: 47.181).

Table 5: Impact of pension income on other outcomes (IV estimates)

	All		Women		Men	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: First stage						
Pension income (100€)	0.399***	0.422***	0.382***	0.393***	0.584***	0.602***
	(0.050)	(0.049)	(0.055)	(0.055)	(0.105)	(0.107)
Panel B: IV						
(I) Financial constraints and optimism						
Lack of money stops†	−0.441	−0.433	−0.654*	−0.655**	−0.382	−0.328
	(0.280)	(0.266)	(0.341)	(0.332)	(0.472)	(0.462)
Feel full of opportunities†	0.317	0.292	−0.135	−0.133	1.186***	1.134**
	(0.248)	(0.234)	(0.297)	(0.288)	(0.454)	(0.444)
Future looks good†	0.649**	0.620**	0.476	0.470	0.888*	0.834*
	(0.261)	(0.246)	(0.309)	(0.300)	(0.465)	(0.451)
(II) Spending and activities						
Food expenditure	0.207	0.244	0.363*	0.389*	0.258	0.237
	(0.178)	(0.168)	(0.213)	(0.207)	(0.321)	(0.311)
Healthcare use index	−0.146	−0.145	0.167	0.156	−0.920***	−0.881**
	(0.227)	(0.217)	(0.286)	(0.277)	(0.356)	(0.345)
Physical activity index†	0.793***	0.727***	0.286	0.254	1.787***	1.718***
	(0.266)	(0.248)	(0.304)	(0.292)	(0.522)	(0.514)
(III) Risky behavior						
Smoking†	−0.131	−0.120	−0.034	−0.031	−0.295	−0.287
	(0.114)	(0.108)	(0.141)	(0.138)	(0.203)	(0.197)
Days/week alcohol (last 6 months)†	0.021	0.033	0.205	0.204	−0.738*	−0.691*
	(0.246)	(0.234)	(0.288)	(0.281)	(0.400)	(0.385)
Observations	4,421	4,421	2,746	2,746	1,675	1,675
First stage F-stat	63.583	73.198	47.603	51.871	30.809	31.795
Contribution Year FE	✓	✓	✓	✓	✓	✓
SHARE Wave FE	✓	✓	✓	✓	✓	✓
Birth year FE	✓	✓	✓	✓	✓	✓
PI without subsidy	✓	✓	✓	✓	✓	✓
Individual Characteristics	✓	✓	✓	✓	✓	✓
Retirement age		✓		✓		✓

Notes: This table shows the effect on health outcomes of an increase in pension income of 100 euros per month. Panel A reports first-stage estimates and panel B reports the IV estimates. The instrument for pension income is an indicator for eligibility for the pension subsidy. Pension income is calculated based on total earning points at retirement. Estimates are based on standardised outcomes and thus measure effects in percent of the standard deviation from mean. All columns control for contribution year, birth year, share wave fixed effects, pension income without subsidy, and the following individual characteristics: school years, male, married, having children, interaction between having children and being in contact with them at least once a week, being a house owner. Columns (2), (4), and (6) add a retirement age control. Columns (1)-(2) show results for the baseline sample. Columns (3)-(4) and (5)-(6) show results for women and men, respectively. Monetary values are expressed in hundred 2015 euro. Standard errors clustered at individual level are in parentheses, *** p<0.01, ** p<0.05, * p<0.1.
Source: Authors' calculations from the SHARE-RV data.
† Sample size is lower for these outcomes. Lowest number of observations is 2,765 (women: 1,719). Lowest first-stage F-stat is 57.607.

Live Longer and Healthier: Impact of Pension Income for Low-Income Retirees

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A Appendix Figures and Tables

Figures

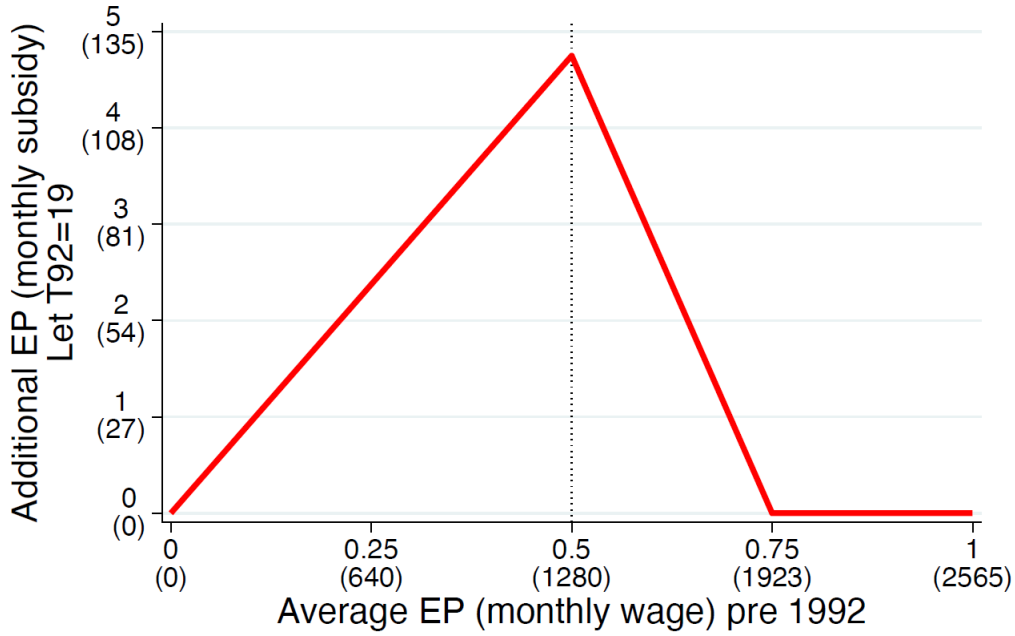
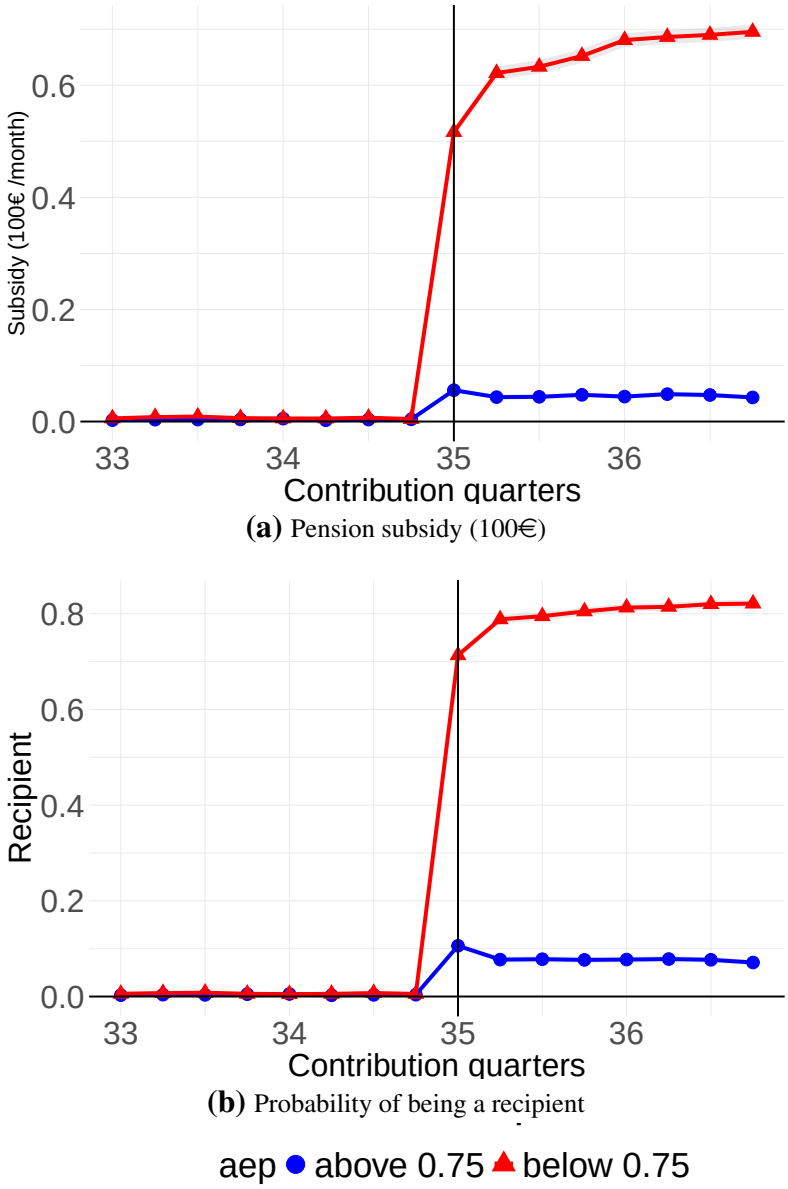


Figure A.1: Relationship between subsidy size and aep^{92}.

Notes: Figure A.1 displays the relationship between subsidy size and average earning points before 1992, in the case of an individual that contributed 19 years to the pension system before 1992. Horizontal axis indicates aep^{92} and corresponding monthly wage in parenthesis, while vertical axis indicates the additional earning points the individual is entitled to from the subsidy program, and the corresponding monetary subsidy amount (in 2015€) in parenthesis.

Source: Figure 1 in Ye (2022).



(a) Pension subsidy (100€)

(b) Probability of being a recipient

Figure A.2: First stage: mean probability of being a recipient and amount of pension subsidy by contribution years.

Notes: Figure A.2 displays the mean amount of pension subsidy (panel (a)) and the mean probability of being a subsidy recipient (panel (b)) by number of contribution years. Within the baseline sample, "$aep \geq 0.75$" (blue circles) indicates individuals with aep between 0.75 and 1.05 (pension benefits between 1050 and 1500€/month) while "$aep < 0.75$" (red triangles) indicates individuals with aep between 0.45 and 0.75 (pension benefits between 600 and 1050€/month). Monetary values are expressed in hundred 2015 euro. The shadowed areas indicate the normally distributed 95% confidence interval.

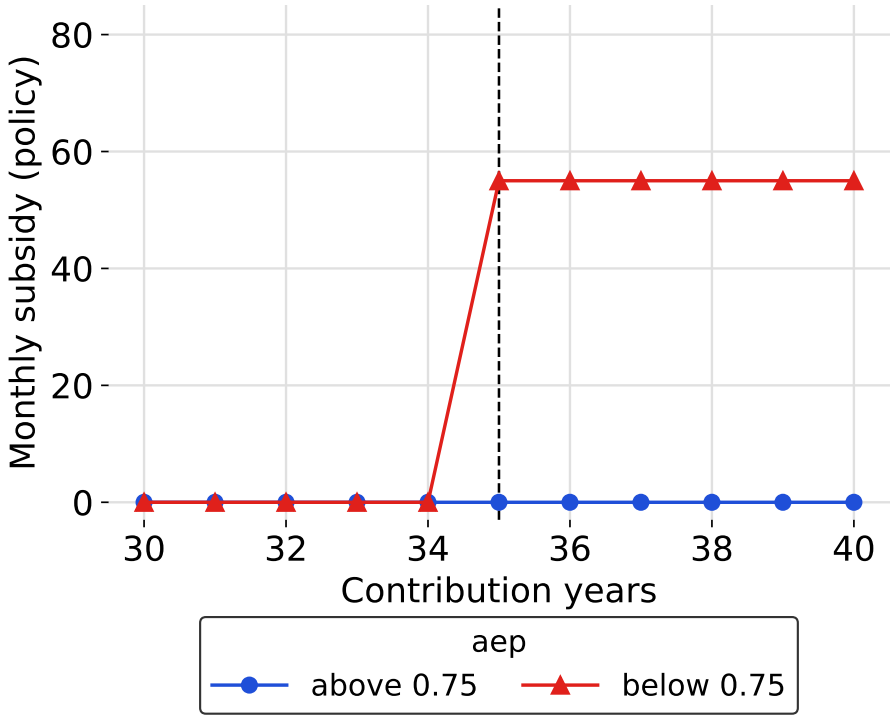
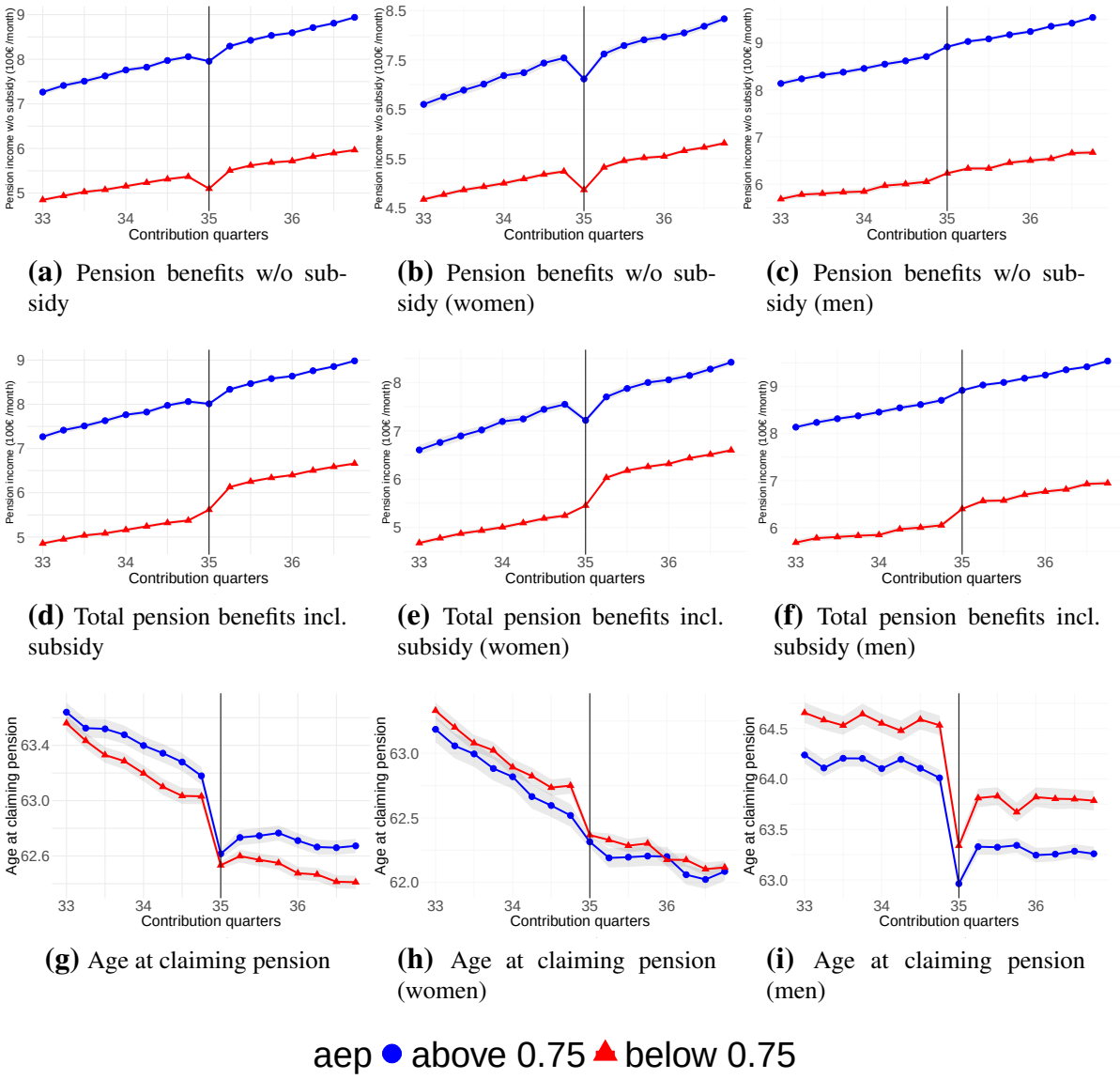


