Your Retirement and My Health Behaviour: Evidence on Retirement Externalities from a Fuzzy Regression Discontinuity Design

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Your Retirement and My Health Behaviour: Evidence on Retirement Externalities from a Fuzzy Regression Discontinuity Design*

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Abstract

This paper presents evidence on intra-household retirement externalities by assessing the causal effect of partner's retirement on own health behaviour in Europe. We identify partner's retirement effects by applying a fuzzy regression discontinuity (RD) framework using retirement eligibility as an exogenous instrument for partner's retirement status. Using data from the Survey of Health, Ageing and Retirement in Europe (SHARE) we find that while partner's retirement increases own physical activity, it also increases smoking by up to 7 cigarettes a day and increases alcohol intake by 1-2 drinks per day. Furthermore, we find that physical activity increases only for individuals that are themselves retired pointing toward compensated effects that arise due to husband's and wife's retirement being complements. Similarly, an increase in alcohol intake is observed only if the individuals are themselves retired and an increase in smoking is only observed if the partner is a smoker suggesting mutual positive externalities and leisure complementarities.

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1 Introduction

Retirement related reforms and legislation have been subjected to great debate particularly in the developed world where a rapidly ageing population is posing considerable challenges to the affordability of pension systems, calling into question the financial sustainability of pension schemes. Simultaneous increases in life expectancy have increased costs for the treasuries which end up paying for more years lived in retirement than individuals spend contributing to state pension funds. For example, the average amount of time spent in retirement across OECD countries has increased from 11 years in 1970 to 18 years in 2012 for men, and from 18 years to 22.5 years for women in the same period (OECD, 2014). Concurrently, public expenditures on pensions also increased in most OECD countries over the past years, with some countries even doubling them relative to national income (OECD, 2014). As a result, many countries have been contemplating changes in official retirement ages and are aiming to raise them in order to secure the viability of statutory social security funds.

There is a growing consensus that retirement reforms, especially changes in retirement age, should carefully account for adverse social and economic effects arising due to individuals retiring either earlier or later, and any actions that alter current policies must discuss both long-term and short-term effects. While the usual focus of economists is largely on the effects of retirement on income and consumption behaviour (Charles, 2002), much of the recent literature has now started to focus on other broader outcomes such as leisure activities, home production, and health and health behaviour (Battistin, 2008; Coe & Lindeboom, 2008; Neuman, 2008; Johnston & Lee, 2009; Coe & Zamarro, 2011; Behncke, 2012; Stancanelli & Soest, 2012, 2014; Insler, 2014; Eibich, 2015). Such broader outcomes are now gaining a foothold in the political debates on retirement legislations and it is a growing view that if effective retirement policies are to be framed, different aspects of life that retirement affects must be considered. However, one aspect that has largely been ignored within this strand of literature is the assessment of externalities arising due to retirement.

It is surprising that such externalities have not received much attention in the literature since there are several reasons why we believe these would exist. It is unanimously agreed that retirement is an important life changing event which can be particularly stressful to the retirees and those around them through spillover effects (Wheaton, 1990; Coe & Zamarro, 2011). Even though a single entity retires, it is clear that retirement sets in motion a sequence of events that have interaction effects with others in the household and thus may affect the behaviour of others (Wheaton, 1990). Further, the propensity of an individual to behave in a certain way may vary with the characteristics and the behaviour of other individuals around (Manski, 1993).

Indeed there is overwhelming evidence on such endogenous and exogenous social effects; where endogenous effects refer to the behaviour of an individual varying with the behaviour of others, and exogenous effects refer to the behaviour of an individual varying with the characteristics of others (see Manski, 1993; Banerjee, 1992; Bhickchandani *et al.*, 1992; Duflo & Saez, 2002, 2003). There is a growing body of both theoretical and empirical literature that identifies such effects in education, savings and retirement decisions, technology adoption etc. (Banerjee & Besley, 1991; Bhickchandani *et al.*, 1992; Duflo & Saez, 2002, 2003; Vergari, 2004). While the literature on this topic largely discusses group behaviour and group characteristics either in terms of groups of individuals or groups of firms, we attempt to draw on this literature and apply it to the behaviour of individuals within a household. Following a similar line of reasoning, it seems plausible to presume that the behaviour or characteristics of individuals directly affect the behaviour of others within the household imposing externalities on others (either positive or negative). While in the case of groups these are often termed herd externalities (Banerjee 1992), in the household case we may call them intra-household externalities [1].

The identification of such retirement related intra-household externalities, specifically in terms of health behaviours, and their implications are the main contribution of this paper. We identify the causal effect of being retired (a characteristic of an individual) on the health behaviours of the other individual (partner) in the household. To this end we use a fuzzy regression discontinuity (RD) design which accounts for the endogeneity of the retirement decision by exploiting the legislation on retirement eligibility, which makes the probability of being in retirement a discontinuous function of age. We use data from the Survey of Health, Ageing and Retirement in Europe (SHARE) for 14 European countries from the first two waves (2004-05 and 2006-07) and also wave 4 (2011). First, we find that the probability to retire shows a significant discontinuity at the country-specific retirement age thus supporting our identification strategy at the outset. Second, our RD estimates show that partners retirement overall has a significant effect on the health behaviours of the other partner. In particular, we find that it has a positive and significant effect on physical activity, smoking and dietary intake. Our results are robust to different model specifications and functional forms of the forcing variable. In addition, the standard validity checks provide no evidence for violations of local random assignment reinforcing our identification strategy.

We also assess effect heterogeneity by exploring partner's retirement effects in different subsamples. We find that partner's retirement only significantly increases moderate physical activity if the other partner is also retired. We explain this finding based on compensated effects that

[1] Previous studies have identified such externalities in different contexts such as health and literacy related intra-household externalities; see Miller & Mobarak, 2013; Lindelow, 2008; Gibson, 2001.

result due to utility from own leisure being affected by the leisure of the spouse where husband's and wife's retirement are complements (Hurd, 1990). In addition, we find that smoking is only significantly increased when the partner is a smoker; it is insignificant otherwise. We propose that this may be due to leisure complementarities where smoking may become a more worthwhile activity when the other partner also does it (Banerjee, 1992). Further, we could expect mutual positive externalities to exist due to similar actions that arise out of mutual interdependence (Bernheim, 1994). Although alcohol consumption is not significant overall, it becomes significant only for retirees themselves. This seems plausible since retirees themselves do not have to worry about employment issues such as missing work, decreased productivity or late arrival at work. Hence, they may indulge in more social drinking with their partners.

The remainder of the paper is organized as follows: in section 2 we discuss relevant literature. In section 3 we discuss the data and variables. In section 4, we present our identification strategy and RD validity checks. Section 5 presents our main results, robustness checks and effect heterogeneity. In section 6 we draw the final conclusions.

2 Relevant Literature

This paper enjoys a broad scope such that it contributes to different strands of literature within economics which are of interest to a broader audience. First, it contributes to the literature on individual risk taking and risk attitudes in general. Understanding the determinants of risk taking plays a crucial role in predicting economic outcomes. Individual charactersitics such as age, gender, height and parental background have been identified as key determinants of risk attitudes in the past (Dohmen, 2011; Figner & Weber, 2011), however, important life changing events such as retirement have received relatively little attention. Second, this paper also contributes to the literature in labour economics where analysing the effects of changes in social security legislations have long been a matter of great interest. While changes in such legislations involve changing different aspects, retirement age changes are common and heavily debated (OECD, 2013). Finally, this paper also adds to the growing body of literature that assesses different determinants of specific risky health behaviours such as smoking, alcohol, and physical activity. Several factors such as income, education, advertising, rate of time preferences etc. have been analysed in the past as important determinants of such health behaviours (for a comprehensive review see Cawley & Ruhm, 2011). However, again relatively little resources have been deployed to understand the impact of retirement (in particular spousal retirement) on such behaviours. Thus this paper contributes (more generally) to the above mentioned streams of literature, and (more specifically) to the literature on retirement and health behaviours.

Although there are several papers that assess the impact of own retirement on own health and health behaviours (Charles, 2002; Dave *et al.*, 2006; Van Solinge, 2007; Bamia *et al.*, 2008; Coe & Lindeboom, 2008; Formann-Hoffman *et al.*, 2008; Neumann, 2008; Chung *et al.*, 2009; Johnston & Lee, 2009; Coe & Zamarro, 2011; Behncke, 2012; Bonsang *et al.*, 2012; Blake & Garrouste, 2013; Bloemen *et al.*, 2013; Celidoni *et al.*, 2013; Insler, 2014; Eibich, 2015), we are not aware of any study that specifically assesses the causal effect of partner's retirement on the other partner's smoking and alcohol behaviour, physical activity, and dietary intake. The evidence on retirement externalities in general is sparse; that on health and health behaviour related externalities is sparser. We discuss related literature by dividing it into two broad strands. The first strand looks at the effect of partner's retirement on more general outcomes such as marital relationships, household consumption, home production and joint leisure (Szinovacz, 1980; Stancanelli & Soest, 2012; 2014; Hallberg, 2003). The second strand of literature, perhaps closer to our paper, looks at the effect of spousal retirement on health outcomes.

