Pension Wealth and the Timing of Retirement

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Abstract

In this paper we study the link between pension wealth and the timing of retirement (or labor supply). Exploiting panel data covering over 40 years we isolate plausible exogenous variation in pension wealth stemming from early career differences in firms pension savings policies. We use this variation to study labor supply decisions from age 55 and onward. We find that larger pension wealth leads to earlier withdrawal from the labor market. Our estimates suggest an elasticity wrt to pension wealth which is increasing the closer individuals are to the official retirement age. For example, there is no effect in the short run e.g. age 57 but we find a sizeable effect from age 60 and onwards. For age 63 we find that an increase of around 100,000 DKK in pension wealth at age 55 decreases earnings by 1% implying a pension wealth elasticity of around 0.3. A large part of the reduction in employment/earnings is counteracted by an increase of individuals who are "self-supporting" ie they are neither employed nor receiving public transfers. We show that while mandated savings requirement may succeed in increasing retirement savings, individuals may respond by retiring earlier, an effect which is important to incorporate in reform discussions on how to create incentives for individuals to save more and retire later.

Keywords: Pension wealth, retirement, labor supply, mandated savings

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1 Introduction

Pension systems face the dual challenges of ensuring adequate pensions and maintaining financial viability, especially in the context of ageing populations, see OECD (2023), European Commission (2024). A common denominator in reform discussions – and also initiatives already taken in some countries – is to encourage individuals to save more and retire later. To this end mandatory pension savings requirements (or automatic enrollment type strategies) may improve pension adequacy and potentially relieve public finances by reducing pension expenditures, which are trending upwards due to an aging population.[1] However, this reform strategy faces some challenges.

First, mandatory savings or automatic enrollment may crowd out in other forms of savings by e.g. decreasing voluntary savings or increasing debt. However, empirical evidence shows that the crowding generally is small, and that such policies succeeds in increasing net-savings (see e.g. Chetty et al. (2014), Madrian and Shea (2001), Choi et al. (2003)). However, more recent evidence points to the net-effect declining over time if there is sccope for front-loading retirement savings e.g. in connection with a change in job[2], see e.g. Choukhmane (2025), Choi et al. (2024), Argento et al. (2015), Beshears et al. (2018), and Choi et al. (2024). Such scope for claiming accumulated retirement savings is not possible in all countries (the savings is illiquid until reaching some age threshold), and such mandatory schemes may therefore have a lasting effect on retirement savings.

Second, and largely overlooked in the literature, mandated retirement savings and the implied wealth accumulation may affect retirement decisions. This issue arises precisely because mandatory savings requirements make some individuals save more than they themselves find optimal. If low voluntary savings is due to e.g. myopia, the response to mandatory savings, may be to retire earlier, and possible at the age when the savings can be claimed. This may be interpreted as a wealth effect of importance for the extensive margin of labor supply (retirement). Such behavioral responses imply that a reform strategy which succeed in increasing retirement savings may be undermined by the induced incentive to retire early.

The contribution of this paper is to analyze how mandatory savings requirements which succeed in increasing retirement savings, via the implied wealth accumulation affect retirement decisions. With

[1]As is well-known a mandated fully funded scheme has a long gestation period since contributions made during working years must be accumulated to finance the retirement pension. With working careers of 40-45 years and retirement periods of 20-30 years it takes 70-80 years before retired through their retirement can claim the benefits contribution over a full work career. There is a clear shift from defined benefit (DB) to defined contribution (DC) schemes, see e.g. OECD (2023), implying that individuals will increasingly rely on their accumulated savings for retirement income

[2]Beshears et al. (2022) present a model showing why naive individuals will withdraw retirement savings in connection with a job shift, if given the option.

outset in behavioral models explaining undersavings and thus gives a rationale for mandatory savings requirements, the wealth-retirement nexus us and analyzed to assess the its empirical importance.

Our work is related to a voluminous theoretical and empirical literature that analyzes savings for retirement. Based on insights from behavioral economics various mechanisms have been shown to imply "under-savings", that is, individuals during working years save less than what is in their own self-interest, see e.g. Andersen et al. (2023). Empirical analyses also confirm that mandatory savings requirements do increase total retirement savings. The effects can be rather larger, and a well-known analysis by Chetty et al. (2014) concludes that "approximately 85% of individuals are passive individuals who save more when induced to do so by an automatic contribution but do not respond at all to price subsidies". In our analysis we show that such effects persist also in the longer run in the Danish institutional setting. This begs the question how this wealth accumulation affects the retirement decision.

While there is a large theoretical and empirical literature exploring retirement decisions, few studies explicitly link mandatory savings requirements to retirement decisions. It is empirically challenging to identify wealth effects in retirement decisions since both savings/wealth and retirement are choices of the individual and thereby often shaped by the same fundamentals. A forward looking individual with a preference for early retirement would tend to have larger pension savings and retire early in the data biasing estimates of this relationship (taste bias). In the standard textbook life-cycle model the individual saves to provide for consumption and thus accumulates wealth up to the retirement point, after which this wealth is decumulated. Thereby consumption is smoothed across working years and the retirement period. In this simple setting wealth peaks at the point of retirement. Additional complexities emerge when considering that wealth accumulation may also be driven by bequest motives or precautionary savings, as well as the role of preferences and health for savings and retirement decisions, see xx.

The empirical challenge is to identify exogenous reasons for changes in pension wealth to assess how pension wealth may affect retirement decision. We exploit that there in the Danish pension scheme are firm specific variations in contributions to funded pension schemes. Collective agreements (and firm specific pension arrangements) determine mandated pension contributions for the individual firm/worker. These variations in pension contributions produce differences in pension wealth across otherwise identical individuals who earlier in their working career had different pension contributions. We exploit Danish administrative data which in addition to various socio-economic variables also includes detailed data on pension contributions (for the years 1995-2022) and pension wealth (for the years 2014-2022).

The core of our empirical strategy can be exemplified as follows: imagine comparing two workers who at age 55 (that is, prior to them actively starting to plan/act on retirement) work in similar jobs with similar wages, savings, experience etc. These workers are similar except for one thing: in the early stages of their career one of these workers worked in a firm with slightly more favorable pension contributions than the other. 15-20 years later this still leads to changes in pensions (that is we have a first stage) and the empirical question is whether these changes in pension wealth also lead to changes in when these workers retire. To validate this empirical design we show a comprehensive battery of checks and tests. For example, we show that in our preferred empirical specification (which, for example, implies that we compare workers working in the same firm and occupation at age 55) there is essentially no correlation between the FCPR at age 40 and the inflow to savings or income of the worker at age 55. The 15 year spacing is motivated by this empirical correlation.

Our findings are as follows: First, we find a positive effect of the firm pension contribution rate (FPCR) age 40 on pension wealth at age 55. A 1 percentage point increase in the FPCR increases pension wealth by 57,000 DKK, an increase of 3%. This is controlling for firm fixed effects at age 55 and including extensive controls at age 40 and 55 to ensure individuals are comparable. However, we note that the inclusion of age 40 controls does not affect our estimate. Hence, it is not the case that individuals off-set a lower contribution rate earlier in their career by paying more into their occupational pension later on. We highlight two important features of the Danish institutional setting, which is that individuals cannot easily withdraw pension wealth prior to their 60s, and accumulated pension wealth is not affected by job-shifts. This is in contrast to the US where e.g., Choi et al. (2024) find that the effect of automatic savings policies on retirement savings is reduced due to job transitions as savings are often withdrawn upon job separation, and separations can cause 401(k) matching contributions to be forfeited.

Second, we study the effect of the FPCR at age 40 on labor supply dynamically from ages 56 to 67. We find that the FPCR has a negative impact on earnings and employment for individuals in their 60s. A one percentage point increase in the FPCR at age 40 decreases earnings at age 66 by 2% and the probability of being employed by 0.5 percentage points (1%). Before age 60, we do not observe any significant effects of the FPCR on earnings and employment. This finding is reassuring, as it aligns with the notion that the mid-to-late 50s is prior to the retirement decision, and that we are comparing individuals who are alike except for their FPCR and pension wealth. Additionally, the FPCR at age 40 has a positive effect on being self supporting and receiving non-public pension payments at age 60 and on. A one percentage point increase in the FPCR increases the probability of being self supporting by 0.4 percentage points (6%) at age 65. After age 65, the effect of the FPCR on being self supporting decreases, and at age 67, the effect is zero. This follows from the fact that as individuals age, they become eligible for state pension.

Third, we estimate the effect of pension wealth at age 55 on labor supply at ages 56 to 63 using the FPCR at age 40 as instrument. For our IV estimates, we can only study labor supply up until the age of 63 as we require data on pension wealth at age 55, and the pension wealth information is only available for the years 2014-2022. Here, we find that an increase of 100,000 DKK (≈14,000 USD)[3] in pension wealth decreases earnings by 1% and employment by 1.5 percentage points (2%) at age 63. For earnings, this implies a large pension wealth elasticity of around 0.3, highlighting the importance of taking the wealth accumulation effect of mandated retirement savings into account. Furthermore, we find that a 100,000 DKK increase in pension wealth increases the probability of being self supporting by 0.9 percentage points (18%).

We further conduct a wide variety of robustness checks, such as varying our definition of the FPCR, sample selection, measuring the FPCR and pension wealth at other ages, spousal spillovers, etc.. Our results are robust to these different specifications.

The paper is organized as follows. Section 2 provides a brief overview of related literature, and Section 3 offers a short introduction to the Danish pension scheme. The data used in the analysis is presented in Section 4, and Section 5 details the empirical strategy. The results, including various robustness checks are presented in Section 6, and Section 7 offers some concluding remarks. Appendix A provides an overview of the Danish pension system, Appendix B presents a stylized theoretical model on the implications of mandated savings requirement for retirement decisions, and Appendix C gives supplementary tables and figures.

2 Related literature

Our analysis takes outset in a vast theoretical literature building on behavioural economics to explain "undersavings" and provide a rationale for mandatory savings requirements [4] . The behavioural explanations are based on various forms of present bias arising from myopia, quasi-hyperbolic preferences, self-control and loss-aversion, see e.g. xx. A common finding is that individuals, when left to their own devices, tend to save too little, resulting in a lower level of old-age consumption as a consequence. The implications of these behavioural decision models for retirement decisions have not attracted much attention in the theoretical literature but it has been explored by Diamond and Köszegi (2003), Holmes (2010), Yu (2021), and Park (2023). In Appendix A we present a stylized model with myopic house-

[3] 1 DKK ≈ 0.14 USD.

[4] In a welfare state a moral hazard problem arises since public support in the form of e.g. means tested pension induce opportunistic behaviour of abstaining from retirement savings in the work years to rely on public support when retired, see XX

holds showing how undersavings and retirement decisions are related. A mandated savings requirements tends to crowd out voluntary savings, if crowding out is less than complete, total savings increases and this tends to support old-age consumption. However, in response there is also a crowding out arising from the higher pension wealth inducing individuals to retire earlier. It is shown that mandated savings requirements do not affect retirment decisions for active savers, but induces earlier retirement for passive savers.The aim of mandated savings requirements to increase consumption in old age may thus be countered by the implied incentives to retire earlier. Such responses also affect public finances via the direct effect employment (retirement) has on tax revenue.

There is a large empirical literature analysing savings decisison, and also the effects of mandated savings reqirement on voluntary savings, see.. The general finding in the literature is that mandated savings requirement are effective in increases savings for many households, see e.e.g Chetty et al. (2014), xxxx. There is also a large empirical literature analysing retirement decisions, see e.g. Blundell () for a survey, exploring both the role of the statutory retirement age and the incentives (participation taxes) implied by taxation, means-testing of public pensions etc.

However, only few studies on the relation between mandatory pension savings and retirement. Some papers explore wealth effect by examining unanticipated shocks to wealth. Imbens et al. (2001) analyse lotteri winners and find that unearned income reduces labor earnings (especially for those aged 55-65). The participation elasticity is around 0.14. Goda et al. (2011) analyse on the basis of surveys the consequence of the negative wealth shokcs induced by the Great Recession and finds that wealth loss can induce later retirement. Brown et al. (2010) analyse role of the timing of inheritance, and find that receipt of inheritance increases probability of early retirement by 4.4 pp.

A few papers analyse the effects of reforms. Artmann et al. (2023) analyse a reform in Germany (2014) which increases pension wealth for mothers, and which in turn reduced their earning (1 extra Euro of pension wealth reduced earnings by 54 cents). Statutory retirement ages have been changed in many countries, which in turns has affected actual retirement ages and consumption, see e.g. Etgeton et al. (2023).

While these studies are providing interesting insights they do not address the effects of mandated pension savings requirements. Such mandated basically reallocate resources within the intertemporal budget constraint of the individual. Current consumption possibilities are purposely reduced to increase future consumption possibilities [5].Such mandates may be effective due to either behavioral factors or due

[5]Though, there may be differences due to different rates of returns or products (annuities) differting from what the individuals can access on their own

to market failures e.g. borrowing constraints, or missing annuity markets. Hence, the studies referred to above do not directly provide evidence on the question whether and how mandatory savings requirements affect retirement decisions. This question is different in nature than the responses to exogenous unanticipated changes in wealth.

The challenge using reforms is that the policy change is implemented to address pre-existing problems, e.g. pension adequacy or financial viability problems due to changing demographics. This raises questions on whether the reform was anticipated and expectations concerning contribution rate, benefit levels etc. did anticipate the reform [6]

3 The Danish pension system

The Danish pension system builds on tax financed public pensions (flat rate pension for all plus means tested supplements), occupational pension schemes, and voluntary savings, see Appendix B. For the present paper the occupational pension part is important, and it mainly rely on pension contribution agreed as part of collective agreements (some firms may offer their own pensions scheme to their employees). Hence, these schemes are collectively negotiated but mandatory at the individual level. The contribution rate is typically split in a part (often 2/3) paid by the employer and the rest (1/3) paid by the employees. The contributions are paid to pension funds (different bargaining areas are associated with different pension funds) which in turn implies that the pension entitlements are not attached to being working for a particular firm, and job-shifts and mobility does not affect accumulated pension wealth. The schemes are largely DC-schemes. Contribution rates differ across bargaining areas, and total contribution rates are in the range of 12-18%, generally larger for highly educated groups (also having higher longevity). The occupational pensions have a long history but were extended to the private part of the labour market in a process starting in the late 1980s, and contribution rates have been steady since around 2010.

The statutory retirement determines eligibility to the tax financed public pension. The statutory retirement age has been increased in response to increasing longevity, and is not formally indexed to longevity, see Appendix B. There are some options for early exit from the labour market depending on health (disability pension and senior pension), labour market history ("early pension"), and an early retirement scheme which is contribution based. Working past the statutory retirement age does not reduce the entitlement to the public pension since it is adjusted on actuarial terms to the actual retirement

[6]The literature on so-called "contractionary fiscal expansions" is an example of how anticipations of policy changes due to non sustainable policy tracks may have alrge effects on behaviour.

age (and more recently it is now possible to claim the public pension while still working post the statutory retirement age).

4 Data

We use Danish administrative data that contains detailed information on pension wealth (years 2014-2022), pension contributions (years 1995-2022), and a wide variety of other variables (labor market outcomes, firm characteristics, educational attainment, etc.). Our data covers the full Danish population, and individuals can only exit the sample if they die or move out of the country, hence, attrition is minimal. All monetary values are adjusted to DKK, 2023-prices, using the Consumer Price Index (CPI) from Statistics Denmark.

4.1 Sample selection

As we construct the firm pension contribution rate (FPCR) for an individual at age 40 and age 55, we condition on individuals being employed at a firm when they are 40 and 55 years old. To limit measurement error, we restrict our sample to workers having only one employer in the year which must be their primary connection to the labor market. We exclude individuals with a military occupation at age 55 due to differential retirement rules for a large share of military employees. We also exclude individuals who receive civil servant pension (*tjenestemandspension*) as they have other pension conditions than the general population. Furthermore, we exclude individuals who receive self-employment income at age 40 or 55 as self employed have more influence on their pension contribution rates or can save up in their business, and business wealth and income are less precisely measured. Table C.1 shows our sample selection, and Table C.2 shows descriptive statistics for the full population and for our selected sample. Compared to the full population, individuals in the selected sample have, on average, seven more years of labor market experience and 400,000 DKK ($\approx 55{,}000$ USD) more in pension wealth at age 55.

4.2 Pension wealth

By collaborating with all pension companies and banks in Denmark, Statistics Denmark and the central bank of Denmark (*Danmarks Nationalbank*) have constructed a pension wealth data set (PENSFORM) from 2014 and on (Andersen et al., 2023). Compared to existing literature, where pension wealth is often imputed, we have a detailed data set on pension wealth for all individuals in Denmark from 2014 to 2022. As our primary variable of interest, we use total pension wealth before taxes. We winsorize pension wealth at the 1st and 99th percentile to reduce the influence of outliers.

4.3 Firm pension contribution rate

We use a data set on pension contributions (INPI) from 1995 to 2022. We construct the yearly firm pension contribution rate (FPCR) by taking the median of the occupational pension contribution rate for all employees with only that firm as employer in that year. The individual occupational pension contribution rate is constructed as the sum of all annual occupational pension contributions (variable *QARBPEN* from INPI) divided by annual earnings for each employee (variable *job_loen_beloeb_smal* from IDAN, The Integrated Database for Labour Market Research). Again, we winsorize the pension contribution rates at the 1st and 99th percentile to reduce the influence of outliers.

4.4 Outcome variables

We construct seven outcome variables to investigate how pension wealth affects labor supply. Only studying employment will not capture enough dimensions as the optimal policy response will depend on what an individual's counterfactual to employment is.

Earnings are defined as the sum of annual labor earnings before taxation and includes overtime, bonuses, and severance payment. We winsorize earnings at the 1st and 99th percentile. For labor market attachment, we classify individuals into six groups based on their status in November each year. **Employment** is an indicator variable for employment. **Partial employment** is an indicator variable for when an individual is employed, but earnings are less than 20% of the average earnings an individual had at age 50-54. **Self supporting** is an indicator variable for when an individual's primary November connection to the labor market is being outside of the labor force or receiving other pensions. This means that an individual who is self supporting is neither receiving government transfers nor being employed (in a firm or self-employed). **Disability pension** is an indicator variable for receiving disability pension. **Early retirement** is an indicator variable for receiving Voluntary Early Retirement Pay (VERP, in Danish *efterloen*).[7] **Other transfers** is an indicator variable for receiving any remaining government transfers (excluding state pension), such as UI benefits, sickness benefits, cash assistance, flex allowance, student grants, etc..

In addition to the labor market outcomes, we also study income from pensions. **Non-public pensions** is a dummy variable that takes on the value of 1 if there is positive income paid out from either

[7] The early retirement age (ERA) and normal retirement age (NRA) are increasing due to the Welfare Agreement from 2006 and the Retirement Reform in 2011. Figure C.1 shows the ERA and NRA for our sample by time and cohort.

mandatory occupational pension schemes or private pension schemes and 0 otherwise. We also study the monetary amount of income from non-public pensions in DKK.

4.5 Descriptive statistics

First, we show how labor supply varies over the life cycle in Figure C.2. The share employed declines with age, while the share exiting the labor market increases with age. People enter early retirement in their early 60s and normal retirement in their mid to late 60s. In Figure C.3, it can clearly be seen that for both men and women, the share who is self supporting is stable until age 60, and from then on, it is increasing until age 65. After age 65, many individuals become eligible for retirement benefits. For women, the share who is self supporting grows significantly, rising by approximately 67% - from around 3% of the population at age 55 to 5% by age 64. We also show how labor supply is correlated with pension wealth. In Figure C.4, we show labor supply for ages 59 to 67 by pension wealth at age 59. Individuals with low pension wealth are more likely to receive disability pension, while those with high pension wealth are much more likely to be employed. This highlights the challenge of estimating the causal effect of pension wealth, as it is an endogenous variable highly related to labor supply. For example, individuals with high preference for working will have both high pension wealth and high labor supply. Alternatively, individuals in poor health may have low labor supply and low pension wealth.

Table C.3 shows the descriptive statistics for the selected sample for all control variables measured at age 40 and 55, instrument (FPCR age 40), and variable of interest (pension wealth age 55). Individuals in the selected sample have an average pension wealth at age 55 of 2.1 million DKK, and the average FPCR at age 40 is 8%. Figure C.5 and Figure C.6 show how individual and firm occupational pension contribution rates increased from 1995 until 2009. Hereafter, pension contribution rates stagnated. Figure C.7 shows how occupational pension contribution rates differ by occupation.

5 Empirical strategy

The key empirical challenge in quantifying the relationship between late (working) life labor supply (age 55 and onwards) and (pension) wealth is that pension wealth is almost mechanically linked to labor supply as it to a large extent shaped by previous labor supply choices. There is thereby a myriad of ways in which selection biases will confound and mask the underlying relationship between pension wealth and whether on not to withdraw early from the labor market. One example is taste bias where individuals with a high taste for working will work more and as a result also have higher pension wealth. Similarly we may expect more productive individuals to earn and save more but also retire later. Mechanisms as the above leads to a positive association between pension wealth and labor supply something we also see born out in the data (more on this further below).

