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Joint Leisure Before and After Retirement:

a double Regression Discontinuity Approach

Elena Stancanelli* and Arthur Van Soest**

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Abstract

The economic literature on retirement argues that individuals in a couple tend to retire at a close time because of externalities in leisure. Earlier studies did not investigate the extent to which partners actually spend more leisure time together upon retiring. Exploiting the law on early retirement age in France, we use a regression discontinuity approach to identify the causal effect of retirement on hours of leisure, separate and together, of the man and the woman in a couple. We use a sample of couples drawn from a French Time Use Survey for the analysis. Using four different definitions of joint leisure, we conclude that generally both separate and joint leisure hours of partners increase significantly upon own retirement. In particular, the hours of leisure spent together by the couple increase on average by about an hour and a half per day upon wife's retirement and by less than an hour upon husband's retirement. The positive effect of partners' retirement on joint leisure is close in size to that on separate leisure or house work hours of partners.

Keywords: Regression Discontinuity, Retirement, Leisure

JEL classification: C26, C31, J26, J22

Résumé

Dans la littérature, on explique généralement le départ rapproché des conjoints à la retraite par les externalités positives qui résultent du loisir partagé. Mais le temps de loisir passé réellement ensemble par les conjoints, que ce soit avant ou après le départ à la retraite, n'a pas été étudié. Notre propos est d'estimer l'effet du retrait du marché du travail des deux partenaires sur le temps de loisir passé ensemble ou séparément. Nous utilisons une approche de discontinuité basée sur l'âge légal de la retraite en France pour identifier cet effet. L'échantillon d'estimation est tiré de l'Enquête Emplois du Temps. Nous employons quatre définitions alternatives du temps de loisir du conjoint. Nous trouvons que les heures consacrées au loisir, séparément ou ensemble, par les deux membres du couple augmentent significativement lors de leur départ à la retraite. En moyenne, le loisir du conjoint augmente d'une heure et demi par jour lorsque la femme part à la retraite et d'un peu moins d'une heure avec le départ à la retraite du mari. Le départ à la retraite augmente le temps de loisir du conjoint plus ou moins dans la même mesure que le temps de loisir séparé ou le temps consacré aux tâches domestiques.

Mots clés: Discontinuité, Retraites, Temps de loisir

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* Sorbonne Economics Research Center, Paris School of Economics, CNRS

**Netspar, Tilburg University, RAND and IZA

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1. Introduction

The economic literature on retirement argues that individuals in a couple tend to retire at a close time because of externalities in leisure. Earlier studies did not investigate the extent to which partners actually spend more leisure time together upon retiring. Here we exploit a rich time use dataset to study the effect of retirement on leisure hours of couples, distinguishing joint leisure hours from separate leisure hours of each partner. To account for the potential endogeneity problem due to the fact that individuals with a stronger preference for leisure (together or separate), may retire earlier, we exploit age discontinuities in retirement due to the early retirement law to identify the causal effect of retirement on leisure.

Earlier structural studies of the retirement decision of individuals in a couple conclude that partners tend to retire together mainly because of leisure complementarities (see, for example, Michael Hurd [1990], Alan Gustman and Thomas Steinmeier [2000], or Maria Casanova, [2010]).[1] James Banks, Richard Blundell, and Maria Casanova Rivas (2010) took a reduced form approach to compare the retirement behaviour of American and British dual-earner couples (using American couples as a control group for British couples) and conclude that British men were significantly more likely to retire when their wife reached the state pension age than comparable American husbands. On the other hand, Alan Gustman and Thomas Steinmeier (2009) argued that in numerous cases individuals in a couple may decide to retire only if their partner does not retire. They find that in the US, the increased labor force participation of married women has lowered married men's hours of market work. Elena Stancanelli (2012), exploiting exogenous variation in the retirement decisions of both spouses, and using a sample of over 80,000 couples drawn from pooled French Labour Force Surveys, found that the man and the woman in a couple significantly reduce hours upon spousal retirement, while the retirement probability is not affected by the spouse's reaching age 60 and above – and this after a 1993 labour market reform which increased the length of the pension contribution period for younger cohorts. These studies did not consider the effect of retirement on the actual hours of leisure that individuals in a couple spend together. This seems worthwhile to directly address the relevance of the leisure complementarities argument.

The literature on joint leisure hours of partners to date has focused on dual-earners. Daniel Hamermesh (2000 and 2002), for example, concluded that in the US partners adapt their work schedules to be able to enjoy leisure synchronously. Daniel Hallberg (2003), matching singles

[1] See Jonathan Gruber and David Wise (2005) for an overview of retirement patterns all over the world.

to individuals in a couple and using Swedish data, investigated the effect of working hours schedules on the fact that partners were found to consume leisure at the same time of the day, trying to disentangle what happened to be "synchronous" leisure, from leisure time that partners really 'chose' to spend 'together'. He found that "actively" chosen joint leisure was only a small proportion of synchronized leisure. Elena Stancanelli and Arthur Van Soest (2012) used a simultaneous equation approach to investigate the causal effect of both partners' retirement on hours spent on home production. They did not consider data on hours of leisure or on how much leisure the two partners spend together.

Here we model the effect of retirement of both partners in a couple on their leisure hours together and separate, endogenizing retirement decisions. To this end we exploit the early retirement law in France, together with the fact that partners typically differ a few years in age. This allows for a (double) regression discontinuity approach to study the causal effect of retirement on joint and separate leisure. We use data drawn from a time use survey for France that collects detailed diary information on the activities carried out by individuals over a full day, the same day for both individuals in a couple. Furthermore, the survey also provides information on timing of the activities, and on "with whom' and "where" each activity was carried out. We experiment with four different definitions of leisure together of partners, to test for the robustness of our results. For comparison purposes, we also estimate the effect of partners' retirement on partners' house work hours, care and physiological time.

We study couples aged 50 to 70. On a typical day, using the narrowest definition of joint leisure, the husband and the wife enjoy on average five and four hours of separate leisure activities, respectively, while over two and a half hours are spent on leisure activities done together. Adopting the broadest definition of joint leisure, the husband and wife spend almost four and two and a half hours of leisure on their own, respectively, while joint leisure averages to almost four hours.

We find that the own retirement probability increases significantly at age 60 for both partners, which supports our identification strategy. However, the own probability to retire does not increase significantly when the partner reaches age 60. These findings are corroborated using a larger sample of over 10 000 couples drawn from French Labor Force Surveys.[2] Using four different definitions of joint leisure, we conclude that generally both separate and joint leisure

[2] Stancanelli (2012) also concludes that either partner' retirement probability is not affected significantly by their spouse reaching age 60. She finds that spouses significantly reduce hours of work when their spouse reaches age 60, though the effects are small in size.

hours of partners increase significantly upon own retirement. In particular, the hours of leisure spent together by the couple increase on average by about an hour and a half per day when the wife retires and by less than an hour upon husband's retirement. The positive effect of partners' retirement on joint leisure is close in size to that on separate leisure or house work hours of partners.

The structure of the paper is as follows. The next section presents the econometric model. Section 3 provides details on the data and the sample selection. The exploratory analysis and the results of the estimations are presented in Sections 4 and 5, respectively. Section 6 concludes.

2. A double regression discontinuity approach

To identify the causal effect of partners' retirement on the time spent on joint and separate leisure, we exploit the legislation in France that sets 60 as the early retirement age for most workers. This creates a discontinuity in the probability of retirement as a function of age that enables us to apply a regression discontinuity approach. Excellent literature reviews of regression discontinuity methods are provided, for example, by David Lee and Thomas Lemieux (2010), Wilbert van der Klaauw (2008), or Guido Imbens and Thomas Lemieux (2007). An application of regression discontinuity to the retirement decision of the head of the household is given in Battistin et al. (2009) who investigate the causal effect of retirement of the head of the household on household private consumption expenditures. Stancanelli (2012) applies a similar approach as in this paper to study the effect of spouses' retirement on spouses' hours of work.

Identification of the causal effect of retirement on leisure hours (the outcome variable) is achieved thanks to the sudden and large increase in retirement (the treatment) at the point of discontinuity (age 60) in the running variable (age). Individuals cannot manipulate their age – and this is one of the requirements for using a regression discontinuity approach (see, for example, Lee and Lemieux, 2010). In our data, year and month of birth were collected, and we also know the day, month and year of the survey interview. Therefore, we assume that age is measured continuously. There are no other policy measures that affect individuals reaching age 60 in France.[3] Retirement is also measured at the time of the interview.

[3] Other policies are targeted at older unemployed workers, aged 55 and above, who are no longer required to search for jobs ("dispenses the recherches d'emploi"), or at employers who have to pay a large penalty for

We need to account for the fact that some people may retire earlier than sixty –due to special early retirement schemes or specific employment sector rules - and others later.[4] Therefore, we have a so called Fuzzy Regression Discontinuity design - the jump in the probability of retirement at age 60 is greater than zero but less than one. In France unemployment, maternity, and sick leave periods are fully covered by pension rights, so that interrupted labour market experience will not translate into smaller pension benefits or a longer working life. We do not account for pension contribution years as they are not observed but are also likely to be endogenous, because individuals with a stronger preference for leisure may have had more career breaks and fewer contribution years.[5]

We use the discontinuities in partners' retirement probabilities at age 60 to instrument the effect of retirement on leisure hours. Let R be a dummy for retirement, equal to one if individuals have retired from market work and zero otherwise, and let L be the hours of leisure. To estimate the effect of individual retirement on individual leisure hours, one can use an instrumental variable approach, namely two stages least squares (see, Jinyong Hahn, Petra Todd and Wilbert van der Klaauw [2001], for proofs; and for example, David Card, Carlos Dobkin, and Nicole Maestas [2009] for an application using also an age discontinuity to identify the treatment). Let us specify an equation for hours of leisure as follows:

$$2)\ L_i = \alpha + R_i\,\iota + Z_i\,\beta^i + \nu_i$$

Jinyong Hahn, Petra Todd and Wilbert van der Klaauw (2001) show that the error term in this equation does not have to be uncorrelated with age for identification purposes. The first stage equation takes the following form:

$$3)\ R_i = D_i\,\gamma^{ri} + Age_i\,D_i\,\eta^{ri} + Age_i\,(1-D_i)\,\pi^{ri} + Z_i\,\beta^{ri} + \nu^{ri}$$

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firing workers older than 55 ("Contribution Delalande"). See Bommier, Roger and Magnac (2003) for an analysis of both policies and their effects on French labour market dynamics. Here we do not include inactive men in the sample for analysis. We included inactive women, as most of them were housewives.

