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ORIGINAL ARTICLE

Couples' joint retirement by household type: Evidence from Finland

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Abstract

This study examines joint retirement in Finland. Employing a regression discontinuity design, the study leverages the exogenous variation provided by the eligibility age for earnings-related pensions. The analysis yields three key findings. First, reaching the eligibility age has a significant effect on an individual's retirement. Second, male spouses' retirement at the age of 63 has a spillover effect on their female spouses. Third, disaggregated analyses show that older spouses in low-income households delay their retirement, older male (female) spouses with female (male) primary earners postpone their retirement, and younger female spouses with male primary earners expedite their retirement.

JEL CLASSIFICATION

C26, J14, J26

1 | INTRODUCTION

A continuous growth in life expectancy increases the population of pensioners, placing stress on public finances. This phenomenon has inspired research on pension policies and retirement decisions. Although most studies have focused on retirement decisions from an individual level (Atalay & Barrett, 2015; Giesecke & Jäger, 2021; Kyyrä, 2015), there is a growing literature on joint retirement, which refers to the synchronization of spouses' retirement timing (Blau, 1998; Gustman & Steinmeier, 2000; Hospido & Zamarro, 2014; Stancanelli & Van Soest, 2012).[1]

Research into joint retirement is important for two reasons. First, the number of dual-earner couples has considerably increased over the last few decades (Van Gils & Kraaykamp, 2008), highlighting the importance of understanding their joint retirement behaviour. Second, research can help evaluate the effects of pension policies on labour supply (Bloemen et al., 2019; Johnsen et al., 2022; Kruse, 2021). For example, if the retirement of one spouse significantly affects the retirement decision of their partner, a policy change targeted at the retiree can also influence aggregate labour supply through spillover effects on the partner.

The decision-making processes between household members can be described by the unitary and non-unitary decision-making models (Donni & Chiappori, 2011; Vermeulen, 2002). The unitary model is based on the assumption that a household behaves as a single decision-maker. According to this model, a household member with a higher wage works more due to their greater contribution to the joint wealth with an equal amount of lost leisure time. As a result, spouses who are breadwinners (primary earners) are more likely to delay their retirement, while non-breadwinner spouses are more likely to advance their retirement in response to their partner's retirement. In the non-unitary (collective) model, each household member maximizes their own welfare. Regarding joint retirement, breadwinner spouses can leverage their bargaining power to advance their own retirement timing or delay their partner's retirement timing (Giovanis & Ozdamar, 2018; Michaud & Vermeulen, 2011).

Joint leisure is often presented as an important motivation for joint retirement behaviour (Blundell et al., 2016; Coile, 2004; Kruse, 2021). Although the preference for joint leisure may be the primary cause of joint retirement, household characteristics can also influence it. According to the literature on collective household behaviour, the higher the household earnings, the more affordable it is for partners to retire jointly, that is, the income effect increases the probability of the advancing joint retirement among households (Blau & Riphahn, 1999; Kapur & Rogowski, 2007). Higher earnings also increase the opportunity costs of retirement, because the monetary benefits of remaining in the labour force are greater; in other words, the substitution effect decreases the probability of advancing joint retirement (De Preter et al., 2015; Queiroz & Souza, 2017). Nevertheless, there is also recent evidence suggesting that joint leisure does not vary with the conventional socio-economic variables, so the intra-household wage gap may not explain the time partners spend together (Browning et al., 2021).

This paper presents new evidence on joint retirements in Finland. The present study is related to recent research that has applied age-based pension eligibility designs in comparable institutional contexts, particularly the study by Garcia-Miralles and Leganza (2021) in Norway, Johnsen et al. (2022) in Denmark, and Lalive and Parrotta (2017) in Switzerland. These studies are either based on retirement reforms (Johnsen et al., 2022), early retirement age (Garcia-Miralles & Leganza, 2021), or full retirement age (Lalive & Parrotta, 2017), and they indicate that the spouses of retirees did adjust their retirement behaviour. Their findings are important for three reasons. First, they show that the labour market effects of welfare reforms may have an impact on other individuals than on those directly affected by the reforms. Second, the effects may be asymmetric by sex, that is, women respond to their male partner's retirement decisions, but men do not respond to their female partner's retirement decisions. Third, the extent of the effects may vary by country, influenced by the domestic institutional features and the type of reforms.

This study contributes to the recent literature in three ways. First, it uses unexplored Finnish data and utilizes the earnings-related eligibility age of 63 years as a cut-off. Second, it employs an instrumental version (IV) of the regression discontinuity (RD) design and a selection method for bandwidth that balances between having a large enough sample size to decrease the variance and using observations that are close enough to the cut-off to provide asymptotically valid estimates (Calonico et al., 2014a, 2014b). Third, it sheds light on possible heterogeneities across household types. Notably, we assess the role of the spouse's age, relative earnings between household members, and aggregate household earnings.

The analysis revealed three main findings. First, the effect of reaching the eligibility age for earnings-related pension on an individual's retirement was substantial—approximately 15–17 percentage points for both sexes. Second, there was a statistically significant spillover effect, approximately 7 percentage points, on women whose spouse reached the threshold eligibility age of 63 years. This joint retirement effect was primarily driven by older spouses who delayed their retirement until their younger spouse's retirement. No similar effect was found among men. Third, the results based on the household type were consistent with the aggregate finding that older spouses of the households were more likely to continue working until their younger spouse reached the pension eligibility age. The joint retirement effect was significant for women and men in low-income households as well as for older male spouses with female primary earners and female spouses with male primary earners. Moreover, younger female spouses with male spouses as primary earners were shown to advance their retirement when their older spouse reached the pension eligibility age.

The remainder of this paper is structured as follows. Section 2 provides background information on the Finnish pension system and describes the data and estimation strategy used in the study. Section 3 presents the results, and Section 4 summarizes the findings and discusses their implications.

2 | INSTITUTIONAL CONTEXT, DATA, AND METHODS

2.1 | Pension schemes in Finland

Since the early 1960s, the Finnish pension system has consisted of a mandatory earnings-related employment pension scheme and a national pension scheme (see, e.g. Barr, 2013; Hietaniemi & Ritola, 2007; Riekhoff & Järnefelt, 2018). The national pension scheme is non-contributory and residence based. In other words, the scheme covers all residents of Finland, provided that the minimum requirements related to the time of residence are fulfilled (Ritola & Tuominen, 2022). The people receiving the national pension have a low income, and its role decreases as income increases. For example, married or cohabiting individuals who receive a specified minimum earnings-related pension (1158 euro per month in 2019) are no longer eligible for the national pension. In essence, the national pension ensures a basic livelihood (i.e. the guarantee pension) for retirees who have accrued little or no earnings-related pension.

The earnings-related pension scheme is contributory. The amount of the pension is based on an accrual rate, and it covers all employees, including the self-employed and farmers. Earnings-related pensions fall under two main acts, the Employees Pensions Act and the Public Sector Pensions Act. In the private sector, which employs approximately 70 per cent of all wage earners, pensions are arranged through insurance policies. In the public sector, wage earners are covered by their employers under the public sector pension acts.

Since the early 1990s, three major pension reforms have been introduced in Finland; see Kuivalainen and Kuitto (2022) and Knuuti and Ritola (2019) for summaries. The first reform of 1996 focused on cost containment leading to retrenchment, whereas the reform of 2005 focused on modernizing the earnings-related scheme. In particular, it aimed to raise the effective retirement age and adjust the pension scheme to the average increase in life expectancy. A flexible retirement age (63–68 years) was introduced, where the relatively low minimum age for eligibility was combined with financial incentives (higher accrual rate) to extend the retirement age beyond the threshold (Kuivalainen & Kuitto, 2022). The reform of 2017 focused on further needs to adapt to the increasing life expectancy. As summarized in Kuivalainen and Kuitto (2022), the 2017 reform relied on strict prerequisites in order to increase the age of retirement, that is, sticks were utilized instead of carrots. The retirement age was set to increase by 3 months for each birth cohort, starting with those born in 1955, until the threshold reached 65 years (for the 1962 cohort).

The earnings-related and national pension schemes constitute the public pension pillar. In 2022, approximately 1.6 million individuals in Finland received earnings-related and national pensions; 94 per cent of them received earnings-related pensions, and approximately one-third of the pension recipients received both the national and earnings-related pension benefits (Finnish Centre for Pensions, 2022). The role of occupational and private pension schemes, observed in many OECD countries, is minor in Finland. The small volume of employer-specific voluntary pensions and pensions based on labour market agreements may be due to the absence of pension ceilings or upper limits to the amount of earnings on which the earnings-related pension is based; see Kuivalainen and Kuitto (2022) and Kangas and Luna (2011) for more details on the role of private individual pensions in Finland.

