

Spousal Retirement and Other Non-Employment Outcomes

Elena Stancanelli**

December 2015

Abstract

Because over 70 per cent of older individuals lives in a couple, it is relevant to investigate spouses' retirement strategies. We study a French pension reform targeted at individuals born in 1934 and later years, and apply a sharp regression discontinuity framework. We use panel data on roughly fifty thousand French couples and estimate both local polynomial and parametric regression discontinuity models. We conclude that the reform encouraged spouses to retire later, as expected, but it also increased slightly the probability of being unemployed for the husband and a "housewife" for the wife. We also find a significant, though small, increase in the unemployment probability of women married to a man affected by the reform. There is little evidence of joint retirement of spouses, a finding which is confirmed also when instrumenting spousal retirement with legal retirement age. We show that joint retirement patterns are essentially driven by the age difference between spouses.

Keywords: Ageing, Retirement, Policy Evaluation. JEL classification: J14, C1, C36, D04

* Paris School of Economics, CNRS, Sorbonne Economics Research Center, and IZA. Adresse: 106 Boulevard de l'Hopital, 75013 Paris. Telephone: 33-(0)1 4407 8261. Email: elena.stancanelli@univ-paris1.fr

† The first version of this study titled "Spouses' Retirement and Hours Outcomes: Evidence from Twofold Regression Discontinuity with Differences-in-Differences", was circulated as IZA DP 6791 in August 2012, and presented in 2013 at a NETSPAR conference in Amsterdam, a SOLE conference in Boston, a French applied economics conference in Nice, and invited seminars at Siena and Aarhus University. I thank all participants for comments and especially so, Rob Alessie, Yingying Dong, Shelly Lundberg, David Margolis, David Neumark, Zhuan Pei, and Robert Pollak. This project has received funding from the European Union 7th Framework Program for research technological development and demonstration under grant agreement no. 613247, research project titled AGENTA. I am also grateful to the Network for Studies on Pensions, Aging and Retirement for financial support. Any errors are mine.

1. Introduction

Increasing individual working lives to counter population ageing and public pension deficits is of utmost interest to policy makers today. Most OECD countries have implemented policies to make individuals work for longer years. In particular, policies that increase legal retirement age have been implemented in a number of OECD countries in recent years. France was a pioneer in this area. The reform we study was voted by the government in the summer of 1993 and implemented as from January 1994. In France like most other countries, retirement laws and pension benefits are individually designed (Gruber, Jonathan and David Wise, 2005), while the vast majority of older people lives in a couple and very likely plan their retirement together (Michael Hurd, 1990; David Blau, 1998; Maria Casanova, 2010; Bo Honoré and Aureo de Paula, 2014). It follows that policies targeted at older individual may also affect their spouse's labor market participation ((Michael Baker, 2002; Courtney Coile, 2004; Donna Gilleskie and David M. Blau, 2006; Kanika Kapur and Jeannette Rogowski, 2007; Banks, Richard Blundell, and Maria Casanova, 2010). This is an area in which we still know very little, in spite of the growing body of research that exploits quasi-natural experiments to identify the effect of public policies on older spouses' retirement (Francois Gerard and Lena Nekby, 2012; Jonathan Cribb, Carl Emmerson and Gemma Tetlow, 2014; Rafael Lalive and Stefan Staubli, 2014).

It is especially interesting to study the retirement behaviour of older married couples in France as like in the U.S. (Francine Blau and Lawrence Khan, 2013), the majority of couples in France are dual-earners and most married women work full-time. The employment participation rates of French women and men aged 45 to 54 are slightly above those of American men and women, since, respectively, the nineties for men and the 2000's for women (see Figure 1). This is the first study that opens the black box of spouses' retirement strategies in France, earlier literature having focused on the individual retirement decision.¹

The retirement policy that we study was announced in the summer of 1993 and implemented as from 1994. It required individuals born in 1934 and later years to contribute three extra months to the social security fund, for each year of birth later than 1933, in order to be able to retire with maximum pension benefits (Section 4). To simplify, let us say that generations

¹ In 2010, legal early retirement age was set at 62 years, with effect, however, only as from 2018. Jean-Olivier Hairault, Francois Langot and Thepthida Sopraseuth (2010) model the employment effect of the distance to legal retirement age in France, within a theoretical job search framework, to conclude that increasing legal retirement age is likely to increase employment rates of older workers. Luc Behagel, Didier Blanchet, and Muriel Roger (2014) provide a comprehensive picture of individual retirement patterns in France.

born in 1934 were required to work three more months (before retiring) while generations born after 1934 were required to work three more months for each year of birth later than 1934 (Section 4). Thus, we exploit information on the date of birth of the spouses to apply a sharp regression discontinuity design of the effect of the reform on own and spousal retirement. Because the husband is on average two years older than the wife, we can estimate both the direct and the indirect (via their spouse been affected) effects of the reform. As far as anticipations go, the reform was voted in the summer of 1993 and implemented as from January 1994, which leaves little scope for individuals to adjust in advance of its coming into force. Even if individuals could have anticipated the reform, they could not change their birthdate. We estimate local polynomials models as well as linear regressions, to conclude that spouses affected by the reform (either directly or indirectly) postponed retirement slightly, but significantly so. However, the reform also increased the probability of unemployment for the husband, and that of being a “housewife” for the wife. The unemployment probability of women married to men affected by the reform also increased significantly though the size of the impact is small. Using the same strategy but setting fictitiously 1992 as the year of the reform and January 1932 as the birthday of those affected by it, we find no effect of this (placebo) fictitious reform on individual employment rates, which validates our approach..

We also found little evidence of joint retirement of spouses, which may though be explained by the small effects of the reform on own retirement. Therefore; to gather additional evidence of the effect of own retirement on spousal retirement, we also rely on the discontinuity in the own retirement probability at age 60, which is the legal retirement age for most workers in France (the age at which most workers can retire with maximum pension benefits), to gather additional evidence of the effect of own retirement on spousal retirement. Although legal retirement age, is well-known in advance, individuals cannot manipulate their age and they cannot retire before having reached legal retirement age. Legal retirement age varies by sector and thus, we take a fuzzy regression discontinuity design (which can also be seen as an instrumental variable approach). Again we find little evidence that spouses immediately retire together. We show that joint retirement patterns are essentially driven by the age difference between spouses, which we argue may not be exogenous to the household decision making process.

The structure of this paper is as follows. The next section presents briefly the theory background. The empirical approach is described in Section 3. The data and sample selection

steps are detailed in Section 4. The results of estimation are discussed in Section 5. The last section draws conclusions.

2. The theoretical background and earlier studies

Most models of retirement focus on individuals (Gruber, Jonathan and David Wise, 2005). The identification challenges of structural models of household retirement are non-negligible, as the decision to retire depends on individual (and spousal) health, wealth and income as well as expectations of these variables and the social security rules (van der Klaauw, Wilbert and Kenneth Wolpin, 2008). Therefore, an extensive literature in economics has taken an empirical approach, relying sometime on simulations or quasi-natural experiments to identify the effect of spousal retirement on the own retirement decision. Let us describe briefly the mechanisms at stake.

The household utility function (U_j) can be seen as a weighted average of the utility of each spouse (U_m, U_f) with m denoting the husband and f , the wife, and the weights (z , and $1-z$) representing the bargaining power of each spouse (see, for example, Olivier Donni, 2008, for a review of household economics models). Under this set up, distribution factors (such as changes in public policies or divorce laws or, why not, retirement law) may affect the weight of each spouse and thus, their say in the household decision process. Spouses maximize the household utility function, U , and the output of home production, H , subject to a budget constraint (equation 3) and a time constraint (equation 4), as follows:

- 1) $U = U_j[z U_m(E_m, R_m, C_h, C_m, t_{lm}, H) + (1-z) U_f(E_f, R_f, C_h, C_f, t_{lf}, H)]$
- 2) $H = g(t_{hm}, t_{hf}, X_j)$
- 3) $p_h C_h + p_m C_m + p_f C_f + p_x X_j = t_{wm} w_m + t_{wf} w_f + Y_m + Y_f$
- 4) $T_m = t_{wm} + t_{lm} + t_{hm} + t_{sm}$; $T_f = t_{wf} + t_{lf} + t_{hf} + t_{sf}$
- 5) with $(t_{wj} = 0) \equiv (E_j = 0)$ and $(t_{wj} > 0) \equiv (E_j = 1)$
- 6) $R_j = R(\text{age}_j, s_j)$ and $(E_j = 0) \supset (R_j = 1)$

We distinguish as conventional in household economics models, private consumption of goods (like an apple) that are consumed privately by each spouse (C_j) and public consumption of goods (C_h) that both spouses enjoy (possibly to different degrees, such as a painting that one spouse adores and the other hates), while t_{ij} characterizes the private leisure time of each spouse, which is often assumed to be more enjoyable if spent together with the spouse. Leisure complementarities are generally considered as one of the main drivers of

joint retirement in earlier studies (Michael Hurd, 1990, Alan Gustman and Thomas Steinmeier, 2000; Maria Casanova, 2010; Pierre-Carl Michaud and Frederic Vermeulen, 2011). The home production good (H) is produced with husband's and wife's time ((t_{hf}, t_{hm})) and market inputs (including durable goods such as a washing machine, and non-durable such as olive oil), for a given home technology. As standard in this literature, the output of household production (such as a clean home) cannot be measured. Home production includes the possibility that spouses specialize in home production full-time, as say a "housewife", which is defined regardless of the gender of the spouse that specializes in household work. But there is also evidence that retirees devote considerable time to home production (Elena Stancanelli and Athur Van Soest, 2012) and substitute private consumption for home production (Mark Aguiar and Eric Hurst, 2005), which is an additional reason to consider home production when trying to understand spouses' retirement decisions.

As customary, the household budget constraint depends on each spouse's labor income (with w being the hourly earnings) and non-labor income (Y_j), which includes also pension income and unemployment benefits. The time constraint is such that the total time available to each spouse (24 hours a day), T , includes the time allocated to market work (t_w), doing unpaid household work (t_h), engaging in leisure activities (t_l), and a reminder which includes sleep and personal care (t_s). Here E_j stands for the employment status of each spouse, which is equal to one when market hours (t_w) are positive and zero when individuals are out of work. The retirement decision, R , depends on individual age (age_j) and social security rules (s_j). Therefore, non-employment includes retirement but also unemployment and other inactivity states such as being a full-time "house wife". The current set up ignores uncertainty which needs to be incorporated into the model together with expectations. Spouses retire if the household expected utility under their retirement is larger than the household expected utility if they do not retire from work. According to this stylized model, the French retirement reform that we study affects the retirement decision of each spouse directly. The expected impact of the reform is to induce individuals to retire later. However, the retirement reform may also affect spouses' bargaining power via changes in distribution factors. For example, due to age differences, the younger spouse may be concerned to a larger extent by the reform than the older spouse. In particular, if the age difference between spouses is large, the existence of a legal retirement age among the various social security rules (s , in our notation) may prevent spouses from retiring together, regardless of their wishes to do so. It follows that if preferences for spending leisure time together outweigh other considerations, as suggested

in earlier literature (Michael Hurd, 1990, Alan Gustman and Thomas Steinmeier, 2000, Maria Casanova, 2010), the younger spouse may enter other non-employment states to be able to enjoy more leisure time together with the older spouse, who has already attained legal retirement age and thus, has fully retired. Here we exploit the French institutional set up which is very complex (Section 4) to isolate the effect of the 1994 reform on spouses' retirement and other non-employment probability.

Although earlier studies conclude that partners tend to retire together (see, for example, Maria Casanova, 2010; Mark An, Bent Jesper Christensen and Nabanita Datta Gupta, 2004; Gustman and Thomas Steinmeier, 2000; Michael Hurd, 1990), recent work highlights asymmetries in spouses' retirement strategies. Robert A Pollak (2013) argues that spouses may have conflicting interests over the timing of retirement because of age differences and gender differences in life expectancy as well as the social security design. Gustman and Thomas Steinmeier (2009) incorporate partial retirement strategies in a discrete choice model of spouses' retirement to conclude that in numerous situations individuals in a couple may decide to retire only if their spouse does not retire. Using data drawn from the Health and Retirement Study (HRS), they find that the increased labour force participation of American women has actually contributed to lower husbands' hours of market work. To date there is also a bulk of controversial evidence on the effect of social security design on spouses' retirement decisions. For example, James Banks, Richard Blundell, and Maria Casanova Rivas (2010) compare retirement behaviour of American and British dual-earners (using American husbands as a control group for British husbands) to conclude that British husbands are significantly more likely to retire when their wife reaches state pension age than their American counterparts. However, Courtney Coile (2004) finds that both American spouses have similar participation responses to own financial and social security incentives but while the husband also reacts to the wife's (cross) incentives the opposite is not true. Kanika Kapur and Jeannette Rogowski (2007) investigating the effect of employer-provided retiree health insurance on the retirement behaviour of dual-earners in the USA, find evidence of asymmetric effects for partners: the wife's health insurance increases joint retirement while the husband's does not. David Blau (1998) concludes that eliminating dual entitlement to social security benefits would have a significantly positive effect on the labour supply of married women and a negative one on husbands' labour supply, though both effects would be small. Michael Baker (2002) found somewhat more symmetric responses of partners, concluding for a negative effect of a new allowance for dependent spouses on the

participation rates of eligible Canadian women and their husbands. Laura Hospido and Gema Zamarro (2014) pool together different countries (due to small sample sizes), to estimate joint retirement patterns of older spouses, and conclude that spouses' joint retirement strategies are important. In contrast, studies that exploit natural experiments and use large samples find little evidence of joint-retirement of spouses (Francois Gerard and Lena Nekby, 2012; Rafael Lalive and Stefan Staubli, 2014; Cribb, Jonathan, Carl Emmerson and Gemma Tetlow, 2014).

All these empirical studies investigated changes in the participation decision of older spouses, focusing on dual-earners without explicitly considering the possibility that public policies may induce spouses to enter other non-employment states than retirement. The literature also paid little attention to the fact that age differences may actually drive the responses of spouses. Age differences may not be exogenous to the household decision making (Pierre-Andre Chiappori, Sonia Oreffice and Climent Quintana Domeque, 2012), Hans Bloemen and Elena Stanca, 2015).

