The effect of spousal retirement on healthcare utilization: Evidence from Austrian retirement policy reforms*

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Abstract

We study the causal effect of retirement on spouses' health care utilization and particularly focus on the role of the availability of a caretaker at home as an important channel. Based on administrative health register from Upper Austria and exploiting exogenous variation in early retirement induced by two Austrian pension reforms in 2000 and 2003, we implement a fuzzy regression-discontinuity design. We find that wives' retirement increases the probability of a dentist visit as well as the participation in health and cancer screening. The availability of the wife as a possible caretakers also reduces the length of hospital stays on average by 1.1 days or 32 percent of a standard deviation. This effect is particularly driven by cardiovascular diseases associated with a higher need for care. Also, the probability of any hospitalization due to mental and behavioral disorders, which are mostly due to alcohol intoxication and misuse, are significantly reduced. In contrast, we do not find any significant effect on outpatient and inpatient healthcare utilization and length of hospital stays for wives if their husbands retire, showing a clear gender imbalance in retirement spillovers. This result also underlines existing gender norms on the provision of informal care among couples.

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Introduction

Retirement is a life-changing event affecting individuals' life in a lot of dimensions. In the context of aging societies and public debates about optimal retirement policies, understanding the consequences of this transition into a new phase of life is important. One such important aspect is health. Retirement is typically associated with positive health effects in terms of healthcare utilization (Frimmel and Pruckner, 2020), less physical and mental stress (Eibich, 2015) and better subjective well-being (Coe and Zamarro, 2011). Potential spillover effects of retirement to other family members, above all the spouse, are less understood. The ongoing presence of a spouse in the household due to retirement may affect spouses in several dimensions, i.e. household and leisure activities or risky health behavior such as alcohol consumption. This may also directly affect the physical or mental health of both retirees and their spouses. Yet, there is another aspect of spousal retirement that did not receive a lot of attention in the literature so far. Retirement also implies that newly retired spouses are available as caretakers. The continuous availability of a caregiver in the household may affect health care utilization through changes in preventive health demand as well as a substitution between hospitalizations and home care, i.e. the length of hospital stays could be reduced or even be prevented. In the context of substantial labor shortages in hospitals, predominantly among nurses, the substitution between hospitalization and informal care is therefore an aspect of retirement with particular relevance.

The impact of the availability of a caretaker in the household on health care utilization is not well-understood so far. This paper aims to fill this gap. We study the causal effect of retirement on spouses' health care utilization and particularly focus on the role of the availability of a caretaker at home as an important channel. We use administrative health register data from Upper Austria providing us with detailed individual inpatient and outpatient health care utilization information (i.e. number of services, and expenditures or hospitalizations). These data have the advantage to be objective in nature and also allows us to assess the impact on financing health care systems. To account for the endogenous retirement decision and to avoid reverse causality arising from spouses in need of care, we exploit exogenous variation in early retirement induced by two Austrian pension reforms in 2000 and 2003, which raised the eligibility age of early retirement stepwise for different quarter-of-births from 60 to 65 for men and 55 to 60 for women. This step-wise increase allows us to implement a fuzzy regression-discontinuity design and estimate a short-run impact of spousal retirement on individual's healthcare utilization. We particularly focus on preventive health behavior, i.e. medical attendance or screening participation and on hospital expenditures and length of hospital stays. For the latter we specifically distinguish between mental and physical admissions as well as negative health events reflecting different degrees of need for care. We find that wives' retirement increases the probability of a dentist visit as well as the participation in health and cancer screening for prostate cancer increases for their husbands. The availability of the wife as a possible caretakers also reduces the length of hospital stays on average by 1.1 days or 32 percent of a standard deviation. This effect is particularly driven by cardiovascular diseases associated with a higher need for care, such as strokes. Also, the probability of any hospitalization due to mental and behavioral disorders, which are mostly due to alcohol intoxication and misuse, are reduced by 1.2 percentage points. Hence, the retirement of the wife improves preventive and risky health behavior of husbands and enables an earlier hospital dismissal. In contrast, we do not find any significant effect on outpatient and inpatient healthcare utilization and length of hospital stays for wives if their husband retire, showing a clear gender imbalance in retirement spillovers. This result also underlines existing gender norms on the provision of informal care among couples.

