Pension Design and Household Composition*

Amelie Mennerich† Annasofie M. Olesen‡

Job Market Paper

November 5, 2026
[Most recent version here]

Abstract

Couples can share household expenses, which reduces their cost of living. Many social insurance programmes therefore pay lower rates per person to couples compared to singles. How does this change relationship choices? This paper exploits administrative data and institutional features of the Danish pension system to show that the separation risk increases by 18% in response to financial incentives in a state pension of this kind. This implies that the overall share of singles in the population increases by 2.3% for a 50,000 DKK (about 7,400 USD) difference in annual income by relationship status. We develop a limited-commitment life-cycle model with endogenous divorce and retirement to evaluate the fiscal and welfare consequences of this policy. We show that the mechanical cost of paying higher rates to singles makes up 54.4% of the total fiscal cost, with the remainder arising due to the behavioural responses in divorce and retirement timing. But while the policy redistributes from couples to singles, it also provides insurance against the risks of divorce and widowhood. For this reason, 40% of those starting as married prefer the status quo with the lower rate for couples to a revenue-neutral equalisation of pensions.

JEL codes: H55, J12, J26, H53

*We would like to thank Abi Adams, Alison Andrew, Mathias F. Jensen, Thomas H. Jørgensen, Hamish Low and Cormac O'Dea for their guidance and support. We are also grateful to seminar participants at EAYE Annual Meeting 2026, SEHO Conference 2026, 4th Diversity and Human Capital Workshop Exeter, CEPR Ageing and Longevity Conference 2026, IIPF Annual Congress 2026, EALE Annual Meeting 2026, University of Oxford and CEBI for helpful discussions.

†Department of Economics, University of Oxford. Contact: amelie.mennerich@economics.ox.ac.uk.

‡Center for Economic Behavior and Inequality (CEBI), University of Copenhagen. The Center for Economic Behavior and Inequality (CEBI) at the University of Copenhagen is financed by grant DNRF134 from the Danish National Research Foundation. Olesen further acknowledges financial support from the Carlsberg Foundation, grant CF22-0317.

1 Introduction

Living with a partner is cheaper than living alone. This is because couples share rent, household bills and many other expenses, such that they benefit from economies of scale in consumption. Under the OECD equivalence scale, someone living alone needs 33% more income to reach the same standard of living as if they were living in a couple. Although the true economies of scale are difficult to measure (Browning et al., 2013), social insurance programmes routinely build this logic into their benefit rates. For example, Supplemental Security Income in the US pays unmarried recipients 33% more per person and the British Universal Credit pays 27% more for individuals who live alone. Most Western pension systems have at least one component of this kind, and the difference in the maximum single and couple rates can be as large as 66% (Canadian Guaranteed Income Supplement).

Paying singles more insures individuals against the higher cost of living alone, but it also changes the incentives to form and remain in a relationship. A higher benefit as a single lowers the financial cost of separating and a benefit cut on moving in with a new partner makes repartnering less attractive. Thus, policies that generously compensate singles for their higher costs may make singlehood more common. At the same time, policies that compensate very little may make it difficult for individuals to exit unhappy partnerships. Whether relationship choices change in response to benefit design matters for individuals, because it shapes how and with whom they spend their time and resources, and for policymakers, because behavioural responses change the fiscal cost and distributional effects of the policy and determine how well relationship status works as a basis for targeting.

Despite how common it is for government programmes to set different rates by relationship status, little is known about its consequences. Do individuals change their relationship choices in response to the difference in benefits between singles and couples? How large is this response? And what do these responses imply for the fiscal cost and the insurance value of the policy? These questions are difficult to answer for most working-life programmes, since eligibility often depends on potentially endogenous factors that could have direct effects on

relationship quality. Furthermore, receipt of these benefits frequently coincides with changes in the amount of time couples can spend together. For example, if individuals receiving disability benefits are more likely to separate, this could be because needing physical support from a partner, or spending more time with them, puts a strain on the relationship.

We overcome these problems by exploiting institutional features of the Danish pension system together with rich administrative data. The Danish state pension is up to 36% higher for singles, a difference in annual income of up to 38,600 DKK (about 5,700 USD), and three features of its design make it well suited to isolating the effect of this incentive on relationship choices. First, eligibility is determined solely by age, which individuals cannot manipulate. Second, a large share of workers retire before the state pension age through an early retirement programme whose benefits do not depend on relationship status, so for them reaching the state pension age changes little except the income gap between living alone and living with a partner. Third, the pension treats married and unmarried cohabiting couples alike, so the relevant margin is the decision to live with a partner rather than only the decision to stay married. Population-wide registers allow us to make use of these features: they record exact birth dates, household composition including unmarried cohabitation, the exact dates of divorces, and the income and pension wealth that determine how much each individual would gain from living alone.

These features support two research designs. Our main design is a regression discontinuity design (RDD) at the state pension age of 65 for the 1940–1953 cohorts. It compares relationship transitions just before and just after an individual's 65th birthday, both in the full population and among early retirees whose labour market status and time use do not change at that age. The RDD assumes that nothing else affecting relationships changes discontinuously at 65. A reform that lowered the state pension age from 67 to 65 for cohorts born from July 1939, while leaving the early retirement age unchanged, lets us test this assumption. For cohorts born just before the cutoff, 65 was not the state pension age, and we find no jump in relationship transitions at 65 for them. Comparing the discontinuity at 65 between the two groups of cohorts in a difference-in-discontinuities design removes any other change that occurs at that age, and gives estimates similar to the main RDD.

We find that relationship choices respond to financial incentives even at older ages, when divorce is rare and moving is costly. The risk of separation from a partner rises by 18% at the state pension age. The risk of legal divorce also increases by 25%. This change in separation and divorce risk is not driven by the effect of actual retirement, as the patterns are the same for early retirees, who experience no other changes at the state pension age. Our findings are not explained by mortality or changes in absolute income. We find suggestive evidence that the rate of transitions into new relationships also responds, albeit much less and with a delay. In order to understand the size of the total response in household composition and the fiscal externality, we aggregate both margins to study the change in the stock of singles. Because of means-testing, the difference in the state pension by relationship status falls with pension wealth and the response is concentrated among those with the largest incentive change. The share living alone rises by 3.8% in the bottom annuity wealth decile and does not increase in the top decile, where the predicted difference in income is small. Scaling the population response by the size of the incentive, we estimate that the overall share living alone increases by 2.3% in response to a 50,000 DKK (about 7,400 USD) difference in annual income.

We develop a limited-commitment life-cycle model to evaluate the fiscal and welfare implications of the policy taking into account the endogeneity of labour supply and marriage dissolution. Because singles are negatively selected in working life, higher pensions for singles have substantial distributional effects. They reduce the difference in average age at retirement by marital status by 1.2 years and reduce consumption inequality in old age. These behavioural responses increase the fiscal cost of providing higher pensions to singles by increasing the share of individuals who receive them and inducing earlier retirement among singles. Compared to everyone receiving the couple level of the state pension, the fiscal cost of the status quo is nearly twice as large as the pure mechanical cost. At the same time, the policy provides valuable insurance against divorce and widowhood, so even 40% of those initially married prefer the status quo to a revenue-neutral equalisation of pension benefits.

This paper builds on the literature on how household composition responds to policies, on decision-making in older couples and on taxation of couples and singles.

Marriage and divorce respond to policies, for example to a reduction in the cost of divorce through changes in divorce law (Voena, 2015b; Wolfers, 2006). Tax systems and social insurance design affect relationship choices, as shown empirically for family or work-related benefits (Bitler et al., 2004; Francesconi et al., 2009; Low et al., 2018; Michelmore, 2018; Moffitt et al., 2020) and joint taxation (Alm and Whittington, 2003; Myohl, 2024). Survivors' benefits affect whether widows remarry (Baker et al., 2004; Brien et al., 2004; Salisbury, 2017), which is so far the main evidence for older adults. Our paper empirically relates most closely to Persson (2020), who shows that marriage and subsequently divorce respond to the grandfathering of survivors' insurance. We study a policy that treats unmarried and married couples the same and that provides immediate rather than expected gains from relationship status choices through a change in monthly income. Structurally, Low et al. (2018) show that marital decisions not only respond to social insurance, but that individuals adjust decisions in response to future benefit exhaustion and marital decisions therefore provide insurance against benefit changes in a limited-commitment life-cycle model. We add to this literature by showing and quantifying the response of separations and divorce of existing couples to financial incentives without a corresponding change in time use. In our context, eligibility and treatment coincide and we have administrative data allowing us to measure the difference in annual income under each relationship status, which allows us to estimate the elasticity and size of the fiscal externality. We further capture a broader relationship margin than the marriage decision because the pension system treats married and unmarried cohabiting couples alike, allowing us to study the decision to live with a partner. And lastly, we extend the finding of an effect of social insurance design on separations to the group of older adults, for whom this has not been studied before and who have lower baseline rates of relationship transitions.

This paper also relates to the literature on decision-making of older couples. A large literature shows that partners coordinate their retirement timing (Blau and Riphahn, 1999; García-Miralles and Leganza, 2024; Johnsen et al., 2022), with structural models attributing joint retirement to complementarities in leisure, correlated preferences within couples, and features of social security (Casanova, 2010; Gustman and Steinmeier, 2000; Gustman and

Steinmeier, 2004; Jørgensen, 2014; Michaud et al., 2020). To our knowledge, we are the first to study joint retirement in the presence of limited commitment, so that retirement decisions result from bargaining that responds to the outside option of divorce. This implies that coordination of retirement choices in order to reap joint leisure is reduced for couples with a high risk of future divorce. In our model couples with high compared to low match quality and hence divorce risk, are 18% less likely to retire in the same year. This complements the findings that divorce experience and divorce risk shape women's labour supply and saving (Costa-Ramón et al., 2024; Olivetti and Rotz, 2016; Voena, 2015b) and that couples with lower commitment coordinate their retirement saving less efficiently (Choukhmane et al., 2025). We also relate to the literature on saving behaviour of older adults. Older couples and singles face different risks in retirement, for example because partnered individuals face the risk of widowhood (De Nardi et al., 2025). Chang and Ko (2023) and Lundberg et al. (2003) argue that bargaining models provide valuable insights into the saving behaviour of older couples. Since we show that even older couples separate in response to financial incentives, our results suggest that divorce remains a credible outside option at older ages, rather than only non-cooperation within marriage (Lundberg and Pollak, 1993).

Finally, our analysis builds on and complements the existing work on how taxes and benefits treat couples and singles and the trade-offs this involves. There is a large literature on the optimal taxation of couples, which shows that in working life, joint taxation affects who marries whom, how consumption and labour are allocated within the household and whether overall inequality is reduced by offering preferential taxes to married couples (Bronson et al., 2025; Gayle and Shephard, 2019; Golosov and Krasikov, 2025; Kleven et al., 2009). They find that in the design of taxation, policymakers need to trade off redistribution within and across households with labour supply incentives, especially for secondary earners. A similar trade-off exists in benefit and pension design: spousal and survivor benefits support secondary earners' consumption, but depress their labour supply (Borella et al., 2023; Groneck and Wallenius, 2021). A differentiation by relationship status in the state pension also redistributes across and within households. But we further show that this involves redistribution within individuals over time. In the life-cycle model, divorce and widowhood are risks and

higher state pensions for singles provide insurance against the loss of consumption in either case, that arises from the loss of economies of scale and access to partner income.[1] At the same time, it affects the incentives for labour supply, which in our case ceases to be a margin of self-insurance once an individual is permanently retired. We find that singles retire earlier, when the pension for singles is higher. But we also show, both in the reduced-form results and the model, that it changes the incentives to live with a partner. And the two margins of incentives interact: Through its effect on divorce risk, a higher state pension for singles changes the retirement behaviour of couples.

In the following, we first describe the institutional context and data. In Section 3, we present the research design and empirical results. We introduce the limited-commitment life-cycle model in Section 4. Counterfactual results are discussed in Section 5 and Section 6 concludes.

2 Institutional context and data

This section describes the institutional features of the Danish pension system on which our empirical strategy relies, as well as the data we use. From the state pension age, all long-term Danish residents receive the state pension, which is means-tested against household income and generally higher when single compared to when living with a partner. Half of our sample retires before the state pension age under an early retirement programme, for which benefits are independent of relationship status and partner's income. For these individuals, reaching the state pension age changes the financial consequences of living with a partner, but not their labour market status and associated leisure time.

[1] This further shifts government spending from the good state, in which consumption is cheap, to the bad state, in which consumption is expensive, and from early to late retirement, in analogy to the advantage of Medicare over Social Security in Einav and Finkelstein (2026).

2.1 Institutional setting

The Danish state pension In Denmark, all income is taxed at the individual level, but some benefits are tested against household income and composition. This includes the state pension, which is a residence-based[2] universal pension funded out of general taxation. It consists of a basic amount and a top-up that depends on whether the recipient lives with a partner and on household income.[3] The differentiation by marital status is motivated as a compensation for the difference in living costs.[4] Figure 1a displays the resulting levels of state pension income for a single or someone living with a partner who is also retired. The maximum gap is 38,600 DKK per year (about 5,700 USD).[5] Since 2003, couples and singles with low household wealth receive an additional annual payment (*ældrecheck*), which can further increase the difference in payment between couples and singles. Individuals living in households with less than 81,500 DKK (about 12,100 USD) of combined liquid wealth receive up to 16,400 DKK (about 2,400 USD) (Johannesen et al., 2026). Since the asset limit is the same for households of couples or singles, this can increase the difference in total state pension income to 55,000 DKK.[6]

The early retirement scheme Workers who contributed to the early retirement fund for most of their working life are eligible to retire at the early retirement age and draw

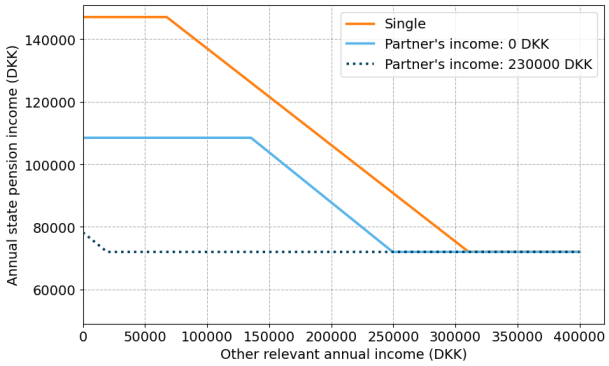
[2]For our sample, 40 years of residence between age 15 and 64 are required to receive the full amount, with pro rata deductions for shorter residences.

[3]For the time period of interest, means-testing is made against total income, including labour (above a threshold of 60,000 DKK, about 8,900 USD), pension and capital income of both partners. And thresholds for deductions against the partner's income are moderately higher when the partner is below the state pension age.

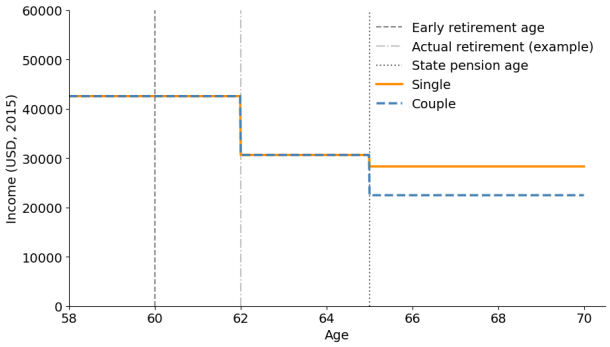
[4]"The purpose of higher benefits for single people is to compensate for the advantages enjoyed by married and cohabiting people. This is primarily a compensation for financial advantages in connection with the payment of fixed expenses and expenses for daily consumption, but also a compensation for the lack of practical help in everyday life with tasks such as shopping, cooking, cleaning, gardening, etc."(Social- og Boligministeriet, 2023)

[5]In the following, we report 2015 values throughout. One 2015 USD corresponds to approximately 6.73 2015 DKK.

[6]Minor additional benefits available from the state pension age and similarly tested against income and wealth are a heating reimbursement (up to 11,750 DKK, about 1,750 USD), a reduced media licence, support for out-of-pocket healthcare costs and minor changes in housing benefits for those eligible. These are smaller in magnitude, but increase the maximum available benefits and the taper rate.



(a) State pension (when partner is retired)



(b) Transition from employment to early and regular retirement (assuming actual retirement and withdrawal of occupational pension from age 61)

Figure 1: Dependence of income on cohabitation status in working life and retirement

early retirement benefits (*efterløn*) until reaching the state pension age. For our sample, the early retirement age is 60 and payments are up to 91% of the maximum unemployment benefit.[7] They are reduced pro rata based on hours worked, such that few people work while receiving the early pension. Furthermore, payments are also reduced based on income from occupational pensions. Occupational pensions that are not yet claimed are disregarded when retirement is delayed until age 62, in which case workers furthermore receive a lump-sum premium and the higher rate of 100% of unemployment benefits. Importantly, early retirement benefits do not depend on relationship status or the income of a partner. In the cohorts we study, 64% of workers contribute to the scheme at age 56 and 51% claim early retirement benefits for at least one year (Figure A.1 and Table A.1). Figure 1b displays an example of the transition into early retirement at age 62 for someone with the median labour income until that age and the median early retirement and occupational pension in early retirement. In this example, the individual has liquid wealth above the asset threshold for the additional annual payment, and draws their occupational pension from age 62.

Other pensions Due to the rollout of mandatory contributions to occupational pensions in the 1990s, the majority of our sample have savings in defined-contribution pensions. For

[7]There were major reforms to early retirement benefits in 1999, such that the first cohort of the control group was subject to slightly more generous rules regarding the level of the early retirement pension and deductions for occupational pensions.

the 1950-1953 cohorts, for whom we observe pension wealth before retirement, 75% hold wealth in occupational pensions (Table A.1). Individuals can generally not choose their contribution rate, as they are covered by bargaining agreements. However, different types of workers and different cohorts have contributed to occupational pensions for different shares of their careers. Tax penalties for early withdrawal apply until age 60.

Definition of a couple Since 1999, unmarried cohabiting couples have been treated like married couples in the state pension. The specific regulation is strict: any two adults, for whom it is legally possible to marry, and who share a significant part of their finances or household work are treated like partnered individuals (Udbetaling Danmark, 2026).

Divorce and widowhood Divorce is relatively easy and cheap (the administrative fee was 900 DKK in 2015). Throughout the period we study, the mandatory separation period never exceeded six months in the case of mutual agreement and one year otherwise. At divorce, all assets including those acquired before the marriage are to be divided equally, with the important exception of pension wealth since 2007. Pension wealth is not divided after it is paid out either, even when it has been reinvested for example in securities (Social- og Boligministeriet, 2006). Before 2007, different types of pension wealth were treated as either joint or separate property. At the death of a spouse, there are limited survivor benefits. The surviving partner receives both state pensions for three months before receiving the updated own level. The individual level is often higher in widowhood due to the treatment of alone-living individuals in general (Figure 1a). Working-age widow(er)s only receive a small one-off payment to help with funeral costs. Many types of occupational or private pensions can (in part) be inherited by a partner, but unmarried partners may need to be explicitly designated as beneficiary, or to have lived together for the last two years. The inheritance tax that applies to other assets is usually 0% for married partners, 15% for unmarried, cohabiting partners of more than two years and 36.25% for everyone else when it exceeds an exempt amount. In our main sample, 4.7% experience divorce after age 56 (Table A.2)

2.2 Data and sample selection

For the empirical analysis, we link information from administrative registers that cover the full population of Denmark from 1995 to 2020. The population register contains information about birth dates, marital status, marital transitions and household composition, including cohabitation, on 1 January of each year. We combine this with information on income, wealth and pension contributions as well as pension wealth, which is available from 2014 only. All income measures denote annual income by calendar year. We therefore combine end-of-year income with the address, partner and marital status information of 1 January of the following year, treating this as if all outcomes were measured on 31 December. The specific samples and cohorts used for each empirical design are covered in Section 3.

In this paper, we study both how the pension design affects relationship choices and the size of the resulting fiscal externality. These two questions call for different measures. The state pension treats two adults as a couple if they could legally marry each other and share a household, defined as sharing financial commitments or housework. Sharing a household is presumed when two adults are registered at the same address (Social- og Boligministeriet, 2024).[8] For the fiscal externality, what matters is whether an individual receives the single or the couple rate of the state pension. Following the presumption, we therefore measure single status by whether an individual is the only adult registered at their address. To make sure this is not driven by institutions such as care homes, we set the household measure to missing for addresses with more than four registered adults.

To understand how the policy affects individual lives through relationship choices, we instead care about their relationship status rather than the sharing of a household as defined by the pension rule. For relationship transitions, we therefore use the partner links constructed by Statistics Denmark. Two adults who live together are assigned a partner ID if they are married to each other or have a joint child, or if they are of opposite sex, have an

[8]Married pensioners who live at different addresses are treated as single only after a concrete assessment, in which shared financial commitments and the legal effects of the marriage itself count towards the couple rate (Social- og Boligministeriet, 2023).

age difference of no more than 15 years and live without other adults, with the exception of their children.

We define a separation as a year in which the partner ID of the previous year is no longer observed. This includes transitions to having no partner as well as direct transitions from one partner to the next. To make sure that the measure is not driven by the death of a spouse, we condition on the survival of the former partner. We complement this measure of separations with legal divorces. These are defined as transitions from married to divorced or, since we observe marital status only once per year, as being married to a different spouse than in the previous year. Our preferred measure of new relationships is the transition from a one-adult household to a two-adult household. We prefer this to the appearance of a new partner ID, because the restrictions on sex, age gap and other household members mainly bind for new couples. The vast majority of couples at the state pension age are married (Table A.2), and married couples are linked regardless of these restrictions, whereas new relationships at older ages are mostly unmarried cohabitations. In short, we measure the share single by household size, separations by partner IDs and new relationships by household size; the alternative measure for each outcome is reported in the Appendix.