The core of our empirical strategy exploits individual panel data and builds on the idea that smaller differences across firms where individuals worked in early career (around age 40) – more than 15-20 years prior to the decisions about late (working) life labor supply – are not influential for subsequent labor market trajectories or earnings dynamics but nevertheless they do accumulate to reasonable differences in pension wealth which may affect the decision about when to retire. In particular we focus on observational similar individuals who around age 55 work in similar jobs, earnings etc (even firms). For these individuals we isolate variation in pension wealth stemming from differences in early career (or mid-career) pension contributions rates.

A key prerequisite for this strategy to work is that differences in pension rates around age 40 actually do lead to differences in pension wealth later in life. An alternative may be that such differences do instead revert over time such that the accumulated differences vanish. While this may be that case it is important to remember that pension savings are a stock variable implying path dependence (or compound interest dynamics). This means that even though individuals over time undo initial differences in the yearly contributions to pension savings historical differences do not disappear. As we return to below we do in fact have a clear and strong first stage reinforcing this point.

The key identifying assumption is that differences in early career pension rates (firms) does not affect the individuals in our sample in other ways that by generating differences in pension wealth. The restriction has at least two important implications:

First, we implicitly assume that individuals are not (too) forward looking in the labor market decisions. In other words, individuals do not (or cannot) undo prior smaller differences in firm pension rates' effect on future pension savings. A key feature of the danish pension design are worth highlighting here. Pension payments are set by firms and to a large extent occupational agreements, see section XX. The individual have no discretionary power here, it is simply a part of the agreement that the individual pays this part and it is not possible to opt out. One implication of this is that there is a mechanical component of pension savings. It is not an active repeated individual choice and anecdotal evidence suggests that a substantial share of individuals have substantial unawareness about their current plan and contribution rates.[8] Overall such unawareness would make it more plausible that early life differences in pension

[8] In general, evidence suggests individuals lack awareness about the complexities of the retirement system. Caplin et al. (2022) show that younger workers in Denmark exhibit biased beliefs, anticipating social security available at an earlier age than policy makers plan. Other studies also document confusion about social security rules and pensions, such as Gustman and

savings may only affect individual choices much later in life e.g. after age 55.

Second, differences in pension rates across firms do not materialize as differences in other career trajectories etc over time. That is it cannot be the case that the differences in pension rates reflect continuous prioritization of career trajectories where e.g. highly productive individuals work in slightly higher pension rate firms early in career and then go down later in life. Here it is important to mention that our research design explicitly focuses on individuals in similar jobs, occupations, earnings (even firms) around the age of 55 to directly ensure that we are in fact focusing on individuals who are very similar in labor market outcomes around age 55.

The validity of our exclusion restriction (i.e. that pension saving rates early in life only affect late life decisions about labor supply through differences in pension savings) of course warrants additional discussion and investigation something we return to in detail when discussing the results. For now we briefly outline some main reasons why we think the exclusion restriction is plausible in our setting.

First, prior research by Chetty et al. (2014) documents that individuals are to a large extent passive savers i.e. their future labor market behavior (and in particular savings behavior) is largely unrelated to prior differences in pension contribution rates.

Second, our empirical design and in particular the temporal spacing of around 15 years in between contributions and measurement of savings make it more plausible that any short term dependencies are gone. Further below we visually show that any dependence between pension contributions are falling over time.

Third, there may be an number of unforeseen circumstances affecting the exact timing of retirement (for example, the timing of grand children, health conditions etc.) this also makes fine-tuning of savings harder and should also reduce speculative motives about particular pension targets.

Fourth, even if individuals wanted to undo early period deficits in pension savings by working in higher contribution firms in the future such moves may be difficult due to e.g. frictions in the market such as information about the distribution of pension rates, collective agreements and occupational rules or even search friction implying that it is costly to find new employment.

Fifth, a key part of our empirical analysis consists of following and analyzing differences in individual behavior over time. To the extent that the exclusion restriction is questionable we may expect to see differences in e.g. alternative savings behavior (e.g. private pension savings or other assets) or even transitions into e.g. disability schemes and the like.

Steinmeier (2005) that shows more than half of the survey respondents in the HRS are unable to report their expected social security and pension benefits.

5.1 Estimating equations

Below we briefly outline our estimating equations. As a first step our reduced form equation describes the relationship between our instrument (the firm pension contribution rate at age 40) and labor supply estimated for each age from age 56 and onward. The reduced form equation is:

$$L = \delta FPCR + X\xi + \mu \tag{1}$$

where L measures labor supply at a particular age measured in different ways (see Section 4.4 for different versions). FCPR is the firm pension contribution rate at age 40 (details on how this variable is generated are explained in Section 4.3). The set of control variables are variables measured at age 55 (and sometimes also age 40) which ensures that we are indeed focusing on differences in pension wealth for observational similar individuals around age 55. The variables are: Firm FE, year FE, individual occupational and private pension contribution rates, dummy for payment to VERP scheme, male dummy, education dummies, marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, earnings (deciles), and wealth (ventiles).[9]. In the empirical analysis we of course conduct robustness checks where we change the set of controls to investigate the stability of our estimates.

In all first stage and reduced form regressions, we cluster standard errors at the level of the firm where individuals where working at age 55. In robustness checks, we also try alternative choices of standard errors using robust standard errors or clustering at the firm level at age 40. For the instrumental variables regressions, we use robust standard errors.

The full IV model consists of a first stage and a second stage equation. Our first stage equation estimates the effect of the firm pension contribution rate at age 40 on pension wealth for individuals in our sample at age 55. The first stage equation is:

$$PW = \alpha FPCR + X\gamma + \nu \tag{2}$$

where PW is pension wealth measures in 2023 DKK at age 55. The other variables are similar to above. The first stage measures the strength of the relation ship between firm pension contribution rates at age 40 and pension wealth later in life.

[9] Measured at age 40: marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, 1 digit industry dummies, earnings (deciles), and wealth (ventiles). The differences in control sets is explained by XXXX

The final IV estimates are obtained through the second stage equation which is:

$$L = \beta \widehat{PW} + X\omega + \varepsilon \tag{3}$$

where $\widehat{PW}$ is the predicted pension wealth at age 55 based on the first stage equation. The empirical model thereby focuses on the relationship between differences in pension wealth generated through differences in early life firm pension contribution rates.

Lastly a couple of general remarks on timing. As explained above the points of measurement are age 40 and age 55.

First, we measure pension wealth at age 55 and study labor supply from there onward to allow for some time in between the measurement of our key "treatment" variable and the outcome we want to measure. It may be reasonable that the closer you get to retirement the more likely it is that you begin to be aware and worry about pension wealth etc. In other words we worry that above age 55 controls, if e.g. centered age 60 instead, would be inadequate as they may begin to also reflect shorter term adjustments wrt to retirement timing, such as e.g. gradual phase out of working life (working fewer hours close to the time which the individual is planning to retire) .

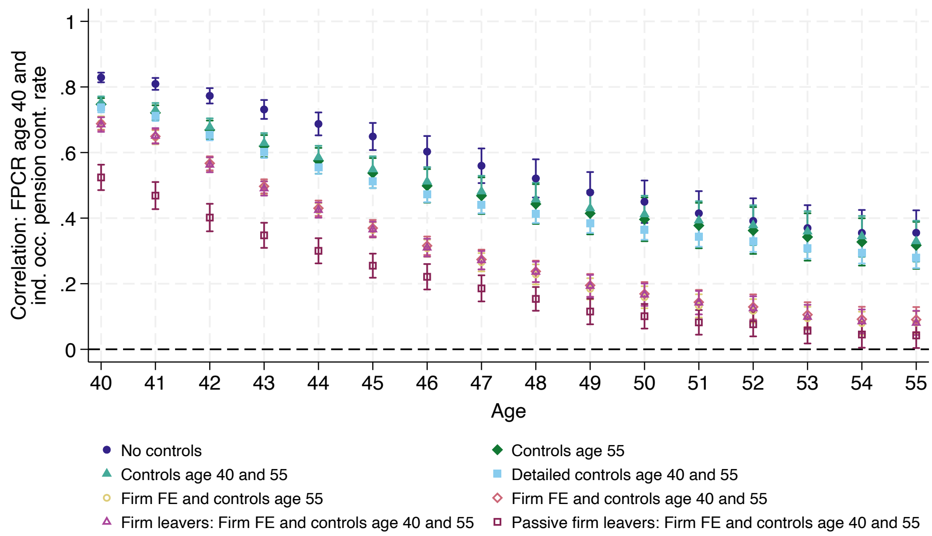
Second, we to select an appropriate time to investigate the role of differences in firm pension rates from we essentially rely on a data-driven strategy. In particular, Age 40 is motivated by the need to really secure temporal distance such that other differences besides differences in firm pension contribution has a chance to "wash out" over time. For example, empirically we see that the relationship between current age contribution rate (or even yearly pension savings) and firm pension rates at earlier ages continuously falls the longer the distance. We return to this relationship below but age 40 is close to the limit on how far back in the data we can go (Figure 1 and Figure C.8).

At age 55, the coefficient of the FPCR at age 40 on the individual occupational pension contribution rate for passive firm leavers and including firm FE and controls age 40 and 55, is 0.04 and not statistically significant from zero on a 1% level.

As a check, we study the correlation over a 20-year period, from age 35 to 55. In Figure C.9, we look at the relationship between the FPCR at age 35 and the individual occupational pension contribution rate at ages 35 to 55. Using a longer period, the coefficient of the FPCR at age 35 on individual occupational pension contribution rate at age 55 is exactly 0.00. Hence, for a longer time period, the positive relationship does indeed 'wash out' completely. In Figure C.10, we show additional correlations using the FPCR age 35. We also show results (first stage, reduced form, IV) using FPCR at age 35 (instead of age

40) in the Appendix. However, using the FPCR at age 35 instead of age 40 implies losing observations and only being able to study retirement behavior up until age 62 due to a limited time period of data. Hence, we use FPCR at age 40 as our primary specification, and find that the coefficients for which we can compare the two specifications, are alike. It should be noted that there is less power for the results using FPCR age 35, as there are fewer observations.

Figure 1: FPCR Age 40 and Individual Occupational Contribution Rates Ages 40 to 55



Notes: This figure shows the correlation between the firm occupational pension contribution rate (FPCR) at age 40 and the individual occupational pension contribution rates at ages 40 to 55. Controls age 55 include year fixed effects, dummy for payment to VERP scheme, male dummy, education dummies, marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, earnings (deciles), and wealth (ventiles). Controls age 40 include marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, 1 digit industry dummies, earnings (deciles), and wealth (ventiles). Detailed controls further include occupation dummies at the 3 digit level for age 40 and 55. Firm FE refers to firm FE at age 55. Firm leavers are defined as individuals who are no longer at age 55 employed at the firm they were employed at age 40. Passive savers are defined as individuals who did not contribute to a private pension at age 40 and 55. Standard errors are clustered at the firm level at age 55, and 95% confidence intervals are shown.

6 Results

First, we start by showing that an individual's firm pension contribution rate (henceforth, FPCR) at age 40 has a substantial impact on pension wealth at age 55, i.e., we have a strong first stage. Second, we study the effect of the FPCR on labor market outcomes and pension income close to the statutory retirement age. Third, we study the effect of pension wealth on labor supply where we instrument pension wealth using the FPCR. We then investigate mechanisms and heterogeneity. Lastly, we validate our results using multiple robustness checks.

6.1 First stage

We present the first stage results in Table 1 where we show that the FPCR at age 40 has a large, positive effect on pension wealth at age 55. First, we note that the inclusion of control variables at age 40 conditional on having age 55 controls, i.e., going from column (2) to column (3), does not seem to change the estimate.[10] A 1 percentage point increase of the FPCR at age 40 increases pension wealth at age 55 by 57,000 DKK controlling for firm fixed effects and a wide variety of control variables at age 40 and 55, including the individual occupational pension contribution rate and private pension contribution rate at age 55. This corresponds to an increase in pension wealth of approximately 3%. Hence, it is not the case, that e.g., workers with a low FPCR at age 40 compensate enough later in their 40s or beginning of their 50s to off-set the difference by paying more into their occupational or private pensions. This is also in line with Chetty et al. (2014) who find exactly that automatic employer contributions to retirement accounts increase pension wealth accumulation. The argument is that most of the population are passive savers, but we also highlight the role of compound interest. Motivated by a strong first stage, we then move on to reduced form and IV estimates.

Table 1: First Stage

	Pension wealth (1)	Pension wealth (2)	Pension wealth (3)	Pension wealth (4)
FPCR	117,527.07***	78,873.24***	78,093.92***	57,457.82***
	(7232.63)	(3976.73)	(3484.53)	(2340.19)
Controls age 55	No	Yes	Yes	Yes
Controls age 40	No	No	Yes	Yes
Firm FE age 55	No	No	No	Yes
Observations	219,968	219,968	219,968	203,847
R^2	0.079	0.444	0.482	0.574
Mean	2,114,397.69	2,114,397.69	2,114,397.69	2,137,672.39
Pct. change	5.56	3.73	3.69	2.69

Notes: This table reports the results from the first stage regression (Equation 2) where FPCR is the firm occupational pension contribution rate at age 40. In columns (1)-(4), the outcome variable is pension wealth at age 55. Column (1) includes no control variables, column (2) includes controls at age 55, column (3) includes controls at age 55 and 40, and column (4) includes controls at age 55 and 40 and firm fixed effects at age 55. Controls age 55 include year fixed effects, individual occupational and private pension contribution rates, dummy for payment to VERP scheme, male dummy, education dummies, marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, earnings (deciles), and wealth (ventiles). Controls age 40 include marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, 1 digit industry dummies, earnings (deciles), and wealth (ventiles). All monetary values are in DKK (2023-prices). Standard errors are clustered at the firm level at age 55 and shown in parentheses. Significance levels are indicated as * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

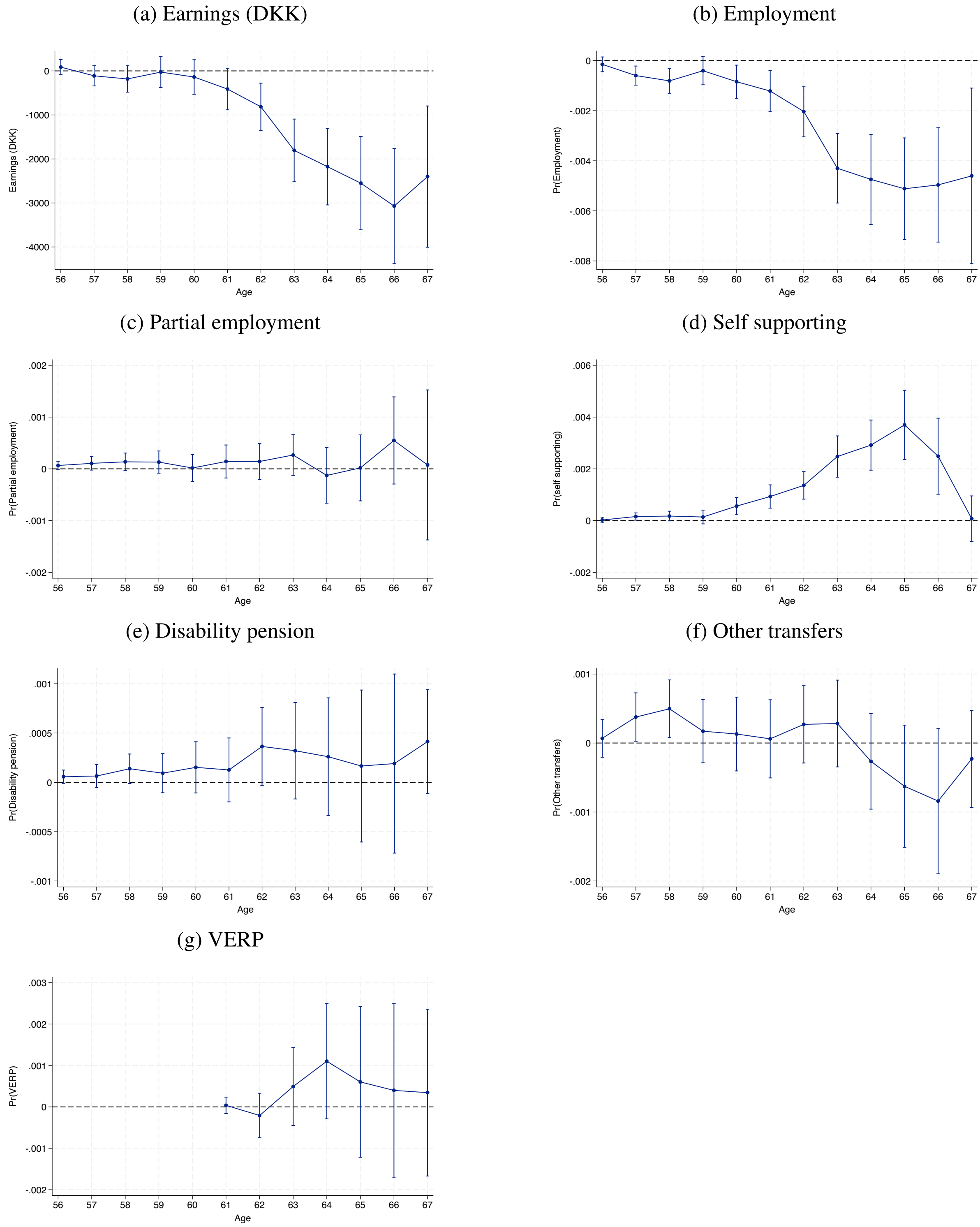
[10] It may also be viewed as reassuring for our empirical design by making the exclusion restriction more likely to be valid.

6.2 Reduced form

For the reduced form estimates, we start by showing the effect of a 1 percentage point increase of the FPCR at age 40 on labor market outcomes at ages 56 to 67 in Figure 2 (see Table C.4 in the Appendix for table with estimates). We find that a higher FPCR decreases earnings and the probability of being employed after age 60. The effects increase by age, and at age 66, a 1 percentage point increase in the FPCR at age 40 decreases earnings by 3000 DKK and the probability of being employed by 0.5 percentage points. This corresponds to a 1.7% decrease in earnings and a 1.4% decrease in the probability of being employed at age 66. We also find that a higher FPCR at age 40 has a positive effect on the probability of being self supporting at age 60 and on, until age 66. For individuals aged 65, a 1 percentage point increase in the FPCR increases the probability of being self supporting by 0.4 percentage points (5.9% increase). As individuals reach the statutory retirement age, we expect the share who is self supporting to decrease as individuals can then receive public pensions. The effect on the probability of being self supporting decreases at age 66 compared to age 65, and the effect is approximately zero at age 67. To contrast the results on labor market outcomes, it should be noted that from 1995 to 2010, the average FPCR in Denmark increased by 6 percentage points from around 4% to 10% as shown in Figure C.5 due to the roll-out of occupational pensions. For the probability of being partially employed, receiving disability pension, or receiving VERP, we do not find any clear effects. For transfers, there is a small statistically significant effect at ages 56 to 57, which could be due to bridging behavior.

In Figure 3, we study how the FPCR affects income from non-public pensions (see Table C.5 in the Appendix for table with estimates). While the rules regarding pension payments are complicated, individuals can, depending on their cohort, receive pension payments from age 60 or later. However, individuals can, by paying a charge of 60% to the government, access their pension deposits at an earlier age. We see that from age 60, an increase in the FPCR at age 40 has a positive effect on both the probability of receiving non-public pension income or not (the extensive margin) and on the monetary value of the non-public pension income. At age 65, a 1 percentage point increase in the FPCR increases the probability of receiving non-public pension income by 1 percentage point (2.4% increase) and the amount of non-public pension income by 1600 DKK (4.5% increase).