2.2 | Data

This study uses administrative registers maintained by Statistics Finland,[2] namely the Finnish Longitudinal Employer-Employee Database that includes demographic, educational, and labour-market information on the entire population of Finland.

A spousal link variable was used to identify dual-earner households. The study only included couples where the retiree had worked in the private sector. Thus, the sample did not include public-sector employees, because many of them—such as police officers, teachers, and military staff—were entitled to age-specific pensions over the investigation period. However, the retiree's spouse could be employed in either the private or public sector. The sample was further restricted to those who had reached the earnings-related eligibility age of 63 between 2008 and 2015, because the pension eligibility age had remained unchanged during this period (see previous section).

There are substitute pathways from work to retirement (Euwals et al., 2012; Kyyrä, 2015). These include early retirement, social insurance (disability retirement and unemployment), active labour policy measures, and inactivity (exiting the labour force). In Finland, most early leavers receive either disability or unemployment-related benefits (Kyyrä, 2015). However, the multiple reasons for retirement were not differentiated in the study in order to maintain good statistical precision. The risk of partial disability retirement is lower in the private sector than in the public sector (Polvinen & Laaksonen, 2023).

We defined retirement as the exit from employment, conditional on being employed one to 4 years earlier.[3] Retirement is determined by the labour market status during the last week of the year.[4] Individuals who were temporarily absent from work were classified as employed if their reason for absence was maternity or paternity leave, earnings-related parental leave, personal illness, holiday, or working-hour arrangements, or if the absence lasted for less than 3 months.

We considered retirement between the ages of 59 and 67 years and restricted the sample to retirees whose spouses were below 67 years of age. The sample construction is consistent with the requirements of the RD modelling. First, there are no discontinuities at these ages in the Finnish social security legislation that would bias the sample. Second, the continuity assumption of the assignment variable's relation to the treatment variable would be violated after the threshold age of 67 because further earnings do not increase pensions. Third, the analysis is not affected by the early leavers because the age thresholds for unemployment and part-time pensions are lower than 63 years (Kyyrä, 2015; Kyyrä & Wilke, 2007).

After these restrictions, the panel data consisted of 391,915 (208,351) person-year observations where the retiree men (women) had worked in the private sector and reached the eligibility age of 63 years during the sample period 2008–2015.[5] The sample individuals may appear in the data as both retirees and spouses. See Tables A1 and A2 for descriptive statistics for the main estimation samples.

Table 1 illustrates the study samples, where either male (Panel A) or female (Panel B) household members reached the pension eligibility age of 63 years during the period 2008–2015. The samples were further divided according to the spouse's age (under or over 63 years), household income level (low or high), and household breadwinner status (male or female). The median income is shown by sex and sample. Income was measured based on annual earnings from work and entrepreneurial activity, which is a reliable indicator of retirement income since earnings-related pensions amounts are determined by past earnings. A household was classified as a high- (low-)income household if its combined earnings were above (below) the median earnings during the study period. A person was considered the breadwinner if their earnings were higher than their spouse's.

Looking at the earnings of high- and low-income households (e.g. €84,800 vs. €52,200 in Panel A, Column 1), the earning differences were attributable to the household members' sex (Columns 2 and 3). However, the difference in earnings between the sexes was smaller within low-income households than high-income households. A similar pattern can be observed when examining differences in earnings among households with a female breadwinner and households with a male breadwinner. The difference in earnings between the sexes was smaller among households with a female breadwinner than among those with a male breadwinner (e.g. €25,200 vs. €33,500 and €41,400 vs. €25,300 in Panel A). Similar patterns emerge when considering women as retirees (Panel B).

2.3 | Methods

The RD design (Angrist & Pischke, 2009; Imbens & Lemieux, 2008; van der Klaauw, 2008) was applied to estimate the causal effect of one spouse's retirement (at age 63) on their partner's retirement probability. Garcia-Miralles and Leganza (2021), Lalive and Parrotta (2017), Stancanelli (2017), and Stancanelli and Van Soest (2012) are examples of comparable studies that use RD to examine retirement decisions. The RD design can be used to mitigate possible reverse causality and omitted variable biases. Reverse causality bias arises if the retiree's retirement causes their spouse to retire and conversely the spouse's retirement causes the retiree to retire. Omitted variable bias arises if, for example, a local labour market shock causes the simultaneous employment loss and retirement of both members of the household.[6]

We used the instrumental variable estimation of the RD design, also called a 'fuzzy' RD estimator, because the treatment (retirement) uptake for the retiree is not complete; all pension-eligible employees do not retire when they reach the earnings-related eligibility age of 63 years (the cut-off point). The smaller the share of employees retiring at the cut-off age, the smaller the intention-to-treat (ITT) effect if the joint retirement effect is fixed.

TABLE 1 Median annual income by age, sex, and household type over the period 2008–2015 (euros).

	Household, in total (1)	Man (2)	Woman (3)
Panel A: Men as retirees			
All households (n = 391,915)	65,018	37,081	27,001
Spouse younger than 63 years (n = 316,226)	64,786	36,882	27,032
Spouse older than 63 years (n = 75,689)	66,110	38,034	26,846
Male breadwinner (n = 294,555)	67,081	41,412	25,270
Female breadwinner (n = 97,076)	58,676	25,185	33,509
High household income (n = 195,955)	84,776	51,188	32,753
Low household income (n = 195,960)	52,178	28,914	23,057
Panel B: Women as retirees			
All households (n = 208,351)	65,174	36,801	27,279
Spouse younger than 63 years (n = 118,094)	65,514	37,264	27,240
Spouse older than 63 years (n = 90,257)	64,703	36,158	27,333
Male breadwinner (n = 149,514)	68,170	42,303	25,088
Female breadwinner (n = 58,600)	57,665	24,053	33,820
High household income (n = 104,173)	86,888	52,019	34,091
Low household income (n = 104,178)	50,754	27,611	22,458

Note: n = Number of observations. Breadwinner is the household member with higher income. The high (low-)-income group has higher (lower) than the median income in the sample. The observations are for individuals between ages 59 and 67.

The fuzzy RD model represents the expected outcome $E(Y_i)$ as a function of the forcing variable (retiree's age, Age_{RET}), both on the left ($-$) and right ($+$) of the cut-off point, and the expected value of the treatment variable ($\widehat{\mu}$), both on the left and right of the cut-off point. Thus, the model includes equations for both spouses in a household where the retiree's age is above 63 years (Equations 1 and 2) and where the retiree's age is below 63 years (Equations 3 and 4):

$$\mu_{\text{RET}+}\, E(Y_i) = \widehat{\mu}_{RET+} + \widehat{\theta}_1\left(\text{Age}_{\text{RET}+} - 63\right), \tag{1}$$

$$\mu_{\text{SPO}+} : E(Y_i) = \widehat{\mu}_{\text{SPO}+} + \widehat{\gamma}_1\left(\text{Age}_{\text{RET}+} - 63\right), \tag{2}$$

$$\mu_{\text{RET}-} : E(Y_i) = \widehat{\mu}_{\text{RET}-} + \widehat{\theta}_1(\text{Age}_{\text{RET}-} - 63), \tag{3}$$

$$\mu_{\text{SPO}-} : E(Y_i) = \widehat{\mu}_{\text{SPO}-} + \widehat{\gamma}_1(\text{Age}_{\text{RET}-} - 63). \tag{4}$$

In essence, all individuals are treated twice, that is, once they reach the eligibility age (direct effect) and once their spouses reach the eligibility age (indirect effect).

The joint retirement effect (i.e. spillover effect) is calculated as the ratio of the two discontinuities:

$$\frac{\widehat{\mu}_{\text{SPO}+} - \widehat{\mu}_{\text{SPO}-}}{\widehat{\mu}_{\text{RET}+} - \widehat{\mu}_{\text{RET}-}}, \tag{5}$$

where the denominator denotes the effect of pension eligibility on retirement probability and the numerator denotes the link between a partner's pension eligibility and their spouse's retirement. The former is defined as the difference in the predicted retirement rate at the cut-off age between the pension-eligible partner ($\widehat{\mu}_{\text{RET}+} = E[Y_i(1)|\text{Age}_{\text{RET}} = 63]$) and the partner ineligible for pension ($\widehat{\mu}_{\text{RET}-} = E[Y_i(0)|\text{Age}_{\text{RET}} = 63]$). The latter is defined as the difference in the predicted retirement rate between partners where the retiring partner is just above ($\widehat{\mu}_{\text{SPO}+} = E[Y_i(1)|\text{Age}_{\text{RET}} = 63]$) or below ($\widehat{\mu}_{\text{SPO}-} = E[Y_i(0)|\text{Age}_{\text{RET}} = 63]$) the cut-off age.