The two types of measures err in opposite directions. Partner IDs are under-inclusive: they classify unmarried same-sex couples, couples with large age gaps and couples living with another adult as single. They may furthermore count the arrival of a third adult as a separation and the departure of a third adult as a new relationship. The household measure is over-inclusive, since it also counts adult children, parents, siblings and flatmates as other adults, although they do not form a couple under the pension rule. For the population share of singles, the partner-based measure therefore provides an upper bound and the household-based measure a lower bound. For the discontinuities at the state pension age, this does not hold mechanically. We instead interpret the two sets of estimates as responses along the partner margin and along the household margin.

We define retirement as labour income permanently falling below 67,500 DKK, the income threshold of no deductions in the state pension. For early retirement, we use two measures.

The first one on this definition or as receiving any income from the early retirement pension.

3 Empirical analysis

3.1 Research design

To estimate how relationship transitions respond to reaching the state pension age, we use a regression discontinuity design (RDD) based on the exogenous transition into state pension eligibility. Specifically, we estimate equation 1, which measures the change in the outcome of interest at the state pension age. The outcomes of interest are the population rates of relationship transitions: separation, legal divorce and moving in with a partner. All outcome variables are measured in percent for readability and age is recentred around the state pension age, such that $\tilde{a}_{i,t}$ is greater than or equal to 0 when individual i has experienced their 65th birthday by time t. The coefficient of interest is γ, the presence and magnitude of any discontinuity at the state pension age.

$$D_{i,t} = \alpha + \sum_{b=1}^{B} \beta_b \, \tilde{a}_{i,t}^{b} + \gamma \, \mathbb{1}(\tilde{a}_{i,t} \geq 0) + \sum_{b=1}^{B} \delta_b \, \mathbb{1}(\tilde{a}_{i,t} \geq 0) \, \tilde{a}_{i,t}^{b} + \sum_{m=1}^{12} \mu_m \mathbb{1}(\text{birth month}_i = m) + \epsilon_{i,t} \tag{1}$$

We cluster standard errors at the individual level. In the main analysis, we use a bandwidth of two years and a linear specification ($B = 1$). In Section 3.5, we show that the estimates are stable across polynomial orders and bandwidths. The same holds for implementing a donut design or using individual fixed effects.

The identifying assumptions are that the running variable is not manipulated, which is trivially true for age, and that in the absence of the treatment, the outcomes would have evolved continuously around the threshold. We can split this assumption in two parts. Firstly, it requires that there would be no discontinuity at age 65 if this were not the state

pension age. We can test this assumption by exploiting cohort variation in the state pension age. Secondly, it furthermore requires that the state pension age shifts relationship choices only through its effect on the relationship-status dependence, rather than through its effect on for example retirement itself.

Regarding the first part, we present the analysis based on variation in the state pension age across cohorts in Section 3.3. For this, we exploit a reform that reduced the state pension age without changing the early retirement age. From 2004, the state pension age was reduced from 67 to 65 for eligible individuals born from July 1939 onwards. We can therefore confirm that there is no discontinuity in relationship transitions at age 65 for the cohorts for whom this was not the state pension age, giving credibility to this part of the identifying assumption of the regression discontinuity design. But we can further exploit the variation in the state pension age to complement our main analysis with difference-in-differences and difference-in-discontinuities designs, using individuals born before July 1939 as a control group for later-born cohorts. Since the control cohorts were treated two years later, we can study any treatment effects for ages 65 and 66 with this approach. This allows us to show suggestive evidence on whether the response in relationship transitions is permanent. There are four reasons why the regression discontinuity design is our main approach. First, it allows us to combine more cohorts, so that we can measure any change at the state pension age more precisely and are able to do heterogeneity analyses. Second, for the late cohorts of our main sample, we have data on their pension wealth before the state pension age, such that we can predict the difference in income as single compared to as living with a partner, at the individual level. This allows us to estimate a treatment intensity and an elasticity. Third, we only observe the full control group from age 60, and are therefore unable to condition on outcomes before the early retirement age. And fourth, the older cohorts faced slightly different rules for the early retirement scheme, such that the treatment and control groups faced slightly different retirement incentives (see Section 2.1). All designs yield similar estimates for separations and the share living alone in the baseline sample, which indicates that the discontinuities in the RDD are not driven by other changes at age 65.

It is more difficult, but an important contribution of this paper, to rule out alternative mechanisms by which the state pension age could affect relationship choices. As is the case with all relationship-dependent benefits, eligibility for them coincides with changes in leisure time or time spent at home. In the case of the state pension, this is through the changes in time use associated with retirement, and disability, unemployment or other working-life benefits similarly aim to replace income from work. Receiving these benefits therefore coincides with changes in time spent at the workplace or at home, and this changes how much time an individual spends with their partner, which could have a direct impact on relationship quality. Moreover, the transition from work to benefit receipt can bring about a large change in income. And it has been shown that mortality risk changes in the aftermath of retirement (Fitzpatrick and Moore, 2018; Kuhn et al., 2020).

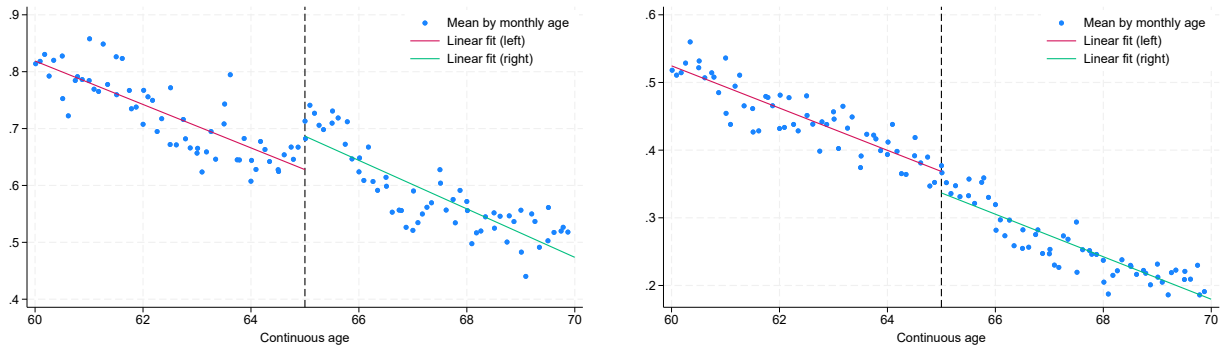
To rule out these confounding factors, we restrict the estimation sample to those with no other changes at the state pension age. The baseline sample consists of all individuals born 1940-1953, who were subject to the same early retirement and state pension ages. To make sure any difference in household size is not driven by mortality, immigration or emigration, we use a balanced sample that includes only individuals who were observed continuously between ages 55 and 67. To rule out any influence of actual retirement, we further condition on the individual having retired before the bandwidth, for example by age 62 when the bandwidth is two years. For this subsample, there are no corresponding changes in leisure time throughout the period we study. This is a selected subsample, but it allows us to isolate the mechanisms. When the outcome is separation and we therefore know the relevant partner, we can further control for the partner also having retired by that time, but we are not able to do this for the other outcomes for which we do not know who the hypothetical partner would be. Lastly, for the subsample of early retirees, the large change in income happens at the age of actual retirement, rather than at the state pension age. The literature on the effects of lottery wins on divorce risk suggests that moderate changes in wealth do not shift the risk of separation significantly when these are shared equally at divorce (Cesarini et al., 2023; Hankins and Hoekstra, 2011). This is different when the richer spouse retains a larger share of their prize. We would therefore expect the relationship-dependence of the

state pension to play a larger role than any absolute change in income. But to fully rule out income effects as alternative mechanisms in our setting, we want to control directly for the change in income at the state pension age. Since income becomes a function of cohabitation status at the state pension age, splitting the sample by the observed change in individual income would be driven by any effects in relationship choices, since income tends to fall for early retirees living with a partner and to remain constant or increase for those living alone. We therefore analyse heterogeneity by whether withdrawal of an occupational pension has started outside of the bandwidth, since level changes in income around age 65 are small for those without a change in pension withdrawal, in the absence of a change in relationship status.

Since our running variable is age, our coefficient estimates are subject to attenuation bias if there are anticipation effects with responses before the state pension age or delayed or gradual effects after the state pension age. With observations on 1 January every year, our running variable is continuous and indicates between ages 65 and 66 what share of the year the individual has spent being eligible for the state pension. Any response that is concentrated around the 65th birthday is therefore almost fully picked up in the first observation after the 65th birthday. Since we have observations on the exact date of divorce and the divorce response is concentrated close to the 65th birthday, we can infer that this probably captures almost the full effect on separations (see Section 3.2).[9] We can further implement a donut design leaving out a few months around the cutoff to verify our results are not dominated by individuals born close to the age cutoff (Section 3.5).

And for the interpretation of our results, we are interested in whether for example separations are retimed or additional. However, the relationship-status dependence of income changes permanently at the state pension age, such that we cannot infer the counterfactual long-term trend of our outcomes of interest from the available data. We are therefore limited to studying the differences between the treated and control groups until age 66 in the

[9]No similar indicator of the precise timing of any change in the likelihood of moving in with a new partner is available, since the state pension rate is determined by cohabitation rather than marriage. For married couples, a separation entails a legal divorce, but no such link exists for new relationships. In Denmark, most newly formed older couples live together before marriage.



(a) Separations (b) New cohabitations

Figure 2: Average separation and new cohabitation rate in the population by age

empirical section. Importantly, these results are again affected by anticipation effects of the control group. We can complement this with our analysis of the counterfactual divorce rate in the simulated data based on the structural model in Section 4.5.

3.2 Results for relationship status transitions

Separations The first channel from which the increase in the likelihood of living alone arises is separations. Figure 2a shows a sharp increase of the separation risk at the state pension age, which we estimate with the RDD. Table 1 presents the estimated change in the likelihood of separating from a partner at the state pension age based on a two-year or five-year bandwidth. The likelihood of separation increases by 0.12pp or 18%. In column (2), we condition on the individual having been a sample member at every age from 55 to 67, which rules out any effects of immigration, emigration or death on the outcome. In column (3), the sample is further restricted to individuals who are permanently retired by age 62, such that the increase in separations cannot be driven by any effects of actual retirement for these individuals. This rules out alternative channels, such as a change in shared leisure time, stress from the transition or health changes associated with retirement. The majority of couples in our sample are married. We therefore study whether legal divorce also increases at the state pension age. As reported in Panel B, we estimate a jump in the population rate of divorce by 0.08pp or 25%. Again, the estimates are not driven by mortality, migration or

	Bandwidth 2 years			Bandwidth 5 years		
	All	Balanced	Retired by 62	All	Balanced	Retired by 62
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Separation						
Discontinuity at 65	0.124***	0.113***	0.124***	0.063***	0.060***	0.062**
	(0.020)	(0.019)	(0.035)	(0.011)	(0.011)	(0.020)
Relative effect (%)	17.5***	17.0***	18.8**	9.3***	9.3***	9.9**
	(3.0)	(3.2)	(5.8)	(1.7)	(1.8)	(3.3)
Base level	0.704	0.668	0.661	0.681	0.644	0.625
Panel B: Divorce						
Discontinuity at 65	0.076***	0.061***	0.050*	0.033***	0.029***	0.029*
	(0.013)	(0.013)	(0.023)	(0.007)	(0.007)	(0.013)
Relative effect (%)	25.2***	21.1***	18.7*	11.1***	10.4***	11.3*
	(4.8)	(4.9)	(9.2)	(2.6)	(2.8)	(5.3)
Base level	0.302	0.291	0.269	0.295	0.281	0.258
Observations	3,744,312	3,565,954	1,095,256	9,153,586	8,690,585	2,668,003

Notes: Discontinuity in the annual rate of separation and divorce (in percentage points) at the state pension age, estimated from equation (1) with a linear specification and birth-month fixed effects. Base level: predicted rate just below the cutoff for individuals born in June (reference birth month). Relative effect: discontinuity divided by the base level, in percent. Separation: end of cohabitation with a married or unmarried partner, excluding widowhood. Divorce: legal divorce from a married partner. Balanced sample: observed continuously between ages 55 and 67. Retired by 62: balanced sample, further restricted to individuals with labour income below 67,500 DKK (2015) from age 62. With a bandwidth of five years, the youngest cohorts are not observed for the full five years after 65, as the data end in 2020; restricting the sample to the 1940-1951 cohorts gives similar estimates (separation 0.058, divorce 0.042). Standard errors clustered at the individual level in parentheses; standard errors of relative effects by the delta method. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 1: RDD: Separation from spouse or unmarried partner and legal divorce

	Bandwidth 2 years			Bandwidth 5 years		
	All	Balanced	Retired by 62	All	Balanced	Retired by 62
	(1)	(2)	(3)	(4)	(5)	(6)
Discontinuity at 65	−0.024	−0.026	−0.015	−0.077***	−0.084***	−0.047**
	(0.019)	(0.020)	(0.032)	(0.011)	(0.011)	(0.018)
Relative effect (%)	−3.2	−3.6	−2.6	−10.6***	−11.9***	−8.6**
	(2.6)	(2.7)	(5.4)	(1.4)	(1.5)	(3.1)
Base level	0.745	0.723	0.580	0.723	0.704	0.547
Observations	3,744,312	3,565,954	1,095,256	9,153,586	8,690,585	2,668,003

Notes: Discontinuity in the annual rate of new relationships (in percentage points) at the state pension age, estimated from equation (1) with a linear specification and birth-month fixed effects. New relationship: transition from a one-adult household in the previous year to a two-adult household in the current year. Results using the Statistics Denmark partner ID are in Table B.5. Base level: predicted rate just below the cutoff for individuals born in June (reference birth month). Relative effect: discontinuity divided by the base level, in percent. Balanced sample: observed continuously between ages 55 and 67. Retired by 62: balanced sample, further restricted to individuals with labour income below 67,500 DKK (2015) from age 62. Standard errors clustered at the individual level in parentheses; standard errors of relative effects by the delta method. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 2: RDD: New partner

retirement. The result is qualitatively consistent across different bandwidths (column and Table B.1). However, magnitudes are smaller at very long or short regression intervals. This is because the response is concentrated around the cutoff. For legal divorce, we observe the precise day of the change in marital status. Figure B.1 shows that the excess mass is concentrated within three months either side of the age cutoff.

We show that the estimates are stable for different definitions of retirement and when restricting the sample to mutually retired couples (Table B.2). Since the restriction of both individuals' having retired by age 62 of the focal person reduces the sample size to one tenth, these estimates are not significant at the 5% level. The increase in the separation risk is of similar size for all quintiles of personal income at age 58, such that it is not driven by low-income households only (Table B.3). The separation risk furthermore increases as either partner turns 65 (Table B.4). While the absolute change in separation and divorce risk is similar for men and women, the relative increase in divorce risk is significantly larger for women because of different base rates.

New relationships On the flip side, the differentiation by relationship status in the state pension could also affect the decision to move in with a new partner. We therefore study whether there is also a discontinuity in the likelihood of moving in with a new partner. In the raw data in Figure 2b, it can be seen that the likelihood of entering a new cohabiting relationship also falls after the state pension age relative to a trend. However, this adjustment happens with a slight delay. Two potential reasons for this variable to move more slowly are that individuals plan these further in advance and it takes time to meet a new partner, and, that singles are not as well-informed about the differential treatment of couples before the state pension age. The lag in adjustment is mirrored in our estimation results. In Table 2, we show that the discontinuity is negative, but it is only significant at the population level for wider bandwidths and when not conditioning on early retirement. For this bandwidth, we estimate a decline in the population rate of new cohabitation spells of 0.08 or 11% in the main sample. The estimates are smaller and inconsistent when measuring new relationships via changes in the partner ID (Table B.5).

Aggregating both margins to the change in the share single The total population share of individuals living with or without a partner is driven by the changes in both inflows and outflows. We have established that both the rate of inflows to the share of singles increases at the state pension age and have found suggestive evidence for a change in the rate of outflows. To later quantify the size of the fiscal externality, we need to aggregate both margins and scale it by the size of the financial incentive. Table 3 shows that the share of individuals living alone rises by 0.34pp, at the state pension age. This is largely driven by a change in the inflows into living alone. Separations, where the other household member was classified as a partner by Statistics Denmark before age 65, contribute 0.1pp of the overall change. There is also a large inflow from other types of households (0.2pp), these could be individuals moving out of larger households or separating from partners who do not meet the criteria of Statistics Denmark's classification (same-sex couples and couples with large age gaps). The overall change in the share of singles is not affected by any change in the rate of entry into widowhood and changes in new relationships make up a smaller share of the overall change. Table B.7 presents the results of the same exercise for the overall share

	Living alone
Change in share single	0.344^{***}
	(0.042)
Contributions:	
Separations	0.100^{***}
	(0.017)
Widowhood	-0.014
	(0.018)
Other departures from the household	0.214^{***}
	(0.019)
Fewer new partnerships	0.045^{*}
	(0.021)
Level of share living alone	0.264^{***}
	(0.028)
Observations	3,638,017

Notes: Discontinuity at the state pension age (in percentage points), estimated from equation (1) with a linear specification, a bandwidth of two years and birth-month fixed effects. The first row is the discontinuity in the annual change in the share living alone (no other adults in the household); the contributions add up to it. Separations: end of cohabitation with a partner (partner ID), excluding widowhood. Other departures from the household: other adults leaving the household that are not identified as a separation or widowhood. Fewer new partnerships: the negative of the discontinuity in the rate of moving from living alone to living with other adults, so that a positive value raises the share single. The sample requires household status in the current and the previous year; household status is missing for addresses with more than four registered adults. Standard errors clustered at the individual level in parentheses. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Results for the share without a partner ID are in Table B.7.

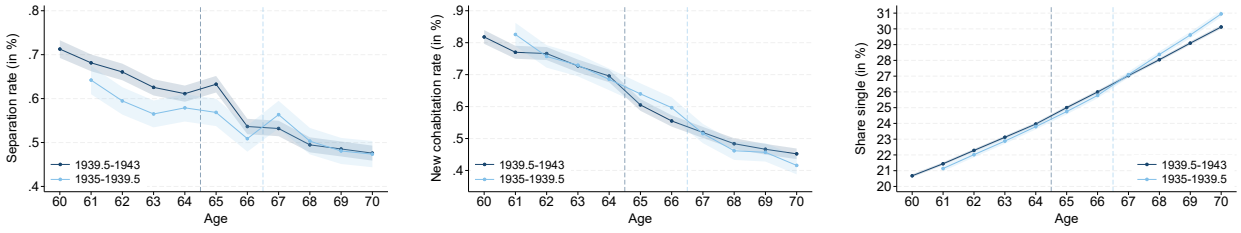
Table 3: Decomposition of change in the share living alone

of adults without a partner ID. Based on this definition, new relationships do not contribute to the overall share of singles.

3.3 Later-treated cohorts and the timing of the response

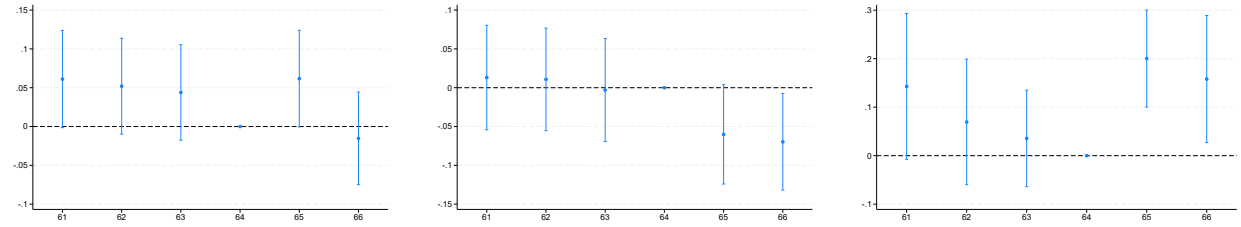
We can show robustness of the reported behavioural changes being driven by the state pension by exploiting variation in the state pension age. A 2004 reform reduced the state pension age from age 67 to 65 for individuals born from July 1939. The state pension age was reduced in order to save expenditure on early retirement pensions, for which eligibility duration fell from seven to five years (Amilon and Larsen, 2023).

Panel A: Raw rates by cohort group



(a) Separations (b) New cohabitations (c) Share living alone

Panel B: Event-study coefficients



(d) Separations (e) New cohabitations (f) Share living alone

Figure 3: Relationship transitions and the share living alone in treated and control cohorts
Notes: Top row: annual rates (in percent) by age for cohorts born July 1939-1943 (state pension age 65) and January 1935-June 1939 (state pension age 67), with 95% confidence intervals; dashed lines mark the years containing the 65th and 67th birthdays. Bottom row: coefficients on age × Early from equation (2), normalised to zero at age 64, with 95% confidence intervals. Age 65 is the calendar year containing the 65th birthday. Standard errors clustered at the individual level.

Figure 3 shows the share of individuals separating from, entering a new cohabitation spell and living alone in the population of the birth cohorts on either side of the cutoff by

age. After the reform, the spike in separations moves from the old state pension age, 67, to the new one, 65. Similarly, the rates of new cohabitation spells and the share of individuals living alone move in parallel until age 64, then diverge at age 65 and reconverge at age 67, the age at which all cohorts are treated. Since this figure plots annual data, age 65 is the calendar year containing the 65th birthday.