With respect to the first strand of literature, Stancanelli & Soest (2012) use a similar identification strategy as ours and exploit the earliest age retirement laws in France. Using data from the French Time Use Survey they find that retirement not only affects own house work time, but also affects partner's time allocation. Further, retirement of the female partner decreases house work of the male partner, but not the other way round, pointing towards heterogeneity in the effects. Zweimuller et al (1996) analyse, both empirically and theoretically, interdependent retirement decisions and the reaction of spouses to changes in retirement age of the partner, respectively. They find that male partners react to the change in the female partner's retirement age, but female partners do not react. Hallberg (2003) studies synchronous time-use of Swedish couples and finds that couples' decisions on leisure are coordinated and depend on each other's work timings. It is more frequent in leisure compared to house work or personal care or sleep. This suggests that leisure activities post retirement may actually depend also on the retirement status of the partner. Stancanelli & Van Soest (2014) assess joint leisure using a similar framework as in Stancanelli & Soest (2012) and conclude that retirement of the husband increases own leisure hours but does not affect joint leisure hours of the couple. However, retirement of the wife does increase joint leisure. Others have focused on cross-partner effects and assess how partner's react to each others retirement incentives (Hospido & Zamarro, 2014; Casanova, 2010; Coile, 2004). In its entirety this strand suggests that there may be externalities of retirement of one partner on production, consumption, leisure etc. of the other partner. It also suggests that there may be differences in the effects of retirement at least with respect to the gender of the individuals demonstrating significant heterogeneity.

With respect to the second strand of literature, and perhaps more relevant for our paper, Szinovacz & Davey (2004) assess if spousal employment and length of retirement affect an individual's postretirement depressive symptoms. They also pay attention to heterogeneous effects by gender. Drawing pooled data from the Health and Retirement Survey and using, primarily, ordinary least squares (OLS) regressions, they find that recently retired men are negatively affected by partner's employment. Joint retirement has a beneficial effect on men in general, but the positive effects of female partner's retirement depend on enjoyment of joint activities. More recently, Bertoni & Brunello (2014) assess the causal effect of husbands retirement on wifes mental health using Japanese data. Specifically, they look at mental health outcomes such as stress, depression and inability to sleep and find a positive effect of husbands retirement. Eibich (2015) assessed the effect of own retirement on own health, however, the author also assessed heterogeneity in own effects by partner's retirement status. He finds that there is no heterogeneity in the results with respect to partner's retirement status.

The scant literature on the topic of retirement related externalities with respect to health behaviours thus leaves substantial scope for further research. In this paper we contribute by addressing this gap in the literature.

3 Data

The data for the analysis is taken from the Survey of Ageing, Health and Retirement in Europe (SHARE). SHARE is a multi-disciplinary panel survey conducted across European countries and includes a rich set of indicators related to socio-economic status, health and employment, social and family networks, and early childhood information amongst several others. For the purpose of the main analysis we use the first two waves of SHARE (2004-05 and 2006-07) and include 14 European countries in our analysis[2]. We also use Wave 4 (2011) of SHARE to asses partner's retirement effects on eating habits of the other partner. SHARE is a representative survey of individuals in a country and a balanced representation of various regions within Europe.

3.1 Sample Construction

First, we only consider individuals within a window of ± 15 years around the official retirement age. This restriction allows us to identify partner's retirement effects with enough precision, while at the same time considering only those individuals with proximity to the retirement

[2]Poland, Ireland and Czech Republic became part of the SHARE survey in wave 2.

eligibility threshold[3]. Second, since our aim is to assess the impact of partner's retirement, it is important that both partners took part in the survey so that we have information about partner's employment status and other variables that we require. We therefore include only those observations for which data on both partners was available. Applying these sample restrictions leaves us with a sample of around 5'000 observations from SHARE waves 1 and 2 and another 3'000 from SHARE wave 4 (see summary statistics in table (1)).

3.2 Outcome Variables

3.2.1 Health Behaviours

While several behavioural risk factors may be related to chronic health conditions and subsequent health care costs, the most important among them are smoking, drinking and obesity (Sturm, 2002). Indeed, many diseases share these common risk factors (Scarborough *et al.*, 2011). SHARE provides a rich set of variables related to physical activity, alcohol consumption and smoking behaviour. We explain the choice of each behavioural indicator in what follows and assess the response of each of these indicators to partner's retirement.

Physical Activity

The first health behaviour we focus on is physical activity. Promotion of physical activity is widely acknowledged as a cost effective means of reducing the economic burden on health systems arising due to chronic degenerative conditions (Roux *et al.*, 2008). A significant proportion of health care costs have been attributed to physical inactivity; for example, Katzmartzyk *et al.* (2000) report direct costs of physical inactivity to be around USD 2.1 billion. Similarly, Kolditz (1999) reports costs of upto USD 24 billion for the United States due to physical inactivity. It is therefore worthwhile to assess the effects of partner's retirement on the physical activity of the other partner. In our analysis we consider two types of physical activity indicators; one capturing moderate physical activity and the other vigorous physical activity. The moderate physical activity indicator reports on how often individuals engage in activities that require a moderate level of energy such as gardening, cleaning the car or going on a walk. The vigorous physical activity measure on the other hand reports how often an individual engages in activities that require a high level of energy such as sports, heavy housework, or a job that involves physical labor. Both physical activity indicators are measured on a 4-point scale ranging from 1 "Hardly ever, or never" to 4 "More than once a week".

[3]We also perform sensitivity tests using different window widths, the results of which are presented in section 5.1.

Alcohol Consumption

The second health behaviour we assess is alcohol consumption. The burden of alcohol consumption is well known; it is one of the largest avoidable risk factors and contributes substantially to the global burden of disease (responsible for almost 4% of total mortality (Rehm *et al.*, 2009)). Much of recent work now considers alcohol an economic problem and not just a public health issue (Baumberg, 2006). Therefore, understanding whether partner's retirement affects alcohol consumption in anyway may provide policy makers (both in the field of labour economics and public health) with interesting insights. For alcohol related behaviour we analyse two different indicators that precisely report drinking habits. The first is how often in the last three months a person consumed alcohol with responses ranging from 1 "Not at all in the last three months" to 7 "Almost every day". The second indicator relates to how many drinks in a day a person consumes and is measured on a continuous scale. As shown in table (1), while 26% report no drinking at all in the last three months, around 20% of the sample reports drinking alcohol at least once or twice a week. Interesting to see here is that about 21% report to drink every day. As for the drinking intensity, table (1) shows that the average number of drinks per day is approximately 3.

Smoking

One of the biggest public health and economic concerns of recent times is tobacco consumption. It is shown to be a risk factor for several diseases many of which such as cardiovascular diseases, respiratory diseases etc. impose a heavy burden on health care systems worldwide (Levenson, 2002; Leidl *et al.*, 2000). It has not only health related costs but also indirect costs due to loss of productivity (Leidl *et al.*, 2000). Smoking therefore, has a huge economic as well as welfare impact on society. In this paper smoking behaviour is captured by the average amount of cigarettes smoked a day which is measured on a continuous scale. Table (1) shows that the average number of cigarettes per day is about 17.

3.2.2 Eating Behaviour

SHARE wave 4 offers information on the eating habits of the elderly across Europe. The corresponding descriptive statistics can be found at the bottom of table (1).

The measure we use here to capture the potential change in the eating behaviour as a response to partner's retirement is given by an indicator reporting whether a person normally eats breakfast, lunch and dinner in a day. The summary statistics show that about 86% of individuals report having all three meals a day.

3.3 Treatment Variable

Retirement and Eligibility Threshold

Retirement status is determined on the basis of a self-reported indicator related to the current job situation at the time of the survey. The survey collected detailed information on key variables related to the age of the individuals and the interview, such that we have data on the month and year of birth of each respondent and also the month and year of interview. We are therefore able to precisely estimate a continuous measure of age of the individual at the time of the interview. This is crucial to the econometric design since age is our forcing variable and (partly) determines the treatment status.