The research design assumes that a spouse's retirement probability is affected only by a change in their partner's retirement status. The joint retirement effect is calculated by dividing the ITT effect by the first-stage treatment rate, which denotes the share of individuals retiring at the pension eligibility age. If retirement is determined completely by pension eligibility, $\widehat{\mu}_{\text{RET}+}$ would be 1 and $\widehat{\mu}_{\text{RET}-}$ would be 0. Thus, the denominator would be 1, and the Equation (5) would simplify to a sharp RD estimator.

We made four further methodological choices. First, following Gelman and Imbens (2019), we used a linear specification for the forcing variable, defined as the difference between an individual's age and the cut-off age (in days). Second, except for graphical illustrations and robustness checks, a triangular kernel was applied in the estimation, as recommended by Cattaneo et al. (2019). Thus, observation weights declined symmetrically and linearly as they got farther from the cut-off. Third, the bandwidths were chosen according to the method developed by Calonico et al. (2014a). It selects a mean squared error (MSE) optimal bandwidth that balances between having an adequately large sample size to decrease the variance and using only observations that are sufficiently close to the cut-off to provide asymptotically valid estimates.[7] Fourth, the confidence intervals calculated may be biased because the leading bias from a chosen lower-order estimate is assumed to be zero (Calonico et al., 2014b). To mitigate the potential biases resulting from using the linear specification for the forcing variable, we present bias-corrected confidence intervals. The estimations were conducted with Stata's *rdrobust* package (Calonico et al., 2014a).

The RD assumes that observations are not bunched around the cut-off, that is, retirement age cannot be manipulated by the households (Imbens & Lemieux, 2008). The present analysis confirmed that this assumption is satisfied: McCrary's (2008) density test did not show bunching in the men's sample ($p = 0.459$) or the women's sample ($p = 0.148$). In addition, predetermined background characteristics should be balanced just below and above the cut-off (Imbens & Lemieux, 2008). The balance requirement can be tested by using the background characteristics as outcomes in the RD estimation. In this study, some statistically significant discontinuities related to the education level and local unemployment rate were detected (Tables A3 and A4). Consequently, possible biases resulting from covariate imbalance were mitigated by estimating the fuzzy RD model with predetermined covariates. Besides the spouse's age and age squared, the covariates included the level of education (with dummies for primary, secondary, and tertiary education), number of children, number of grandchildren, and local unemployment rate (at the municipality level).

3 | ESTIMATION RESULTS

3.1 | Graphical illustration

We begin by presenting the retirement rates of individuals between the ages 59 and 67 when the retiring partner is either a man (Figure 1) or woman (Figure 2). Both subfigures on the left show a sharp increase in retirement probability when individuals reach the earnings-related

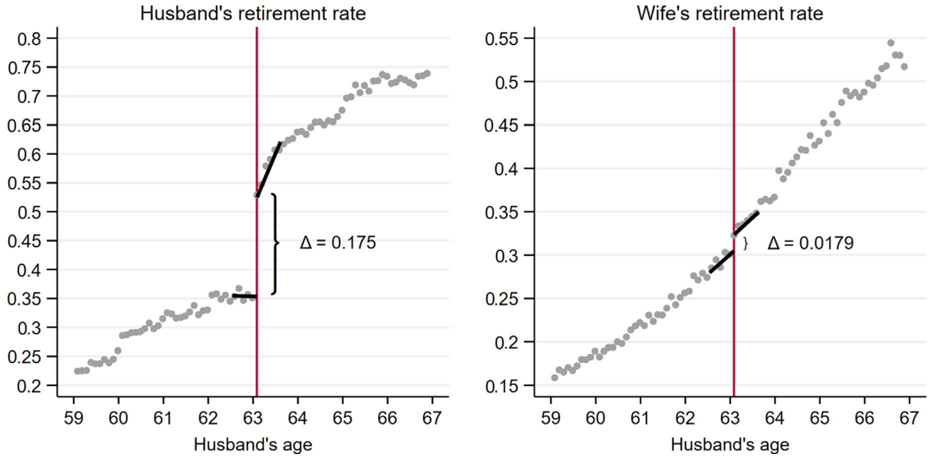

FIGURE 1 Retirement rates by partner: men as retirees. The red line shows the earnings-related pension eligibility age of 63 years. The black lines illustrate results from the regression discontinuity (RD) model with uniform kernel. The estimated joint retirement effect is 0.102 (= 0.0179/0.175; $p < 0.05$). The bandwidth is 0.548 years. The first-stage F-statistics is 212.7. See Table A5 for estimation results.

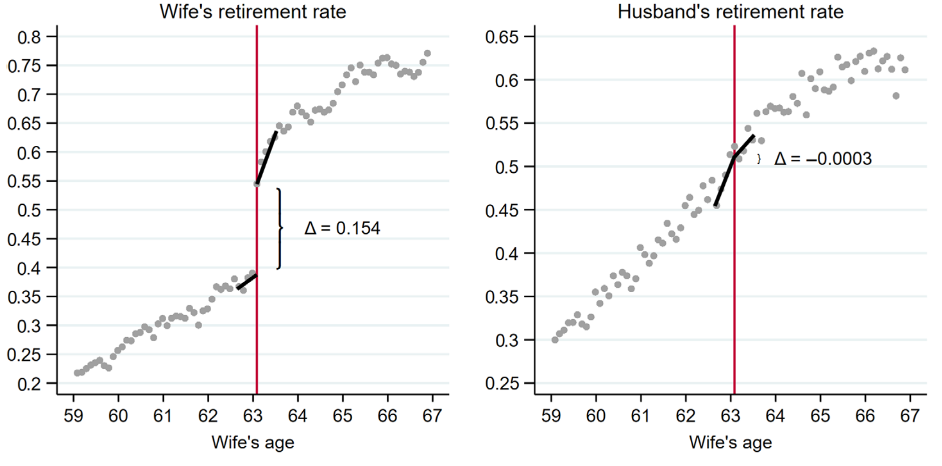

FIGURE 2 Retirement rates by partner: women as retirees. The red line shows the earnings-related pension eligibility age of 63 years. The black lines illustrate results from the regression discontinuity (RD) model with uniform kernel. The estimated joint retirement effect is −0.002 (= −0.0003/0.154; not significant). The bandwidth is 0.440 years. The first-stage F-statistics is 59.3. See Table A5 for estimation results.

pension eligibility age of 63. The retirement rate just before this age was 35 per cent for men and 39 per cent for women. Once men (women) reached the pension eligibility age, their retirement probability increased by 17.5 (15.4) percentage points. Subfigures on the right show the corresponding retirement rates for spouses. Figure 1 (right) illustrates that when men reach the eligibility age for earnings-related pension, their spouse's retirement probability increases by 1.79 percentage points, and the estimated joint retirement effect is 10.2 percentage points. On the contrary, Figure 2 (right) displays no discontinuity for male spouses when their female spouse reaches the cut-off age of 63.

FIGURE 3 Spouse's retirement rates by retiree's sex and spouse's age: men as retirees (figure on the left) and women as retirees (figure on the right). Retirement rates are shown for the ages 61–65. The red line shows the earnings-related pension eligibility age of 63 years. The black lines illustrate results from the regression discontinuity (RD) models. See Table A5 for estimation results.

Figure 3 presents the spouse's retirement rates by their age (younger/older than 63 years). The figure shows that retirement rates are substantially higher when a retiree's spouse is older. For example, when the wife is older than 63 years, her husband's annual retirement probability at age 63 is approximately 64 per cent, whereas when the wife is below 63 years of age, her husband's annual retirement probability is approximately 22 per cent. The subfigure on the left shows discontinuities in the wife's retirement rates, regardless of her age group, when the husband reaches the eligibility age of 63. The subfigure on the right (women as retirees) does not depict clear discontinuities in retirement rates for male spouses.

4 | BASELINE RESULTS

Table 2 shows our baseline results that correspond to Figures 1–3 but use RD estimation that adjusts for predetermined variables and uses triangular kernel to weigh the observations near the cut-off. The first-stage results show that as individuals reach the age of 63, their retirement probability increases sharply: by 17.7 percentage points for men and 16.2 percentage points for women. These first-stage results are also statistically strong, the *F*-statistic being 313.3 for men and 90.8 for women. The increase in retirement probability is larger for those whose spouse is older than 63 years than those whose spouse is younger than 63 (21.2 vs. 18.4 for men and 17.5 vs. 14.3 for women; see Columns 2 and 3).