We formalise this analysis with a difference-in-differences design based on staggered treatment. Importantly, since treatment status is determined by age and the state pension age is known in advance, any anticipation effects in the later-treated cohorts cause attenuation bias. We define treatment variable Early_i as indicating whether the individual was born from July 1939 and therefore had the earlier state pension age.[10]

$$D_{i,t} = \alpha + \sum_{\substack{j=61 \\ j\neq 64}}^{66} \alpha_j \, \mathbb{1}(a_{i,t} = j) + \gamma \, \text{Early}_i + \sum_{\substack{j=61 \\ j\neq 64}}^{66} \beta_j \, \mathbb{1}(a_{i,t} = j) \, \text{Early}_i + \epsilon_{i,t} \tag{2}$$

Panel (B) of Figure 3 displays the event study coefficient estimates from equation 2. We normalise the cohort difference to zero at age 64. Despite the declining pre-trend in separations between age 63 and 64, this rises at the treatment age of the treated cohorts relative to the not yet treated control group. However, this rise is short-lived, lasting only for one period. The event study results are noisy for separations. In the difference-in-discontinuities analysis we find a clear absence of a discontinuity at age 65 for the cohorts with state pension age 67. In the year containing the 66th birthday, the difference between the separation rate of the treated and not-yet-treated groups returns to the reference level (age 64). Similarly, the rate of entering into new relationships (as measured by moving from a one- to two-adult household) falls at the state pension age of the earlier-treated cohorts. The gap in new relationships between the treated and untreated cohorts widens over time, consistent with the delayed response in Section 3.2. The share living alone rises at the state pension age of the treated cohorts relative to the control cohorts, by 0.20pp at age 65, and

[10]We face a trade-off between sample size and precision of our estimates and length of desired pre-trend shown. For a window of 4.5 birth cohorts in the treatment and control group, we are able to show pre-trends from age 61 for the relationship transition variables, which are only defined from the second year of our data.

remains higher at age 66, after a slightly declining pre-trend. The full coefficient estimates of this analysis, as well as estimates for divorce and the partner-ID measures are reported in Table D.1.

Because the event study compares annual age profiles relative to a single base year, it is sensitive to differences in the age profiles of the two cohort groups. We therefore also estimate the change in the discontinuity at 65 between the treated and the control cohorts, which makes the same assumptions as the RDD and differences out any other change at age 65:

$$D_{i,t} = \alpha + \beta\,\tilde{a}_{i,t} + \gamma\,\mathbb{1}(\tilde{a}_{i,t} \geq 0) + \delta\,\mathbb{1}(\tilde{a}_{i,t} \geq 0)\,\tilde{a}_{i,t} + \text{Early}_i[\alpha^E + \beta^E\,\tilde{a}_{i,t} + \theta\,\mathbb{1}(\tilde{a}_{i,t} \geq 0) + \delta^E\,\mathbb{1}(\tilde{a}_{i,t} \geq 0)\,\tilde{a}_{i,t}] + \sum_{m=1}^{12} \mu_m \mathbb{1}(\text{birth month}_i = m) + \epsilon_{i,t} \tag{3}$$

In equation (3), the parameter γ measures the discontinuity at age 65 for the control cohorts, whose state pension age is 67. It therefore provides a placebo test, since 65 is not the state pension age for these cohorts. The parameter of interest, θ, measures the difference in the discontinuity at 65 between the treated and the control cohorts.

Table 4 reports the estimates. The control cohorts show no discontinuity at 65 in any outcome. For the treated cohorts, the separation rate rises by an additional 0.10pp, or about 15%, at the state pension age, close to the RDD estimate of 0.12pp, or 18% (Table 1). The share living alone rises by an additional 0.33-0.44pp (1.4-1.8%), compared with 0.29pp (1.2%) in the RDD on the full sample (Table B.6), although these estimates are less precise. The rate of moving in with another adult does not change significantly at 65, as in the RDD with a bandwidth of two years. The estimates are robust to extending the bandwidth below 65 (Table D.2).

	RDD (state pension age 65) (1)	Placebo at 65 (state pension age 67) (2)	Difference-in-discontinuities (3)
Separation	0.124^{***}	0.017	0.105^{*}
	(0.020)	(0.034)	(0.046)
Relative effect (%)	17.5		15.6
Divorce	0.076^{***}	0.005	0.058^{*}
	(0.013)	(0.019)	(0.027)
Relative effect (%)	25.2		21.3
New relationship	−0.024	−0.013	−0.038
(one to two adults)	(0.019)	(0.037)	(0.048)
Relative effect (%)	−3.2		−5.7
Share living alone	0.285^{***}	−0.056	0.334^{+}
	(0.028)	(0.113)	(0.198)
Relative effect (%)	1.2		1.4
Cohorts	1940-1953	1935-June 1939	1935-1943
Bandwidth (years)	2	1.9	1.9
Birth-month fixed effects	Yes	Yes	Yes

Notes: Discontinuities at age 65, in percentage points; relative effect: discontinuity divided by the predicted level just below 65 for individuals born in June, in percent. Column (1): equation (1) for the 1940-1953 cohorts, whose state pension age is 65, with a bandwidth of two years; these are the estimates in column (1) of Table 1 (separation, divorce), Table 2 (new relationship) and Table B.6 (share living alone). Column (2): discontinuity at 65 for the cohorts born January 1935-June 1939, whose state pension age is 67, from equation (4). Column (3): difference between the discontinuities at 65 of the cohorts born July 1939-December 1943 (state pension age 65) and the control cohorts, from equation (4). The bandwidth in columns (2) and (3) is at most 1.9 years because the control cohorts reach their state pension age at 67; results with a bandwidth of 1.5 years are in Table D.2. Separation: end of cohabitation with a partner (partner ID), excluding widowhood. Divorce: legal divorce. New relationship: transition from a one-adult to a two-adult household. Share living alone: no other adults in the household. Separation, divorce and new relationship: annual rates, in percent; living alone: share, in percent. Standard errors clustered at the individual level in parentheses. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 4: DiDiscontinuity

3.4 Elasticity of the share of singles with respect to pension design

In order to predict the size of the difference in income by relationship status at the individual, we need information on pension wealth, since this determines income in retirement against which the state pension is means-tested. In the following, we therefore restrict the sample to individuals born 1950-1953, for whom pension wealth can be measured before the state pension age. For this sample, Table 5 shows that the share of singles rises by 0.4pp, or 1.6%, at the state pension age. For this table, we measure singlehood through household size and classify someone as single when they live in a household with no other adults. As before, we obtain attenuated results when instead defining singlehood as the absence of a partner ID under the Statistics Denmark classification, because some of the transitions from larger to smaller households are not picked up as transitions from a couple to a single household under this definition (Table B.8). For the full sample, the jump in the share living alone is 0.29 (Table B.6). Because the estimate is a discontinuity at the state pension age, it is a short-run effect. It understates the long-run response if separations are anticipated, or if the changes in transition rates are permanent. We discuss anticipation effects in Section 4.5, and in Section 3.3 we show that over the short time horizon for which we have a control group the effect on the share of singles is stable.

To judge whether a 1-3% increase in the share of singles is large, we scale it by the difference in income by relationship status each individual faces. This difference between the state pension an individual would receive as a single and as part of a couple is generally not observed, since no one receives the state pension before age 65, and every individual is only observed in either state at age 65. It therefore needs to be predicted.

We predict state pension income at age 66 under each relationship status from characteristics fixed before the state pension age: decile of annuity and instalment pension wealth at age 64, decile of other non-housing wealth at age 64, mean labour income over ages 55-59, and birth year. We measure the inputs before the pension age because state pension income

	Bandwidth 2 years			Bandwidth 5 years		
	All	Balanced	Retired by 62	All	Balanced	Retired by 62
	(1)	(2)	(3)	(4)	(5)	(6)
Discontinuity at 65	0.403***	0.400***	0.515***	0.665***	0.600***	0.838***
	(0.057)	(0.058)	(0.106)	(0.053)	(0.053)	(0.098)
Relative effect (%)	1.6***	1.6***	1.9***	2.7***	2.4***	3.1***
	(0.2)	(0.2)	(0.4)	(0.2)	(0.2)	(0.4)
Base level (%)	25.07	24.76	27.30	24.90	24.60	27.16
Observations	954,992	932,173	284,675	1,906,217	1,865,250	569,969

Notes: Discontinuity in the share living alone (in percentage points) at the state pension age, estimated from equation (1) with a linear specification and birth-month fixed effects. Living alone: lives in a household with no other adults. Cohorts 1950-1953, restricted to individuals for whom the predicted difference in state pension income as single and as part of a couple can be computed (no missing income at ages 55-59, pension wealth or non-pension wealth at age 64). Base level: predicted share living alone just below the cutoff for individuals born in June (reference birth month), in percent. Relative effect: discontinuity divided by the base level, in percent. Balanced sample: observed continuously between ages 55 and 67. Retired by 62: balanced sample, further restricted to individuals with labour income below 67,500 DKK (2015) from age 62. Standard errors clustered at the individual level in parentheses; standard errors of relative effects by the delta method. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 5: RDD: Share living alone (1950-1953 cohorts)

at 66 depends on choices of retirement age, withdrawal timing and rate, that may themselves respond to relationship status. We run the first-stage regressions and the predictions separately by gender, because average partner income given own characteristics differs between men and women. Results are reported in Table B.9. For each individual we then calculate the predicted state pension gap as the difference between predicted income as single and predicted income when in a couple.[11]

This rests on a conditional independence assumption:

$$\mathbb{E}[y_i^s | s_i = s, X_i] = \mathbb{E}[y_i^s | X_i] \tag{4}$$

For each relationship status $s \in \{\text{single}, \text{couple}\}$, expected income in that status is recovered from the relationship between observables X_i and income among those currently in it. Because state pension income depends on both own and partner income, this nests an

[11]We take the difference between two predicted values, so that the prediction error in the state pension gap does not differ systematically between singles and couples.

	Share in %
Near zero	2.7
Below statutory gap	35.0
Around statutory gap	23.9
Between statutory gap and gap with senior citizen check	37.5
Between gap with senior citizen check and maximum	0.9
Total	100.0

Near zero: Below 4,000 DKK. Statutory gap: 38,600 DKK. Around statutory gap: within 10%. Gap with senior check: 55,000 DKK. Maximum possible gap: 91,500 DKK.
2015 DKK.

Table 6: Distribution of predicted single-couple gap

	Annuity wealth decile at age 64									
	1	2	3	4	5	6	7	8	9	10
Mean predicted gap	49.7	39.8	41.1	41.6	40.5	40.2	37.3	30.6	24.2	9.7
(1,000 DKK/year)	(4.8)	(8.4)	(7.8)	(7.2)	(6.9)	(7.0)	(7.4)	(8.2)	(8.7)	(8.1)
Mean predicted income	1.36	1.20	1.23	1.26	1.28	1.25	1.19	1.18	1.13	1.04
ratio: single/couple	(0.14)	(0.12)	(0.14)	(0.14)	(0.13)	(0.11)	(0.10)	(0.11)	(0.10)	(0.09)

Notes: Mean gap: mean predicted difference between annual state pension income as single and as part of a couple at age 66, in 1,000 DKK per year. Mean income ratio: mean predicted ratio of income as single to income as part of a couple. Both by decile of annuity pension wealth at age 64 (including lifetime and fixed-term annuities). Standard deviations in parentheses. 2015 DKK.

Table 7: Mean predicted single-couple gap by pension wealth decile at age 64

assumption about hypothetical partners: we assume that the actual partners of those in a relationship by age 66 are the relevant counterfactual for those single at age 66, conditional on observables X_i.

We furthermore face two data limitations. Pension wealth is available only from 2014, which restricts us to the 1950-1953 birth cohorts. And our income measure is annual, so age 66 is the first age at which everyone has received the state pension for a full calendar year, and it is therefore the age at which we predict.

The first stage for state pension income is reported in Table B.9 and the corresponding first stage for total income at age 66 in Table B.10. For state pension income, the R^2 is 0.41-0.42 when single and 0.27-0.29 when in a couple; for total income, it is 0.37-0.40 and 0.38-0.39, respectively.

	Delta method	Bootstrap
Response (pp) per 1000 DKK/year	0.0114***	0.0114***
	(0.00162)	(0.00170)
Semi-elasticity (% per 1000 DKK/year)	0.0453***	0.0453***
	(0.00653)	(0.00682)
Elasticity w.r.t. relative income	0.0868***	0.0868***
	(0.0125)	(0.0133)
Observations	954,992	954,992
Replications		200

Standard errors by delta method treating mean difference as fixed.
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 8: Magnitude of demographic response

The predictions imply that almost every individual receives a higher state pension when single: fewer than 3% have a predicted difference in income close to zero. The statutory gap between the single and couple rates is 38,600 DKK (about 5,700 USD) per year, rising to 55,000 DKK (about 8,200 USD) once the senior citizen check (*ældrecheck*), an annual means-tested supplement, is included for singles but not couples. About one third of individuals face an income difference below the statutory gap; the remainder face a difference in income near it or between it and the gap inclusive of the senior citizen check (Table 6). Because the senior citizen check is means-tested against household wealth with no adjustment for household size, singles qualify for it more often. Table 7 reports the mean predicted income difference and mean predicted income ratio by decile of annuity wealth at age 64. Both decline with pension wealth, but not smoothly: the second to seventh decile face a very similar gap of around 40,000 DKK (about 5,900 USD) per year and an income ratio of around 1.2. In the eighth and ninth decile the tapering gradually reduces the gap to 30,600 and 24,200 DKK, and in the top pension wealth decile it is negligible as a proportion of total income (9,700 DKK, an income ratio of 1.04).

We use this prediction to scale average response and evaluate how the change in singles varies with treatment intensity. On average, the share of singles varies by 0.01pp per 1000 DKK of annual income (Table 8). The relative change implies a semi-elasticity of 0.045% per 1,000 DKK and an elasticity of the share living alone with respect to the difference (ratio)

in income of 0.09. That means, that for a 10% increase in annual income when single, there are on average 0.9% more singles in our setting. Conversely, scaled to a 50,000 DKK (about 7,400 USD) difference in income, which is close to the gap in the bottom pension wealth decile, the share living alone rises by 2.3%.[12]

We are interested in whether the response varies by the size of the financial incentive, following the predicted distribution of the difference in annual income by pension wealth in Table 6. We therefore divide the sample into four differently sized group in line with the levels in predicted annual state pension gap. Individuals with higher pension wealth at age 64 receive larger occupational pensions and therefore lower state pensions at age 66, and the income share of the state pension further declines with other income. The discontinuity is the largest in the group with the highest treatment-intensity. In the bottom annuity wealth decile, the share of singles rises by 1.5pp or 3.8% at the state pension age (Table 9). This implies a response of 0.03pp per 1,000 DKK and an elasticity of 0.125. In the next-most treated group, the discontinuity is smaller, but still significant. For the second to seventh decile of annuity wealth, we estimate a discontinuity of 0.5pp or 1.9% which implies a smaller elasticity of 0.09. For the annuity wealth deciles in the range of tapering, the estimates are very similar to the group with the statutory gap, but not significant, potentially because of the smaller size of the group. Conversely, we find marginally significant estimate of a negative discontinuity in the share living alone for the top annuity wealth decile, which is the group with the smallest treatment intensity. The difference in the response per 1,000 DKK in the most- and least-treated group is significant at the 5% level. Note also that baseline levels of the share living alone differ widely between groups and that the larger discontinuity in the bottom pension wealth groups, which we have established in the previous section is driven more by separations than new relationships, is despite the fact that there are fewer couples in this group to start with. Expressed relative to the share not living alone, the gradient is steeper (2.5% compared with 0.6% in the group at the statutory gap). However, the groups also differ in other characteristics, such as income and relationship stability, that may affect how responsive they are to a given incentive. We therefore interpret this as descriptive

[12]At the statutory gap, the difference is 1.75%.

heterogeneity.

To make sure these results are not affected by the different sizes of the groups, we repeat these calculations by annuity wealth tercile at age 64. Table C.1 shows that the discontinuity at the state pension age declines monotonically with annuity wealth tercile, but the semi-elasticity and elasticity estimates are constant for the bottom two groups. However, this could be simply because the difference in both state pension and total income for these groups are very similar. In Table 9, both the semi-elasticity and elasticity estimates fall between the bottom group and the group with the statutory gap, but given the larger values for the group in the tapering segment, we are hesitant to draw a conclusion on the overall income-profile of the elasticity.

3.5 Robustness

Alternative mechanisms In the main results section, we have already shown that the results are not driven by changes in composition around age 65. All results are robust to restricting the sample to individuals observed at every age from 55 to 67, which rules out effects of **immigration**, **emigration** and **survival**. The increased likelihood of living alone is furthermore not driven by any changes to the mortality of partners, if anything the likelihood of **bereavement** declines at the individual's 65th birthday (Figure E.1 and Table E.1). **Other changes at age 65**, cannot explain the results either, since cohorts for whom this was not the state pension age show no change in separation risk at age 65 (Table 4). The change is hence driven by reaching the state pension age, but the state pension age can affect relationship choices through several channels (Stancanelli, 2014).

Most importantly, any changes that operate through actual retirement, such as changes in **joint leisure time**, **health** or **emotional effects of retirement**, are shown not to be the main driver since our results are the same for the subgroup of early retirees, who retire at least two years before the state pension age. Nor are the results driven by **income effects** of the pension itself. For early retirees, the large change in income occurs at retirement rather

	Above statutory gap	Statutory gap	Taper	Small gap
	(1)	(2)	(3)	(4)
Panel A: Incentive				
Mean gap (1,000 DKK/year)	49.7	40.1	27.5	10.0
Mean income ratio, single/couple	1.36	1.23	1.16	1.04
Panel B: Response of the share living alone				
Base level (%)	40.03	25.24	20.67	18.28
Discontinuity at 65 (pp)	1.518**	0.472***	0.415	−0.644
	(0.497)	(0.130)	(0.282)	(0.393)
Relative change (%)	3.79**	1.87***	2.01	−3.52^{+}
	(1.27)	(0.52)	(1.38)	(2.11)
Per 1,000 DKK/year (pp)	0.0305**	0.0118***	0.0152	−0.0646
	(0.0100)	(0.0032)	(0.0103)	(0.0394)
Semi-elasticity (%)	0.076**	0.047***	0.073	−0.354^{+}
	(0.025)	(0.013)	(0.050)	(0.212)
Elasticity w.r.t. income ratio	0.125**	0.092***	0.144	−0.979^{+}
	(0.042)	(0.026)	(0.099)	(0.587)
Panel C: Response per 1,000 DKK/year relative to column (1)				
Difference (pp)		0.0187	0.0155	0.0951*
		(0.0116)	(0.0153)	(0.0416)
Observations	94,445	575,769	189,431	95,347

Notes: Discontinuity in the share living alone (only adult in the household, in percent) at the state pension age by group of the predicted difference in annual state pension income as single and as part of a couple, estimated in one regression with group-specific intercepts, slopes and discontinuities, a bandwidth of two years and birth-month fixed effects. Cohorts 1950-1953. Groups are based on deciles of annuity and instalment pension wealth at age 64: above the statutory gap (the senior citizen check applies, annuity wealth decile 1), around the statutory gap of 38,600 DKK (deciles 2-7), the taper range (deciles 8-9) and a small remaining gap (decile 10). Base level: predicted share just below the cutoff for individuals born in June. Relative change: discontinuity divided by the base level. Semi-elasticity: relative change per 1,000 DKK/year of mean gap. Elasticity: relative change divided by the log of the mean income ratio. 2015 DKK. Standard errors clustered at the individual level, by the delta method for derived statistics treating group means as fixed. Observations are person-years. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 9: Response by pension treatment intensity (as defined via pension wealth decile)

than at the state pension age, and moderate changes in wealth that are shared equally at divorce have been found not to affect the risk of divorce (Cesarini et al., 2023; Hankins and Hoekstra, 2011). Therefore, we argue that the state pension age affects relationship choices through its effect on changing the cost of living alone by paying higher pensions to individuals living alone.

Registered and actual cohabitation The legal definition of who counts as a couple is strict: two adults living together are to be treated like a couple as soon as they share financial commitments or housework, even when there is no romantic relationship. It is therefore not possible to call a relationship a flatshare, and all outcome measures are based on changes in address. The administrative data contain the address individuals are registered at, and therefore we cannot fully rule out that any individual spends time at a different address with a partner they do not declare in the state pension application.

For the fiscal implication of the response in such-defined relationship choices, it does not matter whether the partners cut all contact or not. But to understand to what extent this affects individuals' living situation both in terms of true changes in the cost of consumption and in terms of who they spend time with, it matters whether the change is genuine, or whether couples agree to merely register at separate addresses and claim the higher state pension whilst continuing to live together.

There are a few reasons why we think this is the exception. First, the rate of divorce rises by 0.08 percentage points at the state pension age, compared with 0.12 percentage points for separations (Table 1), even though divorce at this age is associated with significant costs. It requires the division of property, two principle rulings of the National Social Appeals Board have denied the single rate to divorced couples that maintained joint ownership or shared financial commitments (Social- og Boligministeriet, 2023; Social- og Boligministeriet, 2024). And it increases the tax on inheritance from the 0% rate that applies to spouses to 36.25% above the tax-free amount. Even unmarried couples, who have been registered together for at least two years, benefit from a reduced inheritance rate of 15%. Furthermore, only couples can make medical decisions for one another in old age. Second, the estimated likelihood of

	Baseline	Quadratic	Donut	Individual FE	Logit	Probit	5-year bandwidth
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Discontinuity (pp)	0.124***	0.072**	0.157***	0.121***	0.136***	0.135***	0.063***
	(0.020)	(0.028)	(0.023)	(0.020)	(0.023)	(0.022)	(0.011)
Relative (%)	17.5	9.9	23.0		19.3	19.1	9.3
Observations	3,744,312	3,744,312	3,281,899	3,731,194	3,744,312	3,744,312	9,153,586

Notes: Discontinuity in the annual separation rate (in percentage points) at the state pension age, cohorts 1940-1953, estimated from equation (1) with birth-month fixed effects. Column (1): linear specification with a bandwidth of two years (Table 1, column 1). Column (2): quadratic specification. Column (3): excluding observations within three months of the 65th birthday. Column (4): individual fixed effects. Columns (5)-(6): logit and probit models; the discontinuity is the implied change in the predicted separation rate at the cutoff for individuals born in June, with standard errors by the delta method. Column (7): bandwidth of five years. Separation: end of cohabitation with a married or unmarried partner, excluding widowhood. Relative effect: discontinuity divided by the predicted rate just below the cutoff for individuals born in June. Standard errors clustered at the individual level in parentheses. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 10: Robustness of RDD coefficients

people living at unregistered addresses is assumed to be low, with low rates of tax fraud in Denmark (Kleven et al., 2011) and low case statistics on pension fraud (*Socialt bedrageri i Danmark - Omfangm adfærd og holdninger* 2011). Finally, for new relationships, it is likely that the character or quality of the relationship is affected by the choice between being a living-apart-together couple with separate addresses or sharing a home.

