

Hans Bloemen, Stefan Hochguertel and Jochem Zweerink

Joint Retirement of Couples
Evidence from a Natural Experiment

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Hans Bloemen^{a,b}, Stefan Hochguertel^a and Jochem Zweerink^a

a VU University Amsterdam, Tinbergen Institute, Netspar

b IZA Bonn

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Abstract

We estimate and explain the impact of early retirement of husbands on the wives' probability to retire within one year, using administrative micro panel data that cover the whole Dutch population. We employ an instrumental variable approach in which retirement choice of husbands is instrumented with eligibility rules for generous early retirement benefits that were temporarily and unexpectedly available. The empirical model explains wives' probability to retire within one year. We find that early retirement opportunity of husbands increased the wives' probability to retire within one year by 25.4 percentage points. This is a strong effect. Our results are robust to several sensitivity tests.

JEL classification: C26, J26, J120, J140

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1. Introduction

Large changes across OECD countries are being observed in terms of labor force participation of older workers and retirement patterns. In particular, older workers retire later. These patterns have partly been ascribed to changes in institutions such as restricted access to early retirement (ER).

Understanding the way individuals make labor supply and retirement decisions is crucial for designing effective policies that are meant to change behavior. Traditional microeconomic retirement models that can guide policy makers in policy and parameter choice typically focus on individual decisions in isolation and study the decision process as a function of age, income, health, wealth, and financial or tax incentives (Gustman and Steinmeier (1986), Berkovec and Stern (1991), Lumsdaine, Stock and Wise (1992) and Rust and Phelan (1997)). As a recent strand of literature has emphasized, however, important spillover effects can plausibly be at work when household labor supply and retirement choices are being considered because spousal decisions depend on each other in various ways. Ignoring such effects may have direct implications for the evaluation of policy measures (Blau and Gilleskie (2006) and Van der Klaauw and Wolpin (2008)).

Reverse causality typically makes it challenging to identify the effect of, say, the husband's retirement choice on the labor market status of the wife using observational data, since both spouses' labor supply choices may be linked directly and indirectly through both observables and correlated unobservables, or shocks. Using Dutch administrative micro data and relying on identification through a quasi-natural experiment, we find robust evidence for important spillovers from husbands' retirement decisions on their wives' retirement status emanating from husbands' changed financial incentives to retire early.

The policy change that we exploit became effective in 2005 for certain birth cohorts of civil servants employed for more than ten years by the Dutch central government. These individuals were offered the opportunity to retire during the year 2005, by a temporary reduction of the ER eligibility age. For our empirical work, we focus on dual-earner couples in which the husband does and the wife does not work in the public sector, such as to rule out coincidental treatment of wives through the same reform.¹

¹ We do not estimate the effect of retirement of the wife on retirement status of the husband because of a lack of observations. There are too few wives induced to retire by the introduction of the early retirement arrangement we use. This may have to do with the fact that labor market attachment of women in the Netherlands is not uniformly strong.

The wife's probability to retire is the dependent variable in our model. We employ the mentioned policy change as an instrument for husband's retirement status, and control for both observable characteristics and unobservables. We use an individual fixed effects specification for the latter. Fixed effects also control non-parametrically for cohort effects that may arguably be important. In addition, we control for year fixed effects and nonlinear age effects. Since couples are stable dyads in our sample, we thus identify an effect over and above fixed differences in ages.

According to our central estimates, retirement of male civil servants led to a jump in the probability of their wives to retire within one year by 25.4 percentage points. This is a large effect, given that wives pursue their own careers and have a strong labor market attachment and a sector affiliation of at least 10 consecutive years. Further investigation reveals the effect to be driven by observations on couples with a husband aged 60 and a wife aged 59 or 60. This suggests that the interaction between the ER arrangement for civil servants and private sector ER may play an important role in retirement decisions of couples.

There are two related literatures that our work speaks to. One focuses on joint retirement using structural models. These models assume that husbands and wives make separate retirement decisions and have their own preferences. Appropriate modelling of the relevant financial incentives and suitable parameterization of individual preferences are some of the main challenges in this literature. Papers such as Blau and Gilleskie (2006) and Van der Klaauw and Wolpin (2008) carefully model the incentives provided by social security rules, and specify stochastic processes for wages, health and survival. The main effect of husbands on wives' retirement choices runs through the household budget constraint in those papers. The household budget constraint is not the only channel inducing dependence, however. Spouses enjoy spending time together, i.e. there are leisure complementarities in preferences. Gustman and Steinmeier (2000) study leisure complementarities assuming that there is no uncertainty. They find that spouses coordinate retirement decisions and that coordination of retirement decisions is motivated by leisure complementarities rather than financial incentives provided by the household budget constraint. Casanova Rivas (2010) does take into account uncertainty regarding future income, health and survival. In line with Gustman and Steinmeier (2000), she finds that leisure complementarities are present and account for up to eight percent of observed joint retirements.

We directly contribute to a second strand of very recent empirical literature that estimates the effect of retirement of one partner on retirement status of the spouse. The identification methods used in this literature do not rely on distributional assumptions, but rather on exogenous sources of variation in the retirement rates. Hospido and Zamarro (2013), Banks, Blundell and Casanova Rivas (2010) and Goux, Maurin and Petrongolo (2011) are the survey data studies most comparable to ours. All of them find that spousal decisions can be influenced by retirement shifts of their partners.

Our first contribution is to use strong instruments that provide exogenous (unanticipated) variation in retirement rates of husbands, as explained above. Second, we use administrative data at annual frequency that include end dates of jobs and that allow us to observe the precise within-couple sequencing of retirement. This is critical in order to rule out that our estimates are influenced by behavior of wives that actually retire earlier than their husbands. The latter effect cannot be ruled out in other studies that are based on biennial survey data, posing a potential threat to identification. Third, as we have access to data covering the entire population, we can focus on a sample of particular interest, namely individuals from a very narrow age range where we can (to some degree) control for historical labor market attachment.

The rest of the paper is set up as follows. Section 2 reviews the literature and Section 3 describes the institutional environment, including the policy change that we exploit. Section 4 explains and describes the data. Section 5 delineates the identification strategy we use for estimating the causal effect of husband's retirement on wife's retirement. Section 6 discusses the results and Section 7 concludes.

2. Literature review

Hospido and Zamarro (2013) employ a fuzzy Regression Discontinuity design using the eligibility age for early retirement benefits as discontinuity in the probability to retire. They use data from the Survey on Health, Ageing and Retirement in Europe (SHARE) covering eleven European countries and find that induced retirement of husbands increases the probability that their wives retire in the same two-year interval between survey waves by 16-18 percentage points. Banks, Blundell and Casanova Rivas (2010) employ a before-after difference-in-difference approach, exploiting the difference in eligibility age for public pensions between the UK and US as a source of variation on retirement status. They use data from the 2002 and 2004 waves of the Health and Retirement Study (HRS) for the US and from the

English Longitudinal Study of Ageing (ELSA) for the UK. The eligibility age for public pensions was 62 in the US and 60 in the UK. American husbands whose wives turned 60 during the time between the two survey waves form the control group and the treatment group consists of British husbands whose wives turned 60 during the time between the two survey waves. They find that men in the UK are 14-20 percentage points more likely to retire when their wife reaches state pension age than comparable men in the US. They find a similar effect after employing instrumental variable estimation, using the state pension age as a source of exogenous variation for retirement status of the wife.