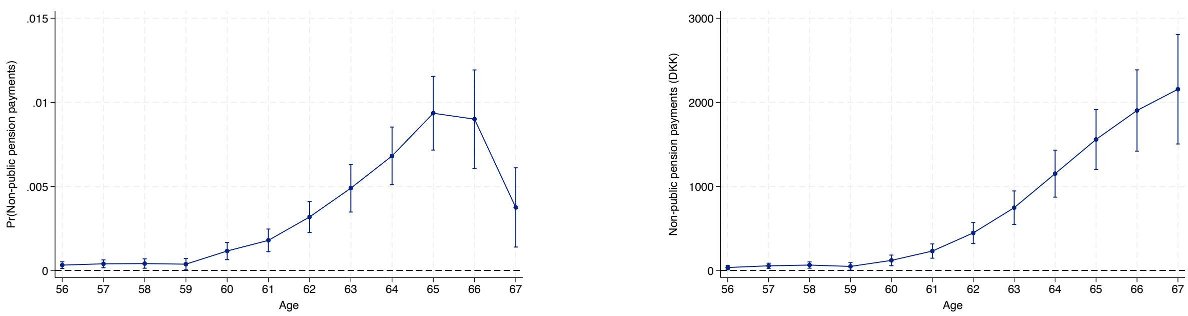
Figure 2: Reduced Form Estimates for Labor Market Outcomes



Notes: This figure plots reduced form estimates (Equation 1) for ages 56 to 67. In panel (a), the outcome variable is earnings, in panel (b), the outcome variable is a dummy for being employed, in panel (c), the outcome variable is a dummy for receiving disability pension, in panel (f), the outcome variable is a dummy for receiving other transfers, and in panel (g), the outcome variable is a dummy for early retirement. Controls age 55 include firm FE, year FE, individual occupational and private pension contribution rates, dummy for payment to VERP scheme, male dummy, education dummies, marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, earnings (deciles), and wealth (ventiles). Controls age 40 include marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, 1 digit industry dummies, earnings (deciles), and wealth (ventiles). All monetary values are in DKK (2023-prices). Standard errors are clustered at the firm level at age 55, and 95% confidence intervals are shown.

Figure 3: Reduced Form Estimates for Pension Income

(a) Non-public pension payments (b) Non-public pension payments (DKK)



Notes: This figure plots reduced form estimates (Equation 1) for ages 56 to 67. In panel (a), the outcome variable is a dummy for receiving non-public pension payments, and in panel (b), the outcome variable is non-public pension payments (DKK). Controls age 55 include firm FE, year FE, individual occupational and private pension contribution rates, dummy for payment to VERP scheme, male dummy, education dummies, marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, earnings (deciles), and wealth (ventiles). Controls age 40 include marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, 1 digit industry dummies, earnings (deciles), and wealth (ventiles). All monetary values are in DKK (2023-prices). Standard errors are clustered at the firm level at age 55, and 95% confidence intervals are shown.

6.3 Instrumental variables

For the OLS and IV estimates, we show the effect of pension wealth on labor market outcomes in Figure 4 (see Table C.6 for IV estimates). As previously mentioned, as pension wealth is endogenous to labor supply decisions, we would expect the OLS estimates to be biased. This can most clearly be seen for earnings. For the OLS estimate without controls, a 100K DKK ($\approx 14,000$ USD) increase in pension wealth at age 55 is associated with 6000 DKK more in earnings at age 63. For the OLS estimate including controls age 40 and 55 and firm fixed effects, a 100K DKK increase in pension wealth is associated with higher earnings of 600 DKK at age 63. While less than the OLS estimate without controls, it still shows a positive correlation between pension wealth and earnings. However, for the IV estimate, a 100K DKK increase in pension wealth has a negative effect on earnings of 5800 DKK (a decrease in earnings of 1.4%) at age 63. Taken together, this clearly highlights that OLS does not capture the endogeneity of pension wealth and hence, an IV approach is necessary.

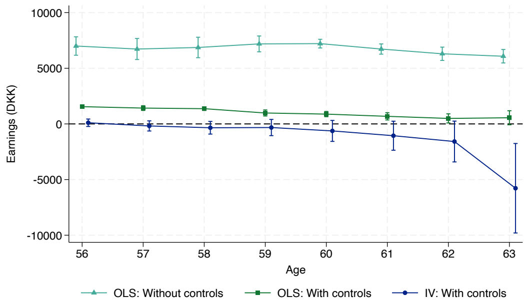
The IV results also show that at age 63, a 100,000 DKK increase in pension wealth at age 55 decreases the probability of being employed by 1.5 percentage points (a decrease of 1.9%) and increases the probability of being self supporting by 0.9 percentage points (a substantial increase of 18.3%). We find no effects on partial employment or disability pension. For other transfers, there seems to be a small, statistically positive effect at ages 57 and 58, which could be due to individuals using public benefits to bridge to retirement.

We then show the effect of pension wealth on pension income in Figure 5 (see Table C.7 for IV estimates). Here we find, that at age 63, a 100,000 DKK increase in pension wealth at age 55 increases the probability of receiving non-public pension payment by 1.8 percentage points (10.8% increase) and the amount of non-public pension payments by 2000 DKK (15.5% increase).

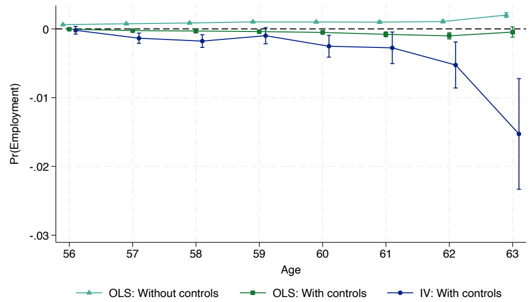
In conclusion, this shows that pension wealth has a negative effect on labor supply and a large, positive impact on being self supporting and receiving non-public pension income for individuals close to the statutory retirement age.

Figure 4: OLS and IV Estimates for Labor Market Outcomes

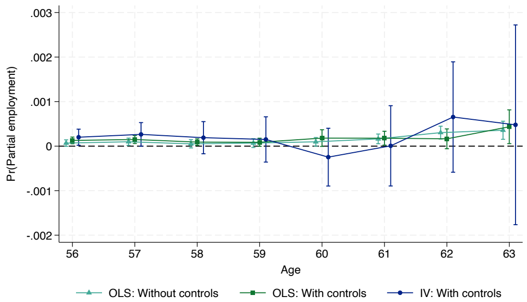
(a) Earnings (DKK)



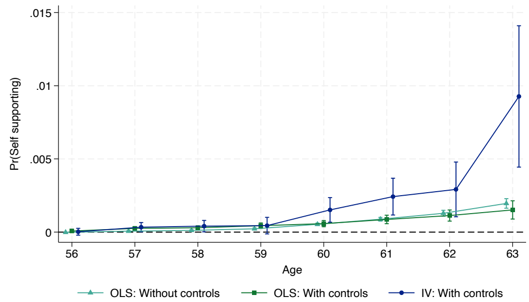
(b) Employment



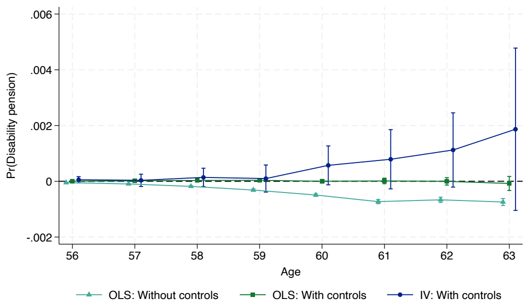
(c) Partial employment



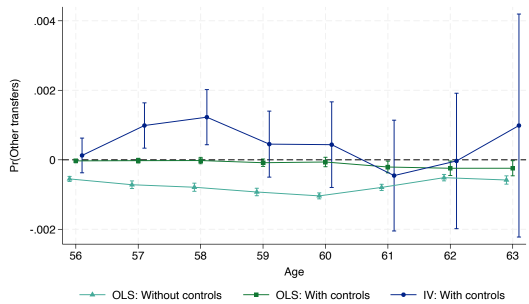
(d) Self supporting



(e) Disability pension



(f) Other transfers

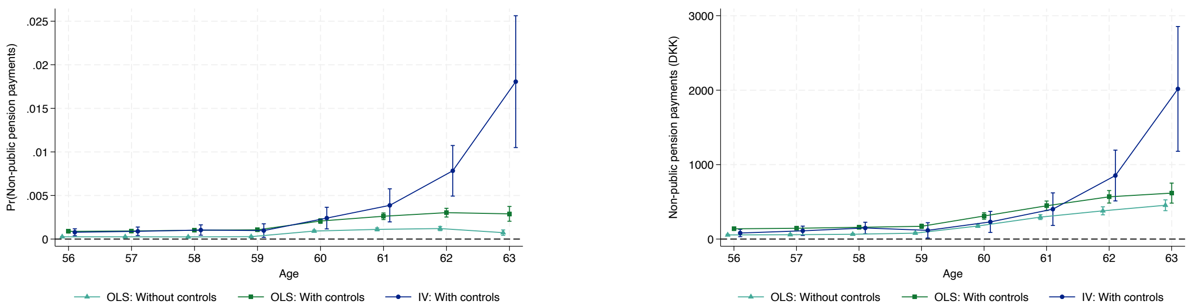


Notes: This figure plots OLS and IV estimates (Equation 3) for ages 56 to 63. In panel (a), the outcome variable is earnings, in panel (b), the outcome variable is a dummy for being employed, in panel (c), the outcome variable is a dummy for receiving disability pension, and in panel (f), the outcome variable is a dummy for receiving other transfers. Controls age 55 include firm FE, year FE, individual occupational and private pension contribution rates, dummy for payment to VERP scheme, male dummy, education dummies, marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, earnings (deciles), and wealth (ventiles). Controls age 40 include marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, 1 digit industry dummies, earnings (deciles), and wealth (ventiles). All monetary values are in DKK (2023-prices). Standard errors are robust, and 95% confidence intervals are shown.

Figure 5: OLS and IV Estimates for Pension Income

(a) Non-public pension payments

(b) Non-public pension payments (DKK)



Notes: This figure plots OLS and IV estimates (Equation 3) for ages 56 to 63. In panel (a), the outcome variable is a dummy for receiving non-public pension payment, and in panel (b), the outcome variable is non-public pension payment (DKK). Controls age 55 include firm FE, year FE, individual occupational and private pension contribution rates, dummy for payment to VERP scheme, male dummy, education dummies, marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, earnings (deciles), and wealth (ventiles). Controls age 40 include marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, 1 digit industry dummies, earnings (deciles), and wealth (ventiles). All monetary values are in DKK (2023-prices). Standard errors are robust, and 95% confidence intervals are shown.

6.4 Pension wealth at age 59

We also repeat our analysis using pension wealth at age 59 and the FPCR at age 44 to be able to study retirement behavior at later ages. However, the drawback is that age 59 is closer to the retirement timing decision, and hence, individuals could possibly already be adjusting their labor supply to withdraw from the labor force, e.g., by working fewer hours. From our previous results, we do, however, see that the effect of pension wealth on labor supply outcomes primarily happens at age 60 and later. We therefore proceed with this check. Measuring pension wealth at age 59 allows us to study reduced form estimates from ages 60 to 71 and IV estimates from ages 60 to 67, allowing us further insights into the timing of retirement and the persistence of the effect of pension wealth on labor supply. In Table C.8, we show our first stage results. We find an effect of 2.6% (close to our main estimate of 2.7% using FPCR age 40 and pension wealth age 55). Figure C.12 and Figure C.13 show our reduced form results. The effect of FPCR on labor supply is decreasing after age 67. At age 71, we find no effect of the FPCR on any labor market outcome. For the monetary value of non-public pension payments, we do find a persistent effect around age 67. As individuals reach the NRA, and can hence no longer receive disability pension and VERP, the coefficient for these becomes zero. Having an older age range also allows us to look at the effect of the FPCR on state pension (in Danish *folkepension*). We find a positive effect of FPCR age 44 on the probability of receiving state pension from ages 67 to 69. This is intuitive following that we also find that the FPCR age 44 has a negative effect on employment at this age and no statistically significant effect on self supporting from age 67 and on. For our IV results, in Figure C.14 and Figure C.15, the effect of pension wealth on earnings and employment is becoming increasingly more negative by age. For self supporting and the probability of receiving non-public pension payments, the effect is largest at age 65. At age 67, the effect of pension wealth on self supporting is no longer statistically significant.

6.5 Heterogeneity

By splitting the sample along gender, education, homeownership, marital status, and saver type, we consider different, important aspects of heterogeneity in Subsection C.5. In Figure C.16, we show the first stage results by the different splits for both pension wealth (DKK) and log(pension wealth). Using pension wealth in levels, we do find that the effect of the FPCR age 40 on pension wealth at age 55 are larger for men than for women. We also find that the effect for homeowners are larger than for non-homeowners. However, the level of pension wealth also differ for these groups. Hence, we investigate how the FPCR age 40 affects the logarithm of pension age 55. Here, we do not find differential effects for any of the sample splits.

Passive savers are defined as individuals who at age 55 and 40 did not contribute to private pensions, while active savers are individuals who had a positive private pension contribution at age 55 and/or age 40. Approximately 60% of the sample are passive savers, while 40% are active savers in our first stage regressions. We show our reduced form estimates by saver type in Figure C.23 and Figure C.24. Figure C.31 and Figure C.32 shows IV estimates for passive and active savers.

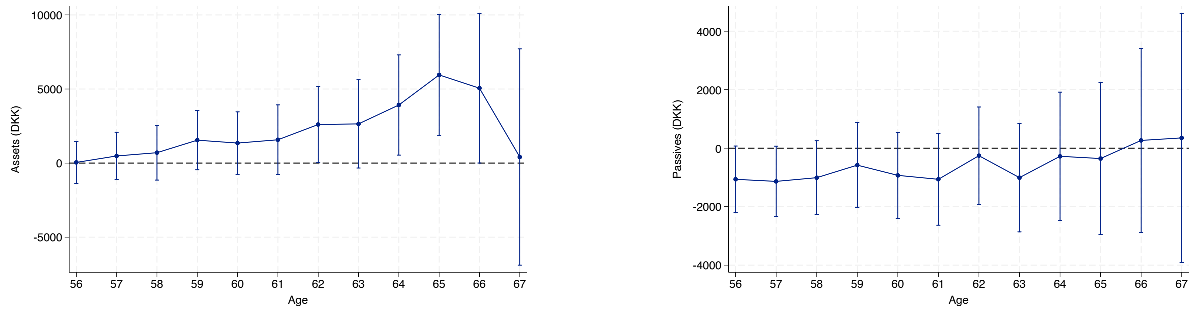
6.6 Robustness checks

To ensure the validity of our results, we consider a wide variety of robustness checks.

First of all, we study how the FPCR at age 40 relates to assets and passives in Figure 6. We find no statistically significant relationship with passives. For assets, there is no statistically significant relationship until age 64. In Figure 7 (OLS and IV estimates), we study how pension wealth affects financial outcomes. Here, it is clear that for IV estimates, there is no statistically significant effect on assets or passives. However, the OLS estimates (especially without adding controls) are statistically significantly positively correlated with assets and passives.

Figure 6: Reduced Form Estimates for Financial Outcomes

(a) Assets (DKK)　　　　(b) Passives (DKK)



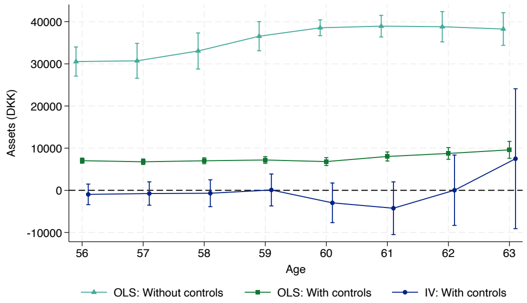
Notes: This figure plots reduced form estimates (Equation 1) for ages 56 to 67. In panel (a), the outcome variable is assets (DKK), and in panel (b), the outcome variable is passives (DKK). Controls age 55 include firm FE, year FE, individual occupational and private pension contribution rates, dummy for payment to VERP scheme, male dummy, education dummies, marriage dummy, children at home dummy, experience, experience squared, tenure, occupation dummies, earnings (deciles), and wealth (ventiles). Controls age 40 include marriage dummy, children at home dummy, experience, experience squared, tenure, occupation dummies, industry dummies, earnings (deciles), and wealth (ventiles). All monetary values are in DKK (2023-prices). Standard errors are clustered at the firm level at age 55, and 95% confidence intervals are shown.

This again underlines the endogeneity of pension wealth and the necessity of instrumenting pension wealth. As a further check, we also repeat our first stage, reduced form, and IV regressions, but varying the inclusion of control variables, in Subsection C.6. We find our results are robust to whether we include control variables at age 40 and dummies for ventiles of net wealth excluding pension wealth at age 55.

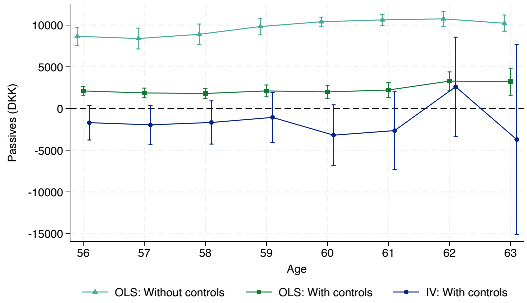
In our sample period, the early retirement age (ERA) and the normal retirement age (NRA) are

Figure 7: OLS and IV Estimates for Financial Outcomes

(a) Assets (DKK)



(b) Passives (DKK)



Notes: This figure plots OLS and IV estimates (Equation 3) for ages 56 to 63. In panel (a), the outcome variable is assets (DKK), and in panel (b), the outcome variable is passives (DKK). Controls age 55 include firm FE, year FE, individual occupational and private pension contribution rates, dummy for payment to VERP scheme, male dummy, education dummies, marriage dummy, children at home dummy, experience, experience squared, tenure, occupation dummies, earnings (deciles), and wealth (ventiles). Controls age 40 include marriage dummy, children at home dummy, experience, experience squared, tenure, occupation dummies, industry dummies, earnings (deciles), and wealth (ventiles). All monetary values are in DKK (2023-prices). Standard errors are robust, and 95% confidence intervals are shown.

increasing in Denmark (see Figure C.1). Hence, at the same age, different cohorts have different retirement ages. We therefore repeat our analysis using distance to ERA and distance to NRA instead of age in Subsection C.7. While the gap between the ERA and NRA was initially 5 years, this gap has changed over time, meaning the distance to the ERA and NRA cannot be determined simply by adding a fixed five-year difference. We find similar results using distance to ERA and NRA as using age. Using distance to NRA, it can also be more clearly seen that the effect of FPCR becomes insignificant and the estimate close to 0 for self supporting after an individual reaches the NRA. As individuals can no longer receive disability pension or VERP after the NRA, the coefficients for these become zero after an individual has reached the NRA.

We also vary the level of clustering in our first stage and reduced form estimations, both clustering on the firm level at age 55 and 40 and using robust standard errors in Subsection C.8. Choice of clustering does not affect the significance of our results.

We also restrict our sample to individuals who were married at age 55 and investigate whether the inclusion of a control variable for spousal earnings at age 55 affects our estimates in Subsection C.9. We find that the inclusion of spousal earnings does not affect neither our first stage, reduced form estimates, nor IV estimates. We also investigate whether the FPCR affects spousal earnings at age 56 to 67. Without controlling for spousal earnings at age 55, we do not find any effect of FPCR on spousal earnings until age 66, where there is a negative effect on spousal earnings. The tendency of joint retirement has been documented in the literature, both using retirement reforms and structural models (e.g., García-Miralles and Leganza (2024), Michaud et al. (2020)), and the negative effect could be due to joint retirement.

However, when controlling for spousal earnings age 55, we find no effect of FPCR on spousal earnings.

Furthermore, we also vary the definition of FPCR in Subsection C.10. In our main specification, we construct the FPCR by taking the median of the occupational pension contribution rate for all employees with only that firm as employer in that year. Alternatively, we could take the mean of the occupational pension contribution rate for all employees with only that firm as employer in that year. In Table C.12, we estimate the first stage regression using the mean occupational pension contribution rate as our FPCR. We find a somewhat larger effect of 69,000 DKK (an increase of 3.3%) compared to our main specification estimate of 57,000 DKK (increase of 2.7%). Hence, taking the median gives a conservative estimate compared to taking the mean. We also repeat our reduced form and IV analysis, where we see similar patterns using the mean as for our main specification (using the median). Additionally, we also try another definition of FPCR. We construct a FPCR for each 1 digit occupation level in the firm meaning that we take the median of the occupational pension contribution rate for all employees within a 1 digit occupation category within a firm with only that firm as employer in that year. Again, we find similar results compared to our main specification.

We then compare the results for the full sample to a restricted sample of firm leavers, i.e., individuals who are not employed at the same firm at age 55 as at age 40 in Subsection C.11. Our first stage results are shown in Table C.14 where we find that 1 percentage point increase of the FPCR at age 40 increases pension wealth at age 55 by 2.7%, a similar estimate as for our main specification. Firm leavers account for approximately three-fourths of our full sample. The RF and IV results for firm leavers are also very similar to our main results.

For our first stage, we also investigate whether the use of matching changes our results in Subsection C.12. We create a dummy variable for having a high FPCR (having the median or above FPCR), and we then use Propensity Score Matching (PSM) to match on having a high FPCR. Figure C.64 shows the propensity scores without restricting on caliper and with a caliper restriction of 0.001, and we show the first stage results in Table C.15. We find very similar results for no matching and matching with and without caliper restrictions.

We also try different functional forms. We use the logarithm of pension wealth as the outcome variable for the first stage regression in Table C.16. Here we find a 3.3% increase which is very comparable to our main estimate of an increase of 2.7 %. We also study the effect of the logarithm of pension wealth instrumented by FPCR on outcomes in Figure C.68 and Figure C.69. Likewise, we find similar effects. We also take the logarithm of the monetary outcomes as an additional check in Figure C.65 (reduced form) and Figure C.66 (IV).