Robustness to statistical choices Table 10 shows how the estimate of the discontinuity in the rate of separations at the state pension age varies with the specification. Specifically, we estimate a significant increase in the separation rate using a two- or five-year bandwidth and a linear or quadratic trend in age. For the two-year bandwidth, we also test robustness to excluding the observations in the three months before and after the 65th birthday. We observe individuals at the end of every calendar year. If any individuals separate in response to the policy just before their 65th birthday, in order to receive the single pension from the start, this would attenuate the baseline and the coefficient estimate in the donut design should be larger. Similarly, if the treatment effect accumulates over time after the 65th birthday, the baseline would also be smaller than the full treatment effect and we would expect the donut design, which excludes observations at for example 65 years and 1 month of age, to find a larger effect. As column (3) shows, the coefficient estimate is slightly larger than the baseline (0.157 against 0.124). In column (4) we add individual fixed effects, to

control for composition changes, but this makes almost no difference since our sample is close to balanced. Since our outcome is binary, we use logit and probit specifications as alternatives and this again yields estimates similar to the baseline linear probability model. Overall, the smaller estimates in the quadratic specification or wider bandwidth are consistent with the response being concentrated in the year of the 65th birthday, similar to what is seen for divorce, for which we know the exact date of the event (Figure B.1).

4 Life-cycle model

We have shown that when policymakers reduce consumption inequality by compensating singles for their higher price of consumption units, they need to trade this off against the behavioural response in cohabitation decisions. However, paying more to singles will have an additional behavioural effect, singles may respond by retiring earlier. Therefore, evaluating the policy requires weighing the marginal benefit of increasing the state pension for singles, which is a reduction in consumption inequality, against the total marginal fiscal externality. The total cost is therefore the cost arising from the increased share of singles, the earlier retirement of singles and any possible interaction term. This interaction term arises, because the value of leisure in retirement depends on how and with whom it is spent. Couples value joint leisure time and coordinate the timing of entry into retirement (García-Miralles and Leganza, 2024; Gustman and Steinmeier, 2000; Hurd, 1990). So, while the income effect on the retirement of singles is positive, the increase in the share of singles could imply that those marginal singles now retire earlier as their leisure becomes less valuable. Conversely, it is also possible, that the value of leisure is greater when alone and the interaction term of the two marginal costs is positive.

Whereas we have estimated the size of the first fiscal externality above, the interaction term cannot be identified without the help of a structural model. In order to understand the fiscal implications and evaluate counterfactual policies, we therefore develop a limited-commitment life-cycle model. Crucially, this model allows for both endogenous retirement

and divorce decisions.

As a brief overview, individuals enter the model in late working life, either as singles or as couples with a fixed age gap. In every period, they decide how much to save and consume and if they are a couple also whether to get a divorce. Divorce is therefore final and singlehood an absorbing state. Once they reach the early retirement age, they can decide whether to permanently retire, based on whether they qualify for the early retirement scheme, their labour income and accumulated assets and pension wealth. Each partner can retire independently, but couples receive an additional joint leisure bonus (or cost) when mutually retired. From the state pension age, everyone receives the state pension and annuity income from occupational pensions, no matter whether they have retired or are still working. Death occurs stochastically and assets are inherited by widow(er)s and divided between divorcees. To follow Danish law, pension wealth is treated as separate property throughout the life cycle. This model is very similar to the model we develop in Mennerich and Olesen (2026).

4.1 Model description

Timing, model entry and exit Women ($i = w$) enter the model at age 53 and men ($i = m$) at age 55. They can enter the model as singles or couples and in the first period there is an equal number of singles of each gender. Time is discrete and at the beginning of each period, each individual survives with a gender- and age-specific survival probability. The within-period timing of shocks and decisions is shown in Figure 4. The model ends at age 86 for women and 88 for men with certainty.[13] At the death of a spouse, surviving partners keep all of the household assets A_t and inherit 30% of their partner's remaining pension wealth.[14]

[13]Expected life tables predict 13% of women of these cohorts to still be alive at age 86 and 7% of men at age 88. Calculations based on: https://www.statbank.dk/20015 (Life table (5 years tables) by life table, sex, age and time).

[14]Since we do not keep track of the evolution of pension wealth in retirement, the surviving spouse inherits 30% of the expected future income stream of the occupational pension of their spouse. This declines with age, since expected remaining years of life and therefore expected future income stream of an annuity decline with age.

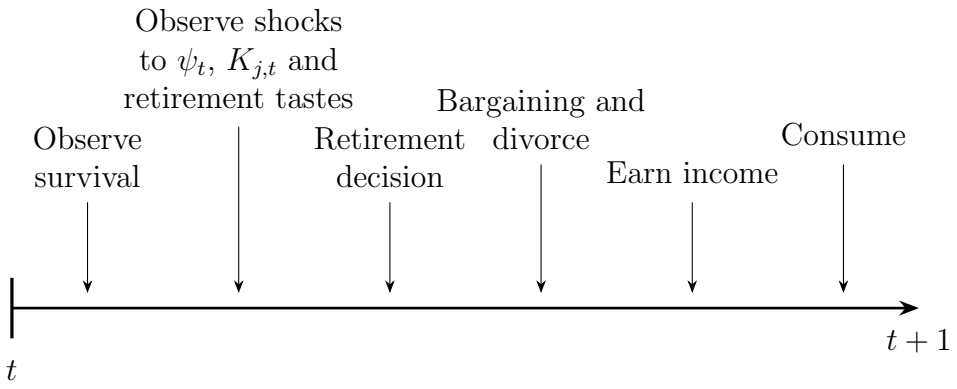


Figure 4: Within-period timeline

Preferences and economies of scale

$$u_j(c_{j,t}, l_{j,t}, n) = \frac{\breve{c}_{j,t}^{1-\rho_j}}{1-\rho_j} - \delta_j^l l_{j,t} + \mathbb{1}[l_{w,t} = 0 \cap l_{m,t} = 0]\ \kappa \tag{5}$$

$$\breve{c}_{j,t} = \frac{c_{i,t}}{e_n} \tag{6}$$

In every period, individuals receive utility from equivalised consumption and leisure. Labour supply is binary, it is normalised to 1 when working and 0 when retired. Individuals receive utility from their own leisure and if they are married, they receive an additional utility κ from joint leisure time in retirement, where κ can be positive or negative. Economies of scale e_n, determine the conversion rate between market-bought consumption and equivalised units. $n = M, S$ denotes whether the household consists of a single adult or married couple, we normalise $e_S = 1$ and use OECD equivalence scales to determine e_M. Therefore, couples benefit from economies of scale in consumption.

Income, budget constraint and savings When working, individuals earn labour income $I_{i,t}$ before taxes and net of pension contributions.

$$\log I_{j,t} = \sum_q \phi_{q,g,t}\ \mathbb{1}[K_{j,t} = q] \tag{7}$$

Labour income is a function of an underlying earnings capacity, for simplicity called human capital $K_{j,t}$ (eq. 7). We let $K_{j,t}$ to take one of a five values, such that the parameters ϕ indicate labour income per income quintile q, gender g and age. As in Foerster, 2025, there are persistent shocks to human capital. At the beginning of each period, surviving individuals draw a new human capital level according to a transition matrix Π such that:

$$K_{j,t+1} = \begin{cases} 1 & \text{with prob. } \pi_{g,t}^{K_{j,t},1} \\ 2 & \text{with prob. } \pi_{g,t}^{K_{j,t},2} \\ etc. & \end{cases} \tag{8}$$

The income process for men and women therefore differs in the value of income per income quintile and age $\phi_{q,g,t}$ and income risk parameters $\pi_{g,t}$.

$$A_t = R\ A_{t-1} + (1-\tau)(Inc_{w,t} + Inc_{m,t}) - c_{w,t} - c_{m,t} \tag{9}$$

$$P_{w,t} = R_{pension}\ P_{w,t-1} + \gamma_t\ I_{w,t-1} \tag{10}$$

$$P_{m,t} = R_{pension}\ P_{m,t-1} + \gamma_t\ I_{m,t-1} \tag{11}$$

From gross labour income, workers pay income tax at rate τ, save and consume. Equation (9) describes the evolution of assets at the household level for couples and we impose a non-negativity constraint on assets $A_t \geq 0$. For singles, the income and consumption term collapse to a single value for each.

In every period of work, individuals additionally contribute share γ of labour income $I_{j,t}$ to individually-held pension wealth $P_{j,t}$, such that equation (10) describes the evolution of pension wealth of the woman up until retirement. To reiterate, because Danish law stipulates that wealth with the exception of pension wealth is joint property, there is only one budget

constraint for non-pension wealth but two separate laws of motion for pension wealth for a married couple in working life.

$$
\begin{aligned}
Inc_{j,t} = {} & \mathbb{1}[r = W]\ I_{j,t} \\
& + \mathbb{1}[t \geq 65]\ sp_{j,t} \\
& + \mathbb{1}[r = R]\ \left(\ \mathbb{1}[60 \leq t < 65\ \cap\ E_j = 1]\ \text{efterløn} + \mathbb{1}[t \geq 65]\ pp_{j,t}\ \right)
\end{aligned}
\tag{12}
$$

Taxation is independent of the source of income, such that the budget constraint (9) remains the same throughout the life cycle. However, different sources of individual pre-tax income $Inc_{i,t}$ are available in work and retirement, such that pre-tax income is constituted by the sum of income from work, state pension income and different sources of retirement income. Denote $r = (W, R)$ as an indicator of whether an individual is working (W) or retired (R), then equation (12) summarises total individual pre-tax income. From the state pension age, individuals receive a state pension independently of whether they are retired or still working. This is a function of household type $n = M, S$ and is means-tested against household income. Details of the state pension formula are described in Appendix F.1. There are two sources of income, that an individual receives only when retired. Firstly, in early retirement, i.e. between ages 60 and 64, retirees receive a fixed annual income from the early retirement scheme (efterløn), but only if they are eligible ($E_i = 1$). We abstract from the choice of making contributions to the early retirement scheme, as well as the actual contributions, and let eligibility depend on randomly drawn initial conditions. We also abstract from the treatment of occupational pensions in early retirement and instead allow the withdrawal of pension wealth only from age 65. At the minimum of age 65 or the age of entry into retirement, pension wealth is converted into an annuity, such that $pp_i = q\ P_{i,t}$. This is in line with the Danish context and we adapt the law of motion for nominal pension wealth in retirement to be $P_{i,t} = P_{i,t-1}$, such that this state variable should no longer be interpreted as an actual account balance.

The problem of the single In retirement, the state space of the single is $\mathcal{S}_{j,t} = \{P_{j,t-1}, A_{j,t-1}, E_j\}$ and in each period, after observing survival and forecasting over future survival risk ($s_{j,t+1}$), the single choses consumption in order to maximise the value:

$$V_{j,t}^R(\mathcal{S}_{j,t}) = \max_{c_j} u_j(c_j) + s_{j,t+1}\beta\mathbb{E}_t\left[V_{j,t+1}^R(\mathcal{S}_{j,t+1})\right] \tag{13}$$

A working single before the earliest possible age of retirement also observes survival, as well as a shock to human capital every period. They similarly chose consumption according to equation (14), where their state space consists of human capital, assets and pension wealth $\mathcal{S}_{j,t} = \{K_{j,t}, P_{j,t-1}, A_{j,t-1}, E_j\}$. Due to low probabilities of remarriage at high ages, we abstract from repartnering and treat singlehood as absorbing.

$$V_{j,t}^W(\mathcal{S}_{j,t}) = \max_{c_j} u_j(c_j, l_j) + s_{j,t+1}\beta\mathbb{E}_t\left[V_{j,t+1}^W(\mathcal{S}_{j,t+1})\right] \tag{14}$$

The problem of the couple Married couples solve the limited-commitment problem of Mazzocco (2007) and Voena (2015b). Conditional on mutual survival, retirement status and no divorce, they maximise utility by optimally choosing consumption of each spouse $c_{w,t}, c_{m,t}$ to maximise the weighted sum of their individual values, where the weight μ_t on the wife's value depends on her bargaining power. We normalise the sum of weights to one, such that the weight on the husband's value is $1 - \mu_t$ and $0 \leq \mu_t \leq 1$. In every period, couples additionally receive utility from match quality ψ_t. Match quality evolves as a random walk with a a possible age trend in the variance of the innovation. Details on the match quality process are described in Appendix F.2. The state space of the working couple therefore consists of $\mathcal{S}_t = \{\psi_t, K_{w,t}, K_{m,t}, P_{w,t-1}, P_{m,t-1}, A_{t-1}, E_w, E_m\}$ and the wife's last period bargaining power μ_{t-1}.

In the following, we first describe the problem of the couple when both partners are

below the early retirement age, such that both partners are working by necessity and we can suppress superscript WW for ease of notation. The problem of the retired couple is described in Appendix F.3. At the beginning of each period, survival of both spouses, shocks to match quality and both partners human capital are observed.[15] Conditional on not divorcing, the couple choses optimal consumption $\tilde{c}_{w,t}, \tilde{c}_{m,t}$ that maximises the surplus from marriage given the previous period's bargaining weight (eq. 15).

$$\begin{aligned} \tilde{c}_{w,t}, \tilde{c}_{m,t} = \underset{c_{w,t}, c_{m,t}}{\arg\max} \; & \mu_t \left(u_w(\tilde{c}_{w,t}, l_{w,t}) + \beta \mathbf{EV}_{w,t+1}(\mathcal{S}_{t+1}, \mu_{t-1}) \right) \\ & + (1-\mu_t) \left(u_m(\tilde{c}_{m,t}, l_{m,t}) + \beta \mathbf{EV}_{m,t+1}(\mathcal{S}_{t+1}, \mu_{t-1}) \right) \\ & s.t. \text{ borrowing constraint} \end{aligned} \tag{15}$$

We use $\mathbf{EV}_{w,t+1}(\mathcal{S}_{t+1}, \mu_{t-1})$ as an abbreviation for the future expected value, which encompasses the expected value of entering next period as a married spouse or widow based on the probability of survival of each spouse. The full description is in Appendix F.3. The optimal consumption choices under no divorce are then used to verify whether the participation constraint is satisfied for each partner. $\tilde{c}_{w,t}, \tilde{c}_{m,t}$ and no divorce $D_t = 0$, constitute the actual solution to the problem of the couple if the resulting values are larger than each person's outside option as denoted in the participation constraints (16, 17).

$$u_w(\tilde{c}_{w,t}, l_{w,t}) + \psi_t + \beta \mathbf{EV}_{w,t+1}(\mathcal{S}_{t+1}, \mu_{t-1}) \geq V^{S,W}_{w,t}(\mathcal{S}_{w,t}) \tag{16}$$

$$u_m(\tilde{c}_{m,t}, l_{m,t}) + \psi_t + \beta \mathbf{EV}_{m,t+1}(\mathcal{S}_{t+1}, \mu_{t-1}) \geq V^{S,W}_{m,t}(\mathcal{S}^D_{m,t}) \tag{17}$$

If one of these is violated, for example the woman's, the weight μ_t is updated from it's last value until that person's within marriage utility is now high enough to make them

[15] A working couple with at least one partner eligible for retirement further observes a retirement taste shock.

indifferent between marriage and divorce. If at the point of indifference the other partner's, in this case the husband's participation constraint (17) is still satisfied, the resulting solution is the optimum of the couple. If it is impossible to find bargaining weight μ_t^* that makes both partners weakly prefer to stay in the marriage, the couple chooses to divorce ($D_t = 1$) and transition to singles. For the comparison of the value of continued marriage and divorce, spouses take into account that their post-divorce assets would be half of household assets $A_{j,t}(\mathcal{S}_{w,t}^D) = \frac{1}{2}A_t(\mathcal{S}_t)$.

The retirement decision From the early retirement age onwards, individuals additionally draw an i.i.d. retirement taste shock at the beginning of each period and must decide whether to permanently transition from working life to retirement.[16] Singles chose their retirement based on the value of being in either state (14, 13) as well as the taste shock. For the couple the decision is more complex, since partner's can retire individually or jointly and any retirement decision might lead to subsequent divorce. The retirement decision is made before the divorce decision and bargaining take place, but after observing all shocks including the match quality innovation. For a mutually working couple in which both spouses are eligible for retirement, there are four options: both working (denoted WW), only the woman working (WR), only the man working (RW) and both retired (RR). For each of these options, a specific taste shock is drawn from a Type-1 extreme value distribution (19), such that the choice probabilities are multinomial logit. There is one inherent difference in the retirement problem of spouses compared to that of singles. Couples in which both partners are retired receive utility bonus or cost κ in every period (Equation 5).

$$V_t(\mathcal{S}_t) = \max \ (V_t^{WW} + \epsilon^{WW},\ V_t^{WR} + \epsilon^{WR},\ V_t^{RW} + \epsilon^{RW},\ V_t^{RR} + \epsilon^{RR}) \tag{18}$$

$$\epsilon^{r_w, r_m} \sim EV1 \tag{19}$$

[16]The purpose of the taste shock is to smooth out value functions. Since retirement is a discrete decision, if future retirement is known deterministically, it can create kinks in the decision problem and value functions in earlier periods. In order to smooth these out to make the solution stable, we make future retirement probabilistic.

Equation 18 describes the value of starting as a couple in which all retirement options are available. Since retirement for either partner is only available when that partner is above the early retirement age and retirement is permanent, the choice set is often smaller.

4.2 Solving the model

We solve the model by backward induction using the endogenous grid method (Carroll, 2006). The EGM requires inversion of marginal utility in order to recover current consumption from marginal utility. In our case, when we allow for gender differences in the CRRA parameter the marginal utility of the couple is not analytically invertible. We therefore use the iEGM method of Hallengreen et al. (2024), such that we precompute marginal utility on a grid of potential consumption values and interpolate the resulting inverse mapping from marginal utility to consumption.[17] For the combination of the continuous consumption choice and discrete retirement and divorce decisions we follow Iskhakov et al. (2017). Conditional on each combination of retirement choices, we solve the consumption problem under continued marriage and divorce and determine the optimal divorce decision by comparing the associated values. We then construct the upper envelope over retirement choices, accounting for the optimal divorce and consumption choices they would imply.

We solve the model over the grids of discrete state variables K_w, K_m, E_w, E_m and use linear interpolation over grids for the continuous state variables $\psi, \mu, A, A_w, A_m, P_w, P_m$. In terms of expectations, survival risk is integrated analytically and since retirement taste shocks are EV1, the expectation over the draw of the retirement taste shock has a closed-form log-sum solution. Human capital follows a Markov process, so that expectations are sums over the known transition matrix. Since match quality innovations are continuous, we compute its expectation using Gauss-Hermite quadrature.

Since retirement is absorbing and there is no remarriage, we first solve the problem of the retired single. We can then use the value of retired singles as outside options for the

[17] For consistency across specifications, we also use the iEGM method when restricting the CRRA parameters to be equal across genders, although in this case marginal utility can be inverted analytically.

retired couple, such that we can compute the value of mutually retired couples. We then solve the problem of the working single, again using the value of the retired single as an input for the retirement decision. For the couple, we then solve the problem of couples in which one partner is retired, for which we need the dual-retired couple, working single and retired single as outside options. Lastly, we can solve the problem for the mutually working couple, in which either partner could transition to retirement.

4.3 Estimation

We estimate the model on the longitudinal sample of Danish women born 1944-1950 and Danish men born 1942-1948. Since our model does not accurately reflect disability insurance, we discard all individuals who ever receive disability insurance as well as their spouses. The estimation proceeds in two steps: In the first step, we take some parameters from the literature or estimate them externally. This includes the wage process. In the second step we estimate the remaining parameters, those governing retirement decisions and the match quality process jointly using the method of simulated moments.

4.3.1 Externally set and calibrated parameters

Table 11 lists all values we take from external sources or estimate externally in a first step. These include the CRRA parameter, equivalence scales, survival probabilities and the wage process. All parameters determined by the institutional context are presented in Table F.1. For the wage process, we define the values of human capital to be income quintiles and estimate parameters $\phi_{q,g,t}$ based on average labour income per gender-income quintile. For the ages above the early retirement age, we extrapolate from the age-trend of income at younger ages in order to account for selection into retirement. The transition matrix K is then estimated from the empirical likelihood of switching income quintile by gender and age, although it is very stable in age. For computational reasons, we set all elements to zero if the likelihood drops below 4%.

We initialise pairs of one man at age 55 and one woman at age 53 as either a married couple or two singles. We randomly assign singles an income quintile based on the marginal distribution of single men and women, for couples we draw initial income quintiles from the joint distribution to allow for assortative matching. We draw initial pension wealth and assets based on the distribution within each income quintile by gender before aggregating non-pension wealth for couples.

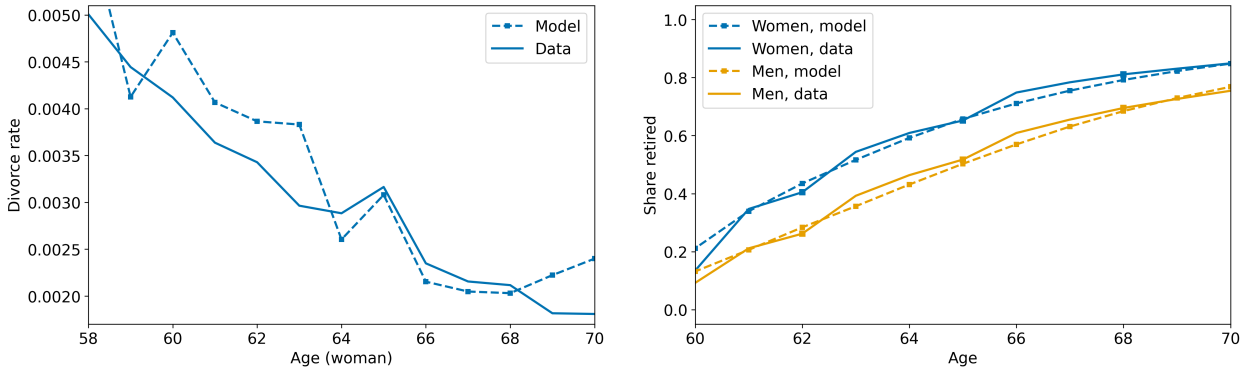
Table 11: Pre-set parameters

Parameter	**Symbol**	**Source**	**Value**
CRRA, women	ρ_w	Attanasio and Weber (1995)	2
CRRA, men	ρ_m	Attanasio and Weber (1995)	2
Annual discount factor	β	Attanasio and Weber (1995)	0.98
Equivalence scale, couple	e^M	DST	0.75
Equivalence scale, single	e^S	DST	1.0
Gross return on liquid assets	R	—	1.02
Gross return on pension wealth	$R_{pension}$	—	1.02
Average tax rate		Foerster (2025)	0.47
Survival probabilities	$s_{w,t}, s_{m,t}$	DST	—

We take survival probabilities from the statistical life tables of the 1946 birth cohort from Statistics Denmark.