Although most of the countries implemented substantial reforms to their pension systems, many of these are aimed at increasing coverage, improving adequacy of retirement incomes, and ensuring financial sustainability among others. Increasing retirement age is only one aspect of systems reforms, although the most sensitive politically (OECD, 2013). Table (2) shows the official retirement ages for the countries in our sample. We can see that the official retirement age for women is lower than men in almost all countries. There is little variation in the retirement ages across countries and between the two years of the survey. Female retirement age increased from 63 to 64 between 2004 and 2006 for Belgium and Switzerland. Most countries gradually increased the official retirement age. Belgium increased it from 63 (2004) to 64 (2006) to 65 (2009) for women. Since January 1996, the official retirement age for Czech Republic has been gradually increasing by 2 months per year for men and 4 months for women with a target age of 63 to be reached by 2012. France aims to increase the retirement age to 67 by 2022. A trend towards the same retirement age for men and women can in general be observed in most countries now. Details on the eligibility thresholds and changes in retirement ages can be obtained from the Social Security Programs Throughout the World Survey (SSPTWS) available from the U.S. Social Security Administration and OECD Pensions at a glance[4].

Since some individuals retire earlier than the official retirement age due to various reasons, we accommodate this by using a fuzzy regression discontinuity which allows for a discrete increase in the retirement probability. In addition, we also run our estimates using early retirement thresholds instead of the official ones. This is discussed in detail in the next section. As seen in table (2) below, retirement age for men is 65 years in all countries except for Czech Republic

[4]The retirement age data can be obtained from `http://www.socialsecurity.gov/policy/docs/progdesc/index.html` [Last accessed 10 May 2015] & OECD Pensions at a Glance.

(61), while that for women is generally lower than men and ranges from 60 up to 65. Moreover, the summary statistics in table (1) show that our sample consists of 2'500 retirees which account for about 52% of the overall sample.

3.4 Confounders

The regression discontinuity design we use to identify the treatment effects of interest allows us to obtain consistent estimates of the treatment effects even without controlling for background characteristics (Lee & Lemieux, 2009). Nonetheless, we include baseline covariates to illustrate (*i*) the robustness of our findings and (*ii*) to reduce sampling variability and thus gain precision in our estimates.

Our set of control variables includes indicators related to income, education, age and gender of the respondent. Specifically, we control for monthly household income after tax and age in months. As a measure of education we use the number of years an individual spent in full time education. In addition, some of our model specifications also include country and time fixed-effects to capture country specific time invariant unobserved heterogeneity and common shocks. In order to ensure that our results are not driven by an individual's own retirement status, we include an indicator for own retirement in some specifications. Table (1) shows that the average respondent is about 63 years old, has accomplished about 11 years of education and lives in a household with 4'400 Euros of disposable income per month. Finally, our sample consists of about 57% men and 43% women.

4 Identification strategy

The main purpose of this paper is to identify the causal effect of partner's retirement on health behaviour and the eating habits of the other partner. Any identification strategy that successfully aims at uncovering such causal effects needs to address the potential endogeneity in the partner's retirement status. Endogeneity in our context could arise due to 1) Omitted Variable Bias - for example, the possibility of grandparenting may make one more likely to consider retirement (positive correlation) and moving closer to grandchildren may decrease smoking (negative correlation), hence a negative bias and 2) Reverse causality - the decision to retire may depend on partner's health and subsequent health behaviour. As a direct consequence, standard regression techniques lead to biased and inconsistent coefficient estimates of the partner's retirement effects of interest. In this paper, we address these endogeneity issues by using a fuzzy regression discontinuity design exploiting a discontinuity in the retirement rate at the country-specific official retirement ages.

4.1 Fuzzy Regression Discontinuity Design

The Regression Discontinuity (RD) design is based on the idea that the researcher has precise knowledge about institutional rules that determine treatment. In that, the individual treatment status is determined by an assignment or forcing variable. If the forcing variable crosses a known cutoff value c, treatment is (partially) switched on or off. Validity of the design crucially depends on the agents inability to precisely control/manipulate the forcing variable near c and thus randomly assigning them into a treatment and control group (Lee & Lemieux, 2009).

In all European countries under consideration in this paper, retirement eligibility does not necessarily imply that individuals are actually retired. Thus, the discontinuity in the probability of going into retirement is smaller than 100% at the retirement cutoff because retirement is not mandatory ("imperfect compliance"). This setup naturally leads to a fuzzy RD design where partner's age is the forcing variable (X_i^p) that partially determines partner's retirement status. As shown in the previous literature, all pension schemes in Europe provide strong incentives to retire at the official retirement ages c (see table (2)) and thus determining the timing of retirement (Coe *et al.*, 2011; Zissimopoulos *et al.*, 2007). Estimation of the partner's retirement effects amounts to using the discontinuity in the retirement probability as an instrumental variable for partner's retirement status. We apply Two-Stage Least Squares (2SLS) to estimate parametric equations of the form,

$$Y_i = \alpha + \tau D_i^p + f(X_i^p - c) + Z_i'\beta + \varepsilon_i \quad (1)$$

$$D_i^p = \gamma + \delta T_i + g(X_i^p - c) + Z_i'\beta + v_i \quad (2)$$

where Y_i is a health behaviour variable or an indicator for dietary intake as described in section 3.2; D_i^p is an indicator for partner's retirement status; $T_i = 1[X_i^p \geq c]$ indicates whether partner i's age exceeds the official country-specific retirement age c; Z_i is a vector of individual background characteristics (see section 3.4) and finally ε_i and v_i are idiosyncratic error terms. $f(\cdot)$ and $g(\cdot)$ are flexible functions of the forcing variable (partner's age)[5]. In line with the more recent findings by Gelman & Imbens (2014), we do not control for higher order (third, fourth, or higher) polynomials of the forcing variable since in general, RD estimates have proven to be sensitive to high-order polynomial approximations and conventional inference tends to perform poorly in these settings. Instead, we include linear and quadratic polynomials (and interactions) to approximate the functional form of the conditional expectation of the outcomes given the forcing variable. Equation (1) shows that the causal effect of partner's retirement status

[5] As is common in the applied RD literature, we use the same order of polynomial for $f(\cdot)$ and $g(\cdot)$ throughout the entire analysis.

on Y_i is captured by the parameter τ. Equation (2) on the other hand is a classical first stage equation linking the endogenous treatment variable D_i^p to the instrument T_i.

As in any standard IV framework, the estimated treatment effect $\hat{\tau}$ has to be interpreted as a local average treatment effect (LATE). That is, we estimate the average treatment effect for those individuals that are affected by the instrument. In our analysis, the group of compliers is substantial in size since many people actually retire at the official retirement age which in turn emphasizes the importance of the estimated retirement effects presented below. However, as shown by Hahn *et al.* (2001), a causal interpretation of the estimated effects requires instrument (i) monotonicity (i.e. crossing the cutoff c might have no effect on the probability of going into retirement for some people but for all those who are affected by c, the probability is affected in the same direction) and (ii) excludability (i.e. X_i^p crossing c has no direct impact on Y_i other than through D_i^p) besides the regular RD assumptions discussed below. Both assumptions are likely to be fulfilled in our setup since (i) it is not reasonable to assume that the official retirement age actually induces individuals not to retire (i.e. monotonicity) and (ii) the fact that a partner crosses the retirement age by itself should not have any effects on the other partners health or eating behaviours other than through retirement (i.e. excludability). Before presenting the estimated partner's retirement effects, we provide more evidence for the validity of the fuzzy RD design in our context.

Discontinuity in the Retirement Rate

To give further motivation for the fuzzy RD framework in our context, figure (1) shows the average share of retirees over bins of half-years of age[6]. The scatter plot is overlaid with a corresponding local linear regression line. The graph clearly indicates that less than 20% of individuals are retired six or more years before reaching the official retirement age. After that, the probability of going into retirement increases rapidly: in the last year before the age cutoff, almost 60% of individuals are retired indicating the cases of early retirement. Above the official retirement threshold, the share of retirees increases sharply by about 20%-points indicating a discontinuous jump in the probability of going into retirement at the country-specific retirement age. This means that individuals below the cutoff have a significantly lower probability to retire than those just above the discontinuity. As mentioned above, the discontinuity simply reflects the fact that all retirement systems in Europe provide strong incentives for employees to go into retirement once they reach the official retirement age. The fact that we actually observe a steep ascent in retirement indicates that people around the cutoff actually respond to such incentives.

[6]The age variable is centered by subtracting the country-specific retirement age c. Hence, centered age corresponds to years until or in retirement.

Since individuals cannot manipulate their age and therefore have no precise control over the assignment variable, it follows naturally that those below form a natural control group for those above. Furthermore, the discontinuity clearly satisfies the relevance condition of an instrument since the first stage effects are highly significant in all our model specifications (see e.g. table (3), Panel B). To be more precise, the probability of going into retirement is estimated to jump on average by about 26-28%-points at the cutoff and the Kleibergen-Paap Wald F-statistics are all well above the rule-of-thumb critical value of 10 indicating instrument relevance. Before moving on to the results section, we present further RD validity checks.

4.2 RD Validity Checks

The key identifying assumption in the RD framework is the inability of individuals to precisely control the assignment variable near the threshold. As a consequence of this assumption, all observed and unobserved characteristics should be balanced around the cutoff and treatment is "as good as randomly assigned". In other words, individuals below the age cutoff represent a valid control group for those just above the threshold and any comparison between groups reveals the local causal effects of interest (Lee & Lemieux 2010).