[4] See, for example, Didier Blanchet and Louis-Paul Pele (1997) and Antoine Bozio (2004) for more details of the French pension system. In 2010, the legal early retirement age was set at 62 years, but this will become effective only in 2018. Jean-Olivier Hairault, Francois Langot and Thepthida Sopraseuth (2010) model the employment effect of the distance to the legal retirement age in France in a theoretical job search framework and conclude that increasing the legal retirement age is likely to increase employment rates of older workers.

[5] We do not control for household income either as it is not exogenous to the retirement choice. Besides, there is no a priori reason to expect wealthier couples to spend more (or less) leisure together than poorer couples. We control for partners' education.

Where the dummy D_i takes value one when the individual has reached age 60 and zero otherwise; Age_i is a flexible polynomial in age; and the vector Z_i contains other individual characteristics. This is equivalent to the following expression:

3a) $R_i = D_i \gamma^{ri} + Age_i D_i (\eta^{ri} - \pi^{ri}) + Age_i \pi^{ri} + Z_i \beta^{ri+} \nu^{ri}$

Combing equations 2 and 3, the reduced form equation for the effect of retirement on leisure hours is:

4) $L_i = \alpha + D_i \gamma^{hi} + Age_i D_i \eta^{hi} + Age_i (1-D_i) \pi^{hi} + Z_i \beta^{hi} + \nu^{hi}$

And $\iota^{IV} = \frac{\gamma^{hi}}{\gamma^{ri}}$

Or, equivalently,

4a) $L_i = \alpha + D_i \gamma^{hi} + + Age_i D_i (\eta^{hi} - \pi^{hi}) + Age_i \pi^{hi} + Z_i \beta^{hi} + \nu^{hi}$

where ι can be estimated using two stages least squares, instrumenting R with D (and correcting the standard errors as in Jinyong Hahn, Petra Todd and Wilbert van der Klaauw [2001]). We assume that that the covariates other than age (denoted by Z here) are not discontinuous at age 60 (see also Section 3.4 for a test of this assumption).

Allowing both partners' retirement to affect joint leisure hours (L_j) of partners, we have:

5) $L_j = \alpha + R_m \iota^m + R_f \iota^f + Z_m \beta^{jm} + Z_f \beta^{jf} + \upsilon_j$

6) $R_j = \alpha + D_m \gamma^{rm} + Age_m D_m \eta^{rm} + Age_m \pi^{rm} + D_f \gamma^{rf} + Age_f D_f \eta^{rf} + Age_f \pi^{rf} + Z_m \beta^{rm} + Z_f \beta^{rf} + \nu^{rj}$

7) $L_j = \alpha + D_m \gamma^{hm} + Age_m D_m \eta^{hm} + Age_m \pi^{hm} + D_f \gamma^{hf} + Age_f D_f \eta^{hf} + Age_f \pi^{hf} + Z_m \beta^{hm} + Z_f \beta^{hf} + \nu^{hj}$

Where m stands for husband and f, for wife, and $\iota^{IV\,m} = \frac{\gamma^{hm}}{\gamma^{rm}}$, $\iota^{IV\,f} = \frac{\gamma^{hf}}{\gamma^{rf}}$

We estimate this model also for disjoint (separate) leisure hours of the husband, L_m, disjoint leisure hours of the wife, L_f; and using four alternative definitions of leisure (see Section 3). To conclude, our estimation setup for partner's joint and separate leisure demands is a FRD

model. We use exogenous variation in partners' retirement to identify and estimate the causal effect of partners' retirement on their leisure hours together and separate.

3. The data: sample selection and covariates

The data for the analysis are drawn from the 1998-99 French time use survey, carried out by the French National Statistical offices (INSEE).[6] This survey is a representative sample of more than 8,000 French households. Three questionnaires were collected: a household questionnaire, an individual questionnaire and a diary of activities. The diary was collected for both adults in the household on the same day, which was chosen by the interviewer and could be either a week day or a weekend day. Activities were coded in ten minutes slots.

3.1 Sample selection

We selected couples, either married or unmarried, which gave a sample of 5,287 couples – after dropping one same sex couple. We then applied the following criteria to select our regression discontinuity estimation sample:

1. Each partner was aged 50 to 70 –which reduced the sample size to 1395 couples.
2. Each partner had filled in the diary (we dropped 109 couples).
3. No partner had filled in the diary on an atypical day, defined as a special occasion day, a vacation day, a wedding or a funeral, or a sickness day (we dropped 106 couples).
4. We dropped partners that did not fill in the activity diary on the same day (we dropped 5 couples).
5. We dropped severely health-handicapped partners (60 couples).
6. Male partners were not unemployed or other inactive (we dropped 72 couples).
7. We kept housewives and other inactive women.

Applying these criteria led to a sample of 1043 couples. The first criterion sets bounds of ten years on each side of the discontinuity. To check for the robustness of the RD estimates we also experiment with narrowing the bounds on both sides of the discontinuity. The unemployed were dropped because of age specific unemployment legislation which allows job seekers older than 55 to be exempted from searching for jobs. This criterion is imposed

[6] The next French Time Use Survey 2009-2010 only collected two diaries per household so that sometimes a child is interviewed together with a parent, which makes the size of the sample with both partners' diaries available too small for the purposes of RD analysis.

only for men as 80% of the inactive women in our sample were housewives. We tested for the sensitivity of the results to excluding other inactive women from the sample (see Table 3).

3.2 Leisure, age, retirement, and covariates

Our definition of leisure includes socializing, eating out and also eating at home, doing sports, playing video-games, watching television, reading, going to the cinema or the theatre or arts exhibitions, hiking, walking, fishing, hunting, performing religious practices and relaxing. In total, it includes forty-six activities. This measure of leisure corresponds to what Aguiar and Hurst (2007), for example, define as "narrow' leisure. Broader measures include any time not at work, such as also notably house work and sleep. Here we do not consider house work since house work is not seen as enjoyable by many. We also ignore sleep as closer to 'biological' time than leisure. Our aim is to capture complementarities in leisure and, therefore, we focus on activities that are considered as "pure" leisure, that is, enjoyable time.

We use records in the activity diary to construct four different definitions of leisure hours together as follows:

a) Both partners reported the same type of leisure activity (out of the 46 considered) at the same time and both of them also said that they did this activity "with family" (the question "with whom" allows for four possible answers: family, friends, neighbors, or other people.)
b) Both partners reported the same leisure activity at the same time and at the same place (there are four possible locations defined for each activity in the diary: at home, at work, outside, or somewhere else.)
c) Both partners reported the same leisure activity at the same time.
d) Both partners reported some leisure activity (of the possible 46) at the same time and at the same place.

The four definitions imply a decreasing degree of restrictiveness - the first being the narrowest and the last the broadest. Definition a. can be seen as the narrowest as it requires partners to perform the same leisure activity (of the possible 46) on the same moment of time and to state both that they did that activity "with family". This is the closest to leisure hours spent "truly together" Definition b. is broader as it encompasses situations where, for example, both partners are at home and they are both reading at the same time. The next definition c. is even broader as it counts as joint leisure diary episodes where both partners are

reading without requiring them to be both at the same place. The last definition d. is the broadest of all, as it considers an episode of leisure as joint leisure if, for example, the husband watches football and the wife reads a book and they are both at home. The leisure episodes of each partner that are not classified as "joint leisure" (according to a given definition) are considered as "disjoint" (separate) leisure, implying that we also have four different definitions of separate leisure hours of each partner –with the narrowest specification of *joint* leisure corresponding to the broadest definition of *separate* leisure (see Section 3.3 and Table 2 for descriptive statistics).

For comparison purposes, we also construct measures of partners' house work outcomes and "physiological" time. We define house work to include the following activities, as conventional (see Stancanelli and Van Soest [2012] for a discussion): cleaning, doing the laundry, ironing, cleaning the dishes, setting the table, doing administrative paper work for the household, shopping, cooking, gardening, house repairs, knitting, sewing, making jam, and taking care of pets. Care hours include time spent caring for children and other adults while "physiological" time encompasses sleep and personal care.

In our data, age is available in months. We also know the day, month and year of the interview. The employment or retirement status is derived from the respondent's self-assessed occupational status (at the day of the interview). The indicator for retirement takes value one for respondents that reported to be retirees or early-retirees. In the analysis, inactive women will be considered as non-employed together with retirees or early-retirees, and as opposed to those still at work. We are interested in leisure complementarities and housewives have as much time available as retired women.

As far as the other covariates go, three education levels are distinguished: less than high school, high school, and college education or more. We also control for the season of the year and the day of the week (week-day or weekend) on which the activity diary was collected.

3.3 Descriptive statistics and discontinuity checks

Descriptive statistics for the estimation sample are given in Table 1. About 57 per cent of the men and 43 per cent of the women in the sample are aged 60 or above. On average, the husband is about two years older than the wife. The percentage employed is larger for men

(36 per cent) than for women (32 per cent).[7] The majority of men and women have less than high school (the benchmark). Men tend to be slightly more educated than women: 12 (10) per cent of husbands (wives) have completed high school and 15 (11) per cent have college or more education. Few couples in this age range still have children living at home and few are cohabiting rather than married (4 per cent).

Descriptive statistics of participation and mean and median durations of all the activities considered (in minutes per day) are given in Table 2 (see Section 3.2 for definitions). First of all, almost all individuals in the sample participate in leisure separately and 'together'. About 99 percent of the sample participates in separate leisure activities on the diary day. Depending on the definition of joint leisure adopted, between 94 and 98 percent spends some leisure together. Going from the narrowest to the broadest definition of joint leisure (see Section 3.2), joint leisure hours increase progressively, and separate leisure hours fall. Under the narrowest definition, we find that the husband enjoys on average five hours per day of separate leisure activities and the wife a little less than four hours, while almost 2.5 hours are spent on leisure activities done together. Adopting the broadest definition of joint leisure, the husband and wife spend almost four and two and a half hours of leisure on their own, respectively, while joint leisure averages to four hours.