Stancanelli (2012) employs a fuzzy Regression Discontinuity design, using age 60, the youngest early retirement age in France, as the discontinuity in the probability to retire. She uses data from the French Labour Force Surveys (LFS). She finds a positive effect of retirement on the partner's hours worked, both for male and female partners. Goux, Maurin and Petrongolo (2011) employ an instrumental variables approach, using an hours worked reduction per working week in large firms in France as a source of exogenous variation in the retirement probability. They combine individual level data from the French LFS with firm level information on the implementation of the shorter workweek from the French "DARES-URSSAF" dataset. They find that men reduce their working hours if their wives reduce working hours. They find no effect of a reduction in working hours of the husband on working hours of the wife.

Zweimueller, Winter-Ebmer and Falkinger (1996) estimate a bivariate probit model, where the dependent variables are the retirement statuses of the husband and the wife. The retirement status of each of the partners depends on the social security variables applicable to him- or herself and on the social security variables applicable to the partner. Using data from the Austrian Microcensus, the authors find that husbands respond to a change in the minimum retirement age of their wives whereas wives do not respond to a change in minimum retirement age of their husbands. Baker (2002) estimates the effect of a decrease in the eligibility age for age-related income security benefits for spouses in Canada on labor force participation of workers. He uses data from the Canadian Survey of Consumer Finances. The author finds that eligibility for the age-related benefits is associated with a six to seven percentage point decrease in labor force participation of men.² He does not find an association between eligibility for the age related benefits and labor force participation for women.

² This is the effect for men whose wives have reached the eligibility age for age related income security benefits for spouses.

3. Institutional background and policy change

We study the case of the Netherlands. We exploit temporary age-specific retirement incentives for civil servants as a source of exogenous variation in retirement rates. At the time of the policy change, the normal retirement age was 65, for both men and women. Actual retirement ages have been substantially lower, due to the use of early retirement arrangements being widespread in almost all sectors.³ The average age at which workers aged 55 and older retired in 2005 was 61 for both men and women (Statistics Netherlands, 2014).

The Netherlands has a pension system that rests on three pillars (Bovenberg and Meijdam, 2001). The first pillar consists of universal flat-rate benefit public old-age pensions, financed on a pay-as-you-go basis. The second pillar concerns occupational pensions. These are funded. Coverage rates are in the order of magnitude of 90% for employees. The third pillar includes private provisions. We study the period 2000-2005, with special attention for 2005, i.e. the year of the policy change we exploit. During the period we study, most occupational pension funds offered early retirement arrangements. So did the public sector pension fund. Its early retirement arrangements typically offered retirement as of the ages 61 or 62 onwards. We exploit a temporary decrease in the ER eligibility age for civil servants as a source of exogenous variation in husbands' retirement probability to estimate the impact of early retirement of husbands on their wives' probability to retire within one year.

The Dutch central government announced a temporary decrease in ER eligibility age for its workers in April 2004. This decrease is referred to as 'the early retirement window' in the remainder of this paper. As a part of a reorganization of the central government, certain civil servants employed at central government organizations were allowed to be offered possibilities for early retirement in the year 2005 at lower than common ages. Central government organizations only had permission to offer early retirement if this would save existing jobs of younger civil servants at the level of the organization.⁴ In practice, each of the central government organizations offered early retirement collectively to its eligible workers, so to either all or none of them (Dutch Government, 2004). This aspect prevents that the early retirement window is targeted at workers whose wives have a relatively low or high probability to retire

³ A detailed description of the Dutch pension system and early retirement arrangements specifically available to civil servants can be found in the Appendix.

⁴ Saving existing jobs refers to preventing forced layoff due to reorganization.

in the year to come.⁵ The gross retirement benefits offered by the early retirement window were equally generous as those associated with regular ER programs and could be up to 70 percent of workers' average wage.⁶

Civil servants could only enter the early retirement window if they satisfied several eligibility criteria (Dutch Government, 2004, 2005). First, civil servants had to be aged 55 or older on the day of early retirement. Second and third, they were required to have had a continuous employment tenure as a civil servant of at least ten years prior to early retirement and to have contributed to the public sector pension fund continuously during the ten years prior to early retirement.⁷ The second and third requirement are important for our identification strategy, because they prevent self-selection into the public sector of workers who would plan to retire early. Central government employers had to decide before 1 January 2005 whether to open the early retirement window and entering civil servants had to retire on or before 1 December 2005. The early retirement window offered early retirement benefits to workers until they reached the age of 65 and with a duration of no longer than eight years. This implies that civil servants aged 57 or older at the day of early retirement were entitled to retirement benefits for the full period until their normal retirement at age 65. Civil servants who were born before 1 January 1948 could let the employer pay for 50 percent of the pension accrual for at most four years. The early retirement window thus provided strong incentives to retire for civil servants aged 58 or older,⁸ slightly weaker incentives to retire for civil servants aged 57 and much weaker incentives to retire for civil servants aged 55 or 56.

⁵ If early retirement would have been offered to workers individually, employers may have offered early retirement only to ill health workers or workers with a low productivity due to having a poor health. This might bias the estimate of the treatment effect of interest upwards.

⁶ The average wage refers to the average wage earned during working life. The replacement rate depended among others on the birth date of an individual. The early retirement window was not actuarially fair, but rather quite advantageous for the worker.

⁷ Interruption of employment and pension contribution of at most two months was allowed, although interruption of employment and pension contribution in the half year prior to early retirement would have led to loss of eligibility.

⁸ The early retirement window offer was "an offer they could not refuse" for workers aged 57 and older.

4. Data

We use administrative data collected and prepared for research purposes by Statistics Netherlands. The data cover the period 1999-2008 and include variables on job and personal characteristics.⁹ The job characteristics data provide information on all jobs any individual has been employed in during 1999-2005. The job information includes start and end date, the industry code and the annual wage. The personal characteristics data contain information on demographic characteristics for the whole Dutch population. The demographic characteristics include nationality, marital status, birth year and birth month. The personal characteristics data also include a partner identifier that allows us to link partners to each other.