Figure A.3: Policy schedule of subsidy size by contribution years and by treatment status

Notes: Figure A.3 displays the pension subsidy schedule by contribution years and by treatment status according to the policy. The control group (blue dots) consists of pensioners with average earnings points at retirement higher than 0.75 and lower than 1.05, while the treatment group (red triangles) consists of pensioners with average earnings points at retirement between 0.45 and 0.75. The average monthly subsidy of 55 euro is the sample mean for treated pensioners with 34 to 36 years of contributions.



(a) Pension benefits w/o subsidy

(b) Pension benefits w/o subsidy (women)

(c) Pension benefits w/o subsidy (men)

(d) Total pension benefits incl. subsidy

(e) Total pension benefits incl. subsidy (women)

(f) Total pension benefits incl. subsidy (men)

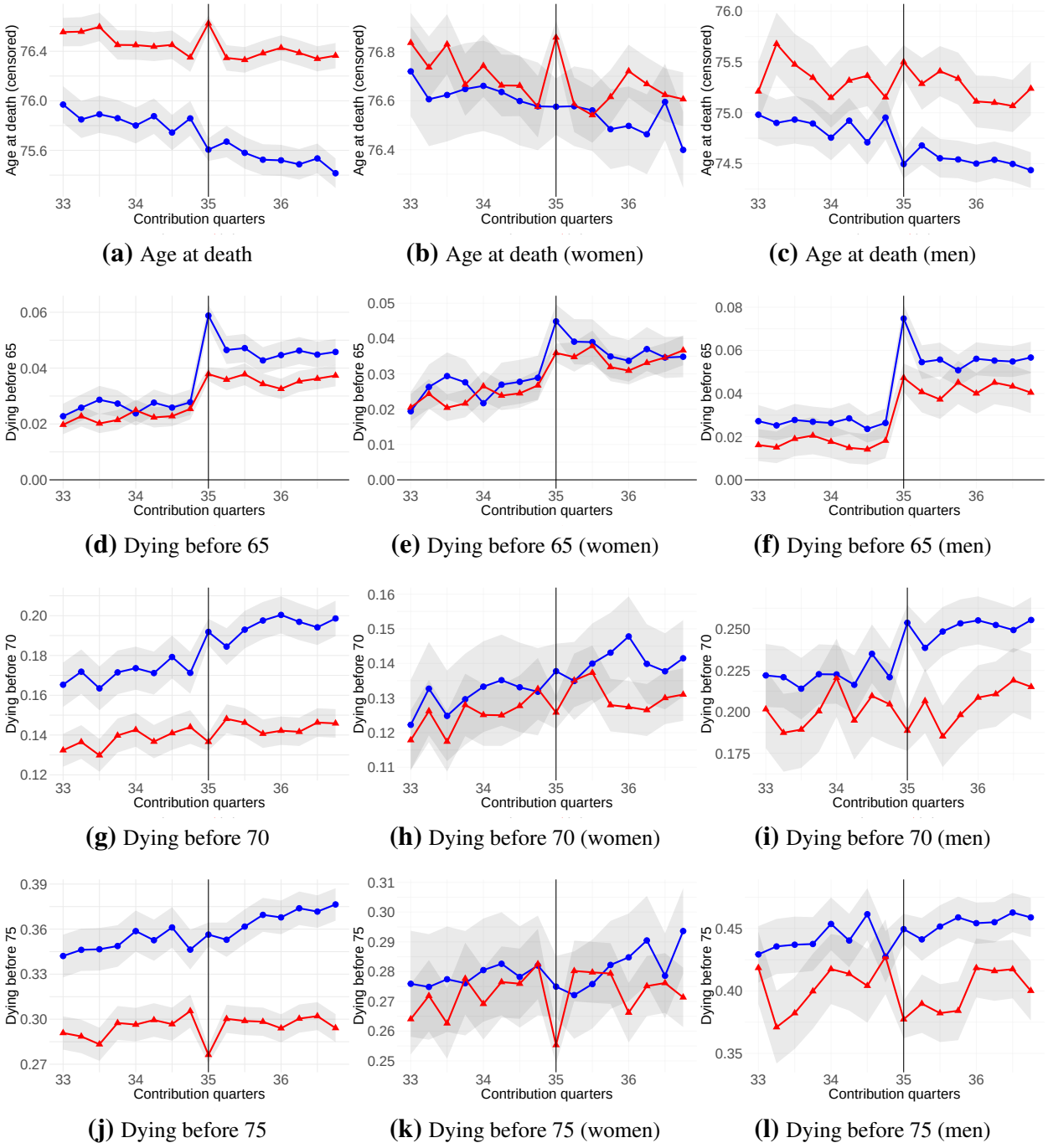
(g) Age at claiming pension

(h) Age at claiming pension (women)

(i) Age at claiming pension (men)

Figure A.4: Scatter plot of pension income and age at claiming over contribution years by treatment status by gender

Notes: Figure A.4 displays the pension benefits with and without subsidy and age at claiming pension by treatment over contribution years by gender. The blue circles indicate individuals with aep between 0.75 and 1.05 (pension benefits between 720 and 1000€/month), while the red triangles indicate individuals with aep between 0.45 and 0.75 (pension benefits between 430 and 720€/month). Monetary values are expressed in hundred 2015 euro. The shadowed areas indicate the normally distributed 95% confidence interval.



(a) Age at death **(b)** Age at death (women) **(c)** Age at death (men)

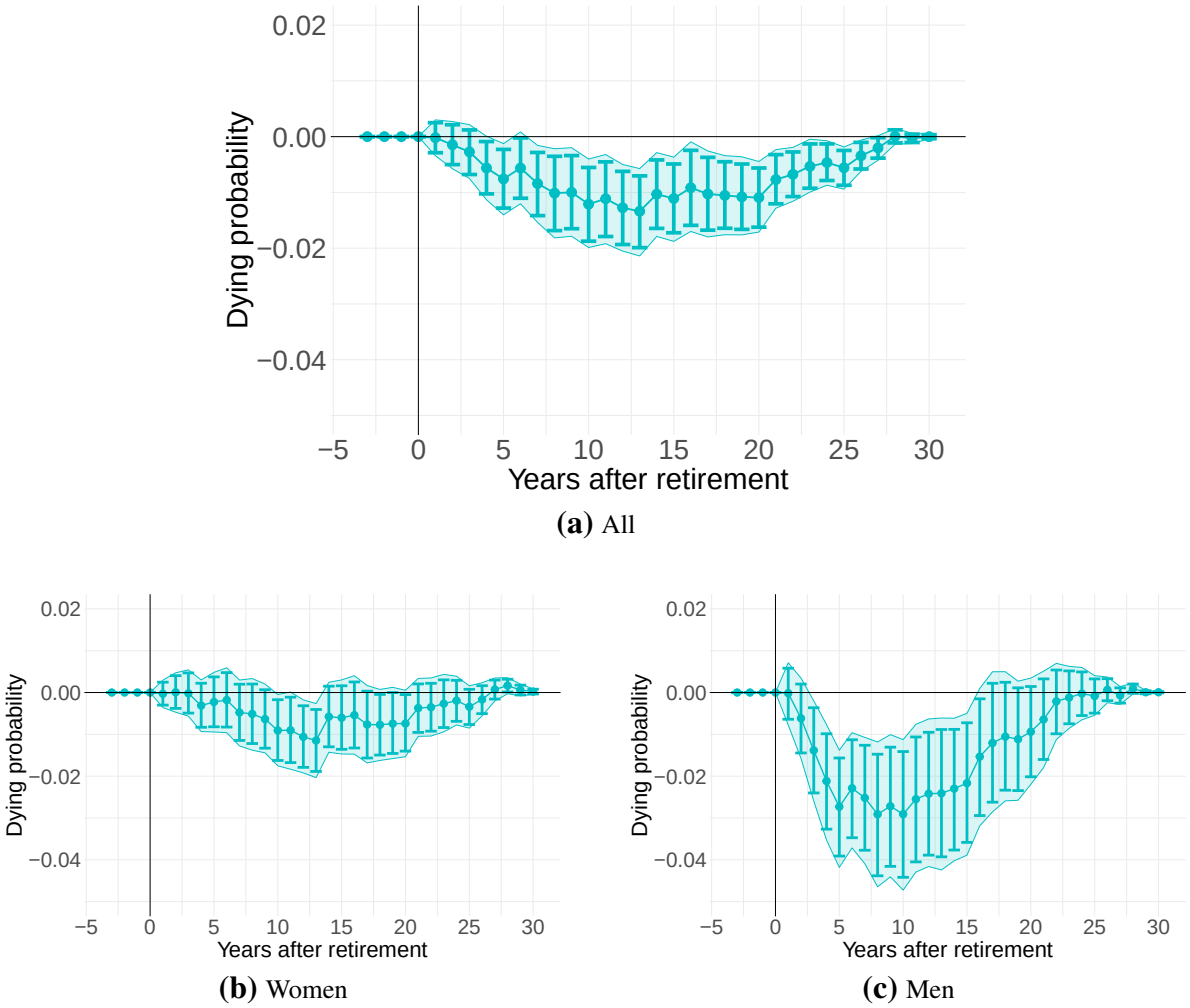
(d) Dying before 65 **(e)** Dying before 65 (women) **(f)** Dying before 65 (men)

(g) Dying before 70 **(h)** Dying before 70 (women) **(i)** Dying before 70 (men)

(j) Dying before 75 **(k)** Dying before 75 (women) **(l)** Dying before 75 (men)

Figure A.5: Scatter plot of mortality outcomes over contribution years by treatment status by gender

Notes: Figure A.5 displays the mean mortality outcomes over contribution years by *aep* group by gender. The shadowed areas indicate the normal 95% confidence interval.



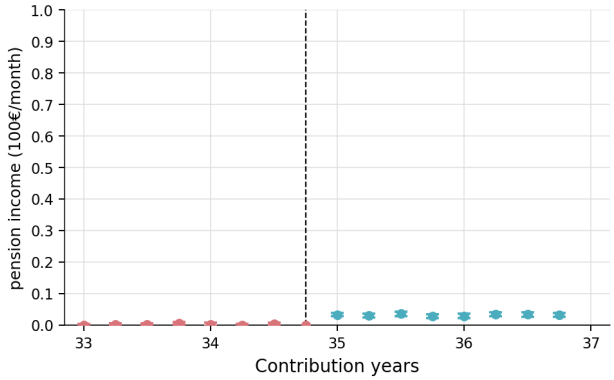
(a) All

(b) Women

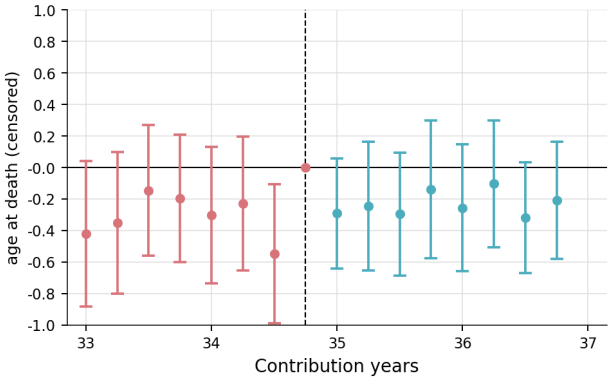
(c) Men

Figure A.6: Effect of eligibility on the probability of dying after retirement

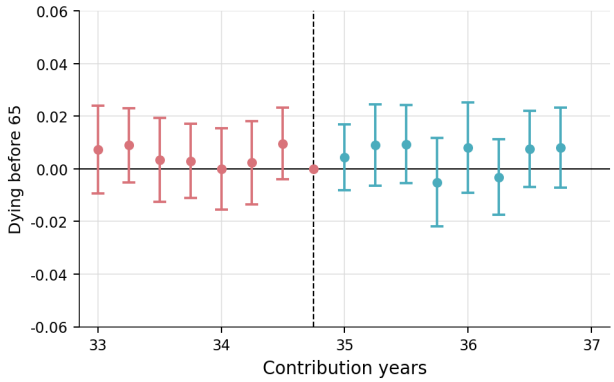
Notes: Figure A.6 shows the reduced-form impact of eligibility for the a subsidy on the probability of dying within each year after retirement. That is, the probability of dying within the first, second, third, ..., 29th, and 30th year after retirement. All figures show the 95 percent CI (shaded area) and the 90 percent CI (solid line).



