Working paper

2014-26

PARTNERS' LEISURE TIME TRULY TOGETHER UPON RETIREMENT

Elena Stancanelli
Paris School of Economics, CNRS, Centre d'Economie de la Sorbonne, OFCE and IZA

Arthur Van Soest
Netspar, Tilburg University, RAND and IZA

December 2014

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Partners' Leisure Time Truly Together Upon Retirement

Elena Stancanelli[*] and Arthur Van Soest[†]

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Abstract[‡]

Externalities in leisure are considered an important reason for partners' joint retirement. This study quantifies the extent to which partners actually spend more leisure time 'together' upon retirement. Exploiting legal retirement age in France, we identify the effect of retirement on partners' hours of leisure, distinguishing leisure hours spent together or not. We find that retirement of the husband increases significantly the separate leisure demand of the husband but it does not affect the leisure hours together of the couple. The wife's retirement significantly increases her separate leisure demand as well as the couple's joint leisure hours.

Keywords: Regression Discontinuity, Retirement, Leisure
JEL classification: C26, C31, J26, J22

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[*] Paris School of Economics, CNRS, and research associate OFCE.
[†] Netspar, Tilburg University, RAND and IZA, Tilburg University, Econometrics Department, PO Box 90153 , 5000 LE Tilburg, The Netherlands. Email: a.h.o.vansoest@tilburguniversity.edu.
[‡] Earlier versions of this paper were presented at invited seminars at Aarhus University, at the Paris School of Economics and at the INED in 2014, at the European Society of Population Economics in Aarhus in June 2013, at the annual meeting of the Society of Labor Economists in Chicago in May 2012, at a workshop on the Economics of Gender, in Nice, in June 2012. We thank all participants for comments. In particular, we are grateful for suggestions to Dominique Anxo, Eric French, David Neumark, Bob Pollak, Thomas Piketty and Catherine Sofer. All errors are ours.

1. Introduction

Many retirement studies conclude that an important explanation for the fact that partners tend to retire together are complementarities in leisure, implying that the utility of leisure time increases if leisure is enjoyed together with the partner. This is the first study that investigates the extent to which partners actually do spend more leisure time together upon retirement. We exploit diary data collected for both partners on the same day, chosen by the interviewer, to investigate the effect of retirement on partners' leisure hours spent together or separately. To account for the potential endogeneity of partners' retirement decisions, we exploit age discontinuities in retirement due to legal retirement age in France.

The empirical literature on joint leisure hours of partners to date has focused on dual earners, thus neglecting retirees. Daniel Hamermesh (2000, 2002) concluded that in the US partners adapt their work schedules to be able to enjoy leisure synchronously. In contrast, Daniel Hallberg (2003), matching singles to individuals in a couple and using Swedish data, found that "actively" chosen partners' joint leisure was only a small proportion of what happened to be "synchronized" leisure, driven by the working hours schedules prevailing in the society. Miriam Beblo and Julio Robledo (2008), focusing on German dual-earners, found that the husband enjoyed on average more leisure than the wife due to his stronger bargaining power. Nabanita Datta Gupta and Leslie Stratton (2010) investigated partners' bargaining power and their leisure hours comparing Danish and American dual-earners. Other studies have focused on time allocation of dual-earner parents (for example, Hallberg, Daniel and Anders Klevmarken, 2003, and Kalenkoski, Charlene, David Ribar and Leslie Stratton, 2009). From the perspective of the individual time allocation decision, Daiji Kawaguchi, Jungmin Lee and Daniel Hamermesh (2013) and Jungmin Lee, Daiji Kawaguchi and Daniel Hamermesh (2012) provided compelling evidence of significant increases in individual leisure hours upon legislated changes that reduced working days in Korea and Japan. Alan Krueger and Andreas Mueller (2012) found that individual leisure hours increased significantly for an inflow sample of American unemployed, though individuals enjoyed leisure less when they were unemployed than when they had a job. None of these studies investigated leisure hours of retirees.

Focusing on the individual decision to retire, a large increase in men's house work upon retirement is documented for the US (Marc Aguiar and Eric Hurst, 2005). For France, using a similar approach as the one in this paper, Elena Stancanelli and Arthur van Soest (2012)

conclude that although both partners increase house work hours upon retirement, the size of the increase is much larger for the husband than for the wife. These studies did not consider leisure hours of retirees either.

Perhaps surprisingly the leisure demand together of retirees has been neglected in the economic literature on time allocation.[1] In contrast, the economic literature on retirement emphasizes the phenomenon of "joint retirement" – the stylized fact that the two partners in a couple often retire closely after each other, even if they do not have the same age. This is explained by institutional arrangements as well as "complementarities in leisure", the fact that leisure activities can be undertaken jointly (Michael Hurd (1990), Alan Gustman and Thomas Steinmeier (2000), Courtney Coile (2004), Mark An, Bent Jesper Christensen and Nabanita Datta Gupta (2004)). In other words, the individual retirement implies a positive externality for the partner's leisure. Many studies used this argument in models explaining the retirement decisions of spouses but did not have at hand actual data on partners' leisure activities undertaken together. For example, An et al. (2004) allow for unobserved heterogeneity to capture correlated preferences for leisure (due to "assortative mating"), and argue that the remaining correlation in the retirement hazards of the two partners are likely due to complementarities in leisure. Recent work though highlighted possible asymmetries in spouses' retirement strategies, which may imply fewer leisure complementarities in partners' retirement. Alan Gustman and Thomas Steinmeier (2009), using data drawn from the Health and Retirement Study (HRS), found that the increased labour force participation of American women contributed to lowering husbands' hours of market work. Robert Pollak (2013) argued that spouses may have conflicting interests over the timing of retirement because of differences in life expectancy as well as the design of old age social security. None of these studies provide direct evidence of whether time spent on joint leisure activities increases upon partners' retirement.

Our approach is empirical. Here we model the effect of retirement of individuals in a couple – referred to hereafter as the "husband" and the "wife", for simplicity, regardless of whether they are married or cohabiting- on their leisure hours spent together and separately, using diary data. Outstandingly, the response rate to the diary survey was 80% which makes this dataset very unique. We experiment with four definitions of leisure together. Using the

[1] Rachel Krantz-Kent and Jay Stewart (2007) provide descriptive evidence on time allocation of older Americans from an individual perspective, not looking at couples –as the ATUS only provides time allocation of one individual per household.

narrowest definition of joint leisure, the husband on average enjoys five hours of leisure activities on his own on a typical day, while the wife spends four hours of leisure on her own. Over 2.5 hours are spent on leisure activities done together, on average. Adopting the broadest definition of joint leisure, husband and wife spends almost four and 2.5 hours of leisure separately, respectively, while partners' joint leisure averages to almost four hours. To allow for the potential endogeneity of retirement decisions, we exploits legal retirement age in France, which is 60 for many workers.[2] We find that the probability to be retired increases significantly at age 60 for both partners, by about 38 percentage points for the husband and 19 percentage points for the wife (34 percentage points for the subsample excluding housewives), which clearly demonstrates the existence of the discontinuities needed for our identification strategy. Moreover, the wife's retirement probability increases significantly when the husband reaches age 60. The husband's retirement probability also increases significantly when the wife turns 60 (when dropping couples with a 'housewife' from the sample). We conclude that partners' joint leisure hours increase significantly upon retirement of the wife –who is usually the last to retire in dual-earner couples. The hours of leisure spent separately by the partners increase significantly upon each partner's retirement and especially so for the husband, for whom the increase is robust to various specification checks. In particular, under all specifications, the immediate increase in the joint leisure hours of partners upon retirement of the wife is smaller than the increase in the husband's separate leisure hours that follows the husband's retirement.

The structure of the paper is as follows. The next section presents the econometric model. Section 3 illustrates 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. The model

In the economic literature on labor supply and time allocation, individuals maximize the utility of leisure and consumption, subject to a budget constraint and a time constraint (there are only twenty-four hours per day). To take into account partners' interactions at the household level, various approaches have been proposed (see, for example; Robert A Pollak, 2003, Olivier Donni and Nicolas Moreau, 2007, Miriam Beblo, 1999, Patricia Apps and Ray Rees, 1997, for an account of collective and other household models). Retirement models

[2] Pension benefits are individualized and do not increase if people continue to work past a certain age or contribution record. There is no spouse allowance in the French pension system.

available to date have not explicitly incorporated partners' leisure choices or other time allocation choices (see also the Introduction).

In this paper, we take an empirical approach and distinguish three types of leisure time of individuals in a couple: the leisure time spent by each partner separately (L_m and L_f , respectively, for the male (*m*) and the female (*f*) partner), that may be seen as partners' private consumption goods, and the leisure hours they spend together (L_h), which could be seen as a public good. Here, we allow partner's retirement status (R_m and R_f respectively, for retirement of the male (*m*) and the female (*f*) partner, set equal to one for individuals who have retired from market work and zero otherwise) to affect leisure choices directly. We specify reduced form equations for separate leisure hours and for leisure hours spent together at the time of the survey, which will depend on partners' characteristics ($\boldsymbol{Z}_i$, $i=m,f$) and partners' retirement status (R_m and R_f) .

In particular, because partners' preferences for leisure may also determine the timing of retirement, retirement status is potentially endogenous. To allow for this, we take a Regression Discontinuity (RD) approach and exploit the legal retirement age in France, which is 60 years for most workers in the private sector.[3] 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. However, to retire with maximum pension benefits individuals are also required to have worked for a certain number of years (often 30 years)[4], which implies that some people may retire after 60 (if they entered the labor market later). Other people may retire earlier than sixty –due to special early retirement schemes or specific employment sector rules. Therefore, we consider a 'Fuzzy' Regression Discontinuity design, which is based upon a (discontinuous) increase in the probability of retirement at age 60 (greater than zero but less than one).

This implies that it is possible to use a dummy for having reached age 60 as an instrument for retirement, to estimate the effect of retirement on leisure hours (indeed, keeping retirement constant, leisure hours change only continuously with age), which is essentially a regression

[3] See, for example, Didier Blanchet and Louis-Paul Pele (1997) 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 (Hairault, Jean-Olivier, Francois Langot, and Thepthida Sopraseuth, 2010).

[4] Due to various reforms of social security, the number of years one needs to work in order to be able to retire with the maximum level of pension benefits depends on individual birth day. Once individual turn into legal retirement age, which is 60 years for most workers, and have worked enough years to retire with the maximum level of pension benefits, their pension benefits do not increase anymore if they continue to work. This explains the large and significant jump into retirement at age sixty, which indeed enables us to apply a RD framework.

discontinuity approach; see, for example, Jinyong Hahn, Petra Todd and Wilbert van der Klaauw, 2001). This approach has the advantage of being closer to a randomized experiment than other quasi-experimental techniques, as individuals of age just above or just below legal retirement age are likely to be very similar in all aspects other than those affected by retirement (see, for example, David Lee and Thomas Lemieux 2010; Guido Imbens and Thomas Lemieux, 2007). 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 – which is one of the requirements for using a regression discontinuity approach (see, for example, Lee and Lemieux, 2010). Moreover, there are no other policies in France that affect individuals reaching age 60. In our data, retirement is measured at the time of the interview and we know the exact day, month and year of the interview. Since we also have information on year and month of birth, we have an almost continuous measure of age and can determine rather precisely how close age at the time of the interview is to the age cut-off for the eligibility of retirement benefits.