Our main interest is in determining the joint retirement effect, that is, the effect of a spouse's retirement on their partner's retirement. The estimates from the fuzzy RD design show that the joint retirement effect is 6.7 percentage points ($p < 0.05$) in the sample of male retirees (see Panel A, Column 1 of Table 2). Thus, the results imply that female spouses adjust their retirement behaviour to retire at the same time as their male partner. On the contrary, similar

TABLE 2 The effect of a partner's retirement on the spouse's retirement by the retiree's sex and spouse's age.

	All spouses (1)	Spouse younger than 63 (2)	Spouse older than 63 (3)
Panel A: Men as retirees			
Estimate	0.067**	0.043*	0.111*
Conventional 95% CI	(0.003, 0.131)	(−0.001, 0.087)	(−0.016, 0.238)
Bias-corrected 95% CI	[−0.014, 0.175]	[0.007, 0.140]	[−0.120, 0.258]
Bandwidth	0.953	1.872	1.063
Observations	102,352	158,279	21,946
First-stage retirement effect	0.177	0.184	0.212
First-stage *F*-statistic	313.29	690.94	101.91
Panel B: Women as retirees			
Estimate	0.047	0.022	0.077
Conventional 95% CI	(−0.078, 0.173)	(−0.204, 0.249)	(−0.070, 0.224)
Bias-corrected 95% CI	[−0.150, 0.222]	[−0.256, 0.417]	[−0.213, 0.220]
Bandwidth	0.705	0.659	0.765
Observations	37,833	14,683	23,900
First-stage retirement effect	0.162	0.143	0.175
First-stage *F*-statistic	90.81	28.05	69.44

Note: The table shows the fuzzy regression discontinuity (RD) estimation results by the retiree's sex and spouse's age (using first-order polynomial on age, triangular kernel, and additional controls). The control variables are spouse's age and age squared, dummies for education level, local unemployment rate, number of children, and number of grandchildren. The procedure described in Calonico et al. (2014a, 2014b) was implemented to determine the optimal bandwidth. Conventional 95% confidence intervals (CIs) are reported in parenthesis, and bias-corrected 95% CIs are in square brackets. The standard errors were clustered at the household level.
* and ** denote conventional statistical significance at $p < 0.10$ and $p < 0.05$, respectively.

behaviour cannot be identified in male spouses when their female partner retires: the estimated joint retirement effect was not statistically significant in the sample of female retirees. However, we can only rule out effect sizes that are larger than 0.173 (at a 95 per cent risk level), due to the limited precision of the estimates.

In Columns 2 and 3 of Table 2, the results are presented by the spouse's age (younger/older than 63 years). The estimates for male retirees (Panel A) suggest that the estimate is larger for older female spouses (0.111, $p < 0.1$) than for younger female spouses (0.043, $p < 0.1$). The estimates in the sample of female retirees were not statistically significant regardless of the age group of the spouse. In summary, the results show that only female spouses adjust their retirement behaviour to the retirement of their male partners.

4.1 | Robustness of the baseline results

We examine the robustness of the baseline results to our methodological choices in several ways. First, a second-order local polynomial was used for the forcing variable (age of the retiree), although recent literature advises not to use higher-order polynomials because they may produce unreliable results near boundary points caused by overfit of the data (Cattaneo et al., 2019; Gelman & Imbens, 2019). Second, we used a simpler, uniform kernel, which weights all observations inside the bandwidth equally. Third, couples whose age difference was smaller than 3 months were excluded. This sample restriction ensured that the retiree and their partner could not reach the retirement eligibility age of 63 at the same time, thus biasing the estimate. Fourth, we estimated the model without controls (as in Figures 1–3) but used a triangular kernel. Fifth, second-order polynomial control on the spouse's age was excluded to ensure that the results were not affected by the multicollinearity of the variables. The analyses (Tables 3 and 4) show that the baseline results are robust across these alternative specifications: the aggregate estimate for the female spouses is centred around 7 percentage points; the effect is larger for older spouses than for younger spouses; and the effect is not statistically significant for the male spouses.

The robustness of the main estimates to the choice of bandwidth was further examined; see Tables A6 and A7. The bandwidth was narrower (66 per cent) or wider (150 per cent) than that implied by the optimal MSE procedure (Calonico et al., 2014a, 2014b). Moreover, we used bandwidth that differed below and above the cut-off (Lee & Lemieux, 2010). The narrower bandwidth results in a smaller sample size, thus lowering the statistical precision of the RD estimate. The wider bandwidth leads to a larger sample size, but it also increases the possibility that the RD estimate is biased due to confounding factors. When the bandwidth was allowed to vary, the optimal width was often wider below the cut-off and narrower above the cut-off. Nevertheless, the results were robust to the bandwidth selection around the optimally chosen bandwidth. They remained significant and qualitatively similar to those for the baseline sample of male retirees and the subsample of younger female spouses. In the subsample of older female spouses, the precision of the estimates varied, but the size of the estimates were similar across the alternative bandwidths. In Table A7, the joint retirement effects once again remained non-significant in the samples of female retirees.

Finally, we conducted a placebo test that estimated the spillover effect of retirement on fake spouses (Table A8). Fake spouses were randomly selected from all spouses (excluding the real spouse) who were of similar age as the real spouse. Because fake and real spouses are unrelated to each other, except for their similar age, we would not expect to find significant joint retirement effects on the fake spouse. Reassuringly, we did not find significant (or sizeable) joint retirement effects on the fake spouse, which, together with the results from the other robustness checks, provided support for the validity of the identification strategy.

4.2 | Results by the household type

Table 5 presents the results for subsamples that are based on breadwinner status (primary earner or secondary earner) and household income (low income or high income).[8] As in the baseline models (Table 2), we estimate models by sex and control for observable predetermined covariates. The results are robust to using controls or not (see Table A9).

The disaggregated analyses show discrepancies among household types, thus shedding light on possible background factors associated with joint retirement decision. First, the results confirmed that the age of the spouse matters. In particular, the effect for older spouses (>63 years) was statistically significant and substantial in low-income households (0.180, $p < 0.05$ for women and 0.226, $p < 0.05$ for men) and when the retiree is the primary earner in the household (0.170, $p < 0.05$ for women and 0.265, $p < 0.05$ for men). In other words, older spouses

TABLE 3 The effect of retirement on the spouse's retirement: robustness checks (men as retirees).

	All spouses (1)	Spouse younger than 63 (2)	Spouse older than 63 (3)
1. Baseline estimates			
Estimate	0.067**	0.043*	0.111*
Conventional 95% CI	(0.003, 0.131)	(−0.001, 0.087)	(−0.016, 0.238)
Bias-corrected 95% CI	[−0.014, 0.175]	[0.007, 0.140]	[−0.120, 0.258]
Bandwidth	0.953	1.872	1.063
Observations	102,352	158,279	21,946
2. Using second-order local polynomial on age			
Estimate	0.070*	0.076**	0.073
Conventional 95% CI	(−0.007, 0.148)	(0.004, 0.149)	(−0.113, 0.260)
Bias-corrected 95% CI	[−0.025, 0.187]	[−0.025, 0.185]	[−0.189, 0.293]
Bandwidth	1.503	1.885	1.109
Observations	159,335	159,268	22,876
3. Using uniform kernel			
Estimate	0.068*	0.073	0.093
Conventional 95% CI	(−0.009, 0.145)	(−0.017, 0.164)	(−0.047, 0.234)
Bias-corrected 95% CI	[−0.017, 0.216]	[−0.024, 0.248]	[−0.13, 0.294]
Bandwidth	0.568	0.538	0.805
Observations	62,017	47,435	16,784
4. Excluding couples whose age difference is smaller than 3 months			
Estimate	0.065***	0.045*	0.091
Conventional 95% CI	(0.020, 0.110)	(−0.002, 0.091)	(−0.071, 0.252)
Bias-corrected 95% CI	[0.006, 0.151]	[0.004, 0.145]	[−0.136, 0.340]
Bandwidth	1.548	1.778	0.782
Observations	153,685	143,883	13,838
5. Not using additional controls			
Estimate	0.101***	0.086**	0.102
Conventional 95% CI	(0.033, 0.168)	(0.014, 0.159)	(−0.050, 0.254)
Bias-corrected 95% CI	[0.008, 0.208]	[0.007, 0.222]	[−0.153, 0.296]
Bandwidth	1.012	0.987	0.831
Observations	108,186	85,309	17,368
6. Excluding second-order polynomial control on spouse's age			
Estimate	0.067**	0.042*	0.122**
Conventional 95% CI	(0.004, 0.131)	(−0.001, 0.086)	(0.009, 0.235)
Bias-corrected 95% CI	[−0.013, 0.175]	[0.006, 0.135]	[−0.089, 0.259]
Bandwidth	0.964	1.949	1.290
Observations	103,470	163,845	26,606

Note: The table shows the fuzzy regression discontinuity (RD) estimation results by the retiree's sex and spouse's age (using first-order polynomial on age, triangular kernel, and additional controls). The control variables are spouse's age and age squared, dummies for education level, local unemployment rate, number of children, and number of grandchildren. The procedure described in Calonico et al. (2014a, 2014b) was implemented to determine the optimal bandwidth. Conventional 95% confidence intervals (CIs) are reported in parenthesis, and bias-corrected 95% CIs are in square brackets. The standard errors were clustered at the household level.