The empirical method

The reform we study only affected individuals born in 1934 as from January 1994. The reform was voted in July 1993 and implemented as from January 1994. Therefore, we can exploit this natural experiment set up as individuals born just before or just after 1934 are likely to be very similar in every other respect and we can isolate the effect of the reform on their retirement decisions. In the survey, month and year of birth were collected as well as the day, month and year of the survey and the labor market status (employment, retirement, unemployment, or being a "housewife") was inquired at the date of the survey interview. Interviews were carried out by person at the respondent's home (which adds to the quality of the data to provide accurate information as respondents could be asked to check their records) and the same household was re-interviewed once every year over a three year period (rotating sample design).

Using a Regression Discontinuity (RD) approach has several advantages over competing differences-in-differences models (Guido Imbens and Thomas Lemieux, 2007; Wilbert Van der Klaauw, 2008; David Lee and Thomas Lemieux, 2010), which have been widely used in most empirical studies of the effects of public policies on spouses' retirement strategies. Essentially, because individuals close to the discontinuity cut-off (here, born in 1934) and situated on the two sides of this cut-off are likely to be very similar, a regression

discontinuity design is very close to an experimental design. In particular, we can here apply a regression discontinuity design because there are no other policies that affect specifically individuals born in 1934. As far as anticipations go (David Lee and Thomas Lemieux, 2010, Section 6.3.1), while birthdate (or age) can certainly not be manipulated, individuals know well their age (and their birthday) and could therefore behave differently ahead of time, in anticipation of the policy change, which would invalidate the natural experiment design. However, since the policy was announced and voted only 6 months before coming into force, this seems unlikely.

Let us denote with O the outcome variable which encompasses retirement, R , as well as other non-employment states, such as unemployment, U , or being a full-time housewife, HW . The treatment T is given by the 1994 policy reform, which affected individuals born in 1934 that were treated as from January 1994. Thus, we construct a dummy variable, T , equal to one for individuals born on January 1934 and later months, and to zero for those born in the months preceding January 1934. M is the running variable, which is defined as the number of months elapsed before and after the treatment T . We observe the outcome variables denoted as O (or R , U , HW), before the treatment $O(t_0)$ or after the treatment $O(t_1)$. Our goal is to estimate the average impact of the treatment on spouses' outcomes. Thus, we should also introduce the suffix j to denote whether the outcome is observed for the husband ($j=m$) or the wife ($j=f$) and whether the treatment hit the husband or the wife, but for the sake of simplicity let us skip this.

$$1) \quad \gamma = E[O(t_1) - O(t_0)]$$

We only observe O for the same individual either before or after the treatment and we assume that any difference in outcomes is due to the treatment. For each spouse j , exposure to the treatment, T (the 1993 reform), is thus, a deterministic function of their birthday (or the birthday of their spouse) as follows:

$$2) \quad \begin{cases} T_j = 1 \{ M_j \geq 1 \text{ January } 1934 \} \text{ or } T = 1 \{ M_j \geq 0 \} \\ T_j = 0 \{ M_j < 1 \text{ January } 1934 \} \text{ or } T = 0 \{ M_j < 0 \} \end{cases}$$

where been born on January 1934 is the 'cut-off' for the treatment, set equal to day zero, for the sake of simplicity of notation. The RD estimate of γ is given as follows:

$$3) \quad \gamma_{RD} = E[O_j(t_1) - O_j(t_0) \mid M_j=0]$$

Assuming continuity of $E[O]$ on the two sides of the cut-off, this estimator can be rewritten as :

$$4) \gamma_{RD} = \lim_{D \rightarrow 0}^- E[O_j(t_1) - O_j(t_0) \mid M_j=0] - \lim_{D \rightarrow 0}^+ E[O_j(t_1) - O_j(t_0) \mid M_j=0]$$

which can be approximated (Hahn, Jinyong; Petra Todd; Wilbert Van der Klaauw, 2001; Imbens, Guido and Thomas Lemieux, 2007) by taking the difference of the mean outcomes of the respondents born in the months close to (before and after) the treatment (the cutoff point of being born in January 1934). Assuming a linear model for the outcome, we can also write:

$$5) O_j = \gamma_{RD} T_j + \lambda f(M_j) T_j + \beta f(M_j) (1-T_j) + u_j$$

Where $f(M_j)$ is a linear polynomial function of the distance in months from being born in January 1934 (or being hit by the policy reform in January 1994) interacted with the treatment dummy T to allow for different effects on the two sides of the cutoff. We estimate γ_{RD} using a non-parametric approach (a local polynomial with a triangular kernel, as in Austin Nichols, 2014), as well as parametric linear regression models. We use the same bandwidth for either type of model, parametric or non-parametric. We apply the procedure as in Sebastian Calonico, Matias D. Cattaneo and Rocio Titiunik (2014) to determine the optimal bandwidth, which gave an optimal bandwidth of 49 months for the RD impact of the reform on the wife's retirement probability and slightly different (36 or 41) bandwidth for the other RD specifications, but we opted for presenting results using the same bandwidth for all the RD specifications (the results are generally robust to using slightly different bandwidth, see later). We estimate each spouse's response to own treatment and to spousal treatment ("cross-effects" or "spillovers" or "indirect" effects) separately. To account for the rotating sample structure - the fact that most couples are observed more than once and up to three times, over the sample period- we cluster the errors at the couple's level, in both the non-parametric and the parametric models. In addition, to control for couple specific characteristics, including age difference between the spouses (or education differences, though the latter appear to be less important, see Figure 2 and Table 1), we also estimate a variant of these models that allows for couple random effects. To conclude, let us point out that individuals that were born in January 1934 and hit by the reform as from January 1994, were actually aged exactly 60 in January 1994 (see the discussion in Section 4). Therefore, our estimates of the reform capture also whether the reform has changed the individual incentives for retiring at age 60. We shall conclude that the reform made treated spouses

significantly less likely to retire at 60, though the drop in the retirement probability at 60 is quite small in size. Our design only captures the immediate short-run effect of the reform.

Next, we also run a placebo test, by using the same RD strategy but setting fictitiously 1992 as the year of the reform and January 1932 as the birthday of those affected by it, and we find no effect of this (placebo) fictitious reform on individual retirement rates, which validates our approach.

Finally, to gather additional insights on the indirect effects of retirement policies targeted at the spouses, we focus specifically on the legal retirement age of 60 at which most French workers retire with maximum pension benefits (Section 4 for institutional details) to set up a “fuzzy” regression discontinuity design of the effect of spousal retirement (instrumented with being aged 60 and above) on the own retirement. This allows for the fact that the retirement probability increases by less than one at the legal retirement age of 60, i.e. not everyone retires at 60 (see Section 4 and Section 6 for graphs that investigate discontinuities at age 55, 60, 65 and also 55 and 3months, concluding that the only significant and relevant discontinuity occurs at age 60). Under a sharp RD design, the jump in the retirement probability at age 60 would be equal to unity and the discrete change in the outcome O at age 60 would give the estimate of the causal impact of the treatment (retirement); while in a FRD design, the jump in the outcome is divided by the jump in the probability of retirement at age 60 to produce the local estimate (which is equivalent to an instrumental variable (IV) estimate) of the causal impact of the treatment on the outcome (Jinyong Hahn, Petra Todd and Wilbert van der Klaauw, 2001). Because legal retirement age can be anticipated, individuals may react in advance of their (spouse) reaching legal retirement age. However, both spouses are bounded by legal retirement age. Not only we do not find any evidence of anticipation effects, but also we do not find much effect of spousal retirement on own retirement.² There are no other policy measures that affect individuals upon reaching age 60 in France. Let us then write the probability of treatment under this set up as follows:

$$1) \begin{cases} S_j = 1\{Age_j \geq 60\} \text{ or } S_j = 1\{Age_j \geq 0\} \\ S_j = 0\{Age_j < 60\} \text{ or } S_j = 0\{Age_j < 0\} \end{cases}$$

² Earlier Regression Discontinuity (RD) studies relied on age or birthdate to identify the effect of policies such as Medicare (public health insurance for older people in the US) on Health (and Mortality), and due to concerns that individuals may, for example, postpone seeing a doctor till having reached the age that switches on entitlement to Medicare, focused on entries to emergency hospitals of individuals aged just below and above the age threshold for entitlement to Medicare, to identify the effect of Medicare on health and mortality (David Card, Carlos Dobkin and Nicole Maestas, 2004 and 2009).

where the spouse's been aged 60 on the day of the survey interview is the 'cut-off' for the treatment, S , set equal to (spouses' age – 60), i.e. zero, for the sake of simplicity of notation. The FRD estimate of γ is given as follows:

$$1) \gamma_{FRD} = E[O_j(t_1) - O_j(t_0) | Age_j=0] / E[R_j(t_1) - R_j(t_0) | Age_j=0]$$

Assuming continuity of $E[O]$ on the two sides of the cut-off and given continuity of the running variable (spouse's age, which we measure in months and fractions of months, i.e. days and from which we subtract legal retirement age, 60 years, for the sake of simplicity of notation), the FRD estimator can be rewritten as :

$$\gamma_{FRD} = \frac{\lim_{Age_j \rightarrow 0^-} E[O_j(t_1) - O_j(t_0) | Age_j=0] - \lim_{Age_j \rightarrow 0^+} E[O_j(t_1) - O_j(t_0) | Age_j=0]}{\lim_{Age_j \rightarrow 0^-} E[R_j(t_1) - R_j(t_0) | Age_j=0] - \lim_{Age_j \rightarrow 0^+} E[R_j(t_1) - R_j(t_0) | Age_j=0]}$$

We can then use a local polynomial approach to estimate γ_{FRD} or a parametric two stages least square approach which is equivalent to a fuzzy RD design (Jinyong Hahn, Petra Todd and Wilbert van der Klaauw, 2001) and write each spouse's outcome, O_i (or R_i , U_i , HW_i) as a function of the other spouse's retirement probability, R_j , instrumented with a dummy, S_j , which takes value one when spouse j has reached age 60 (720 months or 21 840 days) of age and zero otherwise, as follows:

$$2) O_i = a^i + R_j \tau^i + (1 - S_j) * Age_j \mu^i + S_j * Age_j \eta^i + v_i$$

$$3) R_j = a^{rj} + S_j \gamma^{rj} + (1 - S_j) Age_j \mu^{rj} + S_j Age_j \eta^{rj} + v^{rj}$$

where grec letters denote the parameters to be estimated and Age_j is a linear polynomial in age of the spouse j age (normalized by subtracting age 60 from it) and we also allow for interactions of S , the age cut-off dummy, and the age polynomial, as standard (Joshua Angrist and Jorn-Steffen Pischke (2009, page 261). Like for the earlier specification, we set the optimal bandwidths (noting that, typically, in the literature somewhat wider bandwidth are recommended when using a fuzzy regression discontinuity design), following Calonico, Sebastian, Matias D. Cattaneo and Rocio Titiunik (2014) and we also correct the standard error by using robust standard errors (as the outcome variable is discrete) and clustering them at the couple level (since we observe the same couple more times). In addition to this, we also estimate the parametric model controlling for couple fixed effects (or alternatively, random effects). The empirically strategy here can also be seen as an instrumental variable approach, in which spousal retirement is instrumented with a dummy for whether the spouse has reached legal retirement age.

Institutional Background

Most workers in France retire by age 60 and age 60 is the effective retirement age according to recent OECD estimates (OECD, 2014). This is because age 60 is the legal retirement age for most workers in France, at which individuals can retire with the maximum possible level of pension benefits (see later about the pension benefit rules). In 2010, the legal early retirement age was set at 62 years but with effect only in 2018 and later years, thus nowadays the age 60 threshold still applies. Specific sectoral agreements enable some workers to retire earlier than 60 with “early” retirement been often as from age 55, but this applies only to a minority of workers (indeed we find no jump into retirement at age 55: top block of graphs in Figure 8). By age 65, the law also requires most workers to retire if they have not yet done so³. Therefore, one could think of the French retirement system as a two-legal-retirement ages system, with a first threshold at age 60 and a later threshold at age 65, but in practice though, the vast majority of workers retires much before hitting the age 65 threshold (indeed we find no jump into retirement at age 65 for the husband: bottom block of graphs in Figure 8). The reason for this is that future pension benefits do not increase if individuals continue to work once they have reached age 60 and contributed enough years into the social security fund (see later).

As far as pension benefits go, public retirement (defined benefit) pensions are the rule in France. About 79 per cent of retirees claims only a public (first pillar) pension, 6 per cent also receive an occupational (employer-provided) pension and 18 per cent have also subscribed a private pension; while the corresponding figures in the USA are, respectively, 45, 13 and 42 per cent (Lans Bovenberg, 2011). Pension benefits have generally quite generous replacement rates to past earnings, which vary, very roughly, between 50 per cent in the private sector and 80 per cent in the public sector. In particular, the pension benefits are a function of past earnings and attain a maximum level payable, which depends on the length of the workers’ social security records and varies as a function of the year of birth (since the 1994 reform, and other successive reforms in 2003) and the sector of employment. For example, the maximum contribution period was set at 40 years since the 1994 reform for private sector workers born in 1943, which implies that a private sector worker, born in 1943, and having entered the labor market at age twenty, would have to work till age 60, to retire

³ The 2010 reform also raised the 65 threshold with effect as from 2018.

with the maximum level of pension benefit payable—knowing that this pension benefit (adjusted for inflation) would be received every month from retirement to death.

The key to understanding the mechanics of retirement in France is that pension benefits do not increase if individuals continue to work once they have worked long enough to receive the maximum level of pension benefits, which often coincides with having reached the legal retirement age of 60—the private sector worker of our example above would be paid the same monthly pension benefit if they retired at 60 or at 61 years or later. Moreover, periods of unemployment or sickness (including statutory maternity leave) are all counted 100 per cent towards the final pension contribution record⁴ (the 40 years in our example) and thus, fully covered by pension rights, as long as they intervene after a spell of employment covered by social security. Therefore, it follows naturally that most workers retire as soon as they have reached the first threshold of legal retirement age, which is age 60 for most workers—and this is different from early retirement plans which usually start earlier at age 55. Last but not least, there are no spousal benefits in France, but only survivor pensions, and the public health system is universal and does not change at older age.