Our set up is bivariate: the retirement dummies of both partners are potentially endogenous regressors in the joint and separate leisure equations. Therefore, we use an age 60 cut-off dummy for each partner, which is possible since the husband is on average at least two years older than the wife, and create two instruments for these two potentially endogenous regressors. Because we allow for (unrestricted) correlations among the spouses' leisure and retirement decisions (see below), our approach differs from a standard regression discontinuity approach, under which we would estimate each leisure demand equation separately (but estimating each equation separately by 2SLS, our conclusions are not affected; see Table E in the Appendix). Here we estimate a joint model for leisure hours together (L_h), separate leisure hours of the husband (L_m), and separate leisure hours of the wife (L_f), using four alternative definitions of leisure 'together' (see Section 3).[5] To account for endogeneity of retirement in the leisure equations, we also specify two equations for the two retirement dummies R_m and R_f,[6] giving the following simultaneous five equations model:

1) $L_m = \pm_m + R_m 1_m^m + R_f 1_m^f + \mathbf{Age_m}\grave{\mathbf{A}}^{mm} + D_m\mathbf{Age_m}\cdot^{mm} + \mathbf{Age_f}\,\grave{\mathbf{A}}^{mf} + D_f\,\mathbf{Age_f}\cdot^{mf} + \mathbf{Z}_m{}^{2\,mm} + \mathbf{Z}_f{}^{2\,mf} + \upsilon_m$

[5] Since participation in leisure is almost 100 per cent for either separate or joint leisure together (see Section 3), we can use a linear specification for the leisure equations.

[6] We opt for a linear specification of the retirement equations (as under a RD set up) and adjust the standard error by estimating robust standard error.

2) $L_f = \pm_f + R_m 1_f^m + R_f 1_f^f + \mathbf{Age_m}\grave{A}^{\mathbf{fm}} + D_m\mathbf{Age_m}\cdot^{\mathbf{fm}} + \mathbf{Age_f}\,\grave{A}^{\mathbf{ff}} + D_f\,\mathbf{Age_f}\cdot^{\mathbf{ff}} + \boldsymbol{Z_m}^{2\,\mathbf{fm}} + \boldsymbol{Z_f}^{2\,\mathbf{ff}} + \upsilon_f$

3) $L_h = \pm + R_m 1^m + R_f 1^f + \mathbf{Age_m}\grave{A}^{\mathbf{m}} + D_m\mathbf{Age_m}\cdot^{\mathbf{m}} + \mathbf{Age_f}\,\grave{A}^{\mathbf{f}} + D_f\,\mathbf{Age_f}\cdot^{\mathbf{f}} + \boldsymbol{Z_m}^{2\,\mathbf{m}} + \boldsymbol{Z_f}^{2\,\mathbf{f}} + \upsilon_h$

4) $R_m = \pm^{rm} + D_m 3^{rmm} + D_f 3^{rmf} + \mathbf{Age_m}\grave{A}^{\mathbf{rmm}} + D_m\mathbf{Age_m}\cdot^{\mathbf{rmm}} + \mathbf{Age_f}\grave{A}^{\mathbf{rfm}} + D_f\mathbf{Age_f}\cdot^{\mathbf{rfm}} + \boldsymbol{Z_m}^{2\,\mathbf{rmm}} + \boldsymbol{Z_f}^{2\,\mathbf{rfm}} + v^{rm}$

5) $R_f = \pm^{rf} + D_m 3^{rfm} + D_f 3^{rff} + \mathbf{Age_m}\,\grave{A}^{\mathbf{rfm}} + D_m\mathbf{Age_m}\cdot^{\mathbf{rfm}} + \mathbf{Age_f}\,\grave{A}^{\mathbf{rff}} + D_f\,\mathbf{Age_f}\cdot^{\mathbf{rff}} + \boldsymbol{Z_m}^{2\,\mathbf{rfm}} + \boldsymbol{Z_f}^{2\,\mathbf{rff}} + v^{rf}$

Here $\mathbf{Age_m} = [(Age_m - 60), (Age_m - 60)^2, \ldots, (Age_m - 60)^n]$,

$\mathbf{Age_f} = [(Age_f - 60), (Age_f - 60)^2, \ldots, (Age_f - 60)^n]$

The vectors $\boldsymbol{Z_m}$ and $\boldsymbol{Z_f}$ contain control variables (other than age functions) such as education level, presence of children, area of residence dummies, and a dummy for whether the time use diary was collected on a weekend-day. D_m and D_f are dummies for whether the male and female partners have reached age 60 (720 months of age); Greek letters denote (vectors of) coefficients. The v's are normally distributed error terms, independent of $\boldsymbol{Z_m}$ and $\boldsymbol{Z_f}$ and the ages of both partners, but allowed to be correlated across equations. The five equations are estimated jointly using Maximum Likelihood with heteroskedasticity robust standard errors (see David Roodman, 2007 and 2009). By allowing the error terms in equations (1) – (4) to be correlated in an arbitrary way, own and partner's retirement are allowed to be endogenous to the amounts of leisure time. We estimate this model using four alternative definitions of leisure hours together L_h and separate leisure hours of the husband (L_m) and wife (L_f); see Section 3.[7] If leisure complementarities in retirement are important, we would expect to find an immediate and positive effect of retirement on partners' leisure time together.

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).[8] 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 response rate to the

[7] We do not aim at modeling how retirement decisions depend upon financial incentives such as the pension system. We do not use an explicit (structural) model of household decision making either. Therefore, we do not make assumptions on how preferences differ across the two partners or whether the outcome for the household as a whole reflects a cooperative or non-cooperative equilibrium. Though very interesting these issues, are certainly worth a separate treaty and far beyond the scope of our paper.

[8] The next French Time Use Survey 2009-2010 (the French time use survey are run every twelve years by the INSEE, the national statistical offices) has a more complex framework which is such that couples were asked to fill in several additional questionnaires than the diary which very unfortunately led to fewer couples filling in the time diary and this makes the size of the sample with both partners' diaries available far too small for the purposes of our analysis.

survey was 80% (Laurent Lesnard, 2009). The diary was collected for both adults in the household on the same day, which was chosen by the survey designers and could be either a week day or a weekend day. Activities were coded in ten minutes intervals (slots).

3.1 Sample selection

We selected married and unmarried couples and dropped one same sex couple, giving us a sample of 5,287 couples of all ages. We then applied the following criteria to select our 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 (1286 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 (1180 couples).
4. We dropped five couples where the partners that did not fill in the activity diary on the same day.
5. We dropped couples with severely health-handicapped partners (60 couples).
6. We dropped couples where the male partner was unemployed or inactive (72 couples).
7. We kept housewives and unemployed women (as the borderline between the two states is not always clearcut, and especially so for older 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 estimates we also experiment with narrowing these bounds. We kept in the sample housewives or other inactive women, as older women may have a tendency to report themselves as 'housewives', regardless of their previous labor market experience. We will check the sensitivity of the results for excluding housewives or other inactive women other than retirees from the sample.

3.2 Leisure, age, retirement, and covariates

Our definition of leisure includes forty six activities encompassing socializing, eating out or also eating at home, doing sports, playing video-games, watching television, reading, going to the cinema, the theatre, or arts exhibitions, hiking, walking, fishing, hunting, performing religious practices, and relaxing. This corresponds to what Marc Aguiar and Eric Hurst (2007) and others define as "narrow' leisure. Broader measures include any time not at work,

including e.g. house work and sleep. We do not consider house work as leisure (since it is not seen as enjoyable by many), but estimate a comparable model of the effect of retirement on house work of both partners. We also do not include sleep in leisure as it is closer to 'biological' time than to 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.

Based upon the information in the activity diary, we use the following four different definitions of joint leisure hours[9]:

a) Both partners reported exactly the same type of leisure activity (out of the 46 considered) during the same ten-minutes slot 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 exactly the same type of leisure activity (out of the 46 considered) during the same ten-minutes slot and reported performing this 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 exactly the same type of leisure activity (out of the 46 considered) during the same ten-minutes slot.
d) Both partners reported any of the leisure activities (any of the possible 46 listed) during the same ten-minutes slot and reported performing this at the same place.

The four definitions are ordered from narrow to rather broad. Definition a. can be seen as the narrowest and comes closest to leisure hours spent "truly together". Definition b. is broader as it encompasses situations in which, for example, both partners are at home and reading at the same time. Definition c. also counts as joint leisure, for example, diary episodes during which both partners are reading but not at the same place. Definition d. is the broadest of all, as it also considers as joint leisure, for example, the case where the husband watches TV 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" are considered as separate leisure, implying that we also have four different definitions of separate leisure hours of each partner.

Furthermore, we also investigated whether partners carry out household work together, using a similar approach as to construct their joint leisure hours. House work includes the following

[9] Barnet-Verzat Cecile, Ariane Pailhé, Anne Solaz (2011) use similar definitions of joint leisure to study parents' leisure time in the presence of children.

activities (see Stancanelli and Van Soest, 2012): 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 as well time spent caring for children or for other adults. It turned out that only a negligible part of household work is carried together by partners and that our main conclusions are not affected by looking at this variable (results are available from the authors).

The employment or retirement status in our analysis 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 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, we control for education dummies, the number of children living at home, area of residence dummies as, seasonal dummies, and for the day (week-day or weekend) on which the activity diary was collected.

3.3 Descriptive statistics

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).[10] The vast 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 at least a college education. Few couples in this age range still have children living at home and few are cohabiting rather than married (4 per cent).

Participation rates and mean and median durations of all the activities as defined in the previous subsection (in minutes per day) are given in Table 2. First of all, almost all individuals in the sample participate in leisure separately and 'together'. About 99 per cent participate in separate leisure activities on the diary day. Depending on the definition of joint leisure, between 94 and 98 per cent spend some leisure together. Going from the narrowest to

[10] The 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.

the broadest definition of joint leisure (see Section 3.2), joint leisure hours increase progressively, and separate leisure hours fall. Under the narrowest definition, 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 spend almost four and the wife spends two and a half hours of leisure on their own, while joint leisure averages to four hours.

The participation rates in house work on the diary day are equal to 87 per cent for men and 99 per cent for women. Women perform over five hours of house work per day on average, compared to about three hours for men. Only 15 per cent of the male partners in the sample and 22 per cent of the female partners participate in caring activities for children or adults. The average time (including the numerous zeroes) devoted to caring for others on a representative day amounts to 18 minutes for men and 24 minutes for women.

Finally, we check that the distribution of covariates other than age (denoted by Z here) conditional on age is smooth at age 60 (720 months of age) by inspecting the predicted probability of retirement as a function of the Z covariates only (partners' education dummies, number of children living at home, area of residence 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 Figure A in the Appendix). This comforts us that these covariates are not discontinuous at the legal retirement age and we can thus, include them into the model. As a further check, we also estimated our models including and excluding covariates (see Section 5) to conclude that the results of interest here are robust to including or excluding the Z.

4. Exploratory graphical analysis

As usual in the RD context, we ran a "Mc Crary" test (see Justin Mc Crary, 2008) of the null hypothesis that the age distribution of partnered men (women) is smooth at age 60 and did not reject this at the 5 per cent significance level (see also Figures B and C in the Appendix). This shows that there is no evidence that people just below or just above age 60 have a larger tendency to drop out of the sample, and thus, there is no evidence of a selection problem.[11] We graphically explore the discontinuities in the treatment and outcome variables upon reaching age 60 (720 months of age) in Figures 1-5. Figure 1 shows the age profile of both

[11] The usual concern in RD is that the assignment variable can be manipulated, but individuals obviously cannot manipulate their age. The value of the t-test statistic was 1.25 for men and 1.64 for women.

partners' retirement probabilities, letting the retirement probability vary as a function of own and partner's age (see also Figure D in the Appendix for the corresponding raw charts). There are clear jumps in the retirement probability at own age 60 for both partners, whereas the cross-effects are tiny. In Figures 2-5, we plot partners' leisure demands as a function of own age according to each of the four definitions of leisure. Jumps at age 60 (720 months of age) are apparent in separate leisure hours of partners, whereas the jumps in joint leisure are much less pronounced, and this is true for all four definitions of joint and separate leisure. We produce the same type of exploratory analysis dropping couples with a housewife or an unemployed wife from the sample (Appendix, Figures E, F and G). The qualitative conclusions remain the same.

5. Estimation results

As discussed in Section 2, we estimate the effect of partners' retirement on leisure hours spent separately and together, instrumenting partners' retirement with dummies for reaching the legal retirement age (•agee60 dummies•) for each partner. In particular, we use a simultaneous equation approach and estimate a five equations model of partners' retirement and partners' leisure demands by simulated maximum likelihood (results estimating each equation separately by 2SLS, are given in the Appendix). We present the results both including and excluding other covariates. As another robustness check, we re-estimated the models narrowing the bounds on both sides of the age 60 thresholds, including couples with both partners aged 52 to 68 (and alternatively, including couples in which both partners were aged 54 to 66, in the Appendix). We also check the sensitivity of the results to dropping couples in which the wife was a "housewife", thus only selecting dual-earners before and after retirement. Various other specification checks were performed and our main conclusions were not affected.