For comparison purposes, we also show descriptive statistics of house work, care and physiological time. Almost all of the partners in the sample perform some house work on a representative day: the participation rate in house work is equal to 87 per cent for men and 99 per cent for women. The women in our sample spend on average more time on house work than men. Partnered women perform over five hours of house work per day on average, compared to about three hours for partnered men. Everyone participates in physiological activities (encompassing sleep and personal care) and the average duration is almost ten hours per day. In contrast, only 15 per cent of the male partners in the sample and 22 per cent of the female partners participate in the activity of caring for children or adults. The average time (including the numerous zero) devoted to caring for others on a representative day amounts to 18 minutes for the husband and 24 minutes for the wife.

To include other covariates in addition to age (denoted by Z here) in our model, it is required that the Z covariates must not be discontinuous at age 60. To test for this possibility, as

[7] The statistical correlation between the non-employment status (i.e. retirement) of the two partners is equal to 0.45 while that between the dummies for age- 60-and-above of the two partners is 0.64.

customary, we inspected the predicted probability of retirement as a function of the Z covariates only (partners' education dummies and dummies for the season of the year and the day the diary was collected) and concluded that the Z variables are not discontinuous at age 60 (see Charts 2 in the Appendix to the paper). Finally, we ran a so-called "Mc Crary" test (see Justin McCrary, 2008, for details) of the null hypothesis that the age distribution of partnered men (women) is discontinuous at age 60 and rejected this at the 5 per cent significance level (the age distribution of partnered men and women in our sample is plotted in Charts 1 in the Appendix while Charts 2 and 3 show the age density used to calculate the Mc Crary test)[8]. Therefore, we are confident that there is no significant discontinuity in partners' age distribution at age 60.

4. Exploratory graphical analysis

As usual in the RD context, we carry out some exploratory graphical analysis of the discontinuities in the treatment and outcome variables upon reaching age 60 and above for each partner. We show the age profile of partners' retirement probabilities; first, using bins of size ten and letting the own retirement probability vary as a function of own and partners' age (see Charts 1). There are obvious jumps in retirement at age 60 for both partners. In addition to this, we also plot each partner' retirement probability as a function of own age, using smoothed local polynomials in age from the right and the left of the age cutoff (see Charts 2). We also draw 95 per cent confidence bounds around each curve. There is an obvious discontinuity at the age cutoff of 60 for both men and women in a couple. The confidence bands never cross the curves suggesting that the jumps are statistically significant.

Jumps at age 60 are also apparent in separate leisure hours of partners under all definitions of joint leisure considered (see Charts 3 and 4 for definitions a. and d.), though the jumps in joint leisure are much less pronounced using definition a. (see Charts 3), which is the narrowest, than using the broadest definition d. (see Charts 4). Our identification strategy implies that the jumps in leisure are induced by the jump in the retirement probability, suggesting that retirement causes an increase both in separate leisure for each partner and in joint leisure time of partners. The regressions in the next analysis will test this more formally (see also Table C in the Appendix). Similar considerations apply to the jumps in partners' house work or

[8] Individuals cannot presumably control their age. However, the McCrary test also serves as a test that individuals of age 60 do not drop out of the sample. The value of the test was 0.28 with a standard deviation of 0.21 for partnered men and 0.46 with a standard deviation of 0.28 for partnered women.

physiological time (see Section 3.2 for definitions) depicted in Charts 5 –where the jumps in his house work and physiological time appear much more pronounced than hers.

5. Estimation results

As discussed in Section 2, we estimated two stages least squares regressions of the effect of partners' retirement on leisure hours instrumenting each partner's retirement with a dummy for being aged 60 or more and interactions of these dummies with age polynomials. These models were estimated separately for hours of joint leisure and separate leisure hours of each partner. Each model was estimated four times - for the four alternative definitions of joint and separate leisure (see Section 3.2 for definitions). For comparison purposes, we also estimated similar RD models of the causal effect of retirement on house work, care,[9] and physiological time (see Section 3.2 for definitions). As a robustness check, we also re-estimated the models narrowing the bounds on both sides of the age 60 threshold, including couples with both partners aged 52 to 68 and with both partners aged 54 to 66, respectively.

Table 3 shows the estimated coefficients on the discontinuities at age 60 in both partners' retirement probabilities for several specifications. The estimated jumps in the probability to be retired are comparable across specifications. According to the first stage of the 2SLS estimates, the increase at (own) age 60 in the probability to be retired is 0.14 for the husband and 0.22 for the wife (see specifications 3 of Table 3, and also Table B in the Appendix for the full set of results). Whether the partner reaches age 60 has no effect on the own retirement probability. These estimates are robust to dropping covariates (specifications 2 of Table 3) or only including the own age-60-and-above dummy and its interactions with the own age polynomial (specifications 1 of Table 3). They are also robust to dropping other inactive women from the sample (specifications 4 of Table 3). Finally, they are robust to narrowing the sample bounds on the two sides of the age discontinuity, to couples with both partners aged, respectively, 52 to 68 years (specifications 5 of Table 3) or 54 to 66 years (specifications 5 of Table 3). These findings are also corroborated using data drawn from the LFS Surveys (see Appendix and Table A), which also show significant and large jumps in the own retirement probability upon reaching age 60 but no significant effect of spousal retirement - as captured by the spousal age-60-and-above dummy- on the own retirement probability.

[9] Stancanelli and van Soest (2012) estimated simultaneous equation models of retirement and house work or care for the same dataset. They did not estimate two stages least squares models.

Table 4 gives the instrumental variable estimates of the effect of each partner's retirement on separate and joint leisure hour under the four alternative specifications of joint leisure (the full set of results of the first stage regressions is given Table B in the Appendix).[10] Using definition a -which is the narrowest- his retirement has no significant effect on joint leisure hours of the couple while her retirement increases it by over an hour and a half per day, and this represents a 33 per cent increase relative to the average leisure time together of partners aged 55 to less than 60 years.[11] Under different definitions of joint leisure, the increase in joint leisure hours upon her retirement stays in the range of 98 to 110 minutes, which represents an increase of 30 per cent under definition b., 26 per cent for definition c., and 22 per cent using definition d. (always relative to partners aged 55 to less than 60). Using broader definitions of joint leisure, his retirement increases significantly joint leisure, by 40 minutes (7 per cent relative to partners aged 55 to less than 60) using definition b., by 50 minutes (9 per cent) using definition c. and by over an hour (11 per cent) under definition d. (the broadest). Therefore, under all definitions of joint leisure, her retirement increases the time the couple spends together more than his retirement does. The order of retirement may partly explain these findings as the wife is on average two years younger than the husband and she is thus the last to retire. Therefore, when the husband retires the wife may still be at work which limits the possibility to spend more leisure time together. Furthermore, the size of the estimated effect of his retirement on joint leisure increases going from the narrowest to the broadest definition of joint leisure, hers falls. This may also reflect the fact that when he retires she is still at work and there is thus lesser scope for spending time "truly" together (definition a.).

Under all four specifications, separate leisure hours of both partners increase significantly upon own retirement. For men, the size of the increase varies between 143 minutes (17 per cent) according to the narrowest specification of *joint* leisure -which corresponds to the broadest definition of *separate* leisure- and 91 minutes (14 per cent) using the broadest definition of joint leisure (relative to partnered men aged 55 to less than 60). For women, separate leisure hours increase by 87 minutes (19 per cent) according to the narrowest

[10] Reduced form results for leisure hours are given in Table C in the Appendix.

[11] Taking a narrower age cut for the reference sample before the jump we would end up only with individuals that marry with someone of about the same age which is an unrepresentative sample here (remember that on average the husband is two years older than the wife). Therefore, we evaluate the change in leisure at the jump in retirement, relative to the leisure time together of partners aged 55 to less than 60 years and to the average retirement probability of partnered women aged 55 to less than 60 years.

definition of joint leisure against 89 minutes (27 per cent) according to the broadest one (relative to partnered women aged 55 to less than 60).

Upon partner's retirement own separate leisure hours fall, but the effect is not statistically significant, except for female partners under the two broadest definitions of joint leisure (definitions c. and d.; see Table 4): her separate leisure hours fall by 41 minutes (8 per cent) using definition c. or by 63 minutes (13 per cent) using definition d. (relative to partnered women aged 55 to less than 60).

As customary, we checked the robustness of the 2SLS estimates to narrowing the sample bounds on the two sides of the discontinuity, by restricting the sample to couples with both partners aged, respectively, 52 to 68 (see Table 5) or 54 to 66 (see Table 6). The estimates of the effect of partners' retirement on partners' separate and joint leisure hours are generally quite robust both in terms of significance and sign. They are also quite close in size to those in Table 4. In particular, the effect of his retirement on joint leisure hours remains not significant when using definition a. (see Tables 5 and 6). It becomes now also not significant when using definition b. for the sample cut with both partners aged 54-66 years (see Table 6); and its statistical significance falls to the ten per cent level, using definition b. and selecting partners aged 52-68 years (see Table 5). When restricting the sample to partners aged 54-66, the negative effect of her retirement on his separate leisure hours becomes statistically significant for definition b., c., and d. and the negative effect of his retirement on her separate measure become statistically significant at the ten per cent level for definition b and it remains statistically significant for definitions c. and d. Therefore, for couples closer to the age discontinuity than our RD sample, the effect of husband's retirement on joint leisure hours loses significance for some of the definitions used and the negative effect of spousal retirement on separate leisure hours becomes generally statistically significant. However, this does affect the sign and direction of the effect of retirement on partners' separate and joint leisure hours or the interpretation we give of the results in terms of the relative size of these effects (see discussion above and conclusions to the paper).

Finally, to evaluate how much time partners allocate to separate and joint leisure relative to other activities upon retirement, we estimated similar RD models of the causal effect of retirement on house work, care,[12] and physiological time (see Section 3.2 for definitions). We

[12] Stancanelli and van Soest (2012) estimated simultaneous equation models of retirement and house work or care for the same dataset. They did not estimate two stages least squares models.

conclude that when he retires, his housework increases by 127 minutes (17 per cent relative to partners aged 55 to less than 60 years) and hers falls by 38 minutes (4 per cent). Her retirement increases her house work by 100 minutes (16 per cent) and plays not effect on his house work (see Table 7). As far as physiological time goes (see Table 8), this increases significantly upon own retirement, by about an hour (4 per cent) with the size of the effect being slightly smaller and less significant for partnered women than for men. Moreover, this effect becomes not significant for the wife when restricting the sample size on the two bounds of the discontinuity. In contrast, the estimates of the increase in husband's physiological time upon his retirement are robust to this sensitivity check. The hours devoted to caring for others are not significantly affected by partners' retirement (see last two columns of Table 8).