*, **, and *** denote conventional statistical significance at $p < 0.10$, $p < 0.05$, and $p < 0.01$, respectively.

TABLE 4 The effect of retirement on the spouse's retirement: robustness checks (women as retirees).

	All spouses (1)	Spouse younger than 63 (2)	Spouse older than 63 (3)
1. Baseline estimates			
Estimate	0.047	0.022	0.077
Conventional 95% CI	(−0.078, 0.173)	(−0.204, 0.249)	(−0.070, 0.224)
Bias-corrected 95% CI	[−0.150, 0.222]	[−0.256, 0.417]	[−0.213, 0.220]
Bandwidth	0.705	0.659	0.765
Observations	37,833	14,683	23,900
2. Using second-order local polynomial on age			
Estimate	0.037	0.064	0.053
Conventional 95% CI	(−0.117, 0.191)	(−0.234, 0.362)	(−0.136, 0.242)
Bias-corrected 95% CI	[−0.134, 0.255]	[−0.265, 0.523]	[−0.228, 0.253]
Bandwidth	1.144	1.000	1.140
Observations	59,864	22,234	34,381
3. Using uniform kernel			
Estimate	0.048	−0.044	0.104*
Conventional 95% CI	(−0.066, 0.162)	(−0.216, 0.127)	(−0.008, 0.215)
Bias-corrected 95% CI	[−0.138, 0.207]	[−0.183, 0.343]	[−0.094, 0.243]
Bandwidth	0.649	0.749	0.983
Observations	34,875	16,751	30,149
4. Excluding couples whose age difference is smaller than 3 months			
Estimate	0.065	−0.005	0.111*
Conventional 95% CI	(−0.067, 0.197)	(−0.204, 0.195)	(−0.015, 0.237)
Bias-corrected 95% CI	[−0.117, 0.273]	[−0.229, 0.368]	[−0.092, 0.280]
Bandwidth	0.683	0.779	1.030
Observations	33,289	15,494	29,218
5. Not using additional controls			
Estimate	0.058	0.026	0.084
Conventional 95% CI	(−0.074, 0.189)	(−0.177, 0.230)	(−0.044, 0.212)
Bias-corrected 95% CI	[−0.205, 0.184]	[−0.199, 0.408]	[−0.149, 0.228]
Bandwidth	0.766	0.759	1.005
Observations	41,023	16,988	30,761
6. Excluding second-order polynomial control on spouse's age			
Estimate	0.048	0.021	0.079
Conventional 95% CI	(−0.077, 0.174)	(−0.204, 0.246)	(−0.067, 0.226)
Bias-corrected 95% CI	[−0.148, 0.223]	[−0.254, 0.414]	[−0.210, 0.222]
Bandwidth	0.704	0.667	0.766
Observations	37,749	14,855	23,900

Note: See notes to Table 3.

TABLE 5 The effect of a partner's retirement on the spouse's retirement by the spouse's age and household type.

	Breadwinner (primary earner)		Household income	
	Men (1)	**Women (2)**	**High (3)**	**Low (4)**
Panel A: Men as retirees				
1. Spouse younger than 63 years				
Estimate	0.084*	0.036	0.064	0.018
Conventional 95% CI	(−0.015, 0.183)	(−0.123, 0.194)	(−0.043, 0.171)	(−0.076, 0.111)
Bias-corrected 95% CI	[−0.008, 0.285]	[−0.198, 0.264]	[−0.040, 0.278]	[−0.132, 0.143]
Bandwidth	0.746	0.798	1.027	0.964
Observations	49,090	17,508	37,626	36,288
2. Spouse older than 63 years				
Estimate	0.170**	−0.138	0.064	0.180**
Conventional 95% CI	(0.018, 0.323)	(−0.483, 0.207)	(−0.150, 0.279)	(0.009, 0.351)
Bias-corrected 95% CI	[−0.084, 0.366]	[−0.760, 0.255]	[−0.199, 0.429]	[−0.101, 0.411]
Bandwidth	0.925	0.863	0.793	1.125
Observations	14,899	4113	7521	9514
Panel B: Women as the retirees				
1. Spouse younger than 63 years				
Estimate	−0.100	0.383	0.010	0.013
Conventional 95% CI	(−0.267, 0.066)	(−0.125, 0.890)	(−0.448, 0.468)	(−0.216, 0.241)
Bias-corrected 95% CI	[−0.374, 0.138]	[−0.246, 1.238]	[−0.586, 0.787]	[−0.295, 0.380]
Bandwidth	1.119	0.754	0.656	0.680
Observations	18,348	4378	6248	6690
2. Spouse older than 63 years				
Estimate	0.009	0.265**	−0.151	0.226**
Conventional 95% CI	(−0.164, 0.182)	(0.025, 0.504)	(−0.426, 0.124)	(0.024, 0.428)
Bias-corrected 95% CI	[−0.294, 0.214]	[−0.113, 0.618]	[−0.746, 0.056]	[−0.028, 0.567]
Bandwidth	0.682	1.187	0.654	0.689
Observations	14,976	10,621	9106	9197

Note: The table shows the fuzzy regression discontinuity (RD) estimation results by the retiree's sex and spouse's age (using first-order polynomial on age, triangular kernel, and additional controls). The control variables are spouse's age and age squared, dummies for education level, local unemployment rate, number of children, and number of grandchildren. The procedure described in Calonico et al. (2014a, 2014b) was implemented to determine the optimal bandwidth. Conventional 95% confidence intervals (CIs) are reported in parenthesis, and bias-corrected 95% CIs are in square brackets. The standard errors were clustered at the household level.

* and ** denote conventional statistical significance at $p < 0.10$ and $p < 0.05$, respectively.

seemed to hold off retirement until their younger partner to become pension eligible. Second, there was a significant response from younger (>63 years) female spouses when the (older) male breadwinner retired (0.084, $p < 0.10$). This suggests that younger female spouses with a male partner as the primary earner advance their retirement timing.

5 | SUMMARY AND DISCUSSION

Research on joint retirement behaviour plays a pivotal role in the development of effective public policies (Bertogg et al., 2021; Blundell et al., 2016; Kruse, 2021). Particularly, when the pension eligibility age aligns with the socially desired minimum retirement age, the phenomenon of advancing joint retirement effects highlights the potential for pension reforms that encourage individuals to retire at a later stage. Moreover, joint retirement behaviour can exacerbate wage disparities between the sexes if it leads to discrepancies in lifetime earnings between men and women. The gendered effects that alter men's relative lifetime earnings compared with women provide a compelling argument for policy interventions.

This study investigates joint retirement in Finland, aiming to explore the variations in joint retirement based on different household characteristics such as household income, the sex of the primary earner, and the age of the spouse. To estimate the causal impact of a partner's retirement on their spouse's retirement probability, the RD method was employed. Specially, the eligibility age for earnings-related pension was utilized as the exogenous threshold in the estimation. Our analysis focuses on working couples in Finland who retired from the private sector, thus contributing to the existing body of research on early retirement. The study draws insights from recent nationwide studies conducted in Denmark (Garcia-Miralles & Leganza, 2021) and Norway (Johnsen et al., 2022) as well as studies utilizing the RD design (Hospido & Zamarro, 2014; Lalive & Parrotta, 2017; Stancanelli, 2017; Stancanelli & Van Soest, 2012).