Table 3 presents the estimation results assuming that retirement is exogenous to the demand for leisure and controlling for the same explanatory variables as in our preferred specification, specifying each equation as a single equation model. . Under this set up, we find that for all four definitions of joint leisure, joint leisure increases strongly upon each partner's retirement. In particular, partners' leisure time together goes up by between 65 and 95 minutes per day upon retirement of the husband and by 35 to 49 minutes when the wife retires. The amount of leisure time that the husband spends on his own also increases strongly upon his retirement, by 99 to 129 minutes per day, and falls by roughly 14 to 27 minutes upon retirement of the

wife, though the latter effect is only weakly significant. The wife's separate leisure time increases significantly upon her own retirement by 56 to 69 minutes per day and falls by 11 to 41 minutes upon his retirement, though the latter effect is not always statistically significant.

Tables 4 (excluding other covariates) and 5 (including other covariates) show that these patterns are quite different when we allow for the endogeneity of the retirement decisions. Each block in Table 4 presents the selected estimates from the five equations model –which includes two retirement equations, one equation for joint leisure and two for separate leisure (see Section 2), for each of the four definitions of joint and separate leisure (see Section 3). Let us also point that the results of estimation are very similar estimating each equation separately by two stages least squares as under a regression discontinuity framework (see Table in the Appendix).[12] The 'first stage' estimates (the effect of each spouse turning 60 on each spouse's retirement equation) are shown for simplicity only once, in the first block, as they do not vary across the four models corresponding to the four definitions of leisure. We find that retirement increases strongly when individuals turn 60 years of age: the husband's retirement probability increases by 0.38 when he turns 60 while the wife's retirement probability increases by 0.18 when she turns 60. Moreover, the husband reaching 60 years has a positive and significant effect on the wife's retirement probability of about 0.16, while the cross-effect of the wife's reaching age 60 on the husband's retirement probability is positive but small and insignificant. Each of the other four blocks presents the estimated causal effect of each partner's retirement on the separate and joint leisure demands, for each definition of joint and separate leisure.

The effect of own retirement on the separate leisure demand of each partner is statistically significant –and, for all four definitions, much larger in size than in Table 3 (where retirement was assumed to be exogenous and thus not instrumented). The amount of leisure that the husband spends on his own increases upon his retirement by roughly 3 hours and 20 minutes per day, while the separate leisure hours of the wife go up by between three and five hours per day upon her retirement –depending on which definition we use. These are very sizable increases, of the same order of magnitude as the average separate leisure hours of individuals aged 55 to less 60 (close to the age discontinuity), and therefore, imply that separate leisure hours double upon own retirement. In contrast, most of the cross-effects of the partner's

[12] Similar conclusions are also drawn accounting only for one partner's retirement at a time (results available upon the authors), which is explained by the fact that the instruments for retirement work well and the age difference between the partners is on average at least two years (24 months in our model).

retirement on own (separate) leisure hours are insignificant – an exception is the effect of the wife's retirement on the husband's separate leisure which is significant and negative under the last definition of separate leisure (definition d).

The effect of partners' retirement on joint leisure hours is insignificant except for the broadest definition of joint leisure (definition d) for which the wife's retirement increases joint leisure by almost 220 minutes per day. The effect of retirement of the wife on joint leisure is positive for all definitions of joint leisure though only significant for the broadest definition adopted, but the effect of the husband's retirement is always insignificantly negative.

Table A in the Appendix reports the correlations of the errors of the five equations. Although under a standard RD set up, in which equations are estimated one by one, these correlations would of course be irrelevant, in the context of our model of simultaneous equations it is interesting to look at them. The correlation between the errors in both partners' retirement equations is significantly positive, as expected from the joint retirement literature ("assortative mating"; see, e.g., An et al., 2004), and equal to almost 0.13. The error term in the husband's retirement equation also correlates significantly with the error in the equation for joint leisure, with an estimated correlation of about 0.20 to 0.26, depending on the definition of joint leisure adopted. This confirms that retirement should be treated as endogenous, supporting our simultaneous equations framework. The error term in the wife's retirement equation correlates negatively with the error term in the equation of her separate leisure. The same correlation is also negative for men, but statistically insignificant.

Table 5 presents the same key estimates for a model that includes the additional controls $\boldsymbol{Z_m}$ and $\boldsymbol{Z_f}$ (education, children, weekday or weekend diary, etc.; see Section 3). The estimated effects of turning age 60 on the probability to be retired are unaffected and the estimated effects of retirement on each type of leisure remain similar, supporting the RD approach. In particular, the effect of the own retirement on the own separate leisure demand remains positive and statistically significant, for all leisure definitions, though it becomes slightly smaller in size for the husband and larger for the wife. The effect of the wife's retirement on joint leisure also increases in size and is now statistically significant for definitions b and c, while it remains significant for definition d and insignificantly negative for definition a.

As a robustness check, we narrowed the sample on both sides of the legal retirement age cut-off, selecting couples in which both partners were aged 52 to 68 years (see Appendix Tables B (excluding other covariates) and C (including other covariates)). In particular, when

narrowing the sample size, the effect of turning age 60 on own retirement remains strongly significant for both the husband and the wife. The effect of own retirement on own separate leisure time always stays significant and positive for the husband, though its size varies. The significance and the size of the effect of retirement of the wife on separate and joint leisure hours varies relative to the main specification in Tables 4 and 5 probably due to the fact that narrowing the sample size, there are fewer women that retire at age 60. Similar conclusions are drawn, estimating the model for the sample of couples in which both partners were aged 54 to 66 years (see Tables D and E in the Appendix).

As explained in Section 3, our sample includes couples in which the wife reports to be a "housewife". We also estimated the model dropping these couples from the sample, with and without other explanatory variables; see Tables 6 and 7 for the results. In this sample of 732 couples, not only the estimates of the jumps in retirement upon turning 60 years of age are still strongly significant and robust, but also the cross-effect of the wife•s agee60 dummy on the husband's retirement becomes large and significant (equal to almost 0.1). We conclude now that the effect of the wife's retirement on joint leisure time is always positive and significant, for all definitions of joint leisure (including or excluding other covariates). The effects of the husband's retirement on his separate leisure demand and of the wife's retirement on her separate leisure remain large and significantly positive (including or excluding other covariates). Moreover, retirement of the husband does not affect joint leisure under any of these specifications, and its sign is negative as before. However, the effect of the wife's retirement on her separate leisure becomes not significant though remaining large and positive. We also experimented with narrowing the sample boundary to couples in which both partners are aged 52 to 68; but the sample size shrinks to five hundred couples and only the positive effect of retirement of the husband on his separate leisure hours is robust to this specification checks. The estimates of the effect of her retirement on her separate leisure hours and the couples' joint leisure hours remain positive but become less precise. Finally, we also experimented with constructing a measure of housework performed together by the two partners, in a similar way as for leisure together. Our conclusions were not affected and we found little increases in joint household work upon spousal retirement (results are available from the authors).

Our conclusions are unaffected if we estimate partners' retirement and leisure demands simultaneously by simulated maximum likelihood (our preferred specification) or estimate

each equation leisure equation separately by two stages least squares instrumenting retirement with the age discontinuity (as under a Regression Discontinuity set up).

Discussion

Assuming that retirement is *exogenous* to the demand for leisure, we find that for all four definitions of joint leisure, joint leisure increases strongly upon each partner's retirement. In particular, partners' leisure time together goes up by between 65 and 95 minutes per day (depending on the definition of joint leisure adopted) upon retirement of the husband and by 35 to 49 minutes when the wife retires. The size of these effects is not terribly large, considering that on average eight hours per day are freed from paid work upon retirement. Indeed the increase in partners' separate leisure hours upon retirement is also significant and much larger than that in leisure hours together.

When controlling for the *endogeneity* of retirement (instrumenting retirement with a dummy for reaching legal retirement age), the effect of retirement of the husband on the leisure together of the couple becomes not significant statistically –and this finding is robust to all sample cuts and specification checks. Partners' leisure time spent together increases significantly upon retirement of the wife (often the last to retire among dual-earners). The significance of the increase in joint leisure upon the wife's retirement is sensitive to the sample cut and in particular, the effect is significant for all definitions of joint leisure when dropping couples in which the wife is a housewife from the sample –while it is statistically significant only according to the broadest definition of leisure time together (which requires partners to carry out some leisure activity during the same moment of time and in the same place) for the full sample. The increase in separate leisure time of the husband upon his retirement remains significant and its size increases, when instrumenting retirement in the model. The dramatic increase in the husband's own leisure demand at retirement is robust to all specification checks. The wife's separate leisure demand also increases significantly upon her retirement, but this effect is not robust to changes in the sample cut.

Therefore, we conclude that only the wife's retirement leads to an increase in partners' joint leisure hours, while the husband's retirement results in a large increase in his separate leisure hours. A possible explanation for these findings may be that joint retirement is not very important in France, perhaps due to institutional constraints, and therefore, only when the

wife (also) retires (as she is often the youngest partner and the last to retire), partners can spend more leisure time together. In line with this, there is also some limited evidence from surveys on individual reasons to retire that only a minority of French people (report to) retire because their partner also retired (see Aubert, Patrick, Nadine Barthelemy and Samia Benallah, 2012).

6. Conclusions

In the literature on partners' retirement decisions, an important explanation for joint retirement is leisure complementarities. This is the first study to investigate the extent to which leisure hours together of partners change upon retirement. Here we use diary data on leisure activities of French couples in the age group 50-70 to investigate the causal effect of both partners' retirement on the time spent on separate and joint leisure activities.

The data are drawn from a French time use survey that collected an activity diary for both partners on the same day (chosen by the interviewer) and also asked additional questions on 'with whom' and 'where' the activity was carried out. This allows us to construct four alternative measures of joint leisure hours. 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 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.

Our identification strategy builds upon the fact that for many French workers the legal retirement age is sixty, which enables us to exploit the jump in the retirement probability at age 60 to estimate the causal effect of retirement on partners' leisure hours separate or together. We specify and estimate a five simultaneous equation model with two retirement equations, two separate leisure equations, and an equation for joint leisure. We find a significant jump in the own retirement probability at age 60, equal to about 0.38 for the husband and 0.34 for the wife, which supports our identification strategy.

A robust finding is that the husband's retirement leads to an immediate dramatic increase in the husband's leisure time spent separately from the wife, by more than three hours per day, but there is no change in partners' leisure hours together. We find that the husband's retirement has no effect on partners' joint leisure in any of the models accounting for

endogeneity of retirement. The wife's retirement increases both her separate leisure hours and the couple's joint leisure hours, though these effects are not robust to all specification checks.

Our findings may be explained by the fact that the husband is often the first to retire as he is usually older than the wife, so that partners' leisure hours together only increase upon retirement of the wife.

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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
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
Weekend diary	0.23	0.42
Winter season diary	0.25	0.42
Observations	1043	

Note: Source: French Time Use Survey 1998-1999; couples with both partners of age 50-70. See Section 3 for variable definitions and sample selection steps.

Table 2. Participation rates and mean durations (in minutes per day) in leisure, and work activities

	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
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
Separate Leisure (a)	*99.42*	302.42 (177.33)	270	*97.60*	228.24 (144.02)	210
Separate leisure (b)	*99.23*	266.74 (163.04)	240	*96.55*	192.55 (128.28)	180
Separate leisure (c)	*99.04*	246.34 (159.26)	220	*96.26*	172.15 (123.04)	150
Separate leisure (d)	*98.95*	224.26 (146.56)	200	*95.59*	150.07 (112.82)	130

Note: Source: see Table 1. Activities measured in minutes per day. Definitions (a) – (d) of joint leisure are given in Section 3.2: (a): exactly the same leisure activity carried out by the partners at the same time of the diary day and with "family"; (b): exactly the same leisure activity carried out by the partners at the same time and at the same place; (c): exactly the same leisure activity carried out by the partners at the same time; (d): any leisure activity carried out by the partners at the same time and at the same place.