6. Conclusions

In the literature on partners' retirement decisions one of the explanations for joint retirement is leisure complementarities. However, recent work also points to asymmetries in partners' retirement decisions. Earlier studies did not explicitly consider the extent to which partners spend their leisure time together before and after retirement. This seems worthwhile to directly address the relevance of the leisure complementarities argument. In this study, we use diary data on leisure activities of older French partners to investigate the causal effect of retirement on leisure. Our identification strategy exploits the fact that for many French workers the earliest legal early retirement age is sixty. This enables us to use a fuzzy regression discontinuity approach to identify the effect of both partners' retirement on their joint and separate leisure hours.

The data for the analysis are drawn from a French time use survey which collected an activity diary for both partners on the same day and also asked additional questions as regards 'with whom' and 'where' the activity was carried out. Therefore, we can construct four alternative measures of leisure hours spent together by partners. On a typical day, using the narrowest definition of joint leisure –which is the closest approximation to leisure time spent 'truly' together- the husband and the wife enjoy on average five and four hours of separate leisure activities, respectively, while over two and a half hours are spent on leisure activities done together. Adopting the broadest definition of joint leisure, the husband and the wife spend almost four and two and a half hours of leisure on their own, respectively, while joint leisure averages to almost four hours.

We specify and estimate a single equation instrumental variable model of the effect of partners' retirement on their separate or joint leisure hours, instrumenting each partners' retirement with each partner's age-60-and-above dummy and interactions of this dummy with an age polynomial. To test for the robustness of our estimates of the jumps in partners' retirement probabilities at the early retirement age, we also produce similar estimates using comparable data drawn from the French Labor Force Surveys –with a sample of over 10 000 couples. For further robustness checks, we narrow the bounds of the sample on the two sides of the age discontinuity. Finally, to put our estimates into perspective we estimate similar models for changes in partners' house work, care or physiological time upon partners' retirement.

We conclude that the retirement probability increases significantly at age 60 for both partners, supporting our identification strategy. The probability to be retired does not increase when the partner reaches age 60 –which is true also using the Labor Force Survey sample of couples. Using four different definitions of joint leisure, we generally find that both separate and joint leisure hours of partners increase significantly upon own retirement. In particular, joint leisure increases on average by about an hour and a half per day when the wife retires and by less than an hour upon husband's retirement -though the latter effect is not significant under the narrowest definition of joint leisure. Under all definitions of joint leisure, her retirement increases the time the couple spends together more than his retirement does. The order of retirement may explain these findings as the wife is on average two years younger than the husband and she is thus the last to retire. Therefore, when the husband retires the wife may still be at work which limits the possibility to spend more leisure time together. Furthermore, the size of the estimated effect of his retirement on joint leisure increases a little going from the narrowest to the broadest definition of joint leisure, hers falls. This may also reflect the fact that when he retires she is still at work and thus there is lesser scope for spending more leisure time "truly together".

When he retires, his separate leisure increase by 90 to 140 minutes per day (depending on the definition adopted) and her separate leisure increases upon her retirement by slightly less than 90 minutes (under all definitions). Spousal retirement reduces separate leisure hours, though the effect is not always significant. His retirement increases his house work by 130 minutes and reduces hers by almost 40 minutes while her retirement increases her house work by 100 minutes and has no effect on his house work. Therefore, the positive effect of partners' retirement on the hours of leisure spent together is close in size to that on separate leisure or

house work hours of partners. Although the evidence gathered in this paper confirms the existence of significant leisure complementarities in retirement, it also casts doubts on whether they are the main driver of retirement of the man and the woman in a couple.

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Table 1. Descriptive Statistics

	Male partner		***Female partner***	
	Mean	***standard deviation***	***Mean***	***standard deviation***
Age (in years)	60.72	5.50	58.60	5.61
Age 60 or older, dummy	0.57	0.49	0.43	0.47
Retired	0.64	0.48	0.67	0.47
Employed	0.36	0.48	0.32	0.47
Born in France	0.96	0.18	0.97	0.16
High School (12 years schooling)	0.12	0.32	0.10	0.30
College and more	0.15	0.36	0.11	0.31
		Household characteristics		
		Mean	***standard deviation***	
Number of children at home		0.15	0.51	
Cohabiting		0.04	0.19	
Regional Unemployment rate		11.45	2.46	
Weekend time diary		0.23	0.42	
Winter season diary		0.25	0.42	
Observations		1043		

Note: These variables as well as the sample selection steps are detailed in Section 3 of the paper.
Source: French Time Use Survey 1998-1999; couples with both partners of age 50-70.

Table 2. Participation rate and mean duration of market work and leisure

	Male partner			***Female partner***		
	Participation rate %	***Mean duration (st. dev.)***	***Median duration***	***Participation rate %***	***Mean duration (st. dev.)***	***Median duration***
Market work, standard question	*24.74*	112.01 (199.20)	0	*25.02*	94.15 (176.93)	0
Market work, diary	*29.82*	137.83 (235.46)	0	*21.67*	86.04 (182.88)	0
House work	*86.77*	183.70 (152.55)	160	*99.04*	310.60 (147.39)	310
Caring for others	*14.67*	17.66 (66.12)	0	*21.76*	24.31 (65.13)	0
Sleep & personal care	*100*	587.38 (102.16)	570	*100*	593.39 (95.45)	590
Joint Leisure (a)	*93.77*	159.79 (117.22)	140	*93.77*	159.79 (117.22)	140
Joint Leisure (b)	*96.26*	195.47 (130.90)	180	*96.26*	195.47 (130.90)	180
Joint Leisure (c)	*97.60*	215.88 (136.31)	200	*97.60*	215.88 (136.31)	200
Joint Leisure (d)	*97.99*	237.96 (141.89)	230	*97.99*	237.96 (141.89)	230
Disjoint Leisure (a)	*99.42*	302.42 (177.33)	270	*97.60*	228.24 (144.02)	210
Disjoint leisure (b)	*99.23*	266.74 (163.04)	240	*96.55*	192.55 (128.28)	180
Disjoint leisure (c)	*99.04*	246.34 (159.26)	220	*96.26*	172.15 (123.04)	150
Disjoint leisure (d)	*98.95*	224.26 (146.56)	200	*95.59*	150.07 (112.82)	130

Note: Activities are measured in minutes per day. Definition (a) of joint leisure includes exactly the same leisure activities carried out by the partners on the same moment and with "family". Definition (b) of joint leisure includes exactly the same leisure activities carried out by the partners on the same moment and at the same place. Definition (c) of joint leisure includes exactly the same leisure activities carried out by the partners on the same moment. Definition (d) of joint leisure includes any leisure activities carried out by the partners on the same moment and at the same place. See Section 3.2 for more details of definitions.

Chart 1. Means of his and her retirement by own and partner's age (bins of size 10)