This study has several notable advantages. First, high-quality nationwide register data were used, allowing for an accurate assessment of retirement sequencing within couples and enabling detailed analyses within specific subgroups. Second, we employed the fuzzy RD model, along with an optimal bandwidth selection method, to estimate the causal effect of pension availability on joint retirement. Third, we enhanced the RD model by incorporating register-based covariates that accounted for important factors such as the local labour market conditions, education level, and household size. This inclusion of covariates strengthens the validity and accuracy of our findings.

Reaching the pension-eligible age of 63 years was found to have a significant effect on an individual's retirement, approximately 15–17 percentage points. This estimate can be compared with studies that employ research designs (age- and reform-based discontinuity designs) that aim for causal inference and use census data drawn from comparable institutional settings. Specially, Garcia-Miralles and Leganza (2021) found that individuals are approximately 20 percentage points more likely to retire upon becoming eligible for early retirement benefits at the age of 60 in Denmark. Their estimate varies by sex: it is approximately 26 percentage points for men and 15 percentage points for women. Similarly, Johnsen et al. (2022), using the difference-in-difference approach based on the pre-reform firm affiliation of individuals, documented approximately 27 percentage points' increase in early retirement for men and 23 percentage points increase for women for the ages 62–66 in Norway.

Our aggregate estimates of the joint retirement effect indicate that the retirement probability of female spouses increased by approximately 7 percentage points when their partner retires. This effect was primarily driven by older female spouses (effect approximately 11 percentage points) who continued working beyond their eligibility age while waiting for their younger male partners to reach the age of eligibility. These estimates can be compared with the Danish data (Garcia-Miralles & Leganza, 2021) where the pooled estimate is 7.5, which was similar for both sexes but larger for older spouses (9.9 percentage points) than for younger spouses

(2.8 percentage points). The data from Norway (Johnsen et al., 2022) based on an early retirement reform that lowered the age requirement from 67 to 62 years in some firms indicated a smaller response (1.7 percentage points), showing statistical significance only among female spouses.

The aggregate analysis was complemented with disaggregated analyses, providing insights for policy discussion. Consistent with the aggregate findings, delayed effects were observed among specific groups. Older men and women in low-income households, as well as older women (men) whose partners were primary earners, were more likely to delay their retirement. The spillover effects that imply an increase in the overall labour supply were substantial, varying from 18.0 percentage points (female spouses) to 22.6 percentage points (male spouses) in low-income households and from 17.0 percentage points (female spouses) to 26.5 percentage points (male spouses). In addition, we found evidence of younger spouses advancing their retirement timing as their partner reached the pension eligibility age. However, this effect (10.9 percentage points) was statistically significant only for women whose partner was the primary earner. Therefore, the spillover effects that could potentially lead to a decrease in the overall labour supply are likely to be modest.

In summary, our analyses provide information on factors associated with joint retirement. Three key results stand out. First, joint retirement is more likely among spouses who are older than 63 years, that is, spouses tend to wait until their partner reaches the retirement age rather than advancing their retirement timing. Second, female spouses are more likely to retire simultaneously with their male partner than male spouses with their female partner. Finally, couples where men are the primary earners are more likely to retire jointly. In essence, our main findings are consistent with earlier research that has documented that spillovers are likely to be more common for female spouses and that the effect sizes are likely to differ by age and household type.

Our RD analyses rely on several assumptions. First, the instrument had to satisfy the relevance assumption. Second, the independence assumption required that the cut-off age not be associated with any factors that could confound the relationship between the partner and spouse. Third, the exclusion restriction is based on the assumption that the cut-off age affects the spouse's retirement solely through a change in their partner's retirement status. To address potential biases, particularly those arising from age correlation between spouses, we divided the study sample by age and employed a fuzzy RD model with additional covariates and conducted several robustness tests. Moreover, we are not aware of any other age-related discontinuities in the Finnish social security system during the 2008–2015 period that could bias our estimations.

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ENDNOTES

[1] See Amparo and van Soest (2022), Bertogg et al. (2021), Garcia-Miralles and Leganza (2021), and Johnsen et al. (2022) for recent updates on empirical research.

[2] The data are used in Statistics Finland's remote access system (FIONA). For more details on the use of data, see https://www.stat.fi/tup/mikroaineistot/aineistot_en.html

[3] Employment restriction means that our sample individuals are less likely to be retired at age 63 than couples without this restriction (58.5% vs. 68%), and they have higher annual earnings (38,000 vs. 32,000 euro), but similar household size (2 children) and education level (20%–21% highly educated).

[4] Due to the progressive tax system (typical marginal rate >50%), incentives for working after retirement are low. For example, among 63-year-old men (women) who were not employed in the current year, only 2.8% (1.6%) were working in the subsequent year.

[5] Due to the panel structure, the data include 115,729 men and 66,851 women. In Finland, the average number of new retirees per year over the period was approximately 71,200, varying from 66,800 (2012) to 77,100 (2009) (Finnish Centre for Pensions, 2022).

[6] Joint shock to earnings is one possible reason for joint retirement, along with leisure complementary and budget constraints. This study accounted for joint shocks to earnings by augmenting the RD model with information on local unemployment.

[7] MSE is the sum of the estimate's leading bias and variance. The leading bias is calculated by comparing the estimate to an alternative estimate calculated with a 1° higher polynomial order than the forcing variable. The smaller the leading bias, the smaller the possible bias from selecting a particular polynomial order.

[8] For brevity, the first-stage estimates are not reported, but they varied between 10 and 23 percentage points. Furthermore, the instruments were strong (*F*-statistic >25) in all models with a significant joint retirement effect.

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APPENDIX A

TABLE A1 Mean values by wife's age: men as retirees.

	Wives of all ages	Wife younger than 63	Wife older than 63
Husband retired (0/1)	0.436	0.399	0.590
Wife retired (0/1)	0.296	0.203	0.685
Husband's age (in years)	62.43	62.00	64.19
Wife's age (in years)	60.46	59.49	64.52
Husband is older than 63 (0/1)	0.377	0.290	0.734
Wife is older than 63 (0/1)	0.193	0	1
Husband's education			
Primary education (0/1)	0.562	0.557	0.586
Secondary education (0/1)	0.222	0.232	0.179
Tertiary education (0/1)	0.216	0.212	0.235
Wife's education			
Primary education (0/1)	0.538	0.526	0.590
Secondary education (0/1)	0.247	0.258	0.197
Tertiary education (0/1)	0.215	0.216	0.213
Number of children	2.067	2.074	2.041
Number of grandchildren	1.143	0.829	1.143
Local unemployment rate	0.116	0.117	0.115
Number of observations	391,915	316,226	75,689

Note: Local unemployment is measured by the municipality's unemployment rate. The data are from the period 2008 to 2015.

TABLE A2 Mean values by husband's age: women as retirees.

	Husbands of all ages	Husband younger than 63	Husband older than 63
Husband retired (0/1)	0.436	0.256	0.671
Wife retired (0/1)	0.396	0.329	0.485
Husband's age (in years)	62.41	60.58	64.81
Wife's age (in years)	61.88	61.17	62.81
Husband is older than 63 (0/1)	0.433	0	1
Wife is older than 63 (0/1)	0.273	0.139	0.449
Husband's education			
Primary education (0/1)	0.559	0.531	0.595
Secondary education (0/1)	0.209	0.234	0.176
Tertiary education (0/1)	0.232	0.235	0.229
Wife's education			
Primary education (0/1)	0.579	0.555	0.610
Secondary education (0/1)	0.222	0.239	0.199
Tertiary education (0/1)	0.199	0.206	0.190
Number of children	1.991	1.992	1.991
Number of grandchildren	0.946	0.849	1.075
Local unemployment rate	0.114	0.114	0.114
Number of observations	208,351	118,094	90,257

Note: Local unemployment is measured by the municipality's unemployment rate. The data are from the period 2008 to 2015.

TABLE A3 Testing for covariate balance: men as retirees.