7 Conclusion

We study the link between pension wealth and the timing of retirement using Danish administrative data and exploiting plausibly exogenous variation in early career differences in firms' savings policies.

Our first stage results show that the firm pension contribution rate (FPCR) has a long-lasting, positive effect on pension wealth. Including a wide variety of control variables and firm fixed effects at age 55, we find that a 1 percentage point increase in the FPCR at age 40 increases pension wealth at age 55 by 3%. Early career differences in firms' savings policies thus cause persisting differences in pension wealth, and individuals are not off-setting this difference later on in their career nor accumulating other wealth. Therefore, in the Danish context, mandated pension savings serve as an effective tool to increase pension wealth.

Using the variation in FPCRs in early career to instrument for pension wealth, we study the link between pension wealth at age 55 and labor supply. In the short run, i.e., at ages 56-59, we find no effect on earnings, employment, and the probability of being self supporting, i.e., not being employed nor receiving government transfers. At age 63, we find that an increase in pension wealth at age 55 of 100,000 DKK decreases earnings by 1%. This implies a significant pension wealth elasticity of around 0.3. For employment, we find that 100,000 DKK more in pension wealth decreases the probability of being employed by 1.5 percentage points (2%). This decrease is counteracted by an increase in the probability of being self supporting by 0.9 percentage points (18%). We find no sizeable effects on disability pension or other transfers (such as unemployment benefits, cash assistance, etc.). As a mechanism for retirement, we find that individuals with higher pension wealth at age 55 has a higher payout from non-public pensions at age 60 and on.

Our reduced form results allow us to study the link between FPCRs and labor supply until the age of 67. We find that a higher FPCR decreases earnings and the probability of being employed from age 60 and on. For self supporting, we find a positive effect from age 60 to age 66, however, the effect of the FPCR at age 40 on being self supporting at age 67 is zero, an age at which individuals are mostly eligible for public retirement benefits.

Our results show that while mandated pension savings can increase pension wealth, the implied wealth accumulation effect of this can affect the retirement decision and cause individuals to withdraw earlier from the labor market. This highlights the challenge of encouraging individuals to save more and retire later simultaneously. While previously largely overlooked in the literature, our results show that this labor supply channel is important to include in retirement reform discussions.

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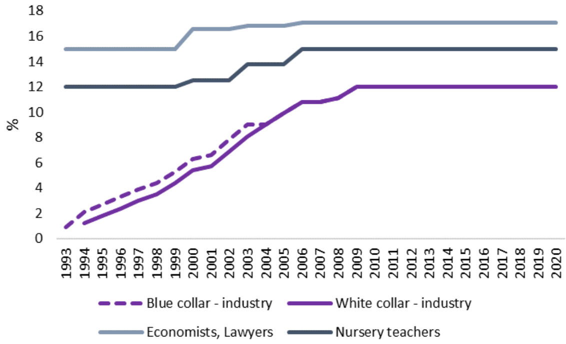


Figure A.1: Enter Caption

A The Danish Pension System

The cornerstones of the Danish pension system are tax financed public pensions, and occupational pension schemes.

The public pension consists of a base amount and means-tested supplements. Eligibility is universal when reaching the statutory pension age subject to a residence requirement[1]. The basic structure is illustrated in Figure A1 for the two most important supplements (pensionstillæg, særlig pensionsydelse/ældrecheck). The figure applies to a single, couples are somewhat more complicated via the means-testing.

Figure A1 Public pensions – basic among and supplements

The public pensions are indexed to private sector wage developments (Satsreguleringsloven) less 0.3 percentage point (if wage increases are above 2%), which finance contribution to a mandated pension arrangement (Obligatorisk pension) for recipient of social transfers.

It is possible to claim the public pension while working beyond the statutory pension age (earlier there was an income-test and a possibility to postpone the payment on actuarial terms) post the statutory pension age.

Occupational pensions consist mainly of collectively bargaining pension arrangements. About 82 % of the employed are working under a collective agreement (100% in the public sector, 73 % in the private sector). To this comes firm specific pension arrangements, but not employees are covered by an occupational pension scheme. The collectively bargained pension schemes have developed over time, see Figure A.2. The key change happened in the late 1980s/early 1990s when such schemes were also introduced widely in the private segment of the labour market. The schemes are organized across occupational groups. Contribution rates have been steady since around 2000. The occupational pension schemes are fully funded and have gradually changed from being DB schemes to being DC schemes

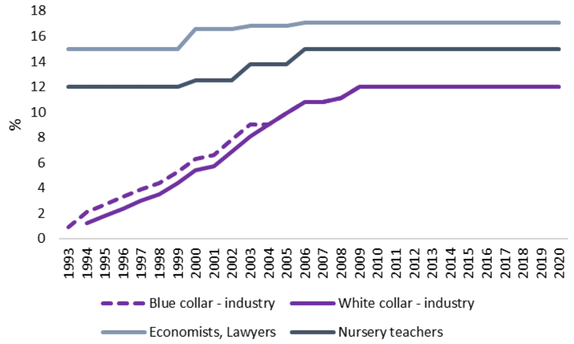


Figure A.2: Enter Caption

(more than 70% of contributions are to DC schemes).

Figure A.2. Contribution rates determined by collective bargaining, selected groups

Source: Andersen (2022).

Two important observations. First, not all wage elements are included in the base for which the contribution rate applies. The pension contributions as a percentage of the total wage is thus lower than the contribution rates reported in Figure 2.B. The average pension contribution as a percentage of the total wage sum was about 10% in 2022. The effective contribution rate is increasing in income. The median contribution rate is increasing from 3.9% for a gross income of DKK 170.000 to 11.8% for a gross income at DKK 935.000. There is considerable dispersion with income group, e.g. for the high income group between 6.6% (P10) and 18.2% (P90), see ATP Faktum 217.

Second, the group not covered by a pension scheme amount to 25-205 of the age group if defined by pension contributions being so low that they will receive the maximal supplement to the public pension, see ATP (2024)

To this comes voluntary pension savings (see below on tax rules) and other forms of savings and wealth accumulation.

Tax rules

Many aspects of the pension system are regulated through the tax code.

For schemes where funds cannot be withdrawn prior to reaching the statutory pension age (see below) there are favourable tax treatments.

· The return on pension savings is taxed more leniently than other forms of capital income. The tax on the rate of rate return is 15.3%, while the capital income tax rate is in the range of xx

· Contributions to pension schemes are non-taxable, and taxed when paid out. With an income tax system with progressive elements, it is implied that the tax value of the deduction of the contribution is higher than the tax applying to the received pension.

· There is an upper bound on contribution to installment pension where benefits are paid out over a period of 10 years or more.

· There is an age specific additional tax deduction on pension contributions made in a window 15 years prior to reaching the statutory pension age.

· Contributions to the scheme "Aldersopsparing" are not tax deductable, but benefit payments are non-taxable income, and they are not included in means testing. There is an upper cap on the annual contribution to the scheme.

Early withdrawal of funds is possible in a window of 3 years prior to reaching the statutory pension age (before 2018 it was 5 years), (https://info.skat.dk/data.aspx?oid=2048232). Funds withdrawn earlier (except in special circumstances) are taxed by 60% (but can in some cases be 405, https://info.skat.dk/data.aspx?oid=2048

Statutory pension age

Statutory ages in the pension system are established by law and, thus, regulated at the political level.

Recent reforms—the 2006 Welfare Reform and the 2011 Retirement Reform—have increased the statutory retirement ages in steps from age 60 years to 64 years for early retirement (2023), for the public pension from 65 years to 67 years (2022), and also shortened the early retirement period from five years to three. Moreover, the pension age (and most other age thresholds including the early retirement age) are now indexed to the development in life-expectancy at the age of 60 in order to target the expected pension period of 14.5 years (17.5 including early retirement) in the long term (currently about 18.5/23.5 years). Parliament decides every 5th year with a 15 year lead the statutory retirement age, hence in 2020 it was decided that the statutory retirement age in 2035 will be 69, and in 2025 it is up for approval that it is going to be 70 years in 2040. There is a speed limit such that the statutory retirement age can only be increased by a maximum of one year every 5th year.

Early exit options

There are different options for retiring earlier than the statutory retirement age. A complex set of schemes exists for individuals with reduced work capabilities. As a rule, permanent support in the form of *disability pensions* can only be granted to persons above the age of 40 if work capabilities are reduced to such an extent that self-support cannot be expected (not even in a so-called flex-job). A 'senior pension' (*seniorpension*) is available from an age 6 years prior to reaching the statutory retirement age, provided work capability is reduced (unable to work at least 15 hours per week). A new scheme 'early pension' (*tidlig pension*) is available for persons who at the age of 61 have worked at least 42 years in the labour market. Finally, early retirement (*efterløn*) is a possibility to retire in a window (after reforms reduced from 5 to 3 years) prior to the statutory pension age for persons who have contributed to the scheme for at least 30 years. The rules have been changes numerous times to make the scheme less generous, and as a consequence the number of persons eligible for early retirement is decreasing.

[1] Full base amount requires residence in at least 40 years since the age of 15. The amount is reduced proportionally for shorter residence periods.

B Theoretical model

The following considers a simple setting admitting an analysis of mandatory savings requirements and its effects on retirement decisions. The model captures the essence of a significant part of the pension literature examining the extent to which mandated savings requirements crowd out voluntary savings, the importance of behavioural decision making, and the role of borrowing constraints. To arrive at clearcut analytical results the following uses a standard two-period overlapping generations setting allowing an analysis of retirement decisions by reinterpreting the length of periods[11] . Specifically, normalize the length of life as young to one, and let the length of the second period be L (≤ 1)[12], see e.g. Bloom et al. (2007), Andersen (2008) and Pestieau and Ponthière (2012). The length of the second period (L) can be interpreted as longevity. The individual then chooses at what age (R) to retire in the second period ($0 \leq R < L$). This approach offers a simple way to analyse pension savings and retirement decisions and the consequences of changes in longevity.

Let lifetime utility for a representative agent be

$$\Omega \equiv u(c^y) + \frac{1}{1+\delta}\left[Lv(c^o) - Rd\,(R,L)\right] \tag{4}$$

where the first term is the utility from consumption when young, c^y (disutility from working is suppressed since labour supply as young is exogenous), and δ is the subjective time preference. The utility as old has two terms: utility from consumption when old, given as the product of longevity L and the flow utility $u(c^o)$ from consuming c^o throughout "old-age", and disutility from work given as the length of the working period (=retirement age) R times the flow disutility from work $d(R,L)$, depending on the retirement age and longevity (for specific properties, see below). The utility functions $u(\cdot)$ and $v(\cdot)$ fulfil all standard properties and δ is the subjective time preference. The marginal disutility of retirement at

[11] Effectively, this assumes a continuous time setting within period two. The simplification arises by having no discounting "within" but only "between" periods. Hence, the consumption flow is constrained to be invariant (smoothed) within the two phases constituting the life-cycle of the individual.

[12] To a first approximation, this can be taken to match observed mortality rates which are constant (and low) up to a certain age, from which they are increasing with age, see Chapter 1.

age R is

$$\eta(R,L) \equiv d(R,L) + Rd_R(R,L) = d(R,L)\left[1+\varepsilon_R(R,L)\right]$$

where $\varepsilon_R(R,L) \equiv \frac{d_R(R,L)R}{d(R,L)}$ is the elasticity of the disutility from work $d(\cdot)$ wrt. the retirement age R. The second order condition to this problem requires that $\eta_R(R,L) - v_{cc}(c^o)\frac{w}{L} < 0$. It is assumed that the marginal disutility is increasing in the retirement age ($\eta_R(R,L) > 0$) and declining in longevity ($\eta_L(R,L) < 0$).

To introduce behavioural decision making in the most simple form the following introduces myopia. Specifically, the preferences in (4) are the choice preferences determining the actions by the individual while the true preferences by which to assess lifetime utility are

$$\Omega \equiv u(c^y) + \frac{1}{1+\delta^*}\left[Lv(c^o) - Rd(R,L)\right]$$

where $\delta^* < \delta$ implying that more weight is attached to the utility as old than implied by the choice preferences. A key implication is that the individually chosen savings level is lower than what is optimal given true preferences, and hence there is undersavings motivating a mandated savings requirement. There is a large literature exploring how various behavioural factors influence intertemporal decision making, and the central finding is the tendency to save insufficiently and this is captured by this formulation, see xxx

Funded DC pension scheme

Consider a mandatory fully funded scheme with a contribution rate[13] τ implying that the budget constraints read

$$c^y = w\left[1-\tau\right] - s$$
$$c^o = \frac{Rw + [1+r]\left[s+\tau w\right]}{L}$$

and s is voluntary savings. For simplicity it is assumed that voluntary and mandatory savings earn the same rate of return. The individual decision problem is solved "backwards" first considering the retirement decision as old given the savings decision made as young, and then considering the savings decision as young. The first order condition for the retirement decision as old reads

[13] Given the interpretation of the old-age period, contributions as old do not matter.

$$v_c(Rw + [1+r][s+\tau w])w = \eta(R, L)$$

where it follows straightforwardly that the retirement age via a wealth effect is declining in savings made as young,

$$\frac{\partial R}{\partial s} = -\frac{v_{cc}(c^o)[1+r]w}{v_{cc}(c^o)w^2 - \eta_R(R, L)} < 0$$

The standard first order condition for optimal voluntary savings as young reads

$$u_c(w[1-\tau] - s) = \frac{1+r}{1+\delta} v_c\left(\frac{Rw + [1+r][s+\tau w]}{L}\right)$$

Importantly this first order condition determines total savings given as $s + \tau w$. A change in mandatory savings leaves total savings unchanged ($\frac{\partial(s+\tau w)}{\partial \tau} = 0$). The intuition is that the two forms of savings are perfect substitutes since they have the same rate of return. What matters to the individual is total savings, and hence the higher the mandated savings, the lower the voluntary savings, $\frac{\partial s}{\partial \tau} = -w < 0$. This captures the standard crowding out result that mandated savings crowds out voluntary saving (here in a strong form due to the assumption that the two forms of savings are perfect substitutes to the individual). Note that it is implied that the retirement age is unaffected by the mandatory pension savings requirement ($\frac{\partial R}{\partial \tau} = 0$).

The crowding out of voluntary savings implies that voluntary savings become negative at sufficiently high mandatory savings requirements ($\tau \geq \underline{\tau}$), that is, the mandated savings requirement is so high that the individual starts borrowing to avoid to low consumption as young (here it is assumed that borrowing is possible at the rate r). Define the critical contribution rate $\underline{\tau}$ as the contribution rate at which voluntary savings is exactly zero,

$$u_c(w[1-\underline{\tau}]) = \frac{1+r}{1+\delta} v_c\left(\frac{Rw + [1+r]\underline{\tau} w}{L}\right)$$

For this contribution rate the retirement age is

$$v_c(Rw + [1+r]\underline{\tau} w)w = \eta(R, L)$$

Next assume in line with the literature that borrowing is not possible[14] ($s \geq 0$). With a binding borrowing constraint, an increase in the contribution rate has a one-to-one effect on savings, since there

[14]Borrowing here is essentially using the pension as collateral, which is not possible in many countries.

is no crowding out, $\frac{\partial(s+\tau w)}{\partial\tau} = w$ for $\tau > \underline{\tau}$. The individual may be characterized as a passive saver in this situation. When the borrowing constraint is binding, the individual would like to increase consumption as young and decrease it as old if borrowing was possible since the marginal utility of consumption is lower as young than (weighted) as old,

$$u_c\left(w\left[1-\tau\right]\right) < \frac{1+r}{1+\delta}v_c\left(\frac{Rw+\left[1+r\right]\tau w}{L}\right) \text{ for } \tau > \underline{\tau}$$

It follows straightforwardly that the optimal retirement age is determined by

$$v_c(\frac{Rw+\left[1+r\right]\tau w}{L})w = \eta\left(R,L\right) \text{ for } \tau > \underline{\tau}$$

For borrowing constrained individuals, the response to an increase in the contribution rate to the mandated funded scheme is to lower the retirement age,

$$\frac{\partial R}{\partial\tau} = \frac{v_{cc}(c^o)\left[1+r\right]\frac{\left[w\right]^2}{L}}{\eta_R(R,L)-v_{cc}(c^o)\frac{w}{L}} < 0 \text{ for } \tau > \underline{\tau}$$

The intuition is that a higher contribution rate decreases consumption as young and increases it as old. This is the opposite of what the borrowing constrained individual wants. Lower marginal utility of consumption as old due to the higher pension makes the individual retire earlier. Hence, a contribution rate so high that the borrowing constraint is binding ($\tau > \underline{\tau}$) reduces the retirement age compared to the case where borrowing is feasible.

Under true preferences the optimal retirement age and savings are determined by (for $s > 0$)

$$v_c(R^*w+\left[1+r\right]\left[s^*+\tau w\right])w = \eta\left(R^*,L\right) \tag{5}$$

$$u_c\left(w\left[1-\tau\right]-s^*\right) = \frac{1+r}{1+\delta^*}v_c\left(\frac{R^*w+\left[1+r\right]\left[s^*+\tau w\right]}{L}\right) \tag{6}$$

Under true preferences savings is higher ($s^* > s$) and the retirement age lower ($R^* < R$) than under the choice preferences. This can be proved by contradiction. Assume that $s > s^*$. Then it follows straightforward that $R < R^*$ since $\frac{\partial R}{\partial s} < 0$. If $s > s^*$ it is implied that $u_c\left(w\left[1-\tau\right]-s^*\right) < u_c\left(w\left[1-\tau\right]-s\right)$ and $R < R^*$ implies $\eta\left(R,L\right) < \eta\left(R^*,L\right)$ which in turn from (5) implies $\frac{Rw+[1+r][s+\tau w]}{L} > \frac{R^*w+[1+r][s^*+\tau w]}{L}$. It thus follows that

$$u_c\left(w\left[1-\tau\right]+s\right) = \frac{1+r}{1+\delta}v_c\left(\frac{Rw+\left[1+r\right]\left[s+\tau w\right]}{L}\right) < \frac{1+r}{1+\delta}v_c\left(\frac{R^*w+\left[1+r\right]\left[s^*+\tau w\right]}{L}\right)$$

Using (6) it is implied that

$$u_c\left(w\left[1-\tau\right]+s^*\right)<u_c\left(w\left[1-\tau\right]-s\right)<\frac{1+r}{1+\delta}v_c\left(\frac{R^*w+\left[1+r\right]\left[s^*+\tau w\right]}{L}\right)<\frac{1+r}{1+\delta^*}v_c\left(\frac{R^*w+\left[1+r\right]\left[s^*+\tau w\right]}{L}\right)$$

and hence a contradiction. Hence, $s^*>s$ and $R^*<R$. Intuition: the individual saves too little due to myopia, hence pension wealth is lower, the marginal utility of consumption as old higher, and as a result a higher retirement age is chosen. Phrased differently, the low savings level implies that the individual ends up having to retire later ("we cannot afford to retire") compared to the situation under true preferences. Notice, that is implied that old-age consumption under true preferences is higher than under choice preferences, (follows from $\eta\left(R,L\right)>\eta\left(R^*,L\right)$

$$c^{o*}=\frac{R^*w+\left[1+r\right]s^*}{L}>\frac{Rw+\left[1+r\right]s}{L}=c^o$$

The difference between s and s^* and thus R and R^* is unaffected by $\tau\leq\underline{\tau}$ for $s>0$, and in this case old-age consumption is

$$c^o=\frac{Rw+\left[1+r\right]\tau w}{L}$$

and

$$\frac{\partial c^o}{\partial\tau}=\frac{w}{L}\frac{\partial R}{\partial\tau}+\frac{\left[1+r\right]}{L}w<\frac{\left[1+r\right]}{L}w$$

Summing up: A policy attempting to increase old-age consumption via mandatory pension savings requirements is (i) not affecting the retirement decision of active savers ($s>0$), (ii) but it is inducing earlier retirement for passive saves (binding borrowing constraint, $s=0$). Finally note that the preceding has disregarded taxation to simplify the exposition. An income tax would, in the standard way, causes individual chosen retirement age (labour supply) to fall short of the socially optimal level. Including income taxation,the decline in the retirement age also has a direct budget effect by decreasing tax revenue.

C Supplementary Tables and Figures

C.1 Tables

Table C.1: Sample Selection

Sample	N
Total population	720,495
Employed age 55 (non-military occupation)	578,642
Employed age 40	528,589
Only 1 employer at age 40 and 55	332,488
No self-employment income at age 40 and 55	255,591
No civil servant pension	254,022
No missing variables	219,968
Selected sample (including firm fixed effects)	203,847

Notes: This table shows the sample selection going from the total population (55-year-olds born in 1959-1967) to our selected sample used for our first stage results, see Subsection 4.1 for further description of sample selection.