Coming finally to the 1994 retirement reform, which was voted in the summer of 1993 and came into force as from January 1994, the reform increased the length of the contribution period necessary to be able to retire with maximum pension benefits for generations of workers born in 1934 and later years up to 1943. To be precise, generations born in 1934 and after were required to contribute an extra quarter of a year (three more months) to social security for each later year of birth, to be able to retire with maximum pension benefits as from 1994. That is to say that those born in 1934 had to work three months longer to be able to retire with maximum pension benefits while those born in 1943, had to work two years and a half longer (ten extra quarters) to be able to retire with maximum pension benefits. Moreover, also the rules for the calculation of the maximum pension benefits were made tighter, setting a longer reference period for the earnings which would serve as the reference

⁴ We do not use information on contribution periods as the running variable because not only this variable is likely to be measured with error in the labor force surveys (being based on a recall question) but also it might well be endogenous as social-security-uncovered career interruptions may be chosen by spouses and may correlate with other individual characteristics that determine the timing of individual and spousal retirement or, possibly, other non-employment transitions. Periods of unemployment, sickness or maternity leave that occur immediately after a work spell, are all fully insured by social security for retirement purposes in France. Therefore, we opt for focusing on the birthdate or age for our experimental design (Section 3).

earnings to calculate the pension benefits –by lengthening the reference period, lesser weight was given to the best earnings, often earned at the very end of the career.

Our empirical design assumes that each generation born as from 1934 onwards was hit by the reform in 1994, as the reform was announced in the summer of 1993 and implemented as from January 1994. The way the reform was announced is that individuals were told that generations born in 1934 and later years, had to contribute an extra three months into the social security fund for each year birth later than 1933, and as from 1994, to be able to retire with maximum pension benefits. For generations born in 1934 and later years, the extra contribution months required to be able to retire with maximum pension benefits varied proportionally with the distance in birth date from this cutoff point. Those born in 1934 needed an extra three months of work history at January 1994 (which is also when they would turn 60, by the way). Those born in 1935 were told that they needed an extra three months of contributions for each year of birth later than 1933 and as from 1994; so they would need say, three extra month by 1994 and three additional extra months by 1995 (for a total of six extra months by 1995, which is also when they would turn sixty). Those born in 1943, would need an extra three months for each year after 1933, for a total of 30 extra months, staggered in ten years' time.

Finally, because we also consider unemployment as an outcome, we should mention that older individuals that entered unemployment were (in the years we consider and since the eighties, due to the so-called law of “dispense de recherche d’emploi”) exempted from actively searching for work, while their unemployment benefits were maintained at the same level until retirement and were not digressive, regardless of the duration of the unemployment spell (Antoine Bommier, Thierry Magnac and Muriel Roger, 2003). Not only, but employer were also (by the law so-called “contribution de delalande”) prevented from laying off older workers and charged with a substantial financial penalty for laying off an older workers (Antoine Bommier, Thierry Magnac and Muriel Roger, 2003). As individuals may enter unemployment to smooth their transition into retirement, we also check for discontinuities in unemployment at age 55 and 3 months, which is the critical age for benefiting from this favourable unemployment terms according to Antoine Bommier, Thierry Magnac and Muriel Roger (2003), and we find (in line also with the findings in Antoine Bommier, Thierry Magnac and Muriel Roger, 2003, who used though a diff-in-diff approach to conclude for little individual responses to these reforms), no significant jump into unemployment at this critical age (Section 6, and Figure 9).

5. The data

The data for the analysis are drawn from the French Labour Force Surveys (LFS) 1990-2002. We use this sample cut for a number of reasons. First of all, these yearly surveys are highly comparable over time as they use the same questionnaire, the same data collection method (personal interviews at the respondent's home) and the same sample design approach. The LFS series was broken in 2003 to comply with Eurostat requirements. The recent LFS series (as from 2003) are carried out quarterly and most of them are done by telephone; and the questionnaire and the sample design have changed dramatically relative to the earlier 1990-2002 surveys. In addition, another reform of the length of the pension contribution period took place in 2003, exactly at the time of the break in the LFS series. Therefore, we select a sample of couples from the 1990-2002 LFS as follows:

- Individuals were matched to their partner if any.
- Single people were dropped from the sample.⁵
- Multi-couple households were also dropped.
- Records from different survey years were pooled together.

This produced a sample of 588 654 couples, including cohabitant couples -which are, however, a tiny minority when restricting the sample to older spouses for the empirical analysis⁶ and our results are robust to including or excluding older cohabiting couples.

The sample size for the empirical analysis varies whether we focus on the husband been born in January 1934 as the cut-off or the wife been born in 1934, or whether we concentrate on legal retirement age and select couples in which the cutoff is set at the husband (or the wife) having reached legal retirement age of 60. Generally speaking, the sample size is always above 50,000 couples, setting an (optimal) bandwidth of 48 month –for either the distance in months from being born in 1934, or the distance in months from being aged 60, and for either spouse (Sections 3 and 5).

The LFS survey has a rotating sample structure –a third of the sample is kept in for three years- which enables us to set them up as a longitudinal dataset, producing a sample of over

⁵ In this survey, it is not possible to distinguish same-sex couples from singles sharing the housing as same sex individuals are automatically coded as singles.

⁶ Joint retirement incentives are likely to differ among the two types of household. Given the small size of the sample of cohabiting couples (think that we are pooling thirteen years of data and that for a regression discontinuity approach to produce reasonable estimates, the sample size should be as large as possible) they are not studied separately in this paper.

30,000 couples that are observed at least twice and at most three times, over the sample period. Attrition is a minor issue as only 5% of the sample is not re-interviewed at least a second time – though some of the non-responses could possibly be associated with the couple changing address upon (joint) retirement (as the survey does not follow households that move). We estimate the empirical models both for the pooled cross-sectional sample (clustering the standard errors at the couple level) and for the longitudinal sample (controlling for couple unobserved heterogeneity by means of fixed or random couple effects).

The LFS collects month and year of birth together with records of the day, month and year of the interview. Therefore, we can construct a continuous measure of month and year of birth and distance from being born in January 1934. We also construct a continuous measure of age on the day of the interview. The retirement status is subjectively assessed by the individual and measured on the interview date. In particular, the individual could choose among reporting that his/her main economic status was employment, or unemployment, in full-time education, a military, retirement, being a housewife or other inactive. Thus, we distinguish as outcome variables: retirement, unemployment or being a “housewife” (few men also report to be full-time home makers).

As far as other variables of interest here go, education refers to completed years of education. The reference category includes individuals with only less than lower intermediary (or middle) education.⁷ Individuals with higher levels of education are likely to enter the labour market later and thus also to retire later than lesser educated individuals. The level of the unemployment rate may affect the individual retirement probability as, for example, employers may encourage older workers to retire in recessionary times. Therefore, we construct a measure of the local unemployment rate, using the level of the departmental unemployment rate in the year before each survey was carried out –which gives 95 department *13 survey values for the local unemployment rate.⁸ We also construct a measure of the number of children, though this variable only measures the number of children still leaving at home and may thus be endogenous to our research outcomes if parents do not retire until the children leave home or vice-versa. We do not include any of these variables in our

⁷ Until the late fifties, education in France was compulsory only until age 14, which resulted in most children obtaining only a ‘primary’ or ‘elementary’ education diploma. In 1959 a reform extended compulsory schooling to age 16, allowing then children from all backgrounds to obtain an intermediary education diploma. This explains why so many people in our sample only completed primary education.

⁸ The most disaggregated area of residence available in the survey is the department. France is divided into 22 regions that are further subdivided into 95 departments - without considering the overseas territories (French Guyana, Guadeloupe, Martinique, Mayotte, Reunion Island) that were not covered by these surveys.

empirical models, but we test the continuity of these variables at the RD cutoff to check that there is nothing else varying discontinuously around the RD cutoff than the running variable.

Descriptive statistics for a large sample including couples in which both spouses are aged between 50 and 70 are provided in Table A in the Appendix. The wife is on average over 2 years younger than the husband. About half of our sample has less than an intermediary (middle) school diploma. About 30 per cent of the men and 27 per cent of the women have only completed middle school; while about 6 per cent of the men and 8.5 per cent of the women have only a high school diploma. The proportion of college graduates is slightly larger for men, (10 per cent) than for women (8 per cent). We know that the proportion of college graduates increases over time and does so faster for women than for men, so that in recent years this pattern is reversed. About 97 per cent of the spouses were French nationals. The average number of children younger than 18 years still at home is 0.30. The local unemployment rate was equal to 9 per cent on average.

6. Graphical analysis

Insights on the validity of the empirical design and the effects of the treatment can be gathered by simply plotting the data (Guido Imbens and Thomas Lemieux, 2007; Wilbert Van der Klaauw, 2008; David Lee and Thomas Lemieux, 2010). First of all, as customary, let us provide graphical evidence that the running variable (respectively, distance in months from being born in 1934, or distance in months from age 60) is continuous at the cut-off (Figure 3). If people were able to manipulate their birthday (or their age) in anticipation of the policy, we may observe that the distribution of the running variable is discontinuous at the cut-off point and this would invalidate the RD approach (Justin McCrary, 2008). In our RD set up, obviously people cannot manipulate the running variable as age and birthday are very precisely measured in developed countries such as France, but they could, for example, move away at retirement.

As often done in empirical RD literature, we plot against the running variable, the raw means of the outcome variable (grouped by bins of two months) together with the kernel triangular estimates (using the same bandwidth as for the empirical model) and the standard error confidence intervals around these estimates. We plot each spouse's retirement probability before and after the 1993 reform (so, before and after 1994 in the graphs, as the reform voted in the summer of 1993 was implemented as from January of 1994). To understand these

graphs (Figure 4), it is important to keep in mind that to the left of the cut-off point, people are older and to the right, people are younger while people at the cut-off turn exactly into their 60th birthday in 1994. Thus, if we consider the husband *before the reform* was implemented, we see a little but significant jump in his probability to retire at the cut-off while *after the reform*, his probability to retire at the cut-off and thereafter, drops significantly as expected. For the wife, the jump in the retirement probability before the reform is less pronounced (it resembles more a kink than a jump), but what matters here is that after the reform, we observe a significant drop in the wife's retirement probability at the cut-off. Thus, the policy works as expected and it reduces the probability to retire at a given point in time, for generations born in 1934 and later years as from 1994.

To check that our RD design of the 1993 policy reform is valid, we run a “placebo” test in which we apply the same RD strategy but we set fictitiously 1992 as the year of implementation of the reform which we assume would hit generations born in 1932 and later years (Figure 5). The graphs before 1992 look very similar to their counterparts for the period before the 1993 reform (left blocks of Figure 4), but the graphs after 1992 show no significant drop in the retirement probability at the 1932 cut-off for either the husband or the wife. Thus, the placebo test validates our RD design: the effects we see in Figures 4 are not spuriously driven by a combination of birth years and policy years.

Then, we investigate graphically, the 1993 policy reform ‘cross’ or ‘indirect’ effects on the spouses (Figure 6), concluding for no significant indirect effects of the reform: the retirement probability of the husband (wife) is smooth as a function of the birth date of the wife (husband). If anything, the husband's retirement probability seems to slightly respond the wife's birthdate before the 1994 reform, but not thereafter.

Finally, we look at other possible non-employment outcomes, to conclude that the husband's unemployment probability goes up after the 1993 reform but there are no significant direct effects of the 1993 reform on the wife's unemployment behaviour (Figure 7). In contrast, the probability that the wife reports to be a housewife increases significantly after the 1993 reform (see Figure 8). It appears that the reform discouraged married women's employment participation.

To gain additional insights on retirement patterns of spouses, we now focus on the cut-off at legal retirement age (considering all the generations and all the years from 1990 to 2002) and inspect graphically the own and cross retirement probability of spouses as a function of their

age (Figures 9). The jump in the own retirement probability upon reaching legal retirement age 60 (top blocks of Figure 9) is greater than zero and less than one (as it should be in a fuzzy RD) and very sizable, as anticipated (Section 4) for both the husband and the wife. We find a very small increase in the wife's retirement probability when the husband is aged 60 and above (bottom left graph in Figure 9) but no eye-detectable effect or of the wife's being aged 60 on the husband's retirement probability (bottom right graph in Figure 9). Therefore, whether we exploit for our RD design, the 1993 policy reform (voted in the summer of 1993 and implemented as from January 1994) or the legal retirement age, we find little effect of the spouse's retirement on the own retirement probability. Based on this evidence, there would appear to be no spillover effects of policies on spouses' retirement behaviour. This contrast with earlier literature that finds considerable joint retirement patterns, though our design only enables us to capture the immediate spillover effects, if any, while spouses are often thought of retiring within a year from each other (David Blau, 1998).

Therefore, we split the sample by the age difference between the spouses and focus on spouses that are within at most a year of age from each other. Figure 10 shows the husband's retirement probability as a function of the wife's age (left graph) and vice-versa, the wife's retirement probability as a function of the husband's age (right graph) for couples that are less than a year apart in age. The retirement probability of the wife now jumps up immediately and significantly as the husband's turn 60. There is also a significant shift up in the retirement probability of the husband, as the wife turns 60. This suggests that age differences between spouses impact significantly on the chances to observe any cross-retirement effects in the data, though age differences between spouses may not be exogenous to the household decisions (Section 2).

Finally, let us check graphically that 60 is the only age cutoff that we should consider in our empirical design. We have estimated (by means of a local polynomial method, applying a triangular kernel distribution and an optimal bandwidth of 48 months) the jump in the retirement probability of each spouse at, respectively:

- _ the legal retirement age of 60 (Top Block of Graphs in Figure A in the Appendix);
- _ the legal retirement age of 65 ((Top Block of Graphs in Figure B in the Appendix);
- _ the age of 55 (Bottom Block of Graphs in Figure B in the Appendix), at which people typically enter sector specific early-retirement schemes;

_ and, finally the age of 55 years and 3 months (Figure C in the Appendix), from which the unemployed are exempted from making any active search effort and receive non-digressive unemployment benefit till the time they retire (Bommier, Magnac, Roger, 2003).

We saw that the retirement probability of each spouse jumps up upon reaching the legal retirement age of 60 years (Figures 9), and our estimates of these jumps are over 0.30 for the husband and over 0.25 for the wife. This difference reflects the fact that many married women have interrupted work histories with uninsured periods out of work⁹ so that by the time they reach age 60, they have not yet paid enough social security contributions to be able to retire with maximum pension benefits; and they opt then for working some more years until they can retire with the maximum pension benefit payable (Section 4). For the other cut-offs considered (see bullet list above), we do not find any significant increase in the retirement probability of either spouse, except for the age 65 cut-off, at which also there is a small jump into retirement for the wife (but not for the husband). Therefore, since in most couples the husband is older than the wife (on average, over two years older) and that we use in our empirical strategy the legal retirement age of 60 to instrument the effect of one spouse's retirement on the other spouse's probability to retire, we can ignore the additional spike in the wife's retirement probability at her age 65, as by then the husband is on average 67 and over and has already retired. Therefore, we use 60 as the relevant legal retirement age cut-off.