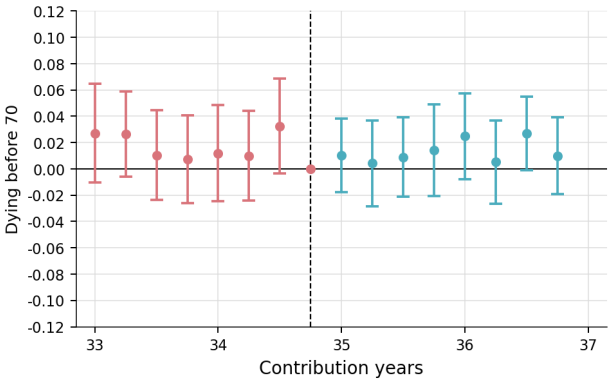
(a) Subsidy amount (100€)



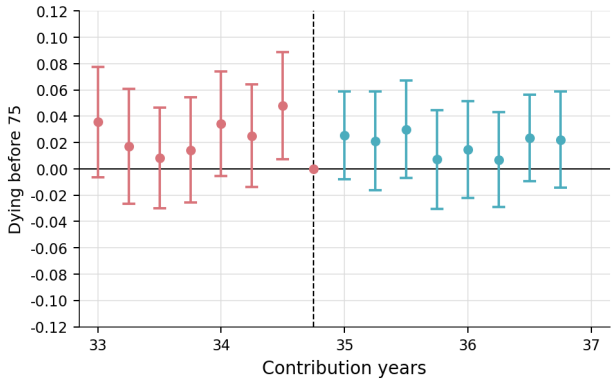
(b) Age at death



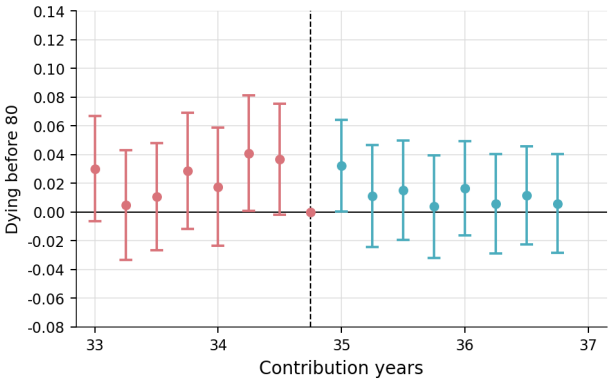
(c) Probability of dying before 65



(d) Probability of dying before 70



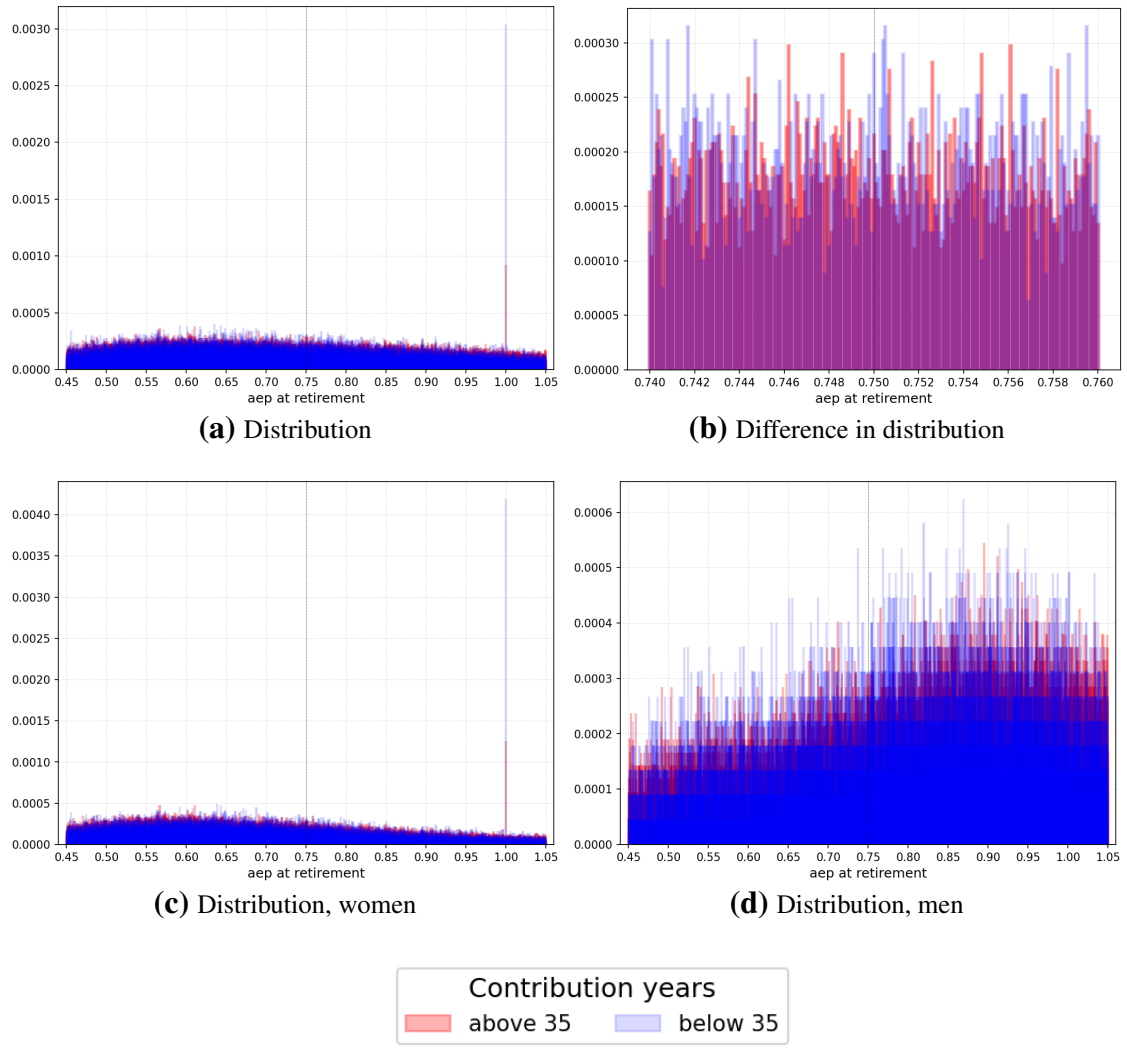
(e) Probability of dying before 75



(f) Probability of dying before 80

Figure A.7: Placebo checks: event study coefficients in the $aep \in$ (0.8-1.25) placebo sample.

Notes: Figure A.7 displays the event study coefficients for pension income (first stage) and mortality outcomes in the $aep \in$ (0.8-1.25) placebo sample. Placebo cut-off at $aep = 1$. All subfigures plot the 95 percent CI (shadowed line) and 90 percent CI (solid line).



(a) Distribution

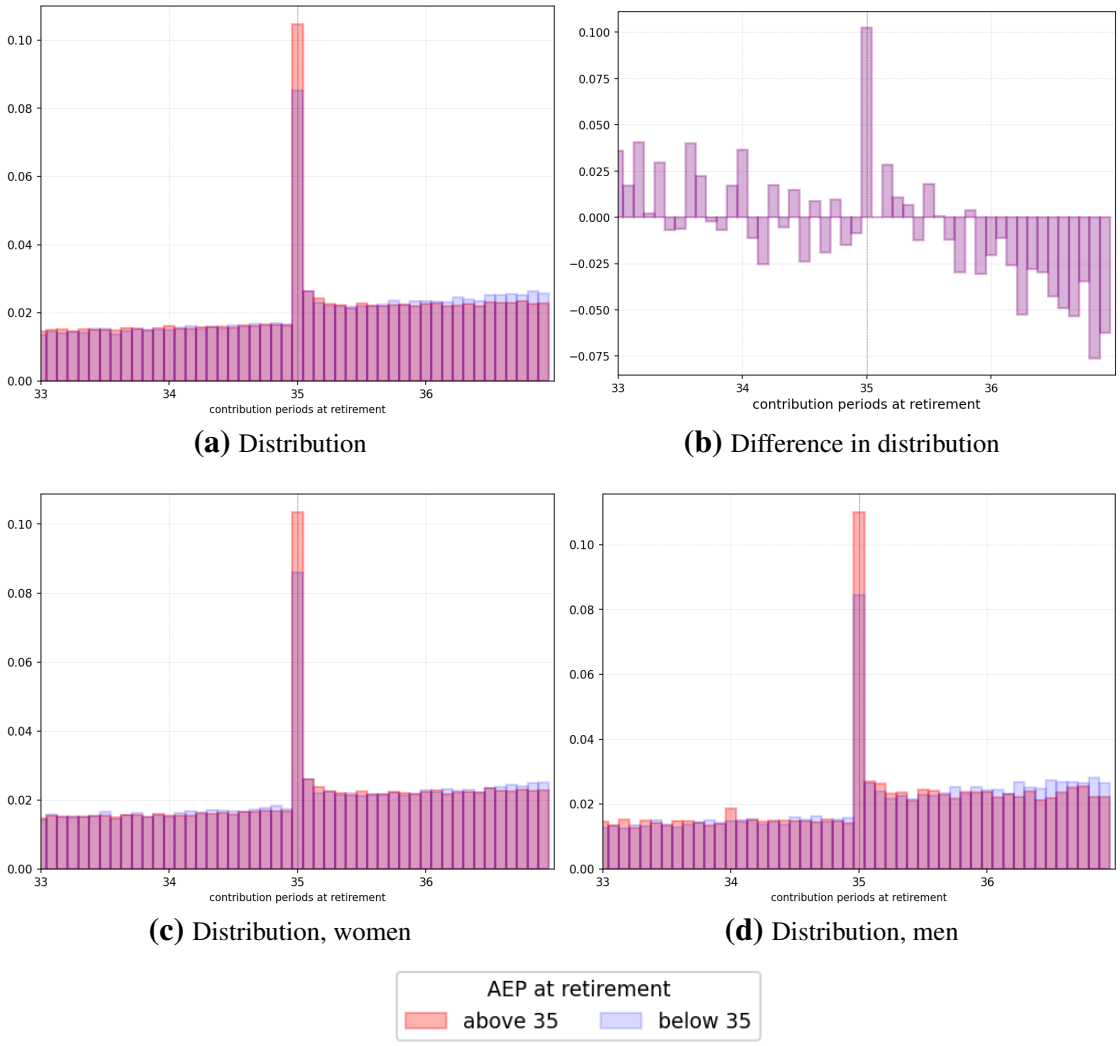
(b) Difference in distribution

(c) Distribution, women

(d) Distribution, men

Figure A.8: Distribution of aep by contribution years above / below 35, full sample and by gender

Notes: Figure A.8 (a) displays the distribution of aep for groups with contribution years above ("above 35", red) and below 35 ("below 35", blue) in the baseline sample. Figure A.8 (b) depicts the difference in density between the "above 35" and the "below 35" group. Figure A.8 (c) and (d) display the distribution for women and men.



(a) Distribution

(b) Difference in distribution

(c) Distribution, women

(d) Distribution, men

Figure A.9: Distribution of contribution years by aep below and above 0.75, full sample and by gender

Notes: Figure A.9 (a) displays the distribution of contribution years for groups with aep above (blue) and below 0.75 (red) in the baseline sample. Figure A.9 (b) shows the difference in distribution between below 0.75 and above 0.75 groups. Figures (c) and (d) display the distribution for women and men.

Tables

Table A.1: Sample selection.

	From full RTWF sample to baseline		
	All	Women	Men
	(1)	(2)	(3)
Eligibility ($D \times Above35$)	-0.003***	-0.004***	-0.000
	(0.000)	(0.001)	(0.000)
aep< 0.75	0.003***	0.002***	0.004***
	(0.000)	(0.000)	(0.000)
CY$>$35	-0.166***	-0.242***	-0.092***
	(0.009)	(0.013)	(0.006)
Obs.	15,466,731	5,420,712	10,046,019
Adj. R-sqr	0.229	0.313	0.139
Contribution Quarter FE	✓	✓	✓
Birth month-year FE	✓	✓	✓
Individual Characteristics	✓	✓	✓
PI without subsidy	✓	✓	✓

Notes: Baseline sample defined as: residing in West Germany, holding German nationality, perceiving old-age pension, cohorts 1934 - 1944, aep_i between 0.45 and 1.05, contribution years between 33 and 36. Full sample includes anyone who died after age 60 while claiming or contributing to any pension, and born after 1900. Individual Characteristics include a gender and having children indicator. Monetary values are expressed in hundred 2015 euro. Standard errors clustered by birth month-year are in parentheses, bootstrapped p-values are in brackets. With respect to bootstrapped p-values: *** p<0.01, ** p<0.05, * p<0.1. *Source*: Authors' calculations from the RTWF data.