Table C.2: External Validity

	Selected sample		Total population	
	Mean	SD	Mean	SD
Employed at age 55	1.00	0.00	0.80	0.40
Employed at age 40	1.00	0.00	0.83	0.37
Civil servant pension age 55	0.00	0.00	0.01	0.09
Business income at age 55	0.00	0.00	0.15	0.35
Business income at age 40	0.00	0.00	0.12	0.33
More than 1 employer at age 55	0.00	0.00	0.21	0.40
More than 1 employer at age 40	0.00	0.00	0.17	0.37
Measured at age 55				
Pension wealth (DKK)	2,137,672.39	1,470,307.00	1,740,242.40	1,932,488.13
Year	2018.19	2.55	2018.16	2.56
Married	0.64	0.48	0.59	0.49
Children at home	0.33	0.47	0.32	0.47
Male	0.47	0.50	0.50	0.50
Lower secondary, primary, unknown	0.15	0.36	0.23	0.42
Upper secondary	0.05	0.22	0.05	0.23
Vocational education	0.44	0.50	0.40	0.49
Short cycle tertiary	0.06	0.23	0.05	0.22
Bachelor	0.22	0.41	0.17	0.38
Master, doctoral	0.08	0.27	0.09	0.28
Experience (years)	31.37	6.77	24.61	11.66
Payment to VERP scheme	0.40	0.49	0.28	0.45
Earnings (DKK)	511,520.04	214,116.44	341,632.12	297,211.84
Other wealth (DKK)	426,969.47	842,739.81	429,163.92	1,121,999.00
Measured at age 40				
Married	0.66	0.47	0.63	0.48
Children at home	0.80	0.40	0.77	0.42
Experience (years)	17.41	5.72	14.70	7.15
Earnings (DKK)	441,968.33	170,881.45	356,438.30	244,433.88
Other wealth (DKK)	145,303.43	377,448.91	133,482.37	480,830.00
N	203,847		720,495	

Notes: This table reports mean and standard deviation for selected variables measured at age 55 and 40 for the full population of individuals born in 1959-1967 and for the selected sample used in the first stage regression (Equation 2), see Subsection 4.1 for description of sample selection.

Table C.3: Descriptive Statistics

	Mean	SD
Pension wealth (DKK) age 55	2,137,672.39	1,470,307.00
FPCR (in %) age 40	8.26	3.47
Measured at age 55		
Individual occupational cont. rate (in %)	12.13	4.92
Individual private cont. rate (in %)	0.75	2.30
Year	2018.19	2.55
Married	0.64	0.48
Children at home	0.33	0.47
Male	0.47	0.50
Lower secondary, primary, unknown	0.15	0.36
Upper secondary	0.05	0.22
Vocational education	0.44	0.50
Short cycle tertiary	0.06	0.23
Bachelor	0.22	0.41
Master, doctoral	0.08	0.27
Payment to VERP scheme	0.40	0.49
Experience (years)	31.37	6.77
Tenure (years)	9.19	8.36
Earnings (DKK)	511,520.04	214,116.44
Other wealth (DKK)	426,969.47	842,739.81
Occupation dummies		
Managers	0.07	0.25
Professionals	0.28	0.45
Technicians and associate professionals	0.16	0.36
Clerical support workers	0.12	0.33
Services and sales workers	0.13	0.34
Skilled agricultural, forestry, fishery	0.00	0.06
Craft and related trades workers	0.08	0.27
Plant and machine operators and assemblers	0.08	0.28
Elementary occupations	0.08	0.27
Measured at age 40		
Married	0.66	0.47
Children at home	0.80	0.40
Experience (years)	17.41	5.72
Tenure (years)	5.46	5.21
Earnings (DKK)	441,968.33	170,881.45
Other wealth (DKK)	145,303.43	377,447.91

Notes: Continued on next page

Table C.3: Descriptive Statistics Cont'd

	Mean	SD
Occupation dummies age 40 (DISCO88)		
Military	0.06	0.23
Managers	0.03	0.17
Professionals	0.15	0.36
Technicians and associate professionals	0.25	0.43
Clerical support workers	0.13	0.33
Services and sales workers	0.10	0.31
Skilled agricultural, forestry, fishery	0.00	0.05
Craft and related trades workers	0.10	0.29
Plant and machine operators and assemblers	0.09	0.28
Elementary occupations	0.10	0.30
Industry dummies age 40		
Agriculture. fishing. quarrying	0.01	0.09
Manufacturing	0.22	0.41
Electricity, gas, and water supply	0.01	0.09
Construction	0.05	0.21
Ws. and retail trade, hotels, restaurants	0.14	0.35
Transport, post, communication	0.07	0.25
Finance and business activities	0.14	0.35
Public and personal services	0.37	0.48
Other	0.00	0.02
N	203,847	

Notes: This table reports mean and standard deviation for pension wealth at age 55, FPCR (firm pension contribution rate at age 40), and control variables measured at age 55 and 40 for the sample in the first stage regression (Equation 2).

Table C.4: Reduced Form Estimates for Labor Market Outcomes

	Age 56	Age 57	Age 58	Age 59	Age 60	Age 61	Age 62	Age 63	Age 64	Age 65	Age 66	Age 67
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Panel A: Earnings (DKK)												
FPCR	85.71	-111.55	-182.58	-26.74	-139.03	-412.22	-815.05**	-1806.38***	-2176.73***	-2551.23***	-3071.77***	-2402.26**
	(87.32)	(117.44)	(153.35)	(178.76)	(200.48)	(240.86)	(273.72)	(363.32)	(442.99)	(540.88)	(667.78)	(819.05)
Observations	247,313	219,827	193,551	168,365	143,531	120,858	99,494	79,400	60,729	43,650	27,843	12,442
R^2	0.829	0.756	0.701	0.650	0.603	0.546	0.493	0.448	0.415	0.384	0.352	0.330
Mean	497,304.55	486,359.28	477,145.35	468,175.17	457,258.52	443,280.30	420,481.00	370,980.58	294,824.33	233,053.84	178,574.87	113,564.43
Pct. change	0.017	-0.023	-0.038	-0.006	-0.030	-0.093	-0.194	-0.487	-0.738	-1.095	-1.720	-2.115
Panel B: Employment												
FPCR	-0.000	-0.001**	-0.001**	-0.000	-0.001*	-0.001**	-0.002***	-0.004***	-0.005***	-0.005***	-0.005***	-0.005*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Observations	247,313	219,827	193,551	168,365	143,531	120,858	99,494	79,400	60,729	43,650	27,843	12,442
R^2	0.125	0.129	0.131	0.134	0.134	0.139	0.166	0.203	0.240	0.250	0.256	0.250
Mean	0.973	0.960	0.949	0.938	0.923	0.895	0.842	0.705	0.561	0.448	0.355	0.243
Pct. change	-0.015	-0.062	-0.085	-0.043	-0.091	-0.136	-0.242	-0.609	-0.845	-1.143	-1.399	-1.895
Panel C: Partial employment												
FPCR	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.000	0.000	0.001	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
Observations	247,313	219,827	193,551	168,365	143,531	120,858	99,494	79,400	60,729	43,650	27,843	12,442
R^2	0.143	0.124	0.120	0.123	0.124	0.123	0.128	0.129	0.131	0.146	0.151	0.166
Mean	0.002	0.004	0.006	0.008	0.010	0.012	0.013	0.014	0.017	0.018	0.021	0.029
Pct. change	3.017	2.502	2.180	1.564	0.155	1.183	1.126	1.923	-0.745	0.101	2.597	0.260
Panel D: Self supporting												
FPCR	0.000	0.000*	0.000	0.000	0.001***	0.001***	0.001***	0.002***	0.003***	0.004***	0.002***	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)
Observations	247,313	219,827	193,551	168,365	143,531	120,858	99,494	79,400	60,729	43,650	27,843	12,442
R^2	0.102	0.100	0.103	0.100	0.104	0.117	0.133	0.154	0.187	0.209	0.227	0.162
Mean	0.004	0.006	0.008	0.011	0.018	0.026	0.034	0.045	0.052	0.062	0.057	0.012
Pct. change	0.630	2.706	2.250	1.288	3.148	3.581	3.961	5.525	5.570	5.923	4.363	0.576

Notes: Continued on next page

Table C.4: Reduced Form Estimates for Labor Market Outcomes Cont'd

	Age 56	Age 57	Age 58	Age 59	Age 60	Age 61	Age 62	Age 63	Age 64	Age 65	Age 66	Age 67
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Panel E: Disability pension												
FPCR	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	247,313	219,827	193,551	168,365	143,531	120,858	99,494	79,400	60,729	43,650	27,843	12,442
R^2	0.082	0.091	0.095	0.102	0.105	0.116	0.119	0.130	0.135	0.145	0.148	0.157
Mean	0.001	0.003	0.006	0.010	0.014	0.020	0.025	0.030	0.033	0.037	0.030	0.006
Pct. change	4.597	1.847	2.159	0.974	1.106	0.647	1.457	1.084	0.779	0.451	0.636	6.509
Panel F: Other transfers												
FPCR	0.000	0.000*	0.000*	0.000	0.000	0.000	0.000	0.000	-0.000	-0.001	-0.001	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
Observations	247,313	219,827	193,551	168,365	143,531	120,858	99,494	79,400	60,729	43,650	27,843	12,442
R^2	0.119	0.124	0.124	0.125	0.126	0.122	0.123	0.127	0.129	0.128	0.138	0.141
Mean	0.022	0.031	0.037	0.042	0.046	0.044	0.042	0.039	0.036	0.034	0.027	0.005
Pct. change	0.316	1.206	1.346	0.412	0.285	0.137	0.640	0.721	-0.740	-1.819	-3.069	-4.262
Panel G: VERP												
FPCR						0.000	-0.000	0.000	0.001	0.001	0.000	0.000
						(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Observations						120,858	99,494	79,400	60,729	43,650	27,843	12,442
R^2						0.141	0.222	0.237	0.281	0.308	0.249	0.154
Mean						0.009	0.040	0.159	0.283	0.363	0.340	0.084
Pct. change						0.445	-0.514	0.310	0.390	0.166	0.117	0.410

Notes: This table reports reduced form estimates (Equation 1) for ages 56 to 67. In panel (a), the outcome variable is earnings, in panel (b), the outcome variable is a dummy for being employed, in panel (c), the outcome variable is a dummy for receiving disability pension, in panel (f), the outcome variable is dummy for receiving other transfers, and in panel (g), the outcome variable is a dummy for early retirement. Controls age 55 include firm FE, year FE, individual occupational and private pension contribution rates, dummy for payment to VERP scheme, male dummy, education dummies, marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, earnings (deciles), and wealth (ventiles). Controls age 40 include marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, 1 digit industry dummies, earnings (deciles), and wealth (ventiles). All monetary values are in DKK (2023-prices). Standard errors are clustered at the firm level at age 55 and shown in parentheses. Significance levels are indicated as * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

Table C.5: Reduced Form Estimates for Pension Income

	Age 56	Age 57	Age 58	Age 59	Age 60	Age 61	Age 62	Age 63	Age 64	Age 65	Age 66	Age 67
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Panel A: Pr(non-public pension payments)												
FPCR	0.000**	0.000***	0.000**	0.000*	0.001***	0.002***	0.003***	0.005***	0.007***	0.009***	0.009***	0.004**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Observations	247,313	219,827	193,551	168,365	143,531	120,858	99,494	79,400	60,729	43,650	27,843	12,442
R^2	0.128	0.115	0.109	0.105	0.106	0.109	0.129	0.158	0.198	0.219	0.230	0.193
Mean	0.014	0.018	0.022	0.026	0.047	0.074	0.119	0.222	0.320	0.396	0.559	0.912
Pct. change	2.268	2.233	1.884	1.420	2.445	2.426	2.675	2.208	2.129	2.359	1.611	0.411
Panel B: Non-public pension payments (DKK)												
FPCR	34.97**	55.46***	64.32***	48.19*	119.95***	230.89***	446.79***	746.99***	1151.83***	1558.60***	1903.06***	2156.00***
	(13.26)	(15.63)	(19.08)	(22.80)	(32.17)	(43.14)	(64.40)	(101.45)	(142.62)	(181.19)	(246.70)	(332.37)
Observations	247,313	219,827	193,551	168,365	143,531	120,858	99,494	79,400	60,729	43,650	27,843	12,442
R^2	0.135	0.122	0.113	0.107	0.109	0.118	0.138	0.165	0.207	0.264	0.313	0.366
Mean	1354.80	1749.56	2183.76	2689.69	3997.45	6094.24	9452.66	16,312.59	26,399.94	34,443.99	42,979.01	72,637.58
Pct. change	2.581	3.170	2.945	1.792	3.001	3.789	4.727	4.579	4.363	4.525	4.428	2.968

Notes: This table reports reduced form estimates (Equation 1) for ages 56 to 67. In panel (a), the outcome variable is a dummy for receiving non-public pension payment, and in panel (b), the outcome variable is non-public pension payments in DKK. Controls age 55 include firm FE, year FE, individual occupational and private pension contribution rates, dummy for payment to VERP scheme, male dummy, education dummies, marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, earnings (deciles), and wealth (ventiles). Controls age 40 include marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, 1 digit industry dummies, earnings (deciles), and wealth (ventiles). All monetary values are in DKK (2023-prices). Standard errors are clustered at the firm level at age 55 and shown in parentheses. Significance levels are indicated as * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

Table C.6: IV estimates for Labor Market Outcomes

	Age 56	Age 57	Age 58	Age 59	Age 60	Age 61	Age 62	Age 63
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Earnings (DKK)								
Pension wealth (100K DKK)	104.32	-181.58	-344.72	-325.22	-628.97	-1059.12	-1581.42	-5777.32**
	(170.21)	(231.89)	(290.22)	(371.35)	(480.87)	(664.77)	(935.08)	(2050.48)
Observations	176,926	149,892	124,014	99,349	75,258	53,373	33,129	14,809
R^2	0.745	0.648	0.584	0.526	0.471	0.408	0.354	0.242
Mean	509,931.10	500,030.28	490,178.38	479,840.76	467,069.65	450,835.01	432,113.62	398,731.67
Pct. change	0.020	-0.036	-0.070	-0.068	-0.135	-0.235	-0.366	-1.449
Panel B: Employment								
Pension wealth (100K DKK)	-0.000	-0.001***	-0.002***	-0.001	-0.003**	-0.003*	-0.005**	-0.015***
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.002)	(0.004)
Observations	176,926	149,892	124,014	99,349	75,258	53,373	33,129	14,809
R^2	0.025	0.026	0.028	0.035	0.033	0.041	0.036	-0.050
Mean	0.976	0.963	0.953	0.941	0.925	0.899	0.871	0.810
Pct. change	-0.021	-0.141	-0.186	-0.105	-0.273	-0.306	-0.603	-1.887
Panel C: Partial employment								
Pension wealth (100K DKK)	0.000*	0.000	0.000	0.000	-0.000	0.000	0.001	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
Observations	176,926	149,892	124,014	99,349	75,258	53,373	33,129	14,809
R^2	0.035	0.023	0.017	0.011	0.009	0.012	0.012	0.019
Mean	0.002	0.004	0.007	0.009	0.011	0.012	0.013	0.014
Pct. change	8.452	5.929	2.879	1.730	-2.302	0.058	5.123	3.394
Panel D: Self supporting								
Pension wealth (100K DKK)	0.000	0.000*	0.000*	0.000	0.002***	0.002***	0.003**	0.009***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.002)
Observations	176,926	149,892	124,014	99,349	75,258	53,373	33,129	14,809
R^2	0.006	0.007	0.010	0.012	0.014	0.016	0.023	-0.055
Mean	0.004	0.006	0.008	0.012	0.018	0.027	0.036	0.051
Pct. change	0.581	5.509	5.124	3.809	8.269	8.999	8.120	18.282

Notes: Continued on next page

Table C.6: IV Estimates for Labor Market Outcomes Cont'd

	Age 56 (1)	Age 57 (2)	Age 58 (3)	Age 59 (4)	Age 60 (5)	Age 61 (6)	Age 62 (7)	Age 63 (8)
Panel E: Disability pension								
Pension wealth (100K DKK)	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.002
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Observations	176,926	149,892	124,014	99,349	75,258	53,373	33,129	14,809
R^2	0.009	0.014	0.018	0.021	0.022	0.031	0.031	0.036
Mean	0.001	0.003	0.006	0.009	0.015	0.022	0.020	0.020
Pct. change	5.307	1.131	2.376	1.037	3.940	3.644	5.753	9.471
Panel F: Other transfers								
Pension wealth (100K DKK)	0.000	0.001**	0.001**	0.000	0.000	-0.000	-0.000	0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.002)
Observations	176,926	149,892	124,014	99,349	75,258	53,373	33,129	14,809
R^2	0.019	0.017	0.016	0.020	0.020	0.018	0.014	0.017
Mean	0.019	0.028	0.033	0.037	0.042	0.038	0.031	0.026
Pct. change	0.655	3.582	3.712	1.205	1.039	-1.183	-0.106	3.762

Notes: This table reports IV estimates (Equation 3) for ages 56 to 63. In panel (a), the outcome variable is earnings, in panel (b), the outcome variable is a dummy for being employed, in panel (c), the outcome variable is a dummy for receiving disability pension, and in panel (f), the outcome variable is dummy for receiving other transfers. Controls age 55 include firm FE, year FE, individual occupational and private pension contribution rates, dummy for payment to VERP scheme, male dummy, education dummies, marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, earnings (deciles), and wealth (ventiles). Controls age 40 include marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, 1 digit industry dummies, earnings (deciles), and wealth (ventiles). All monetary values are in DKK (2023-prices). Standard errors are robust and shown in parentheses. Significance levels are indicated as * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

Table C.7: IV Estimates for Pension Income

	Age 56	Age 57	Age 58	Age 59	Age 60	Age 61	Age 62	Age 63
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Pr(non-public pension payments)								
Pension wealth (100K DKK)	0.001***	0.001***	0.001***	0.001*	0.002***	0.004***	0.008***	0.018***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.004)
Observations	176,926	149,892	124,014	99,349	75,258	53,373	33,129	14,809
R^2	0.057	0.046	0.037	0.031	0.032	0.029	0.016	-0.090
Mean	0.014	0.017	0.021	0.026	0.046	0.073	0.104	0.167
Pct. change	5.657	5.147	4.935	3.789	5.181	5.276	7.521	10.832
Panel B: Non-public pension payments (DKK)								
Pension wealth (100K DKK)	81.31**	110.99***	148.91***	117.23*	230.64**	401.66***	853.48***	2017.10***
	(24.91)	(32.02)	(39.39)	(52.52)	(72.11)	(111.55)	(174.11)	(427.45)
Observations	176,926	149,892	124,014	99,349	75,258	53,373	33,129	14,809
R^2	0.057	0.045	0.036	0.029	0.034	0.039	0.039	-0.046
Mean	1353.08	1737.11	2117.67	2634.35	3916.97	6147.21	9209.75	13,021.34
Pct. change	6.009	6.389	7.032	4.450	5.888	6.534	9.267	15.491

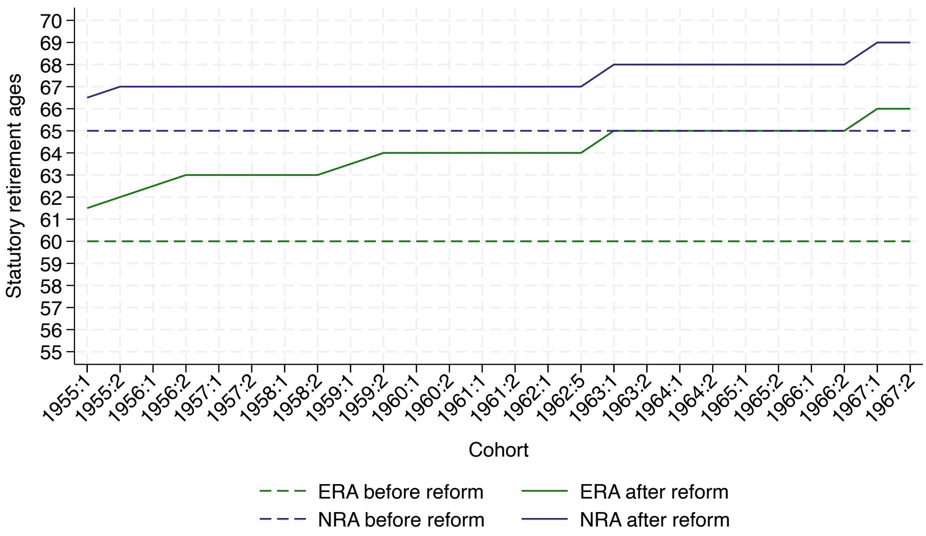
Notes: This table reports IV estimates (Equation 3) for ages 56 to 63. In panel (a), the outcome variable is a dummy for receiving non-public pension payment, and in panel (b), the outcome variable is non-public pension payments in DKK. Controls age 55 include firm FE, year FE, individual occupational and private pension contribution rates, dummy for payment to VERP scheme, male dummy, education dummies, marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, earnings (deciles), and wealth (ventiles). Controls age 40 include marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, 1 digit industry dummies, earnings (deciles), and wealth (ventiles). All monetary values are in DKK (2023-prices). Standard errors are robust and shown in parentheses. Significance levels are indicated as * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