For our analysis we select observations on different-sex couples for which both members aged 53-60 during 2000-2005.¹⁰ We exclude observations on couples that include at least one individual without a Dutch citizenship during 2000-2005. We also exclude observations for which either husband or wife has not been continuously employed for the ten years prior to January 1st of the year of observation. We make this selection for the following reasons. First, for wives, because having been employed continuously for the ten years prior to the year of observation ensures that the wife has a strong labor market attachment. Second, for husbands, because one of the eligibility criteria for entering the early retirement window for civil servants is that civil servants have been continuously employed as a civil servant for the ten years prior to early retirement. For the same reason, observations on husbands who switched between the public sector and any other sector are excluded from the analysis as well. Observations on couples that include at least one worker who died in 2000-2005 or stayed in the hospital somewhere between 1998 and the final year of observation are also excluded from our analysis. By making this selection we aim to limit the endogeneity of retirement status of wives and husbands to health. We also drop observations for the years after the year in which at least one

⁹ The original file names are *Doodsoorzaken (2000-2005)*, *Landelijke Medische Registratie (LMR, 1998-2004)*, *SSB Banen (1999-2008)*, *SSB Personen (2000-2005)* and *PARTNERBUS (2010)*. Unfortunately, for the years we are interested in, there are no data available on e.g. financial wealth.

¹⁰ We do not use the observations for 1999, because we need the 1999 observations to generate one-year lagged wage income and one-year lagged wage income of the partner in 2000. We use observations on couples who are married or have a registered partnership. Registered partnership refers to partnerships enjoying legal status similar to marriage. Being married excludes cohabitation without being married or without having a registered partnership.

member of the couple has retired.¹¹ We use about 4,500 observations on couples for which the husband worked as a civil servant.

Table 1 shows descriptive statistics for couples that include a husband who is a civil servant. Age of the wife and age of the husband are measured on December 31st of the respective year. Wage income of the wife and wage income of the husband (at $t-1$) indicate the total wage income a worker and her husband earned in the year prior to the year of observation. The income variables are measured in thousands of deflated euros.

The control group in our instrumental variable model includes wives whose husband is a civil servant aged 53-54 in 2005, i.e. wives with a husband who could not be offered early retirement. The treatment group includes wives with a husband who is a civil servant aged 55-60 in 2005, i.e. women partnered with those civil servants who could be offered early retirement. Table 1 shows that wives in the control group have a similar lagged wage income as wives in the treatment group. Wage income for husbands and wives is also similar for the treatment group as for similarly selected couples in the years before the early retirement window was opened. For the external validity of our study, it is important to notice that couples that include a husband who is a civil servant are in general comparable, in terms of observables, to couples that include a husband who is employed outside the public sector.¹²

The early retirement window was opened for civil servants employed by the central government. We use an industry code to identify civil servants employed by the central government. However, groups of civil servants not employed by the central government have the same industry code as civil servants employed by the central government. Hence, when we refer to civil servants, we in fact refer to civil servants employed by the central government plus some groups of other civil servants who were not eligible for entering the early retirement window. Another data issue concerns the lack of data on early retirement window offers. Because we do not observe to which civil servants the early retirement window was offered, we cannot observe whether a civil servant who does not retire rejected the early retirement offer or simply was not offered the early retirement window. This implies that the

¹¹ We define retirement as leaving the job without entering any new job afterwards. We discuss this in more detail later in this section.

¹² The husbands employed outside the public sector are selected in a similar way (tenure in industry) as the husbands employed as a civil servant.

“treatment” group as observed in our data is somewhat larger than the “true” treatment group.¹³ Important to notice is that the early retirement window was offered to workers in departments or organizations within the central government collectively rather than to individual workers. This makes it unlikely that there was selection in offering the early retirement window to workers. The final data imperfection is the absence of data on whether individuals receive retirement benefits. We cope with this issue by basing our definition of retirement on whether a worker has left his or her job and has not entered another job afterwards but before January 1st, 2009.

A remaining important concern is that if spouses retire in the same year, but wives retire earlier than their husbands, this may be considered as wives being induced to retire by retirement of their husbands. To prevent this, we define retirement status in the following way. We define retirement as having quit a job and not having worked in any other job after, but before January 1st, 2009. However, if spouses retire in the same year, but the wife retires before the husband, we consider the husband to have continued working rather than having retired in this year.¹⁴ If the husband retires in a particular year, and the wife retires within 365 days after the husband, we consider the wife as having retired in the same calendar year.

5. Methodology

We employ an instrumental variable approach to estimate the impact of early retirement of the husband on retirement status of the wife. We instrument the retirement choice of the husband using dummy variables for the ages at which husbands were eligible for entering the early retirement window interacted with a dummy variable for the year 2005, i.e. the year of the policy change.¹⁵ We estimate our model using only observations on wives employed outside the public sector who have a husband who is a civil servant. We use wives whose husband is aged 53 or 54 in 2005 as the control group and wives whose husband is aged 55-60 in 2005 as the treatment group. The model controls for time-invariant heterogeneity. The treatment effect we estimate is a Local Average Treatment Effect (LATE), i.e. the effect of early retirement of the husband on the wife’s probability to retire within one year for those couples for whom the husband was induced to retire early by variation in the eligibility conditions.

¹³ We do not know how much smaller the “true” treatment group is than the observed treatment group.

¹⁴ If at least one member of the couple retires in a year, we will use no observations for this couple in later years.

¹⁵ Bloemen, Hochguertel and Zweerink (2013) employ a similar identification strategy to estimate the effect of retirement on the probability to die within five years.

5.1 Instrument validity

The validity of our instruments hinges on the satisfaction of two conditions. First, the instruments have an impact on the probability that husbands retire. Second, the instruments do not correlate with unobserved factors having an impact on the probability that wives retire. We use dummies for eligibility for retirement benefits for husbands due to the opening of the early retirement window for civil servants in 2005 as instruments for husband's retirement status.

Figure 1 shows retirement rates for husbands who are civil servant. Husbands aged 56-60 have higher retirement rates in 2005 than in earlier years. The difference in retirement rates between 2005 and earlier years is especially large for husbands aged 58-60. Husbands aged 53-54 have similar retirement rates in 2005 as in earlier years. This is all in line with the age-specific incentives as provided by the temporary decrease in eligibility age in early retirement benefits, as discussed in Section 3. This supports our hypothesis that our instruments are relevant.¹⁶

To our knowledge, there were in 2005 no similar early retirement windows in sectors other than the public sector. We thus do not expect the opening of the early retirement window to have had a direct impact on the probability that the wives of the male civil servants retire. We are also not aware of any event other than the opening of the early retirement window, that may have affected the probability to retire for husbands being civil servant and aged 55-60 in 2005. We expect that our instruments are not correlated with unobserved factors that influenced wives' probability to retire.¹⁷ Wives' unobserved health, number of hours worked or stress levels associated with work are among the unobserved factors that may have influenced wives' probability to retire. Correlation due to anticipation of the opening of the early retirement window is not expected to be an issue. This is because the opening of the early retirement window was only announced by the government in April 2004 and central government employers only decided after that time whether and to whom they would actually open the early retirement window. We also do not expect selection into public sector jobs by husbands or wives after the announcement of the opening of the early retirement window to be an issue. The reason for this is that eligibility for the early retirement window required individuals to have been employed as a civil

¹⁶ The Appendix describes pension related policy changes in the period around the introduction of the early retirement arrangement we exploit, and discusses its possible effects on retirement rates.