Figure 1. Retirement as a function of own and partner's age (bins of ten months).

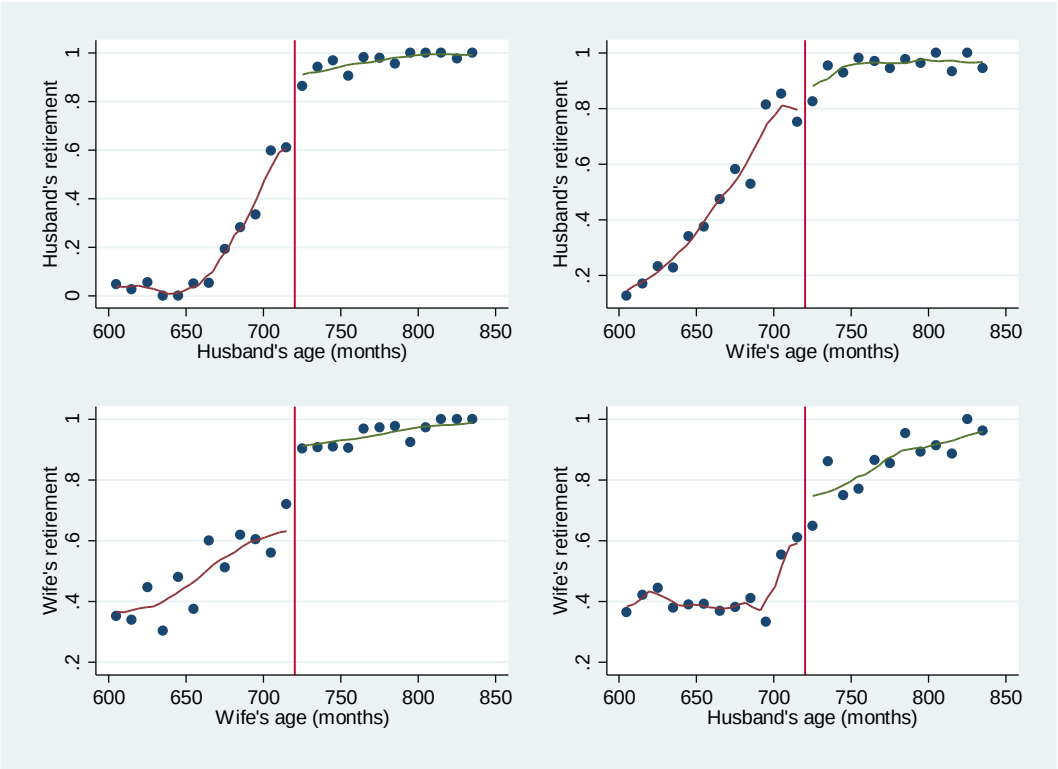

Figure 2. Joint and separate leisure as a function of age (bins of ten months)
Definition (a) of joint leisure (narrowest definition)

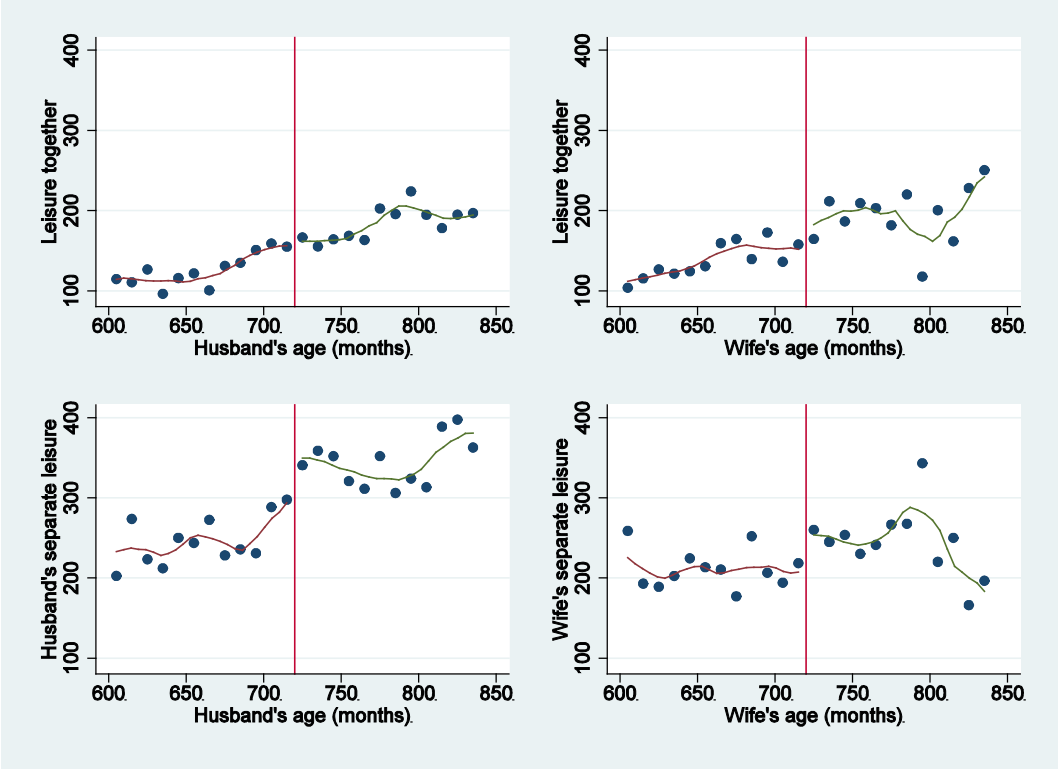

Figure 3. Joint and separate leisure as a function of age (bins of ten months)
Definition (b) of joint leisure

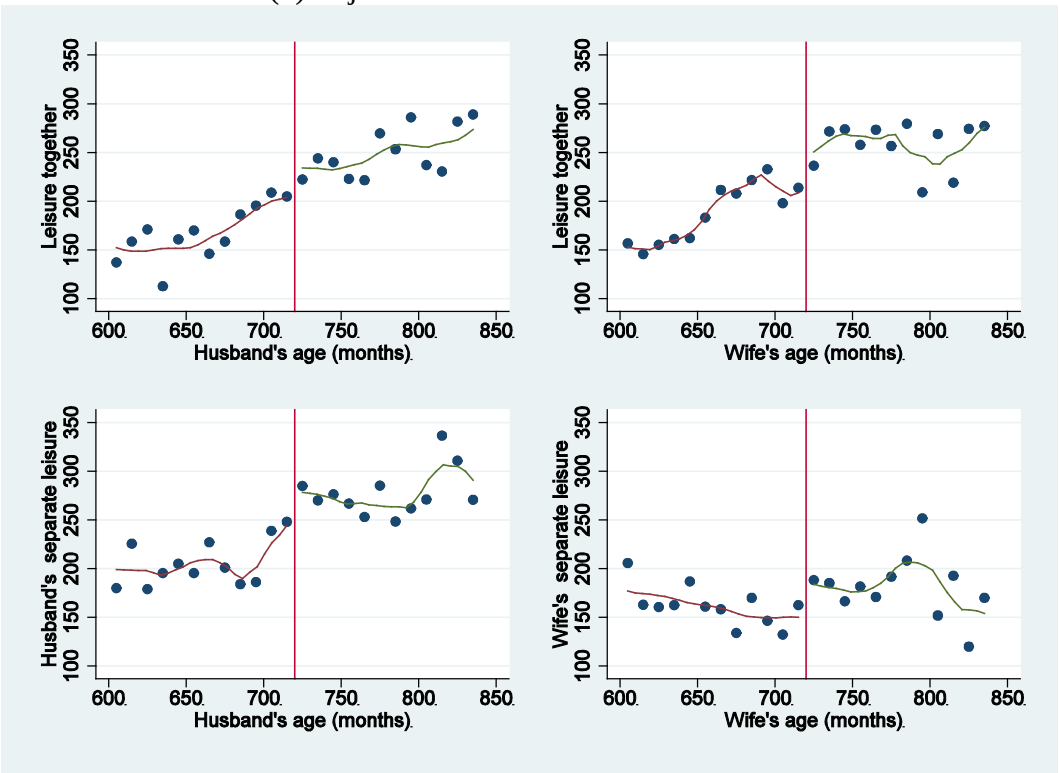

Figure 4. Joint and separate leisure as a function of age (bins of ten months)
Definition (c) of joint leisure

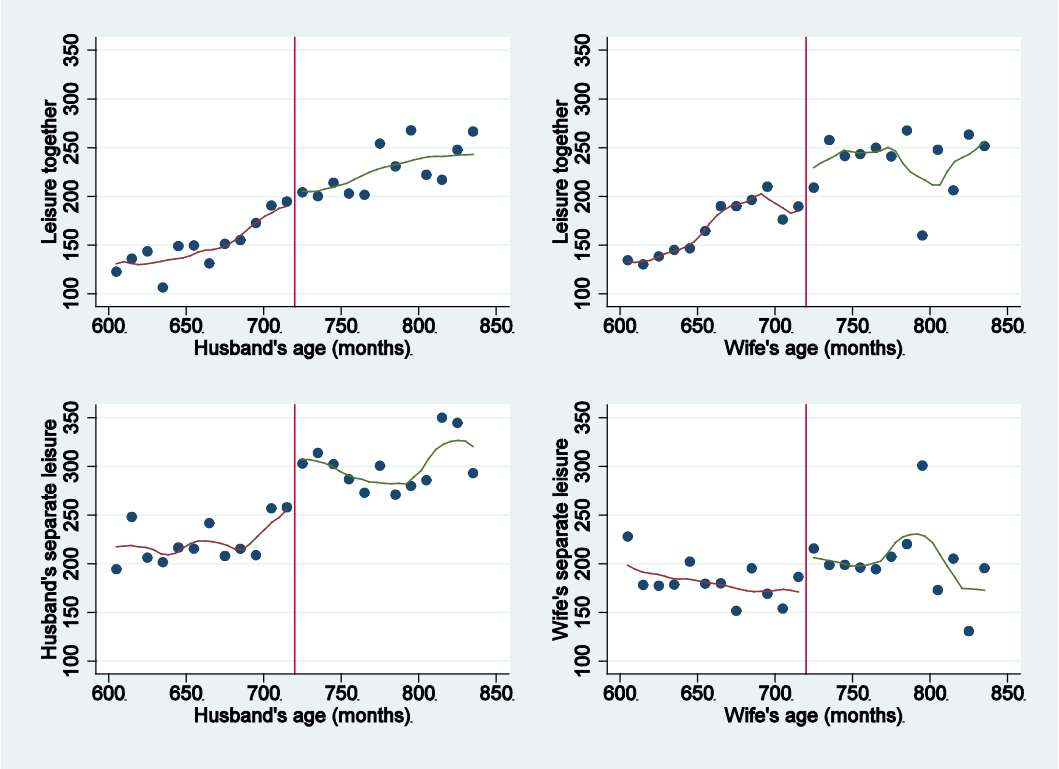

Figure 5. Joint and separate leisure as a function of age (bins of ten months)
Definition (d) of joint leisure