4.3.2 Method of Simulated Moments

The remaining parameters are estimated using the method of simulated moments (SMM). These are the utility weight on leisure for each gender, the variance of the retirement taste shock, the joint retirement bonus, and the initial level and the slope of the standard deviation of match quality innovations. We collect them in the vector $\theta = (\delta_w^L, \delta_m^L, \sigma_{ret}, \kappa, a, b)$. Our targeted moments are the share retired at ages 62, 65 and 68 by gender, the elasticity of retirement with respect to pension wealth, three moments of the coordination of retirement within couples, and the share ever divorced at each age from 56 to 84. We do not target divorce rates, so the age profile of the divorce rate, including the spike at the state pension



(a) Divorce rate

(b) Retirement

Figure 5: Model fit retirement and divorce

age, is untargeted.[18]

Computationally, we first estimate the same set of moments in our simulated data for 150 starting points of potential parameter vectors θ_0 randomly selected by Sobol sequencing. We compute the value of the objective function $F = (m(\theta_0) - \hat{m})'\hat{W}(m(\theta_0) - \hat{m})$ based on a weighting matrix $\hat{W}$ that has the inverse of the squared estimation errors of the moments in the data as its diagonal elements. We check whether the five best starting points are similar, to ensure that we will converge to the global optimum. We then minimise the objective function using the Nelder-Mead algorithm (SMM). For each iteration, we simulate the model on 100,000 men and women that are either two singles or one couple in the first period.

4.4 Model fit

The model fits the retirement profiles of men and women very well. This is because we allow different weights on the utility for leisure by gender, model the early retirement scheme in detail and estimate the model on data that excludes disability insurance recipients and their partners as a path into retirement that the model would not capture. As shown in Table 12, since we allow the couples to receive additional utility κ for joint leisure in retirement, we

[18]We observe the share ever divorced until age 70. Beyond that age, we extrapolate it from predicted divorce rates and use the prediction error for these moments.

can also match the coordination of spouses retirement timing well. Similarly, the elasticity of retirement with respect to pension wealth, that we take from Andersen et al. (2026), is well matched giving us confidence in the model matching retirement decisions well.

We target the share ever divorced and not the divorce rate, so the age profile of the divorce rate is untargeted. The model fits the share ever divorced closely until age 70 (Table 12) and reproduces the rise in divorce at the state pension age (Figure 5a). It over-predicts divorce at high ages, partly because there are no bequest motives in the model. Note that the pattern of the divorce rate in the model is affected by the assumption of fixed two-year age gaps. For example, for all married women in the model, they are 63 when their spouses enter the period of state pension eligibility. In the data, this would be spread out across different ages of the woman due to heterogeneity in age gaps.

Importantly, the model can qualitatively reproduce the untargeted pattern of divorce at age 65. Table F.2 reproduces the regressions of our empirical analysis (Section 3.2) on the simulated data. At a two-year bandwidth, the divorce rate rises by 0.09 percentage points at the state pension age, compared with 0.08 in the data. In the model, this rise occurs at the wife's state pension age. As in the data, where the response is concentrated among those with low pension wealth, the spike in divorce at the state pension age is largest for lower-income couples, who also have a higher divorce rate around that age (Figure F.1).

4.5 Implications of the estimated model

The model can be used for two purposes. Firstly, we can use the baseline calibration to investigate mechanisms we cannot observe in the data. Secondly, we can use the estimated model to simulate behaviour under counterfactual policies, to confirm that the spike in divorce at the state pension age disappears when equalising pensions for singles and couples and to evaluate these policies with respect to their fiscal and welfare implications.

Parameter			Estimate
Estimated parameters			
δ_w^L			0.095
δ_m^L			0.064
σ_{ret}			0.300
κ			0.185
a			1.005
b			−0.368
Moments	Data	Model	Difference
Share retired			
Women, age 62	0.40	0.44	0.04
Women, age 65	0.65	0.66	0.01
Women, age 68	0.81	0.79	−0.02
Men, age 62	0.26	0.28	0.02
Men, age 65	0.52	0.50	−0.02
Men, age 68	0.70	0.68	−0.02
Share ever divorced			
Age 57	0.018	0.019	0.001
Age 60	0.031	0.033	0.002
Age 63	0.040	0.044	0.004
Age 66	0.047	0.050	0.003
Age 69	0.052	0.055	0.003
Age 75†	0.059	0.071	0.012
Age 80†	0.062	0.094	0.032
Age 84†	0.064	0.121	0.057
Other retirement moments			
Pension elasticity	−0.30	−0.31	−0.01
Retire together	0.19	0.16	−0.03
Retire within 1 year	0.38	0.39	0.01
Retire within 3 years	0.66	0.71	0.05

Notes: All moments are targeted. The table shows a selection of the share ever divorced, which is targeted at every age from 56 to 84. †Data extrapolated from predicted divorce rates. Share ever divorced: model values among those married at model entry and alive at that age, as in the data. In the estimation, we use a somewhat different definition of this moment, which gives a similar fit up to age 70.

Table 12: Estimated parameters and model fit

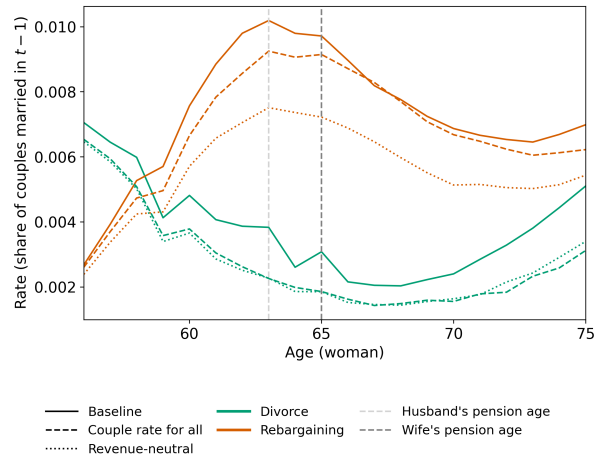
Effects of the state pension on divorce and intra-household allocation Figure 6a shows that the model can replicate the empirical pattern of divorce, and that divorce rates in and around retirement are lower when singles and couples receive the same state pension.[19] This confirms, that the financial incentive channel works in the expected direction and can generate the pattern observed in the data. The proportion of initially married individuals that are divorced by age 70 is 5.54% in the baseline, and would be 1.03 % pt. (18.7%) lower if everyone received the couple rate. Due to the fixed two year age gap in the model, there are four dates at which the institutional context changes for men and women, the early retirement age and state pension age of either partner.

We can use the model to understand how the state pension leads to a higher divorce rate and whether there are changes to bargaining power and behaviour of continuing couples. In the model, a change in the outside option can cause a participation constraint to become violated. In this case, the couple will update the bargaining weight in favour of the affected spouse, and divorce only when it is not possible to satisfy both participation constraints at once. As shown in Figure 6a, from around age 58 most violations of a participation constraint are resolved by rebargaining rather than divorce.

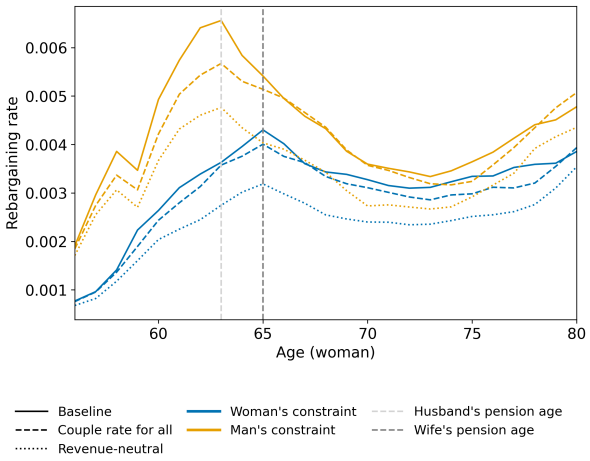
State pension eligibility does affect bargaining and similarly divorce through its effect on outside options. As either partner becomes eligible for the state pension, their outside option changes and, if the change is large enough to cause a violation in the participation constraint, the bargaining power is updated when it is possible to do so without violating the other partner's constraint. Figure 6b shows that updates in the husband's favour peak at his state pension age and updates in the wife's favour peak at hers. But the early retirement age also matters: there is a smaller peak in the frequency of bargaining power updates in the husband's favour at his early retirement age (the wife's age 58).

Figure 6c shows the resulting age-profile of average bargaining power, and Figure 6d shows the evolution of bargaining power by relative income in the first period. We initialise all couples with equal bargaining power, but within the first periods, these get updated in favour

[19] In the counterfactuals, the supplement is means-tested on individual rather than household income.



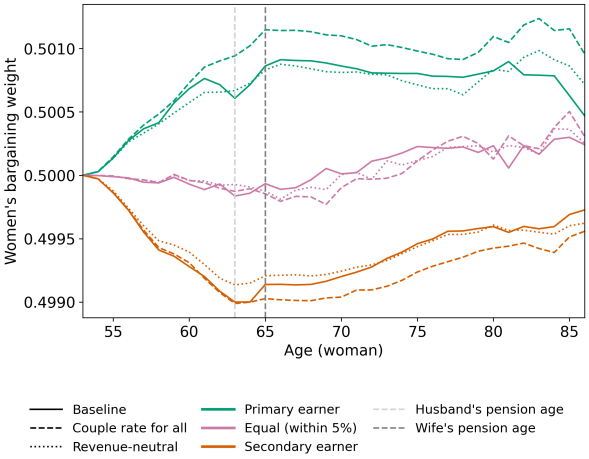
(a) Divorce and rebargaining rate



(b) Bargaining update by gender



(c) Average bargaining power of couples



(d) Bargaining power by relative income in t=1

Figure 6: Bargaining and divorce

of the primary earner. The spouse with higher labour income and correspondingly pension wealth, has a better outside option and can therefore capture more of the consumption of the couple. Women's average bargaining power falls slightly until the husband's state pension age and recovers at the wife's. The bargaining power of couples with equal incomes barely moves.

Effect of the state pension on consumption and labour supply inequality Table 13 gives an overview of behaviour under the counterfactuals. Married individuals retire much earlier than singles, due to differences in income and wealth at the start of the model and the utility of joint leisure. Under the counterfactual scenarios, in which couple and single rates are equalised, this difference is larger than in the status quo. Thus, paying higher rates to singles reduces the relationship-status gap in retirement ages.

For consumption, paying higher pensions to singles similarly reduces the inequality in old-age consumption by relationship status. However, overall inequality also depends on the within-group inequality and the share of couples and singles. Therefore, we find that the revenue-neutral equalisation of pensions marginally reduces overall consumption inequality at age 70. There are fewer singles under this scenario and the within-group inequality among couples falls.

Value of joint retirement Our model implies that couples value joint leisure, such that they will coordinate their retirement timing in order to spend more time together. This confirms the results of Casanova (2010) and Gustman and Steinmeier (2000). Since their specifications of utility from joint leisure are different, the estimates cannot be directly compared.

In the model, the value of joint leisure, in combination with women being the younger spouse, may exacerbate gender differences in retirement ages. As shown in Table 13, single women retire 1.0 year earlier than single men, compared with a gap of 1.6 years among those who start married.

	Status quo (1)	Couple rate for all (2)	Revenue-neutral equalisation (3)
Panel A: Retirement age			
Men, started married	65.43	65.73	65.27
Men, started single	68.79	70.20	69.55
Women, started married	63.83	64.18	63.78
Women, started single	67.79	69.36	68.60
Gap, started married minus started single	−3.65	−4.82	−4.54
Panel B: Relationship status			
Divorced by 70 (% of initially married)	5.54	4.51	4.40
Single at 70 (%)	48.13	47.45	47.39
Panel C: Assets at age 60 (1,000 DKK)			
Couples	1,599.8	1,637.9	1,579.1
Single women	826.1	863.9	847.3
Single men	706.0	737.6	724.1
Panel D: Equivalised consumption at age 70 (1,000 DKK)			
Married men	216.6	217.1	222.6
Single men	211.8	204.9	206.5
Married women	212.2	214.0	219.1
Single women	206.4	199.4	200.4
Gini coefficient	0.185	0.190	0.184
10th percentile relative to mean	0.586	0.563	0.592

Notes: Simulated outcomes under the status quo, a counterfactual in which everyone receives the couple rate of the state pension, and a revenue-neutral equalisation of the single and couple rates. In both counterfactuals, the supplement is means-tested on individual income. Marital status is defined at model entry. Retirement ages are conditional on retiring; the gap pools men and women. Divorced by 70 and single at 70 are conditional on being alive at 70. Consumption is equivalised (divided by 0.75 in couples); inequality measures pool men and women alive at age 70. Ages of couples and single women refer to the woman's age; those of single men to the man's age. 2015 DKK.

Table 13: Behaviour under the status quo and equal pension schedules for all

5 Fiscal and welfare implications of relationship-status-dependence of the state pension

We can compare the baseline policies to alternatives under the aspects of individual welfare and public finances.

5.1 Distributional effects of pension equalisation

As shown in Table 13, the status quo reduces consumption inequality in old age between married and single individuals compared to the counterfactual with equal pensions. It similarly reduces the pre-existing difference in retirement ages by marital status. Due to negative selection and no gains from joint leisure time, single retire much later than married individuals when pensions are equal.

5.2 Fiscal implications

Paying higher pensions to singles has a fiscal cost compared to everyone receiving the lower couple rate. In Table 14, we decompose this cost into mechanical and behavioural effects. Mechanically, higher state pension payments raise expenditure. Since all income is taxed equally, the increase in state pension payments implies an increase in tax revenue. The overall mechanical effect is a net cost to the government. Behaviourally, higher pensions for singles increase divorce, so that more individuals receive the single rate, and lead individuals to retire earlier. Both channels further increase pension expenditure, and earlier retirement also decreases tax revenue as it reduces lifetime labour income.

	Status quo	Status quo relative to couple rate for all		
	(level)	Total	Mechanical	Behavioural
	(1)	(2)	(3)	(4)
Pension expenditure	1,571.3	193.6	161.4	32.1
Tax revenue	2,561.0	36.4	75.9	−39.5
Net cost to the government		157.2	85.5	71.7
Share of net cost (%)		100.0	54.4	45.6

Notes: Column (1): present value of lifetime pension expenditure and tax revenue per individual in the status quo. Columns (2)-(4): difference between the status quo and a counterfactual in which everyone receives the couple rate of the state pension; positive values are higher expenditure, higher revenue or a higher net cost under the status quo. Mechanical: change holding behaviour fixed; behavioural: remainder due to changes in divorce, retirement and saving. Pension expenditure includes the state pension and early retirement benefits (efterløn). Tax revenue is levied on labour income, private pensions, early retirement benefits and the state pension. Present values discounted at $R = 1.02$ to the first model period, in 1,000 DKK (2015) per simulated individual, including periods after death with zero revenue and expenditure.

Table 14: Mechanical and behavioural fiscal effects

5.3 Risk, insurance and equivalent variation

For fixed households, generous guarantee pensions provide large welfare gains since they act as insurance against income risk over the working life and returns to assets, at the cost of incentives to work after the qualifying age (O'Dea, 2018). In our context, we ignore the risk to asset returns but there are two additional risks that guarantee pensions insure. Firstly, the risk of drawing a bad shock to match quality and experiencing divorce, with the division of assets, shared income and economies of scale is mediated by a pension safety net. And secondly, the same insurance also reduces the risk to consumption from the death of a spouse.

Figure 7 shows event studies of equivalised consumption around marital shocks for women. Women experience large falls in equivalised consumption at divorce, due to the loss of economies of scale and income pooling. But if the state pension is higher for singles, that drop is smaller compared to when it is the same for singles and couples. Interestingly, the policy only affects the consumption drop at divorce for retired women. In working life, women do not receive the higher state pension to cushion the impact, and as Figure 7 shows,

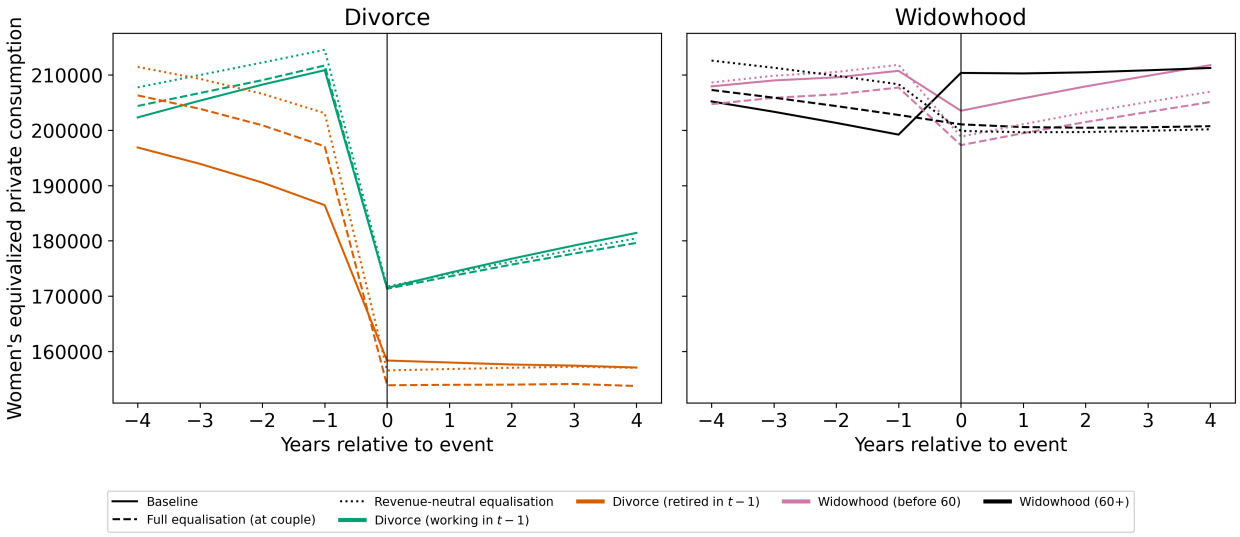


Figure 7: Consumption around divorce and death of a spouse

the design of the state pension does not meaningfully affect the consumption-saving trade-off for working women who experience divorce. The state pension therefore insures consumption against divorce for the more severe risk. In retirement, there is no self-insurance through labour supply, such that risk to current consumption is larger. The pattern is similar for widowhood. Since surviving spouses inherit the full non-pension wealth and part of their spouse's remaining pension wealth, they experience a consumption increase in the baseline. When their spouse dies, they can increase own consumption due to higher state pension income as a widow and since they can draw down the remaining joint assets. But without the insurance of the baseline state pension, they still see a drop in consumption. Younger widows are more severely affected by the loss of their spouse as the joint assets are not enough to balance out reduced household income over a long time. Even for them, the consumption drop is somewhat smaller under the baseline.

To understand the full welfare effect based on ex ante risk, we compute equivalent variation by gender and income for those starting the model as married. All individuals that are single in the first period weakly prefer the status quo to the revenue-neutral counterfactual by their expected difference in lifetime income, since we do not allow for repartnering in the model. As Table 15 shows, 39.8% of married individuals ex ante favour the system with higher rates for singles, because they value the insurance against divorce and widowhood

	All (1)	Women (2)	Men (3)
Panel A: Mean equivalent variation (1,000 DKK)			
All	7.4	−6.2	21.0
Low income		−18.8	1.5
Middle income		−10.1	16.1
High income		5.4	35.6
Panel B: Distribution			
Share worse off under equalisation (%)	39.8	62.1	17.4
10th percentile (1,000 DKK)	−24.8		
Median (1,000 DKK)	6.4		
90th percentile (1,000 DKK)	41.5		

Notes: Equivalent variation of a revenue-neutral equalisation of the single and couple rates of the state pension for individuals who start the model married, evaluated at model entry before any shocks are realised: the one-time change in assets under the status quo that would make an individual as well off as under the equalisation. Positive values mean that the individual is better off under the equalisation. Those starting single are not included. Income groups are terciles of wage income at model entry within gender. 2015 DKK.

Table 15: Equivalent variation of a revenue-neutral equalisation

more than the higher rate for their present marital status. Willingness to pay for equal pension varies with gender, due to gender differences in life expectancy and likelihood of being widowed. It also varies with income, due to the means-testing in the state pension. Women are on average worse off under the equalisation, and 62.1% of them prefer the status quo, compared with 17.4% of men. Preferences furthermore correlate with initial match quality, which predicts future divorce risk. In the first period, 62% of those in the lowest match quality tercile prefer the status quo, compared with 17% in the highest.

6 Conclusion

In social insurance design, policymakers often set different rates by marital or relationship status to take account of the fact that couples can make use of economies of scale in consumption. In this paper, we show that the differences in income by relationship status can affect individuals' relationship choices. Exploiting rich administrative data and universal eligibility for a state pension, we have shown that the separation risk increases in response to eligibility. This is true both for unmarried and married couples. The divorce risk even increases for couples that have been married for more than 20 years.