7. Estimation Results

We have estimated the effect of the 1993 retirement reform on spousal retirement and other non-employment outcomes by applying a sharp RD design, using both a local polynomial estimator and a linear parametric model (Section 3) with the same (optimal) bandwidth. We have also estimated the effect of spousal retirement (instrumented with the spouse's reaching legal retirement age) on own retirement under a fuzzy RD design, by means of a local polynomial estimator and a parametric instrumental variable model (Section 3). All the models adjust the standard errors and cluster them at the couple's level (or estimate couple's random effects).

⁹ They may have quit work, for example, to take care of children or of their elderly parents (Kristian Bolin, Bjorn Lindgren and Petter Lundborg, 2008).

Sharp RD design: estimates of the direct effects of the 1993 policy reform

Let us first of all point out that the two approaches, non-parametric local polynomials using a triangular kernel estimator or parametric estimation of a linear regression model, lead to comparable results (Table 1). We find that the 1993 reform reduced significantly both spouses probability to retire at age 60 (individuals born in 1934, our cut-off, are 60 in 1994, which is when the policy was implemented) but the size of these effects is very small. The drop in the retirement probability is equal, respectively; to about 0.02 for the husband and 0.04 for the wife. When estimating a linear regression with couple's random effects though, the estimates are slightly larger for the wife and double the size for the husband, for whom the retirement probability drops now by 0.04. Because for generations born in 1933, and observed as from 1994, the mean of retirement was, respectively, for the husband, 0.94 and for the wife, 0.69, the reform does not appear to have reduced substantially the retirement probability. Earlier studies¹⁰ of the individual effect of the reform using an incremental diff-in-diff strategy also found very small effects of this reform on the individual retirement probability.

Next, we estimate the effect of the reform on spouses' probability to exit into other non-employment states (columns 4, 5, and 6 of Table 1). We find that the husband's probability to be unemployed increases significantly, though the size of the effect is very small, and equal to 0.01 according to the estimates from a linear regression model with couple's random effects, which are larger than the estimates obtained using local polynomials or a linear regression not accounting for random effects (Column 4 of Table 1). Because the husband's probability to be found unemployed just before the cut-off (for generations born in 1933, and as from 1994) is equal to 0.003, the RD estimate of a 0.01 increase in unemployment is huge. This suggests that older men who could not retire with maximum benefits yet, were likely (pushed or) trapped into unemployment from the 1993 reform. Because older unemployed were dispensed from actively searching for a job and their unemployment benefits were not made digressive, regardless of the length of their unemployment spell (Section 4), the reform may have reinforced unemployment traps for them. Alternatively, it could be that employers dismissed these workers¹¹ as the (possibly psychic) costs of employing older workers longer perhaps outweighed the penalty incurred for dismissing them (Section 4). We have used some extra questions on the reasons for entering inactivity to try and find out more about

¹⁰ Antoine Bozio (2006).

¹¹ The literature documents that employers may discriminate against older workers (Joanna Lahey, 2008).

these issues, using as the outcome variable the reasons for being inactive (dismissal, quit, taking care of family, or health problems), but unfortunately given the small sample sizes at stake nothing showed up significant.

As far as the wife's unemployment probability goes, the estimated coefficient of the effect of the 1993 reform on her being unemployed is positive but statistically significant only for the model with couple's random effects (and also for the local polynomial model with large bandwidth of 96 months). The RD estimate is equal to 0.007 (last row of column 5 in Table 1), which suggests that the chances to be found unemployed due to the 1993 reform almost double for the wife. Finally, we look at the effect of the reform on the wife reporting to be a housewife. This may possibly also capture situations of long-term (or discouraged) unemployment. We find a significant increase in the probability of being a housewife following the 1993 reform. The estimated coefficient is statistically significant and very close in size, whatever the estimator used (last column of Table 1), which suggest that the 1993 reform "pushed" married women into being a housewife. The size of the effect is small though and equal to about 0.03, which represents a 14% increase in the probability to be a housewife at old age.

Therefore, while we find that the direct effects of the 1993 reform on couples were to reduce, as expected, spouses' own probability to retire at age 60, we also find that it increased significantly though by a small extent, exits into unemployment for the husband and into being a housewife for the wife.

Sharp RD design: estimates of the indirect effects of the 1993 policy reform

Next, we estimated the indirect effects of the 1993 reform on each spouse by taking the birth date of the spouse as the forcing variable and estimating the discontinuity in the wife's outcomes as a function of the husband's birthdate and vice-versa. The cut-off point is here whether the spouse was born in 1934 (as from January 1994). The empirical RD design is the same as above and we use the same estimators as above (Section 3). We do not find any significant cross-effects but almost all the estimates of the indirect effect of the reform on spousal retirement are negative (Columns 1 and 2 of Table 2). It is straightforward to interpret these negative (though not significant) cross-effects. The 1993 reform induced spouses to postpone retirement by increasing the periods of social security contributions needed to retire with maximum pension benefits (Section 4), and we do estimate above significant and negative, though small, direct effects of the reform on spouses' own

retirement probability. If the husband postpones retirement, then the wife will also have an incentive to do so, and vice-versa. This explains the negative coefficients on the cross-effects. The non-significance of these indirect effects does not come as a surprise given the small size of the direct effects.

Coming next to the other non-employment outcomes, the husband's probability to be unemployed does not appear to vary as a function of whether the wife was affected by the reform or not. In contrast, the wife's unemployment probability responds significantly to the husband's retirement. Her unemployment probability increases significantly when the husband is hit by the 1993 reform and the estimated RD coefficient is close to 0.01 and statistically significant under all empirical methods used (Column 5 of Table 2). This estimate represents an increase of hundred per cent on the wife's unemployment probability when the husband is hit by the reform, as her unemployment probability when he is born in 1933 (and observed in 1994 and later) is about 1%. The spillover effect on her probability to be a housewife is also positive but only statistically significant at the ten per cent level, and only when allowing for couple's random effects, or using a smaller bandwidth of 24 months. The size of the effect is though quite small, about 0.02 to 0.03. It is not very clear why would the wife's non-employment probability increase when the husband is hit by the reform, except that we saw that the husband's own unemployment probability also increases significantly because of the reform, which may indicate that both spouses are more likely to be found unemployed due to the reform.

To check that we are not confounding the direct and indirect effect of the reform, we also re-estimated similar RD models allowing for multiple discontinuities (Matias Cattaneo, Luke Keel, Rocio Titunik and Gonzalo Vazquez-Bare, 2015), specifying a discontinuity for the husband's been born in January 1934 or later and an additional discontinuity for the wife's been born in January 1934 or later. Therefore, we now allow explicitly spouses to be treated twice, when they are hit by the reform (direct effect) and when their spouse is hit (indirect effect). Under this set up, we allow for the same bandwidth in both spouses' birth dates. The estimation results are very comparable to those obtained estimating the two discontinuities separately, and we skip reporting them in an additional table for the sake of conciseness, but they are available from the authors.

Sharp RD design: placebo of the 1993 policy reform

To check the validity of our RD design, we replicated a similar set up for spouses born in 1932 and later years (up to 1993), assuming fictitiously that a similar reform was put into force in 1992 and replicated the estimations of the models above for the sample years between 1990 and 1993. As Figure 5 also illustrates (Section 6), we do not find any direct or indirect effect of this fictitious reform on spouses' outcomes (for the sake of brevity we do not show the results of estimation but they are available from the author).

Fuzzy RD design: indirect effects of spousal retirement on own outcomes

To gather further insights on spouses joint retirement strategies, we exploit the large discontinuity in each spouse's retirement at legal retirement age (top block of graphs in Figure 9, Section 6) to instrument the spouse's retirement and estimate the effect of the spouse's retirement (instrumented with legal retirement age) on own retirement. We set up a Fuzzy Regression Discontinuity design and estimate it both non-parametrically (local polynomials) and parametrically (linear regressions). All the models adjust the standard error and either cluster them at the couple's level or include random (or fixed) couple's effects (Section 3). As far as anticipations go (Section 3), although age and retirement can be anticipated, legal retirement age constraints are binding and thus, spouses cannot anticipate retirement. Moreover, the graphs in Figure 9 show no evidence of anticipation. Besides, we do not find much evidence of any indirect effect of spousal retirement on own retirement (bottom blocks of graphs in Figure 9). We estimate the model for all the couples (Columns 2 and 3 of Table 2) and also distinguishing couples by spouses' age difference (Columns 4 to 7 of Table 2). Spouses' age difference may not be exogenous to the process of spouses' decision making (Section 2), an issue which has been neglected in most literature on spouses' retirement to date. To control for this, we also estimate for each specification, a model which includes couple's fixed effects. The estimates obtained using different modeling specifications (Section 3) are very close in size.

Let us first of all, point out that the first stage estimates are strongly significant and indicate a large jump on the own retirement probability upon turning 60 for each spouse. In particular, the husband's retirement probability increases by 0.32 using a local polynomial estimator and by 0.34 when estimating a linear regression model (Section 3 for model specification). The wife's retirement probability increases by 0.25 using a local polynomial estimator and by 0.27 when estimating a linear regression model. Therefore, the first stage estimates are large

and strongly significant. We now find a significant and positive, though very small, effect of own retirement on spousal retirement: the husband's retirement probability jumps up by 0.05 to 0.06 when the wife retires, while the wife retirement probability increases by 0.02 to 0.03 when the husband's retire –though the estimate is not significant statistically using a local polynomial approach. Given the large proportion of spouses that retire between age 59 and age 60, these cross-effects (though significant and positive as predicted in the earlier literature) are not large and suggest little immediate joint retirement of spouses. This is not surprising since for the average couple, the age difference between spouses is over two years (Figure 2) and legal retirement age constraints the timing of each spouse's retirement. Therefore, we split the sample according to the age difference between spouses, distinguishing three groups of “unions”:

_ couples in which the age difference between the husband and the wife is at most one year (Columns 4 and 5 of Table 3), regardless of who is the older spouse (the husband is at most one year older than the wife, or, vice-versa);

_ couples in which the wife is over a year older than the husband (Column 6 of Table 3), which represent less than 20% of the couples ;

_ couples in which the husband is over a year older than the wife (Columns 7 of Table 3), which is the vast majority of couples.

Perhaps not surprisingly we find that couples that are close in age retire together (Columns 4 and 5 of Table 3), but these estimates simply confound the effect of own and spousal age, given that both spouses will turn 60 at a very close time. When looking at couples in which the husband is over a year older than the wife, retirement of the husband is found to significantly lower the chances that the wife retires at a close time, though the size of this effect is small in absolute value and equal to about 0.07 to 0.08, depending on the method of estimation. For the reverse case of the husband being over a year younger than the wife, the estimates of the effect of her retirement on his retirement are also negative but never statistically significant. Because age differences between spouses have been falling over time (Figure 2), we probably go in the direction of important co-retirement confounding effects when using more recent data. We should also mention that the age difference may also induce the older spouse to postpone retirement, something which we have not checked here, as in our data most of the older spouses are already retired by the time the younger spouse turns 60.

Conclusions

Because of population ageing and increasing budgetary pressure most OECD countries have introduced policies to extend individual working lives. Over two-third of older individuals live in a couple and therefore, it is of utmost importance for policy purposes to understand the retirement strategies of married workers. Earlier literature concluded that spouse retire together. Recent studies argue that spouses may have conflicting interests over the timing of their retirement, because of the design of social security and the fact that the wife is typically younger than the husband.

Our study is novel in three respects. First, in contrast with previous studies that focused on the (joint) participation decision we also look at unemployment and being a “housewife”, among the outcome variables. Second, earlier literature relates to North-American, Anglo-Saxon or Northern European countries in which private pension schemes are much more widespread than in continental and southern Europe. Most French retirees rely on first pillar (public) pensions which are individually designed and thus create a disincentive for spouses to “retire together”. Third, in this study we exploit a retirement reform to identify the direct and indirect effects of the reform on spouses’ retirement and other non-employment outcomes. We also make use of the discontinuity in retirement at legal retirement age to gain additional insights into spouses’ joint retirement patterns.

We estimate both non-parametric local polynomials using triangular kernel estimators and parametric linear regression models with linear polynomials in the forcing variable (and their interaction with the cut-off). The model is estimated with (rotating) panel data on over 50 000 French couples and we also control for individual unobserved heterogeneity. The estimates obtained using the different methods are very similar. We conclude that the 1993 policy reform significantly reduced each spouse’s retirement probability, though by a small amount. The reform also increased significantly the husband’s unemployment probability and the wife’s probability to be a housewife, which came as unexpected. Moreover, the husband’s treatment has an indirect and positive effect also on the wife’s probability to be unemployed, which again came as a surprise. Though the size of all these immediate “unintended” effects of the 1993 reform is small, they are statistically significant and robust to specification checks.

We also exploit the discontinuity in retirement at legal retirement age to estimate the effect of spousal retirement (instrumented with legal retirement age) on own retirement, to conclude, like for the 1993 reform, that there is little evidence of spouses retiring together. We show that spouses' joint retirement strategies reflect the age difference between the spouses, which we argue may not be exogenous to the household decision making.

References

- Aguiar, Mark, and Eric Hurst. 2005. "Consumption versus Expenditure." *Journal of Political Economy*, 113(5), 919-948.
- An, Mark Y., Bent Jesper Christensen and Nabanita Datta Gupta (2004), "Multivariate Mixed Proportional Hazard Modelling of the Joint Retirement of Married Couples", *Journal of Applied Econometrics*, 19, pp. 687-704.
- Angrist, Joshua D. and Jorn-Steffen Pischke (2009) "Mostly Harmless Econometrics: An Empiricist's Companion", Princeton University Press.
- Aubert, Patrick, Nadine Barthelemy and Samia Benallah (2012), "Le départ à la retraite : motivations et connaissance des droits", DREES Recherches Etudes Evaluation et Statistiques, 34, 1-44.
- Baker, Michael (2002). The Retirement Behavior of Married Couples: Evidence from the Spouse's Allowance, *Journal of Human Resources*, 37(1), 1-34.
- Banks, James, Richard Blundell, and Maria Casanova Rivas (2010), "The dynamics of retirement behaviour in couples: reduced form evidence from England and the US," mimeo, 2010.
- Battistin, Erich, Agar Brugiavini, Enrico Rettore and Guglielmo Weber (2009), "The Retirement Consumption Puzzle: Evidence from a Regression Discontinuity Approach" *American Economic Review*, 99(5), 2209-2226.
- Behagel, Luc, Didier Blanchet, and Muriel Roger (2014), "Retirement, Early-Retirement and Disability: Explaining the Labor Force Participation after 55 in France", NBER, Working Paper No. 20030.
- Blau, Francine, D. and Kahn, Lawrence, M. (2013), "Female Labor Supply: Why is the US falling Behind", *American Economic Review*, 103(3), 251-56.
- Blau David M. (1998), Labor Force Dynamics of Older Married Couples, *Journal of Labor Economics*, 16(3), 595-629.
- Bloemen, Hans and Stancanelli, Elena (2013), "Toyboys or Supergirls ? An analysis of partners' employment outcomes when she outearns him", *Review of the Economics of the Household*, August, 1-30.