Checks for Local Random Assignment

As a first validity check for local random assignment, we investigate the density of the forcing variable. Figure (2) shows the histogram of age overlaid with a kernel density estimate. Inspecting the density graph suggests no manipulation of the assignment variable since it appears to be smooth around the threshold thus reinforcing the validity of the RD approach used in this paper.

Inspection of Baseline Covariates

As an additional validity check we compare observable characteristics of individuals just below and above the official retirement age to see whether they are locally balanced around the cutoff. In fact, if treatment is locally randomized then individuals around the retirement threshold should not differ substantially in observable and unobservable characteristics. Figure (3) shows the average years of education and share of men over bins of half-years of age in a window of $\pm$ 20 years around the cutoff. The graph shows no discontinuity in any of the baseline covariates at the threshold pointing towards local random assignment[7]. Overall, the RD validity checks

[7] These findings are reinforced when carrying out mean comparison t-tests for individuals just below and above the cutoff.

support our identification strategy and provide no evidence for violations of the key underlying assumptions.

5 Results

In this section, we present the estimated partner's retirement effects for different model specifications and subsamples. In each of the tables below, we run three model specifications: model one includes individual background characteristics such as income, education, age and gender; model two then adds country and year fixed effects; finally, in model three we control for own retirement status and allow for a more flexible functional form of the forcing variable to capture potential non-linearities by adding a quadratic polynomial of partner's age to the model equation. In all specifications, we use the discontinuity in the retirement rate at the country-specific official retirement age (T_i) as an instrument for partner's retirement status. We perform the analysis for moderate and vigorous physical activity, frequency of alcohol consumption, number of drinks, number of cigarettes per day and the three meals a day indicator. Note here that tables (3), (4), (6) and (7) are constructed such that Panel A (top panel) shows the estimated partner's retirement effects for the different RD specifications and Panel B (bottom panel) shows the corresponding first stage effects for the RD models above.

Physical activity

Table (3) shows the results for moderate and vigorous physical activity, and number of cigarettes smoked per day. The first stage effects in Panel B are positive and highly significant in all RD specifications. Furthermore, the discontinuity in the retirement rate is estimated to be between 28-32%-points at the official retirement age coinciding with the graphical evidence from figure (1). In addition, the Kleibergen-Paap Wald F-statistics are well-above the rule of thumb value of 10 thus clearly reinforcing instrument relevance.

Panel A shows partner's retirement effects: starting with the discussion for the outcome of moderate physical activity, we see that our RD estimates show a positive sign across all model specifications. Moreover, the effects are significant indicating that individuals engage more often in moderate physical activities such as gardening or going on a walk as a response to their partner's retirement. Figure (4) (top left panel) is in line with this finding and shows a small but positive discontinuity in moderate physical activity at the retirement cutoff.

As for partner's retirement effects on vigorous physical activity our RD models show that there is an increase in vigorous physical activity in all three model specifications, though not statistically significant. Again this is in line with the graphical evidence displayed in figure (4) (top right panel): the engagement in vigorous physical activity does not seem to be much affected by partner's retirement decision.

Smoking

In table (3) we also present the results for smoking behaviour. Precisely, we look at the number of cigarettes smoked per day. As before, the first stage results (Panel B) support the relevance and strength of our instrument as all the F-statistics are well-above the conventional benchmark of 10.

In panel B, we clearly see that the RD estimates of the effect of partner's retirement on cigarettes smoked per day are positive and highly significant in all three specifications. In fact, our RD coefficient estimates suggest that cigarette consumption increases on average by about 7 to 8 cigarettes a day as a response to partner's retirement. Similar but less drastic increases in smoking can also be observed in figure (4) (bottom left panel): the graph clearly indicates a positive discontinuity in the number of cigarettes smoked at the retirement threshold.

Alcohol Consumption

Table (4) presents partner's retirement effects on individual drinking behaviour. As above, the first stage effects presented in panel B show that instrument relevance is easily satisfied in all our RD specifications clearly rejecting the null of a weak instrument in all models.

As for the frequency of alcohol consumption,the RD estimates show a positive effect on frequency of drinking, although statistically insignificant. This can also be seen when looking at figure (5) (top left panel): the graph indicates only a small but positive discontinuity in the frequency of alcohol consumption at the retirement cutoff.

A similar picture can be drawn when looking at the intensity of alcohol consumption as measured by the number of alcoholic beverages consumed per day: our RD estimates point toward an increase of about 1-2 drinks more a day as a response to partner's retirement. Although, the estimated partner's retirement effect is only statistically significant for model specification one where we exclusively control for individual background characteristics.

Dietary Intake

Finally, table (4) also shows the results for eating habits, where we focus on the three meals a day variable which indicates whether a person normally eats breakfast, lunch and dinner in a day. The first stage effects in panel B show that our instrument is significantly related to the partner's retirement status and thus clearly satisfies the relevance condition.

In Panel A, our RD estimates clearly provide evidence for a positive and highly significant effect of partner's retirement on the probability of eating three meals a day for the other partner. To be more specific, our RD estimates suggest an increase in the probability of eating breakfast, lunch and dinner by about 13-15%-points once the other partner goes into retirement. Figure (5) shows basically no discontinuity in three meals per day at the retirement cutoff. However, it is clearly visible that the probability of having three meals a day is on average higher for those above the cutoff than for those below explaining the positive and significant effect as captured by our three RD models.

5.1 Robustness Checks

In the last section we showed that our findings are robust to different model specifications. We further assess the robustness of our results by varying the window size in close neighborhoods around the discontinuity.

Table (5) presents the resulting partner's retirement effects when shrinking the window size around the retirement cutoff to ±10 years, then ±7 years and finally ±5 years of partner's age. Using different window widths ensures that the results do not entirely depend on the correct specification of the functional form of the forcing variable or that they are driven by data points that are far away from the discontinuity (Angrist & Pischke 2009; Lee & Lemieux 2010). In general, the results in table (5) replicate our main findings as we find significant partner's retirement effects for moderate physical activity, smoking, drinking intensity and having three meals a day. Not surprisingly, the results using discontinuity samples of ± 5 and 7 years around the cutoff are estimated with much less precision as they are constructed using only a fraction of the full data. Still, the estimated treatment effects are qualitatively the same and therefore lead to the same conclusions as discussed above.

In order to ensure that the significant effect of partner's retirement on an individual's behaviour is not driven by a specific country, we exclude countries one at a time from our analysis. The results are robust to this overall. In addition, we also conduct a falsification test where we generate the treatment variable based on fictitious retirement ages for all the countries. As expected, we do not find robust and significant results for any of the outcome variables which further support our empirical strategy and main results. These results are available from the authors upon request.

5.2 Effect Heterogeneity

In this section, we further explore the partner's retirement effects by analyzing heterogeneity in the effects by different subgroups. It may be plausible to presume that the positive effect of partner's retirement on moderate and vigorous physical activity may manifest itself only for those that are retired themselves. Our rationale is that we would expect retired couples to spend more time together on leisure activities compared to couples where at least one partner is still in the labor market. In economic terms, there may be compensated effects such that utility from own leisure activities increases with the partner being involved in the leisure activity as well. As Hurd (1990) mentions it, husband's and wives' retirement may be complements, such that in our case we may find retirement effects only if both partner's are retired which allows them to indulge in joint activities. On top of that, retired couples are more likely to share the work load at home which leaves them with more time to engage in leisure activities. We test for this hypothesis by analyzing the partner's retirement effects separately for retired and non-retired respondents. The results can be found in table (6): as expected, we only find significant partner's retirement effects within the subsample of retirees. Our estimates suggest that retired individuals significantly increase engagement in moderate physical activities once their partner goes into retirement. In contrast, we do not find any evidence for behavioural changes in physical activity as a response to partner's retirement for the non-retirees. Therefore the results strongly support our hypothesis that behavioural changes only take place if both partners are retired pointing toward leisure complementarities or positive mutual externalities of retirement.

Similarly for alcohol consumption, we would expect that a retired individual would drink more since he/she does not have to worry about employment issues such as being late for work, missing days of work entirely due to excessive drinking, and worry about reduced productivity. Therefore, when the partner retires, there is a greater possibility of social drinking with the partner or others and hence an increase in alcohol consumption. The results in tables (6) clearly support this argument. Here our analysis shows an interesting new aspect which was not present in the overall sample: both the frequency and intensity of drinking increases for individuals that are already retired once their partner goes into retirement. Thus our analysis clearly points toward social drinking once both partners are retired. In contrast, the same is not true for the non-retirees. Here we find no changes in drinking behaviour as a response to partner retirement.