Table A.2: Summary statistics (RTWF)

	West German Pensioners			Cohorts 1934 - 1944			Baseline Sample		
	Mean	Std.Dev.	N	Mean	Std.Dev.	N	Mean	Std.Dev.	N
Mortality outcomes									
Age at death	75.47	5.29	7,245,634	75.75	5.11	3,876,548	75.69	5.16	213,637
Dying before 65	0.04	0.19	7,245,634	0.04	0.19	3,876,548	0.04	0.19	213,637
Dying before 70	0.20	0.40	7,245,634	0.17	0.38	3,876,548	0.18	0.38	213,637
Dying before 75	0.38	0.49	7,245,634	0.35	0.48	3,876,548	0.36	0.48	213,637
Dying before 80	0.59	0.49	7,245,634	0.60	0.49	3,876,548	0.60	0.49	213,637
Pension income and subsidy related variables									
Pension income (PI, 100€)	9.70	5.94	7,245,560	10.36	5.85	3,876,548	6.95	2.22	213,637
Subsidy (100€)†	1.09	0.76	970,245	1.08	0.70	529,280	0.77	0.54	64,597
Subsidy recipient	0.13	0.34	7,245,634	0.14	0.34	3,876,548	0.30	0.46	213,637
PI w/o subsidy (100€)	9.55	5.99	7,245,560	10.21	5.92	3,876,548	6.71	2.27	213,637
Pension related characteristics									
CY	36.18	11.15	7,245,634	37.07	10.83	3,876,548	35.16	1.09	213,637
CY$\geq$35	0.64	0.48	7,245,634	0.69	0.46	3,876,548	0.63	0.48	213,637
aep	0.91	0.33	7,245,634	0.95	0.32	3,876,548	0.72	0.16	213,637
aep$<$0.75	0.35	0.48	7,245,634	0.30	0.46	3,876,548	0.57	0.49	213,637
CY$\geq$35 & aep$<$0.75	0.16	0.37	7,245,634	0.15	0.36	3,876,548	0.36	0.48	213,637
Age at claiming pension	63.75	2.96	7,245,634	63.05	2.54	3,876,548	62.80	2.30	213,637
% claim disability pension	0.12	0.33	7,245,634	0.14	0.35	3,876,548	0.14	0.34	213,637
% claim unemployment pension	0.12	0.33	7,245,634	0.17	0.38	3,876,548	0.07	0.26	213,637
% claim women pension	0.11	0.31	7,245,634	0.15	0.36	3,876,548	0.29	0.46	213,637
% claim disability insurance first	0.03	0.16	6,418,999	0.03	0.17	3,592,129	0.04	0.18	197,139
% claim old-age pension first	0.97	0.17	6,418,999	0.97	0.18	3,592,129	0.96	0.20	197,139
Individual characteristics									
Birth year	1,936.98	6.96	7,245,634	1,938.17	2.96	3,876,548	1,938.08	2.96	213,637
% male	0.55	0.50	7,245,634	0.58	0.49	3,876,548	0.30	0.46	213,637
% married	0.66	0.48	7,245,634	0.71	0.45	3,876,548	0.64	0.48	213,637
Number of children*	2.01	1.41	3,234,404	1.97	1.36	1,628,000	2.12	1.39	148,985
% private health insurance	0.11	0.31	7,245,634	0.11	0.31	3,876,548	0.09	0.29	213,637
% public health insurance	0.84	0.36	7,245,634	0.85	0.36	3,876,548	0.87	0.33	213,637
% private LTC insurance	0.02	0.13	7,245,634	0.01	0.10	3,876,548	0.01	0.09	213,637
% public LTC insurance	0.84	0.37	7,245,634	0.85	0.36	3,876,548	0.87	0.33	213,637

Notes: Table A.2 reports descriptive statistics for the *West German Pensioners* sample, the *1934-1944* sample and the *baseline* sample. *West German Pensioners* sample restricts to those who died between 1992 and 2024 and were residing in West Germany, holding German citizenship and claiming old-age pension at time of death. *1934-1944* sample further restricts to individuals born between 1934 and 1944. *Baseline* sample further adds aep (average earning points from full contribution periods) and contribution years (CY) restrictions, respectively to the bandwidths of 0.45 - 1.05 and 33 - 36. Age at death is censored at age 80. Number of children is imputed from child-benefits claims.
† conditional on being a recipient. * only reported for women in the sample.
Source: Authors' calculations from the RTWF data.

Table A.3: Definition main outcomes in SHARE-RV data.

	Definition	Scale	Standardized
I) General Health			
CASP	Quality-of-life scale for early old-age individuals considering both mental and physical health.	0-57, the higher the better	Yes
Self-reported health	Self-reported evaluation of own's health.	0 (Poor) - 4 (Excellent)	Yes
Depression index	EURO-D Measure of Depressive Symptoms in the Aging Population, measured as number of reported symptoms of depression.	0 (no symptoms) - 12	Yes
Number of chronic diseases	Number of chronic diseases currently treated for: heart attack, high blood pressure, high blood cholesterol, stroke, diabetes, chronic lung disease, cancer, ulcer, parkinson, cataracts, hip femoral fracture.	0 - 11	Yes
Functional limitations	Index combining difficulties with Activities of Daily Living (ADLs) and Instrumental Activities of Daily Living (IADLs).	Combined à la Anderson (2008)	Yes
II) Financial constraints and optimism			
Low money stops	How often does money stop from doing things.	0 (never) - 3 (often)	Yes
Full of opportunities	How often feels life is full of opportunities.	0 (never) - 3 (often)	Yes
Future looks good	How often future looks good.	0 (never) - 3 (often)	Yes
III) Spending and activities			
Healthcare utilization	Index combining hospital overnight stays, number and length of hospital stays, nursing home use, professional home care, and doctor visits (winsorized at the 99th percentile).	Combined à la Anderson (2008)	Yes
Food expenditure	Spending on food at home and outside the home.	100€/month	Yes
Physical activity	Index of frequency of vigorous and moderate physical activity (higher = more active).	Combined à la Anderson (2008)	Yes
IV) Risky behaviors			
Days/week alcohol	How many days per week consumed alcohol in the past six months.	1 - 7	Yes
Smoking	Regular smoker at the time of the interview.	0 - 1	No

Notes: Table A.3 describes main output variables used from the SHARE-RV. The "Standardized" column indicates whether the variable is standardized (mean 0, standard deviation 1) prior to estimation; binary probability outcomes are kept on their 0-1 scale. Combined indices (functional limitations, healthcare utilization, food consumption, physical activity) are built as the missing-tolerant average of their standardized (z-scored) components, following Anderson (2008).
Source: SHARE data documentation.

Table A.4: Summary statistics (SHARE-RV)

	West German Pensioners			SHARE-RV Sample			RTWF Sample		
	Mean	Std.Dev.	N	Mean	Std.Dev.	N	Mean	Std.Dev.	N
Outcome variables									
Health measures									
CASP	39.42	5.33	6,747	39.08	5.39	4,421	38.17	5.92	383
Self-reported health	1.72	0.97	6,747	1.67	0.96	4,421	1.60	1.01	383
Depression index	2.22	1.93	5,820	2.33	1.96	3,804	2.50	2.05	339
Number of chronic diseases	1.46	1.29	6,747	1.45	1.30	4,421	1.59	1.50	383
Functional limitations index									
Difficulties with ADLAs	0.19	0.68	6,747	0.18	0.64	4,421	0.27	0.76	383
Difficulties with IADLAs	0.05	0.29	6,747	0.04	0.27	4,421	0.05	0.31	383
Feelings measures									
Lack of money stops	0.93	1.03	6,607	1.01	1.06	4,343	0.98	1.11	366
Feel full of opportunities	2.25	0.85	6,607	2.21	0.86	4,343	2.07	0.93	366
Future looks good	2.22	0.85	6,607	2.18	0.86	4,343	2.08	0.88	366
Consumption									
Food expenditure	9.77	6.21	6,747	8.93	5.46	4,421	8.80	5.44	383
Healthcare use index									
Hospital overnight stays	0.22	0.41	6,745	0.21	0.41	4,420	0.22	0.41	382
Times in hospital	0.33	0.81	6,744	0.34	0.83	4,419	0.38	0.97	382
Nights in hospital	2.52	10.28	6,742	2.60	10.71	4,418	3.04	11.26	381
How often seen a doctor	8.48	12.66	6,735	8.69	13.84	4,411	9.80	20.99	382
Professional home care	0.03	0.18	6,190	0.03	0.17	4,075	0.08	0.28	335
Physical activity index									
Vigorous physical activities	2.48	1.32	5,849	2.54	1.33	3,823	2.62	1.31	339
Moderate physical activities	1.46	0.90	5,851	1.48	0.91	3,823	1.53	0.95	339
Risky behaviors									
Days/week alcohol*	2.69	2.06	4,259	2.53	1.97	2,765	2.51	1.88	248
Smoking	0.13	0.34	4,343	0.15	0.36	2,824	0.11	0.31	252
Pension income (PI) and subsidy									
PI (100€/month)	10.23	6.34	6,747	8.99	4.51	4,421	8.51	2.04	383
PI without subsidy (100€)	10.12	6.39	6,747	8.83	4.57	4,421	8.00	2.19	383
Subsidy (100€/month)	0.11	0.36	6,747	0.16	0.42	4,421	0.51	0.66	383
Subsidy recipient	0.13	0.34	6,747	0.19	0.39	4,421	0.46	0.50	383
Pension related characteristics									
CY	34.09	14.13	6,747	35.07	11.99	4,421	35.48	2.94	383
CY>35	0.60	0.49	6,747	0.59	0.49	4,421	0.58	0.49	383
aep	0.96	0.38	6,747	0.82	0.25	4,421	0.71	0.17	383
aep<0.75	0.34	0.47	6,747	0.43	0.50	4,421	0.62	0.49	383
aep in 1992	0.90	0.37	6,258	0.79	0.28	4,186	0.70	0.24	375
Age at claiming pension	63.51	2.36	6,747	63.30	2.14	4,421	61.92	2.07	383
Self-reported retirement age	62.82	2.86	1,628	62.81	2.87	1,121	61.16	3.55	67
Individual and household characteristics									
Birth year	1943.91	6.68	6,747	1945.28	6.09	4,421	1940.26	2.66	383
Age	71.29	6.78	6,747	70.07	6.30	4,421	73.72	5.09	383
% male	0.49	0.50	6,747	0.38	0.49	4,421	0.23	0.42	383
% married	0.78	0.41	6,747	0.78	0.42	4,421	0.68	0.47	383
Number of children	1.18	1.42	6,747	1.38	1.42	4,421	1.89	1.60	383
% contacts children $\geq$ 1/week	0.46	0.50	6,747	0.45	0.50	4,421	0.49	0.50	383
Months unemployed bf 1992	4.37	10.50	6,747	5.42	11.73	4,421	6.30	13.47	383
Months sickness bf 1992	1.53	4.53	6,747	1.86	5.16	4,421	2.09	5.26	383
Years of schooling	12.22	3.42	6,747	11.73	3.03	4,421	11.11	2.82	383
Own a house	0.41	0.49	6,747	0.39	0.49	4,421	0.35	0.48	383
Pension/household income	0.39	0.26	4,840	0.38	0.24	3,144	0.41	0.22	275

Notes: Table A.4 reports descriptive statistics for the SHARE-RV sample. *West German Pensioners* sample includes old-age German retirees residing in West Germany. *Baseline* sample further restricts to those born after 1934, with 15 to 55 contribution years (CY) and average earning points at retirement (aep) between 0.25 and 1.25. SHARE-RV *Restricted* sample uses the same restrictions as the RTWF baseline sample. * Refers to previous six months.
Source: Authors' calculations from the SHARE-RV data.

Table A.5: Summary statistics by gender (SHARE-RV sample)

	All			Women			Men		
	Mean	Std.Dev.	N	Mean	Std.Dev.	N	Mean	Std.Dev.	N
Outcome variables									
Health measures									
CASP	39.08	5.39	4,421	39.15	5.31	2,746	38.95	5.52	1,675
Self-reported health	1.67	0.96	4,421	1.69	0.96	2,746	1.63	0.96	1,675
Depression index	2.33	1.96	3,804	2.55	1.98	2,383	1.95	1.86	1,421
Number of chronic diseases	1.45	1.30	4,421	1.39	1.25	2,746	1.56	1.37	1,675
Functional limitations index									
Difficulties with ADLAs	0.18	0.64	4,421	0.18	0.64	2,746	0.19	0.63	1,675
Difficulties with IADLAs	0.04	0.27	4,421	0.03	0.24	2,746	0.06	0.31	1,675
Feelings measures									
Lack of money stops	1.01	1.06	4,343	1.00	1.05	2,702	1.03	1.08	1,641
Feel full of opportunities	2.21	0.86	4,343	2.24	0.84	2,702	2.17	0.88	1,641
Future looks good	2.18	0.86	4,343	2.19	0.84	2,702	2.17	0.89	1,641
Consumption									
Food expenditure	8.93	5.46	4,421	8.74	5.45	2,746	9.26	5.47	1,675
Healthcare use index									
Hospital overnight stays	0.21	0.41	4,420	0.19	0.40	2,745	0.25	0.43	1,675
Times in hospital	0.34	0.83	4,419	0.29	0.76	2,744	0.40	0.92	1,675
Nights in hospital	2.60	10.71	4,418	2.20	9.29	2,743	3.27	12.66	1,675
How often seen a doctor	8.69	13.84	4,411	8.48	13.10	2,737	9.03	14.98	1,674
Professional home care	0.03	0.17	4,075	0.03	0.17	2,532	0.03	0.18	1,543
Physical activity index									
Vigorous physical activities	2.54	1.33	3,823	2.51	1.33	2,389	2.58	1.32	1,434
Moderate physical activities	1.48	0.91	3,823	1.45	0.88	2,389	1.53	0.94	1,434
Risky behaviors									
Days/week alcohol*	2.53	1.97	2,765	2.28	1.79	1,719	2.93	2.18	1,046
Smoking	0.15	0.36	2,824	0.14	0.35	1,752	0.17	0.38	1,072
Pension income (PI) and subsidy									
PI (100€/month)	8.99	4.51	4,421	7.40	3.79	2,746	11.61	4.38	1,675
PI without subsidy (100€)	8.83	4.57	4,421	7.17	3.78	2,746	11.55	4.44	1,675
Subsidy (100€/month)	0.16	0.42	4,421	0.22	0.46	2,746	0.06	0.32	1,675
Subsidy recipient	0.19	0.39	4,421	0.28	0.45	2,746	0.05	0.22	1,675
Pension related characteristics									
CY	35.07	11.99	4,421	31.44	11.59	2,746	41.04	10.08	1,675
CY>35	0.59	0.49	4,421	0.45	0.50	2,746	0.82	0.39	1,675
aep	0.82	0.25	4,421	0.73	0.21	2,746	0.97	0.22	1,675
aep<0.75	0.43	0.50	4,421	0.60	0.49	2,746	0.16	0.36	1,675
aep in 1992	0.79	0.28	4,186	0.64	0.21	2,572	1.01	0.22	1,614
Age at claiming pension	63.30	2.14	4,421	63.18	2.28	2,746	63.50	1.86	1,675
Self-reported retirement age	62.81	2.87	1,121	62.71	2.88	708	62.97	2.83	413
Individual and household characteristics									
Birth year	1945.28	6.09	4,421	1945.78	6.03	2,746	1944.47	6.10	1,675
Age	70.07	6.30	4,421	69.66	6.27	2,746	70.74	6.30	1,675
% male	0.38	0.49	4,421	0.00	0.00	2,746	1.00	0.00	1,675
% married	0.78	0.42	4,421	0.75	0.44	2,746	0.82	0.38	1,675
Number of children	1.38	1.42	4,421	2.18	1.20	2,746	0.08	0.45	1,675
% contacts children $\geq$ 1/week	0.45	0.50	4,421	0.48	0.50	2,746	0.40	0.49	1,675
Months unemployed bf 1992	5.42	11.73	4,421	5.41	10.65	2,746	5.45	13.31	1,675
Months sickness bf 1992	1.86	5.16	4,421	1.66	4.94	2,746	2.19	5.49	1,675
Years of schooling	11.73	3.03	4,421	11.50	3.02	2,746	12.11	3.00	1,675
Own a house	0.39	0.49	4,421	0.39	0.49	2,746	0.37	0.48	1,675
Pension/household income	0.38	0.24	3,144	0.32	0.21	2,001	0.49	0.25	1,143

Notes: Table A.5 reports descriptive statistics by gender for the SHARE-RV *baseline* sample: old-age German retirees residing in West Germany, born after 1934, with 15 to 55 contribution years (CY) and average earning points at retirement (aep) between 0.25 and 1.25. * Refers to previous six months.
Source: Authors' calculations from the SHARE-RV data.