C.2 Graphs

Figure C.1: ERA and NRA by Time and Cohort

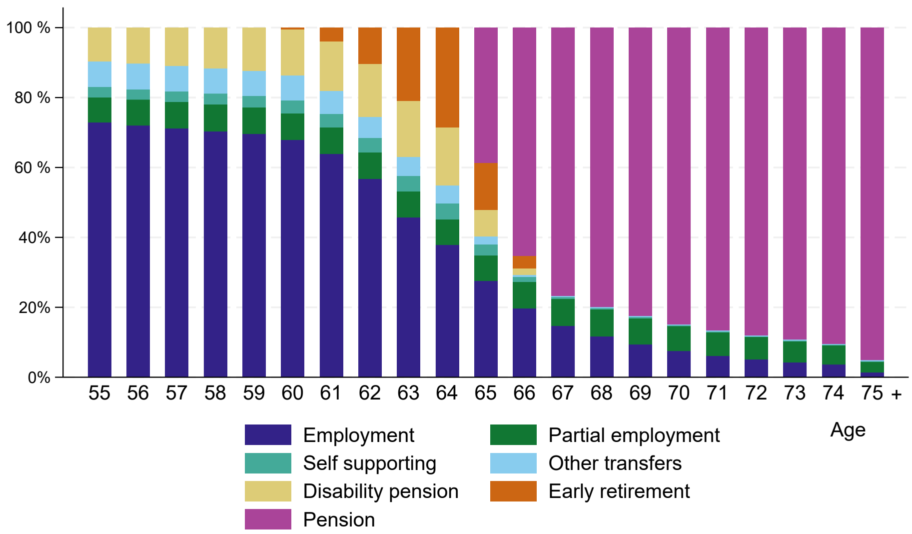
(a) ERA and NRA by time

(b) ERA and NRA by cohort



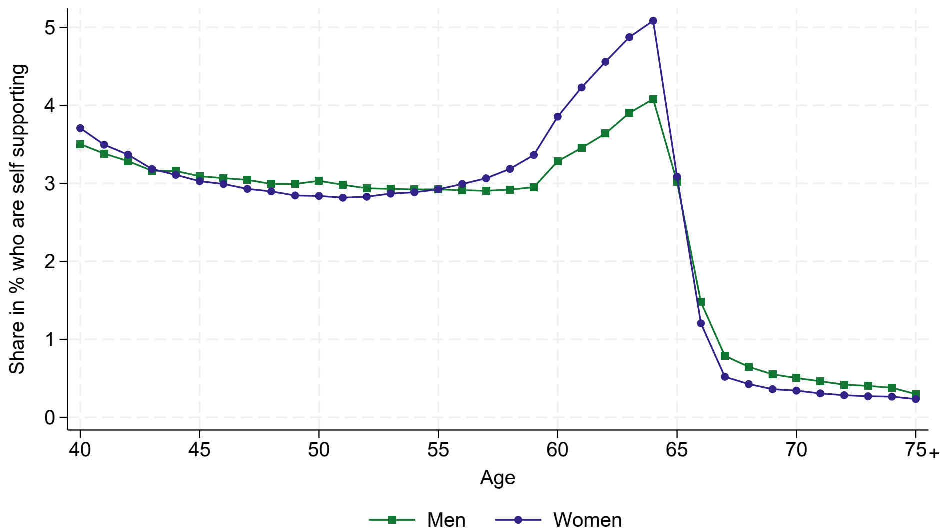
Notes: Panel (a) displays the early retirement age (ERA) and normal retirement age (NRA) before and after the 2006 Welfare Agreement and 2011 Retirement Reform for the time period 2010-2034. Panel (b) displays the ERA and NRA before and after for the cohorts in our sample, i.e., individuals born in 1955-1967.

Figure C.2: Labor Supply by Age



Notes: Displays labor supply by age for the years 2014-2022.

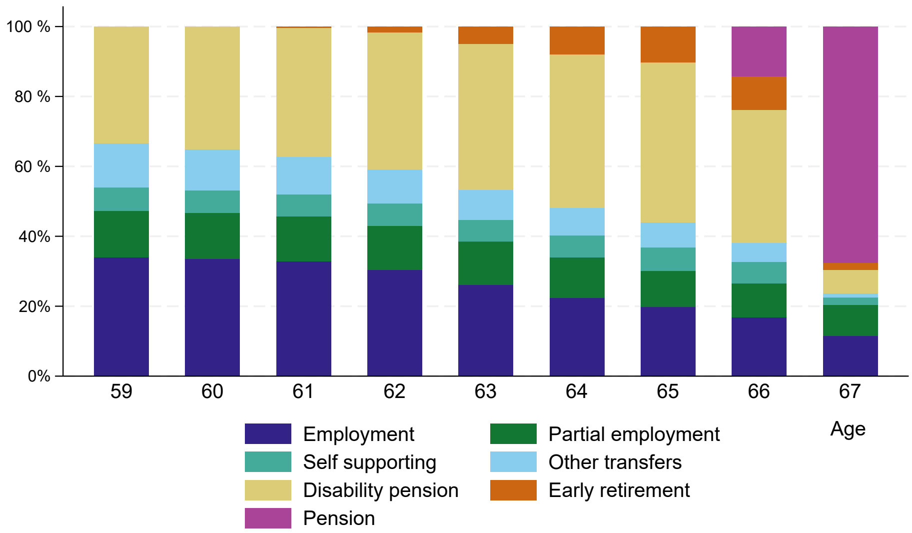
Figure C.3: Self Supporting by Age



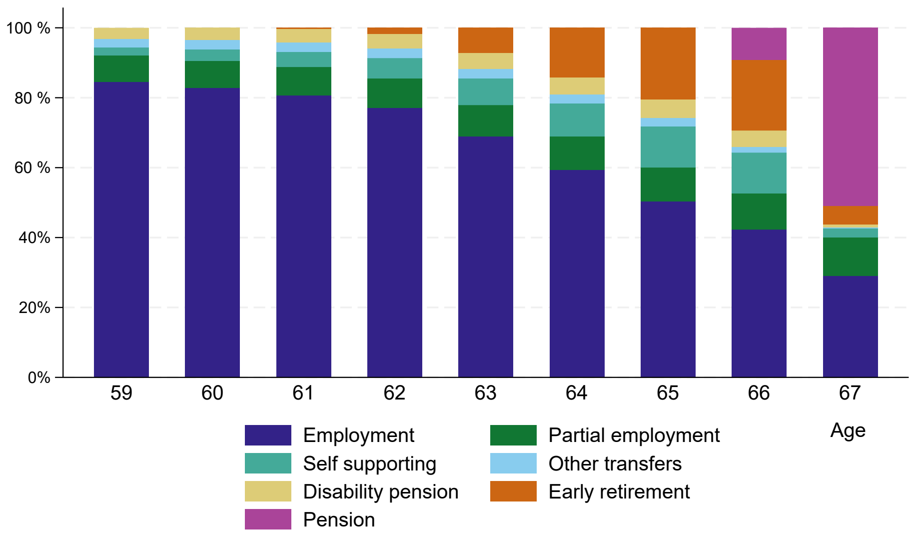
Notes: Displays the share who is self supporting in % by age for men and women for the years 2014-2022.

Figure C.4: Labor Supply by Pension Wealth

(a) Lowest 25%

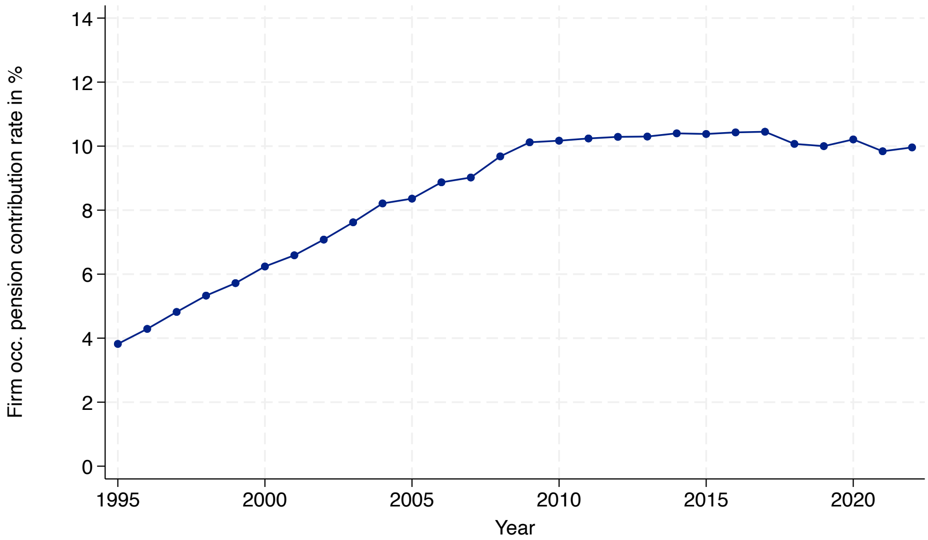


(b) Highest 25%



Notes: Displays labor supply by age and pension wealth at age 59 for the years 2014-2022. Panel (a) shows labor supply for age 59 to 67 for the 25% of individuals with lowest pension wealth by cohort, and panel (b) shows labor supply for age 59 to 67 for the 25% of individuals with the highest pension wealth by cohort.

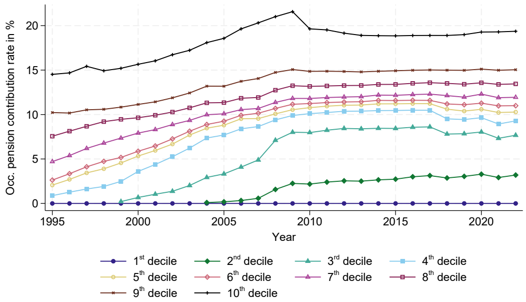
Figure C.5: Average Firm Occupational Pension Contribution Rate over Time



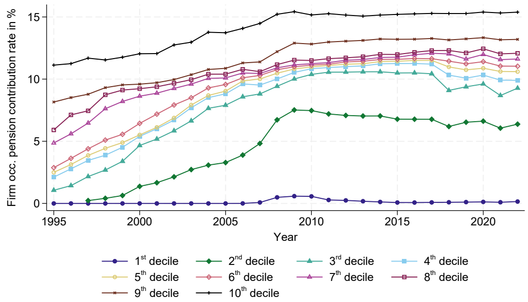
Notes: Displays the average firm occupational pension contribution rate over time. The sample is individuals aged 20 to 60 years old with only one employer in a year for the years 1995-2022.

Figure C.6: Occupational Pension Contribution Rates over Time by Deciles

(a) Individual pension contribution rate



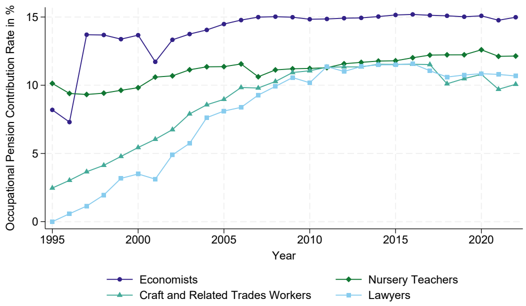
(b) Firm pension contribution rate



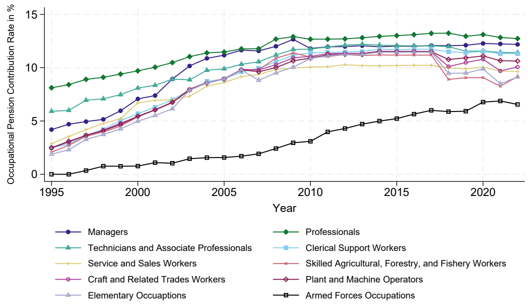
Notes: Panel (a) displays the average individual occupational pension contribution rate over time by deciles, and panel (b) displays the average firm occupational contribution rate over time weighted by individuals by deciles. The sample is individuals aged 20 to 60 with only one employer in a year for the years 1995-2022.

Figure C.7: Occupational Pension Contribution Rates over Time by Occupation Groups

(a) Selected occupation groups



(b) 1 digit occupation groups

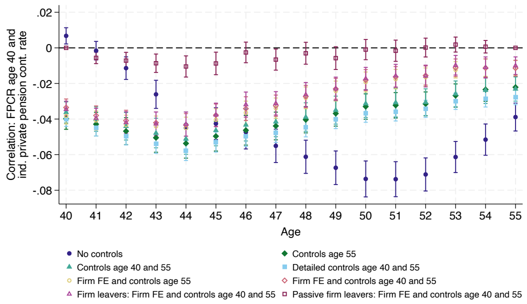


Notes: Panel (a) displays the average individual occupational pension contribution rate over time for selected occupation groups, and panel (b) displays the average individual occupational pension contribution rate over time for 1 digit occupation groups. The sample is individuals aged 25 to 55 with only one employer in a year for the years 1995-2022.

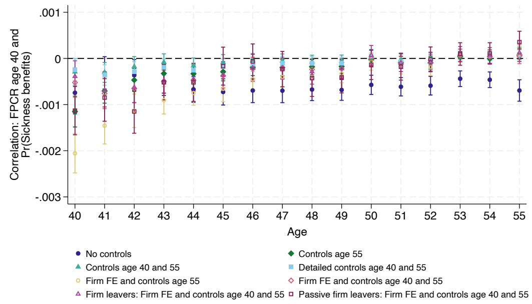
C.3 Correlation Between FPCR and Individual Behavior

Figure C.8: FPCR Age 40 and Correlations Ages 40 to 55

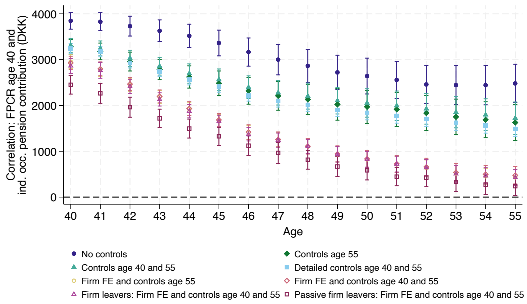
(a) Private pension contribution rate



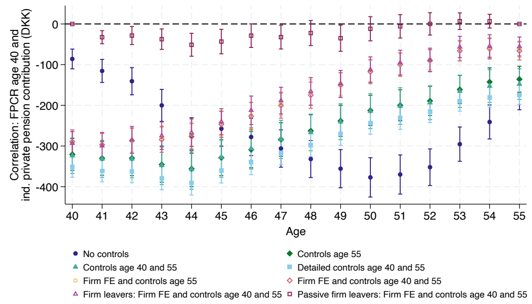
(b) Sickness benefits



(c) Occupational pension contribution (DKK)

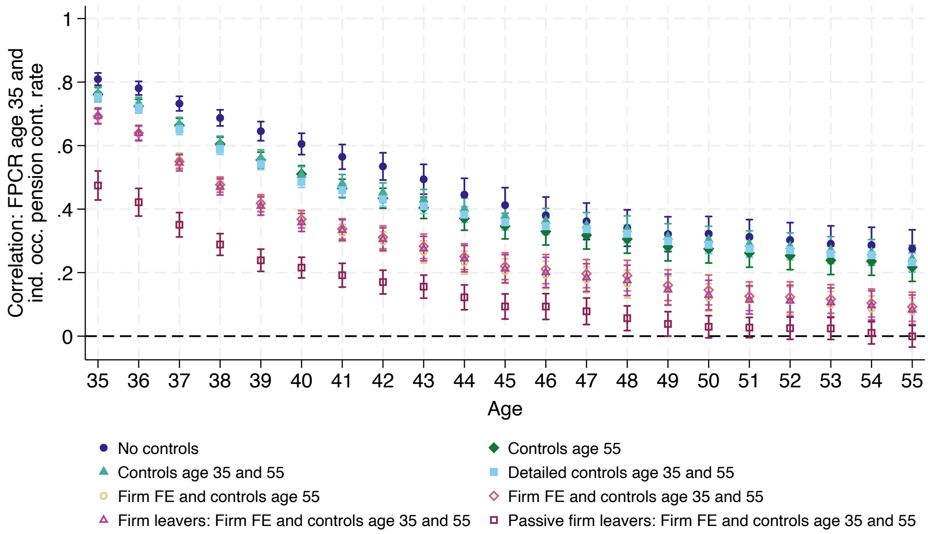


(d) Private pension contribution (DKK)



Notes: This figure shows the correlation at ages 40 to 55 between the firm occupational pension contribution rate at age 40 and individual private pension contribution rate (panel (a)), a dummy for receiving sickness benefits (panel (b)), individual occupational pension contribution in DKK (panel (c)), and individual private pension contribution in DKK (panel (d)). Controls age 55 include year fixed effects, dummy for payment to VERP scheme, male dummy, education dummies, marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, earnings (deciles), and wealth (ventiles). Controls age 40 include marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, 1 digit industry dummies, earnings (deciles), and wealth (ventiles). Detailed controls further include occupation dummies at the 3 digit level for age 40 and 55. Firm FE refers to firm FE at age 55. Firm leavers are defined as individuals who are no longer employed at the firm they were employed at age 40. All monetary values are in DKK (2023-prices). Standard errors are clustered at the firm level at age 55, and 95% confidence intervals are shown.

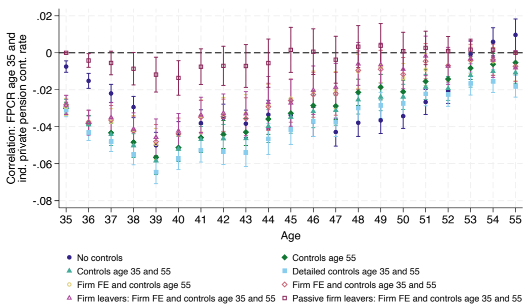
Figure C.9: FPCR Age 35 and Individual Occupational Contribution Rates Ages 35 to 55



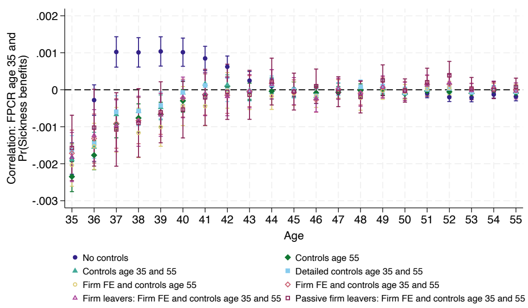
Notes: This figure shows the correlation between the firm occupational pension contribution rate (FPCR) at age 35 and the individual occupational pension contribution rates at ages 35 to 55. Controls age 55 include year fixed effects, dummy for payment to VERP scheme, male dummy, education dummies, marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, earnings (deciles), and wealth (ventiles). Controls age 35 include marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, 1 digit industry dummies, earnings (deciles), and wealth (ventiles). Detailed controls further include occupation dummies at the 3 digit level for age 35 and 55. Firm FE refers to firm FE at age 55. Firm leavers are defined as individuals who are no longer at age 55 employed at the firm they were employed at age 35. Passive savers are defined as individuals who did not contribute to a private pension at age 35 and 55. Standard errors are clustered at the firm level at age 55, and 95% confidence intervals are shown.