We also expect heterogeneity in smoking behaviour with respect to the smoking status of the retiring partner. A priori we expect that the effect of partner's retirement on smoking should be significant only if the partner himself is a smoker. This may be due to strong complementarities in smoking where greater utility is derived out of the activity when the other partner also does it (Banerjee, 1992). Since both partner's now also have a greater amount of time to spend with each other, they may involve more in such complementary behaviour. Further, there may also be strong mutual positive externalities as mentioned in Bernheim (1994) arising due to similar activities. We find limited evidence for this: table (7) presents the coefficient estimates for the subsamples of partner smoker and partner non-smoker. Our analysis suggests here that smoking is only significantly increased for couples where both partners are smokers. They are insignificant if the partner is a non-smoker.

6 Conclusion

In this paper we set out to study intra-household externalities with respect to retirement where we assess the causal impact of retirement of a partner on the health behaviour of the other partner. Our evidence, stemming from a regression discontinuity design that explores discontinuities in retirement created by official retirement age thresholds of countries, suggests that indeed retirement of one partner affects health behaviour of the other partner in several ways. We find that partner's retirement increases smoking, moderate physical activity, alcohol consumption and food intake of the other partner. Furthermore, we find that there is significant heterogeneity across different groups that we analyze, which provides a better understanding of the results and underlying mechanisms. We find that moderate physical activity and alcohol consumption are affected only if the individual himself/herself is also retired. Smoking is significantly affected only when the retiring partner is also a smoker. We explain these findings by referring to leisure complementarities and mutual positive externalities. We also try and relate the findings to endogenous and exogenous intra-household effects where the characteristics of an individual (in our case being retired) affects behaviour of the others around the individual. Although these effects generally are invoked when referring to groups of individuals, we borrow this logic and utilise it in our household analysis.

After having identified these effects, a natural question that arises is: how do the results inform policy makers and why do they matter? Ageing of the baby boomers has resulted in a demographic shift in the OECD countries where the proportion of population nearing retirement or already retired has increased substantially (Johnston & Lee, 2009; Bonsang *et al.*, 2012). Further, increases in life expectancy have increased the duration of life lived in the retired state for an individual (Bonsang *et al.*, 2012). A large number of individuals are moving and are expected to move out of the labour market and into retirement, and a large number of countries are aiming to increase or decrease retirement ages and implement different policies either to economically strengthen the aged population or to control public finances (Charles, 2002; Behncke, 2010; Celidoni *et al.*, 2013; Cribb *et al.*, 2014). Understanding the implications of retirement on different aspects of life is therefore vital if complete understanding of the consequences of retirement is desired and flawless retirement policies are to be framed (Insler, 2014).

The findings in the paper suggest that indeed partner retirement has significant effects on risky health behaviour such that they induce an individual to increase smoking and drinking. This increase in bad health habits will eventually have cumulative negative effects on health which might result in significant costs to the healthcare system in the near future. If partners consider joint retirement, this effect may even be aggravated. Further, retirees already live on reduced income (ceteris paribus) and hence an increase in expenditure on smoking and alcohol may drive down consumption on other healthier food or activities. As such there may be a double negative effect. However, at the same time the results also show that there is an increase in physical activity and dietary intake which can have beneficial effects. The trade-off then lies between the extent to which physical activity is beneficial and the extent to which smoking and alcohol are harmful. For instance, raising the retirement age may delay the beneficial effects of physical activity but it may also delay the harmful effects arising due to smoking and alcohol consumption. Similarly, reducing the statutory age will advance the ill effects of smoking and alcohol but will also advance the benefits of physical activity. In this case, health promotion strategies for the elderly and couples nearing retirement or already retired could exclusively target reduction of smoking and alcohol consumption. The paper therefore raises important points and provides new avenues to researchers that are interested in analysing such trade-offs. If anything, it is at least clear that both the costs and benefits arising due to retirement not just on the individual but also on others affected by the retirement decision of the individual must be internalised when framing retirement policies.

Since a large number of individuals are moving into retirement due to the huge demographic shift, neglecting such externalities may lead policy makers to inaccurately gauge the impact of retirement which may become problematic for the social system, if not today, certainly at a later date. This is the first paper to the best of our knowledge that highlights such causal behavioural externalities of retirement of the partner and thus provides interesting new insights in order to shape retirement reforms in countries.

Tables and Figures

Table 1: Summary Statistics

	Mean	**S.D.**	**Min**	**Max**	**N**
Retired	0.52	0.5	0	1	4922
Age	63.07	8.48	45.25	91.08	4926
Education	10.79	4.13	0	25	4926
Household Income	4439	8144.85	0.11	60'003	4899
Male	0.57	0.49	0	1	4926
Moderate Physical Activity					
"Hardly ever, or never"	0.09	0.28	0	1	4926
"One to three times a month"	0.06	0.23	0	1	4926
"Once a week"	0.13	0.34	0	1	4926
"More than once a week"	0.72	0.45	0	1	4926
Vigorous Physical Activity					
"Hardly ever, or never"	0.39	0.49	0	1	4925
"One to three times a month"	0.1	0.3	0	1	4925
"Once a week"	0.15	0.36	0	1	4925
"More than once a week"	0.36	0.48	0	1	4925
Frequency of Alcohol Consumption					
"Not at all in last 3 months"	0.26	0.44	0	1	4925
"Less than once a month"	0.1	0.3	0	1	4925
"Once or twice a month"	0.12	0.33	0	1	4925
"Once or twice a week"	0.2	0.4	0	1	4925
"Three or four days a week"	0.08	0.27	0	1	4925
"Five or six days a week"	0.03	0.16	0	1	4925
"Almost every day"	0.21	0.41	0	1	4925
Intensity of Alcohol Consumption					
Drinks per Day	2.94	5.83	0	50	4107
Smoking Behaviour					
Cigarettes per Day	16.85	11.48	0	100	1862
Dietary Intake					
Three Meals a Day	0.86	0.35	0	1	3200

Notes: Summary statistics for "three meals a Day" are from SHARE Wave 4.

Table 2: Official Retirement Ages

	2004		2006	
	Male	Female	Male	Female
Austria	65	60	65	60
Belgium	65	63	65	64
Czech Republic	61	60	61	60
Denmark	65	65	65	65
France	60	60	60	60
Germany	65	65	65	65
Greece	65	60	65	60
Ireland	65	65	65	65
Italy	65	60	65	60
Netherlands	65	65	65	65
Poland	65	60	65	60
Spain	65	65	65	65
Sweden	65	65	65	65
Switzerland	65	63	65	64

Source: Social Security Programs Throughout the World Survey 2015.

Notes: Table 2 shows the official retirement age stratified by gender and country for years 2004-05 and 2006-07 - both waves of the SHARE survey.

Table 3: Partner's Retirement Effects:

Physical Activity & Smoking behaviour

Panel A: Partner's Retirement Effects									
Outcome Variable	**Moderate Physical Activity**			**Vigorous Physical Activity**			**Cigarettes per Day**		
Specification	RD (1)	RD (2)	RD (3)	RD (1)	RD (2)	RD (3)	RD (1)	RD (2)	RD (3)
Partner Retired	0.35**	0.32**	0.29*	0.14	0.11	0.17	7.66**	7.63**	6.91**
	(0.17)	(0.16)	(0.17)	(0.24)	(0.23)	(0.23)	(3.19)	(3.18)	(3.29)
Individual Characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country and Year FE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Own Retirement and Flexible Age Function	No	No	Yes	No	No	Yes	No	No	Yes
Panel B: First Stage Effects									
Dependent Variable: Partner Retired									
I(Partner's Age $\geq$ Retirement Age)	0.28***	0.29***	0.28***	0.28***	0.29***	0.28***	0.32***	0.32***	0.31***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.04)	(0.04)	(0.04)
Number of Observations	4926	4926	4922	4925	4925	4923	1862	1862	1860
R^2	0.43	0.45	0.45	0.43	0.45	0.45	0.40	0.43	0.44
Kleibergen-Paap Wald F-stats	157.13	175.20	165.88	157.49	175.47	166.13	77.06	79.14	72.50

Notes: Panel A: Fuzzy RD estimates for the outcomes moderate physical activity, vigorous physical activity and cigarettes smoked per day. The instrument for the partner's retirement status is the discontinuity in the retirement rate at the country-specific official retirement age. Panel B: First stage regression results using partner's retirement status as the dependent variable. All regressions include partner's age (centered) and an interaction term of partners age (centered) and the instrument. Individual characteristics include education, logarithmized income, age and gender; Country and time fixed effects are included with country and year dummies; A flexible functional form for partner's age is specified by adding partner's age squared (centered). Standard errors clustered at the individual level in parentheses: *** $p < 0.01$ ** $p < 0.05$ * $p < 0.1$.