Table A.6: Event study estimates in baseline sample.

	(aep<0.75) × quarters of contribution														
	33Q1	33Q2	33Q3	33Q4	34Q1	34Q2	34Q3	35Q1	35Q2	35Q3	35Q4	36Q1	36Q2	36Q3	36Q4
Panel A: First Stage															
Recipient	0.005*	0.000	0.004	−0.004	−0.001	0.004	0.000	0.585***	0.694***	0.697***	0.711***	0.720***	0.715***	0.725***	0.734***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.006)	(0.006)	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
	[0.070]	[0.918]	[0.174]	[0.183]	[0.684]	[0.191]	[0.885]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Subsidy	0.008**	0.004	0.005*	−0.001	0.000	0.005	0.001	0.442***	0.551***	0.560***	0.571***	0.603***	0.601***	0.612***	0.615***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.006)	(0.010)	(0.010)	(0.009)	(0.012)	(0.011)	(0.009)	(0.011)
	[0.018]	[0.280]	[0.078]	[0.876]	[0.927]	[0.119]	[0.776]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Pension income	0.008**	0.004	0.005*	−0.001	0.000	0.005	0.001	0.442***	0.551***	0.560***	0.571***	0.603***	0.601***	0.612***	0.615***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.006)	(0.010)	(0.010)	(0.009)	(0.012)	(0.011)	(0.009)	(0.011)
	[0.018]	[0.280]	[0.078]	[0.876]	[0.927]	[0.119]	[0.776]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Panel B: Impact on Mortality															
Age at death	0.244*	0.219	0.269*	0.129	0.267*	0.223*	0.253**	0.460***	0.270**	0.325**	0.454***	0.422**	0.388***	0.303**	0.475***
	(0.141)	(0.149)	(0.141)	(0.141)	(0.150)	(0.130)	(0.130)	(0.119)	(0.127)	(0.127)	(0.118)	(0.131)	(0.114)	(0.124)	(0.130)
	[0.078]	[0.141]	[0.064]	[0.374]	[0.075]	[0.084]	[0.047]	[0.000]	[0.035]	[0.013]	[0.000]	[0.001]	[0.000]	[0.013]	[0.000]
Dying before 65	−0.003	−0.003	−0.007	−0.005	0.000	−0.005	−0.001	−0.018***	−0.010*	−0.007	−0.008	−0.010**	−0.007	−0.008*	−0.008*
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)
	[0.543]	[0.535]	[0.261]	[0.315]	[0.935]	[0.322]	[0.783]	[0.000]	[0.054]	[0.216]	[0.151]	[0.042]	[0.142]	[0.090]	[0.062]
Dying before 70	−0.014	−0.010	−0.010	−0.010	−0.010	−0.017	−0.013	−0.025**	−0.014	−0.025**	−0.034***	−0.034***	−0.025**	−0.023**	−0.025**
	(0.011)	(0.011)	(0.011)	(0.011)	(0.012)	(0.011)	(0.011)	(0.009)	(0.011)	(0.009)	(0.009)	(0.010)	(0.010)	(0.009)	(0.010)
	[0.251]	[0.373]	[0.350]	[0.389]	[0.386]	[0.105]	[0.228]	[0.005]	[0.173]	[0.005]	[0.000]	[0.000]	[0.012]	[0.010]	[0.018]
Dying before 75	−0.024*	−0.012	−0.029**	−0.011	−0.030**	−0.026**	−0.029**	−0.038***	−0.022*	−0.028**	−0.039***	−0.035**	−0.037**	−0.026**	−0.044***
	(0.013)	(0.015)	(0.013)	(0.014)	(0.014)	(0.012)	(0.013)	(0.011)	(0.012)	(0.012)	(0.012)	(0.012)	(0.011)	(0.012)	(0.013)
	[0.065]	[0.415]	[0.042]	[0.427]	[0.035]	[0.027]	[0.025]	[0.000]	[0.068]	[0.025]	[0.000]	[0.004]	[0.002]	[0.027]	[0.000]
Dying before 80	−0.025*	−0.024	−0.023*	−0.014	−0.027*	−0.017	−0.021	−0.028**	−0.025*	−0.019	−0.027**	−0.027**	−0.035**	−0.019	−0.049***
	(0.014)	(0.015)	(0.013)	(0.014)	(0.014)	(0.013)	(0.013)	(0.011)	(0.013)	(0.013)	(0.012)	(0.013)	(0.011)	(0.012)	(0.013)
	[0.076]	[0.102]	[0.087]	[0.325]	[0.062]	[0.183]	[0.119]	[0.017]	[0.054]	[0.136]	[0.031]	[0.031]	[0.003]	[0.138]	[0.000]
Obs	213,637														
Contribution Quarter FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Birth month-year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Individual Characteristics	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PI without subsidy	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Notes: Estimates for baseline sample. Restrictions: 1934-1944 birth cohorts, 33-36 contribution years, 0.45-1.05 aep. Individual Characteristics include having children, not having health insurance, and male dummy. Monetary values are expressed in hundred 2015 euro. Standard errors clustered by birth month-year are in parentheses, bootstrapped p-values in brackets. With respect to bootstrapped p-values: *** p<0.01, ** p<0.05, * p<0.1. *Source*: Authors' calculations from the RTWF data.

Table A.7: Impact of subsidy eligibility on other measures of mortality (DID estimates)

	All (1)	**Women** (2)	**Men** (3)
Dying between 65 and 70	-0.008**	-0.002	-0.029***
	(0.003)	(0.004)	(0.007)
	[0.011]	[0.527]	[0.000]
Dying between 70 and 75	0.001	0.000	-0.001
	(0.003)	(0.004)	(0.007)
	[0.726]	[0.933]	[0.896]
Dying between 75 and 80	0.004	-0.003	0.023**
	(0.004)	(0.005)	(0.007)
	[0.346]	[0.592]	[0.001]
Dying within 5 years	-0.008**	-0.002	-0.027***
	(0.003)	(0.004)	(0.007)
	[0.020]	[0.530]	[0.000]
Dying within 10 years	-0.012**	-0.009**	-0.029**
	(0.004)	(0.005)	(0.009)
	[0.005]	[0.044]	[0.001]
Dying within 20 years	-0.011**	-0.007*	-0.009
	(0.003)	(0.004)	(0.006)
	[0.001]	[0.075]	[0.153]
Obs	213,637	148,985	64,652
Contribution Quarter FE	✓	✓	✓
Birth month-year FE	✓	✓	✓
Individual Characteristics	✓	✓	✓
PI without subsidy	✓	✓	✓

Notes: This table shows the impact of eligibility for the pension subsidy on a list of alternative measures of mortality: probabilities of dying between age 65 and 70, probabilities of dying between age 70 and 75, probabilities of dying between age 75 and 80,probabilities of dying within 5, 10, and 20 years from the age at which they started claiming the current pension. Column 1 shows the impact for the baseline sample. Columns 2 and 3 show the results by gender. All specifications control for contribution quarter fixed effects , birth month-year fixed effects, individual characteristics (having children and male indicators) and monthly pension income without subsidy. Standard errors clustered by birth month-year are in parentheses, bootstrapped p-values in brackets. With respect to bootstrapped p-values: *** p<0.01, ** p<0.05, * p<0.1.
Source: Authors' calculations from the RTWF data.

Table A.8: Robustness checks (DID estimates)

	Baseline	**1934-1944**						**1934-1954**	**1934-1938**
$aep \in$	[0.45,1.05]	[0.45,1.05]	[0.45,1.05]	[0.45,1.05]	**[0.6,0.9]**	[0.45,1.05]	**[0.25,1.25]**	[0.45,1.05]	[0.45, 1.05]
CY $\in$	33 - 36	33 - 36	33 - 36	33 - 36	33 - 36	30 - 40	**20 - 50**	33 - 36	33 - 36
exactly at 35 CY	keep	**drop**	keep	keep	keep	keep	keep	keep	keep
aep$\in$[0.74-0.76]	keep	keep	**drop**	keep	keep	keep	keep	keep	keep
Died after 2020	keep	keep	keep	**drop**	keep	keep	keep	keep	keep
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
First stage									
Recipient	0.684***	0.710***	0.693***	0.697***	0.616***	0.732***	0.721***	0.671***	0.684***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.005)	(0.003)	(0.005)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Subsidy	0.553***	0.580***	0.570***	0.553***	0.290***	0.640***	0.713***	0.503***	0.601***
	(0.007)	(0.008)	(0.007)	(0.007)	(0.004)	(0.008)	(0.014)	(0.008)	(0.007)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Pension income	0.553***	0.580***	0.570***	0.553***	0.290***	0.640***	0.713***	0.503***	0.601***
	(0.007)	(0.008)	(0.007)	(0.007)	(0.004)	(0.008)	(0.014)	(0.008)	(0.007)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Impact on mortality									
Age at death	0.198***	0.170***	0.196***	0.173***	0.087	0.230***	0.283***	0.162***	0.133**
	(0.045)	(0.046)	(0.047)	(0.053)	(0.066)	(0.029)	(0.016)	(0.039)	(0.060)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.188]	[0.000]	[0.000]	[0.000]	[0.034]
Dying before 65	-0.008***	-0.006**	-0.007***	-0.008***	-0.006**	-0.006***	-0.010***	-0.008***	-0.008***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)
	[0.000]	[0.001]	[0.000]	[0.000]	[0.011]	[0.000]	[0.000]	[0.000]	[0.000]
Dying before 70	-0.015***	-0.014***	-0.015***	-0.017***	-0.011**	-0.015***	-0.017***	-0.010**	-0.012**
	(0.003)	(0.004)	(0.004)	(0.005)	(0.005)	(0.002)	(0.001)	(0.003)	(0.004)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.025]	[0.000]	[0.000]	[0.002]	[0.014]
Dying before 75	-0.014***	-0.012**	-0.014**	-0.011**	-0.006	-0.019***	-0.021***	-0.012**	-0.009
	(0.004)	(0.004)	(0.004)	(0.005)	(0.006)	(0.003)	(0.002)	(0.004)	(0.006)
	[0.000]	[0.002]	[0.001]	[0.038]	[0.371]	[0.000]	[0.000]	[0.002]	[0.106]
Dying before 80	-0.010**	-0.010**	-0.011**	-0.002	0.001	-0.013***	-0.015***	-0.009**	-0.001
	(0.004)	(0.004)	(0.004)	(0.003)	(0.006)	(0.003)	(0.002)	(0.003)	(0.006)
	[0.013]	[0.011]	[0.004]	[0.624]	[0.843]	[0.000]	[0.000]	[0.004]	[0.850]
Obs	213,637	193,042	205,799	141,641	116,056	655,162	3,535,042	258,534	122,178
Contribution Quarter FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Birth month-year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Individual Characteristics	✓	✓	✓	✓	✓	✓	✓	✓	✓
PI without subsidy	✓	✓	✓	✓	✓	✓	✓	✓	✓

Notes: This table shows the robustness of the estimates by varying sample selection. Column (1) shows the results for the baseline sample. Column (2) excludes individuals who retired after exactly 35 years of contribution (420 months). Column (3) excludes individuals whose aep at retirement is between [0.74,0.76). Column (4) excludes individuals who died after 2020 (Covid-19). Column (5) considers only individuals with $aep \in [0.6 - 0.9]$ within the baseline sample. Column (6) extends the baseline sample to include individuals with $CY \in [30 - 40]$. Column (7) extends the baseline sample to include individuals with $aep \in [0.25 - 1.25]$ and with 20-50 contribution years, similar to the SHARE-RV baseline sample restrictions. Column (8) expands the cohorts restriction to 1934-1954. Column (9) restricts the baseline sample to those born between 1934 and 1938 (excludes cohorts born during World War II). All specifications control for contribution quarter fixed effects, birth month-year fixed effects, individual characteristics (male, having children) and monthly pension income without subsidy.Standard errors clustered by birth month-year are in parentheses, bootstrapped p-values in brackets. With respect to bootstrapped p-values: *** p<0.01, ** p<0.05, * p<0.1.
Source: Authors' calculations from the RTWF data.