¹⁷ Wives were employed outside the public sector.

servant continuously for the ten years prior to early retirement and to have contributed to the public sector pension fund during the ten years prior to early retirement.

Another possible threat to the exogeneity of our instruments is that factors other than the opening of the early retirement window may have boosted retirement rates for civil servants in 2005. Changes in disability insurance may, for instance, have affected retirement rates of civil servants.¹⁸ Figure 2 shows that retirement rates for husbands aged 55-60 employed outside the public sector were not higher in 2005 than in other years. This indicates that factors affecting retirement rates of all husbands aged 55-60 were not responsible for the increase in retirement rates of husbands employed as a civil servant aged 55-60 in 2005. It could also be that retirement rates for wives whose husband is aged 55-60 were higher in 2005 than in earlier years, irrespective of the sector the husband was employed in. The introduction of a policy that provides wives with an incentive to retire if the husband is aged 55-60, for instance, may have caused such a deviation. Figure 3 shows that retirement rates for wives employed outside the public sector whose husband is aged 55-60 and also employed outside the public sector were not higher in 2005 than in earlier years.

Figure 4 shows retirement rates for wives by husbands' age and birth cohort when the husband is a civil servant. Wives' retirement rates show a clear jump for husbands aged 60 in 2005, though there is no such jump present for wives with younger husbands in 2005. This may suggest that if we find an effect of retirement of the husband on retirement status of the wife, this effect may be driven by wives who have a husband aged 60 in 2005. The wives who retired in 2005 and have a husband aged 60 in 2005, are all 59 or 60 years old. Especially the wives aged 60 in 2005 may have been eligible for regular early retirement benefits. This could explain why they retired, though wives of younger husbands, who were on average also younger themselves, may not have retired in 2005.

5.2 Model specification

We employ a two-stage-least-squares fixed effects instrumental variable model to estimate the LATE. In the first stage, retirement status of the husband is estimated and in the second stage, the impact of predicted retirement of the husband on the wife's probability to retire is estimated. As we use a fixed effects model, our model has the advantage that it controls for effects of time-invariant individual

¹⁸ Disability insurance and its relation to early retirement are discussed in the Appendix. Disability insurance is a universal social insurance scheme and not sector-specific.

characteristics and allows individual fixed effects and observed characteristics to be correlated with each other. We control for year effects and for differences in wife's and husband's probability to retire across age. We specify the first stage of our model as follows:

$$(1) \quad H_{it} = e_0 + \sum_{j=2000}^{j=2004} b_j D_{jt} + \sum_{k=2}^{k=3} c_k A_{kit} + \sum_{k=2}^{k=3} c_{kp} A_{kitp} + \sum_{l=55}^{l=60} d_{05lp} D_{05,t} E_{lit} + g'_{it-1} m + e_i + v_{it}$$

where H_{it} is a dummy that is 1 if the husband of couple i is aged 55 or older in year t and the husband of couple i retired in year t . H_{it} is 0 otherwise. D_{jt} is a year dummy that is 1 in year j and 0 otherwise. A_{kit} (A_{kitp}) denotes the difference between the age of the wife (husband) in couple i in year t and 53, taken to the k th power.¹⁹ E_{lit} is an age dummy that is 1 if the husband in couple i reaches age l in year t and 0 otherwise. g_{it-1} includes one-year lagged wage income of the wife and one-year lagged wage income of the husband. v_{it} is an error term. e_i is an individual fixed effect that is allowed to be arbitrarily correlated with all covariates.

The second stage is specified as follows:

$$(2) \quad W_{it} = \alpha_0 + \sum_{j=2000}^{j=2004} \gamma_j D_{jt} + \sum_{k=2}^{k=3} \delta_k A_{kit} + \sum_{k=2}^{k=3} \delta_{kp} A_{kitp} + g'_{it-1} \varphi + \omega \hat{H}_{it} + \alpha_i + u_{it}$$

where W_{it} is a dummy that is 1 if the wife in couple i retires in year t and 0 otherwise. ω indicates the LATE. α_i is allowed to be correlated with all covariates. α_i and e_i are also allowed to be correlated. u_{it} and v_{it} are allowed to be correlated.

6. Results

6.1 The uninstrumented case

We shall instrument retirement status of the husband because of the potential endogeneity of retirement status of the husband to the retirement status of the wife. For comparison, Table 2 shows the coefficient estimates on retirement status of the husband H_{it} for the specification (2) for the case in which retirement status H_{it} is not instrumented. The coefficient estimate on retirement status of the husband is insignificant at the ten percent significance level. If retirement status of the husband would be exogenous to retirement status of the wife, the coefficient estimate on retirement status of the

¹⁹ We do not include A_{1it} and/or A_{1itp} in our models. Including A_{1it} and/or A_{1itp} is not possible due to multicollinearity caused by the presence of the year dummies.

husband in the fixed effects model without instruments would be similar to the one in the instrumental variable model with fixed effects.

6.2 *Instrumental variable estimates*

Table 3 shows the instrumental variable fixed effects estimates.²⁰ The estimates show that retirement of husbands induced by the early retirement window increased their wives' probability to retire within one year by 25.4 percentage points. This effect is significant at the five percent significance level. The effect is slightly larger than the effects found by Hospido and Zamarro (2013) and Banks, Blundell and Casanova Rivas (2010). Hospido and Zamarro (2013) and Banks, Blundell and Casanova Rivas (2010) find a positive effect of 16-18 percentage points and 14-20 percentage points of retirement of the husband on wives' probability to retire within the same two-year time interval.

The *F* statistics in the first stage show that our instruments are relevant at the one percent significance level. The coefficients on the instruments in the first stage are positive, indicating that the opening of the early retirement window did induce eligible male civil servants to retire.

6.3 *Robustness checks*

Age dummies and nonlinear age and year terms

Our statements concerning the probability to retire are to be understood conditional on age and age of the husband. Age is an important determinant of retirement status of the wife, so is age of the husband an important determinant of retirement status of the husband. This may make our result sensitive to the way age and age of the husband enter our model. We control for second and third order age and husband's age effects in our instrumental variable model. This baseline estimate is redisplayed as variation a in Table 4. As a robustness check, we estimate the instrumental variable model once controlling for second order age and husband's age effects only and once controlling for a fourth-degree polynomial in husband's age. Table 4 shows that the LATE estimates for the alternative models are similar to the LATE estimate for the baseline model. This indicates that our instrumental variable result is robust to controlling for age and husband's age effects of one order lower or one order higher (variations b and c). Our instrumental variable result is robust to controlling for age and husband's age

²⁰ Table 6 shows the first and second stage estimates.

fixed effects rather than nonlinear age effects (variation d) and non-linear year effects rather than year fixed effects (variation e) as well.²¹

Extended control group: workers aged 52-54 in 2005

Given the selection of our dataset, the control group consists of wives with a husband who is either 53 or 54 in 2005. Because we use fixed effects models, the control group effectively consists of wives who have a husband who is aged 54 in 2005 only. We include observations on wives and husbands aged 52 for all years and extend our control group to wives who have a husband aged 52-54 in 2005 to verify whether our result is not driven by particular characteristics of either male civil servants aged 54 in 2005, or their wives' characteristics. Table 4, variation f, shows that our result is robust to including wives and husbands aged 52 in our dataset.