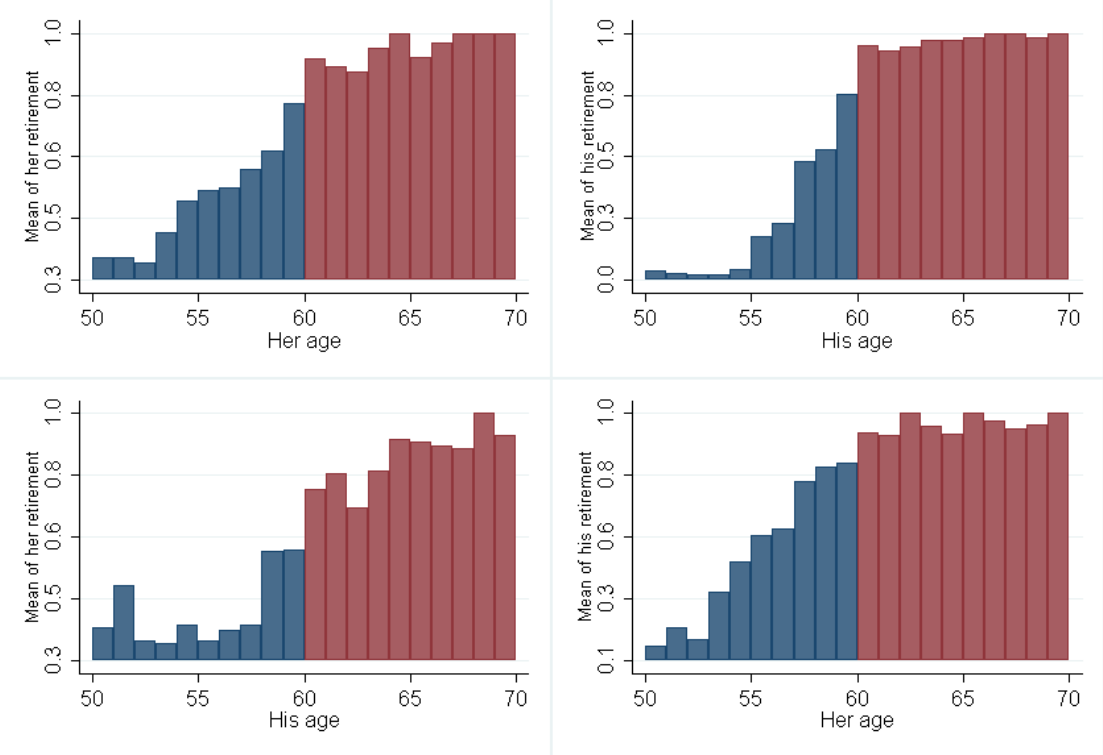


Chart 2. Retirement probabilities of partners: smoothed local polynomials in age

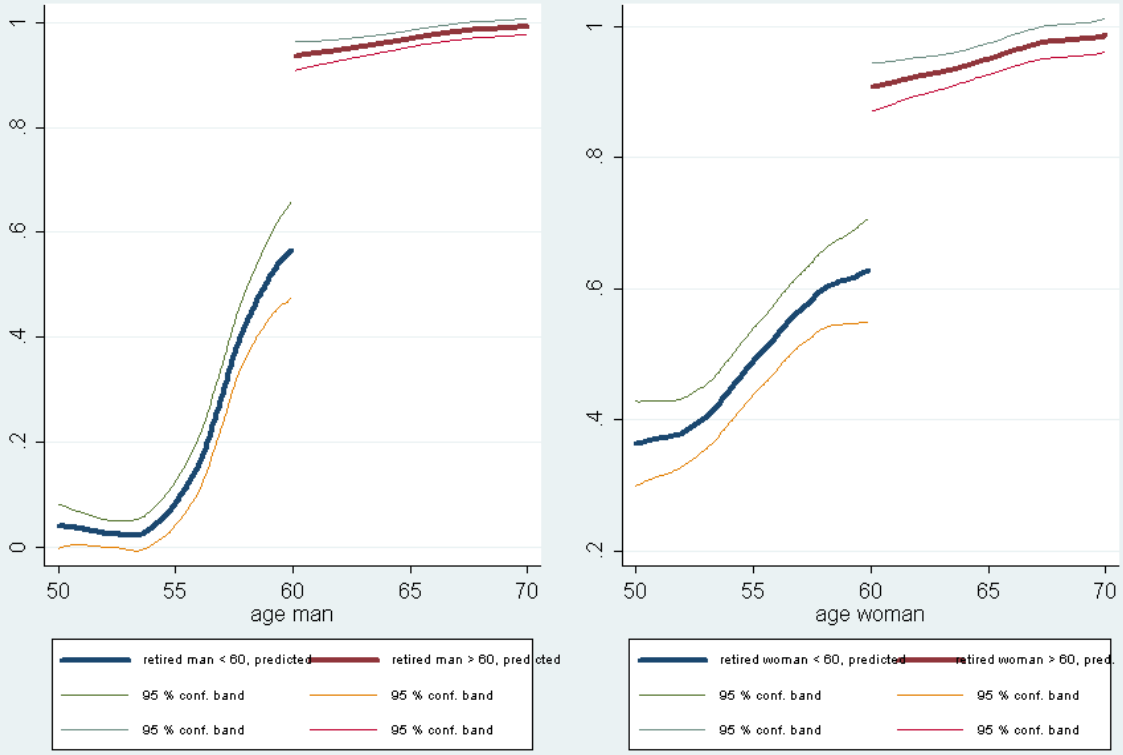
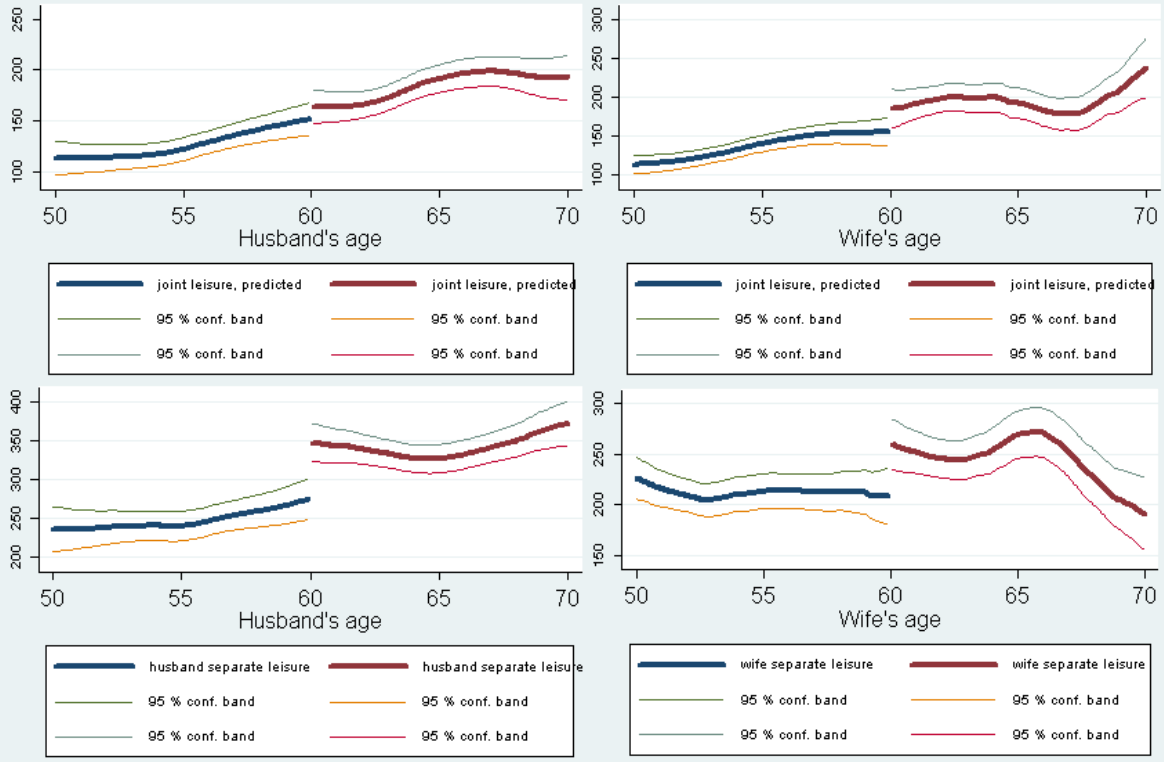
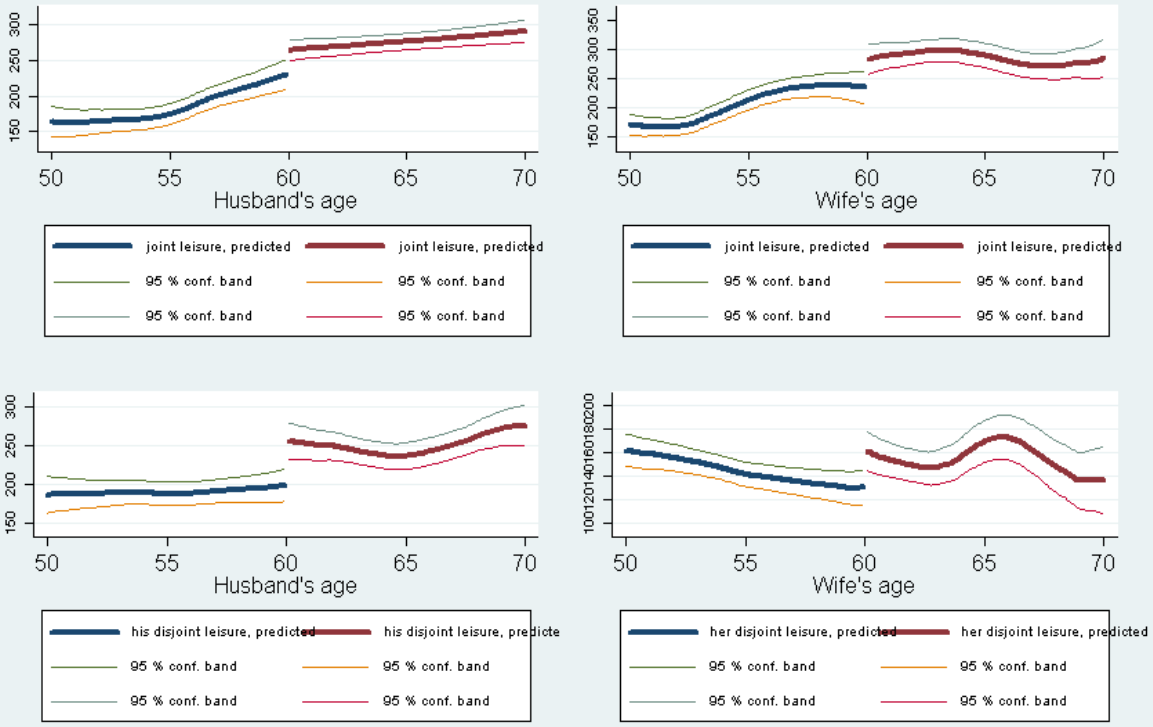


Chart 3. Age discontinuities in joint and separate leisure of partners, definition a



Note: leisure is measured in minutes per day

Chart 4. Age discontinuities in joint and separate leisure, definition d



Note: leisure is measured in minutes per day.

Chart 5. Age Discontinuities in House Work or Physiological time

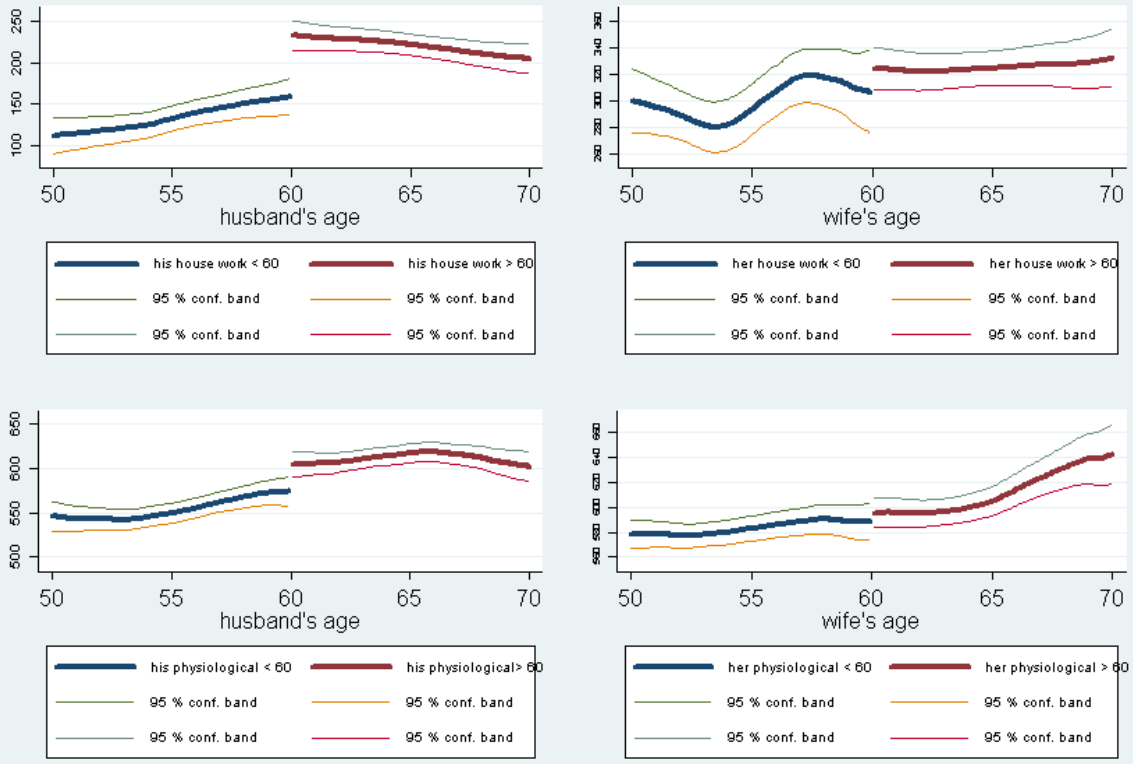


Table 3. First Stage Regressions: linear probability models of retirement.