Most importantly this paper contributes to the growing literature on the spillover effects of spousal retirement on health. The current literature typically analyzes retirement effects on spouses' physical and mental health and risky health behavior. Müller and Shaikh (2018) look at the effect of own and spousal retirement on subjective health, the frequency and intensity of alcohol consumption, smoking behavior and the extent of physical activities using SHARE data and retirement eligibility as instrument. They find that spousal retirement increases alcohol consumption and smoking intensity among smokers, and decreases physical activities and subjective health. Bertoni and Brunello (2017) show that husband's retirement has a negative effect on wife's mental health (self-reported depression, stress, lack of sleep), but not vice versa. Zang (2020) finds positive retirement spillover effects from husbands to wives in China (improvement in wife's physical and mental health) based on China Health and Retirement Longitudinal Survey and a fuzzy regression discontinuity design. Picchio and van Ours (2020) study the mental health effects of retirement in the Netherlands and find that husband's retirement positively affects their own and their spouse's mental health, while Messe and Wolff (2019) report no spillover effects using a Differences-in-Difference model. For Australia, Atalay and Zhu (2018) document a positive effect of wife's retirement on husband's mental health. All these studies rely on self-reported health and (risky) health behavior and exploit exogenous variation in retirement induced by pension reforms or cross-country differences in the statutory retirement ages. We significantly extend this literature by analyzing the spillover effects of spousal retirement on healthcare utilization using administrative health register data and a different set of hospitalizations and health behavior outcomes. Furthermore, we particularly discuss the availability of the spouse as a possible caretaker as a relevant mechanism in health demand and healthcare utilization which has not gained a lot of attention so far.

Second, we also relate to the extensive literature on understanding the health effects of retirement showing that retirement affects mental and physical health and healthcare utilization. Most papers find a positive causal effect of retirement on health (e.g. Westerlund et al. (2009); Coe and Zamarro (2011); Horner (2014); Gorry et al. (2018); Shai (2015)), while those studies finding a negative retirement effect relate their findings to the loss of professional responsibilities, lack of physical and mental activities, and increased unhealthy lifestyles (e.g. Dave et al. (2008); Rohwedder and Willis (2010); Behncke (2012); Hernaes et al. (2013); Barschkett et al. (2022)). In recent years, several studies analyzed the causal effect of retirement on healthcare utilization and find significant reductions in outpatient medical attendance, drug prescriptions or hospitalizations (Frimmel and Pruckner (2020); Eibich (2015); Hagen (2018); Zhang et al. (2018); Biro et al. (2022); Eibich and Goldzahl (2021)). Garrouste and Perdrix (2022) provides a very recent literature review on this issue.

Finally we also supplement the literature on spillover effects of spousal retirement in non-health dimensions. The most extensive evidence is related to joint retirement behavior of spouses. Hospido and Zamarro (2014) or Lalive and Parrotta (2017) find that women are more likely to retire when their husbands retire, but not vice versa. In contrast, for an earlier pension reform in Austria Zweimüller et al. (1996) show that husbands react to changes in wives' legal minimum retirement age but wives do not react. Atalay and Zhu (2018) for Australia find within-family spillover effects that are symmetric by gender. Evidence for joint retirement is also available for Denmark (García-Miralles, Esteban and Leganza, 2021) Netherlands (Bloemen et al., 2019), Norway (Kruse, 2021; Johnsen et al., 2021) and only weakly for France (Stancanelli, 2017). There is also evidence that spousal retirement negatively affects marital quality, i.e. Stancanelli (2014) find that husband's retirement increases the probability of divorce in France, and is causally related to leisure activities and home production. Stancanelli and Van Soest (2016) that retirement of the husband significantly increases own hours of leisure joint leisure hours of the couple, while wife's retirement increases joint leisure as well. Stancanelli and Van Soest (2012) find that retirement of the female partner significantly reduces male hours of home production but not vice versa. Similar to our approach, these studies use regression discontinuity designs to estimate the causal impact of spousal retirement. Fischer and Müller (2020) show that the time conflict between labor and informal care provision is an economically relevant constraint for women and later female retirement causally reduces low-intensity care. We contribute to this strand of literature by considering the provision of care due to the continuous availability of the spouse as an alternative dimension of home production and how this translate into need and duration of hospitalizations and preventive health demand.

The paper is organized as follows: Section 1 provides an overview of the institutional background of the Austrian healthcare and pension system, Section 2 describes our data and the sample we use for our analysis, Section 3 discusses our empirical model and identification strategy, Section 4 summarizes our results and presents several robustness checks, and Section 5 concludes.

1 The Austrian health care and pension system

The Austrian healthcare system Austria has a Bismarckian-type healthcare system with universal access to medical services to the full population. Mandatory health insurance depends on occupation and place of residence. The insurance funds are earmarked for all private-sector employees, retirees from the private sector, and their dependents. The group of insured persons represents approximately 75% of the population.[1] The health care system does not differentiate between employees and retirees with respect to utilization, so retired persons continue to have unlimited access to health care services after retirement.