	Wives of all ages (1)	Wife younger than 63 (2)	Wife older than 63 (3)
Wife is aged 63 or older	0.018	n/a	n/a
(i.e. pension eligible; 0/1)	(−0.054, 0.090)		
	[−0.079, 0.133]		
Husband's education			
Primary education (0/1)	−0.123**	−0.089*	−0.092
	(−0.214, −0.031)	(−0.182, 0.004)	(−0.257, 0.072)
	[−0.310, −0.042]	[−0.328, −0.054]	[−0.363, 0.120]
Secondary education (0/1)	0.021	0.031	0.008
	(−0.024, 0.067)	(−0.025, 0.088)	(−0.083, 0.099)
	[−0.028, 0.124]	[−0.031, 0.155]	[−0.150, 0.141]
Tertiary education (0/1)	0.123**	0.086*	0.071
	(0.033, 0.214)	(−0.006, 0.178)	(−0.061, 0.203)
	[0.029, 0.295]	[0.023, 0.292]	[−0.023, 0.366]
Wife's education			
Primary education (0/1)	−0.089*	−0.084	−0.071
	(−0.183, 0.004)	(−0.184, 0.017)	(−0.235, 0.092)
	[−0.231, 0.044]	[−0.261, 0.035]	[−0.335, 0.146]
Secondary education (0/1)	0.083**	0.098**	0.057
	(0.001, 0.166)	(0.006, 0.190)	(−0.064, 0.179)
	[−0.097, 0.146]	[−0.102, 0.170]	[−0.099, 0.257]
Tertiary education (0/1)	−0.020	−0.046	−0.014
	(−0.057, 0.017)	(−0.107, 0.015)	(−0.117, 0.090)
	[−0.090, 0.021]	[−0.099, 0.094]	[−0.155, 0.170]
Number of children	−0.112	−0.112*	0.080
	(−0.338, 0.114)	(−0.240, 0.015)	(−0.318, 0.479)
	[−0.461, 0.206]	[−0.367, 0.044]	[−0.625, 0.533]
Number of grandchildren	−0.022	0.058	−0.248
	(−0.225, 0.180)	(−0.094, 0.210)	(−0.671, 0.175)
	[−0.389, 0.210]	[−0.218, 0.286]	[−0.873, 0.368]
Local unemployment rate	−0.007*	−0.008**	0.002
	(−0.014, 0.000)	(−0.016, −0.000)	(−0.010, 0.015)
	[−0.013, 0.008]	[−0.020, 0.003]	[−0.013, 0.022]
Number of observations (in total)	391,915	316,226	75,689

Note: The table shows regression discontinuity estimates at the cut-off age of 63 years. Triangular kernel were used. The data are from the period 2008 to 2015. The procedure described in Calonico et al. (2014a, 2014b) was implemented to determine the optimal bandwidth. Conventional 95% confidence intervals (CIs) are reported in parenthesis, and bias-corrected 95% CIs are in square brackets. The standard errors were clustered at the household level.
* and ** denote conventional statistical significance at $p < 0.10$ and $p < 0.05$, respectively.

TABLE A4 Testing for covariate balance: women as retirees.

	Husbands of all ages (1)	**Husband younger than 63 (2)**	**Husband older than 63 (3)**
Husband is aged 63 or older	0.061	n/a	n/a
(i.e. pension eligible; 0/1)	(−0.047, 0.169)		
	[−0.201, 0.119]		
Husband's education			
Primary education (0/1)	0.060	−0.027	0.050
	(−0.114, 0.235)	(−0.177, 0.122)	(−0.116, 0.215)
	[−0.099, 0.413]	[−0.253, 0.231]	[−0.091, 0.398]
Secondary education (0/1)	−0.041	−0.034	0.002
	(−0.149, 0.068)	(−0.155, 0.087)	(−0.099, 0.104)
	[−0.262, 0.060]	[−0.244, 0.150]	[−0.227, 0.079]
Tertiary education (0/1)	0.021	0.059	−0.009
	(−0.107, 0.149)	(−0.076, 0.194)	(−0.145, 0.127)
	[−0.204, 0.175]	[−0.154, 0.281]	[−0.233, 0.168]
Wife's education			
Primary education (0/1)	−0.008	0.033	−0.067
	(−0.166, 0.150)	(−0.157, 0.223)	(−0.225, 0.090)
	[−0.149, 0.316]	[−0.191, 0.374]	[−0.259, 0.207]
Secondary education (0/1)	−0.079	0.019	−0.109
	(−0.199, 0.040)	(−0.141, 0.180)	(−0.250, 0.032)
	[−0.450, −0.095]	[−0.298, 0.182]	[−0.514, −0.099]
Tertiary education (0/1)	0.143**	−0.050	0.111**
	(0.005, 0.282)	(−0.195, 0.095)	(0.001, 0.220)
	[0.016, 0.423]	[−0.251, 0.172]	[0.052, 0.378]
Number of children	−0.169	−0.054	−0.172
	(−0.491, 0.154)	(−0.509, 0.402)	(−0.460, 0.116)
	[−0.645, 0.305]	[−0.825, 0.561]	[−0.673, 0.234]
Number of grandchildren	0.087	0.117	0.065
	(−0.268, 0.442)	(−0.298, 0.533)	(−0.296, 0.425)
	[−0.562, 0.485]	[−0.395, 0.845]	[−0.641, 0.429]
Local unemployment rate	−0.001	0.004	−0.011**
	(−0.015, 0.012)	(−0.013, 0.021)	(−0.020, −0.001)
	[−0.015, 0.024]	[−0.011, 0.039]	[−0.026, 0.002]
Number of observations (in total)	208,351	118,094	90,257

Note: The table shows regression discontinuity estimates at the cut-off age of 63 years. Triangular kernel were used. The data are from the period 2008 to 2015. The procedure described in Calonico et al. (2014a, 2014b) was implemented to determine the optimal bandwidth. Conventional 95% confidence intervals (CIs) are reported in parenthesis, and bias-corrected 95% CIs are in square brackets. The standard errors were clustered at the household level.
* and ** denote conventional statistical significance at $p < 0.10$ and $p < 0.05$, respectively.

TABLE A5 The effect of a partner's retirement on the spouse's retirement by the retiree's sex and spouse's age (*uniform kernel and no controls added*).

	All spouses (1)	**Spouse younger than 63 (2)**	**Spouse older than 63 (3)**
Panel A: Men as retirees			
Estimate	0.102**	0.095**	0.135*
Conventional 95% CI	(0.016, 0.188)	(0.001, 0.189)	(−0.004, 0.274)
Bias-corrected 95% CI	[−0.010, 0.249]	[−0.008, 0.274]	[−0.156, 0.265]
Bandwidth	0.548	0.536	0.837
Observations within bandwidth	59,842	47,187	17,507
First-stage retirement effect	0.175	0.165	0.206
First-stage *F*-statistic	212.67	138.90	80.22
Panel B: Women as retirees			
Estimate	−0.002	−0.027	0.101*
Conventional 95% CI	(−0.171, 0.168)	(−0.170, 0.115)	(−0.009, 0.210)
Bias-corrected 95% CI	[−0.261, 0.248]	[−0.228, 0.209]	[−0.114, 0.236]
Bandwidth	0.440	0.986	1.036
Observations within bandwidth	23,565	21,958	31,624
First-stage retirement effect	0.154	0.171	0.182
First-stage *F*-statistic	59.29	66.31	114.62

Note: The table shows the fuzzy regression discontinuity (RD) estimation results by the retiree's sex and spouse's age (using first-order polynomial on age, uniform kernel, and no additional controls). The procedure described in Calonico et al. (2014a, 2014b) was implemented to determine the optimal bandwidth. Conventional 95% confidence intervals (CIs) are reported in parenthesis, and bias-corrected 95% CIs are in square brackets. The standard errors were clustered at the household level. See Figures 1–3 for the illustration of the results.

* and ** denote conventional statistical significance at $p < 0.10$ and $p < 0.05$, respectively.

TABLE A6 The effect of retirement on the spouse's retirement: sensitivity of the results to bandwidth (men as retirees).

	All spouses (1)	Spouse younger than 63 (2)	Spouse older than 63 (3)
1. Baseline estimates			
Estimate	0.067**	0.043*	0.111*
Conventional 95% CI	(0.003, 0.131)	(−0.001, 0.087)	(−0.016, 0.238)
Bias-corrected 95% CI	[−0.014, 0.175]	[0.007, 0.140]	[−0.120, 0.258]
Bandwidth	0.953	1.872	1.063
Observations	102,352	158,279	21,946
2. BW is 66% of the baseline			
Estimate	0.076*	0.059*	0.086
Conventional 95% CI	(−0.005, 0.157)	(−0.001, 0.118)	(−0.071, 0.242)
Bias-corrected 95% CI	[−0.019, 0.220]	[−0.018, 0.170]	[−0.164, 0.298]
Bandwidth	0.629	1.236	0.701
Observations	68,516	105,443	14,655
3. BW is 150% of the baseline			
Estimate	0.067***	0.038**	0.130**
Conventional 95% CI	(0.021, 0.114)	(0.001, 0.075)	(0.031, 0.230)
Bias-corrected 95% CI	[−0.005, 0.146]	[0.001, 0.103]	[−0.062, 0.245]
Bandwidth	1.430	2.808	1.594
Observations	151,407	230,380	33,028
4. BW can vary by side			
Estimate	0.072*	0.076**	0.090
Conventional 95% CI	(−0.012, 0.156)	(0.001, 0.151)	(−0.058, 0.238)
Bias-corrected 95% CI	[−0.052, 0.196]	[−0.030, 0.197]	[−0.140, 0.296]
Bandwidth left	0.834	1.509	0.685
Bandwidth right	0.516	0.730	0.876
Observations	74,870	105,079	16,886

Note: Bandwidth (BW) is measured in years. Table shows the fuzzy regression discontinuity (RD) estimation results by the retiree's sex and spouse's age. The baseline estimates use the same BW on both sides of the cut-off, 1st order polynomial on age, triangular kernel, and additional controls. The control variables are spouse's age and age squared, dummies for education level, local unemployment rate, number of children, and number of grandchildren. The procedure described in Calonico et al. (2014a, 2014b) was implemented to determine the optimal BW. Conventional 95% confidence intervals (CIs) are reported in parenthesis, and bias-corrected 95% CIs are in square brackets. The standard errors were clustered at the household level. *, **, and *** denote conventional statistical significance at $p < 0.10$, $p < 0.05$, and $p < 0.01$, respectively.