Research on relationship outcomes in response to social insurance design often faces the challenge that benefit receipt or changes to benefit rates often induce or correlate with changes in the amount of time couples spend together. We can show that the separation risk increases even for those who are already retired and we can show suggestive evidence that the results even hold for dual-retired couples.

Given the universal eligibility for the programme we study, we can analyse the magnitude of the response not just in terms of flows, but also in the stock of singles in a cohort, as that cohort crosses the state pension age. We find that the share of singles increases by 2.3% in response to a 50,000 DKK (about 7,400 USD) difference in annual income. In our setting, the majority of the response is driven by separations rather than fewer new partnerships. This could be because of the large marriage share of our population and because of low baseline

rates of entering new relationships. However, the cost of changing behaviour in order to avoid a reduction in benefits is also much larger than in the context of survivor benefits. Whereas in our context the relationship status is determined by sharing a household, or living together, survivor benefits usually get withdrawn at remarriage only (Baker et al., 2004; Brien et al., 2004; Salisbury, 2017).

This project also sheds further light on the behaviour of older couples. First and foremost, we show that older couples separate in response to financial incentives. But we also show that while couples coordinate their retirement so as to spend more leisure time together, couples with higher divorce risk do so to a smaller extent.

We also provide evidence on the benefits of relationship-status dependence in pension design. Paying higher pensions to singles meaningfully reduces inequality in retirement consumption and age at retirement compared with everyone receiving the lower couple rate of the state pension. This is because singles have higher costs of living, which may be the primary motivation for paying them more. But this is also because singles are negatively selected. If both the likelihood of marriage and the likelihood of divorce in working life are affected by income shocks over the life cycle, then the pension-differentiation provides some insurance against the marital consequences of income risk.

Dynamically speaking, the higher rates apply to any married individual should they ever experience divorce or widowhood in the future. And individuals value this insurance. 40% of married individuals ex ante prefer the status quo with a higher rate for singles to the revenue-neutral counterfactual that would equalise the pensions for all at an intermediate level. This is because they are forward looking and because the policy provides divorce insurance and life insurance.

References

Alm, J., & Whittington, L. A. (2003). Shacking Up or Shelling Out: Income Taxes, Marriage, and Cohabitation. *Review of Economics of the Household*, *1*(3), 169–186.

Amilon, A., & Larsen, M. (2023). Increasing retirement ages in Denmark: Do changes in gender, education, employment status and health matter? *European Journal of Ageing*, *20*(1), 24.

Andersen, T. M., Borgbjerg, A. K., & Maibom, J. (2026). *Pension Wealth and the Timing of Retirement* (Working Paper No. 12386). CESifo Working Paper.

Attanasio, O. P., & Weber, G. (1995). Is Consumption Growth Consistent with Intertemporal Optimization? Evidence from the Consumer Expenditure Survey [Publisher: University of Chicago Press]. *Journal of Political Economy*, *103*(6), 1121–1157. Retrieved July 8, 2025, from https://www.jstor.org/stable/2138706

Baker, M., Kantarevic, J., & Hanna, E. (2004). The Married Widow: Marriage Penalties Matter! *Journal of the European Economic Association*, *2*(4), 634–664.

Bitler, M. P., Gelbach, J. B., Hoynes, H. W., & Zavodny, M. (2004). The impact of welfare reform on marriage and divorce. *Demography*, *41*(2), 213–236.

Blau, D. M., & Riphahn, R. T. (1999). Labor force transitions of older married couples in Germany. *Labour Economics*, *6*(2), 229–252.

Borella, M., De Nardi, M., & Yang, F. (2023). Are Marriage-Related Taxes and Social Security Benefits Holding Back Female Labour Supply? *The Review of Economic Studies*, *90*(1), 102–131.

Brien, M. J., Dickert-Conlin, S., & Weaver, D. A. (2004). Widows Waiting to Wed? (Re)Marriage and Economic Incentives in Social Security Widow Benefits. *The Journal of Human Resources*, *39*(3), 585–623.

Brien, M. J., Lillard, L. A., & Stern, S. (2006). Cohabitation, Marriage, and Divorce in a Model of Match Quality. *International Economic Review*, *47*(2), 451–494.

Bronson, M. A., Haanwinckel, D., & Mazzocco, M. (2025). Taxation and Household Decisions: An Intertemporal Analysis.

Browning, M., Chiappori, P.-A., & Lewbel, A. (2013). Estimating Consumption Economies of Scale, Adult Equivalence Scales, and Household Bargaining Power. *The Review of Economic Studies*, *80*(4), 1267–1303.

Bruze, G., Svarer, M., & Weiss, Y. (2015). The Dynamics of Marriage and Divorce [Publisher: [The University of Chicago Press, Society of Labor Economists, NORC at the University of Chicago]]. *Journal of Labor Economics*, *33*(1), 123–170.

Carroll, C. D. (2006). The method of endogenous gridpoints for solving dynamic stochastic optimization problems. *Economics Letters*, *91*(3), 312–320.

Casanova, M. (2010). *Happy Together: A Structural Model of Couples' Joint Retirement Choices* (tech. rep.). mimeo.

Cesarini, D., Lindqvist, E., Östling, R., & Terskaya, A. (2023). Fortunate Families? The Effects of Wealth on Marriage and Fertility.

Chang, M., & Ko, A. (2023). Marital Transitions, Housing, and Long-Term Care in Old Age.

Choukhmane, T., Goodman, L., & O'Dea, C. (2025). Efficiency in Household Decision-Making: Evidence from the Retirement Savings of US Couples. *American Economic Review*, *115*(5), 1485–1519.

Costa-Ramón, A., Schaede, U., Slotwinski, M., & Brenoe, A. A. (2024). (Not) Thinking About the Future: Inattention and Maternal Labor Supply.

De Nardi, M., French, E., Jones, J. B., & McGee, R. (2025). Why Do Couples and Singles Save during Retirement? Household Heterogeneity and Its Aggregate Implications. *Journal of Political Economy*, *133*(3), 750–792.

Einav, L., & Finkelstein, A. (2026). Elderly Health and Longevity in the US: Evidence and Implications.

Fitzpatrick, M. D., & Moore, T. J. (2018). The mortality effects of retirement: Evidence from Social Security eligibility at age 62. *Journal of Public Economics*, *157*, 121–137.

Foerster, H. (2025). Untying the Knot: How Child Support and Alimony Affect Couples' Dynamic Decisions and Welfare. *Review of Economic Studies*, *92*(5), 3029–3066.

Foerster, H., Obermeier, T., & Schulz, B. (2024). Job Displacement, Remarriage, and Marital Sorting. *SSRN Electronic Journal*.

Francesconi, M., Rainer, H., & Van Der Klaauw, W. (2009). The Effects of In-Work Benefit Reform in Britain on Couples: Theory and Evidence. *The Economic Journal*, *119*(535), F66–F100.

García-Miralles, E., & Leganza, J. M. (2024). Joint retirement of couples: Evidence from discontinuities in Denmark. *Journal of Public Economics*, *230*, 105036.

Gayle, G.-L., & Shephard, A. (2019). Optimal Taxation, Marriage, Home Production, and Family Labor Supply. *Econometrica*, *87*(1), 291–326.

Golosov, M., & Krasikov, I. (2025). The Optimal Taxation of Couples. *The Quarterly Journal of Economics*, *140*(3), 2163–2211.

Groneck, M., & Wallenius, J. (2021). It Sucks to Be Single! Marital Status and Redistribution of Social Security. *The Economic Journal*, *131*(633), 327–371.

Gustman, A. L., & Steinmeier, T. L. (2000). Retirement in Dual-Career Families: A Structural Model [Publisher: The University of Chicago Press]. *Journal of Labor Economics*, *18*(3), 503–545.

Gustman, A. L., & Steinmeier, T. L. (2004). Personal Accounts and Family Retirement [Issue: 10305 Series: Working Paper Series Type: Working Paper _eprint: 10305].

Hallengreen, A., Jørgensen, T. H., & Olesen, A. M. (2024). Fast Solution of Dynamic Intra-Household Bargaining Models.

Hankins, S., & Hoekstra, M. (2011). Lucky in Life, Unlucky in Love?: The Effect of Random Income Shocks on Marriage and Divorce. *Journal of Human Resources*, *46*(2), 403–426.

Hurd, M. D. (1990). The Joint Retirement Decision of Husbands and Wives. In *Issues in the Economics of Aging* (pp. 231–258). University of Chicago Press.

Iskhakov, F., Jørgensen, T. H., Rust, J., & Schjerning, B. (2017). The endogenous grid method for discrete-continuous dynamic choice models with (or without) taste shocks. *Quantitative Economics*, *8*(2), 317–365.

Johannesen, N., Sæverud, J., & Saez, E. (2026). Taxing the Wealth of the Poor:Evidence from the Danish Old-Age Support Asset Test. *American Economic Review: Insights*, *8*(2), 247–264.

Johnsen, J. V., Vaage, K., & Willén, A. (2022). Interactions in Public Policies: Spousal Responses and Program Spillovers of Welfare Reforms. *The Economic Journal*, *132*(642), 834–864.

Jørgensen, T. H. (2014). Leisure Complementarities in Retirement.

Kleven, H. J., Knudsen, M. B., Kreiner, C. T., Pedersen, S., & Saez, E. (2011). Unwilling or Unable to Cheat? Evidence From a Tax Audit Experiment in Denmark. *Econometrica*, *79*(3), 651–692.

Kleven, H. J., Kreiner, C. T., & Saez, E. (2009). The Optimal Income Taxation of Couples. *Econometrica*, *77*(2), 537–560.

Kuhn, A., Staubli, S., Wuellrich, J.-P., & Zweimüller, J. (2020). Fatal attraction? Extended unemployment benefits, labor force exits, and mortality. *Journal of Public Economics*, *191*, 104087.

Low, H., Meghir, C., Pistaferri, L., & Voena, A. (2018). Marriage, Labor Supply and the Dynamics of the Social Safety Net [Issue: 24356 Series: Working Paper Series Type: Working Paper _eprint: 24356].

Lundberg, S., & Pollak, R. A. (1993). Separate spheres bargaining and the marriage market. *Journal of political Economy*, *101*(6), 988–1010.

Lundberg, S., Startz, R., & Stillman, S. (2003). The retirement-consumption puzzle: A marital bargaining approach. *Journal of Public Economics*, *87*(5), 1199–1218.

Mazzocco, M. (2007). Household Intertemporal Behaviour: A Collective Characterization and a Test of Commitment. *The Review of Economic Studies*, *74*(3), 857–895.

Mennerich, A., & Olesen, A. M. (2026). Gender Pension Gaps and their Implications for Late Divorce.

Michaud, P.-C., Van Soest, A., & Bissonnette, L. (2020). Understanding joint retirement. *Journal of Economic Behavior & Organization*, *173*, 386–401.

Michelmore, K. (2018). The earned income tax credit and union formation: The impact of expected spouse earnings. *Review of Economics of the Household*, *16*(2), 377–406.

Moffitt, R. A., Phelan, B. J., & Winkler, A. E. (2020). Welfare Rules, Incentives, and Family Structure. *The Journal of Human Resources*, *55*(1), 1–42.

Myohl, N. (2024). Till taxes keep us apart? The impact of the marriage tax on the marriage rate. *International Tax and Public Finance*, *31*(2), 552–592.

O'Dea, C. (2018). Insurance, Efficiency and the Design of Public Pensions.

Olivetti, C., & Rotz, D. E. (2016). Changes in Marriage and Divorce as Drivers of Employment and Retirement of Older Women [Publisher: National Bureau of Economic Research, Inc]. *NBER Working Papers*, (22738).

Persson, P. (2020). Social Insurance and the Marriage Market. *Journal of Political Economy*, *128*(1), 252–300.

Salisbury, L. (2017). Women's Income and Marriage Markets in the United States: Evidence from the Civil War Pension. *The Journal of Economic History*, *77*(1), 1–38.

Social- og Boligministeriet. (2006). Vejledning om behandlingen af pensionsrettigheder ved dødsfald, separation og skilsmisse\n(Lov nr. 483 og 484 af 7. juni 2006). Retrieved January 27, 2025, from https://www.retsinformation.dk/eli/retsinfo/2006/10088

Social- og Boligministeriet. (2023). Ankestyrelsens principmeddelelse 28-23 om folkepension - førtidspension - gifte - reelt enlig - samlevende.

Social- og Boligministeriet. (2024). Ankestyrelsens principmeddelelse 5-24 om formodningsregel - pension - samlevende - reel enlig - fælles husførelse - pensionistens fordele.

Socialt bedrageri i Danmark - Omfangm adfærd og holdninger (tech. rep.). (2011).

Stancanelli, E. (2014). *Divorcing Upon Retirement: A Regression Discontinuity Study* (tech. rep.). IZA - Institute of Labor Economics.

Udbetaling Danmark. (2026). State Pension.

Voena, A. (2015a). Yours, Mine, and Ours: Do Divorce Laws Affect the Intertemporal Behavior of Married Couples? *American Economic Review*, *105*(8), 2295–2332.

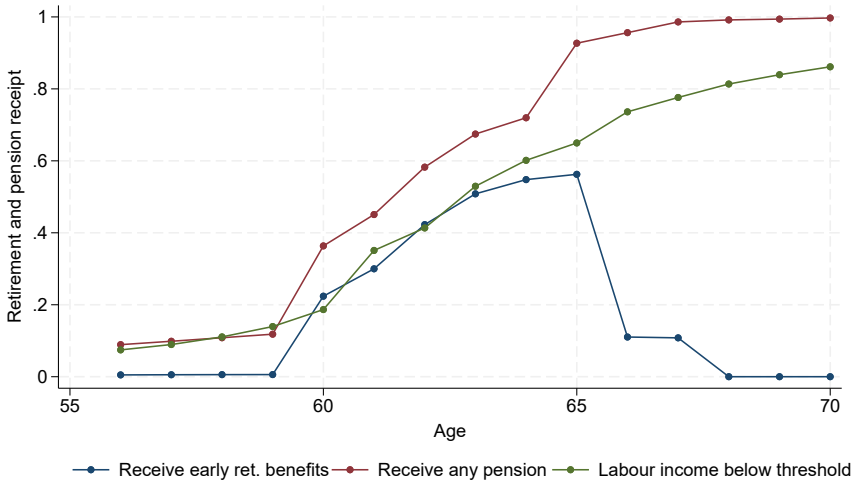
Voena, A. (2015b). Yours, mine, and ours: Do divorce laws affect the intertemporal behavior of married couples? *American Economic Review*, *105*(8), 2295–2332.

Wolfers, J. (2006). Did unilateral divorce laws raise divorce rates? A reconciliation and new results. *American economic review*, *96*(5), 1802–1820.

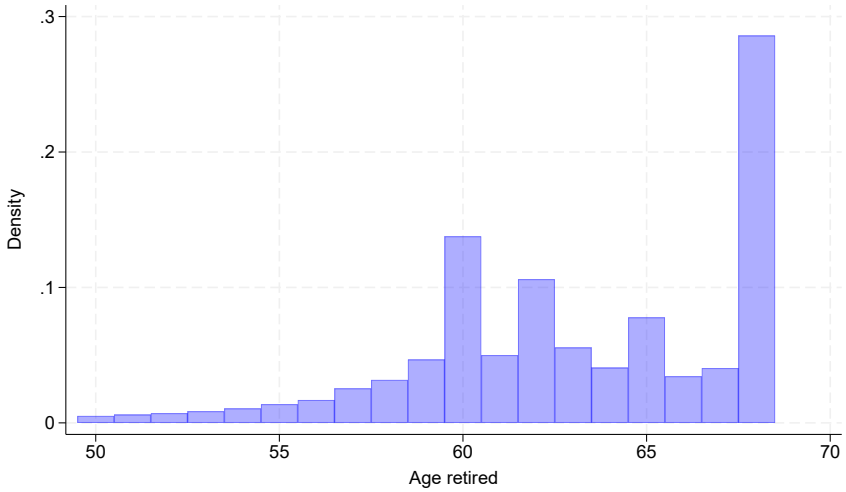
ONLINE APPENDIX:

Pension Design and Household Composition

A Summary statistics



(a) Retirement based on labour supply and pension income (Cohorts 1940-1950)



(b) Histogram of retirement age (with share still working at 68) (Cohorts 1940-1953)

Figure A.1: Retirement and pension receipt

	Age 56		Age 64	
	Mean	SD	Mean	SD
Pension saving (%)				
Contributes to early retirement scheme[a]	64	48	2	15
Contributes to employer-administered pension:				
lifelong annuity	47	50	24	42
instalment pension	19	39	12	33
lump-sum pension	27	44	4	20
Contributes to privately administered pension:				
lifelong annuity	5	22	3	17
instalment pension	13	34	13	34
lump-sum pension	21	41	10	30
Has pension wealth[b] employer-administered			75	43
privately administered			54	50
instalment pension			61	49
capital pension			35	48
Observations	1,011,432		941,779	

Notes: Individuals born 1940-1953, observed at ages 56 and 64. All values in percent.

[a] Observed for 823,536 (age 56) individuals.

[b] Pension wealth is observed from 2014 only, so these shares refer to the 1950-1953 cohorts at age 64 (263,307 individuals). All individuals hold some lifelong annuity wealth (ATP).

Table A.1: Pension contributions and wealth (main sample)

	Age 56		Age 64	
	Mean	SD	Mean	SD
Panel A: Income (1,000 DKK per year)				
Total personal income	339.8	199.0	288.5	184.0
Labour income	278.7	217.6	123.2	210.4
Public pensions incl. early retirement benefits	23.4	55.2	105.2	83.6
of which state and disability pension	19.3	50.8	26.3	61.0
Occupational and private pensions	3.6	25.6	15.4	48.0
incl. civil service pensions and ATP	6.4	34.9	36.1	78.8
Retired (%)[a]	6	24	53	50
Panel B: Relationship status (%)				
Single (lives without other adults)[b]	19.4	39.6	24.4	43.0
Single (no partner ID)	24.6	43.1	27.8	44.8
Married	70.8	45.5	68.5	46.5
Widow	3.89	19.34	7.58	26.47
Panel C: Relationship transitions in the current year (%)				
Separation (excl. widowhood)	1.16	10.69	0.69	8.30
Divorce	0.51	7.10	0.30	5.50
New cohabitation (from one- to two-adult household)	1.21	10.93	0.76	8.66
New cohabitation (new partner ID)	1.10	10.43	0.61	7.81
Panel D: Ever in the future (%)				
Single (lives without other adults)	38.5	48.7	34.9	47.7
Single (no partner ID)	43.5	49.6	40.0	49.0
Separation (excl. widowhood)	10.7	31.0	5.3	22.5
Divorce	4.7	21.1	1.9	13.7
Widow	15.6	36.3	15.9	36.6
New cohabitation (from one- to two-adult household)	9.9	29.9	4.0	19.5
New cohabitation (new partner ID)	8.9	28.5	3.5	18.4
Observations	1,011,432		941,779	

Notes: Individuals born 1940-1953, observed at ages 56 and 64. Incomes in 2015 DKK. Panel D: share experiencing the event at any later age observed (until sample exit or 2020). Single (no partner): no partner under the Statistics Denmark definition of cohabiting couples. Separation: end of cohabitation with a married or unmarried partner, conditional on both partners remaining in the sample.

[a] Labour income permanently below 67,500 DKK. Observed for 877,098 (age 56) and 827,172 (age 64) individuals.

[b] Observed for 995,716 (age 56) and 934,910 (age 64) individuals.

Table A.2: Summary statistics (main sample)

	Control cohorts		Treated cohorts	
	Mean	SD	Mean	SD
Panel A: Income (1,000 DKK per year)				
Total personal income	232.9	163.0	263.6	176.9
Labour income	70.2	162.8	91.1	186.8
Public pensions incl. early retirement benefits	109.7	69.0	112.8	77.6
of which state and disability pension	31.8	59.2	25.9	57.5
Occupational and private pensions	12.8	45.9	14.8	49.2
incl. civil service pensions and ATP	31.5	75.2	35.6	80.1
Retired (%)[a]	53	50	57	50
Panel B: Relationship status (%)				
Single (lives without other adults)[b]	23.8	42.6	24.0	42.7
Single (no partner ID)	27.7	44.8	27.4	44.6
Married	69.5	46.1	69.8	45.9
Widow	11.61	32.03	9.36	29.13
Panel C: Relationship transitions in the current year (%)				
Separation (excl. widowhood)	0.58	7.59	0.64	7.99
Divorce	0.18	4.25	0.24	4.91
New cohabitation (from one- to two-adult household)	0.69	8.25	0.69	8.25
New cohabitation (new partner ID)	0.57	7.54	0.60	7.74
Observations	227,823		265,309	

Notes: Individuals observed at age 64. Control cohorts: born January 1935 to June 1939, state pension age 67. Treated cohorts: born July 1939 to December 1943, state pension age 65. Incomes in 2015 DKK. Variable definitions as in Table A.2.

[a] Labour income permanently below 67,500 DKK. Observed for 147,737 (control) and 210,373 (treated) individuals.

[b] Observed for 225,100 (control) and 262,957 (treated) individuals.

Table A.3: Summary statistics for differences-in-differences (treatment and control group)

B Empirical analysis

B.1 Heterogeneity and robustness for relationship status transitions

	Separations			Divorce		
	(1)	(2)	(3)	(4)	(5)	(6)
	h(1)	h(2)	h(5)	h(1)	h(2)	h(5)
Over 65=1	0.0495*	0.106***	0.0619***	0.0346*	0.0609***	0.0314***
	(0.0250)	(0.0175)	(0.0109)	(0.0167)	(0.0116)	(0.00726)
Age	0.0545+	-0.0179+	-0.0419***	0.0141	-0.0107	-0.0189***
	(0.0300)	(0.0106)	(0.00274)	(0.0201)	(0.00708)	(0.00185)
Over 65=1 × Age	-0.112**	-0.0989***	-0.00726+	-0.0395	-0.0573***	-0.0126***
	(0.0429)	(0.0148)	(0.00379)	(0.0286)	(0.00986)	(0.00251)
Constant	0.720***	0.690***	0.666***	0.311***	0.299***	0.292***
	(0.0171)	(0.0121)	(0.00770)	(0.0114)	(0.00803)	(0.00515)
Observations	1874303	3744312	9153586	1874303	3744312	9153586
Relative effect	0.069+	0.153***	0.093***	0.111*	0.204***	0.108***
	(0.036)	(0.027)	(0.017)	(0.056)	(0.043)	(0.026)

Standard errors in parentheses

Age centred at 65.