	1) only own age polynomials		2) both partners' age polynomials		3) age polynomials and controls	
	He retired	She retired	He retired	She retired	He retired	She retired
He age>= 60	0.141***		0.147**	0.0537	0.147**	0.0503
	(0.074)		(0.0744)	(0.0815)	(0.0742)	(0.0814)
She age>= 60		0.247***	-0.0507	0.211***	-0.0512	0.223***
		(0.096)	(0.0523)	(0.0741)	(0.0517)	(0.0751)
Other Controls	No	No	No	No	Yes	Yes
Spousal age dummies	No	No	Yes	Yes	Yes	Yes
Spousal other controls	No	No	No	No	Yes	Yes

	4) dropping other inactive women		5) selecting partners aged 52-68		6) selecting partners aged 54-66	
	He retired	She retired	He retired	She retired	He retired	She retired
He age>= 60	0.156**	0.0177	0.182**	0.00703	0.304***	-0.0719
	(0.0787)	(0.0847)	(0.0829)	(0.0911)	(0.105)	(0.118)
She age>= 60	-0.0552	0.260***	-0.0567	0.266***	-0.0563	0.202**
	(0.0563)	(0.0807)	(0.0598)	(0.0837)	(0.0764)	(0.101)
Other Controls	Yes	Yes	Yes	Yes	Yes	Yes
Spousal age dummies	Yes	Yes	Yes	Yes	Yes	Yes
Spousal other controls	Yes	Yes	Yes	Yes	Yes	Yes

We use quadratic age polynomials. The sample includes 1043 couples (799 couples, when restricting the sample to partners aged 52-68, and 560 couples, when restricting the sample to partners aged 56-64). Other controls include education dummies, season and winter diary dummies.

*** p<0.01, ** p<0.05, * p<0.1 Standard errors in parentheses.

Table . 4 Results of estimation of the effect of partners' retirement on joint or separate leisure demands.

Instrumental variable estimates using two stages least squares methods

Using alternative definitions of partner's leisure time together

Definition a, same activity, same time interval, with family

	His disj. leisure	*% change*	**Her disj. Leisure**	*% change*	**Joint Leisure**	*% change*
He Retired	142.87***	*17*	-10.9377	*-1.7*	19.662	*4.5*
	(25.713)		(21.546)		(16.99)	
She retired	-31.813	*-5.32*	87.045**	*18.71*	100.79***	*32.87*
	(41.522)		(35.242)		(28.098)	
Mean (age 55-59)	*268.9*		*209.36*		*138*	

Definition b, same activity, same time interval, same place

	His disj. leisure		**Her disj. leisure**		**Joint Leisure**	
He Retired	122.921***	*16.3*	-30.892	*-5.4*	39.617**	*7.6*
	(23.877)		(19.525)		(17.714)	
She retired	-41.488	*-7.74*	77.371***	*19.16*	110.467**	*29.98*
	(38.021)		-31.348		(28.98)	
Mean (age 55-59)	*241.28*		*181.74*		*165.78*	

Definition c, same activity, same time interval

	His disj. leisure		**Her disj. leisure**		**Joint Leisure**	
He Retired	112.430***	*16*	-41.383**	*-8.4*	50.108**	*8.76*
	(23.312)		(18.393)		(18.065)	
She retired	-38.314	*-7.69*	80.544***	*23.92*	107.293***	*26.4*
	(37.477)		(29.997)		(29.538)	
Mean (age 55-59)	*224.22*		*164.68*		*182.84*	

Definition d, any leisure activity, same time interval, same place

	His disj. leisure		**Her disj. leisure**		**Joint Leisure**	
He Retired	91.130***	*14*	-62.683***	*-13.54*	71.408***	*11.45*
	(21.343)		(16.533)		(18.641)	
She retired	-29.565	*-6.4*	89.293***	*27.14*	98.544***	*22.23*
	(34.191)		(26.561)		(30.621)	
Mean (age 55-59)	*207.61*		*148.07*		*199.45*	

We move from definition (a), the most restrictive, to definition (d), the broadest. We only show results of estimation of the effects of both partners' retirement on joint and separate leisure demands. The other covariates included are education dummies, winter and weekend diary dummies, age 60 and above dummies interacted with age polynomials. See Section 2 for the model specification and Section 3.2 for definitions of leisure. Observations: 1043 couples.

For the sample of partners aged 55 and more but less than 60, the mean of his retirement is equal to 0.32, and the mean of hers is equal to 0.45 (including housewives) or 0.16 (excluding inactive women).

Table . 5 Results of estimation of joint retirement and joint and separate leisure demands.

Two stages least squares estimates of leisure and retirement: sample age 52-68

Using alternative definitions of partner's leisure time together

Definition a

	His disj. Leisure	**Her disj. leisure**	**Joint Leisure**
He Retired	106.839***	-46.372**	24.110
	(28.00)	(22.298)	(19.302)
She retired	-35.109	120.321***	84.399**
	(43.563)	(34.492)	(30.670)
Mean (age 55-59)			

Definition b

	His disj. Leisure	**Her disj. leisure**	**Joint Leisure**
He Retired	115.237***	-35.762	35.424*
	(28.476)	(23.859)	(20.438)
She retired	-32.965	120.710***	102.890***
	(43.977)	(35.989)	(32.480)
Mean (age 55-59)			

Definition c

	His disj. Leisure	**Her disj. leisure**	**Joint Leisure**
He Retired	122.219***	-23.653	46.984**
	(30.669)	(26.379)	(20.765)
She retired	-12.355	140.575***	98.640***
	(48.213)	(41.032)	(33.076)
Mean (age 55-59)			

Definition d

	His disj. Leisure	**Her disj. leisure**	**Joint Leisure**
He Retired	93.917***	-58.938***	61.436***
	(26.579)	(20.645)	(21.432)
She retired	-46.522	108.449***	107.886***
	(40.804)	-31.502	(34.234)
Mean (age 55-59)			

We move from definition (a), the most restrictive, to definition (d), the broadest. We only show results of estimation of the effects of partners' retirement on joint and separate leisure demands. The other covariates included are education dummies, winter and weekend diary dummies, age 60 and above dummies interacted with age polynomials. See Section 2 for the model specification and Section 3.2 for definitions of leisure. Observations: 799 couples.

*** p<0.01, ** p<0.05, * p<0.1

Standard errors in parentheses.

Table .6 Results of estimation of joint retirement and joint and separate leisure demands.

Two stages least squares estimates of leisure and retirement: sample age 54-66

Using alternative definitions of partner's leisure time together

	Definition a		
	His disj. leisure	**Her disj. leisure**	**Joint Leisure**
He Retired	184.410***	-44.997	27.612
	(44.86)	(36.406)	(26.838)
She retired	-100.69	150.516***	98.633**
	(64.631)	(53.139)	(41.064)
Mean (age 55-59)	*268.9*	*209.36*	*138*
	Definition b		
	His disj. leisure	**Her disj. leisure**	**Joint Leisure**
He Retired	168.983***	-60.424*	43.038
	(40.590)	(32.241)	(27.480)
She retired	-110.186**	141.019***	108.129***
	(58.629)	(46.932)	(41.747)
Mean (age 55-59)	*241.28*	*181.74*	*165.78*
	Definition c		
	His disj. leisure	**Her disj. leisure**	**Joint Leisure**
He Retired	154.033***	-75.374**	57.989**
	(39.224)	(30.454)	(28.130)
She retired	-102.047*	149.158***	99.990***
	(57.671)	(45.330)	(42.377)
Mean (age 55-59)	*224.22*	*164.68*	*182.84*
	Definition d		
	His disj. leisure	**Her disj. leisure**	**Joint Leisure**
He Retired	137.564***	-91.843**	74.458**
	(36.922)	(28.583)	(28.099)
She retired	-106.609**	144.596***	104.553**
	(53.697)	(42.133)	(43.046)
Mean (age 55-59)	*207.61*	*148.07*	*199.45*

We move from definition (a), the most restrictive, to definition (d), the broadest. We only show results of estimation of the effects of partners' retirement on joint and separate leisure demands. The other covariates included are education dummies, winter and weekend diary dummies, age 60 and above dummies interacted with age polynomials. See Section 2 for the model specification and Section 3.2 for definitions of leisure. Observations: 560 couples.

*** p<0.01, ** p<0.05, * p<0.1

Table . 7 Results of estimation of joint retirement and household production.

Two stages least squares estimates of leisure and retirement

Using the full sample

	His housework	**Her housework**
He Retired	127.543***	-38.375*
	(21.421)	(21.24)
She retired	-41.809	100.963**
	(34.236)	(32.608)
Mean (age 55-59)	*133.85*	*287.70*

Sample of couples with partners aged 52 to 68: 799 couples

	His housework	**Her housework**
He Retired	119.14***	-18.67
	(26.68)	(26.44)
She retired	-38.68	70.34*
	(40.44)	(38.75)

Sample of couples with partners aged 54 to 66: 560 couples

	His housework	**Her housework**
He Retired	141.03***	-25.34
	(31.61)	(31.83)
She retired	-70.40	99.06**
	(49.99)	(46.72)

For the sample of partners aged 55 and more but less than 60, the mean of his retirement is equal to 0.32, and the mean of hers is equal to 0.45 (including housewives) or 0.16 (excluding inactive women).
Observations in the full sample: 1043. We use quadratic age polynomials.
*** p<0.01, ** p<0.05, * p<0.1 Standard errors in parentheses.