Extended dataset: hospitalized workers

Ill-health workers may have a higher probability to retire early than healthy workers. We have tried to limit bias due to the potential endogeneity of retirement status to health by dropping observations on workers who have not been hospitalized between 1998 and retirement. We can verify how sensitive our result is to initial health status by estimating the instrumental variable models using observations on workers who have been hospitalized between 1998 and retirement and those who have not been hospitalized between 1998 and retirement. Table 4, variation g, shows that the LATE estimated using observations on hospitalized workers only is much smaller in magnitude than the LATE estimated using observations on nonhospitalized workers only. The intuition for this finding is that previously hospitalized husbands are induced to retire by health problems rather than financial incentives compared to husbands who were not hospitalized before. Similarly, previously hospitalized wives are induced to retire by health problems rather than by retirement of their husband. Because the number of observations on nonhospitalized civil servants is small, the LATE estimates based on observations of hospitalized and nonhospitalized workers differ only slightly from the LATE based on observations of nonhospitalized workers only (variation h).

²¹ Husbands'/wives' age fixed effects enter the model through husbands'/wives' age dummies and the non-linear year effects are controlled for in the model by including the terms $(year - 1999)^2$ and $(year - 1999)^3$.

Extended dataset: workers employed outside the public sector

The dataset used for the estimation of the LATE consists of observations on wives with a husband who is civil servant only. Our result may depend on civil servant-specific retirement rates of husbands across age and years. As a robustness check, we estimate a modified version of the model using data on wives with husbands who are either civil servant or employed outside the public sector. The model we estimate is the model specified in (1) and (2), except that the instruments, i.e. the interactions between the dummy for the year 2005 and the dummies for the ages 55-60, are multiplied by a dummy for being a civil servant. Table 4, variation i, shows that our LATE estimate is robust to correcting for civil servant specific retirement patterns.

Individual effects: random effects and no individual effects

We also estimate the instrumental variable models with individual random effects (RE); variation in estimates may point to individual effects being correlated with covariates. We estimate the RE instrumental variable model using the baseline specification as in (1) and (2). Table 4, variation j, shows that the LATE estimated using the RE model is significant at the five percent level and that it is slightly smaller than the LATE estimated using the FE model.²² The difference between the fixed effects and random effects LATE estimate indicates that individual effects are correlated with at least some covariates. Individual effects may, for instance, be correlated with lagged wage income. Wives or their husbands with a higher wage income in the previous year may have time-invariant characteristics that make them more or less likely to retire. As individual effects and at least some covariates are correlated, the instrumental variable model with individual fixed effects is preferred over the instrumental variable model with random effects. Lastly, we estimate the instrumental variable model without individual effects to verify how sensitive our result is to not controlling for unobserved heterogeneity. Table 4, variation k, shows that the LATE estimate without individual fixed effects is a bit smaller than the one with individual fixed effects, but stays significant at the conventional five percent level. Interestingly, the effect is similar to the effect found by Hospido and Zamarro (2013) and Banks, Blundell and Casanova Rivas (2010), who also do not control for unobserved heterogeneity.

²² Performing a Hausman test on the differences between coefficient estimates in the random effects and fixed effects model tells us that the differences between coefficient estimates in the two models are significant at the one percent significance level.

Placebo treatment effects

We have estimated placebo treatment effects to check whether the treatment effects we find might be spurious. We estimate effects for placebo treatments in any of the years 2000-2004. Six instruments are used. These instruments are the interactions between the dummy for the placebo treatment year and the dummy for every age of the husband in the age range 55-60. Table 5 shows that the placebo LATE is insignificant at the ten percent level for all years, except 2004. The placebo LATE for the year 2004 could simply be significant at the ten percent level due to chance. By chance, we would expect placebo LATEs to be significant at the ten percent level in ten percent of the cases if we would estimate a large number of placebo LATEs. We find that the placebo LATEs are significant in one out of five times, i.e. in 20 percent of the times. This is not a large deviation from the expected ten percent given the small number of LATEs estimated.

7. Conclusions

This paper has studied the effect of induced retirement of the husband on retirement status of the wife. The population we studied includes couples with wives who have a strong labor force attachment. We benefited from having administrative data from the Netherlands and having a strong and exogenous source of variation in retirement status of the husband to our disposal. We have found that induced retirement of husbands increases the probability that the wife retires within one year by 25.4 percentage points. This result, which is robust, indicates that the temporary decrease of the eligibility age for early retirement benefits had strong spillovers to their spouse for male civil servants. The effect was driven by husbands aged 60 who had a wife aged 59 or 60. This is interesting, because in sectors other than the public sector, age 60 was a common eligibility age for early retirement benefits. Interactions between the early retirement window under review and regular early retirement arrangements in other sectors may thus play a role in the couples' decision to retire. This is relevant, also when considering the spillovers of the introduction of age specific retirement incentives to retirement status of spouses in contexts and countries other than the ones currently studied.

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Appendix²³

The Dutch pension system

The Dutch pension system rests on three pillars (Bovenberg and Meijdam, 2001). The first pillar is the public old-age pension. The public old-age pension is financed on a pay-as-you-go basis.

Contributions stem from workers and employers. All residents registered in the Netherlands accrue public old-age pension rights. Public old-age pension benefits are flat. For couples they equal the minimum wage. Singles receive 70 percent of the minimum wage. For every year between the ages 15 and 65 that an individual did not reside in the Netherlands, public old-age benefits are cut by two percentage points. The second pillar consists of occupational pensions. Occupational pensions are funded pensions and are generally managed on the sector level.²⁴ About 90 percent of the workers participate in an occupational pension plan. Occupational pension schemes receive contributions from workers and employers. Workers who participate in a pension plan pay contributions over the difference between their wage and a nominal threshold called the “franchise”. As every firm or sector has its own pension plan and pension conditions, there is a large heterogeneity among occupational pensions. At the time at which the early retirement window under review was opened, there was also a large heterogeneity in early retirement arrangements. The third pillar consists of private provisions. Private provisions include amongst others annuity insurance.

Regular early retirement arrangements for civil servants

As of April 1st, 1997, early retirement benefits for civil servants consisted of two parts. The first part was in general 70 percent of the “franchise” for civil servants who had worked full-time during their working life.²⁵ The first part intended to compensate early retirees for the lack of old-age pension benefits for the period between early retirement and normal retirement. Civil servants were eligible for the first part if they satisfied two conditions. First, they had to have been employed as a civil servant continuously during the ten years prior to early retirement. Second, they had to have contributed continuously to the public pension fund during the ten years preceding early retirement. The first part of early retirement benefits was in general higher when a civil servant retired at a later age. The first part was financed on a pay-as-you-go-basis. Workers and employers contributed to the early retirement benefit scheme. Part

²³ The Appendix is obtained from Bloemen, Hochguertel and Zweerink (2013).