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.1: RDD: Varying bandwidth for separations and divorce (Full sample)

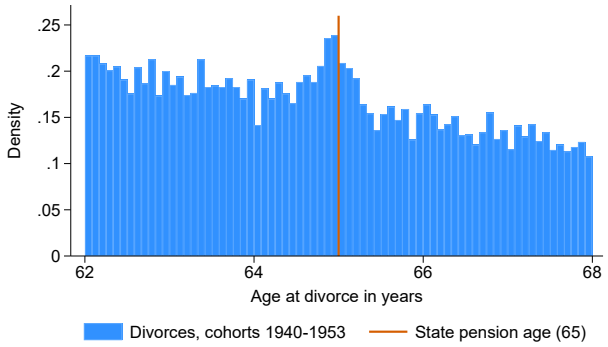


Figure B.1: Distribution of divorces at ages 62-68

		Retired by 62		Both partners retired by 62	
	Balanced	Early retirement benefits	Labour income	Early retirement benefits	Labour income
	(1)	(2)	(3)	(4)	(5)
Discontinuity at 65	0.100***	0.106***	0.127***	0.067	0.068^{+}
	(0.018)	(0.032)	(0.032)	(0.046)	(0.036)
Relative effect (%)	15.4***	17.1**	20.0***	15.6	38.4
	(2.9)	(5.6)	(5.5)	(11.6)	(23.6)
Base level	0.652	0.618	0.634	0.431	0.178
Observations	3,565,954	1,011,728	1,095,256	349,392	273,052

Notes: Discontinuity in the annual separation rate (in percentage points) at the state pension age, estimated from equation (1) with a linear specification and a bandwidth of two years. Separation: end of cohabitation with a married or unmarried partner, excluding widowhood. All columns use the balanced sample (observed continuously between ages 55 and 67). Retired by 62, early retirement benefits: receives early retirement benefits (efterløn) by age 62. Retired by 62, labour income: labour income below 67,500 DKK (2015) from age 62. Both partners retired by 62: the individual and the partner both satisfy the respective definition. Base level: predicted rate just below the cutoff. Relative effect: discontinuity divided by the base level, in percent. Standard errors clustered at the individual level in parentheses; standard errors of relative effects by the delta method. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table B.2: RDD: Separations conditional on own and partner's retirement

	Quintile of personal income at age 58				
	1 (lowest)	2	3	4	5 (highest)
	(1)	(2)	(3)	(4)	(5)
Discontinuity at 65	0.112*	0.120**	0.109**	0.150***	0.106*
	(0.048)	(0.043)	(0.041)	(0.041)	(0.044)
Relative effect (%)	13.0*	17.6*	17.1*	26.5**	14.2*
	(5.9)	(6.9)	(7.1)	(8.4)	(6.3)
Base level	0.862	0.680	0.634	0.565	0.742
Observations	713,690	724,829	754,583	760,372	761,452

Notes: Discontinuity in the annual separation rate (in percentage points) at the state pension age by quintile of personal income at age 58, estimated from equation (1) separately for each quintile, with a linear specification, a bandwidth of two years and birth-month fixed effects. Cohorts 1940-1953. Separation: end of cohabitation with a married or unmarried partner, excluding widowhood. Base level: predicted rate just below the cutoff for individuals born in June (reference birth month). Relative effect: discontinuity divided by the base level, in percent. Standard errors clustered at the individual level in parentheses; standard errors of relative effects by the delta method. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table B.3: RDD: Separations by quintile of total personal (individual) income at age 58

	Men			Women		
	Discon-tinuity	Relative (%)	Base level	Discon-tinuity	Relative (%)	Base level
Panel A: Bandwidth 2 years						
Separation	0.122***	14.8***	0.823	0.125***	21.3***	0.588
	(0.030)	(3.9)		(0.025)	(4.8)	
One to two adults	−0.044	−5.7	0.785	−0.003	−0.4	0.705
	(0.028)	(3.5)		(0.027)	(3.8)	
Living alone	0.336***	1.6***	20.65	0.238***	0.8***	28.64
	(0.039)	(0.2)		(0.040)	(0.1)	
Panel B: Bandwidth 5 years						
One to two adults	−0.086***	−11.5***	0.750	−0.067***	−9.6***	0.697
	(0.016)	(2.0)		(0.015)	(2.1)	

Notes: Discontinuity at the state pension age by gender of the individual reaching it, estimated from equation (1) separately for men and women, with a linear specification and birth-month fixed effects. Cohorts 1940-1953. Separation and one to two adults: annual rates, in percent; living alone: share, in percent. Discontinuities in percentage points. Separation: end of cohabitation with a married or unmarried partner, excluding widowhood. One to two adults: transition from a one-adult to a two-adult household. Living alone: no other adults in the household. Base level: predicted value just below the cutoff for individuals born in June (reference birth month). Relative effect: discontinuity divided by the base level, in percent. Observations (men/women): 1,846,933/1,897,379 in Panel A (living alone: 1,798,914/1,854,218); 4,514,204/4,639,382 in Panel B. Standard errors clustered at the individual level in parentheses; standard errors of relative effects by the delta method. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table B.4: RDD: Changes to relationship transition rates and the share living alone by gender

	Bandwidth 2 years			Bandwidth 5 years		
	All	Balanced	Retired by 62	All	Balanced	Retired by 62
	(1)	(2)	(3)	(4)	(5)	(6)
Discontinuity at 65	0.011	0.013	0.017	-0.019^{+}	-0.023^{*}	0.033^{*}
	(0.018)	(0.018)	(0.029)	(0.010)	(0.010)	(0.017)
Relative effect (%)	1.8	2.1	3.5	-3.3^{*}	-4.0^{*}	7.8^{+}
	(2.9)	(3.0)	(5.9)	(1.7)	(1.7)	(4.1)
Base level	0.610	0.588	0.501	0.588	0.568	0.422
Observations	3,744,312	3,565,954	1,095,256	9,153,586	8,690,585	2,668,003

Notes: Discontinuity in the annual rate of entering a new partnership (in percentage points) at the state pension age, estimated from equation (1) with a linear specification and birth-month fixed effects. New partner ID: the individual has a partner under the Statistics Denmark definition of cohabiting couples who differs from the partner in the previous year, or had no partner in the previous year. Base level: predicted rate just below the cutoff for individuals born in June (reference birth month). Relative effect: discontinuity divided by the base level, in percent. Balanced sample: observed continuously between ages 55 and 67. Retired by 62: balanced sample, further restricted to individuals with labour income below 67,500 DKK (2015) from age 62. Standard errors clustered at the individual level in parentheses; standard errors of relative effects by the delta method. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table B.5: RDD: New relationships as measured via partner ID

B.2 Discontinuity in the share of singles in the population

	Bandwidth 2 years			Bandwidth 5 years		
	All	Balanced	Retired by 62	All	Balanced	Retired by 62
	(1)	(2)	(3)	(4)	(5)	(6)
Discontinuity at 65	0.285***	0.276***	0.362***	0.331***	0.476***	0.634***
	(0.028)	(0.027)	(0.048)	(0.024)	(0.023)	(0.041)
Relative effect (%)	1.2***	1.1***	1.5***	1.3***	2.0***	2.6***
	(0.1)	(0.1)	(0.2)	(0.1)	(0.1)	(0.2)
Base level (%)	24.70	24.04	24.32	24.65	23.96	24.31
Observations	3,653,132	3,480,638	1,070,933	8,646,873	8,203,413	2,524,427

Notes: Discontinuity in the share living alone (no other adults in the household, in percent) at the state pension age, in percentage points. Cohorts 1940-1953. Estimated from equation (1) with a linear specification and birth-month fixed effects. Base level: predicted share just below the cutoff for individuals born in June (reference birth month), in percent. Relative effect: discontinuity divided by the base level, in percent. Balanced sample: observed continuously between ages 55 and 67. Retired by 62: balanced sample, further restricted to individuals with labour income below 67,500 DKK (2015) from age 62. Standard errors clustered at the individual level in parentheses; standard errors of relative effects by the delta method. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table B.6: RDD: Single as defined by household size (1940 to 1953 birth cohorts)

	Living alone (1)	No partner ID (2)
Change in share single	0.344***	0.094**
	(0.042)	(0.034)
Contributions:		
Separations	0.100***	0.113***
	(0.017)	(0.019)
Widowhood	−0.014	−0.011
	(0.018)	(0.019)
Other departures from the household	0.214***	0.001
	(0.019)	(0.001)
Fewer new partnerships	0.045*	−0.009
	(0.021)	(0.017)
Level of share single	0.264***	0.041
	(0.028)	(0.024)
Observations	3,638,017	3,738,130

Notes: Discontinuity at the state pension age (in percentage points), estimated from equation (1) with a linear specification, a bandwidth of two years and birth-month fixed effects. The first row is the discontinuity in the annual change in the share single; the contributions add up to it. Separations: end of cohabitation with a partner (partner ID), excluding widowhood. Other departures from the household: other adults leaving the household that are not identified as a separation or widowhood. Fewer new partnerships: the negative of the discontinuity in the rate of moving from living alone to living with other adults (column 1) or of gaining a new partner ID (column 2), so that a positive value raises the share single. The sample requires household status in the current and the previous year; household status is missing for addresses with more than four registered adults. Standard errors clustered at the individual level in parentheses. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Living alone: no other adults in the household. No partner ID: no partner under the Statistics Denmark definition of cohabiting couples.

Table B.7: Decomposition of change in the share living alone

	Bandwidth 2 years			Bandwidth 5 years		
	All	Balanced	Retired by 62	All	Balanced	Retired by 62
	(1)	(2)	(3)	(4)	(5)	(6)
Discontinuity at 65	0.117**	0.132**	0.128	0.525***	0.462***	0.763***
	(0.044)	(0.045)	(0.082)	(0.044)	(0.044)	(0.080)
Relative effect (%)	0.4**	0.5**	0.4	1.8***	1.6***	2.5***
	(0.1)	(0.2)	(0.3)	(0.2)	(0.2)	(0.3)
Base level (%)	28.57	28.15	30.64	28.47	28.03	30.49
Observations	1,027,023	1,002,030	305,520	2,358,172	2,310,290	704,025

Notes: Discontinuity in the share without a partner ID (no partner under the Statistics Denmark definition of cohabiting couples, in percent) at the state pension age, in percentage points. Cohorts 1950-1953. Estimated from equation (1) with a linear specification and birth-month fixed effects. Base level: predicted share just below the cutoff for individuals born in June (reference birth month), in percent. Relative effect: discontinuity divided by the base level, in percent. Balanced sample: observed continuously between ages 55 and 67. Retired by 62: balanced sample, further restricted to individuals with labour income below 67,500 DKK (2015) from age 62. Standard errors clustered at the individual level in parentheses; standard errors of relative effects by the delta method. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table B.8: RDD: Single as defined per Statistics Denmark partner ID (1950 to 1953 birth cohorts)

B.3 Predictions of the income difference by relationship status

	Single women		Single men		Women in couples		Men in couples	
	(1)		(2)		(3)		(4)	
Panel A: Mean labour income, ages 55-59 (decile)								
Decile 2	−15.9***	(0.8)	−16.5***	(1.0)	−17.7***	(0.5)	−19.1***	(0.8)
Decile 3	−26.1***	(0.9)	−28.8***	(1.2)	−24.9***	(0.5)	−30.3***	(0.8)
Decile 4	−27.6***	(0.9)	−33.3***	(1.3)	−25.2***	(0.5)	−33.5***	(0.8)
Decile 5	−32.5***	(1.0)	−36.8***	(1.3)	−27.6***	(0.5)	−35.0***	(0.8)
Decile 6	−39.3***	(1.0)	−40.5***	(1.3)	−31.3***	(0.5)	−38.1***	(0.8)
Decile 7	−46.7***	(1.0)	−47.2***	(1.3)	−36.6***	(0.5)	−41.8***	(0.8)
Decile 8	−59.5***	(1.0)	−58.8***	(1.4)	−42.9***	(0.5)	−48.4***	(0.8)
Decile 9	−70.8***	(1.1)	−73.3***	(1.4)	−49.6***	(0.6)	−54.7***	(0.8)
Decile 10	−87.1***	(1.4)	−88.6***	(1.5)	−63.2***	(0.7)	−68.3***	(0.8)
Panel B: Annuity and instalment pension wealth at age 64 (decile)								
Decile 2	−7.3***	(0.9)	−7.6***	(1.1)	−3.8***	(0.5)	−1.0	(0.7)
Decile 3	−6.6***	(0.9)	−5.3***	(1.1)	−3.6***	(0.5)	0.4	(0.7)
Decile 4	−5.3***	(1.0)	−6.1***	(1.2)	−3.0***	(0.5)	−0.3	(0.7)
Decile 5	−4.5***	(1.0)	−5.0***	(1.3)	−1.6**	(0.5)	1.6*	(0.7)
Decile 6	−6.0***	(1.0)	−2.8*	(1.3)	−3.3***	(0.6)	2.5***	(0.7)
Decile 7	−9.1***	(1.1)	−8.4***	(1.4)	−6.7***	(0.6)	−1.7*	(0.7)
Decile 8	−13.0***	(1.1)	−17.4***	(1.5)	−7.8***	(0.6)	−5.8***	(0.7)
Decile 9	−20.7***	(1.1)	−24.7***	(1.5)	−11.7***	(0.6)	−9.9***	(0.8)
Decile 10	−35.8***	(1.2)	−38.2***	(1.5)	−16.3***	(0.6)	−14.9***	(0.7)
Panel C: Other non-housing wealth at age 64 (decile)								
Decile 2	5.9***	(0.9)	4.0***	(1.1)	5.1***	(0.5)	2.2***	(0.6)
Decile 3	4.3***	(1.0)	0.3	(1.1)	2.4***	(0.5)	−1.5*	(0.6)
Decile 4	3.0**	(1.0)	0.0	(1.2)	0.3	(0.5)	−2.4***	(0.6)
Decile 5	1.3	(1.0)	−1.1	(1.2)	−1.4**	(0.5)	−2.7***	(0.6)
Decile 6	−2.9**	(1.0)	−5.5***	(1.3)	−2.5***	(0.5)	−2.4***	(0.6)
Decile 7	−4.5***	(1.0)	−4.2**	(1.3)	−1.8***	(0.5)	−2.4***	(0.6)
Decile 8	−4.1***	(1.0)	−5.3***	(1.3)	−2.0***	(0.5)	−1.3*	(0.6)
Decile 9	−4.8***	(1.0)	−5.2***	(1.2)	−3.2***	(0.5)	−1.5*	(0.6)
Decile 10	−11.7***	(1.0)	−11.0***	(1.2)	−7.2***	(0.5)	−4.4***	(0.6)
Constant	177.6***	(0.9)	181.4***	(1.1)	129.8***	(0.5)	129.9***	(0.8)
Observations	29,402		21,640		67,718		71,146	
R^2	0.41		0.42		0.29		0.27	
RMSE	36.8		40.9		28.1		34.5	

Notes: OLS regressions of state pension income at age 66, by relationship status and gender, used to predict income as single and in a couple (Section 3.4). Coefficients, standard errors, constant and RMSE in 1,000 DKK (2015). Reference categories: first decile of each characteristic and the year 2016. All regressions include year fixed effects. Standard errors in parentheses, to the right of each coefficient. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table B.9: First stage: state pension income at age 66 by relationship status and gender

	Single women		Single men		Women in couples		Men in couples	
	(1)		(2)		(3)		(4)	
Panel A: Mean labour income, ages 55-59 (decile)								
Decile 2	−9.5***	(2.3)	−10.5***	(3.1)	−7.9***	(2.0)	−2.6	(4.2)
Decile 3	−16.9***	(2.6)	−6.7+	(3.7)	−10.2***	(1.9)	14.6***	(4.3)
Decile 4	−9.8***	(2.6)	0.5	(4.1)	0.5	(1.9)	23.2***	(4.5)
Decile 5	2.4	(2.7)	17.1***	(4.2)	15.5***	(2.0)	27.9***	(4.4)
Decile 6	18.0***	(2.8)	27.8***	(4.2)	36.7***	(2.1)	44.5***	(4.2)
Decile 7	34.8***	(2.8)	38.5***	(4.2)	58.5***	(2.1)	62.6***	(4.2)
Decile 8	66.9***	(2.8)	63.4***	(4.3)	93.9***	(2.1)	94.4***	(4.2)
Decile 9	99.8***	(3.1)	110.6***	(4.3)	134.8***	(2.3)	129.9***	(4.1)
Decile 10	216.4***	(4.0)	218.6***	(4.6)	267.7***	(2.8)	272.6***	(4.2)
Panel B: Annuity and instalment pension wealth at age 64 (decile)								
Decile 2	13.8***	(2.5)	7.0*	(3.5)	25.0***	(2.0)	21.5***	(3.9)
Decile 3	9.2***	(2.6)	3.3	(3.6)	14.9***	(2.0)	12.1**	(3.9)
Decile 4	6.2*	(2.7)	0.0	(3.8)	8.5***	(2.0)	2.4	(3.9)
Decile 5	11.4***	(2.8)	3.0	(3.9)	8.1***	(2.1)	−2.7	(3.9)
Decile 6	16.5***	(3.0)	1.1	(4.0)	15.2***	(2.2)	−6.3	(3.9)
Decile 7	27.1***	(3.1)	18.1***	(4.3)	27.4***	(2.3)	15.0***	(3.9)
Decile 8	38.5***	(3.0)	35.2***	(4.6)	35.1***	(2.2)	29.5***	(4.0)
Decile 9	58.2***	(3.0)	60.6***	(4.8)	61.2***	(2.2)	60.7***	(4.1)
Decile 10	143.6***	(3.4)	165.1***	(4.8)	134.8***	(2.5)	185.4***	(4.0)
Panel C: Other non-housing wealth at age 64 (decile)								
Decile 2	3.7	(2.6)	4.8	(3.3)	3.3+	(2.0)	−3.4	(3.3)
Decile 3	11.9***	(2.7)	12.8***	(3.5)	10.6***	(1.9)	3.5	(3.2)
Decile 4	10.6***	(2.8)	14.8***	(3.7)	8.5***	(1.9)	4.1	(3.2)
Decile 5	10.8***	(2.9)	10.6**	(3.8)	4.9*	(1.9)	2.1	(3.2)
Decile 6	5.0+	(3.0)	9.9*	(4.0)	5.9**	(1.9)	−3.6	(3.2)
Decile 7	10.9***	(3.0)	8.3*	(4.0)	2.4	(1.9)	−0.7	(3.2)
Decile 8	12.6***	(3.0)	10.4**	(4.0)	7.5***	(1.9)	−5.7+	(3.2)
Decile 9	17.9***	(2.9)	19.2***	(3.9)	15.2***	(1.9)	3.1	(3.2)
Decile 10	72.1***	(2.9)	68.8***	(3.8)	64.7***	(2.1)	76.5***	(3.2)
Constant	229.5***	(2.6)	223.6***	(3.4)	155.0***	(2.0)	178.9***	(4.2)
Observations	29,402		21,640		67,718		71,146	
R^2	0.37		0.40		0.39		0.38	
RMSE	105.3		127.7		111.0		185.9	

Notes: OLS regressions of total personal income at age 66, by relationship status and gender, used to predict income as single and in a couple (Section 3.4). Coefficients, standard errors, constant and RMSE in 1,000 DKK (2015). Reference categories: first decile of each characteristic and the year 2016. All regressions include year fixed effects. Standard errors in parentheses, to the right of each coefficient. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table B.10: First-stage: total personal income at age 66 by relationship status and gender

C Elasticity of the share living alone with respect to pension wealth by group

	Tercile 1 (lowest) (1)	Tercile 2 (2)	Tercile 3 (highest) (3)
Panel A: Incentive			
Mean gap (1,000 DKK/year)	43.3	40.1	22.9
Mean income ratio, single/couple	1.26	1.25	1.12
Panel B: Response of the share living alone			
Base level (%)	31.65	23.65	19.95
Discontinuity at 65 (pp)	0.753***	0.526*	0.165
	(0.222)	(0.211)	(0.205)
Relative change (%)	2.38***	2.22*	0.83
	(0.71)	(0.90)	(1.03)
Per 1,000 DKK/year (pp)	0.0174***	0.0131*	0.0072
	(0.0051)	(0.0053)	(0.0089)
Semi-elasticity (%)	0.055***	0.055*	0.036
	(0.016)	(0.022)	(0.045)
Elasticity w.r.t. income ratio	0.106***	0.103*	0.075
	(0.032)	(0.042)	(0.094)
Panel C: Response per 1,000 DKK/year relative to column (1)			
Difference (pp)		0.0043	0.0102
		(0.0088)	(0.0119)
Observations	319,012	319,665	316,315

Notes: Discontinuity in the share living alone (only adult in the household, in percent) at the state pension age by tercile of annuity and instalment pension wealth at age 64, estimated in one regression with tercile-specific intercepts, slopes and discontinuities, a bandwidth of two years and birth-month fixed effects. Cohorts 1950-1953. Mean gap: mean predicted difference between annual state pension income as single and as part of a couple. Base level: predicted share just below the cutoff for individuals born in June. Relative change: discontinuity divided by the base level. Semi-elasticity: relative change per 1,000 DKK/year of mean gap. Elasticity: relative change divided by the mean log income ratio. Panel C: response per 1,000 DKK/year in column (1) minus that in the respective column. 2015 DKK. Standard errors clustered at the individual level, by the delta method for derived statistics treating group means as fixed. Observations are person-years. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table C.1: Response by pension wealth tercile