Bolin, Kristian, Bjorn Lindgren and Petter Lundborg (2008) "Your next of kin or your own career? Caring and working among the 50+ of Europe." *Journal of Health Economics* 27(3), 718–738.

Bommier, Antoine, Thierry Magnac and Muriel Roger (2003), "Le marché du travail à l'approche de la retraite : évolutions en France entre 1982 et 1999", *Revue Française d'Economie*, XVIII(1), pp. 23-82.

Bovenberg, Lans (2011), "Pension reform in the Netherlands from an international perspective", mimeo.

Bozio Antoine, (2006), "Reformes des Retraites: Estimations sur Donnees Francaises", PhD thesis.

Casanova, Maria, "Happy Together: a structural model of couples' joint retirement choices," mimeo, 2010.

Calonico, Sebastian, Matias D. Cattaneo and Rocio Titiunik (2014), "Robust Non-Parametric Confidence Intervals for Regression Discontinuity Designs", *Econometrica*, 82 (6), 2295-2326.

Card, David, Carlos Dobkin and Nicole Maestas (2009), "Does Medicare Save Lives?" *Quarterly Journal of Economics*, 124(2), 597-636.

Card, David, Carlos Dobkin and Nicole Maestas (2004), The Impact of Nearly Universal Insurance Coverage on Health Care Utilization and Health: Evidence from Medicare, NBER Working Paper 10365, March.

Casanova, Maria, "Happy Together: a structural model of couples' joint retirement choices," mimeo, 2010.

Cattaneo, Matias, D., Luke Keel, Rocio Titunik and Gonzalo Vazquez-Bare (2015), "Identification in Regression Discontinuity Designs with Multiple Cutoffs", mimeo.

Chiappori, Pierre-André, Oreffice, Sonia and Climent Quintana-Domeque (2012), "Fatter attraction: anthropometric and socioeconomic matching on the marriage market", *Journal of Political Economy*, 120(4), 659-695.

Coile, Courtney C. (2004), "Retirement incentives and couples' retirement decisions," *Topics in Economic Analysis & Policy*, 4(1), 1-28.

Cribb, Jonathan, Carl Emmerson and Gemma Tetlow (2014), "How does increasing the early retirement age for women affect the labour supply of (women and their) husbands?", IFS, 2014.

Dilender, Marc (2014), "Social Security and Divorce Decisions", Upjohn Institute working paper 14-206.

Donni, Olivier (2008), Collective models of the household. Published in: S. Durlauf and L. Blume (eds), *The New Palgrave Dictionary of Economics*, 2nd Edition.

Donni, Oliver, and Nicolas Moreau (2007), "Collective Labor Supply: A Single-Equation Model and Some Evidence from French Data," *Journal of Human Resources*, 42, 214-246.

Gerard, Francois and Lena Nekby (2012), "Spousal Retirement: A Reform Based Approach to Identifying Spillover Effects", mimeo.

Gilleskie, Donna B. and David M. Blau (2006), "Health insurance and retirement of married couples," *Journal of Applied Econometrics*, 21(7), 935-953.

Gruber, Jonathan and David Wise (2005), "Social Security Programs and Retirement around the World: Fiscal Implications, Introduction and Summary," NBER Working Papers 11290, National Bureau of Economic Research, Inc.

Gustman, Alan and Thomas Steinmeier (2009), Integrating Retirement Models, NBER Working Paper 15607.

Gustman, Alan and Thomas Steinmeier (2000), Retirement in Dual-Career Families: A Structural Model, *Journal of Labor Economics*, 18, 503-545.

Hairault, Jean-Olivier, Francois Langot and Thepthida Sopraseuth (2010), "Distance to Retirement and Older Workers' Employment: The Case for Delaying the Retirement Age", *Journal of the European Economic Association*, MIT Press, vol. 8(5), pages 1034-1076, 09.

Hahn, Jinyong; Petra Todd; Wilbert Van der Klaauw (2001), Regression-Discontinuity Design, *Econometrica*, 69 (1), pp. 201-209.

Honoré, Bo and Aureo de Paula (2014), "Joint Retirement in Europe", NETSPAR Discussion Paper, No. 10/2014-052.

Hurd, Michael (1990), The Joint Retirement Decision of Husbands and Wives, in: *Issues in the Economics of Aging*, David Wise (ed.), NBER, pp. 231-258.

Imbens, Guido and Thomas Lemieux (2007), Regression Discontinuity Design: a Guide to Practice, *Journal of Econometrics*, 142, 615-635.

Kapur, Kanika and Jeannette Rogowski (2007), 'The role of health insurance in joint retirement among married couples', *Industrial and Labor Relations Review*, 60 (3), pp. 397-407.

van der Klaauw, Wilbert (2008), "Regression Discontinuity Analysis: a Survey of Recent Developments in Economics", *Labour*, 22(2), 219-245.

van der Klaauw, Wilbert and Kenneth Wolpin (2008), "Social Security and the Retirement and Savings Behavior of Low Income Households", *Journal of Econometrics*, 145 (1-2), 21-42.

Lahey, Joanna (2008), "Age, Women, and Hiring: An Experimental Study", *Journal of Human Resources*, 43(1), 30-56.

Lalive, Rafael and Stefan Staubli (2014), "How Does Raising Women's Full Retirement Age Affect Labor Supply, Income, and Mortality? Evidence from Switzerland", August, 2014, mimeo.

Lalive, Rafael and Pierpaolo Parrotta (2014), "Coworker Interactions in Labor Supply", mimeo.

Lee, David S. (2008), "Randomized experiments from non-random selection in the U.S. House Elections", *Journal of Econometrics*, 142, 675-697.

Lee, David S. and Thomas Lemieux (2010), Regression Discontinuity Designs in Economics, *Journal of Economic Literature*, 48(2), 281-355.

Michaud, Pierre-Carl and Frederic Vermeulen (2011), "A collective labor supply model with complementarities in leisure: identification and estimation by means of panel data", *Labour Economics*, 18, 159-167.

McCrary Justin (2008), "Manipulation of the Running Variable in the Regression Discontinuity Design: A Density Test," *Journal of Econometrics*, 142, 698-714.

Nichols, Austin (2014), "Stata Module for Regression Discontinuity Estimation", Stata journal, Boston College.

OECD (2011), "Doing Better for Families".

OECD (2014), Estimates of effective retirement age, based on the results of national labour force surveys, the European Union Labour Force, OECD, online statistics.

Pollak, Robert A. (2003), "Gary Becker's Contributions to Family and Household Economics," *Review of Economics of the Household*, 1 (1-2), pp.111-141.

Pollak, Robert A. (2013), "Labor Supply and Claiming Social Security Benefits: A Couples' Perspective", unpublished, mimeo.

Roodman, David. 2007. "CMP: Stata module to implement conditional (recursive) mixed process estimator." Statistical Software Components S456882, Boston College Department of Economics, revised 22 May 2009.

Roodman, David. 2009. "Estimating Fully Observed Recursive Mixed-Process Models with CMP." Working Paper 168, Center for Global Development.

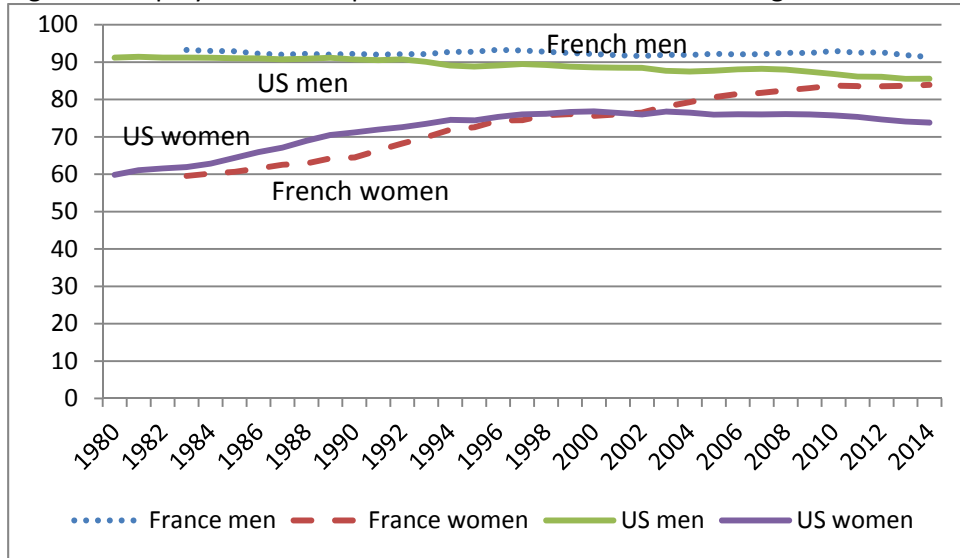
Sédillot, B. and E. Walraet, (2002), "*La cessation d'activité au sein des couples: y a-t-il interdépendance des choix?*", *Economie et Statistique*, 357-358

Stancanelli, Elena and Arthur Van Soest (2012), “Retirement and Home Production: A Regression Discontinuity approach”, *American Economic Review*, Papers and Proceedings, 102(3), 600-605.

Stancanelli, Elena (2012), “Spouses’ Retirement and Hours of Work Outcomes: Evidence from Twofold Regression Discontinuity”, IZA DP 6791, August 2012.

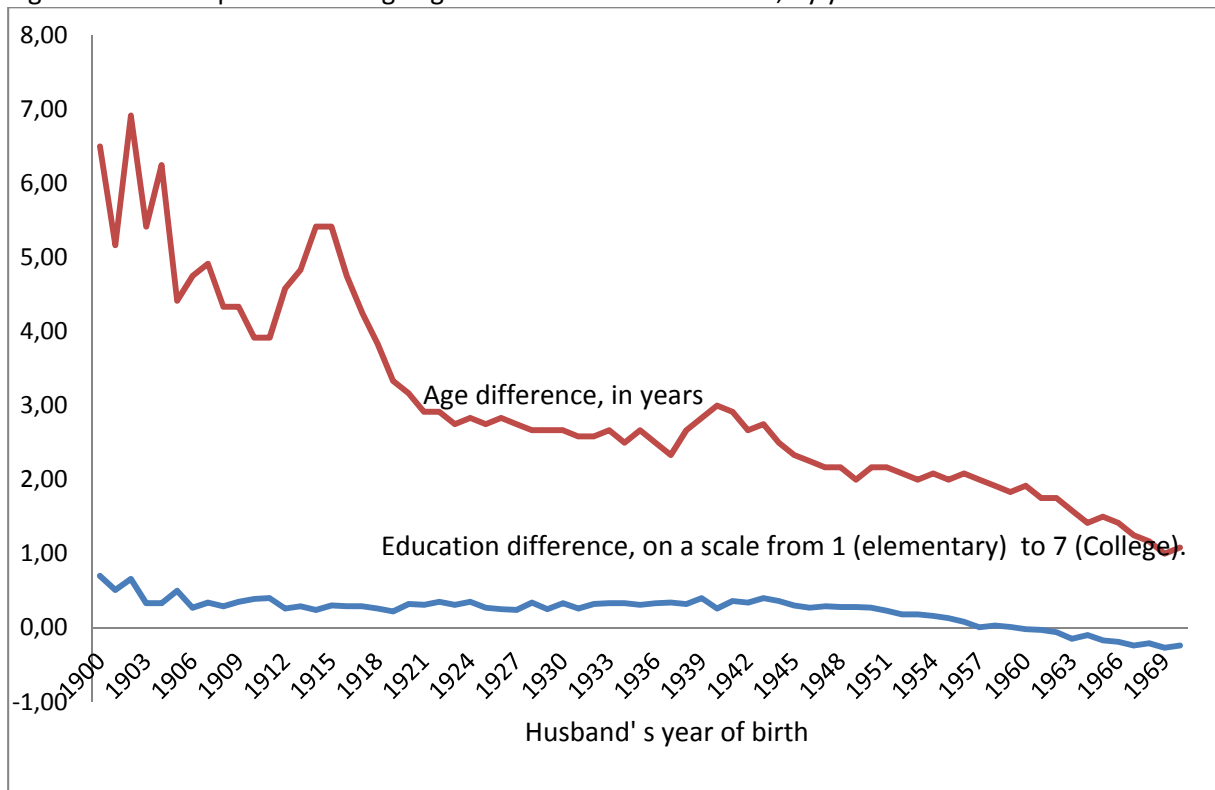
Van der Klaauw, Wilbert (2008), Regression-Discontinuity Analysis: A Survey of Recent Developments in Economics, *Labour*, 22(2), 219-245.

Figure 1. Employment Participation Rates of Men and Women Aged 45 to 54.



Source: OECD Statistics Online.

Figure 2. French spouses' average age and education differences, by year of birth of the husband.



The graph shows the average age and education difference between the husband and the wife. The horizontal axis is the year of birth of the husband while the vertical axis provides the average age and education differences between spouses, for each husband birth year. Age is measured in years. Education is measured on a scale going from one (elementary education) to seven (having obtained a university degree). The graph shows that the age difference between spouses has been falling dramatically over time. The husband was on average six years older than the wife, for couples in which the husband was born in 1900, but the age difference between spouses is slightly more than a year for more recent cohorts. Education differences between the husband and the wife have always been quite small and the trend has reverted for more recent generations in favour of the wife who is slightly more educated than the husband, on average. Source: author calculations, French LFS weighted data.

Figure 3. McCrary Graphs of the Discontinuities in the running variable at the cut-off.