²⁴ Various large employers have their own pension fund.

²⁵ This replacement rate is based on retirement at the ER eligibility age. The ER eligibility age depends on the birth date of an individual.

two of early retirement benefits was funded. Workers and employers contributed to the accrual of benefits in the second part. When a civil servant would have accrued benefits for 40 years, the sum of the first and second part would have been 70 percent of the final wage.²⁶ The replacement rate was reduced by 1.75 percentage points for every year a civil servant would have accrued benefits less than 40 years. Civil servants were allowed to do paid work after early retirement. However, total income of a retired civil servant was not allowed to exceed 100 percent of the final gross wage.²⁷ Otherwise, early retirement benefits were cut to bring the total income earned on 100 percent of the final gross wage (means test).

Other policy changes

On January 1st, 2004, the public sector pension fund switched from a final wage pension system to an average wage pension system.²⁸ However, due to a transition arrangement, civil servants born before January 1st, 1954 were hardly affected by the switch.

On January 1st, 2006, the so-called fiscal facilitation of early retirement benefits for individuals born January 1st, 1950 or later was terminated.²⁹ This implied that most early retirement arrangements for the affected individuals disappeared. Early retirement among civil servants usually occurred at age 61 or 62. The termination of the fiscal facilitation of early retirement benefits could have been anticipated as of 2003 and may have induced anticipation effects of civil servants aged 53-55 in 2005.

Early retirement via disability insurance

Workers may facilitate an early withdrawal from the labor force by starting to receive disability insurance (DI) benefits. Workers could start receiving DI benefits if they would be judged to be disabled by a medical examiner of the social insurance institute. DI benefits amounted to up to 70 percent of the final earned gross wage. The DI system was financed by workers and employers. In the context of this paper, it is important to notice that civil servants faced the same generosity of and eligibility criteria for

²⁶ This replacement rate is based on retirement at the ER eligibility age. The ER eligibility age depends on the birth date of an individual.

²⁷ Income does not only include wage income here, but also some other specified sources of income.

²⁸ The pension fund for the health care sector also switched from a final wage system to an average wage system on January 1st, 2004. Many other pension funds also switched in the years before or after January 1st, 2004.

²⁹ The fiscal facilitation of the early retirement contributions implied that the early retirement benefits were taxed, and that the early retirement contributions paid by workers and employers were exempted from taxation. As effectively less tax was paid, the fiscal facilitation made early retirement very attractive for eligible workers and employers.

DI benefits as workers employed in other sectors, and that there were no major changes in DI in 2005 except one on December 29th.

From that day on, eligibility criteria for starting to receive disability benefits have been tightened and disability benefits have been made less generous for workers who are only partially disabled. One year earlier, another change in disability insurance had taken place. Since January 1st, 2004, workers could only start receiving DI benefits after having been ill during employment continuously for two years. We hardly observe any civil servants who are induced to retire in 2005 to start receiving disability benefits. Moreover, the inflow into DI for men in all ages decreased smoothly from 53,000 in 2001 to 36,000 in 2004 and dropped to 17,000 in 2005. It is thus unlikely that the retirement rates in 2005 were boosted by changed incentives in DI (Statistics Netherlands, 2006).

Tables and Figures

Table 1: Descriptive statistics for couples that include a wife who is employed outside the public sector*

Variable	Control group ages 53-54 year 2005		Treatment group ages 55-60 year 2005	
	Mean	Std. dev.	Mean	Std. dev.
Age wife	54.00	1.29	55.57	1.96
Age husband	53.66	0.47	57.23	1.57
Wage income wife [t-1] (in 1000s of Euros)	28.23	12.70	27.06	11.46
Wage income husband [t-1] (in 1000s of Euros)	41.01	13.40	40.72	13.78
N	263		1,159	
Husband is a civil servant				
Variable	ages 53-54 years 2000-2004		ages 55-60 years 2000-2004	
	Mean	Std. dev.	Mean	Std. dev.
Age wife	53.49	0.50	56.52	1.43
Age husband	55.46	1.81	57.21	1.91
Wage income wife [t-1] (in 1000s of euros)	27.13	12.09	26.52	12.12
Wage income husband [t-1] (in 1000s of Euros)	39.89	12.27	41.22	12.91
N	1,652		2,327	
Husband is employed outside the public sector				
Variable	ages 53-54 years 2000-2005		ages 55-60 years 2000-2005	
	Mean	Std. dev.	Mean	Std. dev.
Age wife	53.49	0.50	56.60	1.46
Age husband	55.63	1.84	57.28	1.91
Wage income wife [t-1] (in 1000s of euros)	27.03	11.68	26.94	11.73
Wage income husband [t-1] (in 1000s of Euros)	39.68	18.23	40.94	19.13
N	14,379		20,488	

*The control group consist of wives employed outside the public sector who have a husband who is a civil servant aged 53-54 in 2005. The treatment group consist of wives employed outside the public sector having a husband employed as a civil servant aged 55-60 in 2005.

Table 2: Uninstrumented fixed effects estimates for the wife's probability to retire within one year *

N	4,593
Coefficient estimate retirement status husband ($\hat{\omega}$)	
Standard errors	0.025
P-value	0.028
Fraction of total variation explained by individual fixed effects	
	0.370

Table 3: Fixed effects instrumental variable estimates for the wife's probability to retire within one year *

N	4,593
Coefficient estimate retirement status husband ($\hat{\omega}$)	
Standard error	0.254
P-value	0.127
F statistic on instruments in first stage	
	12.00
P-value	0.000
Fraction of total variation explained by individual fixed effects in first stage	
	0.420
Fraction of total variation explained by individual fixed effects in second stage	
	0.575

* The model estimated here controls for one-year lagged wage income of the husband and wife, year fixed effects, nonlinear husband's and wife's age effects and individual fixed effects. The p-values on the coefficient are based on heteroskedasticity robust standard errors that are clustered at the individual level.

Table 4: Robustness checks *

Variation	LATE	Std. err.	P-value	F stat.	N
a. Baseline (Table 3): FE IV 2nd, 3rd order age effects	0.254	0.127	0.044	12.00	4,593
b. FE IV 2nd order age effects	0.264	0.149	0.077	8.32	4,593
c. FE IV 2nd, 3rd, 4th order age effects	0.213	0.119	0.074	10.19	4,593
d. FE IV age dummies	0.234	0.124	0.058	10.67	4,593
e. FE IV 1st, 2nd, 3rd order year effects	0.221	0.128	0.084	7.30	4,593
f. FE IV for dataset incl. workers aged 52	0.238	0.108	0.027	15.14	6,083
g. FE IV for workers hospitalized before retirement only	0.093	0.257	0.718	3.18	1,877
h. FE IV for dataset incl. workers hospitalized before retirement	0.194	0.121	0.109	15.05	6,470
i. FE IV for dataset incl. workers employed outside the public sector	0.191	0.100	0.057	7.49	36,147
j. Random effects IV (baseline sample)	0.194	0.085	0.023	94.59	4,593
k. Pooled IV (baseline sample)	0.177	0.087	0.041	18.65	5,401

* The model estimated here controls for one-year lagged wage income of the husband and wife, year fixed effects, nonlinear husband's and wife's age effects and individual fixed effects, unless mentioned otherwise. The LATE refers to the coefficient estimate for retirement status of the husband ($\hat{\omega}$). The p-values on the coefficient are based on heteroskedasticity robust standard errors that are clustered at the individual level.