Table A.9: Placebo checks (DID estimates)

	Baseline	Placebo			
$aep \in$	[0.45,1.05]	**[0.8,1.25]**	**[1.0,1.4]**	[0.45,1.05]	[0.45,1.05]
CY	[33,36]	[33,36]	[33,36]	**[28,31]**	**[38,41]**
cutoff: $aep <$	0.75	1.0	1.2	0.75	0.75
cutoff: $CY \geq$	35	35	35	30	40
	(1)	(2)	(3)	(4)	(5)
First stage					
Recipient	0.684***	0.042***	0.025***	0.000	-0.006**
	(0.003)	(0.002)	(0.002)	(0.001)	(0.002)
	[0.000]	[0.000]	[0.000]	[0.663]	[0.012]
Subsidy	0.553***	0.030***	0.011***	0.000	0.070***
	(0.007)	(0.002)	(0.001)	(0.001)	(0.005)
	[0.000]	[0.000]	[0.000]	[0.642]	[0.000]
Pension income	0.553***	0.030***	0.011***	0.000	0.070***
	(0.007)	(0.002)	(0.001)	(0.001)	(0.005)
	[0.000]	[0.000]	[0.000]	[0.642]	[0.000]
Impact on mortality					
Age at death	0.198***	0.033	-0.080	0.002	0.002
	(0.045)	(0.069)	(0.115)	(0.053)	(0.033)
	[0.000]	[0.623]	[0.489]	[0.975]	[0.943]
Dying before 65	-0.008***	0.001	0.001	0.001	-0.001
	(0.002)	(0.002)	(0.004)	(0.001)	(0.001)
	[0.000]	[0.816]	[0.838]	[0.598]	[0.602]
Dying before 70	-0.015***	-0.002	0.014	0.003	0.000
	(0.003)	(0.006)	(0.008)	(0.004)	(0.003)
	[0.000]	[0.696]	[0.110]	[0.450]	[0.933]
Dying before 75	-0.014***	-0.003	0.005	0.001	-0.001
	(0.004)	(0.006)	(0.011)	(0.005)	(0.003)
	[0.000]	[0.586]	[0.659]	[0.910]	[0.702]
Dying before 80	-0.010**	-0.007	0.001	-0.004	0.003
	(0.004)	(0.005)	(0.011)	(0.005)	(0.003)
	[0.013]	[0.222]	[0.884]	[0.455]	[0.373]
Obs	213,637	99,568	46,955	150,554	358,034
Contribution Quarter FE	✓	✓	✓	✓	✓
Birth month-year FE	✓	✓	✓	✓	✓
Individual Characteristics	✓	✓	✓	✓	✓
PI without subsidy	✓	✓	✓	✓	✓

Notes: This table shows the impact of eligibility for the pension subsidy for a list of placebo samples. Column (1) shows the results for the baseline sample. Columns (2) and (3) takes the same contribution year restriction but varying the aep restriction and cut-offs. Column (2) restricts aep to be between 0.8 and 1.25 with a placebo cut-off at 1.0, column (3) restricts aep to be between 1.0 and 1.4 with a placebo cut-off at 1.2. Columns (4) and (5) uses the same aep restriction as in baseline, but varies the contribution years restriction and cut-offs. Column (4) restricts contribution years to be between 28 and 31 with a placebo cutoff at 30, column (5) restricts contribution years to be between 38 and 41 with placebo cut-off at 40. All specifications control for contribution quarter fixed effects, birth month-year fixed effects, individual characteristics (male, having children) and monthly pension income without subsidy. Standard errors clustered by birth month-year are in parentheses, bootstrapped p-values in brackets. With respect to bootstrapped p-values: *** p<0.01, ** p<0.05, * p<0.1.
Source: Authors' calculations from the RTWF data.

Table A.10: Contemporaneous shocks by contribution quarters and pre-determined variables (DID estimates)

	(1)	(2)	(3)	(4)
First stage				
Recipient	0.684^{***}	0.632^{***}	0.615^{***}	0.624^{***}
	(0.003)	(0.004)	(0.004)	(0.003)
	[0.000]	[0.000]	[0.000]	[0.000]
Subsidy	0.553^{***}	0.489^{***}	0.449^{***}	0.483^{***}
	(0.007)	(0.005)	(0.005)	(0.006)
	[0.000]	[0.000]	[0.000]	[0.000]
Pension income	0.553^{***}	0.489^{***}	0.449^{***}	0.483^{***}
	(0.007)	(0.005)	(0.005)	(0.006)
	[0.000]	[0.000]	[0.000]	[0.000]
Impact on mortality				
Age at death	0.198^{***}	0.187^{**}	0.155^{**}	0.178^{**}
	(0.045)	(0.062)	(0.062)	(0.061)
	[0.000]	[0.002]	[0.013]	[0.003]
Dying before 65	-0.008^{***}	-0.008^{***}	-0.007^{***}	-0.008^{***}
	(0.002)	(0.002)	(0.002)	(0.002)
	[0.000]	[0.000]	[0.000]	[0.000]
Dying before 70	-0.015^{***}	-0.018^{***}	-0.015^{**}	-0.017^{***}
	(0.003)	(0.004)	(0.005)	(0.004)
	[0.000]	[0.000]	[0.001]	[0.000]
Dying before 75	-0.014^{***}	-0.011^{*}	-0.008	-0.010^{*}
	(0.004)	(0.006)	(0.006)	(0.006)
	[0.000]	[0.065]	[0.174]	[0.074]
Dying before 80	-0.010^{**}	-0.007	-0.007	-0.007
	(0.004)	(0.005)	(0.005)	(0.005)
	[0.008]	[0.174]	[0.199]	[0.205]
Obs.	213,637	213,637	213,637	213,637
Contribution Quarter (CQ) FE	✓	✓	✓	✓
Birth month-year FE	✓	✓	✓	✓
Individual Characteristics	✓	✓	✓	✓
PI w/o subsidy	✓	✓	✓	✓
CQ x PI w/o subsidy		✓		✓
CQ x PI w/o subsidy 25€			✓	
CQ x Married, CQ x Kid				✓

Notes: This table shows the impact of being eligible for the pension subsidy on first stage and mortality outcomes, controlling for contemporaneous shocks. Column (1) indicates baseline estimates. Column (2) controls for contribution quarters FE interacted with pension income without subsidy. Column (3) controls for contribution quarters FE interacted with pension income without subsidy groups by 25€/month. Column (4) controls for for contribution quarters FE interacted with pension income without subsidy, marital status, and having children. Standard errors clustered by birth month-year are in parentheses, bootstrapped p-values in brackets. *** p<0.01, ** p<0.05, * p<0.1. *Source*: Authors' calculations from the RTWF data.

Table A.11: P-values on significance in differences of point estimates for heterogeneous effects (Table 2 and Table A.13)

	Table 2				Table A.13	
	Gender	**Marital status**	**Subsidy**	**Health insurance**	**Child**	**Marital status**
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: First stage						
Recipient	0.000	0.000	0.000	0.000	0.000	0.000
Subsidy	0.000	0.103	0.000	0.000	0.000	0.036
Pension income	0.000	0.103	0.000	0.000	0.000	0.036
Panel B: Impact on mortality						
Age at death	0.000	0.510	0.000	0.202	0.016	0.679
Dying before 65	0.106	0.205	0.759	0.775	0.802	0.958
Dying before 70	0.000	0.707	0.000	0.328	0.050	0.990
Dying before 75	0.002	0.912	0.000	0.148	0.025	0.790
Dying before 80	0.349	0.404	0.000	0.153	0.065	0.415

Notes: This table shows the bootstrapped p-values on the significance of differences in point estimates in heterogeneous effects. The Null-Hypothesis is that the point estimates in subgroups (e.g. male vs. female) are identical. P-values higher than 0.1 indicate that we cannot reject the H0 with a probability higher than 90%. The null hypothesis (H0) is that the point estimates from the heterogeneous groups are significantly different. Columns (1)-(4) report differences by gender (women - men), by marital status (married - not married), by subsidy size (high - low) and by type of health insurance (public - private), corresponding to the estimates in Table 2. Columns (5)-(6) report the differences by having children (yes-no) and by marital status (married - not married) for women, corresponding to the estimates in Table A.13. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.
Source: Authors' calculations from the RTWF data.

Table A.12: Heterogeneity effects by subsidy size and gender (DID estimates)

	Women			*Men*		
	Baseline	**Treatment heterogeneity**		**Baseline**	**Treatment heterogeneity**	
Treatment $aep \in$	[0.45,0.75]	[0.45,0.61]	[0.61,0.75]	[0.45,0.75]	[0.45,0.61]	[0.61,0.75]
	(1)	(2)	(3)	(4)	(5)	(6)
First stage						
Recipient	0.710***	0.773***	0.633***	0.394***	0.359***	0.422***
	(0.003)	(0.004)	(0.004)	(0.005)	(0.009)	(0.007)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Subsidy	0.606***	0.884***	0.289***	0.224***	0.319***	0.154***
	(0.007)	(0.011)	(0.003)	(0.004)	(0.008)	(0.003)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Pension income	0.606***	0.884***	0.289***	0.224***	0.319***	0.154***
	(0.007)	(0.011)	(0.003)	(0.004)	(0.008)	(0.003)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Impact on mortality						
Age at death	0.039	0.071	-0.001	0.404***	1.015***	-0.054
	(0.052)	(0.054)	(0.056)	(0.097)	(0.112)	(0.106)
	[0.459]	[0.189]	[0.979]	[0.000]	[0.000]	[0.606]
Dying before 65	-0.001	0.000	-0.002	-0.007**	-0.015***	-0.001
	(0.002)	(0.002)	(0.002)	(0.003)	(0.004)	(0.004)
	[0.694]	[0.835]	[0.294]	[0.042]	[0.000]	[0.825]
Dying before 70	-0.003	-0.004	-0.002	-0.036***	-0.070***	-0.010
	(0.004)	(0.004)	(0.004)	(0.008)	(0.009)	(0.008)
	[0.484]	[0.376]	[0.709]	[0.000]	[0.000]	[0.209]
Dying before 75	-0.003	-0.007	0.002	-0.037***	-0.085***	0.000
	(0.005)	(0.005)	(0.005)	(0.009)	(0.010)	(0.010)
	[0.582]	[0.200]	[0.676]	[0.000]	[0.000]	[0.997]
Dying before 80	-0.005	-0.010**	0.000	-0.014	-0.063***	0.024**
	(0.004)	(0.005)	(0.005)	(0.008)	(0.010)	(0.009)
	[0.225]	[0.043]	[0.931]	[0.101]	[0.000]	[0.013]
Obs	148,985	120,578	115,408	64,652	56,349	58,170
Contribution Quarter FE	✓	✓	✓	✓	✓	✓
Birth month-year FE	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓
PI without subsidy	✓	✓	✓	✓	✓	✓

Notes: This table shows the impact of eligibility for the pension subsides by aep subgroups and gender. Columns 1 shows baseline results. Columns 2 and 5 use individuals with $aep \in [0.45, 0.61)$ as treatment group. Columns 3 and 6 take individuals with $aep \in [0.61, 0.75)$ as treatment group. All specifications control for contribution quarter fixed effects, birth month-year fixed effects, individual characteristics (male, having children) and monthly pension income without subsidy. Age at death is expressed in years. Monetary values are expressed in hundred 2015 euro. Standard errors clustered by birth month-year are in parentheses, bootstrapped p-values in brackets. With respect to bootstrapped p-values: *** p<0.01, ** p<0.05, * p<0.1. *Source*: Authors' calculations from the RTWF data.

Table A.13: Heterogeneity effects by marital status and gender (DID estimates)

	Women				*Men*	
	Marital status		**Children**		**Marital status**	
	Married	Not married	Yes	No	Married	Not married
	(1)	(2)	(3)	(4)	(5)	(6)
First stage						
Recipient	0.685***	0.753***	0.692***	0.799***	0.275***	0.593***
	(0.004)	(0.004)	(0.004)	(0.006)	(0.005)	(0.009)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Subsidy	0.608***	0.596***	0.586***	0.742***	0.171***	0.312***
	(0.007)	(0.008)	(0.007)	(0.013)	(0.004)	(0.008)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Pension income	0.608***	0.596***	0.586***	0.742***	0.171***	0.312***
	(0.007)	(0.008)	(0.007)	(0.013)	(0.004)	(0.008)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Impact on mortality						
Age at death	0.024	0.073	-0.019	0.377**	0.366***	0.331**
	(0.066)	(0.091)	(0.056)	(0.152)	(0.109)	(0.150)
	[0.731]	[0.411]	[0.752]	[0.014]	[0.000]	[0.030]
Dying before 65	-0.001	-0.001	0.000	-0.002	-0.003	-0.011*
	(0.002)	(0.003)	(0.002)	(0.006)	(0.004)	(0.006)
	[0.716]	[0.842]	[0.837]	[0.711]	[0.448]	[0.065]
Dying before 70	-0.004	-0.003	0.001	-0.024**	-0.032***	-0.034**
	(0.005)	(0.006)	(0.004)	(0.012)	(0.009)	(0.012)
	[0.497]	[0.577]	[0.829]	[0.045]	[0.000]	[0.006]
Dying before 75	-0.002	-0.005	0.002	-0.033**	-0.038***	-0.023*
	(0.006)	(0.009)	(0.005)	(0.014)	(0.010)	(0.014)
	[0.781]	[0.589]	[0.644]	[0.026]	[0.000]	[0.088]
Dying before 80	-0.002	-0.011	-0.001	-0.032**	-0.010	-0.009
	(0.006)	(0.009)	(0.005)	(0.014)	(0.011)	(0.011)
	[0.768]	[0.210]	[0.835]	[0.026]	[0.350]	[0.440]
Obs	96,012	52,960	130,642	18,343	39,654	24,964
Contribution Quarter FE	✓	✓	✓	✓	✓	✓
Birth month-year FE	✓	✓	✓	✓	✓	✓
Individual Characteristics	✓	✓	✓	✓	✓	✓
Income	✓	✓	✓	✓	✓	✓

Notes: This table shows the impact of eligibility for the pension subsides by subgroups and gender. Columns (1)-(4) focus on women, columns (5)-(6) focus on men. Columns (1)-(2) and (5)-(6) divide by gender and marital status at time of death. Columns (3)-(4) split women by having children, imputed from child benefits claims. Monetary values are expressed in hundred 2015 euro. Standard errors clustered by birth month-year are in parentheses, bootstrapped p-values in brackets. With respect to bootstrapped p-values: *** p<0.01, ** p<0.05, * p<0.1. *Source*: Authors' calculations from the RTWF data.