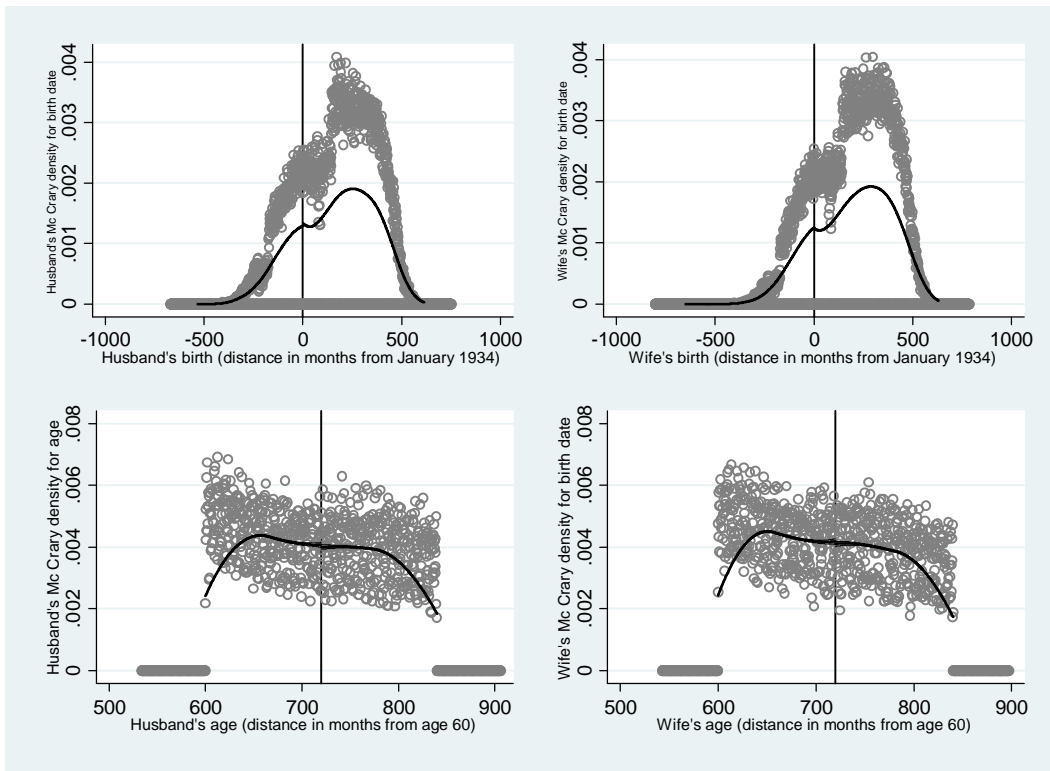
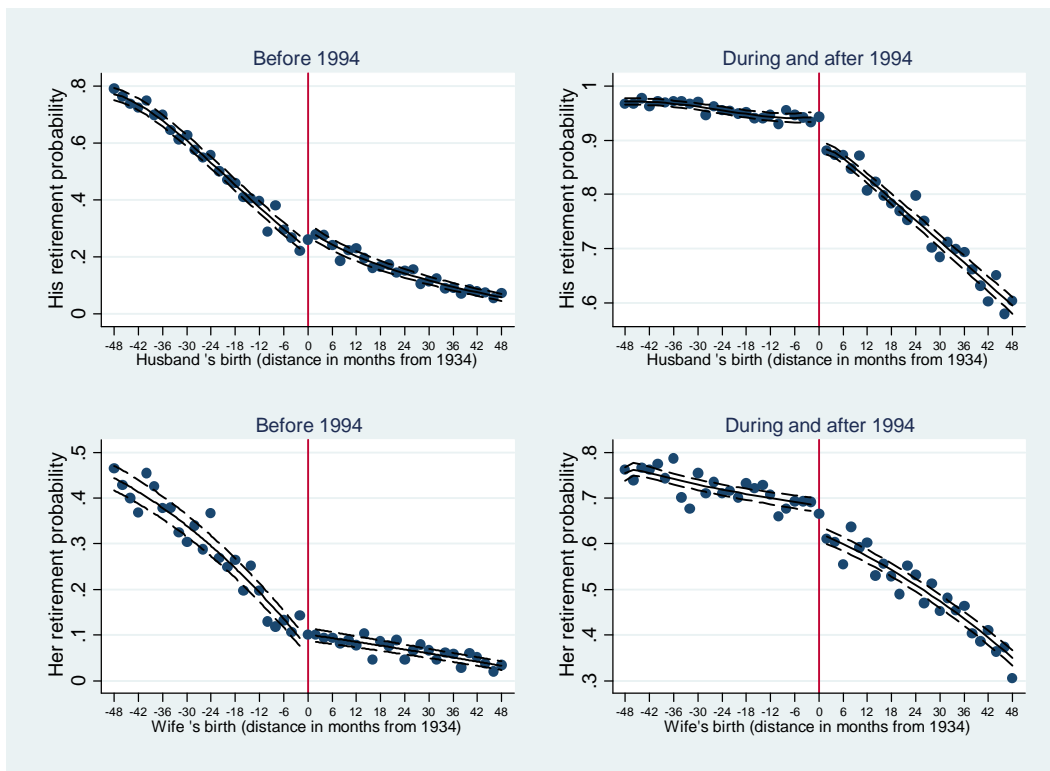
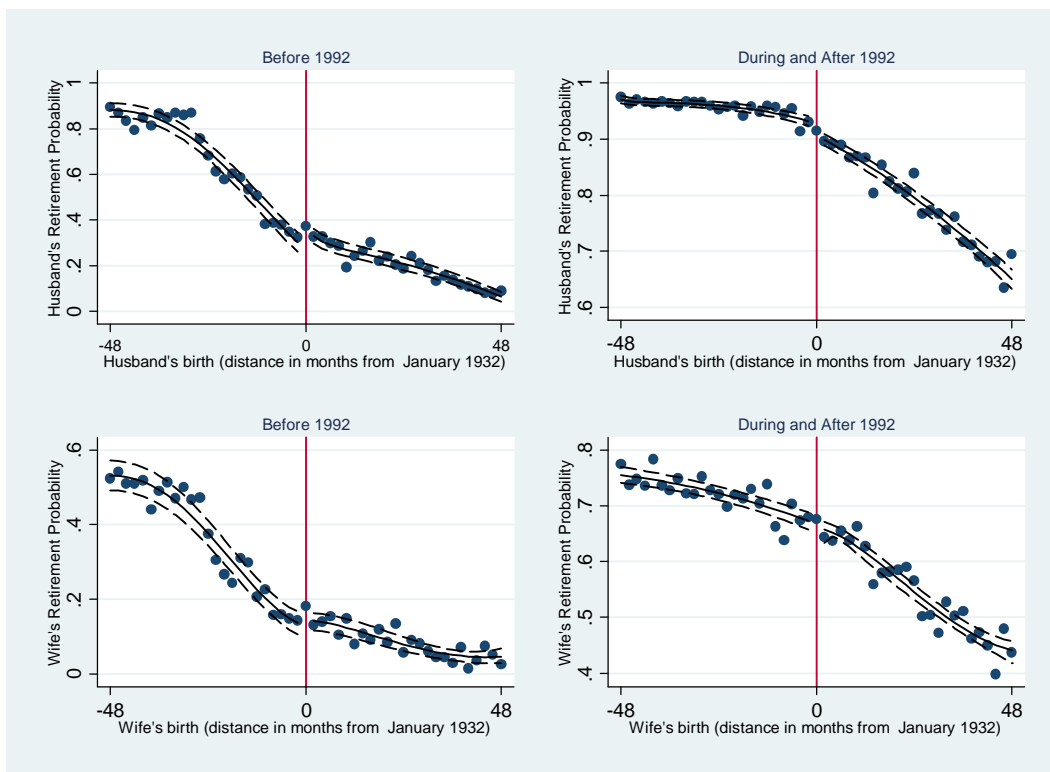


Figure 4. Husband's and Wife's **Own** Retirement Probability before and after the 1994 Reform



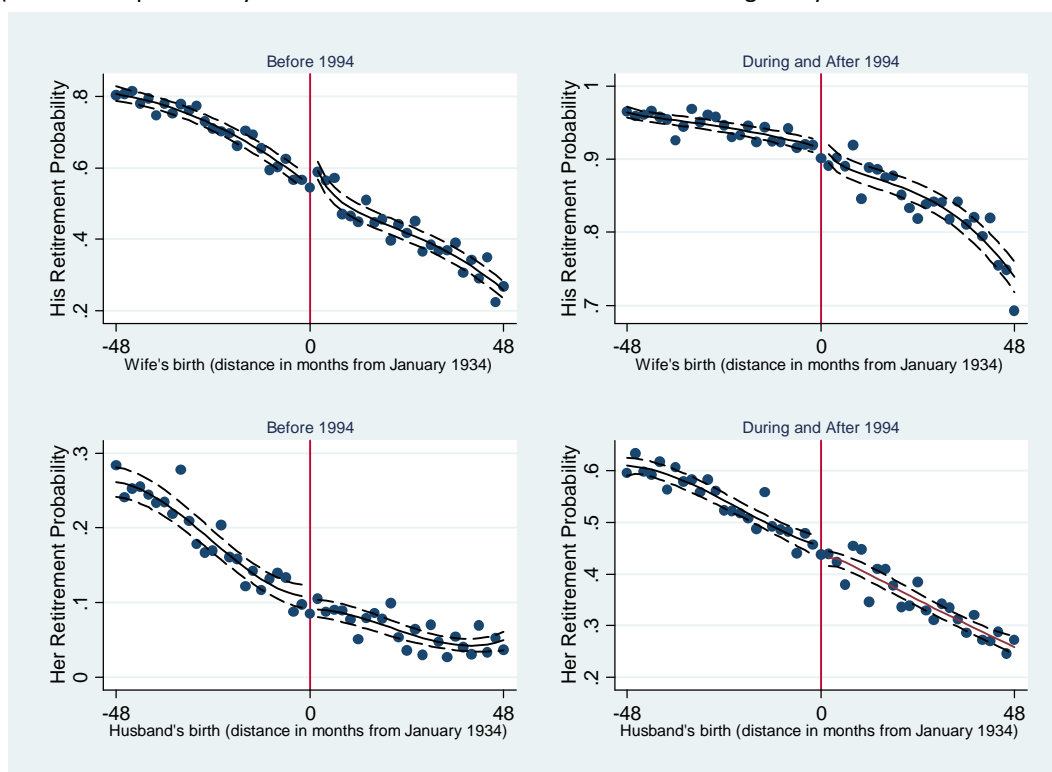
Note: The graphs show the retirement probability of the husband (top block of graphs) and the wife (bottom block of graphs) by own month of birth before and after the reform of 1994. The birth month of “zero” corresponds to January 1934: individuals born in 1934 and later were hit by a retirement reform in 1994. The observations are grouped by bins of two months. The dots are the raw means of the outcome variable (the retirement probability) which is plotted against the running variable (distance in months from being born in January 1934). The solid line is non-parametrically fitted using a triangular kernel with a bandwidth of 48 months. The dotted lines are the 5 percent confidence bounds around the kernel estimates.

Figure 5. Placebo: Husband's and Wife's Retirement Probability before and after 1992



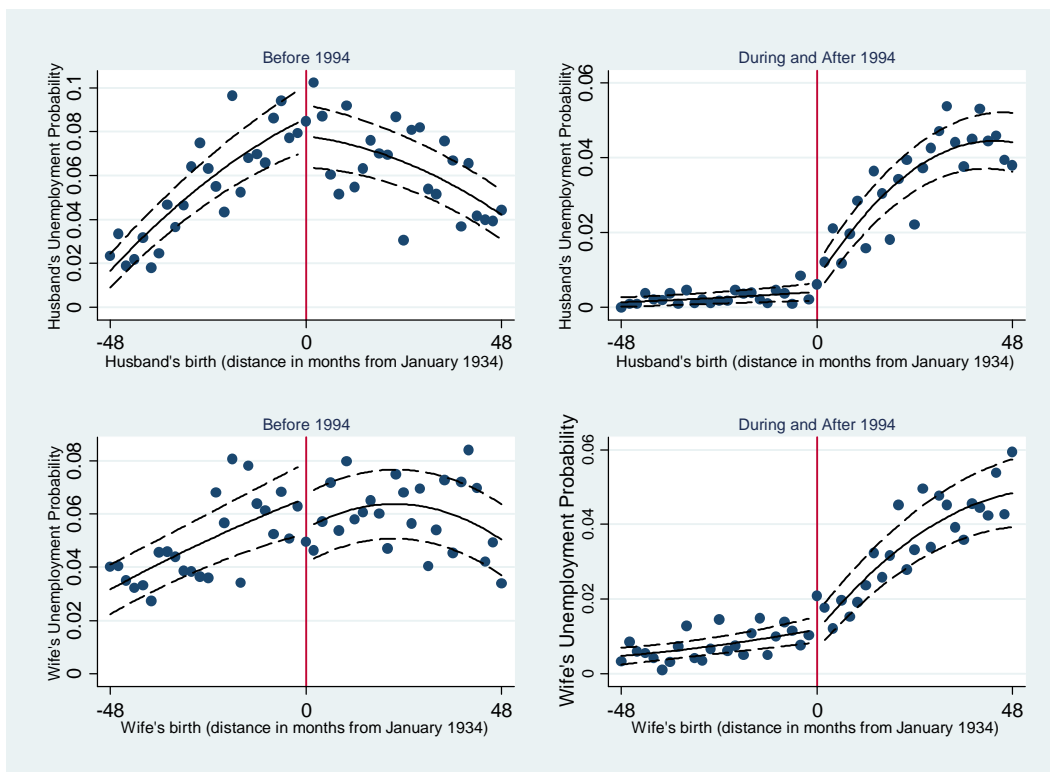
Note: The graphs show the retirement probability of the husband (top block of graphs) and the wife (bottom block of graphs) by own month of birth before and after 1992. There was no reform in 1992. These graphs are a counterfactual for the 1994 reform. The birth month of “zero” corresponds to January 1932. The observations are grouped by bins of two months. The dots are the raw means of the outcome variable (the retirement probability) which is plotted against the running variable (distance in months from being born in January 1932). The solid line is non-parametrically fitted using a triangular kernel with a bandwidth of 48 months. The dotted lines are the 5 percent confidence bounds around the kernel estimates.