Table 5: Placebo local average treatment effect estimates*

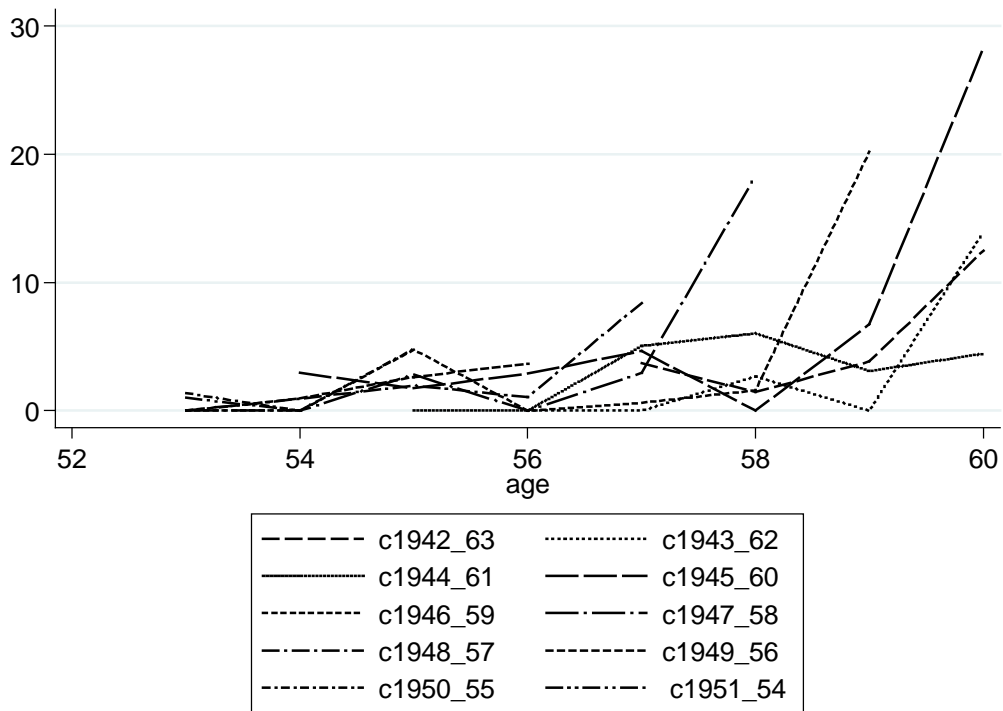
Placebo treatment year	LATE	Std. err.	P-value	F test statistic
2000	-0.469	0.320	0.142	1.60
2001	-0.026	0.200	0.896	3.60
2002	-0.037	0.222	0.867	3.67
2003	0.192	0.209	0.358	2.85
2004	0.273	0.138	0.048	6.77

* The instruments are the interactions between the dummy for the placebo treatment year and the dummies for the husband's ages 55-60. The model estimated here controls for one-year lagged wage income of the husband and wife, year fixed effects, nonlinear husband's and wife's age effects and individual fixed effects. The LATE refers to the coefficient estimate for retirement status of the husband ($\hat{\omega}$). The p-values on the coefficient are based on heteroskedasticity robust standard errors that are clustered at the individual level.

Table 6: First and second stage and reduced form estimates (underlying the baseline specification of Table 3)

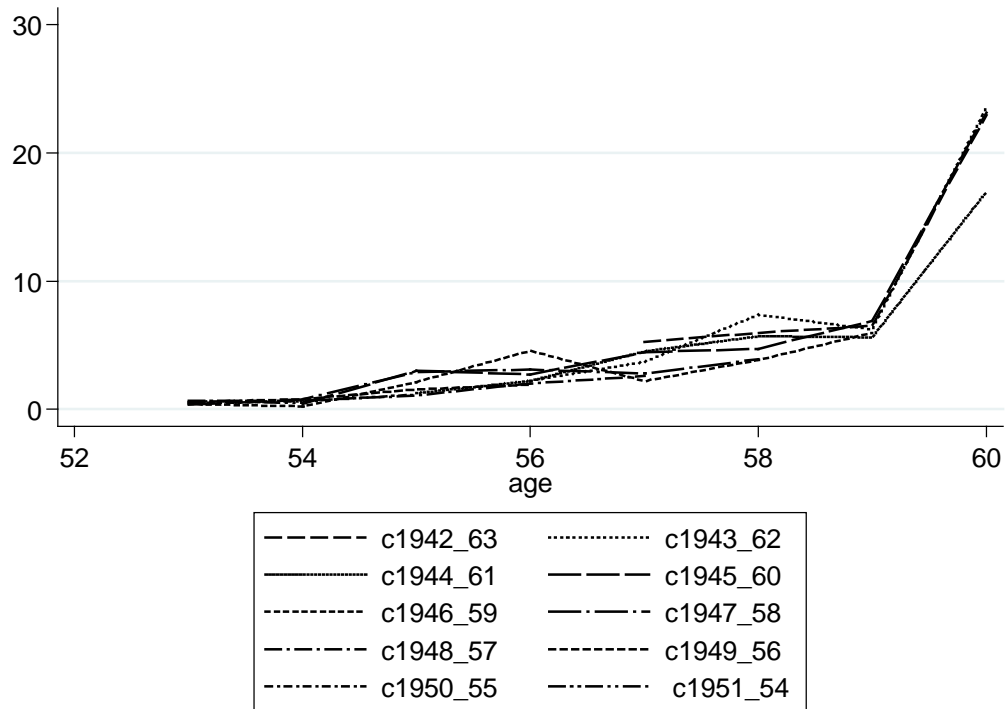
	First stage			Second stage			Reduced form		
	Retirement status husband			Retirement status wife			Retirement status wife		
	Coefficient	Std. err.	P-value	Coefficient	Std. err.	P-value	Coefficient	Std. err.	P-value
Wage income wife [t-1]	0.000	0.001	0.975	0.000	0.001	0.722	0.000	0.001	0.732
Wage income husband [t-1]	0.001	0.002	0.700	-0.002	0.001	0.092	-0.002	0.001	0.086
Year2000	-0.114	0.059	0.052	-0.172	0.059	0.004	-0.178	0.057	0.002
Year2001	-0.072	0.046	0.117	-0.129	0.049	0.008	-0.128	0.046	0.006
Year2002	-0.051	0.033	0.116	-0.078	0.036	0.030	-0.076	0.033	0.020
Year2003	-0.032	0.019	0.095	-0.061	0.024	0.012	-0.059	0.020	0.003
Year2004	-0.007	0.007	0.345	-0.022	0.013	0.099	-0.020	0.007	0.007
(Age wife – 53) ²	0.000	0.004	0.925	-0.014	0.005	0.001	-0.014	0.004	0.001
(Age wife – 53) ³	0.000	0.000	0.976	0.002	0.001	0.000	0.002	0.001	0.000
(Age husband – 53) ²	-0.010	0.004	0.022	-0.002	0.003	0.555	-0.002	0.004	0.639
(Age husband – 53) ³	0.001	0.000	0.002	0.000	0.000	0.701	0.000	0.000	0.646
Year2005*Age husband=55	0.065	0.023	0.004				-0.003	0.005	0.476
Year2005*Age husband=56	0.035	0.017	0.045				0.022	0.015	0.154
Year2005*Age husband=57	0.095	0.025	0.000				0.027	0.017	0.120
Year2005*Age husband=58	0.164	0.031	0.000				0.015	0.017	0.388
Year2005*Age husband=59	0.181	0.035	0.000				0.044	0.023	0.059
Year2005*Age husband=60	0.208	0.054	0.000				0.105	0.040	0.008
Retirement status husband				0.254	0.127	0.044			
<i>F</i> statistic instruments	12.00								
Fraction of total variation explained by individual fixed effects in first stage	0.420			0.575			0.565		