Figure C.10: FPCR Age 35 and Correlations Ages 35 to 55

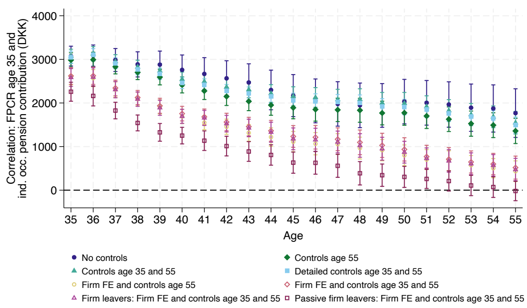
(a) Private pension contribution rate



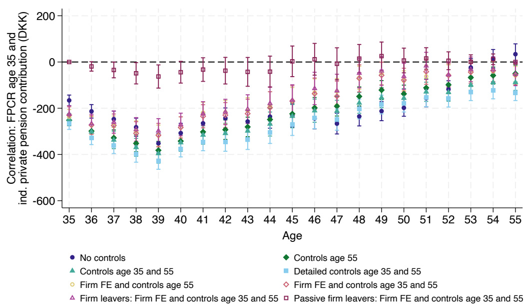
(b) Sickness benefits



(c) Occupational pension contribution (DKK)

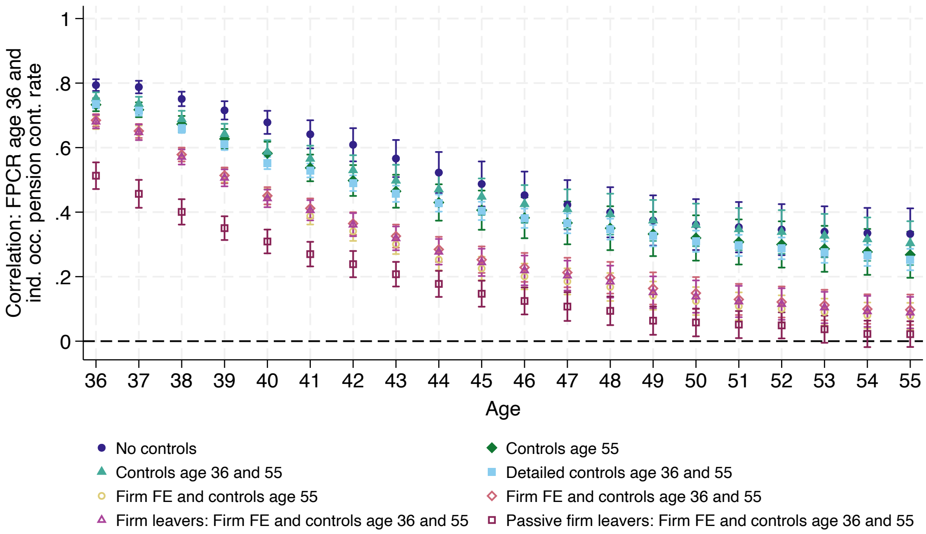


(d) Private pension contribution (DKK)



Notes: This figure shows the correlation at ages 35 to 55 between the firm occupational pension contribution rate at age 35 and individual private pension contribution rate (panel (a)), a dummy for receiving sickness benefits (panel (b)), individual occupational pension contribution in DKK (panel (c)), and individual private pension contribution in DKK (panel (d)). Controls age 55 include year fixed effects, dummy for payment to VERP scheme, male dummy, education dummies, marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, earnings (deciles), and wealth (ventiles). Controls age 35 include marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, 1 digit industry dummies, earnings (deciles), and wealth (ventiles). Detailed controls further include occupation dummies at the 3 digit level for age 35 and 55. Firm FE refers to firm FE at age 55. Firm leavers are defined as individuals who are no longer at age 55 employed at the firm they were employed at age 35. All monetary values are in DKK (2023-prices). Standard errors are clustered at the firm level at age 55, and 95% confidence intervals are shown.

Figure C.11: FPCR Age 36 and Individual Occupational Contribution Rates Ages 36 to 55



Notes: This figure shows the correlation between the firm occupational pension contribution rate (FPCR) at age 36 and the individual occupational pension contribution rates at ages 36 to 55. Controls age 55 include year fixed effects, dummy for payment to VERP scheme, male dummy, education dummies, marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, earnings (deciles), and wealth (ventiles). Controls age 36 include marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, 1 digit industry dummies, earnings (deciles), and wealth (ventiles). Detailed controls further include occupation dummies at the 3 digit level for age 36 and 55. Firm FE refers to firm FE at age 55. Firm leavers are defined as individuals who are no longer at age 55 employed at the firm they were employed at age 36. Passive savers are defined as individuals who did not contribute to a private pension at age 36 and 55. Standard errors are clustered at the firm level at age 55, and 95% confidence intervals are shown.

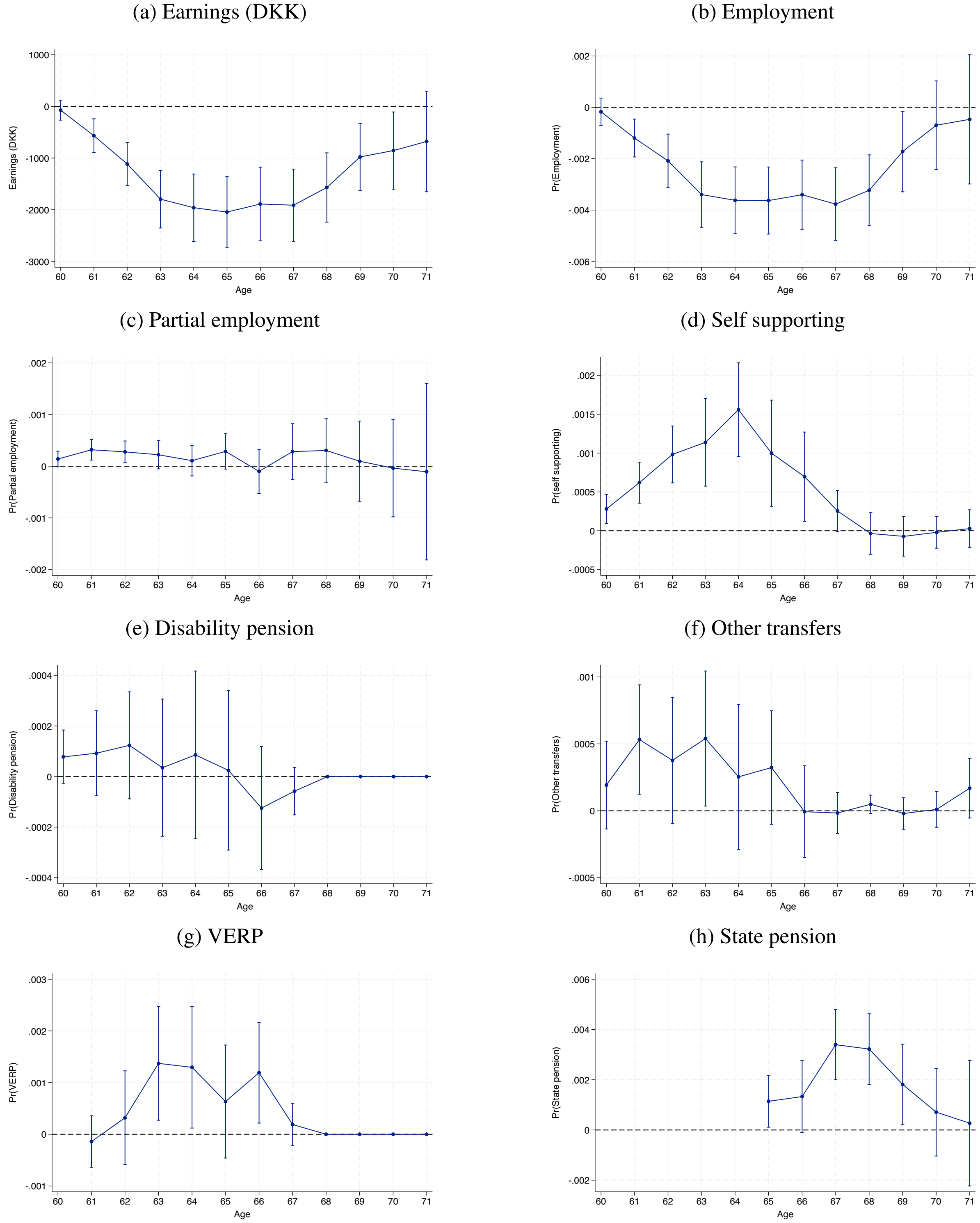
C.4 Pension Wealth at Age 59

Table C.8: First Stage: Age 59

	Pension wealth (1)	Pension wealth (2)	Pension wealth (3)	Pension wealth (4)
FPCR	130,860.10***	87,401.37***	88,224.96***	63,207.39***
	(8557.44)	(4722.14)	(4314.55)	(3432.01)
Controls age 59	No	Yes	Yes	Yes
Controls age 44	No	No	Yes	Yes
Firm FE age 59	No	No	No	Yes
Observations	203,713	203,713	203,713	188,608
R^2	0.073	0.454	0.489	0.583
Mean	2,380,252.89	2,380,252.89	2,380,252.89	2,404,161.93
Pct. change	5.50	3.67	3.71	2.63

Notes: This table reports the results from the first stage regression (Equation 2) where FPCR is the firm occupational pension contribution rate at age 44. In columns (1)-(4), the outcome variable is pension wealth at age 59. Column (1) includes no control variables, column (2) includes controls at age 59, column (3) includes controls at age 59 and 44, and column (4) includes controls at age 59 and 44 and firm fixed effects at age 59. Controls age 59 include year fixed effects, individual occupational and private pension contribution rates, dummy for payment to VERP scheme, male dummy, education dummies, marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, earnings (deciles), and wealth (ventiles). Controls age 44 include marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, 1 digit industry dummies, earnings (deciles), and wealth (ventiles). All monetary values are in DKK (2023-prices). Standard errors are clustered at the firm level at age 59 and shown in parentheses. Significance levels are indicated as * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

Figure C.12: Reduced Form Estimates for Labor Market Outcomes: Age 59



(a) Earnings (DKK)

(b) Employment

(c) Partial employment

(d) Self supporting

(e) Disability pension

(f) Other transfers

(g) VERP

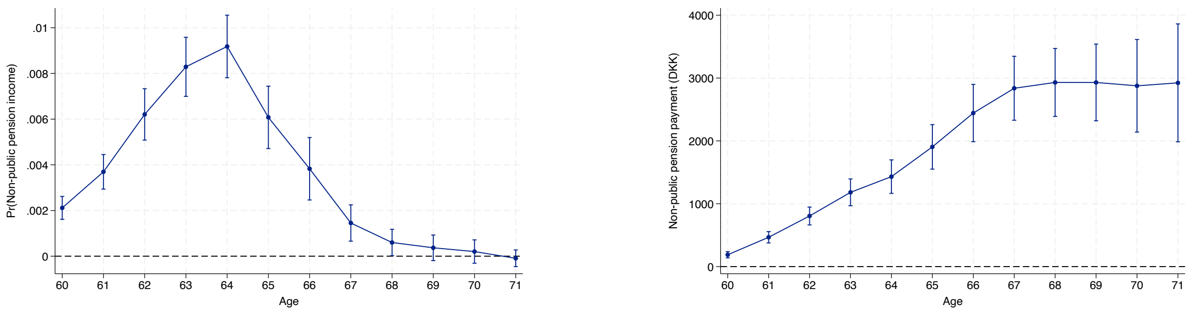
(h) State pension

Notes: This figure plots reduced form estimates (Equation 1) for ages 60 to 71 using FPCR age 44. In panel (a), the outcome variable is earnings, in panel (b), the outcome variable is a dummy for being employed, in panel (c), the outcome variable is a dummy for receiving disability pension, in panel (f), the outcome is a dummy for receiving other transfers, in panel (g), the outcome is a dummy for early retirement, and in panel (f), the outcome is a dummy for state pension. Controls age 59 include firm FE, year FE, individual occupational and private pension contribution rates, dummy for payment to VERP scheme, male dummy, education dummies, marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, earnings (deciles), and wealth (ventiles). Controls age 44 include marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, 1 digit industry dummies, earnings (deciles), and wealth (ventiles). All monetary values are in DKK (2023-prices). Standard errors are clustered at the firm level at age 59, and 95% confidence intervals are shown.

Figure C.13: Reduced Form Estimates for Pension Income: Age 59

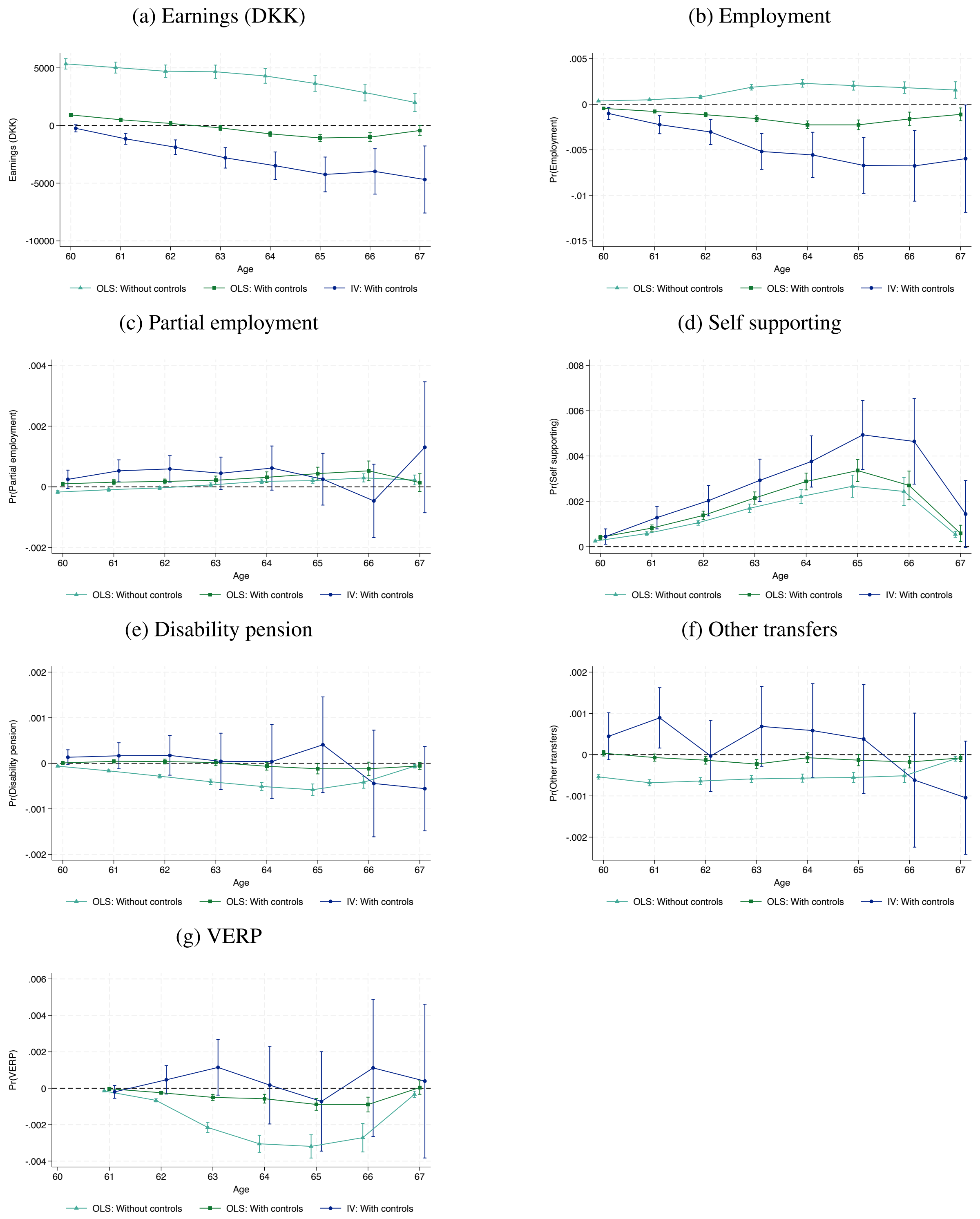
(a) Non-public pension payments

(b) Non-public pension payments (DKK)



Notes: This figure plots reduced form estimates (Equation 1) for ages 60 to 71 using FPCR age 44. In panel (a), the outcome variable is a dummy for receiving non-public pension payment, and in panel (b), the outcome variable is non-public pension payment (DKK). Controls age 59 include firm FE, year FE, individual occupational and private pension contribution rates, dummy for payment to VERP scheme, male dummy, education dummies, marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, earnings (deciles), and wealth (ventiles). Controls age 44 include marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, 1 digit industry dummies, earnings (deciles), and wealth (ventiles). All monetary values are in DKK (2023-prices). Standard errors are clustered at the firm level at age 59, and 95% confidence intervals are shown.

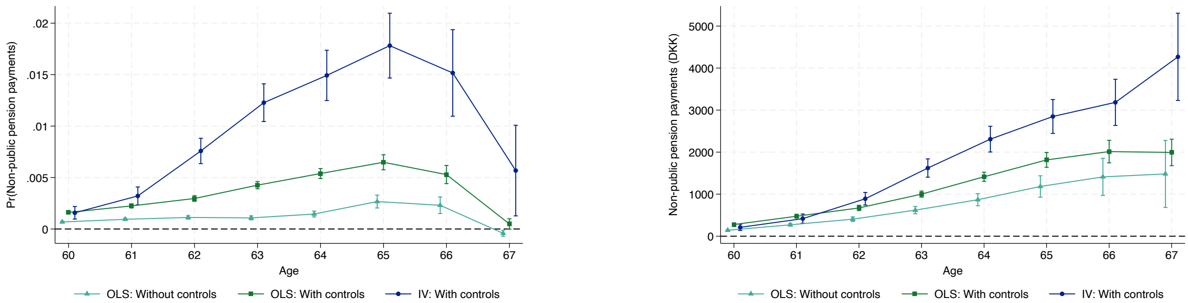
Figure C.14: OLS and IV Estimates for Labor Market Outcomes: Age 59



Notes: This figure plots OLS and IV estimates (Equation 3) for ages 60 to 67 using FPCR age 44 to instrument pension wealth age 59. In panel (a), the outcome variable is earnings, in panel (b), the outcome variable is a dummy for being employed, in panel (c), the outcome variable is a dummy for receiving disability pension, in panel (f), the outcome variable is a dummy for receiving other transfers, and in panel (g), the outcome variable is a dummy for early retirement. Controls age 59 include firm FE, year FE, individual occupational and private pension contribution rates, dummy for payment to VERP scheme, male dummy, education dummies, marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, earnings (deciles), and wealth (ventiles). Controls age 44 include marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, 1 digit industry dummies, earnings (deciles), and wealth (ventiles). All monetary values are in DKK (2023-prices). Standard errors are robust, and 95% confidence intervals are shown.

Figure C.15: OLS and IV Estimates for Pension Income: Age 59

(a) Non-public pension payments (b) Non-public pension payments (DKK)

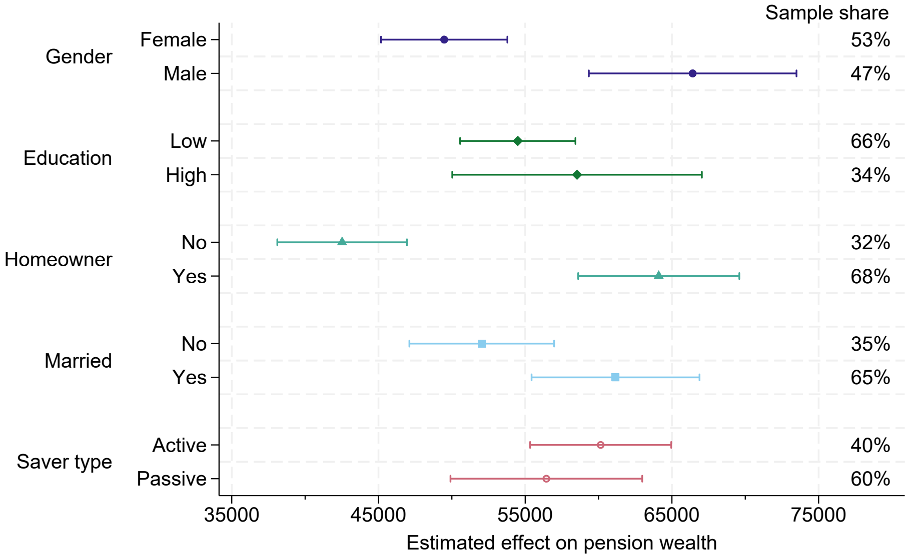


Notes: This figure plots OLS and IV estimates (Equation 3) for ages 60 to 67 using FPCR age 44 to instrument pension wealth age 59. In panel (a), the outcome variable is a dummy for receiving non-public pension payment, and in panel (b), the outcome variable is non-public pension payment (DKK). Controls age 59 include firm FE, year FE, individual occupational and private pension contribution rates, dummy for payment to VERP scheme, male dummy, education dummies, marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, earnings (deciles), and wealth (ventiles). Controls age 44 include marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, 1 digit industry dummies, earnings (deciles), and wealth (ventiles). All monetary values are in DKK (2023-prices). Standard errors are robust, and 95% confidence intervals are shown.