Figure 6. Husband's and Wife's **Cross Retirement Probability** before and after the 1994 Reform (Retirement probability of the wife as a function of the husband being hit by the reform and viceversa)



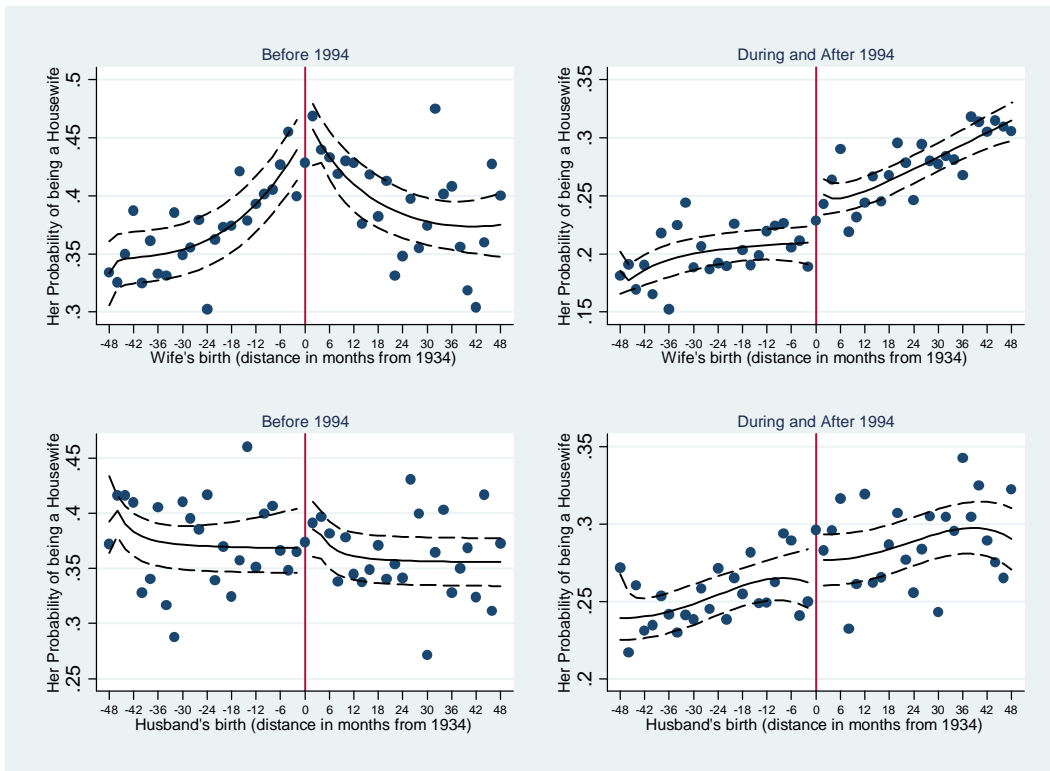
Note: The graphs show the retirement probability of the husband by the month of birth of the wife, respectively, before and after the reform of 1994 (top block of graphs) and the retirement probability of the wife by the month of birth of the husband, respectively, before and after the reform of 1994 (bottom block of graphs). The birth month of “zero” corresponds to January 1934: individuals born in 1934 and later were hit by a retirement reform in 1994. The observations are grouped by bins of two months. The dots are the raw means of the outcome variable (the own retirement probability) which is plotted against the running variable (spousal distance in months from being born in January 1934). The solid line is non-parametrically fitted using a triangular kernel with a bandwidth of 48 months. The dotted lines are the 5 percent confidence bounds around the kernel estimates.

Figure 7: Husband's and Wife's Unemployment Probability Before and After the 1994 Reform.



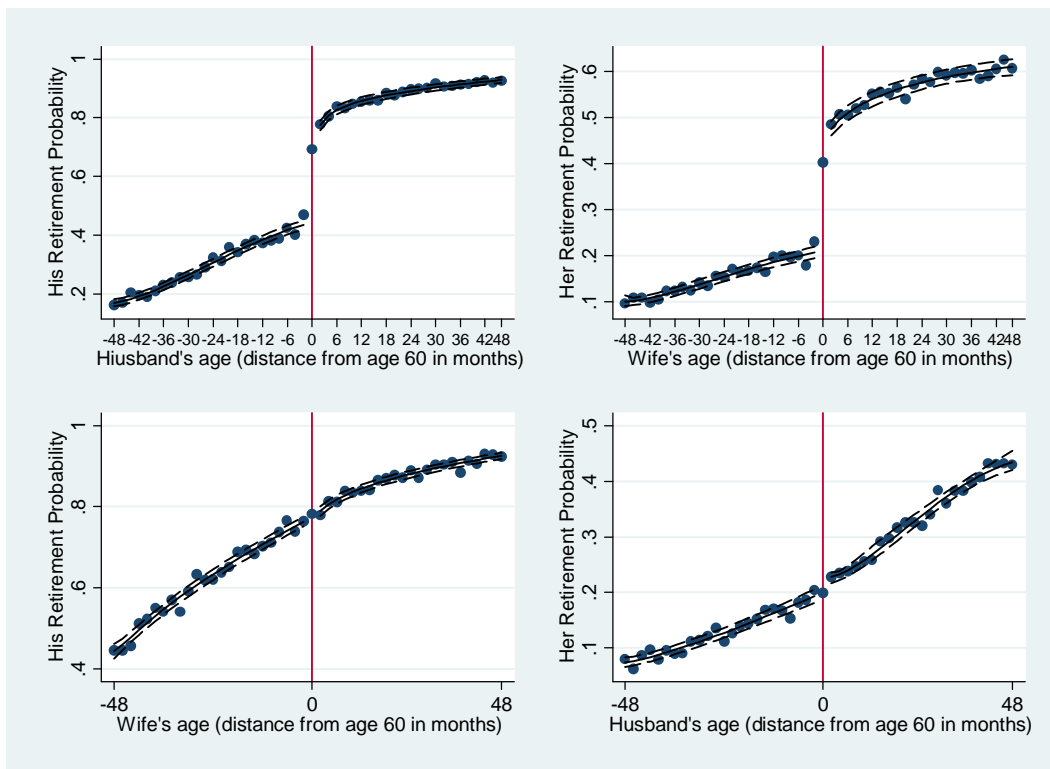
Note: The graphs show the unemployment probability of, respectively, the husband (top block of graphs) and the wife (bottom block of graphs) by the own month of birth, before and after the reform of 1994. The birth month of “zero” corresponds to January 1934: individuals born in 1934 and later were hit by a retirement reform in 1994. The observations are grouped by bins of two months. The dots are the raw means of the outcome variable (the probability of unemployment) which is plotted against the running variable (distance in months from being born in January 1934). The solid line is non-parametrically fitted using a triangular kernel with a bandwidth of 48 months. The dotted lines are the 5 percent confidence bounds around the kernel estimates.

Figure 8: Wife's Probability of Being a Housewife Before and After the 1994 Reform.



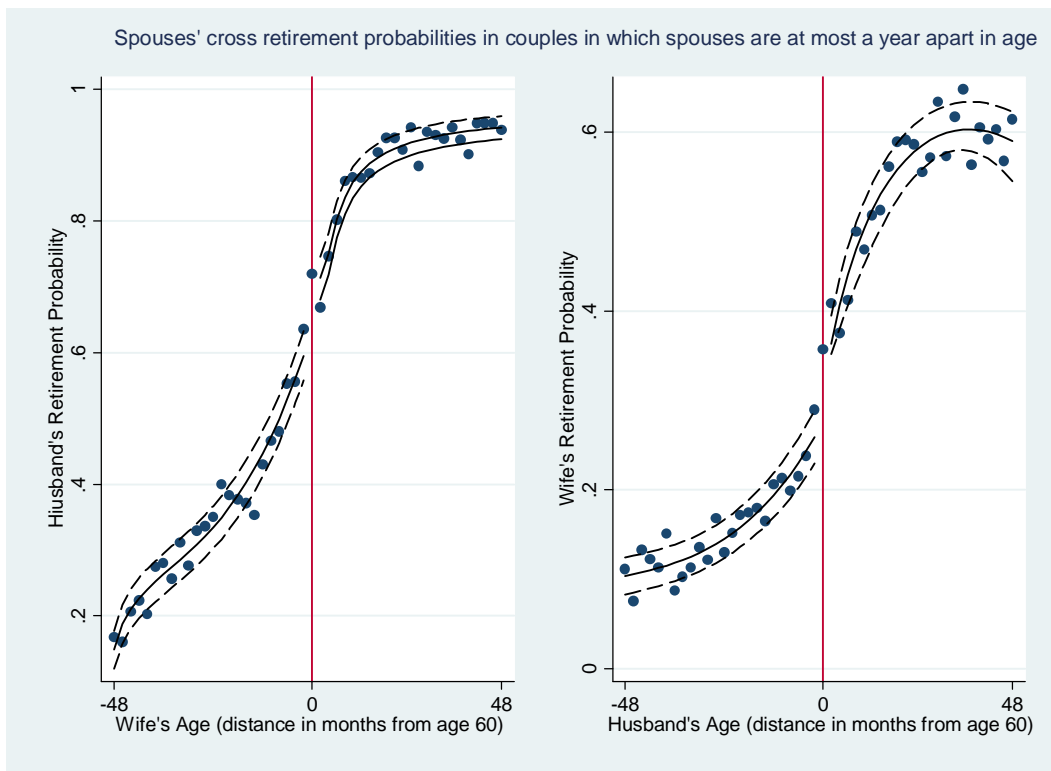
Note: The graphs show the probability of the wife's being a housewife by month of birth of, respectively, the wife (top block of graphs) or the husband (bottom block of graphs), before and after the reform of 1994. The birth month of "zero" corresponds to January 1934: individuals born in 1934 and later were hit by a retirement reform in 1994. The observations are grouped by bins of two months. The dots are the raw means of the outcome variable (the probability of the wife's being a housewife) which is plotted against the running variable (distance in months from being born in January 1934). The solid line is non-parametrically fitted using a triangular kernel with a bandwidth of 48 months. The dotted lines are the 5 percent confidence bounds around the kernel estimates.

Figure 9. Husband's and Wife's **Own** and **Cross** Retirement Probability at legal retirement age



Note: The graphs show the retirement probability of the husband (top block of graphs) and the wife (bottom block of graphs) by own and spouse's age. The age of "zero" corresponds to being aged 60, which is the legal retirement age for most workers in France (see discussion in the text). The observations are grouped by bins of two months. The dots are the raw means of the outcome variable (the retirement probability) which is plotted against the running variable (distance in months from being aged 60 when interviewed). Retirement status is measured at the interview date. The solid line is non-parametrically fitted using a triangular kernel with a bandwidth of 48 months. The dotted lines are the 5 percent confidence bounds around the kernel estimates.

Figure 10. Husband's and Wife's **Cross** Retirement Probability at legal retirement age: couples in which the age difference between spouses is at most one year.



Note: The graphs show the retirement probability of the husband (left graph) and the wife (right graph) by the spouse's age. The age of "zero" corresponds to being aged 60, which is the legal retirement age for most workers in France (see discussion in the text). The observations are grouped by bins of two months. The dots are the raw means of the outcome variable (the own retirement probability) which is plotted against the running variable (spouses' distance in months from being aged 60 when interviewed). Retirement status is measured at the interview date. The solid line is non-parametrically fitted using a triangular kernel with a bandwidth of 48 months. The dotted lines are the 5 percent confidence bounds around the kernel estimates.

Table 1. Results of estimation of the direct effect of the 1934 reform for the spouses (own effects)

Outcome:	He Retired	She Retired	He Unemp.	She Unemp.	She Housewife
<i>Mean if born in 1933</i>	0.94	0.69	0.003	0.01	0.21
<i>(st dev. from the mean)</i>	(0.23)	(0.46)	(0.06)	(0.1)	(0.41)
Local Polynomial model bandwidth 48 months, robust standard errors clustered at the couple's level					
Dummy for born ≥ 1934	-0.0197**	-0.039**	0.0066**	0.003	0.027**
<i>(standard error)</i>	(0.007)	(0.013)	(0.002)	(0.003)	(0.011)
<i>Observation number</i>	51350	48284	51350	48284	48284
Local Polynomial model bandwidth 24 months, robust standard errors clustered at the couple's level					
Dummy for born ≥ 1934	-0.0169**	-0.036**	0.0049*	0.003	0.035**
	(0.009)	(0.0188)	(0.003)	(0.004)	0.016)
Local Polynomial model bandwidth 96 months, robust standard errors clustered at the couple's level					
Dummy for born ≥ 1934	-0.0145**	-0.0436**	0.0092**	0.006**	0.029**
	(0.005)	(0.009)	(0.0019)	(0.002)	(0.008)
Parametric model, linear birth polynomial & interaction with D, robust st. err. clustered, bandwidth 48 m.					
Dummy for born ≥ 1934	-0.020**	-0.0329**	0.0096**	0.005	0.0217**
	(0.007)	(0.012)	(0.0023)	(0.003)	(0.010)
<i>R square</i>	0.117	0.065	0.130	0.011	0.009
<i>Observation number</i>	51350	48284	51350	48284	48284
Parametric model, linear birth polynomial & interac. with D, robust st. err., couple random effects, bandwidth 48 m.					
Dummy for born ≥ 1934	-0.0449**	-0.049**	0.0123**	0.007**	0.029**
	(0.007)	(0.0117)	(0.0025)	(0.003)	(0.010)
<i>R square overall</i>	0.116	0.065	0.016	0.011	0.012
<i>Observation number</i>	51350	48284	51350	48284	48284
<i>Panel Observation no.</i>	22907	21452	22907	21452	21452

The local linear polynomials are estimated using non-parametric triangular kernel. The standard errors are adjusted and clustered at the couple's level. The parametric model include linear polynomials in the distance from birth in 1934 and interaction of the dummy for been born in 1934 and later years with this polynomial. The standard errors are robust and also clustered at the couple's level.