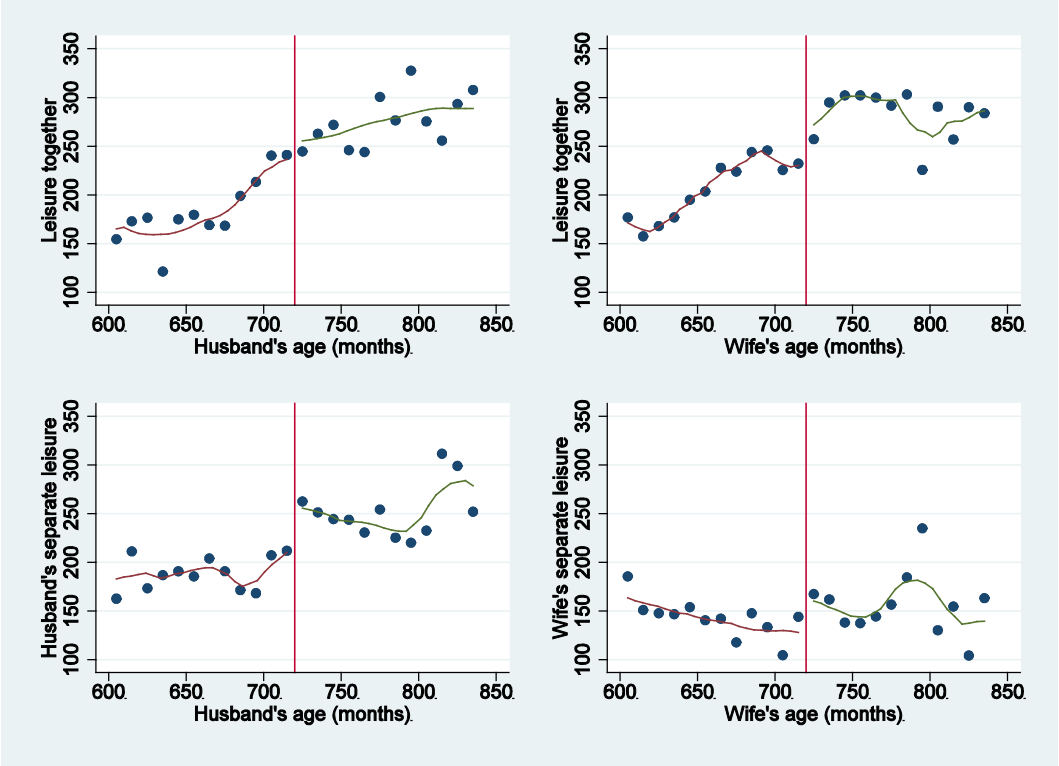

Table 3. The effect of retirement on joint and separate leisure: Single equation estimates, assuming that retirement is exogenous

Outcome definition a, same leisure activity, same time interval, with family			
	His separate leisure	**Her separate leisure**	**Joint Leisure**
He Retired	115.749***	-24.91*	78.40***
	(17.454)	(13.63)	(13.45)
She retired	-21.505*	60.98**	43.77***
	(12.444)	(9.72)	(9.59)
Mean leisure (at age 55-59)	*268.9*	*209.36*	*138*
Outcome definition b, same leisure activity, same time interval, same place			
	His separate leisure	**Her separate leisure**	**Joint Leisure**
He Retired	129.02***	-11.4	64.88***
	(18.609)	(15.81)	(12.36)
She retired	-13.93	68.99**	35.756***
	(13.27)	(11.27)	(8.816)
Mean leisure (at age 55-59)	*241.28*	*181.74*	*165.78*
Outcome definition c, same leisure activity, same time interval			
	His separate leisure	**Her separate leisure**	**Joint Leisure**
He Retired	115.749***	-24.639*	78.214***
	(17.454)	(14.158)	(13.296)
She retired	-21.505*	61.427***	43.324***
	(12.444)	(10.095)	(9.480)
Mean leisure (at age 55-59)	*224.22*	*164.68*	*182.84*
Outcome definition d, any leisure activity, same time interval, same place			
	His separate leisure	**Her separate leisure**	**Joint Leisure**
He Retired	99.20***	-41.29***	94.76***
	(15.27)	(12.34)	(13.689)
She retired	-27.40**	55.53***	49.217***
	(11.39)	(8.80)	(9.760)
Mean leisure (at age 55-59)	*207.61*	*148.07*	*199.45*

Notes: Other controls: quadratic polynomials in age-60 interacted with the agee60 dummies; partners' education dummies; a dummy for any child still living at home; area of residence dummies; seasonal dummies; a weekend diary dummy. See Section 2 for the model specification and Section 3.2 for definitions of leisure. Here retirement of the wife is defined as non-employment. Observations: 1043 couples both aged 50-70.
*** p<0.01, ** p<0.05, * p<0.1 Standard errors in parentheses.

Table 4. The effect of retirement on joint and separate leisure: Simultaneous equation estimates, instrumenting retirement of both partners with the agee60 dummies; no other controls except age functions

	His Retirement	Her Retirement	
His age 60 & above	0.380***	0.157**	
	(0.035)	(0.051)	
Her age 60 & above	0.031	0.187***	
	(0.035)	(0.051)	
Mean retirement (age 55-59)	*0.3259*	*0.485*	
	Outcome definition a, same leisure activity, same time interval, with family		
	His separate leisure	**Her separate leisure**	**Joint Leisure**
He Retired	200.89**	-78.82	-39.32
	(85.92)	(85.03)	(57.62)
She retired	-94.66	300.40**	95.17
	(128.94)	(127.65)	(86.47)
Mean leisure (at age 55-59)	*268.9*	*209.36*	*138*
	Outcome definition b, same leisure activity, same time interval, same place		
	His separate leisure	**Her separate leisure**	**Joint Leisure**
He Retired	213.95**	-65.65	-52.37
	(82.80)	(73.57)	(65.19
She retired	-149.27	245.59**	149.79
	(124.23)	(110.42)	(97.83)
Mean leisure (at age 55-59)	*241.28*	*181.74*	*165.78*
	Outcome definition c, same leisure activity, same time interval		
	His separate leisure	**Her separate leisure**	**Joint Leisure**
He Retired	188.80**	-90.85	-27.22
	(80.29)	(72.23)	(66.48)
She retired	-140.50	254.46**	141.00
	(120.50)	(108.41)	(99.79)
Mean leisure (at age 55-59)	*224.22*	*164.68*	*182.84*
	Outcome definition d, any leisure activity, same time interval, same place		
	His separate leisure	**Her separate leisure**	**Joint Leisure**
He Retired	225.13**	-54.51	-63.56
	(81.40	(60.17)	(74.47)
She retired	-218.46*	176.47**	218.98**
	(122.16)	(90.30)	(111.78)
Mean leisure (at age 55-59)	*207.61*	*148.07*	*199.45*

Notes: The table only shows the estimates of the effects of the agee60 dummies for each partner on the retirement probabilities and the effects of each partner's retirement on joint and separate leisure (outcome equations). Other controls: quadratic polynomials in age-60 interacted with the agee60 dummies. See Section 2 for the model specification and Section 3.2 for definitions of leisure. Here retirement of the wife is defined as non-employment. Observations: 1043 couples aged 50-70.
*** p<0.01, ** p<0.05, * p<0.1 Standard errors in parentheses.

Table 5. The effect of retirement on joint and separate leisure: Simultaneous equation estimates, instrumenting retirement of both partners with the agee60 dummies; with additional controls

	His Retirement	Her Retirement	
His age 60 & above	0.380***	0.160***	
	(0.034)	(0.050)	
Her age 60 & above	0.035	0.185***	
	(0.035)	(0.051)	
Mean retirement (age 55-59)	*0.3259*	*0.485*	
	Outcome definition a, same leisure activity, same time interval, with family		
	His separate leisure	**Her separate leisure**	**Joint Leisure**
He Retired	165.85**	-100.58	-39.46
	(84.51)	(94.68)	(58.77)
She retired	-6.27	375.72**	94.20
	(127.53)	(142.88)	(88.69)
Mean leisure (at age 55-59)	*268.9*	*209.36*	*138*
	Outcome definition b, same leisure activity, same time interval, same place		
	His separate leisure	**Her separate leisure**	**Joint Leisure**
He Retired	184.703**	-81.73	-34.52
	(80.088)	(81.87)	(67.43)
She retired	-67.99	314.00**	174.06*
	(120.85)	(123.55)	(101.72)
Mean leisure (at age 55-59)	*241.28*	*181.74*	*165.78*
	Outcome definition c, same leisure activity, same time interval		
	His separate leisure	**Her separate leisure**	**Joint Leisure**
He Retired	160.91**	-105.51	-34.52
	(79.09)	(77.90)	(67.43)
She retired	-86.119	295.84**	174.06*
	(119.34)	(117.56)	(101.72)
Mean leisure (at age 55-59)	*224.22*	*164.68*	*182.84*
	Outcome definition d, any leisure activity, same time interval, same place		
	His separate leisure	**Her separate leisure**	**Joint Leisure**
He Retired	198.63**	-67.80	-72.24
	(78.24)	(64.57)	(76.63)
She retired	-166.41	215.58**	254.34**
	(118.06)	(97.43)	(115.63)
Mean leisure (at age 55-59)	*207.61*	*148.07*	*199.45*

Notes: The table only shows the estimates of the effects of the agee60 dummies for each partner on the retirement probabilities and the effects of each partner's retirement on joint and separate leisure (outcome equations). Other controls: quadratic polynomials in age-60 interacted with the agee60 dummies; partners' education dummies; a dummy for any child still living at home; area of residence dummies; seasonal dummies; a weekend diary dummy. . See Section 2 for the model specification and Section 3.2 for definitions of leisure. Here retirement of the wife is defined as non-employment. Observations: 1043 couples aged 50-70. *** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses.

Table 6. The effect of retirement on joint and separate leisure: Simultaneous equation estimates, instrumenting retirement of both partners with the agee60 dummies; no other controls except age functions. Sample excluding couples in which the woman is a 'housewife'

	His Retirement	**Her Retirement**	
His age 60 & above	0.347***	0.160***	
	(0.042)	(0.052)	
Her age 60 & above	0.081**	0.338***	
	(0.042)	(0.052)	
Mean retirement (age 55-59)	*0.353*	*0.221*	
	Outcome definition a, same leisure activity, same time interval, with family		
	His separate leisure	**Her separate leisure**	**Joint Leisure**
He Retired	205.65**	-65.78	-73.93
	(100.59)	(86.05)	(67.04)
She retired	-147.51	178.89**	118.77*
	(94.62)	(80.95)	(63.07)
Mean leisure (at age 55-59)	*274.71*	*197.05*	*142.94*
	Outcome definition b, same leisure activity, same time interval, same place		
	His separate leisure	**Her separate leisure**	**Joint Leisure**
He Retired	242.68**	-28.76	-110.96
	(94.52)	(78.03)	(74.59)
She retired	-165.21*	161.19**	136.47*
	(88.92)	(73.40)	(70.17)
Mean leisure (at age 55-59)	*227.5*	*150.29*	*190.15*
	Outcome definition c, same leisure activity, same time interval		
	His separate leisure	**Her separate leisure**	**Joint Leisure**
He Retired	221.66**	-49.77	-89.94
	(93.03)	(74.73)	(76.52)
She retired	-169.65**	156.75**	140.91**
	(87.52)	(70.30)	(71.98)
Mean leisure (at age 55-59)	*243.97*	*166.76*	*173.68*
	Outcome definition d, any leisure activity, same time interval, same place		
	His separate leisure	**Her separate leisure**	**Joint Leisure**
He Retired	252.10**	-19.35	-120.37
	(90.09)	(65.99)	(81.60)
She retired	-217.71**	108.69*	188.98**
	(84.75)	(62.08)	(76.77)
Mean leisure (at age 55-59)	*206.76*	*129.56*	*210.88*

Notes: The table only shows the estimates of the effects of the agee60 dummies for each partner on the retirement probabilities and the effects of each partner's retirement on joint and separate leisure (outcome equations). Other controls: quadratic polynomials in age-60 interacted with the agee60 dummies. See Section 2 for the model specification and Section 3.2 for definitions of leisure. Observations: 732 couples aged 50-70.
*** p<0.01, ** p<0.05, * p<0.1 Standard errors in parentheses.