Table A.14: Impact of pension income on mortality (IV estimates)

	All		Women		Men	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: First stage						
Pension income	0.554***	0.554***	0.605***	0.605***	0.224***	0.224***
(instr.=eligible)	(0.023)	(0.023)	(0.021)	(0.021)	(0.006)	(0.006)
	[0.001]	[0.001]	[0.351]	[0.422]	[0.012]	[0.013]
Panel B: IV						
Age at death	0.375***	0.378***	0.065	0.072	1.805**	1.772**
	(0.099)	(0.097)	(0.076)	(0.076)	(0.579)	(0.565)
	[0.001]	[0.001]	[0.422]	[0.351]	[0.013]	[0.012]
Dying before 65	-0.014***	-0.014***	-0.001	-0.003*	-0.030**	-0.027*
	(0.001)	(0.002)	(0.001)	(0.001)	(0.011)	(0.012)
	[0.000]	[0.000]	[0.493]	[0.086]	[0.045]	[0.089]
Dying before 70	-0.029***	-0.029***	-0.005	-0.006	-0.160***	-0.157***
	(0.006)	(0.006)	(0.004)	(0.004)	(0.048)	(0.047)
	[0.001]	[0.000]	[0.289]	[0.205]	[0.005]	[0.004]
Dying before 75	-0.027**	-0.027**	-0.004	-0.004	-0.163**	-0.162**
	(0.009)	(0.009)	(0.009)	(0.009)	(0.056)	(0.055)
	[0.017]	[0.017]	[0.636]	[0.687]	[0.021]	[0.020]
Dying before 80	-0.020	-0.020	-0.009	-0.008	-0.061	-0.061
	(0.011)	(0.012)	(0.010)	(0.010)	(0.044)	(0.043)
	[0.131]	[0.134]	[0.386]	[0.467]	[0.232]	[0.230]
First stage F-stat	570.28	570.28	792.45	792.45	1,234.7	1,234.7
Obs	213637	213,637	148,985	148,985	64,652	64,652
Contribution years FE	✓	✓	✓	✓	✓	✓
Birth month-year FE	✓	✓	✓	✓	✓	✓
Individual Characteristics	✓	✓	✓	✓	✓	✓
PI without subsidy	✓	✓	✓	✓	✓	✓
Age at claiming pension		✓		✓		✓

Notes: This table shows the effect on mortality of an increase in pension income of 100 euros per month. Panel A reports first-stage estimates and panel B reports the IV estimates. The instrument for pension income is an indicator of eligibility for pension subsidy. Pension income is calculated based on total earning points at retirement. In addition to individual characteristics, pension income without subsidy, birth month-year fixed effects and contribution quarter fixed effects in the odd columns, the even columns control for age at claiming pensions. Columns 1 and 2 show the results for the baseline sample. Columns 3 to 6 show the results for women and men respectively. Monetary values are expressed 2015 in hundred euro. Standard errors clustered by birth year are in parentheses, bootstrapped p-values in brackets. With respect to bootstrapped p-values: *** p<0.01, ** p<0.05, * p<0.1.

Source: Authors' calculations from the RTWF data.

Table A.15: Summary statistics for the compliers

	Baseline		Eligible group		Compliers		Never takers		C-NT
	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.	P-value
RTWF Sample									
Pension income and subsidy related variables									
Subsidy (100€)	0.23	0.46	0.61	0.58	0.79	0.55	0.00	0.00	0.000
Subsidy recipient	0.30	0.46	0.77	0.42	1.00	0.00	0.00	0.00	0.000
PI w/o subsidy (100€)	6.71	2.27	5.72	1.64	5.67	1.66	5.90	1.59	0.000
Individual characteristics									
Birth year	1,938.08	2.96	1,938.00	2.97	1,937.87	2.95	1,938.45	3.02	0.000
% male	0.30	0.46	0.19	0.39	0.10	0.30	0.51	0.50	0.000
% married	0.64	0.48	0.66	0.47	0.65	0.48	0.71	0.45	0.000
Has children†	0.88	0.33	0.90	0.30	0.90	0.30	0.90	0.30	0.811
% private health insurance	0.09	0.29	0.09	0.29	0.05	0.22	0.23	0.42	0.000
% public health insurance	0.87	0.33	0.88	0.33	0.92	0.27	0.72	0.45	0.000
% private LTC insurance	0.01	0.09	0.01	0.09	0.01	0.08	0.02	0.14	0.000
% public LTC insurance	0.87	0.33	0.88	0.33	0.92	0.27	0.72	0.45	0.000
% DI before retirement	0.04	0.18	0.03	0.18	0.03	0.18	0.04	0.20	0.000
Occupation									
Reduced contribution periods	3.12	2.17	3.07	2.12	2.99	2.18	3.32	1.84	0.000
% unskilled tasks‡	0.34	0.47	0.38	0.48	0.40	0.49	0.31	0.46	0.000
% skilled tasks‡	0.62	0.49	0.58	0.49	0.57	0.50	0.63	0.48	0.000
% complex tasks‡	0.04	0.20	0.04	0.20	0.03	0.18	0.06	0.24	0.000
Obs.	213,637		76,769		59,371		17,398		
SHARE-RV Sample									
Pension income and subsidy related variables									
Subsidy (100€)	0.16	0.42	0.62	0.69	1.01	0.62	0.00	0.00	0.000
Subsidy recipient	0.19	0.39	0.62	0.49	1.00	0.00	0.00	0.00	-
PI without subsidy (100€)	8.83	4.57	7.72	2.07	7.39	1.97	8.25	2.13	0.000
Individual and household characteristics									
Birth year	1945.28	6.09	1946.52	6.10	1946.23	5.54	1947.00	6.88	0.070
Age	70.07	6.30	68.81	6.10	68.95	5.94	68.57	6.36	0.373
% male	0.38	0.49	0.22	0.41	0.17	0.37	0.29	0.46	0.000
% married	0.78	0.42	0.79	0.41	0.77	0.42	0.82	0.38	0.063
Number of children	1.38	1.42	1.60	1.28	1.69	1.27	1.45	1.28	0.007
% contacts children $\geq$1/week	0.45	0.50	0.46	0.50	0.46	0.50	0.46	0.50	0.939
Months unemployed bf 1992	5.42	11.73	8.22	15.50	7.64	15.74	9.16	15.07	0.159
Months sickness bf 1992	1.86	5.16	1.41	3.79	1.38	3.98	1.45	3.48	0.788
Years of schooling	11.73	3.03	11.61	3.03	10.85	2.45	12.84	3.45	0.000
Own a house	0.39	0.49	0.35	0.48	0.31	0.46	0.42	0.49	0.001
Pension/household income	0.38	0.24	0.38	0.21	0.42	0.20	0.33	0.20	0.000
Observations	4,421		837		527		310		

Notes: Table A.15 reports descriptive statistics for the compliers and never takers. Eligible group consists of individuals fulfill both eligibility conditions. Compliers are subsidy recipients in eligible group and never takers are not subsidy recipient in the eligible group. Last column reports p-values of differences in means between compliers and never takers. LTC stands for long-term care, DI stands for disability insurance. † Refers to women sample. ‡ Available only for 3,531 observations. *Source*: Authors' calculations from the RTWF and SHARE-RV data.

Table A.16: Heterogeneity by share of pension income over total household income (IV estimates)

	Share of pension income over total household income:					
	Below 40%, "Well-off"			**Above 40% "Poor"**		
	All	Women	Men	All	Women	Men
Panel A: First stage						
Pension income (100€)	0.289***	0.278***	0.465***	0.479***	0.418***	0.794***
	(0.056)	(0.063)	(0.139)	(0.108)	(0.130)	(0.178)
Panel B: IV						
I) General health status						
CASP	0.935*	0.115	1.781**	0.444	1.226*	-0.129
	(0.492)	(0.521)	(0.855)	(0.536)	(0.722)	(0.860)
Self-reported health	1.160**	0.352	1.608*	0.839	0.378	1.848**
	(0.515)	(0.564)	(0.879)	(0.546)	(0.759)	(0.875)
Depression index†	-0.525	0.030	-1.059	0.016	1.109	0.248
	(0.489)	(0.583)	(0.866)	(0.491)	(0.676)	(0.836)
Number of chronic diseases	-1.097**	-0.335	-1.317*	-0.698	-0.024	-3.006***
	(0.501)	(0.502)	(0.795)	(0.537)	(0.714)	(0.733)
Functional limitations index	-0.437	0.213	-1.421*	-0.328	-0.006	0.183
	(0.438)	(0.461)	(0.745)	(0.437)	(0.465)	(0.373)
II) Financial constraints and optimism						
Lack of money stops†	-0.405	-0.483	-0.590	-0.647	-1.613**	-0.619
	(0.435)	(0.498)	(0.686)	(0.514)	(0.728)	(0.676)
Feel full of opportunities†	0.489	-0.237	1.582**	0.391	1.201*	0.705
	(0.421)	(0.502)	(0.760)	(0.554)	(0.692)	(0.830)
Future looks good†	0.921*	0.634	1.365*	0.660	1.188*	-0.134
	(0.472)	(0.549)	(0.786)	(0.521)	(0.722)	(0.612)
III) Spending and activities						
Food expenditure	0.309	0.550	-0.106	0.037	0.627	0.866***
	(0.297)	(0.352)	(0.534)	(0.321)	(0.427)	(0.324)
Healthcare use index	-0.459	-0.269	-0.768	-0.169	0.383	-1.856**
	(0.407)	(0.431)	(0.671)	(0.548)	(0.690)	(0.846)
Physical activity index†	1.664***	1.159**	1.809**	0.660	0.078	2.683**
	(0.530)	(0.570)	(0.817)	(0.499)	(0.577)	(1.204)
IV) Risky behavior						
Smoking†	0.102	0.417*	-0.679*	-0.463**	-0.563**	-0.677*
	(0.182)	(0.221)	(0.402)	(0.207)	(0.283)	(0.353)
Days/week alcohol (last 6 months)†	0.105	0.196	-1.787*	0.305	0.927	-1.741**
	(0.434)	(0.473)	(0.933)	(0.445)	(0.582)	(0.688)
Observations	1,719	1,340	379	1,187	489	698
First stage F-stat	26.627	19.680	11.221	19.855	10.382	19.784
Contribution Quarter FE	✓	✓	✓	✓	✓	✓
Cohort FE	✓	✓	✓	✓	✓	✓
Individual Characteristics	✓	✓	✓	✓	✓	✓
Retirement age	✓	✓	✓	✓	✓	✓

Notes: This table shows heterogeneous effect on SHARE-RV outcomes of an increase in pension income of 100 euros per month, by share of pension income over total household income. Panel A reports first-stage estimates and Panel B reports the IV estimates. The instrument for pension income is an indicator for eligibility for the pension subsidy. Pension income is calculated based on total earning points at retirement. Estimates are based on standardised outcomes and thus measure effects in percent of the standard deviation from mean. Controls include: contribution year, share wave fixed effects, age as a quadratic polynomial, pension income without subsidy, education level indicators in four categories, married, having children, interaction between having children and being in contact with them at least once a week, SES indicators, retirement age. Columns (1) and (4) additionally control for a male indicator. Columns (1)-(3) focus on the subgroup with pension income share below 40%, Columns (4)-(6) on the same share above 40%. Standard errors clustered at individual level are in parentheses, *** p<0.01, ** p<0.05, * p<0.1. *Source*: Authors' calculations from the SHARE-RV data.

† Sample size is smaller for these variables. Lowest number of observations is 2,608 (women: 1,643). Lowest first stage F-statistics 9.4, for well-off men when outcome is risky behaviors. All other first stage F-statistics are above 10.