Table 2. Results of estimation of the indirect effect of the 1934 reform for the spouses (cross-effects)

	He Retired	She Retired	He Unemp.	She Unemp.	She Housewife
<i>Mean if born 1933</i>	0.94	0.69	0.003	0.01	0.21
<i>Mean if spouse born 1933</i>	0.92	0.47	0.006	0.04	0.26
Local Polynomial model bandwidth 48 months, robust standard errors clustered at the couple's level					
D. Spouse born \geq 1934	-0.0010	-0.0048	0.003	0.011**	0.014
standard error	(0.008)	(0.014)	(0.002)	(0.005)	(0.013)
<i>Observation number</i>	48284	51350	48284	51350	51350
Local Polynomial model bandwidth 24 months, robust standard errors clustered at the couple's level					
D. Spouse born \geq 1934	-0.014	-0.007	0.006*	0.014**	0.029*
	(0.011)	(0.0198)	(0.003)	(0.008)	(0.018)
Local Polynomial model bandwidth 96 months, robust standard errors clustered at the couple's level					
D. Spouse born \geq 1934	0.009	-0.0118	-0.0008	0.007**	0.009
	(0.006)	(0.0098)	(0.002)	(0.004)	(0.009)
Parametric model, linear birth polynomial & interaction with D, robust st. err. clustered, bandwidth 48 m.					
D. Spouse born \geq 1934	-0.004	-0.008	0.0009	0.009*	0.012
	(0.007)	(0.012)	(0.002)	(0.005)	(0.011)
<i>R square</i>	0.036	0.047	0.11	0.004	0.002
<i>Observation number</i>	48284	51350	48284	51350	51350
Parametric model, linear birth polynomial & interac. with D, robust st. err., couple random effects, bandwidth 48 m.					
D. Spouse born \geq 1934	-0.008	-0.015	0.001	0.010**	0.018*
	(0.007)	(0.012)	(0.002)	(0.005)	(0.011)
<i>R square overall</i>	0.036	0.047	0.003	0.004	0.002
<i>Observation number</i>	48284	51350	48284	51350	51350
<i>Panel Observation no.</i>	21452	22907	21452	22907	22907

Note: The local linear polynomial are estimated using non-parametric triangular kernel. The standard errors are adjusted and clustered at the couple's level. The parametric model include linear polynomials in the distance from birth in 1934 and interaction of the dummy for been born in 1934 and later years with this polynomial. The standard errors are robust and also clustered at the couple's level. Standard errors are given in brackets. In the table, ** indicates statistical significance at the 5% level and * indicates statistical significance at the 10% level.

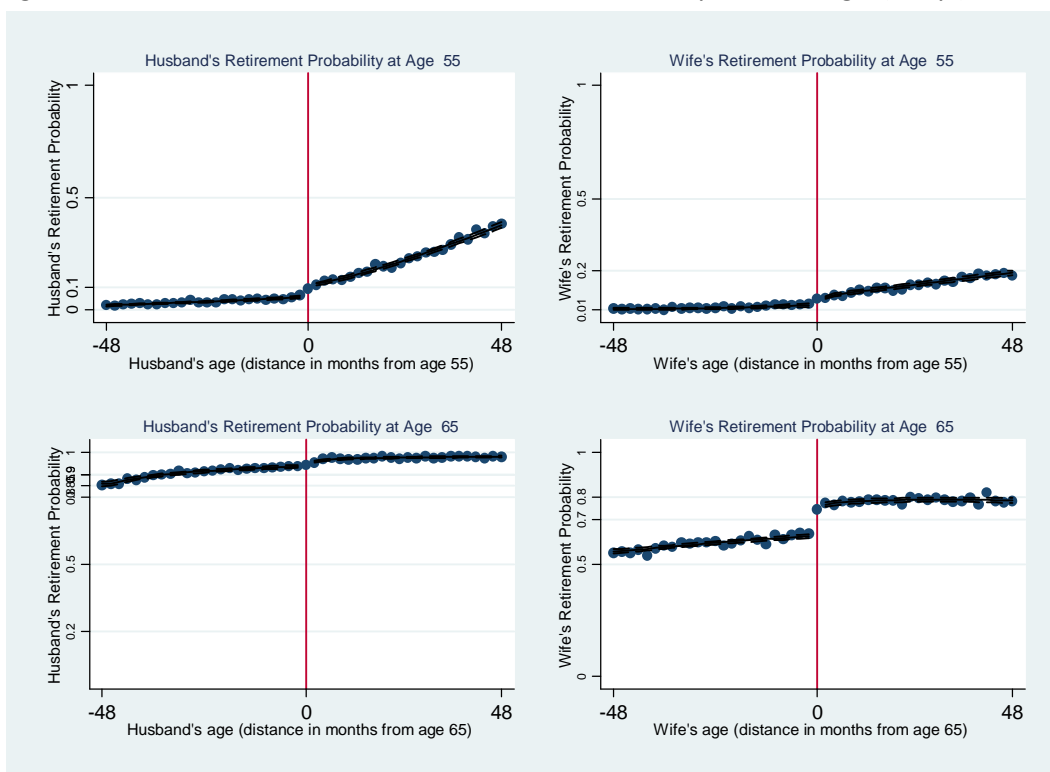
Table 3. Results of estimation of the indirect effect of spouse's retirement (instrumented with legal retirement age) on own retirement

	All couples		Couples at most a year apart in age		He is more than a year younger	She is more than a year younger
	He Retired	She Retired	He Retired	She Retired	He Retired	She Retired
Mean outcome if his age 59	0.41	0.18	0.42	0.23	0.45	0.07
Mean outcome if her age 59	0.74	0.20	0.52	0.20	0.19	0.21
<i>Local Polynomial model bandwidth 48 months, robust standard errors clustered at the couple's level</i>						
Spouse Retired	0.051** (0.023)	0.016 (0.018)	0.77** (0.079)	0.42** (0.04)	-0.08 (0.06)	-0.080** (0.015)
<i>Denominator</i>						
D. Spouse aged ≥60	0.25** (0.007)	0.32** (0.007)	0.23** (0.016)	0.33** (0.016)	0.25** (0.018)	0.32** (0.008)
<i>Parametric model, linear birth polynomial & interaction with D, robust st. err. clustered, bandwidth 48 m.</i>						
Spouse Retired	0.051** (0.022)	0.035** (0.016)	0.87** (0.07)	0.54** (0.045)	-0.04 (0.06)	-0.082** (0.014)
<i>First stage</i>						
D. Spouse aged ≥60	0.27** (0.006)	0.34** (0.006)	0.26** (0.01)	0.35** (0.015)	0.26** (0.02)	0.34** (0.008)
<i>Parametric model, linear birth polynomial & interac. with D, robust st. err., couple random effects, bandwidth 48 m.</i>						
Spouse Retired	0.06** (0.013)	0.023** (0.011)	0.84** (0.04)	0.46** (0.03)	-0.04 (0.03)	-0.078** (0.012)
<i>First stage</i>						
D. Spouse aged ≥60	0.27** (0.004)	0.34** (0.004)	0.26** (0.015)	0.342** (0.009)	0.27** (0.01)	0.34** (0.005)
<i>Parametric model, linear birth polynomial & interac. with D, robust st. err., couple fixed effects, bandwidth 48 m.</i>						
Spouse Retired	0.06** (0.014)	0.024** (0.012)	0.82** (0.05)	0.43** (0.03)	-0.05 (0.04)	-0.072** (0.013)
<i>First stage</i>						
D. Spouse aged ≥60	0.27** (0.005)	0.34** (0.004)	0.25** (0.01)	0.34** (0.001)	0.27** (0.01)	0.34** (0.005)
Observation number	71612	74942	13721	13741	11014	25332
Panel Observation no.	35484	37542	6807	6832	5572	50277

Note: The local linear polynomial are estimated using non-parametric triangular kernel. The standard errors are adjusted and clustered at the couple's level. The parametric model include linear polynomials in the age (distance in months from age 60 at the date of the interview) and a linear interaction of the dummy for been aged 60 and above with this polynomial. The standard errors are robust and also clustered at the couple's level. Standard errors are given in brackets. In the table, ** indicates statistical significance at the 5% level and * indicates statistical significance at the 10% level.

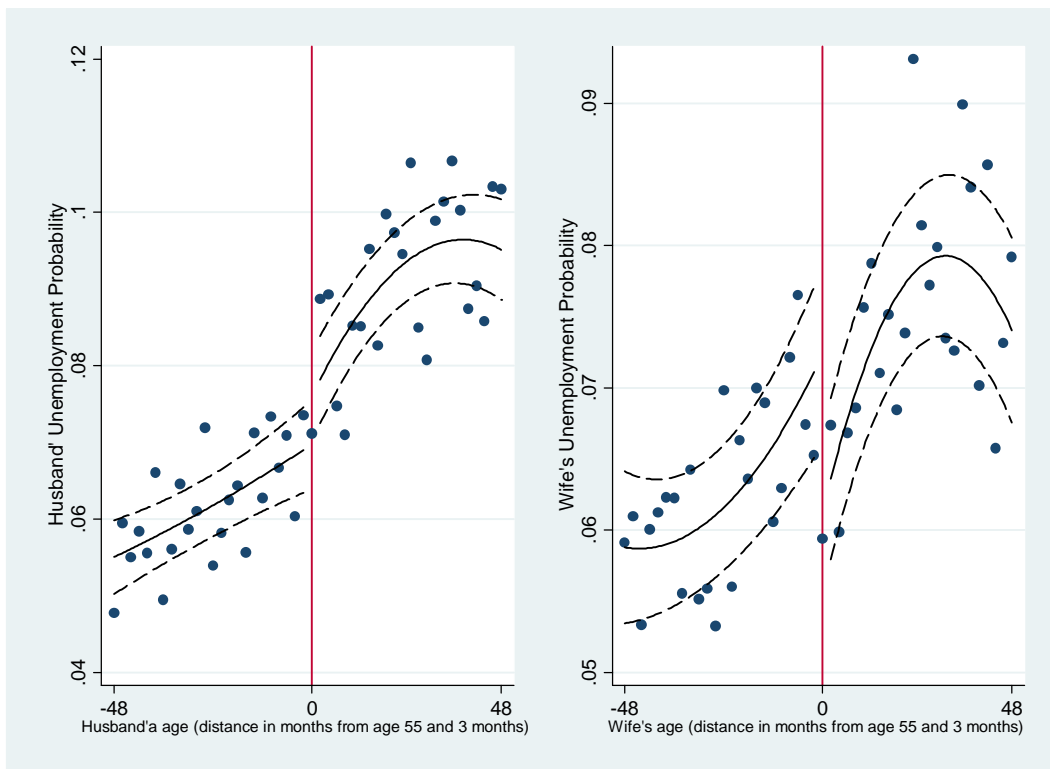
Appendix

Figure A. Husband's and Wife's **Own** Retirement Probability at other legal (early-)retirement age



Note: The graphs show the retirement probability of the husband (left block of graphs) and the wife (right block of graphs) by own age. The age of “zero” corresponds, respectively, to the early retirement age of 55 (top block of graphs) and to the legal retirement age of 65 (bottom blocks of graphs). While 60 is the legal retirement age for most workers in France, age 55 is the typical age at which special early-retirement programs may apply and age 65 is the legal retirement age by which most workers are obliged to retire if they have not yet done so. The observations are grouped by bins of two months. The dots are the raw means of the outcome variable (the retirement probability) which is plotted against the running variable (distance in months from being aged, respectively, 55 or 65, when interviewed). The retirement status is also measured at the interview date. The solid line is non-parametrically fitted using a triangular kernel with a bandwidth of 48 months. The dotted lines are the 5 percent confidence bounds around the kernel estimates. Very few spouses retire at early retirement age 55: there is no discontinuity in retirement probabilities at age 55 for either husband or wife. By age 65, most husbands have already retired: there is no jump into retirement at age 65 for the husband. In contrast, although the average wife will have retired at age 60, we also observe a noticeable jump into retirement at age 65, at least for some of the wives.

Figure B. Husband's and Wife's Unemployment Probability at age 55 and 3 months



Note: The graphs show the unemployment probability of the husband (left graph) and the wife (right graphs) by own age. The age of “zero” corresponds to the age of 55 and 3 months, at which individual that are unemployed are dispensed from actively searching from work and their unemployment benefit are not degressive anymore, so that they can make a smooth transition into retirement if needed. The observations are grouped by bins of two months. The dots are the raw means of the outcome variable (the unemployment probability) which is plotted against the running variable (distance in months from being aged 55 and 3 months when interviewed). The unemployment status is also measured at the interview date. The solid line is non-parametrically fitted using a triangular kernel with a bandwidth of 48 months. The dotted lines are the 5 percent confidence bounds around the kernel estimates.

Table A. Descriptives statistics of the sample of couples with both spouses aged 50 to 70.

	Husband		Wife	
	Mean	Standard dev.	Mean	St. dev.
Age	60.776	5.293	58.617	5.239
Age 60 and above	.553	.497	.403	.490
Elementary School	0.531	0.499	0.605	0.488
Middle School	0.292	0.454	0.252	0.434
High School	0.065	0.247	0.075	0.264
College	0.109	0.312	0.063	0.244
French	0.949	0.217	0.957	0.201
Retired	.598	.490	.308	.461
Employed	0.337	0.472	0.317	0.465
Other Inactive	0.063	0.244	0.373	0.483
Usual Hours	41.707	11.950	33.837	13.692
Couple's characteristics				
		Mean	Standard dev.	
Married		0.970	0.169	
Children number		0.393	0.773	
Local U rate		9.368	2.429	
<i>Observations no.</i>	<i>148395</i>			
<p>Note: The sample includes all active and inactive partners aged 50 to 70. It includes also cohabitant couples. Hours are averaged over positive values of hours.</p>				

Table B. Reasons to retire (multiple answers possible): %

	Very Important	Important	Minor reason	Not at all relevant
Retirement Rights reasons				
<i>You can still continue to work or take up a new job</i>	11	11	9	69
<i>You turned 60 years of age</i>	37	14	5	44
<i>You turned into the age at which you could retire with the highest possible retirement pension.</i>	49	22	5	24
Job related reasons				
<i>You were dismissed or forced to retire</i>	9	3	2	86
<i>Your employer or colleagues were pushing you to retire one way or other</i>	12	8	6	73
<i>You were unhappy with the job conditions</i>	12	9	7	72
<i>You had health problems that hindered you work capacities</i>	15	8	6	71
<i>You had had enough of your job</i>	23	17	10	50
Personal and Family reasons				
<i>You had family obligations</i>	7	7	4	81
<i>Your spouse was also retiring or had already retired</i>	12	6	3	78
<i>You had other personal projects</i>	7	12	8	72
<i>You wanted to take advantage of being retired as long as possible</i>	47	21	7	26

Note: Each row sums up to 100%. The sample is a representative sample of French retirees that entered retirement from employment. The respondent could answer multiple questions.

Source: Enquête Motivations de départ à la retraite 2010, CNAV-COR-DARES-DGT-DREES-DSS.