Table . 8 Results of estimation of joint retirement and physiological or care time

Two stages least squares estimates

full sample

	his physiological	**her physiological**	**his care**	**her care**
He Retired	66.596***	-0.155	4.94	-7.73
	(15.91)	(13.82)	(10.4)	(10.87)
She retired	7.021	52.106**	14.3	4.64
	(25.861)	(22.327)	(16.96)	(16.08)
Mean (age 55-59)	*559.54*	*579.54*	*15.59*	*29.08*
Sample with couples aged 52 to 68 included: 799 observations				
	his physiological	**her physiological**	**his care**	**her care**
He Retired	47.22**	-4.73	12.81	-5.16
	(18.99)	(17.37)	(11.81)	(13.48)
She retired	42.55	51.65*	6.15	2.52
	(28.82)	(27.09)	(19.15)	(17.81)
Sample with couples aged 54 to 66 included: 560 observations				
	his physiological	**her physiological**	**his care**	**her care**
He Retired	49.64**	33.26	13.81	7.62
	(22.48)	(21.24)	(16.62)	(16.85)
She retired	55.71	-12.72	16.95	-10.69
	(34.93)	(33.91)	(27.85)	(23.00)

Physiological time encompasses sleep and personal care while care time includes caring for others (see Section 3.2 for definitions). For the sample of partners aged 55 and more but less than 60, the mean of his retirement is equal to 0.32, and the mean of hers is equal to 0.45 (including housewives) or 0.16 (excluding inactive women). Observations: 1043. We use quadratic age polynomials. See the description of the model is Section 2.

*** p<0.01, ** p<0.05, * p<0.1

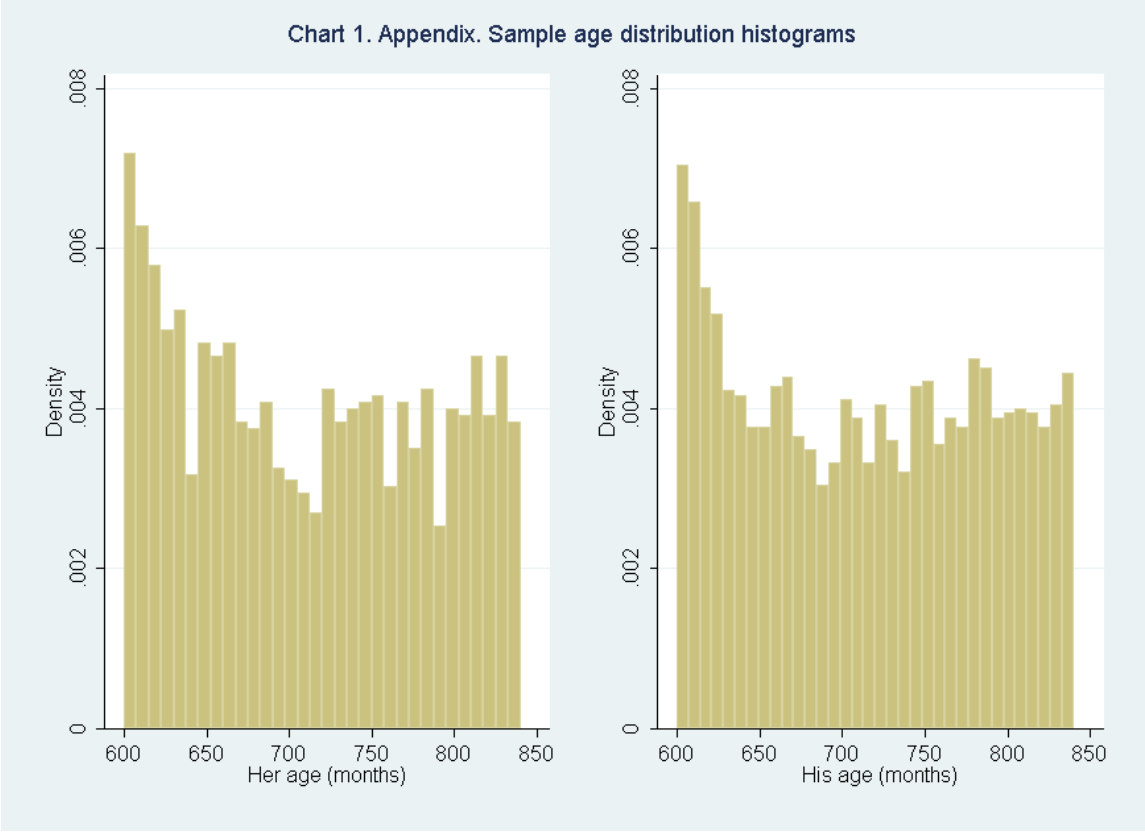


Chart 1. Appendix. Sample age distribution histograms
Density
0
.002
.004
.006
.008
600
650
700
750
800
850
Her age (months)
His age (months)

Chart 2. Appendix. Estimated male age density on the two sides of age 60 for the Mc Crary test.

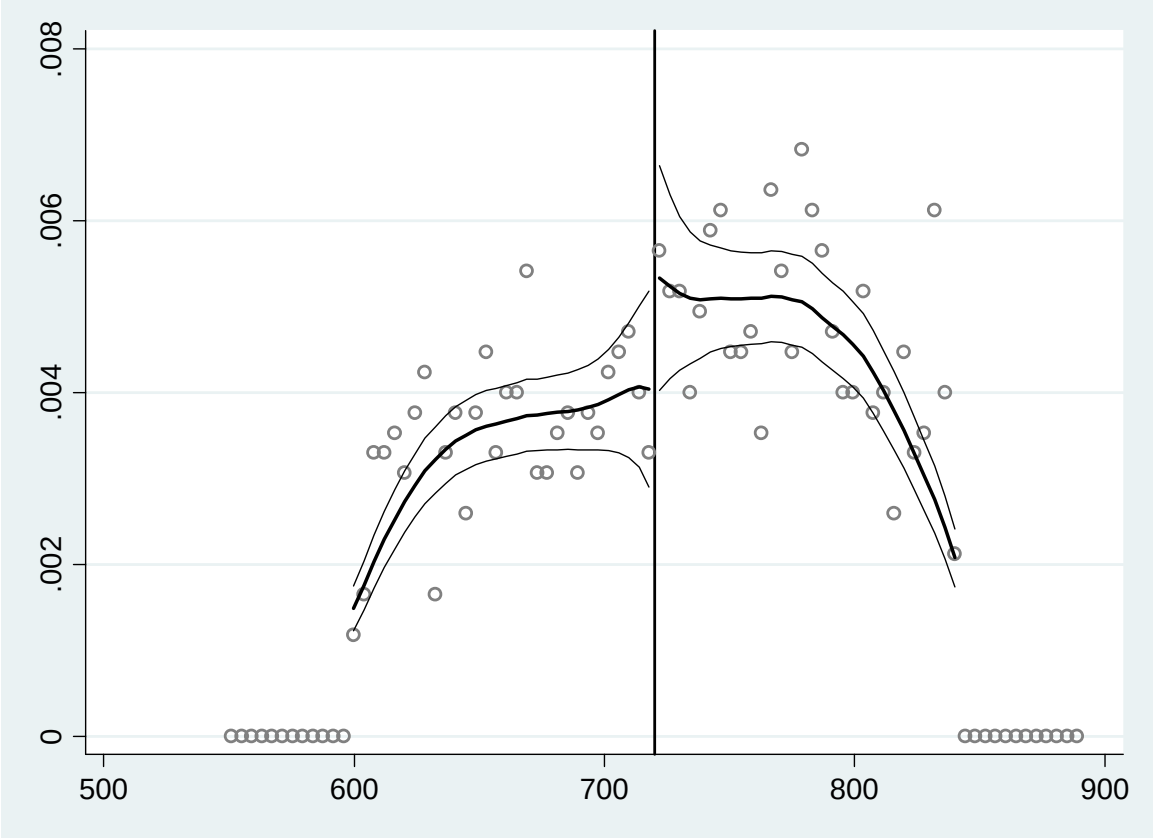


Chart 3. Appendix. Estimated female age density on the two sides of age 60 for the Mc Crary test