Figure 1: Retirement rates for husbands who are civil servant, by birth cohort (percentages)*



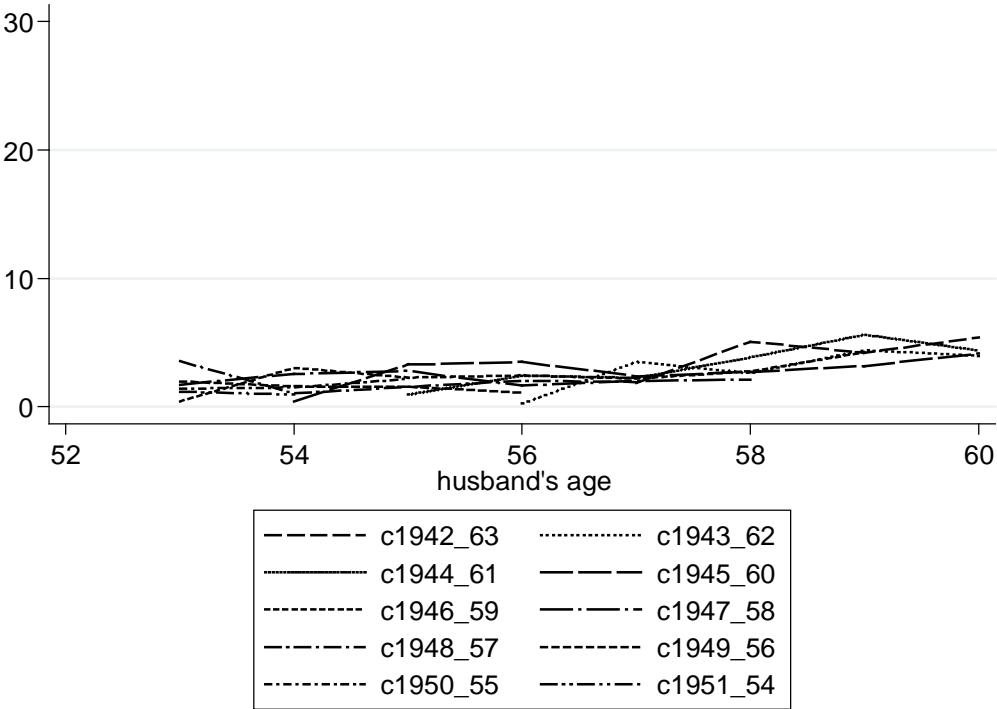
*Age of the husband on December 31st, 2005 is indicated behind each birth cohort. This figure is based on data for 2000-2005.

Figure 2: Retirement rates for husbands who are employed outside the public sector, by birth cohort (percentages)*



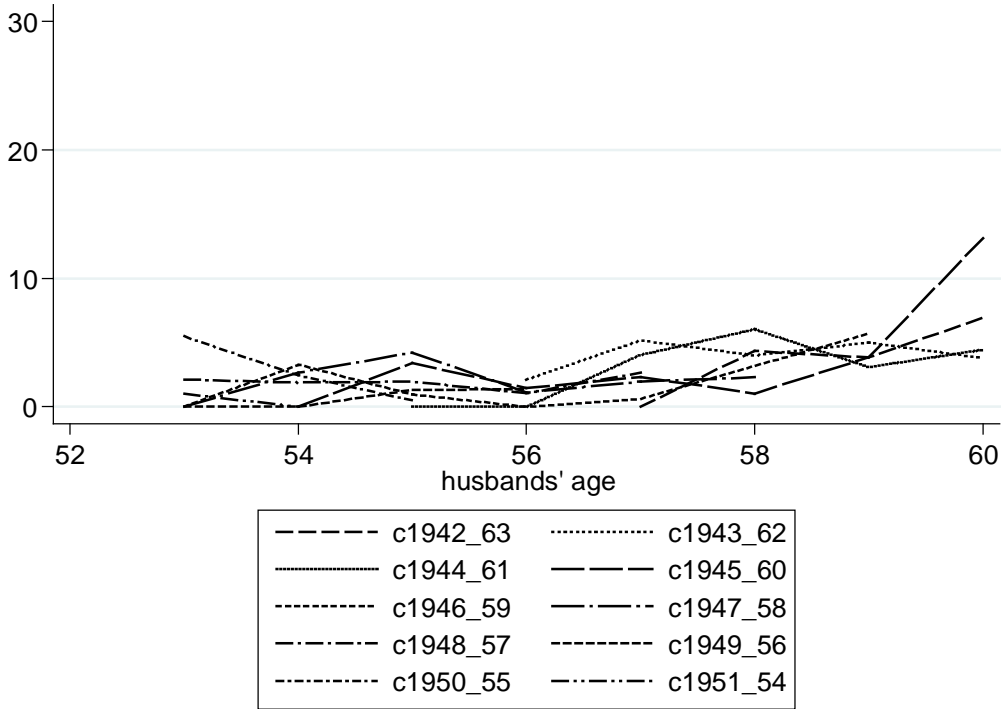
*Age of the husband on December 31st, 2005 is indicated behind each birth cohort. This figure is based on data for 2000-2005.

Figure 3: Retirement rates for wives employed outside the public sector whose husband is also employed outside the public sector, by husbands' birth cohort (percentages)*



*Age of the husband on December 31st, 2005 is indicated behind each husbands' birth cohort. This figure is based on data for 2000-2005.

Figure 4: Retirement rates for wives employed outside the public sector whose husband is a civil servant, by husbands' birth cohort (percentages)*



*Age of the husband on December 31st, 2005 is indicated behind each husbands' birth cohort. This figure is based on data for 2000-2005.