Table 7. The effect of retirement on joint and separate leisure: Simultaneous equation estimates, instrumenting retirement of both partners with the agee60 dummies; with additional controls. Sample excluding couples in which the woman is a 'housewife'

	His Retirement	Her Retirement	
His age 60 & above	0.342***	0.151***	
	(0.041)	(0.050)	
Her age 60 & above	0.097**	0.339***	
	(0.041)	(0.051)	
Mean retirement (age 55-59)	*0.353*	*0.221*	
	Outcome definition a, same leisure activity, same time interval, with family		
	His separate leisure	**Her separate leisure**	**Joint Leisure**
He Retired	161.84*	-101.66	-54.27
	(98.27)	(90.63)	(66.09)
She retired	-86.69	251.56**	117.49*
	(94.66)	(87.30)	(63.66)
Mean leisure (at age 55-59)	*274.71*	*197.05*	*142.94*
	Outcome definition b, same leisure activity, same time interval, same place		
	His separate leisure	**Her separate leisure**	**Joint Leisure**
He Retired	208.34**	-55.18	-100.75
	(92.27)	(8238)	(73.67)
She retired	-108.96	229.29**	139.77**
	(88.88)	(79.35)	(70.96)
Mean leisure (at age 55-59)	*227.5*	*150.29*	*190.15*
	Outcome definition c, same leisure activity, same time interval		
	His separate leisure	**Her separate leisure**	**Joint Leisure**
He Retired	188.48**	-75.04	-80.90
	(92.03)	(78.59)	(74.01)
She retired	-127.30	210.95**	158.10**
	(88.65)	(75.70)	(71.30)
Mean leisure (at age 55-59)	*243.97*	*166.76*	*173.68*
	Outcome definition d, any leisure activity, same time interval, same place		
	His separate leisure	**Her separate leisure**	**Joint Leisure**
He Retired	228.84**	-34.70	-121.26
	(88.67)	(68.62)	(80.26)
She retired	-187.37**	150.90**	218.18**
	(85.61)	(66.10)	(77.31)
Mean leisure (at age 55-59)	*206.76*	*129.56*	*210.88*

Notes: The table only shows the estimates of the effects of the agee60 dummies for each partner on the retirement probabilities and the effects of each partner's retirement on joint and separate leisure (outcome equations). Other controls: quadratic polynomials in age-60 interacted with the agee60 dummies; partners' education dummies; a dummy for any child still living at home; area of residence dummies; seasonal dummies; a weekend diary dummy. See Section 2 for the model specification and Section 3.2 for definitions of leisure.
Observations: 732 couples aged 50-70. *** p<0.01, ** p<0.05, * p<0.1. Standard errors in parentheses.

APPENDIX. (We would like to stress that we do not expect to publish the Appendix. These additional tables are provided mainly for Editor and Referee inspection)

Figure A. Smoothness of covariates other than age at legal retirement age
Predicted retirement as a function of the Z covariates (bins of ten months)

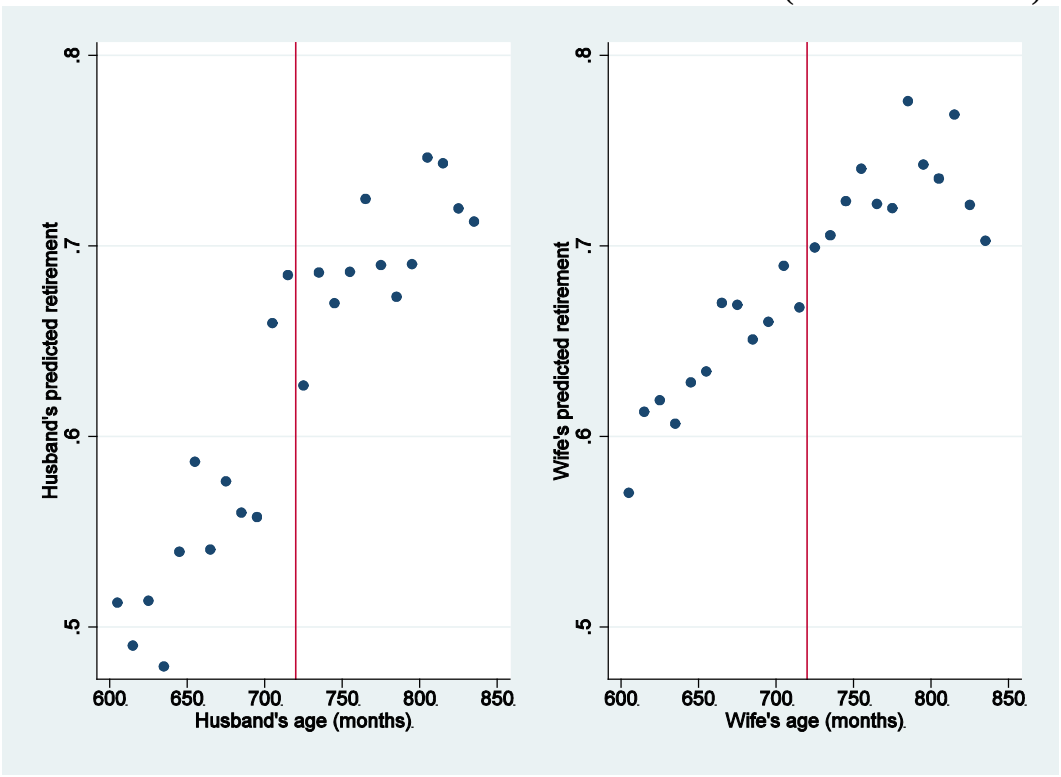

Table A. Correlations of the errors of the equations from the models in Table 4

Outcome definition a, same leisure activity, same time interval, with family

	Her Retirement	His separate leisure	Her separate leisure	Joint leisure
His Retirement	0.127***	-0.104	0.029	0.250**
	(0.031)	(0.112)	(0.113)	(0.108)
Her Retirement		0.164	-0.609**	-0.151
		(0.285)	(0.280)	(0.283)
His separate leisure			0.274	-0.448**
			(0.199)	(0.086)
Her separate leisure				-0.255
				(0.0205)

Outcome definition b, same leisure activity, same time interval, same place

	Her Retirement	His separate leisure	Her separate leisure	Joint leisure
His Retirement	0.127***	-0.140	-0.002	0.262**
	(0.031)	(0.109)	(0.115)	(0.103)
Her Retirement		0.282	-0.560**	-0.273
		(0.282)	(0.283)	(0.279)
His separate leisure			0.131	-0.451**
			(0.194)	(0.126)
Her separate leisure				-0.164
				(0.205)

Outcome definition c, same leisure activity, same time interval

	Her Retirement	His separate leisure	Her separate leisure	Joint leisure
His Retirement	0.127***	-0.099	0.047	0.201*
	(0.031)	(0.111)	(0.111)	(0.107)
Her Retirement		0.275	-0.597**	-0.248
		(0.283)	(0.279)	(0.282)
His separate leisure			0.084	-0.429***
			(0.197)	(0.115)
Her separate leisure				-0.162
				(0.207)

Outcome definition d, any leisure activity, same time interval, same place

	Her Retirement	His separate leisure	Her separate leisure	Joint leisure
His Retirement	0.127***	-0.169	-0.038	0.259**
	(0.031)	(0.104)	(0.118)	(0.010)
Her Retirement		0.470*	-0.431	-0.431
		(0.276)	(0.286)	(0.273)
His separate leisure			-0.045	-0.502**
			(0.188)	(0.177)
Her separate leisure				-0.120
				(0.204)

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

Table B. Results of estimation of the effect of partners' retirement on joint or separate leisure demands. Simultaneous equation estimation of leisure separate or together and his and her retirement. Instrumenting Retirement with the dummy for being aged 60 and above. Sample of couples with both partners aged 52 to 68.

	His Retirement	**Her Retirement**	
His age 60 & above	0.318***	0.112*	
	(0.042)	(0.059)	
Her age 60 & above	-0.007	0.198***	
	(0.042)	(0.058)	
Mean retirement (age 55-59)	*0.3259*	*0.485*	
	Outcome definition a, same leisure activity, same time interval, with family		
	His separate leisure	**Her separate leisure**	**Joint Leisure**
He Retired	272.54**	-46.28	-44.42
	(94.85)	(80.19)	(62.77)
She retired	-127.25	198.63*	114.67
	(128.85)	(108.97)	(85.26)
Mean leisure (at age 55-59)	*268.9*	*209.36*	*138*
	Outcome definition b, same leisure activity, same time interval, same place		
	His separate leisure	**Her separate leisure**	**Joint Leisure**
He Retired	238.82**	-80.00	-10.69
	(91.78)	(70.59)	(69.38)
She retired	-169.42	156.47*	156.85*
	(124.71)	(95.92)	(94.27)
Mean leisure (at age 55-59)	*241.28*	*181.74*	*165.78*
	Outcome definition c, same leisure activity, same time interval		
	His separate leisure	**Her separate leisure**	**Joint Leisure**
He Retired	218.29**	-100.53	9.83
	(90.72)	(67.26)	(71.32)
She retired	-183.61	142.28	171.03*
	(123.27)	(91.39)	(96.90)
Mean leisure (at age 55-59)	*224.22*	*164.68*	*182.84*
	Outcome definition d, any leisure activity, same time interval, same place		
	His separate leisure	**Her separate leisure**	**Joint Leisure**
He Retired	261.38**	-57.44	-33.25
	(88.44)	(60.48)	(75.93)
She retired	-209.77*	116.12	197.19*
	(120.18)	(82.18)	(103.18)
Mean leisure (at 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 the dummies for being age 60 and above of each partner on the retirement probability (first stage) and the effect of each partner's retirement on joint and separate leisure demands (outcome equations). Other controls include partners' age polynomials interacted with the dummies for being aged 60 and above. See Section 2 for the model specification and Section 3.2 for definitions of leisure. Observations: 746 couples.
*** p<0.01, ** p<0.05, * p<0.1 Standard errors in parentheses.

Table C. Results of estimation of the effect of partners' retirement on joint or separate leisure demands. Simultaneous equation estimation of leisure separate or together and his and her retirement. Instrumenting Retirement with the dummy for being aged 60 and above and including other covariates. Sample of couples with both partners aged 52 to 68.

	His Retirement	**Her Retirement**	
His age 60 & above	0.333***	0.122**	
	(0.041)	(0.059)	
Her age 60 & above	0.0002	0.227***	
	(0.041)	(0.059)	
Mean retirement (age 55-59)	*0.359*	*0.485*	
	Outcome definition a, same leisure activity, same time interval, with family		
	His separate leisure	**Her separate leisure**	**Joint Leisure**
He Retired	238.48**	-52.22	-35.44
	(84.45)	(75.09)	(58.90)
She retired	-75.90	208.27**	118.00
	(107.98)	(96.01)	(75.32)
Mean leisure (at age 55-59)	*268.9*	*209.36*	*138*
	Outcome definition b, same leisure activity, same time interval, same place		
	His separate leisure	**Her separate leisure**	**Joint Leisure**
He Retired	208.04**	-82.66	-4.99
	(81.88)	(66.45)	(64.96)
She retired	-114.53	169.65**	156.63*
	(104.69)	(84.97)	(83.05)
Mean leisure (at age 55-59)	*241.28*	*181.74*	*165.78*
	Outcome definition c, same leisure activity, same time interval		
	His separate leisure	**Her separate leisure**	**Joint Leisure**
He Retired	188.29**	-102.37	14.76
	(81.84)	(62.85)	(65.99)
She retired	-142.44	141.64*	184.54**
	(104.58)	(80.36)	(84.33)
Mean leisure (at age 55-59)	*224.22*	*164.68*	*182.84*
	Outcome definition d, any leisure activity, same time interval, same place		
	His separate leisure	**Her separate leisure**	**Joint Leisure**
He Retired	224.70**	-65.98	-21.65
	(77.78)	(57.01)	(68.73)
She retired	-157.12	127.01*	199.22**
	(99.43)	(72.89)	(87.87)
Mean leisure (at 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 the dummies for being age 60 and above of each partner on the retirement probability (first stage) and the effect of each partner's retirement on joint and separate leisure demands (outcome equations). Other controls include partners' age polynomials interacted with the dummies for being aged 60 and above; partners' education dummies, a dummy for any child still living at home, area of residence fixed effects, season of the year and weekend diary dummies. See Section 2 for the model specification and Section 3.2 for definitions of leisure. Observations: 746 couples.