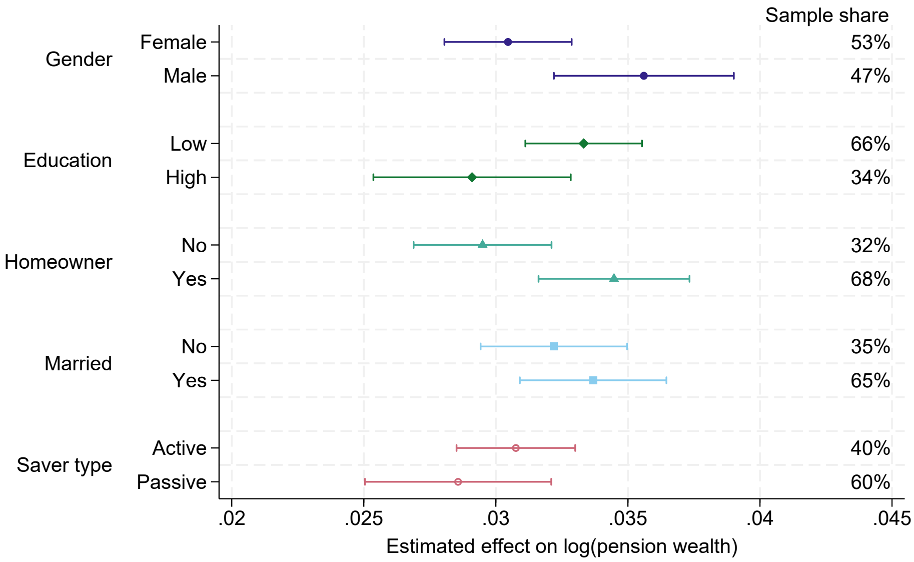
C.5 Heterogeneous Treatment Effects

Figure C.16: First Stage Heterogeneity

(a) Pension wealth (DKK) age 55

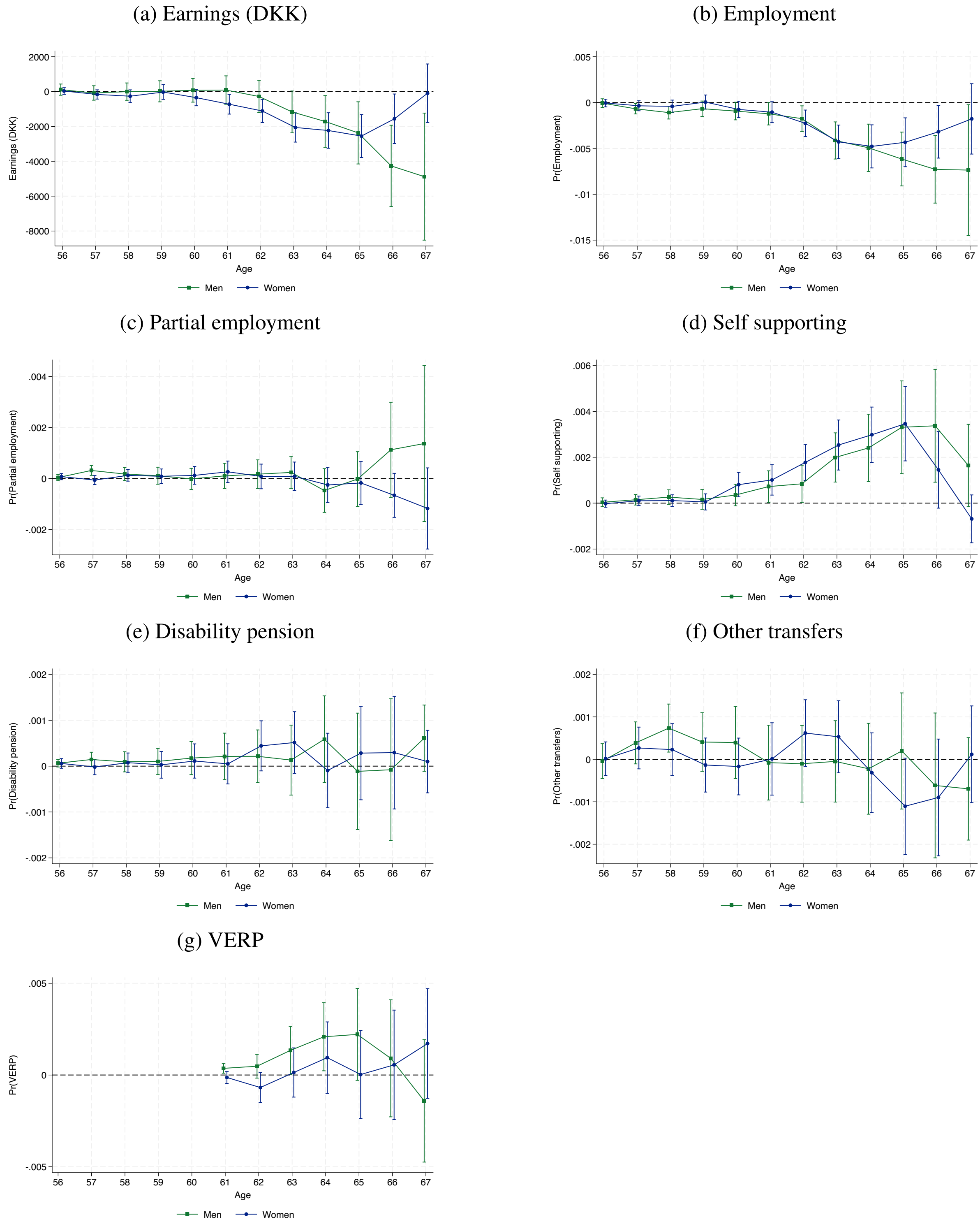


(b) Log(Pension wealth) age 55



Notes: Displays the results from the first stage regression (Equation 2) where FPCR is the firm occupational pension contribution rate at age 40 by sample split on gender, education, homeownership, martial status, and saver type, for pension wealth age 55 in panel (a) and log(pension wealth) age 55 in panel (b). Controls age 55 include year fixed effects, individual occupational and private pension contribution rates, dummy for payment to VERP scheme, male dummy, education dummies, marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, earnings (deciles), and wealth (ventiles). Controls age 40 include marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, 1 digit industry dummies, earnings (deciles), and wealth (ventiles). All monetary values are in DKK (2023-prices). An individual has saver type passive if private pension contribution was equal to zero at age 40 and 55. Standard errors are clustered at the firm level at age 55, and 95% confidence intervals are shown.

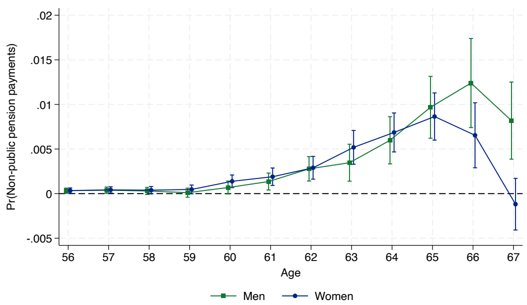
Figure C.17: Reduced Form Estimates by Gender



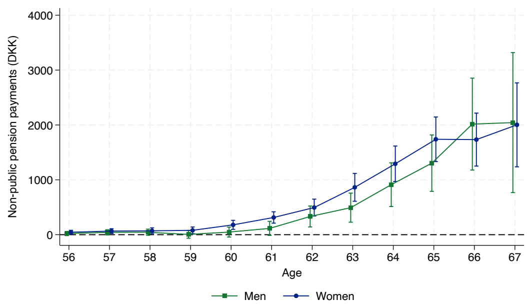
Notes: This figure plots reduced form estimates (Equation 1) for ages 56 to 67 for men and women. In panel (a), the outcome variable is earnings, in panel (b), the outcome variable is a dummy for being employed, in panel (c), the outcome variable is a dummy for receiving disability pension, in panel (f), the outcome variable is dummy for receiving other transfers, and in panel (g), the outcome variable is a dummy for early retirement. Controls age 55 include firm FE, year FE, individual occupational and private pension contribution rates, dummy for payment to VERP scheme, male dummy, education dummies, marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, earnings (deciles), and wealth (ventiles). Controls age 40 include marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, 1 digit industry dummies, earnings (deciles), and wealth (ventiles). All monetary values are in DKK (2023-prices). Standard errors are clustered at the firm level at age 55, and 95% confidence intervals are shown.

Figure C.18: Reduced Form Estimates for Pension Income by Gender

(a) Non-public pension payments



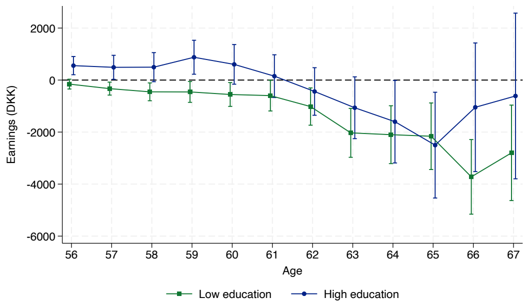
(b) Non-public pension payments (DKK)



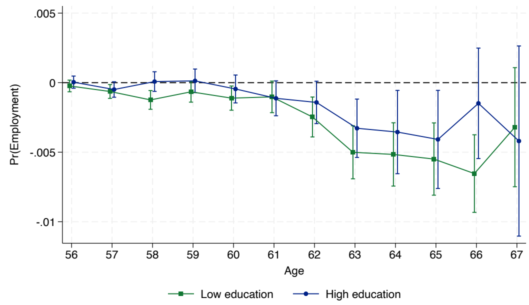
Notes: This figure plots reduced form estimates (Equation 1) for ages 56 to 67 for men and women. In panel (a), the outcome variable is a dummy for receiving non-public pension payment, and in panel (b), the outcome variable is non-public pension payment (DKK). Controls age 55 include firm FE, year FE, individual occupational and private pension contribution rates, dummy for payment to VERP scheme, male dummy, education dummies, marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, earnings (deciles), and wealth (ventiles). Controls age 40 include marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, 1 digit industry dummies, earnings (deciles), and wealth (ventiles). All monetary values are in DKK (2023-prices). Standard errors are clustered at the firm level at age 55, and 95% confidence intervals are shown.

Figure C.19: Reduced Form Estimates by Education

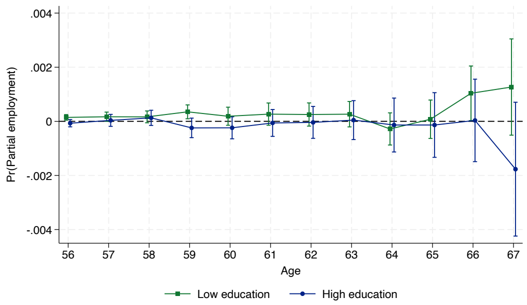
(a) Earnings (DKK)



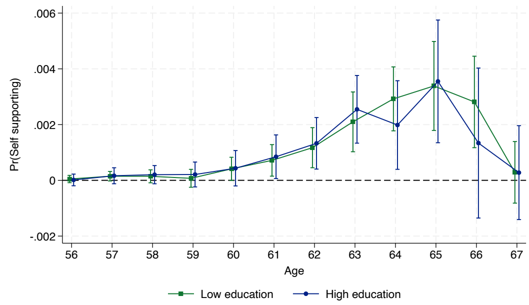
(b) Employment



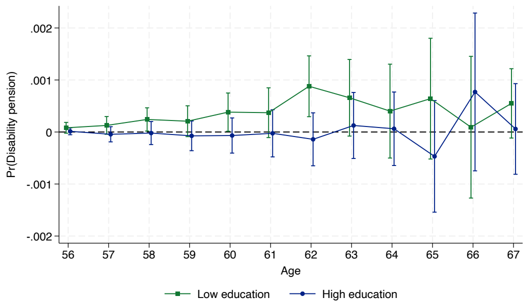
(c) Partial employment



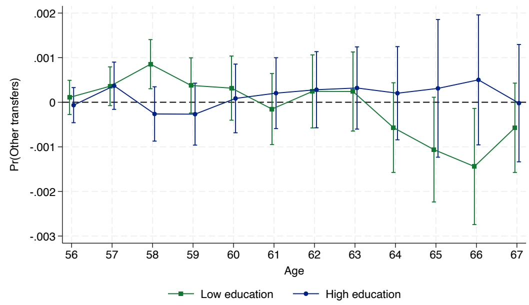
(d) Self supporting



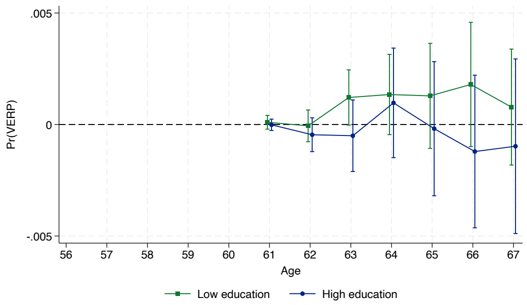
(e) Disability pension



(f) Other transfers



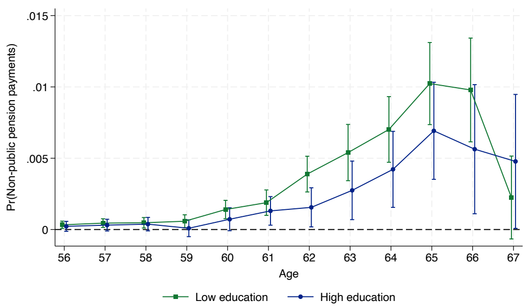
(g) VERP



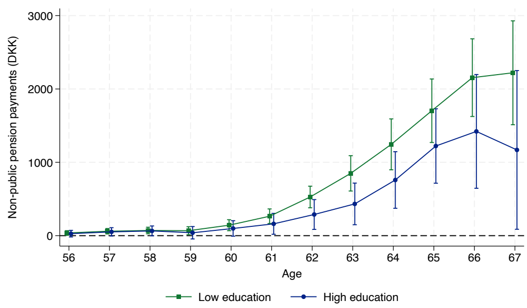
Notes: This figure plots reduced form estimates (Equation 1) for ages 56 to 67 for low (below college level) and high education (college level or above). In panel (a), the outcome variable is earnings, in panel (b), the outcome variable is a dummy for being employed, in panel (c), the outcome variable is a dummy for receiving disability pension, in panel (f), the outcome variable is dummy for receiving other transfers, and in panel (g), the outcome variable is a dummy for early retirement. Controls age 55 include firm FE, year FE, individual occupational and private pension contribution rates, dummy for payment to VERP scheme, male dummy, education dummies, marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, earnings (deciles), and wealth (ventiles). Controls age 40 include marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, 1 digit industry dummies, earnings (deciles), and wealth (ventiles). All monetary values are in DKK (2023-prices). Standard errors are clustered at the firm level at age 55, and 95% confidence intervals are shown.

Figure C.20: Reduced Form Estimates for Pension Income by Education

(a) Non-public pension payments



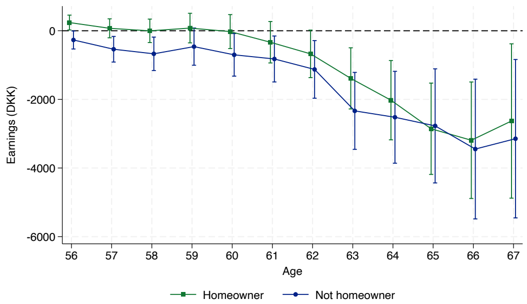
(b) Non-public pension payments (DKK)



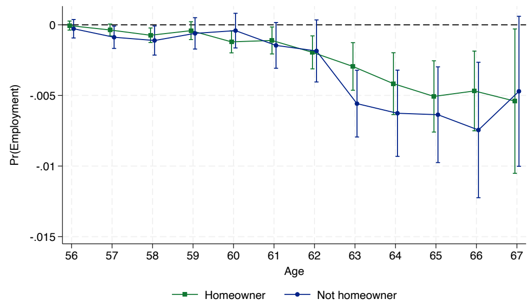
Notes: This figure plots reduced form estimates (Equation 1) for ages 56 to 67 for low (below college level) and high education (college level or above). In panel (a), the outcome variable is a dummy for receiving non-public pension payment, and in panel (b), the outcome variable is non-public pension payment (DKK). Controls age 55 include firm FE, year FE, individual occupational and private pension contribution rates, dummy for payment to VERP scheme, male dummy, education dummies, marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, earnings (deciles), and wealth (ventiles). Controls age 40 include marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, 1 digit industry dummies, earnings (deciles), and wealth (ventiles). All monetary values are in DKK (2023-prices). Standard errors are clustered at the firm level at age 55, and 95% confidence intervals are shown.

Figure C.21: Reduced Form Estimates by Homeownership

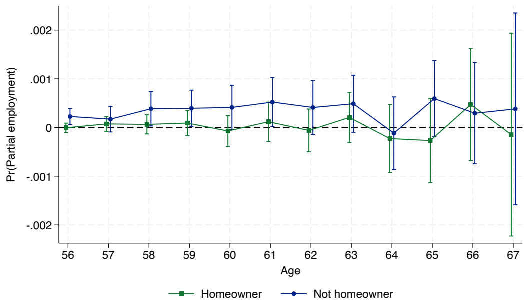
(a) Earnings (DKK)



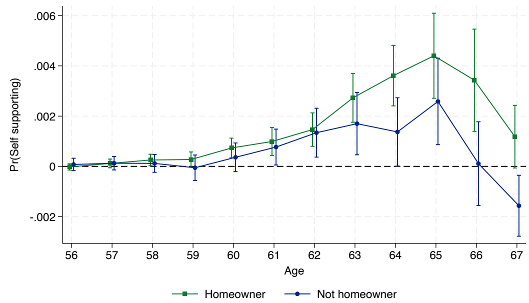
(b) Employment



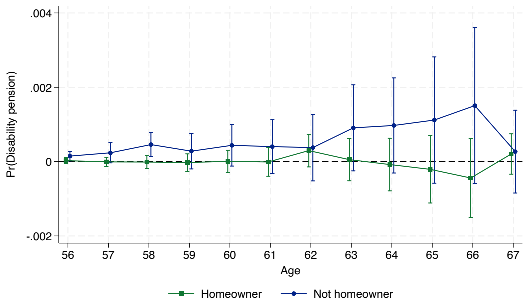
(c) Partial employment



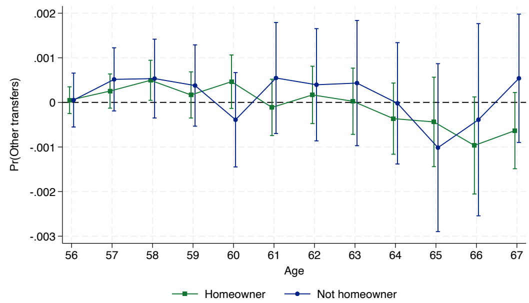
(d) Self supporting



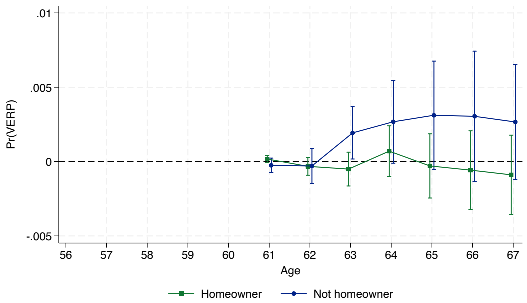
(e) Disability pension



(f) Other transfers



(g) VERP

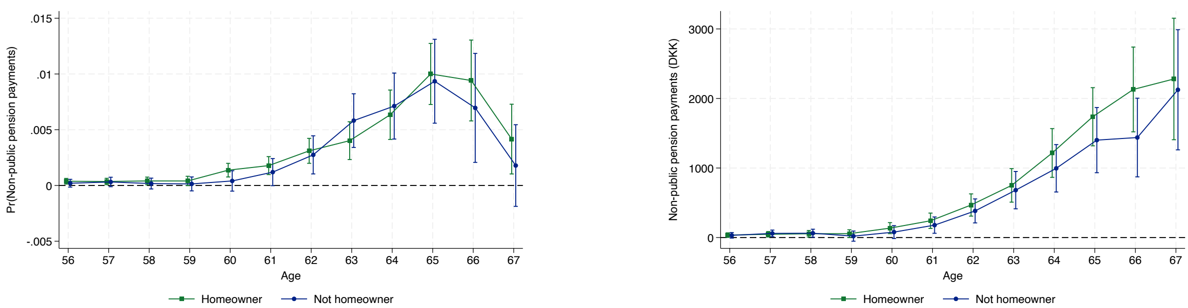


Notes: This figure plots reduced form estimates (Equation 1) for ages 56 to 67 by homeownership at age 55. In panel (a), the outcome variable is earnings, in panel (b), the outcome variable is a dummy for being employed, in panel (c), the outcome variable is a dummy for receiving disability pension, in panel (f), the outcome variable is dummy for receiving other transfers, and in panel (g), the outcome variable is a dummy for early retirement. Controls age 55 include firm FE, year FE, individual occupational and private pension contribution rates, dummy for payment to VERP scheme, male dummy, education dummies, marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, earnings (deciles), and wealth (ventiles). Controls age 40 include marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, 1 digit industry dummies, earnings (deciles), and wealth (ventiles). All monetary values are in DKK (2023-prices). Standard errors are clustered at the firm level at age 55, and 95% confidence intervals are shown.

Figure C.22: Reduced Form Estimates for Pension Income by Homeownership

(a) Non-public pension payments

(b) Non-public pension payments (DKK)



Notes: This figure plots reduced form estimates (Equation 1) for ages 56 to 67 by homeownership at age 55. In panel (a), the outcome variable is a dummy for receiving non-public pension payment, and in panel (b), the outcome variable is non-public pension payment (DKK). Controls age 55 include firm FE, year FE, individual occupational and private pension contribution rates, dummy for payment to VERP scheme, male dummy, education dummies, marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, earnings (deciles), and wealth (ventiles). Controls age 40 include marriage dummy, children at home dummy, experience, experience squared, tenure, 1 digit occupation dummies, 1 digit industry dummies, earnings (deciles), and wealth (ventiles). All monetary values are in DKK (2023-prices). Standard errors are clustered at the firm level at age 55, and 95% confidence intervals are shown.