Table 4: Partner's Retirement Effects:

Alcohol Consumption & Dietary Intake

Panel A: Partner's Retirement Effects									
Outcome Variable	**Days of Alcohol Consumption**			**Drinks per Day**			**Three Meals a Day**		
Specification	RD (1)	RD (2)	RD (3)	RD (1)	RD (2)	RD (3)	RD (1)	RD (2)	RD (3)
Partner Retired	0.52	0.21	0.17	2.31*	1.68	1.36	0.13*	0.15**	0.15**
	(0.38)	(0.35)	(0.36)	(1.19)	(1.11)	(1.15)	(0.08)	(0.07)	(0.07)
Individual Characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country and Year FE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Own Retirement and Flexible Age Function	No	No	Yes	No	No	Yes	No	No	Yes
Panel B: First Stage Effects									
Dependent Variable: Partner Retired									
I(Partner's Age $\geq$ Retirement Age)	0.28***	0.29***	0.28***	0.26***	0.27***	0.26***	0.26***	0.27***	0.27***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Number of Observations	4925	4925	4924	4107	4107	4104	3200	3200	3200
R^2	0.43	0.45	0.45	0.44	0.46	0.46	0.39	0.41	0.41
Kleibergen-Paap Wald F-stats	158.04	176.08	166.72	118.46	130.14	119.63	112.51	122.31	122.83

Notes: Panel A: Fuzzy RD estimates for the outcomes frequency of alcohol consumption, number of drinks per day and the indicator for three meals a day. The instrument for the partner's retirement status is the discontinuity in the retirement rate at the country-specific official retirement age. Panel B: First stage regression results using partner's retirement status as the dependent variable. All regressions include partner's age (centered) and an interaction term of partners age (centered) and the instrument. Individual characteristics include education, logarithmized income, age and gender; Country and time fixed effects are included with country and year dummies; A flexible functional form for partner's age is specified by adding partner's age squared (centered). Standard errors clustered at the individual level in parentheses: *** $p < 0.01$ ** $p < 0.05$ * $p < 0.1$.

Table 5: Robustness Checks:

Varying Window Width

Outcome Variable	Mod. Activity	Vig. Activity	Days of Alcohol	No. of Drinks	No. of Smokes	Three meals a Day
Window width +/- 5 years						
Partner Retired	0.16	0.22	1.04	4.97**	13.07**	0.19*
	(0.30)	(0.42)	(0.66)	(2.13)	(5.72)	(0.10)
Number of Observations	1921	1923	1922	1609	718	1669
Window width +/- 7 years						
Partner Retired	0.36	0.29	1.08*	3.59*	10.56**	0.20**
	(0.28)	(0.38)	(0.60)	(2.16)	(5.05)	(0.09)
Number of Observations	2690	2691	2691	2243	1015	2313
Window width +/- 10 years						
Partner Retired	0.40	0.34	0.58	2.78	10.03**	0.15**
	(0.24)	(0.34)	(0.51)	(1.76)	(4.42)	(0.07)
Number of Observations	3629	3630	3630	3033	1381	2821
Individual Characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Country and Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Own Retirement and Flexible Age Function	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Fuzzy RD estimates for different window widths using each of the outcome variables as the dependent variable. All regressions include individual characteristics, country and year fixed effects and a flexible age function as controls. The instrument for the partner's retirement status is the discontinuity in the retirement rate at the country-specific official retirement age. Standard errors clustered at the individual level in parentheses: *** $p < 0.01$ ** $p < 0.05$ * $p < 0.1$.

Table 6: Effect Heterogeneity:

Retirees vs. Non-Retirees

Panel A: Partner's Retirement Effects								
Subsample	**Retirees**				**Non-Retirees**			
Outcome Variable	Mod. Activity	Vig. Activity	Days of Alcohol	No. of Drinks	Mod. Activity	Vig. Activity	Days of Alcohol	No. of Drinks
Partner Retired	0.40*	0.44	1.02**	3.34**	0.07	-0.17	-0.81*	-0.63
	(0.21)	(0.27)	(0.42)	(1.41)	(0.22)	(0.30)	(0.49)	(1.44)
Individual Characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country and Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Own Retirement and Flexible Age Function	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel B: First Stage Effects								
Dependent Variable: Partner Retired								
I(Partner's Age $\geq$ Retirement Age)	0.30***	0.30***	0.30***	0.27***	0.36***	0.36***	0.36***	0.34***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)
Number of Observations	2949	2951	2952	2369	2662	2661	2661	2277
R^2	0.37	0.37	0.37	0.38	0.51	0.51	0.51	0.49
Kleibergen-Paap Wald F-stats	125.24	131.66	125.47	84.78	104.00	103.92	104.57	73.45

Notes: Fuzzy RD estimates for the partner's retirement effects in the subsamples of retirees and non-retirees. The instrument for the partner's retirement status is the discontinuity in the retirement rate at the country-specific retirement age. Standard errors clustered at the individual level in parentheses: *** $p < 0.01$ ** $p < 0.05$ * $p < 0.1$.

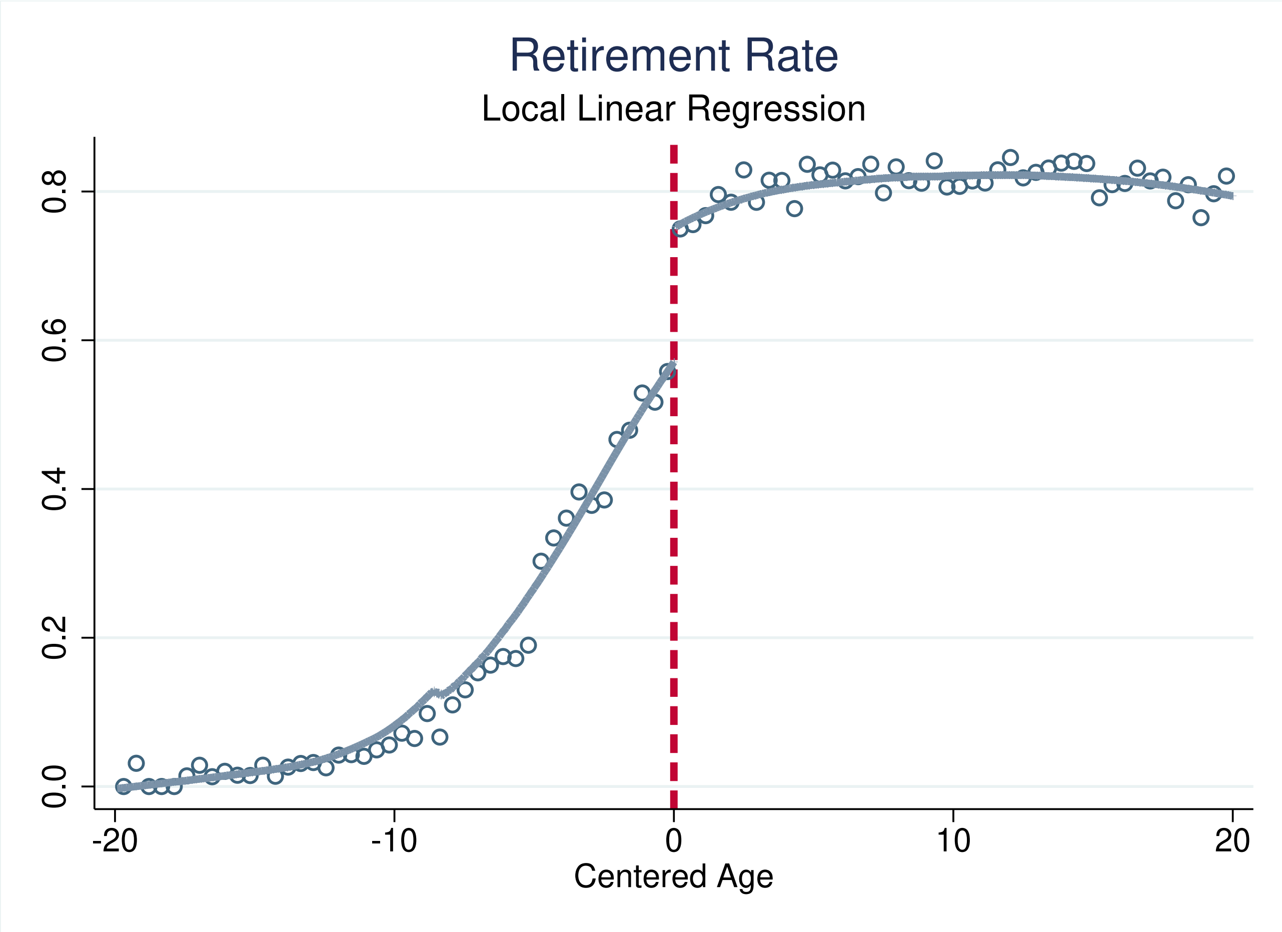
Table 7: Effect Heterogeneity:

Partner Smoker vs. Partner Non-Smoker

Panel A: Partner's Retirement Effects		
Dependent Variable: Cigarette Consumption		
Subsample	**Partner Smoker**	**Partner Non-Smoker**
Partner Retired	8.93*	9.84
	(5.41)	(7.06)
Individual Characteristics	Yes	Yes
Country and Year FE	Yes	Yes
Panel B: First Stage Effects		
Dependent Variable: Partner Retired		
Subsample	**Partner Smoker**	**Partner Non-Smoker**
I(Partner's Age $\geq$ Retirement Age)	0.38***	0.27***
	(0.07)	(0.06)
Individual Characteristics	Yes	Yes
Country and Year FE	Yes	Yes
Number of Observations	622	661
R^2	0.43	0.47
Kleibergen-Paap Wald F-stats	32.79	18.88

Notes: Panel A: Fuzzy RD estimates for the partner's retirement effects in the subsamples of smoking and non-smoking partners using number of smokes per day as the dependent variable. The instrument for the partner's retirement status is the discontinuity in the retirement rate at the country-specific retirement age. Panel B: First stage regression results using the partner's retirement status as the dependent variable. For a description of the control variables see e.g. the notes in table 4. Standard errors clustered at the individual level in parentheses: *** $p < 0.01$ ** $p < 0.05$ * $p < 0.1$.

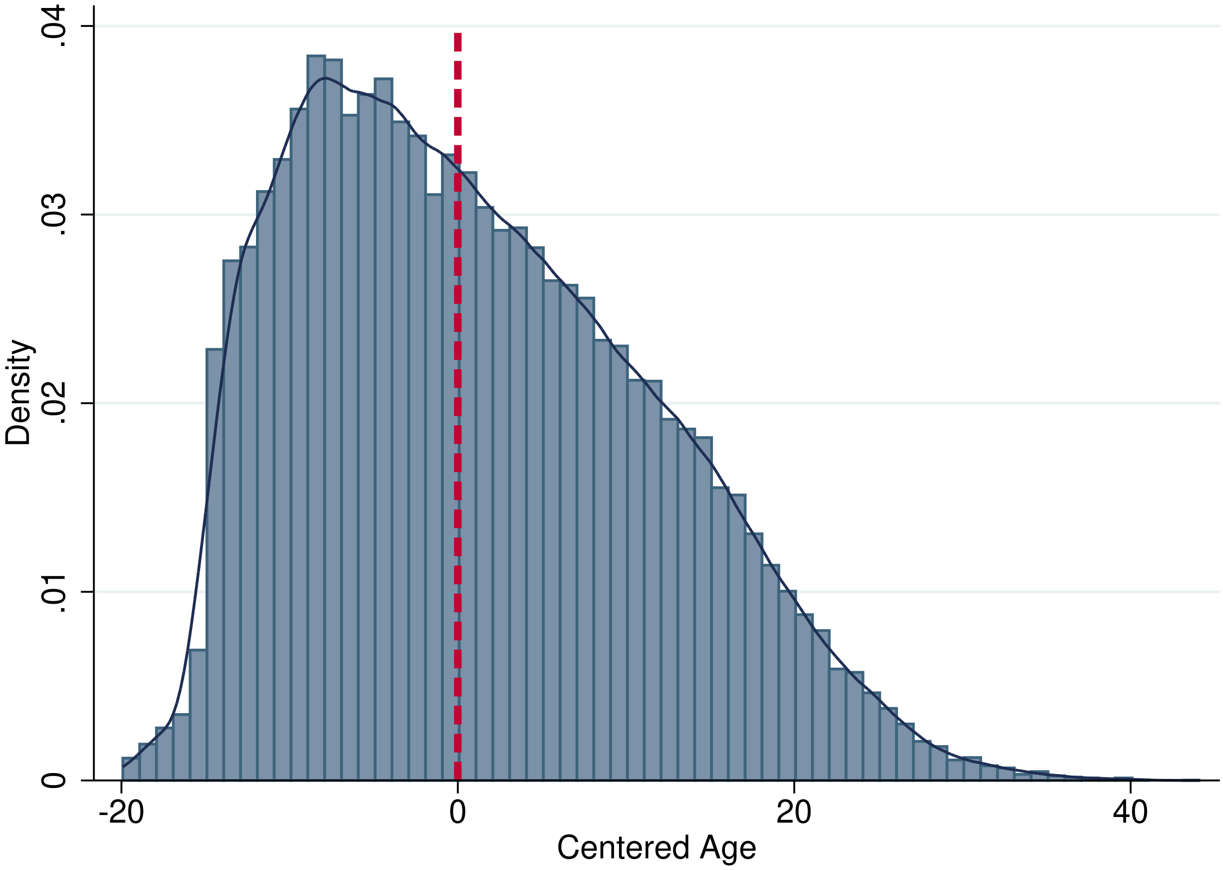
Figure 1: Retirement Rate



Notes: Figure 1 shows the retirement rate of 20 years above and below the country-specific retirement age in bins of half-years of age. Centered age equals the distance of a persons' age to the country-specific official retirement age.

Figure 2: RD Validity Checks:

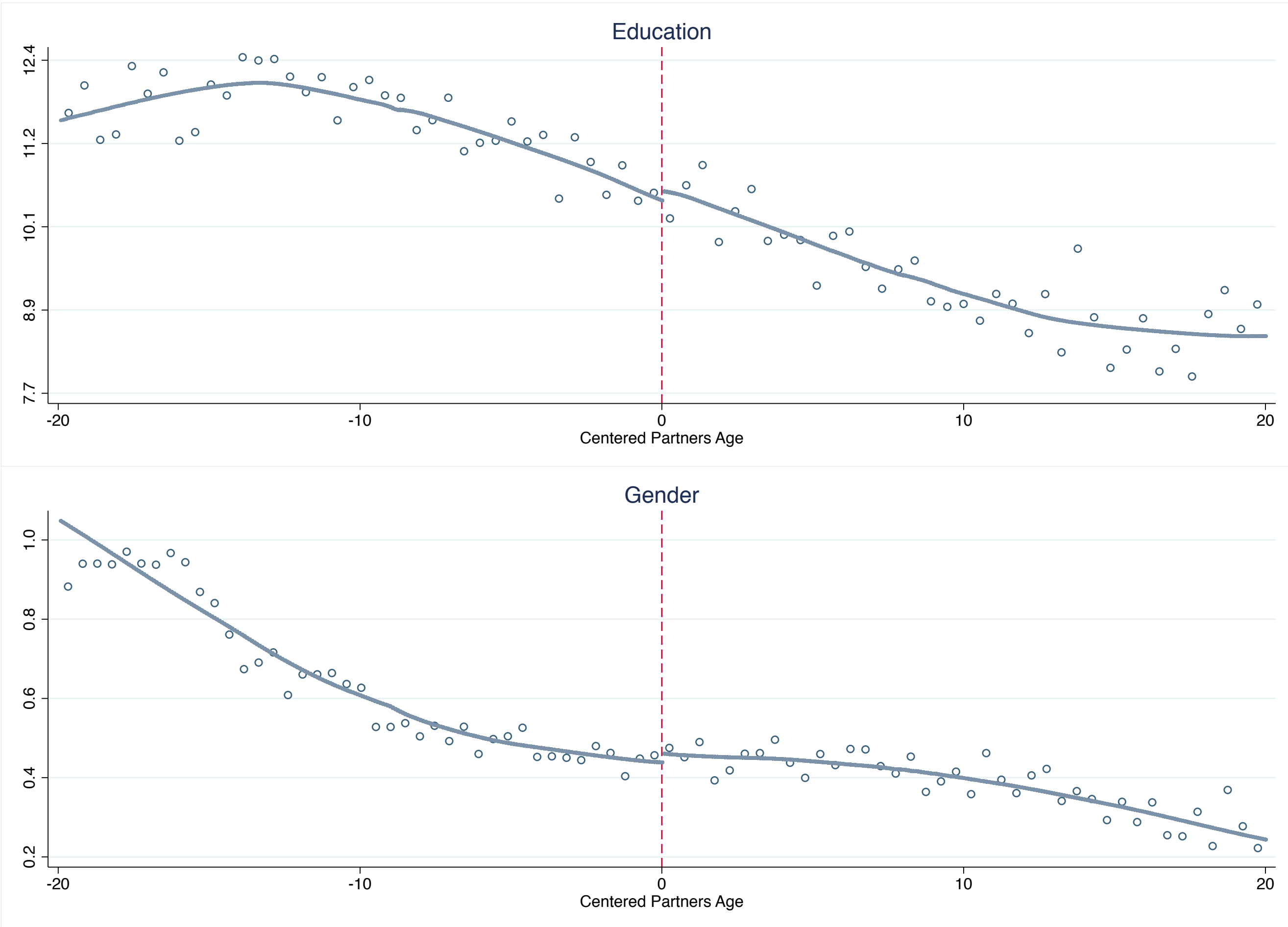
Density of Forcing Variable



Notes: Figure 2 shows the distribution of the age variable around the retirement cutoff. Age is centered at the country-specific retirement age. The dashed line indicates the retirement cutoff.