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

Table D. Results of estimation of the effect of partners' retirement on joint or separate leisure demands. Simultaneous equation estimation of leisure separate or together and his and her retirement Instrumenting Retirement with the dummy for being aged 60 and above. Sample of couples with both partners aged 54 to 66

	His Retirement	**Her Retirement**	
His age 60 & above	0.318***	0.011	
	(0.058)	(0.075)	
Her age 60 & above	-0.020	0.166**	
	(0.055)	(0.071)	
Mean retirement (age 55-59)	*0.3259*	*0.485*	
	Outcome definition a, same leisure activity, same time interval, with family		
	His separate leisure	**Her separate leisure**	**Joint Leisure**
He Retired	321.18**	50.75	-93.49
	(105.10)	(92.06)	(71.92)
She retired	-1.33	251.28	-5.53
	(191.71)	(167.96)	(131.09)
Mean leisure (at age 55-59)	*268.9*	*209.36*	*138*
	Outcome definition b, same leisure activity, same time interval, same place		
	His separate leisure	**Her separate leisure**	**Joint Leisure**
He Retired	282.25**	10.81	-53.56
	(98.11)	(73.76)	(74.57)
She retired	-102.62	149.78	95.67
	(178.92)	(134.34)	(135.88)
Mean leisure (at age 55-59)	*241.28*	*181.74*	*165.78*
	Outcome definition c, same leisure activity, same time interval		
	His separate leisure	**Her separate leisure**	**Joint Leisure**
He Retired	239.89**	-30.55	-12.20
	(96.78)	(67.34)	(76.24)
She retired	-146.26	106.03	139.33
	(176.43)	(122.80)	(138.99)
Mean leisure (at age 55-59)	*224.22*	*164.68*	*182.84*
	Outcome definition d, any leisure activity, same time interval, same place		
	His separate leisure	**Her separate leisure**	**Joint Leisure**
He Retired	254.12**	-16.32	-26.43
	(93.50)	(62.38)	(78.80)
She retired	-158.36	94.04	151.41
	(170.51)	(113.74)	(143.69)
Mean leisure (at 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 the dummies for being age 60 and above of each partner on the retirement probability (first stage) and the effect of each partner's retirement on joint and separate leisure demands (outcome equations). Other controls include partners' age polynomials interacted with the dummies for being aged 60 and above. See Section 2 for the model specification and Section 3.2 for definitions of leisure. Observations: 506 couples.
*** p<0.01, ** p<0.05, * p<0.1 Standard errors in parentheses.

Table E. Results of estimation of the effect of partners' retirement on joint or separate leisure demands. Simultaneous equation estimation of leisure separate or together and his and her retirement Instrumenting Retirement with the dummy for being aged 60 and above and including other covariates. Sample of couples with both partners aged 54 to 66

	His Retirement	**Her Retirement**	
His age 60 & above	0.348***	0.015	
	(0.054)	(0.073)	
Her age 60 & above	-0.010	0.184**	
	(0.053)	(0.072)	
Mean retirement (age 55-59)	*0.3259*	*0.485*	
	Outcome definition a, same leisure activity, same time interval, with family		
	His separate leisure	**Her separate leisure**	**Joint Leisure**
He Retired	281.54**	46.54	-74.80
	(89.34)	(80.96)	(61.07)
She retired	22.22	248.32*	46.34
	(165.40)	(149.89)	(113.07)
Mean leisure (at age 55-59)	*268.9*	*209.36*	*138*
	Outcome definition b, same leisure activity, same time interval, same place		
	His separate leisure	**Her separate leisure**	**Joint Leisure**
He Retired	251.14**	16.13	-44.40
	(84.72)	(64.07)	(68.48)
She retired	-94.76	131.34	163.32
	(156.85)	(118.63)	(126.79)
Mean leisure (at age 55-59)	*241.28*	*181.74*	*165.78*
	Outcome definition c, same leisure activity, same time interval		
	His separate leisure	**Her separate leisure**	**Joint Leisure**
He Retired	200.08**	-34.93	6.66
	(85.36)	(57.89)	(72.18)
She retired	-159.46	66.64	228.02*
	(158.03)	(107.19)	(133.64)
Mean leisure (at age 55-59)	*224.22*	*164.68*	*182.84*
	Outcome definition d, any leisure activity, same time interval, same place		
	His separate leisure	**Her separate leisure**	**Joint Leisure**
He Retired	209.55**	-25.45	-2.81
	(80.64)	(53.56)	(72.57)
She retired	-154.76	71.34	223.32*
	(149.29)	(99.16)	(134.36)
Mean leisure (at 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 the dummies for being age 60 and above of each partner on the retirement probability (first stage) and the effect of each partner's retirement on joint and separate leisure demands (outcome equations). Other controls include partners' age polynomials interacted with the dummies for being aged 60 and above; partners' education dummies, a dummy for any child still living at home, area of residence fixed effects, season of the year and weekend diary dummies. See Section 2 for the model specification and Section 3.2 for definitions of leisure. Observations: 506 couples.

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

Table F. Results of estimation of the effect of partners' retirement on joint or separate leisure demands.
Each leisure equation is estimated separately by two stages least squares instrumenting his and her R

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

	His disj. Leisure	**Her disj. Leisure**	**Joint Leisure**
He Retired	211.63***	-20.00	-25.87
	(61.41)	(55.64)	(43.91)
She retired	-154.07	240. 41**	98.29
	(105.42)	(93.35)	(75.51)
Mean leisure (at age 55-59)	*268.9*	*209.36*	*138*

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

	His disj. leisure	**Her disj. leisure**	**Joint Leisure**
He Retired	178.60***	-43.22	1.63
	(56.91)	(48.83)	(47.09)
She retired	-158.88	207.28**	117.07
	(95.40)	(77.67)	(82.29)
Mean (age 55-59)	*241.28*	*181.74*	*165.78*

Definition c, same leisure activity, same time interval

	His disj. leisure	**Her disj. leisure**	**Joint Leisure**
He Retired	201.88***	-23.15	-17.11
	(57.19)	(51.53)	(46.38)
She retired	-148.24	227.39**	98.11
	(96.04)	(81.18)	(79.93)
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	171.12***	-45.97	1.40
	(55.93)	(43.20)	(47.79)
She retired	-187.79**	182.68**	147.24*
	(94.13)	(68.46)	(84.09)
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. Other controls include partners' age polynomials, partners' education dummies, a dummy for any child still living at home, local unemployment rate, area of residence fixed effects, season of the year and weekend diary dummies. See Section 2 for the model specification and Section 3.2 for definitions of leisure. Observations: 1043 couples.

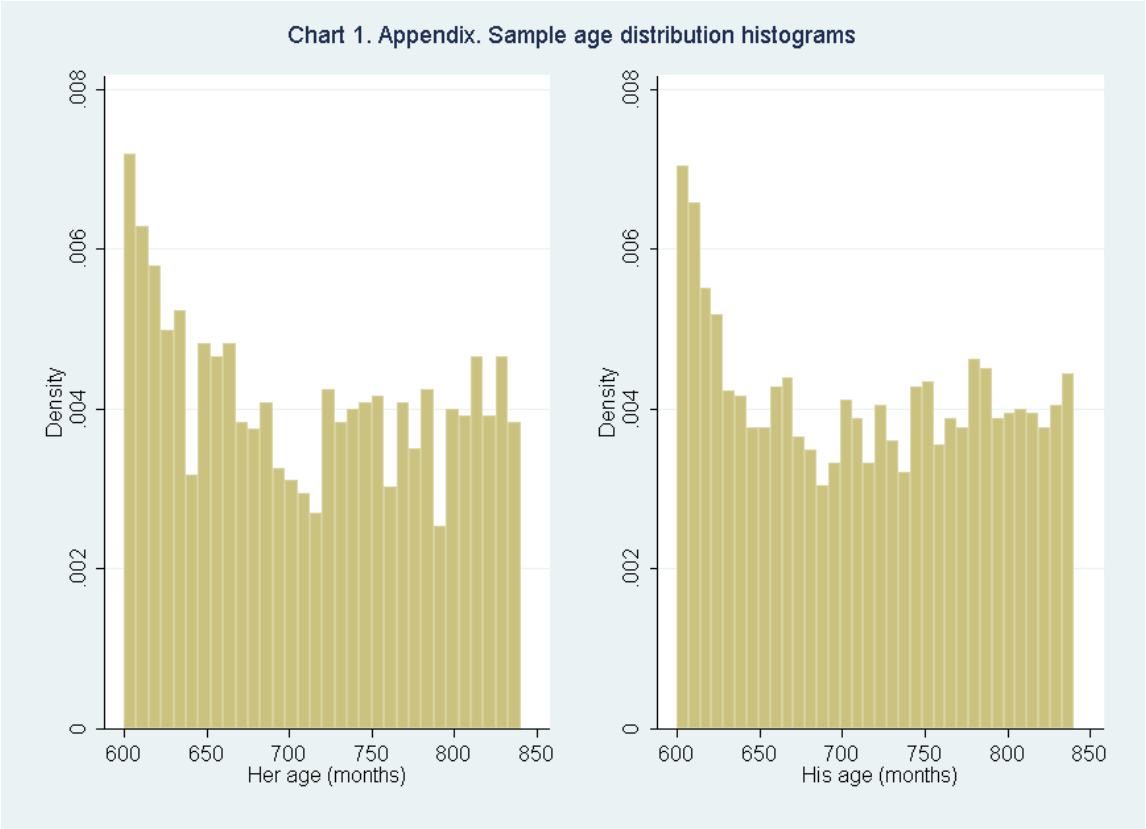
Chart 1. Appendix. Sample age distribution histograms
Density
0
.002
.004
.006
.008
600
650
700
750
800
850
Her age (months)
His age (months)

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

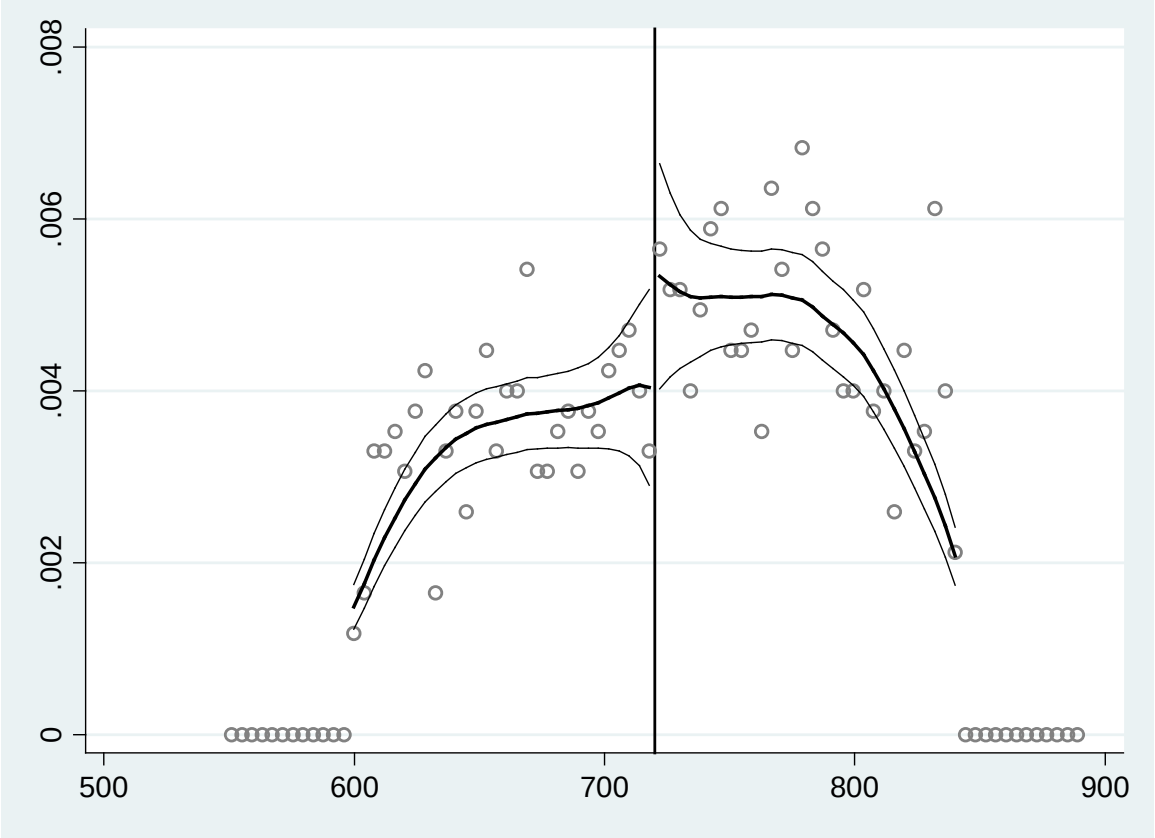

Figure C. Appendix. Estimated female age density on the two sides of age 60 for the Mc Crary test