D Later-treated cohorts and the timing of the response

	Separation	Divorce	New partnership		Share single	
			New partner	One to two adults	Living alone	No partner ID
	(1)	(2)	(3)	(4)	(5)	(6)
Early × age 61	0.061^{+}	0.000	−0.022	0.013	0.143^{+}	0.390***
	(0.032)	(0.020)	(0.032)	(0.034)	(0.077)	(0.071)
Early × age 62	0.052^{+}	0.000	0.010	0.011	0.070	0.290***
	(0.032)	(0.019)	(0.032)	(0.034)	(0.066)	(0.060)
Early × age 63	0.044	−0.015	−0.006	−0.003	0.036	0.148***
	(0.031)	(0.019)	(0.032)	(0.034)	(0.051)	(0.045)
Early × age 64			Reference			
Early × age 65	0.062^{+}	0.031^{+}	−0.037	−0.060^{+}	0.200***	−0.088*
	(0.032)	(0.019)	(0.030)	(0.033)	(0.051)	(0.045)
Early × age 66	−0.015	−0.045*	−0.080**	−0.070*	0.158*	−0.212***
	(0.030)	(0.018)	(0.029)	(0.032)	(0.067)	(0.061)
Early	0.063**	0.060***	0.032	0.001	0.243*	−0.303*
	(0.022)	(0.013)	(0.022)	(0.024)	(0.122)	(0.128)
Control mean at 64	0.579	0.181	0.571	0.685	23.80	27.72
Age fixed effects			Yes			
Observations	2,976,052	2,976,052	2,976,052	2,976,052	2,943,357	2,976,052

Notes: Estimates of equation (2). Early: born July 1939-December 1943 (state pension age 65); control cohorts: born January 1935-June 1939 (state pension age 67). Age in whole years; age 65 is the calendar year containing the 65th birthday. Coefficients on Early × age are relative to age 64. Control mean at 64: constant, i.e. the mean outcome of the control cohorts at age 64. Columns (1)-(4): annual rates, in percent; columns (5)-(6): shares, in percent. Separation: end of cohabitation with a married or unmarried partner, excluding widowhood. Divorce: legal divorce from a married partner. New partner ID: new partner under the Statistics Denmark definition of cohabiting couples. One to two adults: transition from a one-adult to a two-adult household. Living alone: no other adults in the household. No partner ID: no partner under the Statistics Denmark definition. For the partner-ID measure, the event-study coefficients decline linearly with age before the state pension age, by about 0.13pp per year between ages 61 and 64. Compared with this pre-trend, the coefficients at ages 65 and 66 (−0.088 and −0.212) lie about 0.03-0.04pp above its extrapolation, which is consistent in sign and magnitude with the RDD estimate (0.063pp). The difference-in-discontinuities estimate, which accounts for group-specific age trends, is positive but imprecise (Table D.2). Standard errors clustered at the individual level in parentheses. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table D.1: Event study coefficients for all outcomes

	Separation	New partnership		Share single	
		New partner ID	One to two adults	Living alone	No partner ID
	(1)	(2)	(3)	(4)	(5)
Panel A: Bandwidth 1.5 years					
Over 65	0.025	0.010	−0.024	−0.099	−0.092
	(0.038)	(0.038)	(0.041)	(0.104)	(0.104)
Early × Over 65	0.103*	−0.007	−0.025	0.443*	0.293+
	(0.052)	(0.050)	(0.054)	(0.174)	(0.178)
Observations	1,469,856	1,469,856	1,469,856	1,455,481	1,469,856
Panel B: Bandwidth 1.9 years					
Over 65	0.017	0.041	−0.013	−0.056	−0.047
	(0.034)	(0.034)	(0.037)	(0.113)	(0.115)
Early × Over 65	0.105*	−0.045	−0.038	0.334+	0.147
	(0.046)	(0.044)	(0.048)	(0.198)	(0.205)
Observations	1,866,326	1,866,326	1,866,326	1,848,079	1,866,326
Panel C: Bandwidth 2.9 years below and 1.9 years above 65					
Over 65	0.022	0.026	−0.014	−0.040	−0.009
	(0.031)	(0.030)	(0.033)	(0.098)	(0.099)
Early × Over 65	0.106*	−0.022	−0.036	0.334*	0.133
	(0.042)	(0.040)	(0.044)	(0.167)	(0.172)
Observations	2,371,540	2,371,540	2,371,540	2,346,868	2,371,540
Panel D: Bandwidth 3.9 years below and 1.9 years above 65					
Over 65	0.036	0.022	0.008	−0.037	0.037
	(0.029)	(0.029)	(0.031)	(0.092)	(0.093)
Early × Over 65	0.103*	−0.040	−0.050	0.352*	0.116
	(0.040)	(0.038)	(0.041)	(0.153)	(0.157)
Observations	2,883,819	2,883,819	2,883,819	2,852,188	2,883,819
Birth-month fixed effects	Yes	Yes	Yes	Yes	Yes

Notes: Estimates of equation (3), a local linear specification in continuous age centred at 65, fully interacted with Early, with birth-month fixed effects. Early: born July 1939-December 1943 (state pension age 65); control cohorts: born January 1935-June 1939 (state pension age 67). Over 65: discontinuity at 65 in the control cohorts, for whom 65 is not the state pension age (placebo). Early × Over 65: difference between the discontinuities at 65 in the treated and the control cohorts. The bandwidth above 65 is at most 1.9 years because the control cohorts reach their state pension age at 67. Columns (1)-(3): annual rates, in percent; columns (4)-(5): shares, in percent. Separation: end of cohabitation with a married or unmarried partner, excluding widowhood. New partner ID: new partner under the Statistics Denmark definition of cohabiting couples. One to two adults: transition from a one-adult to a two-adult household. Living alone: no other adults in the household. No partner ID: no partner under the Statistics Denmark definition of cohabiting couples. Standard errors clustered at the individual level in parentheses. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table D.2: DiDiscontinuity: All outcomes

E Robustness

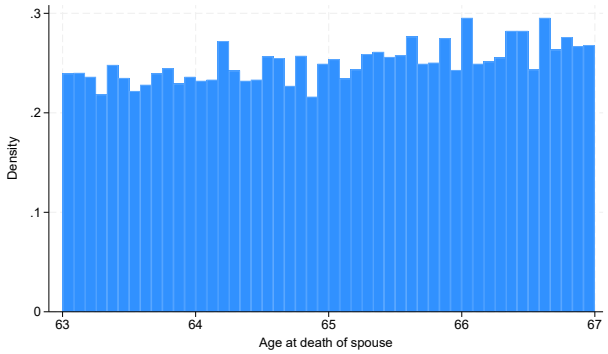


Figure E.1: Histogram of age at bereavement

	All	Balanced	Retired by 62	(3) and no DI	(4) and constant income
	(1)	(2)	(3)	(4)	(5)
Discontinuity at 65	−0.012	−0.011	−0.060*	−0.058*	−0.072
	(0.015)	(0.014)	(0.026)	(0.029)	(0.077)
Relative effect (%)	−0.2	−0.1	−0.7*	−0.7*	−0.5
	(0.2)	(0.2)	(0.3)	(0.4)	(0.5)
Base level (%)	7.78	7.76	8.45	8.16	14.76
Observations	3,744,312	3,565,954	1,095,256	848,720	193,828

Notes: Discontinuity in bereavement (death of the partner, in percent) at the state pension age, in percentage points. Estimated from equation (1) with a linear specification, a bandwidth of two years and birth-month fixed effects. Base level: predicted value just below the cutoff for individuals born in June (reference birth month), in percent. Relative effect: discontinuity divided by the base level, in percent. Balanced sample: observed continuously between ages 55 and 67. Retired by 62: balanced sample, further restricted to individuals with labour income below 67,500 DKK (2015) from age 62. No DI: never receives public pension income before the early retirement age. Constant income: Income at age 66 within 10% of age-64 income. Standard errors clustered at the individual level in parentheses; standard errors of relative effects by the delta method. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table E.1: RDD: Bereavement

F Details of the structural model

F.1 The state-pension formula

The state pension consists of a relation-ship status independent base amount sp_b plus a variable top-up $top^n_{i,t}$. The non-negative top-up is a decreasing function of household income from all other sources I^{other} and takes different maxima and taper rates for singles and couples.

$$sp^n_{i,t} = sp_b + top^n_{i,t} \tag{20}$$

$$top^S_{i,t}(I_i) = \max\left(0, top^S_{max} - top^S_{taper}\ (I^{other}_{i,t} - \underline{\mathrm{I}}^S)\right) \tag{21}$$

$$top^M_{i,t}(I_w, I_m) = \max\left(0, top^M_{max} - top^M_{taper}\ ((I^{other}_{w,t} - \underline{\mathrm{I}}^M) + (I^{other}_{m,t} - \underline{\mathrm{I}}^M))\right) \tag{22}$$

F.2 The match quality process

Match quality ψ_t evolves according to equation (23). It is therefore a unit root and the innovation term is drawn from a normal distribution with a time-varying variance (equation 24).

$$\psi_t = \psi_{t-1} + \epsilon^\psi_t \tag{23}$$

$$\epsilon^\psi_t \sim \mathcal{N}(0, \sigma^2_t) \tag{24}$$

$$\sigma_t = a \exp(bt) \tag{25}$$

Since we start the model at age 53 for women and 55 for men, the match quality process needs to take into account that marriages are not newly formed. Couples with the lowest

match quality will have already divorced, and starting from a normal distribution of match quality would not be appropriate. We therefore draw initial match quality from a standard normal distribution truncated from below at its 37th percentile, so that there are no excess divorces at model entry. We allow the variance of the innovation term to change over time to account for learning about match quality as well as age trends in the cost of divorce. The cost of divorce may increase over time, due to changes in the cost of moving with high age and changes in repartnering odds with age. Brien et al. (2006) and Bruze et al. (2015) capture a down-ward sloping divorce rate in the duration of marriage through bayesian updating on latent quality or time-varying divorce costs. The time-varying innovation of match quality is supposed to capture both of these channels, whilst keeping match quality a random walk as in Foerster et al. (2024), Low et al. (2018), and Voena (2015a).

F.3 The problem of the couple

The couple problem proceeds from backward induction across and within each period. Conditional on no retirement and divorce, the divorcees optimise their values according to Equation 14. The resulting values are $(V^W_{w,t}(\mathcal{S}^{Div}_{w,t}), V^W_{m,t}(\mathcal{S}^{Div}_{m,t}))$. The inputs $(\mathcal{S}^{Div}_{w,t}, \mathcal{S}^{Div}_{m,t})$ take account of the mapping between the state space when married and divorcing, for example assets of the divorcing man will be half of assets the couple entered the period with. The optima based on retirement of either former spouse are arrived at analogously (Equation 13) and are denoted $(V^R_{w,t}(\mathcal{S}^{Div}_{w,t}), V^R_{m,t}(\mathcal{S}^{Div}_{m,t}))$. The couple optimises its joint value conditional on the choice of labour market status of each partner and the choice of no divorce as $V_t^{WW,Mar}(\mathcal{S}_t)$ by choosing the consumption pair $(\tilde{c}_{w,t}, \tilde{c}_{m,t})$. The resulting values are then used to compute the individual benefit from continued marriage $(V^{WW,Mar}_{w,t}, V^{WW,Mar}_{m,t})$ as in Equation 26.

$$V^{WW,Mar}_{w,t+1}(\mathcal{S}_t) = u_w(\tilde{c}_{w,t}, l_{w,t}) + \psi_t + \beta \mathbf{EV}^{WW}_{w,t+1}(\mathcal{S}_{t+1}, \mu_{t-1}) \tag{26}$$

The expected value is taken over future probabilities of survival of each spouse and payoff to future marriage or widowhood (Equation 27).

$$\mathbf{EV}^{WW}_{w,t+1}(\mathcal{S}_{t+1},\mu_{t-1}) = s_{w,t+1}\left(s_{m,t+1}\mathbb{E}[V^{WW}_{w,t+1}(\mathcal{S}_{t+1})] + (1-s_{m,t+1})\mathbb{E}[V^{W}_{w,t+1}(\mathcal{S}^{Wid}_{w,t+1})]\right) \tag{27}$$

$$\mathbf{EV}^{WW}_{m,t+1}(\mathcal{S}_{t+1},\mu_{t-1}) = \underbrace{s_{m,t+1}}_{\text{own survival}}\left(\underbrace{s_{w,t+1}\mathbb{E}[V^{WW}_{m,t+1}(\mathcal{S}_{t+1})]}_{\text{continued marriage}} + \underbrace{(1-s_{w,t+1})\mathbb{E}[V^{W}_{m,t+1}(\mathcal{S}^{Wid}_{m,t+1})]}_{\text{widowhood}}\right) \tag{28}$$

The full optimisation problem of the married, mutually working couple is to find the optimum over all choices $ch_t = (D_t, c_{w,t}, c_{m,t})$, which gives the value of the married couple V^{WW}_t. Note that the superscript WW denotes that this is a couple with two working individuals. There are therefore four couple values based on each spouses retirement status $r = (W, R)$: $V^{WW}, V^{WR}, V^{RW}, V^{RR}$. This choice of work status for both partners affects the expected future value since retirement is permanent and the option set of the future couple is therefore limited once one partner retires.

$$\begin{aligned} V^{WW}_t(\mathcal{S}_t) = \max_{ch_t} \; & (1-D_t)\Big[\mu_t\left(u_w(c_{w,t},l_{w,t}) + \psi_t + \beta\mathbf{EV}^{WW}_{w,t+1}(\mathcal{S}_{t+1},\mu_{t-1})\right) \\ & + (1-\mu_t)\left(u_m(c_{m,t},l_{m,t}) + \psi_t + \beta\mathbf{EV}^{WW}_{m,t+1}\right)\Big] \\ & + D_t\Big[\mu_t\left(u_w(c_{w,t},l_{w,t}) + \beta s_{w,t+1}\mathbb{E}[V^{W}_{w,t+1}(\mathcal{S}^{Div}_{w,t+1})]\right) \\ & + (1-\mu_t)\left(u_m(c_{m,t},l_{m,t}) + \beta s_{m,t+1}\mathbb{E}[V^{W}_{m,t+1}(\mathcal{S}^{Div}_{m,t+1})]\right)\Big] \end{aligned} \tag{29}$$

s.t.

$$\left.\begin{aligned} V_{w,t}^{WW,Mar}(\mathcal{S}_t) &= u_w(\tilde{c}_{w,t}, l_{w,t}) + \psi_t + \beta \mathbf{EV}_{w,t+1}^{WW}(\mathcal{S}_{t+1}, \mu_{t-1}) \geq V_{w,t}^{S,W}(\mathcal{S}_{w,t}) \\ V_{m,t}^{WW,Mar}(\mathcal{S}_t) &= u_m(\tilde{c}_{m,t}, l_{m,t}) + \psi_t + \beta \mathbf{EV}_{m,t+1}^{WW}(\mathcal{S}_{t+1}, \mu_{t-1}) \geq V_{m,t}^{S,W}(\mathcal{S}_{m,t}) \\ A_t &= R\ A_{t-1} + (1-\tau)(Inc_{w,t} + Inc_{m,t}) - c_{w,t} - c_{m,t} \end{aligned}\right\} \text{if } D_t = 0$$

$$\left.\begin{aligned} A_{w,t} &= R\ \frac{1}{2}\ A_{t-1} + (1-\tau) Inc_{w,t} - c_{w,t} \\ A_{m,t} &= R\ \frac{1}{2}\ A_{t-1} + (1-\tau) Inc_{m,t} - c_{m,t} \end{aligned}\right\} \text{if } D_t = 1$$

The problem of the retired couple is like the problem of the married couple in working life with reduced state space ($\mathcal{S}_t = \{P_{w,t-1}, P_{m,t-1}, A_{t-1}, E_w, E_m\}, \mu_t$). Conditional on only one partner being retired, the state space contains the human capital of the working spouse.

F.4 Estimation

Parameter	Source	Value
Early retirement age	Legislation	60
State pension eligibility age	Legislation	65
Early retirement benefit	Legislation	4.30
State pension base rate	Legislation	1.54
State pension base cap	Legislation	6.74
State pension base taper rate	Legislation	0.300
State pension supplement (single)	Legislation	1.71
State pension supplement cap (single)	Legislation	1.49
State pension supplement taper rate (single)	Legislation	0.309
State pension supplement (couple, both retired)	Legislation	0.86
State pension supplement cap (couple, both retired)	Legislation	2.80
State pension supplement taper rate (couple, both retired)	Legislation	0.160
State pension supplement (couple, one retired)	Legislation	0.86
State pension supplement cap (couple, one retired)	Legislation	2.80
State pension supplement taper rate (couple, one retired)	Legislation	0.320
Women's share of wealth at divorce	Legislation	0.5
Share of pension inherited	—	0.3
Share of liquid assets inherited	—	1

Notes: Based on the design of the Danish old-age pension scheme as of 2019. Monetary values are annual, in units of 50,000 DKK.

Table F.1: Pre-set parameters

F.5 Model fit

	$h = 2$	$h = 3$	$h = 5$
Over 65	0.0903***	0.049***	0.0236***
	(0.0155)	(0.00687)	(0.00653)
Age recentered	-0.0704***	-0.0545***	-0.0445***
	(0.00842)	(0.00301)	(0.00194)
Over 65 × Age recentered	-0.0352***	0.00923*	0.015***
	(0.00811)	(0.00404)	(0.00274)
Constant	0.261***	0.282***	0.294***
	(0.0129)	(0.0068)	(0.00642)
Over 65 / Constant	0.346***	0.173***	0.0804***
	(0.0754)	(0.0276)	(0.0235)
Observations	4106337	6161839	10279724

Notes: Women and men stacked at their own age. Standard errors clustered by household in parentheses. Outcomes in percentage points. Columns vary by bandwidth h. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table F.2: RDD in simulated data

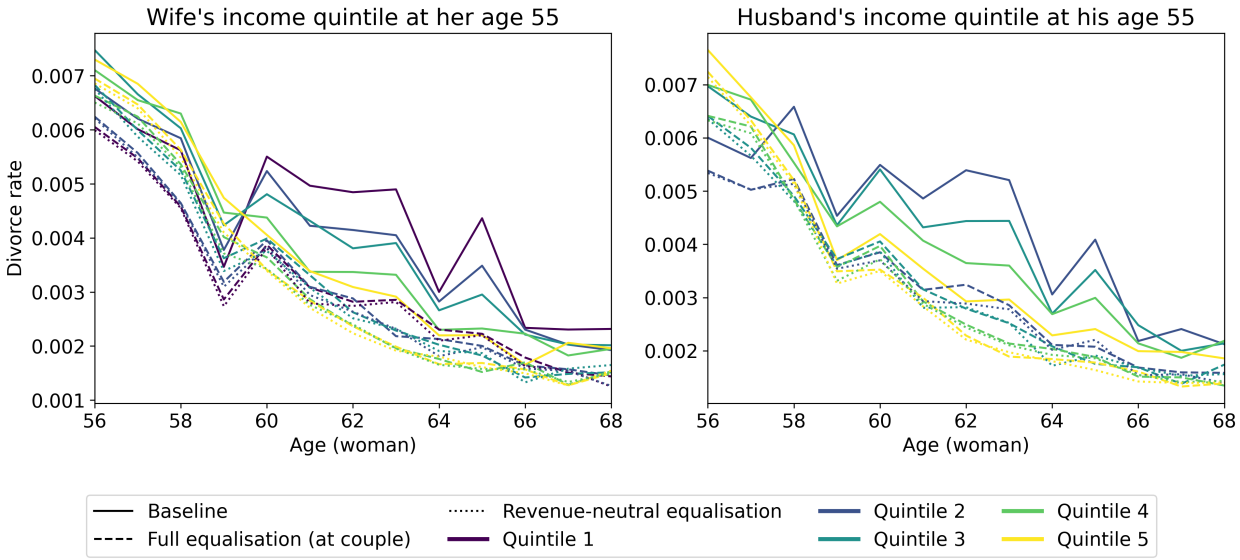


Figure F.1: Divorce rate by human capital quintile and gender in simulated data

F.6 Model results

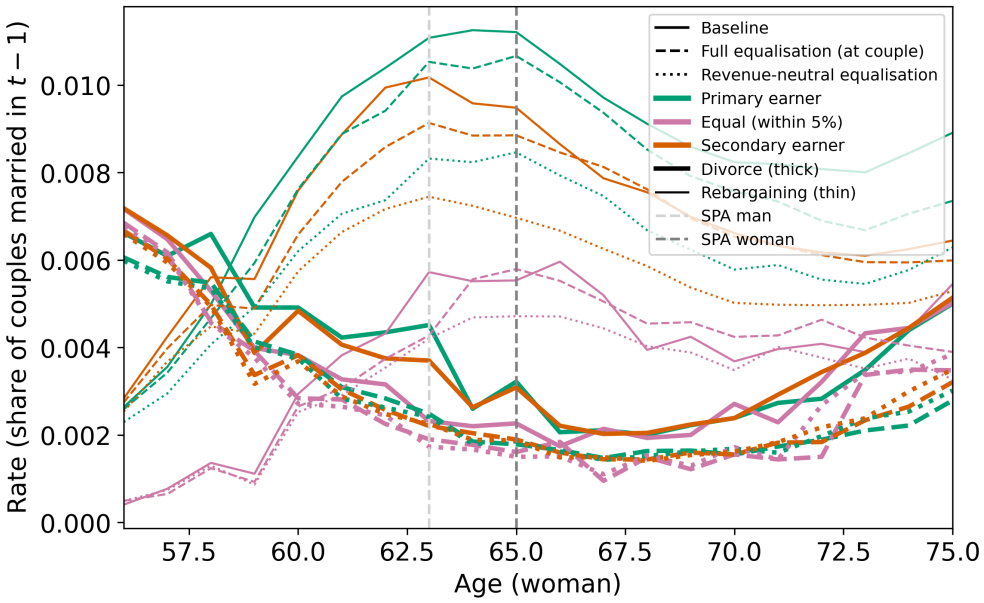


Figure F.2: Divorce and bargaining rate by relative income in $t = 1$