Table A.17: Heterogeneity by any household member owning a house (IV estimates)

	Without home ownership			Home ownership		
	All	Women	Men	All	Women	Men
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: First stage						
Pension income (100€)	0.493***	0.460***	0.754***	0.300***	0.283***	0.305**
	(0.061)	(0.068)	(0.140)	(0.067)	(0.073)	(0.130)
Panel B: IV						
I) General health status						
CASP	0.542*	0.352	0.864*	0.547	0.034	0.283
	(0.291)	(0.323)	(0.493)	(0.496)	(0.574)	(1.671)
Self-reported health	0.654**	0.126	1.687***	0.865*	0.320	2.168
	(0.304)	(0.351)	(0.546)	(0.516)	(0.620)	(1.973)
Depression index†	-0.189	0.287	-0.876*	-0.145	0.463	0.119
	(0.308)	(0.376)	(0.492)	(0.456)	(0.592)	(1.423)
Number of chronic diseases	-0.180	0.153	-1.279**	-1.040*	-0.888	-3.588*
	(0.275)	(0.334)	(0.585)	(0.543)	(0.572)	(2.140)
Functional limitations index	-0.062	0.303	-0.679*	-0.550*	0.065	-2.049*
	(0.254)	(0.318)	(0.376)	(0.320)	(0.277)	(1.151)
II) Financial constraints and optimism						
Lack of money stops†	-0.314	-0.659*	-0.522	0.158	-0.044	1.324
	(0.285)	(0.337)	(0.438)	(0.493)	(0.576)	(1.760)
Feel full of opportunities†	0.284	-0.027	1.128**	0.431	-0.463	2.174*
	(0.278)	(0.313)	(0.474)	(0.425)	(0.524)	(1.307)
Future looks good†	0.694**	0.564*	0.695	0.542	0.203	1.138
	(0.280)	(0.328)	(0.458)	(0.464)	(0.583)	(1.266)
III) Spending and activities						
Food consumption index†	0.157	0.583**	-0.361	0.264	0.308	1.204
	(0.194)	(0.249)	(0.285)	(0.230)	(0.280)	(0.784)
Healthcare use index	-0.213	0.126	-1.218***	-0.354	-0.085	-0.544
	(0.256)	(0.330)	(0.446)	(0.402)	(0.474)	(0.943)
Physical activity index†	0.270	-0.236	1.821***	1.222**	0.982*	2.493
	(0.291)	(0.369)	(0.636)	(0.498)	(0.557)	(1.774)
IV) Risky behavior						
Smoking†	-0.106	-0.070	-0.314*	0.002	0.140	0.754
	(0.124)	(0.164)	(0.170)	(0.183)	(0.226)	(0.651)
Days/week alcohol (last 6 months)†	-0.165	0.207	-0.879*	0.065	-0.138	-1.627
	(0.274)	(0.356)	(0.515)	(0.464)	(0.508)	(1.689)
Observations	2,496	1,507	989	1,584	992	592
First stage F-stat	65.850	45.730	29.061	20.194	15.052	5.516
Contribution Quarter FE	✓	✓	✓	✓	✓	✓
Cohort FE	✓	✓	✓	✓	✓	✓
Individual Characteristics	✓	✓	✓	✓	✓	✓
Retirement age	✓	✓	✓	✓	✓	✓

Notes: This table shows heterogeneous effect on SHARE-RV outcomes of an increase in pension income of 100 euros per month, by home ownership. Columns (1)-(3) focus on individuals in households without home ownership, Columns (4)-(6) on home owners (own or partner). Panel A reports first-stage estimates and Panel B reports the IV estimates. The instrument for pension income is an indicator for eligibility for the pension subsidy. Pension income is calculated based on total earning points at retirement. Estimates are based on standardised outcomes and thus measure effects in percent of the standard deviation from mean. Controls include: contribution year, share wave fixed effects, age as a quadratic polynomial, pension income without subsidy, education level indicators in four categories, married, having children, interaction between having children and being in contact with them at least once a week, SES indicators, retirement age. Columns (1) and (4) additionally control for a male indicator. Standard errors clustered at individual level are in parentheses, *** p<0.01, ** p<0.05, * p<0.1.
Source: Authors' calculations from the SHARE-RV data.
† Sample size is smaller for these variables. Lowest number of observations is 2,765 (women: 1,719). Lowest first stage F-statistics is 5.1, for men who own their home, when outcome is risky behaviors. All other first stage F-statistics are above 10.

B Additional Details on Institution

B.1 Details on pension benefit formula

The main determinant of pension benefits is the sum of the individually accumulated earnings points (Entgeltpunkte, (EP)). Essentially, for each year τ of contributions, a worker i accumulates some earnings points $EP_{i\tau}$, which are determined by the individual wage $w_{i\tau}$ relative to the average wage of all the insured $\bar{w_\tau}$. For example, a worker whose wage is half of the average wage in the contribution year τ will accumulate 0.5 points in that year. Equation 1 shows the monthly pension benefits for individual i who retires in year t.

$$PB_{it} = \underbrace{(\sum_{\tau} EP_{i\tau} + \text{ Subsidy}_i)}_{\text{Personal Pension Base}} \times PV_t \text{ , where } EP_{i\tau} = \frac{w_{i\tau}}{\bar{w_\tau}} \tag{A.1}$$

The amount of pension benefit PB_{it} is the personal pension base multiplied by the pension value.

This benefit level will also be adjusted by an adjustment factor AF_{it}. The adjustment factor penalizes early claims. Benefit levels decrease by 0.3% for each month before the full retirement age is reached. However, the deductions of 3.6% per year of delayed claiming are low by international standards and not actuarially fair. As a consequence, there still exists a positive implicit tax on working, even after accounting for the financial penalty. The pension benefit also depends on the type of pension. This factor is equal to one for the old-age pension, and is less than one for disability pensions. Almost all subsidy recipients claim an old-age pension.

The worker's personal pension base is the sum of the EPs accumulated over time, plus additional EPs credited by the subsidy program. For example, an average wage earner with 15 contribution years accumulates 15 EPs. At the time of the claim t, this personal pension base is scaled up by the pension value PV_t, which is determined aggregately by factors such as the average wage of all insured, the contribution rate and demographic changes. This pension value PV_t is adjusted on July 1 of each year. For example, one EP was equivalent to 31.03 euros per month in 2018. Overall, workers with short contribution years or low relative wage incomes are more likely to face old-age poverty. On average, one less year of full value contribution decreases the gross replacement rate by around 1.17%. This is one of the reasons that women are the majority of the subsidy recipients as they have short employment periods and a lower wage over their life cycle.

Pensioners can work while claiming their pensions, however, they face a stringent earnings test between the early retirement age (ERA) and the normal retirement age (NRA). If pensioners work at jobs paid more than 450 euros per month, they need to file for partial retirement. This makes

working at a regular job while claiming a full pension impossible. After the NRA, pension recipients no longer face earnings tests.[1]

B.2 Pension reforms and pension pathways

Since the 1990s, there have been a number of pension reforms, which introduced the early retirement actuarial adjustment (Berkel and Börsch-Supan, 2004), increased the statutory retirement ages (Engels et al., 2017), encouraged a tax-advantaged private savings plan (Börsch-Supan et al., 2015) and included a sustainability factor in the pension benefits formula (Börsch-Supan et al., 2004).

Workers can claim the standard old-age pension (SGB VI §235) at age 65 throughout our sample period. The eligibility condition is at least 5 years of contributions. For cohorts 1947 to 1964, this age will gradually increase by one month for each birth year from age 65 to 67. These changes began in 2012 and will be complete in 2030 (See SGB VI §235(2)).

Several alternate pathways make retiring before the regular retirement age 65 possible in Germany. There are four main early retirement pathways: old-age pensions for women, old-age pensions due to unemployment (and part-time work), old-age pensions for the long-term insured and old-age pensions for severely disabled persons. Each pathway has its own eligibility conditions. Each pathway has also its own full retirement age (FRA) and early retirement age (ERA). For example, age 60 is the early retirement age for the women's pension pathway. Age 63 is the early retirement age for the long-term insured pathway.

The pension reforms in the past few decades have typically reduced public pension generosity by raising the retirement age and penalizing early claiming. The increase in statutory retirement age and the financial penalty for early claiming were phased in gradually in monthly increments. An individual can claim, at the earliest, at the ERA, however each year before FRA renders a 3.6% benefit deduction. (See Engels et al. (2017) for more details).

For women born between 1932 and 1942, The changes in ERA, FRA and the corresponding deductions when claim at the ERA remain rather stable.

Women could claim a pension at the earliest age of 60, either via the *women's pension*. Women with at least 15 years of contributions, of which at least 10 must have occurred after age 40, were eligible for the women's pathway. The penalty for retiring at 60 via women's pension was phased in gradually in monthly increments. The FRA for women's pension was increased from 60 to 65 by monthly steps since the cohort of 1941. For the cohort born in 1941, the penalty is 7.2%. For the cohort born in 1942, the penalty is 10.8%. It stabilised at 18% for cohorts born after 1945.

[1]The benefits that are "taxed" away due to the earnings test are not lost but postponed at an actuarially fair rate.

Another way to claim pension as early as age 60 is via *pension for severely disabled*. Workers who have lost their earnings capacity can claim the old-age pension for disabled workers. This pathway is also referred to as invalidity pathway. The eligibility condition is having lost of at least 50% of one's earnings capacity and at least 35 years of waiting period, which include, for example, periods of raising a child who is less than 10 years old. The ERA for this pathway was 60 for our sample. It is scheduled to gradually increase to age 62 between the 1952 and 1963 cohorts. The FRA for retiring at 60 via disabled pension was increased gradually by 1 month for each month of birth from 60 to 63 for cohorts 1941 to 1943. It is scheduled to gradually increase from age 63 to 65 for the 1952 to 1963 cohorts.

Another possible way to claim pension at age 60 is via *old-age pension due to unemployment*. The eligibility requirements for the UI pathway were: 1) at least 15 years of contributions, at least 8 of which must have occurred in the past 10 years, and 2) being unemployed for at least 1 year after the age of 58 and a half, or in old-age part-time work. For cohorts younger than 1946, ERA remained at 60. However, the FRA has increased gradually from 60 to 65 between the 1937 and 1941 cohorts. Therefore, for cohorts born after 1937, the penalty to claim at 60 ranges from 3.6% to 18%.

At age 63, workers with at least 35 years of contributions to claim the *old-age pension for long-term insured* as early as age 63 (SGB VI §236). The FRA without penalty for early claims was 63 until the 1936 cohort. It was increased gradually, in monthly steps, from age 63 to 65 for cohorts 1937 to 1938 and remained at 65 until the 1948 cohort. The ERA, meanwhile, remained stable at age 63. Hence, workers eligible for this pathway could always claim as early as age 63, however they faced an actuarial adjustment in the form of a 0.3% permanent pension reduction per each month they retired in advance of the FRA. For cohorts born after 1938, the penalty to claim at 63 remained at 7.2%.

B.3 An example of pension subsidy calculation

The *de jure* eligibility condition of the subsidy program requires only the average monthly EP of full-value contribution years at retirement (aep^t) to be less than 0.0625 (t is the year of retirement). Yet, because the average monthly EP of full-value contribution periods before 1992 (aep_i^{92}) cannot exceed 0.0625 after the subsidy, this implies that the *de facto* eligibility condition requires both aep^t and aep_i^{92} to be less than 0.0625. Following is one example showing how pension benefits and subsidy are calculated, provided the German Pension Office website:

Example: Calculation of the monthly average The total EPs for the contribution periods are 46.6909. Of this total amount, 31.6900 earning points are attributed to the 517 months of full-value

contribution period. Of the 31.6900 earning points, 26.5000 earning points are attributed to 400 months of full-value contribution before 31.12.1991.

Solution

- Dividing 31.6909 earning points by 517 months gives us 0.0613 earning points. The monthly average of all full-value contribution periods does not reach (is below) the value of 0.0625.
- Dividing 26.5000 earning points by 400 months gives us 0.0663 earning points. The monthly average of all full-value contribution periods until 31.12.1991 reaches/is above the value of 0.0625.
- Therefore, additional (extra/add-on) earning points do not have to be calculated.

B.4 Details on pension-related periods

The total creditable/pension period (Wartezeit/Anrechenbare Zeiten) is approximately composed of the contribution period ((SGB VI § 55 Beitragszeiten) and the consideration period (SGB VI § 57 Berücksichtigungszeiten). The contribution periods consist of full value contribution periods (Vollwertigen Beiträgen) and reduced contribution periods (Beitragsgeminderte). Full value contribution periods are periods when compulsory contributions are paid according to the social security regulation. Reduced contribution periods include periods of unemployment, sickness and vocational training. During those periods, EPs are accumulated even though the worker has made no contributions. The consideration periods include child-raising periods. The time of raising a child to age 10 counts in the consideration period. The package is 10 years for one child, 15 years for two children and 20 years for more than two children.

C Details on IV Assumptions

There are three conditions necessary to interpret the two-stage least squares IV estimates. First, the interaction of these two eligibility conditions is independent of unobserved characteristics that affect pension income and mortality. Further, pension income must be strongly associated with the two eligibility conditions. The DID results in Section 5.1 confirm the exogeneity and relevance of the instruments.

Second, the exclusion restriction requires that the interaction of the two eligibility conditions affect mortality outcomes only through changes in pension income. One concern would be the indirect impact of pension subsidy program on age at claiming pension. We have shown that

eligibility for the subsidy has economically small impacts on retirement choices. Nonetheless, by controlling for age at claiming pension in our regressions, we address this concern on second-order effects of the subsidy program. Throughout the paper, we always show the IV estimates with and without controlling for age at claiming pension. The results are similar.

Third, the monotonicity condition requires that satisfying both eligibility conditions will not cause a reduction in pension income. This condition is readily satisfied because of the nature of the subsidy program which aims to increase pension income.

D Calculation of the Monetary Gain in Life Expectancy

We perform a simple cost-benefit analysis by computing the associated increase in the value of a statistical life when receiving an additional 100€ pension benefits per month. Following are the steps of this calculation.

First, by combining our estimated improvements in the probability of dying before 70 and the life tables for the average German (Destatis, 2023), we calculate an implied average improvement of life expectancy at 60 of about 24.4 months for men.

Our IV estimates for men imply a 15.7 percentage point increase in the probability of surviving to age 70, conditional on living past age 60. Thus, the cumulative product of survival probabilities between ages 60 and 70 increases by 15.7 percentage points. We then calculate life expectancy at age 60 using this formula: life expectancy at age τ is calculated as $\sum_{j=\tau}^{\tau^m} \prod_{q=1}^{\tau^m-\tau} s(q)$, where τ_m is the maximum attainable age (Collett, 2015). We assume $\tau_m = 100$. In the last step, we compute the gain in life expectancy as the difference between our estimated life expectancy at age 60 and the life expectancy implied by the life tables for the average German in 2018/2020 (Destatis, 2023), which is considered as the life expectancy without the subsidy-induced increase in survival probability.

Second, we calculate the gain in the value of a statistical life. We use the value of a statistical life year at age 60 implied by Aldy and Viscusi (2007), which is 262,910€ . Thus, for each 100€ subsidy, the mortality improvements for men are worth 533,726€.

Lastly, we calculate the fiscal cost of providing the subsidy. Given an average pre-subsidy pension income of 642€/month for men in our treatment group, a 100€ increase in monthly pension benefits will cost about 44,176€ per male subsidy recipient. According to the life table for Germany 2018/2020 (Destatis, 2023), the life expectancy of men at the age of 60 is 21.75 years or 261 months. Thus, the net cost of the additional life expectancy due to a subsidy of 100€/month for the average male recipient is 100€*(261+24.36)+642€*24.36, which is about 44,176€. As we do not

find any significant changes in the age when the pension is claimed, we do not take into account the loss of tax revenue due to early retirement.

Therefore, the net monetary benefit of the life expectancy gains in our sample is about 489,550€ on average per male subsidy recipient. The pension subsidy program was cost-effective in increasing the life expectancy of male recipients.