TABLE A7 The effect of retirement on the spouse's retirement: sensitivity of the results to bandwidth (women as retirees).

	All spouses (1)	Spouse younger than 63 (2)	Spouse older than 63 (3)
1. Baseline estimates			
Estimate	0.047	0.022	0.077
Conventional 95% CI	(−0.078, 0.173)	(−0.204, 0.249)	(−0.070, 0.224)
Bias-corrected 95% CI	[−0.150, 0.222]	[−0.256, 0.417]	[−0.213, 0.220]
Bandwidth	0.705	0.659	0.765
Observations	37,833	14,683	23,900
2. BW is 66% of the baseline			
Estimate	0.028	0.051	0.028
Conventional 95% CI	(−0.142, 0.199)	(−0.275, 0.376)	(−0.167, 0.223)
Bias-corrected 95% CI	[−0.171, 0.327]	[−0.349, 0.603]	[−0.268, 0.302]
Bandwidth	0.465	0.435	0.505
Observations	24,944	9584	15,906
3. BW is 150% of the baseline			
Estimate	0.049	−0.029	0.099*
Conventional 95% CI	(−0.046, 0.143)	(−0.196, 0.138)	(−0.013, 0.212)
Bias-corrected 95% CI	[−0.097, 0.188]	[−0.199, 0.301]	[−0.115, 0.229]
Bandwidth	1.057	0.989	1.148
Observations	55,636	21,972	34,583
4. BW can vary by side			
Estimate	0.103	0.174	0.073
Conventional 95% CI	(−0.029, 0.234)	(−0.049, 0.396)	(−0.087, 0.232)
Bias-corrected 95% CI	[−0.045, 0.345]	[−0.117, 0.544]	[−0.181, 0.286]
Bandwidth left	1.589	1.724	0.873
Bandwidth right	0.482	0.493	0.592
Observations	62,288	33,505	22,925

Note: Bandwidth (BW) is measured in years. Table shows the fuzzy regression discontinuity (RD) estimation results by the retiree's sex and spouse's age. The baseline estimates use the same BW on both sides of the cut-off, first-order polynomial on age, triangular kernel, and additional controls. The control variables are spouse's age and age squared, dummies for education level, local unemployment rate, number of children, and number of grandchildren. The procedure described in Calonico et al. (2014a, 2014b) was implemented to determine the optimal BW. Conventional 95% confidence intervals (CIs) are reported in parenthesis, and bias-corrected 95% CIs are in square brackets. The standard errors were clustered at the household level. * and ** denote conventional statistical significance at $p < 0.10$ and $p < 0.05$, respectively.

TABLE A8 The effect of a partner's retirement on the *fake spouse*'s retirement by the retiree's sex and *fake spouse*'s age.

	All fake spouses (1)	Fake spouse younger than 63 (2)	Fake spouse older than 63 (3)
Panel A: Men as retirees			
Estimate	0.028	0.028	0.026
Conventional 95% CI	(−0.074, 0.130)	(−0.040, 0.096)	(−0.139, 0.190)
Bias-corrected 95% CI	[−0.141, 0.159]	[−0.078, 0.123]	[−0.278, 0.201]
Bandwidth	0.621	1.222	0.833
Observations	44,831	68,190	11,883
First-stage retirement effect	0.190	0.206	0.233
First-stage *F*-statistic	160.44	294.69	64.55
Panel B: Women as retirees			
Estimate	0.071	0.047	0.066
Conventional 95% CI	(−0.054, 0.196)	(−0.103, 0.197)	(−0.158, 0.290)
Bias-corrected 95% CI	[−0.144, 0.223]	[−0.151, 0.293]	[−0.252, 0.401]
Bandwidth	0.791	0.954	0.513
Observations	28,353	14,125	10,732
First-stage retirement effect	0.208	0.222	0.178
First-stage *F*-statistic	119.84	67.60	35.20

Note: The table shows the fuzzy regression discontinuity (RD) estimation results by the retiree's sex and fake spouse's age (using first-order polynomial on age, triangular kernel, and additional controls). The fake spouse was randomly selected from all spouses (excluding the real spouse) that have the same age as the real spouse. The control variables are spouse's age and age squared, dummies for education level, local unemployment rate, number of children, and number of grandchildren. The procedure described in Calonico et al. (2014a, 2014b) was implemented to determine the optimal bandwidth. Conventional 95% confidence intervals (CIs) are reported in parenthesis, and bias-corrected 95% CIs are in square brackets. The standard errors were clustered at the household level.

* and ** denote conventional statistical significance at $p < 0.10$ and $p < 0.05$, respectively.

TABLE A9 The effect of a partner's retirement on the spouse's retirement by the spouse's age and household type (*no additional controls*).

	Breadwinner (primary earner)		**Household income**	
	Men (1)	**Women (2)**	**High (3)**	**Low (4)**
Panel A: Men as retirees				
1. Spouse younger than 63 years				
Estimate	0.109**	0.071	0.056	0.069
Conventional 95% CI	(0.008, 0.209)	(−0.099, 0.240)	(−0.061, 0.174)	(−0.037, 0.174)
Bias-corrected 95% CI	[0.001, 0.298]	[−0.196, 0.297]	[−0.040, 0.303]	[−0.077, 0.234]
Bandwidth	0.757	0.743	0.879	0.795
Observations	49,825	16,398	37,789	35,444
2. Spouse older than 63 years				
Estimate	0.179**	−0.143	0.037	0.165**
Conventional 95% CI	(0.013, 0.346)	(−0.508, 0.223)	(−0.172, 0.246)	(0.004, 0.325)
Bias-corrected 95% CI	[−0.098, 0.394]	[−0.754, 0.323]	[−0.245, 0.370]	[−0.083, 0.412]
Bandwidth	0.852	0.807	0.720	1.323
Observations	13,726	3847	7955	12,881
Panel B: Women as the retirees				
1. Spouse younger than 63 years				
Estimate	−0.095	0.326	−0.002	0.029
Conventional 95% CI	(−0.265, 0.074)	(−0.118, 0.769)	(−0.511, 0.508)	(−0.217, 0.276)
Bias-corrected 95% CI	[−0.358, 0.164]	[−0.138, 1.167]	[−0.674, 0.835]	[−0.292, 0.440]
Bandwidth	1.120	0.889	0.615	0.644
Observations	18,390	5132	6904	7135
2. Spouse older than 63 years				
Estimate	0.010	0.264**	−0.127	0.209*
Conventional 95% CI	(−0.161, 0.181)	(0.049, 0.478)	(−0.385, 0.131)	(−0.007, 0.425)
Bias-corrected 95% CI	[−0.329, 0.176]	[−0.062, 0.606]	[−0.648, 0.111]	[−0.011, 0.626]
Bandwidth	0.747	1.372	0.674	0.634
Observations	16,318	12,185	10,497	10,050

Note: The table shows the fuzzy regression discontinuity (RD) estimation results by the retiree's sex and spouse's age (using first-order polynomial on age, triangular kernel, and no additional controls). The procedure described in Calonico et al. (2014a, 2014b) was implemented to determine the optimal bandwidth. Conventional 95% confidence intervals (CIs) are reported in parenthesis, and bias-corrected 95% CIs are in square brackets. The standard errors were clustered at the household level.
* and ** denote conventional statistical significance at $p < 0.10$ and $p < 0.05$, respectively.