Figure 3: Discontinuity Graphs:

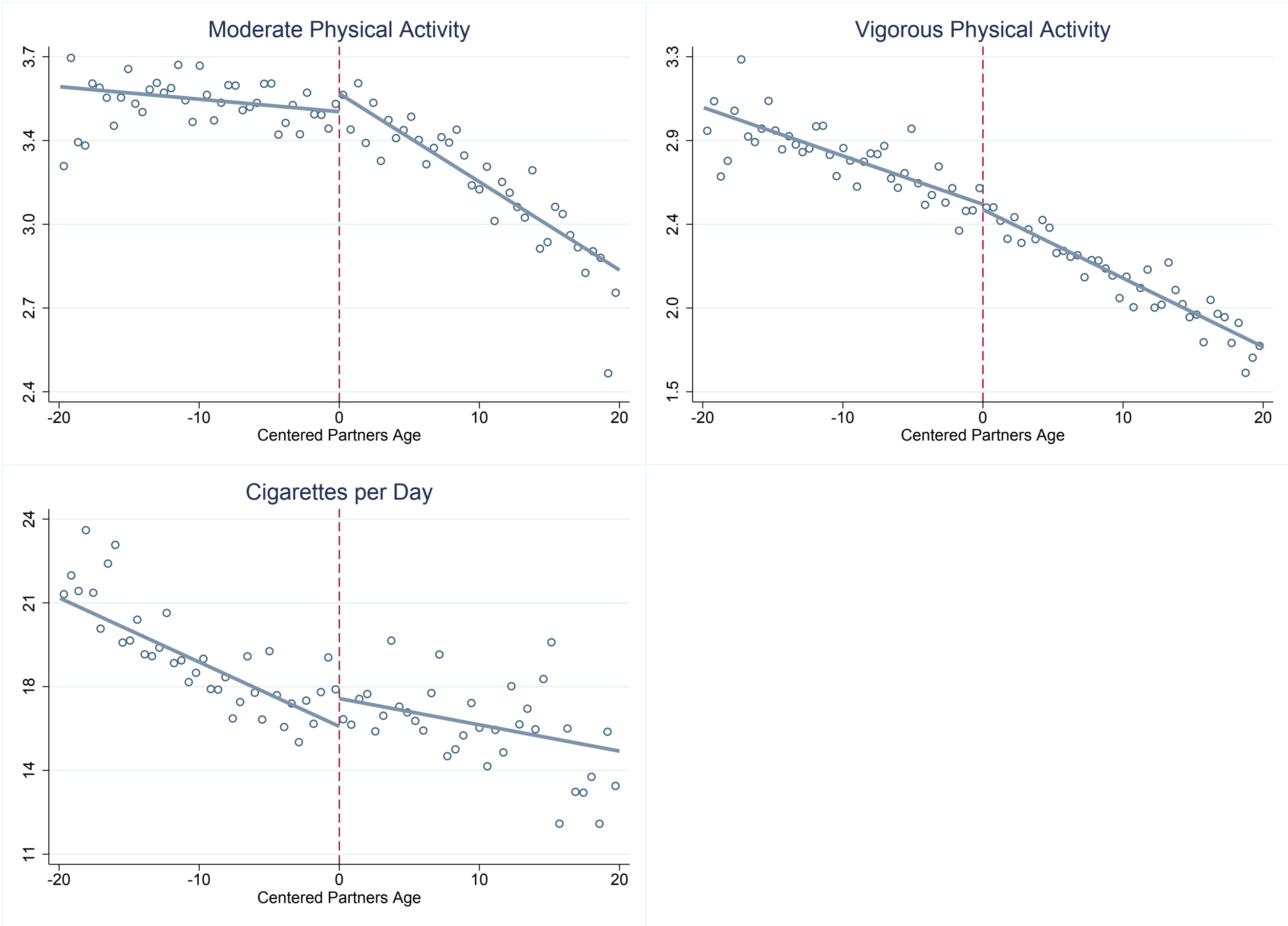
Baseline Covariates



Notes: Figure 3 shows the discontinuity graphs for the baseline covariates education and gender around the retirement cutoff (dashed lines). Age is centered at the country-specific retirement age.

Figure 4: Discontinuity Graphs:

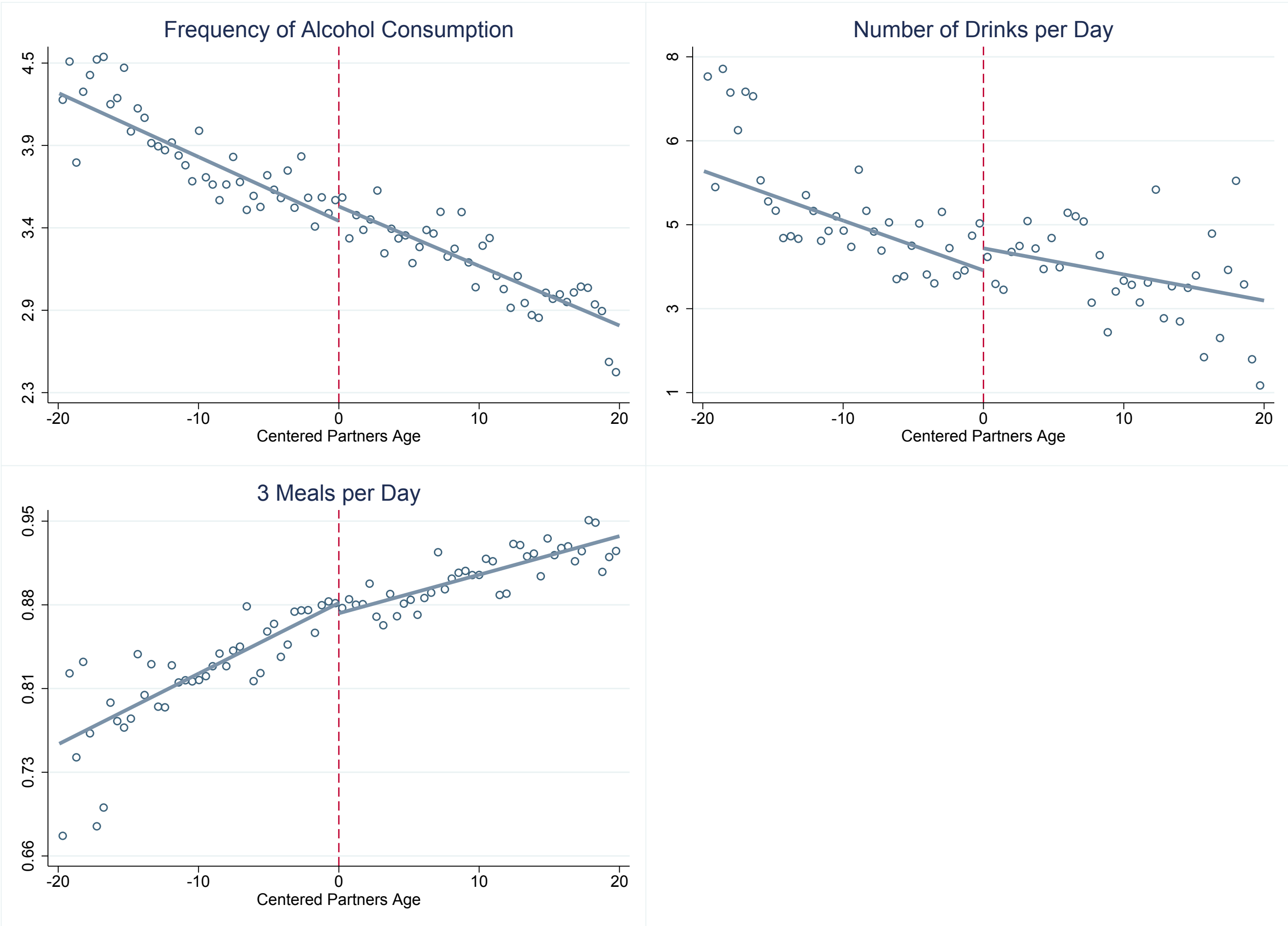
Outcome Variables



Notes: Figure 4 shows the discontinuity graphs for moderate and vigorous physical activity, as well as cigarettes smoked per day. The dashed lines indicate the retirement cutoffs.

Figure 5: Discontinuity Graphs:

Outcome Variables



Notes: Figure 5 shows the discontinuity graphs for the outcomes of days of alcohol consumption, number of drinks per day, and three meals a day. The dashed lines indicate the retirement cutoffs.

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