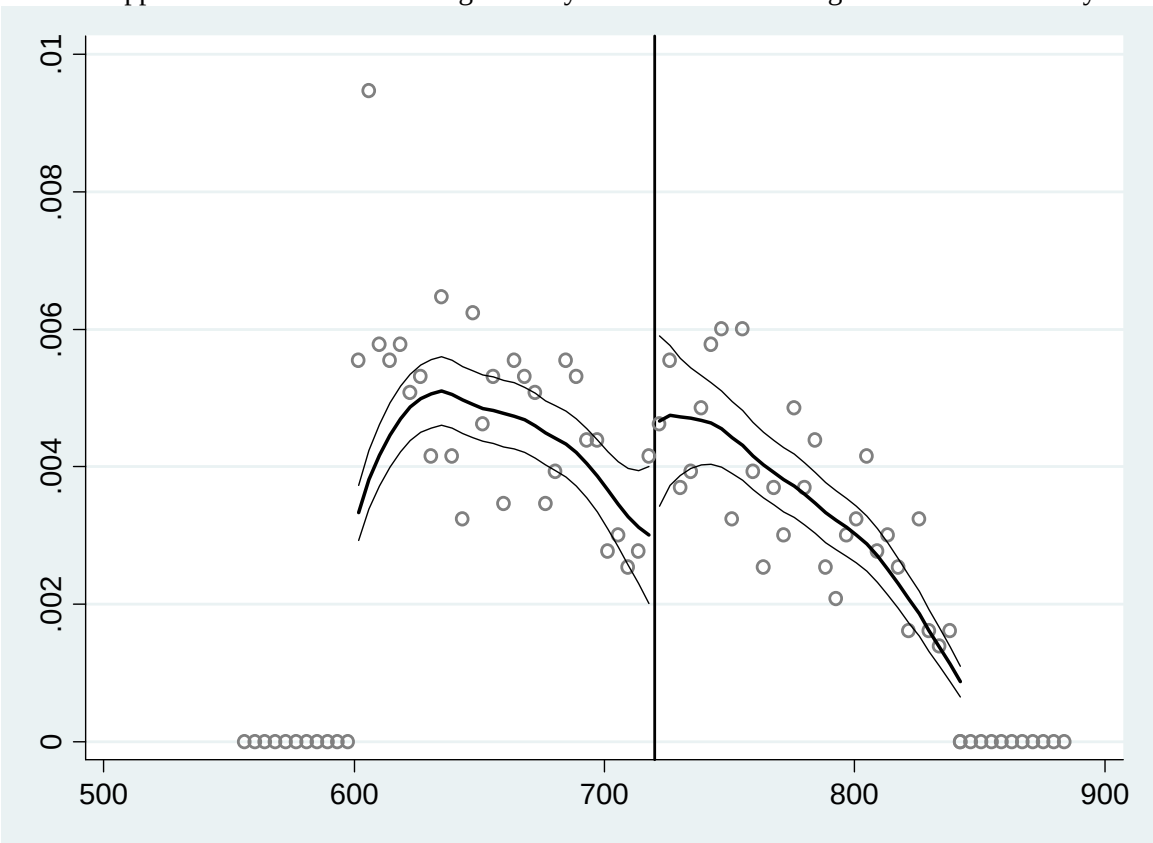
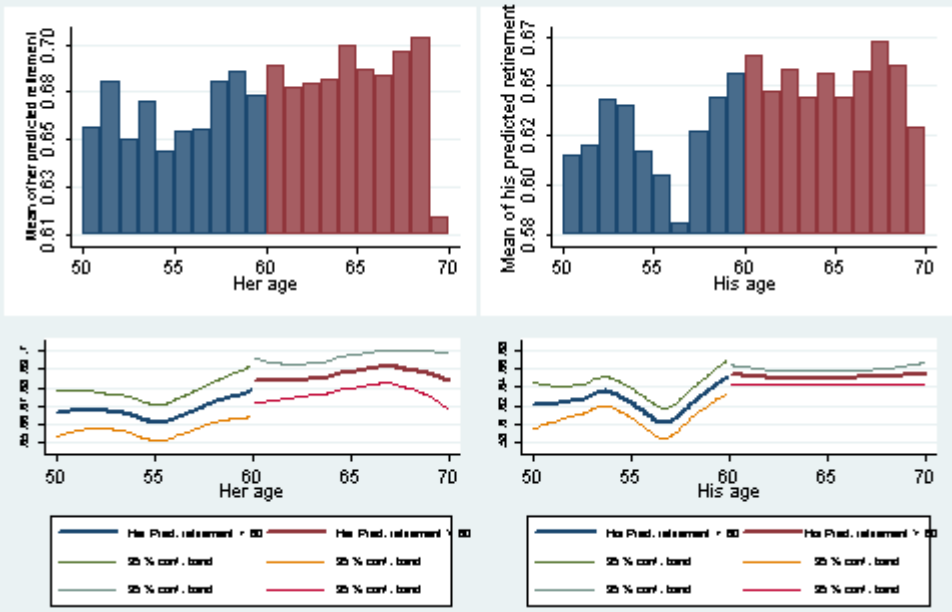


Chart 4. Appendix. Predicted retirement probabilities as a function of covariates other than age.
This serves as a test for the smoothness of the other covariates at the age cutoff of 60



A. Corroborating evidence from the French Labor Force Survey

To check for the robustness of the first stage Fuzzy Regression Discontinuity estimates of the jumps in partners' retirement probabilities upon reaching age 60, we selected also a comparable sample from the French Labor Force Surveys of 1998, taking the same steps as at points 1, 5, 6 and 7 of the sample selection process described in Section 3.1. In the LFS surveys, the month of birth as well as the day, month and year of the interview were collected, so that we can compute age in the same way as for the French Time Use Survey. The retirement status at the time of the interview was also collected using the same type of self-assessed question as for the French Time Use Survey. Therefore, we can compare the estimates of the discontinuities in partners' retirement at own and partner's age 60 from the two surveys.

The French Labor Force Survey sample thus constructed includes 10679 couples with both partners aged between 50 and 70. The estimates of the jumps in partners' retirement at age 60 and above, using the LFS sample are close to those using the sample of couples from the Time Use Survey. In particular, according to 2SLS results, at age 60 the retirement probability increases by 0.20 for the husband and by 0.21 for the wife (see Table B Appendix below). We find no significant effect of spousal retirement on own retirement either (captured by the insignificant effect of the age-60-and-above dummy of the partner on the own retirement probability). Therefore, these findings corroborate our estimates based upon the time use survey sample.

Table A. Appendix First Stage Regressions: linear probability models of retirement. LFS data.

	1) only own age polynomials		2) both partners'age polynomials		3) age polynomials and controls	
	He retired	She retired	He retired	She retired	He retired	She retired
He age>= 60	0.202***		0.200***	0.00931	0.200***	0.00732
	(0.0230)		(0.0231)	(0.0206)	(0.0227)	(0.0206)
She age>= 60		0.213***	0.00827	0.213***	0.00702	0.212***
		(0.0249)	(0.0155)	(0.0250)	(0.0152)	(0.0249)
Other Controls	No	No	No	No	Yes	Yes
Spousal age dummies	No	No	Yes	Yes	Yes	Yes
Spousal other controls	No	No	No	No	Yes	Yes
	4) dropping other inactive women		5) selecting partners aged 52-68		6) selecting partners aged 54-66	
	He retired	She retired	He retired	She retired	He retired	She retired
He age>= 60	0.195***	0.0116	0.191***	0.0119	0.208***	-0.0109
	(0.0240)	(0.0222)	(0.0268)	(0.0249)	(0.0340)	(0.0322)
She age>= 60	0.00500	0.207***	0.0118	0.244***	0.00413	0.259***
	(0.0162)	(0.0264)	(0.0181)	(0.0289)	(0.0236)	(0.0356)
Other Controls	Yes	Yes	Yes	Yes	Yes	Yes
Spousal age dummies	Yes	Yes	Yes	Yes	Yes	Yes
Spousal other controls	Yes	Yes	Yes	Yes	Yes	Yes

We use quadratic age polynomials. The sample includes 10679 couples with both partners aged 50 to 70 years (7666 couples, when restricting the sample to partners aged 52-68, and 5167 couples, when restricting the sample to partners aged 56-64). Other controls include education dummies.

*** p<0.01, ** p<0.05, * p<0.1 Standard errors in parentheses.

Table B. Appendix. Results of estimation of first stage linear retirement probability models. Time Use Data Sample.

	linear retirement probabilities	
	He retires	She retires
He Intermediate Educ.	-0.0279	0.0416
	-0.0302	-0.0404
High educ. Husb.	-0.0822***	0.0617
	-0.0304	-0.0454
Intermediate Educ. Wife	0.0446	-0.036
	-0.0368	-0.0435
High educ. Wife	-0.0211	-0.201***
	-0.0342	-0.0496
Winter diary	0.0271	-0.0228
	-0.0187	-0.0288
Weekend diary	0.0206	0.00416
	-0.0209	-0.0282
He is 60=Dm	**0.147****	**0.0503**
	-0.0742	-0.0814
Dm * (His age -60)	-0.167***	-0.0336
	-0.0295	-0.0373
Dm * (His age -60) ^2	-0.0144***	-0.00699*
	-0.00265	-0.00365
She is 60=Df	**-0.0512**	**0.223*****
	-0.0517	-0.0751
Df * (Her age -60)	0.028	-0.00309
	-0.0228	-0.0335
Df * (Her age -60)^2	-0.00354*	0.00286
	-0.00202	-0.00295
His age	0.191***	0.0519
	-0.0264	-0.0315
His age squared	0.0126***	0.00574*
	-0.00235	-0.00316
Her age	0.00602	0.0033
	-0.018	-0.0292
Her age squared	0.000466	-0.00201
	-0.00151	-0.00261

The sample includes 1043 couples. Each equation is estimated by OLS with robust standard error. The estimates of being aged 60 and above are statistically significant for each partner in the retirement probability equations, as required for identification.
*** p<0.01, ** p<0.05, * p<0.1 Standard errors in parentheses.

Table C. Appendix. Results of estimation of reduced form leisure equations.

	reduced form leisure equations		
	joint leisure definition a	his disj.leisure definition a	her disj. leisure definition a
He Intermediate Educ.	3.526	20.76	-1.83
	-11.38	-16.9	-12.45
High educ. Husb.	4.456	16.25	33.33**
	-10.92	-18.14	-13.64
Intermediate Educ. Wife	-7.908	18.51	17.28
	-12.24	-18.85	-14.88
High educ. Wife	-45.48***	2.772	22.54
	-12.04	-19.75	-14.83
Winter diary	9.549	7.313	10.94
	-8.04	-11.01	-9.135
Weekend diary	25.72***	21.57*	-6.309
	-8.959	-11.86	-9.364
He is 60=Dm	**-21.67**	**45.5**	**-26.6**
	-18.36	-29.09	-22.1
Dm * (His age -60)	-2.115	-23.21*	2.187
	-9.097	-13.92	-10.87
Dm * (His age -60) ^2	-1.487	-0.262	-2.172**
	-0.921	-1.391	-1.09
She is 60=Df	**30.95**	**-31**	**24.49**
	-22.56	-30.24	-19.44
Df * (Her age -60)	1.045	15.33	6.828
	-10.54	-13.61	-10.24
Df * (Her age -60)^2	0.99	-1.095	-1.334
	-1.028	-1.303	-1.026
His age	11.06*	16.72	7.181
	-6.507	-10.55	-8.764
His age squared	0.819	1.261	0.922
	-0.677	-1.038	-0.872
Her age	-3.576	-3.12	2.072
	-6.568	-9.366	-6.63
Her age squared	-0.627	-0.247	0.471
	-0.569	-0.831	-0.61

The sample includes 1043 couples. Each equation is estimated by OLS with robust standard error. The estimates of being aged 60 and above are not statistically significant in the reduced form leisure equations, as required for first stage instruments (see results in Table 4 and following).
*** p<0.01, ** p<0.05, * p<0.1 Standard errors in parentheses.