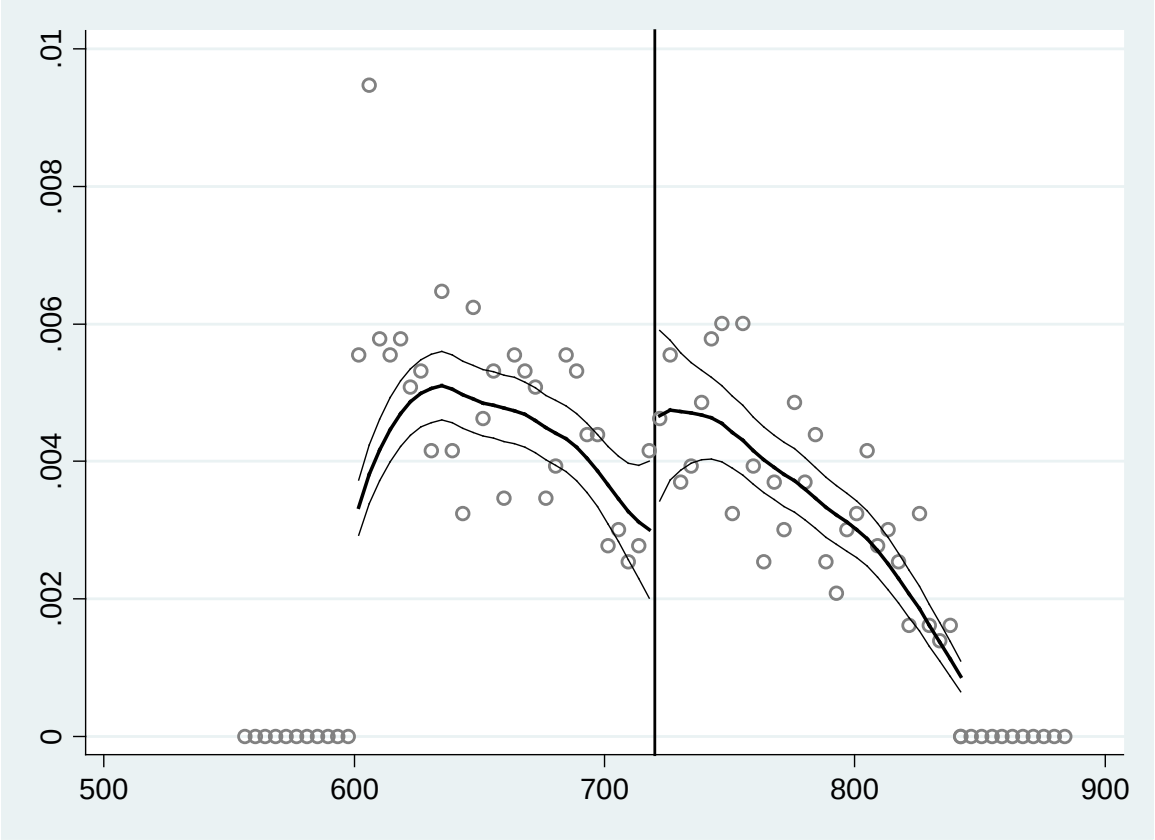

Figure D. Partners' retirement as a function of own and partner's age (bins of ten months).

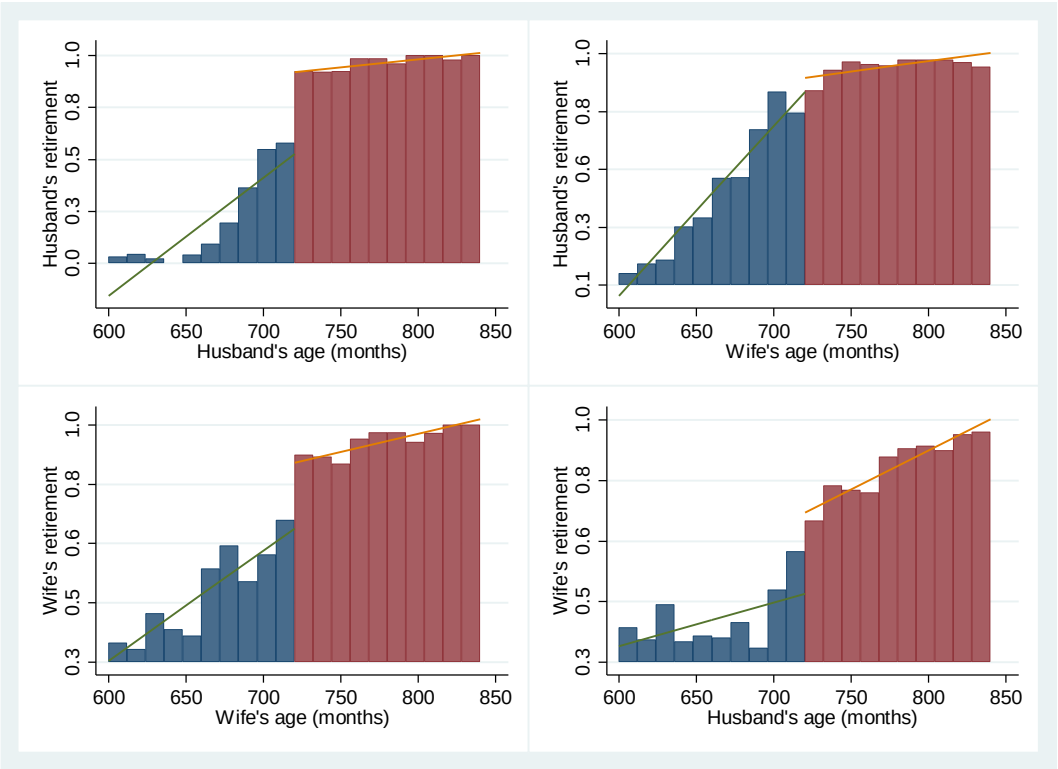

Figure E. Partners' retirement as a function of partner's age (bins of ten months). Sample excluding couples in which the wife is a "housewife".

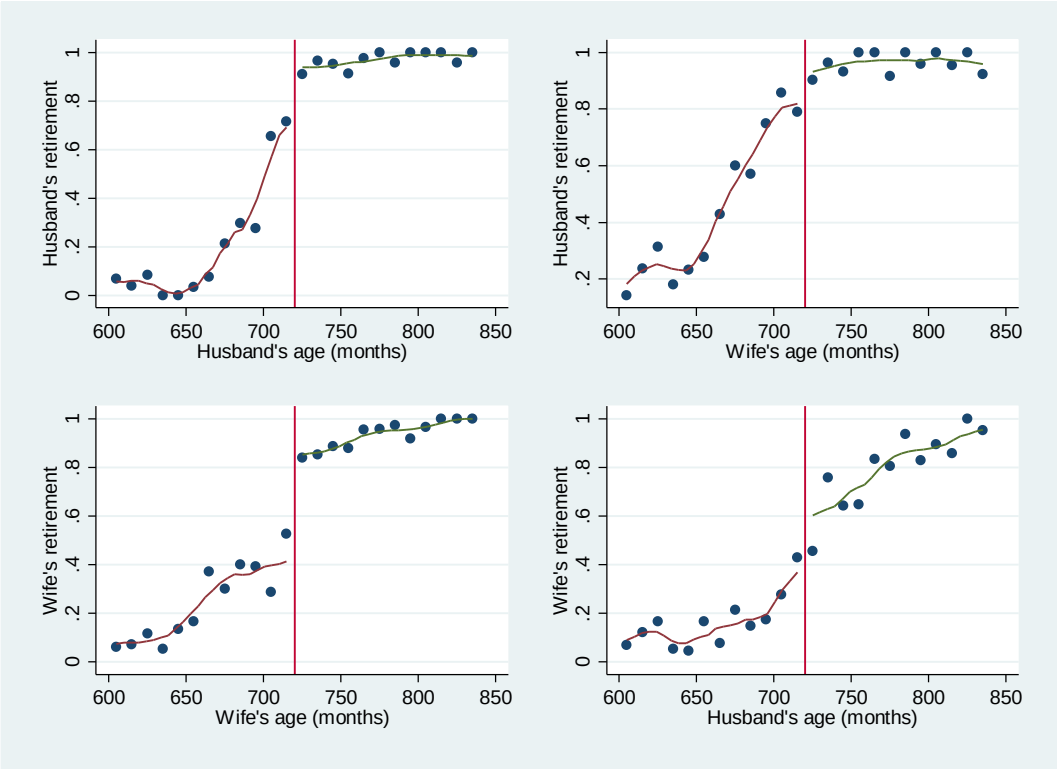

Figure F. Partners' leisure time together as a function of age (bins of ten months).
Sample excluding couples in which the wife is a "housewife".
Using the narrowest (a) and the broadest (d) definition of leisure together.

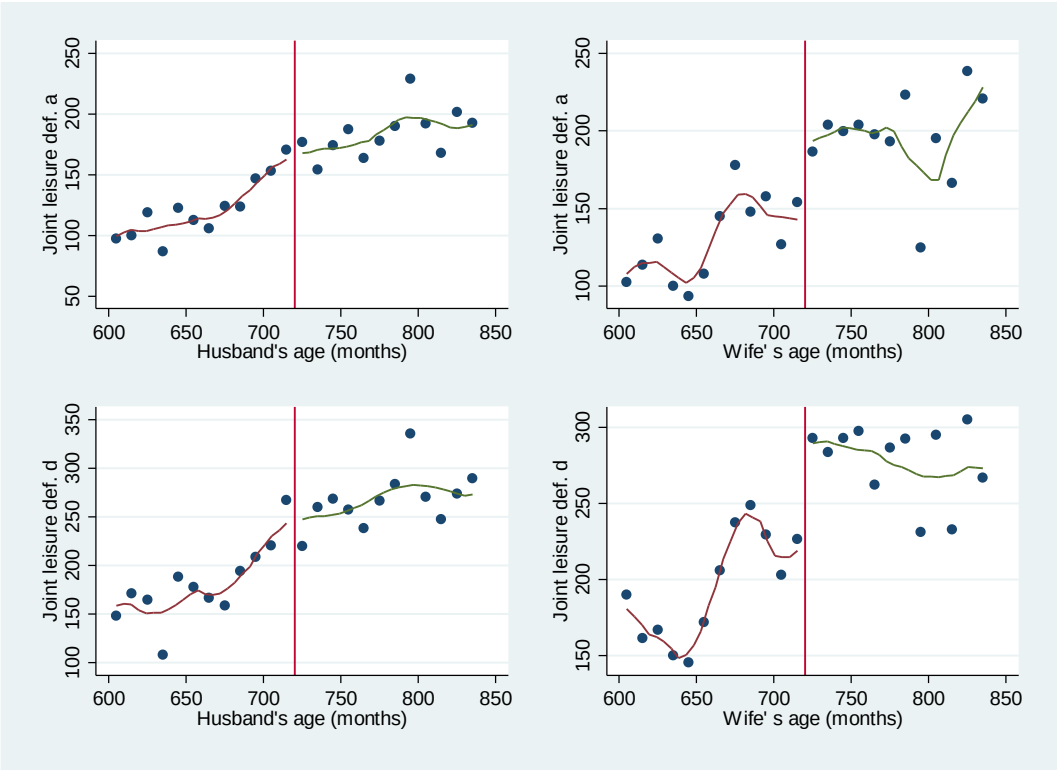

Figure G. Partners' separate leisure time as a function of age (bins of ten months).
Sample excluding couples in which the wife is a "housewife".
Using the two broader definitions of separate leisure ((a) and b)).