The health insurance covers all expenses for medical care in the inpatient and outpatient sector, including those for medication.[2] Ambulatory care is provided by GPs and medical specialists. The GP has a gatekeeping function, provides primary care and, if necessary, coordinates further treatment, i.e. referral to specialist care or hospital admission. Alternatively, patients can directly consult outpatient hospital departments in case of emergency or during weekends and night hours.

The Austrian pension system The public pension system in Austria covers all private-sector workers and provides early retirement, old-age and disability pensions, and is the most important pillar in old-age financial provision for retirees in Austria. Pension eligibility depends on the number of insurance months collected during one's working life and income histories. For most individuals in the sample the assessment base of the pension is based on the 15 best annual earnings years.[3]

The statutory retirement age is 65 for men and 60 for women, however, the factual retirement age including disability pensions for men (women) in 2018 is 61.3 (59.3) years. At the same time, the Austrian public pension systems offers a generous gross pension replacement rate of 76.5% in 2018 as compared to the OECD average of 49% (OECD, 2019). To smooth the transition into retirement, the Austrian government introduced partial retirement schemes for older employees in the early 2000s, where the working time reductions of elderly workers are subsidized.

Pension reforms To ensure the fiscal sustainability of the public pension system, the Austrian government implemented two pension reforms in 2000 and 2003 to increase workers' early retirement age. These reforms included a gradual increase in the eligibility

[1]The rest of the population is covered by special social insurance institutions that provide farmers, civil servants, and self-employed individuals with health insurance.

[2]There is a modest prescription charge (6.65 € in 2022) for medical drugs, and a small deductible per day of inpatient treatment.

[3]In 2004, the system gradually changed to a pension account system, which considers lifetime income.

age for early retirement stepwise for different birth-quarter cohorts.[4] The first reform gradually increased eligibility age from 60 to 61.5 for men, and from 55 to 56.5 for women, i.e. men born before October 1940 were eligible for early retirement at the age of 60, whereas for men born in the fourth quarter of 1940, the eligibility age was increased by two months. For every subsequent birth quarter, the eligibility age rose until the total increase of 1.5 years was reached. The same stepwise increase applies to women born after September 1945. The second reform in 2003, continued to increase the eligibility age for early retirement from 61.5 to 65 years for men and from 56.5 to 60 years for women through a stepwise increase of one month for each birth-quarter cohort. Figure 1 summarizes these reforms graphically. Workers with at least 40 social insurance years were allowed to retire at age 62 via the so-called corridor pension. Thus, the gradual increase in early retirement age for men is practically capped at age 62 (see horizontal red line in figure 1). Also men (women) with more than 45 (40) insurance years, or workers with heavy labor were exempted from the reform and remained at age 60 (55) as the earliest possible retirement age.

Labor market effects of these reforms are documented in Staubli and Zweimüller (2013) and Manoli and Weber (2016). Staubli and Zweimüller (2013) find that the increase in the early-retirement eligibility age increased employment by 9.75 percentage points for men and 11 percentage points for women. The reforms generated substantial spillovers on the unemployment insurance program. Using a regression-kink design and a more labor market attached workers than Staubli and Zweimüller (2013), Manoli and Weber (2016) show that a one-year increase in the early retirement age increased the average job exit age by 0.4 years.[5] Figure 2 plots the share of retired women (panel (a)) and men (panel (b)) for birth cohorts that are affected by the reform differently, i.e. each line represents a birth cohort with a different early retirement age. For both gender, the pattern is very consistent with the literature, that individuals with higher eligibility age of early retirement indeed systematically retire at a significantly later age. This response in later retirement is also quite symmetric across gender and increases in the early retirement age.

2 Data and sample

Data Sources We combine several sources of Austrian administrative data. First we use data from the Upper Austrian Health Insurance Fund which provides billing data for all private sector workers in the province of Upper Austria.[6] This data provides us with

[4]Further relevant changes on account of the reforms included a stepwise extension of the assessment base, from the best 15 earning years to lifetime earnings and increased penalties for early retirement, from 2% to 4% of the pension per year (capped at 10%).

[5]Frimmel and Pruckner (2020) exploited these two Austrian pension reforms to study the causal effect of retirement on own healthcare utilization in Austria.

[6]The Upper Austrian Health Insurance Fund covers approximately 75 percent of the entire Upper Austrian population.

detailed information on health care utilization in the outpatient and inpatient sector, i.e. medical services (GPs, medical specialists), screening participation (general health screenings, cancer screenings such as PSA tests or mammography), drugs prescriptions on he ATC level (anatomical-therapeutic-chemical classification system) as well as hospital admission diagnosis according to ICD-10 systematic, length of hospital stays and the corresponding billed DRG (diagnosis-related-groups) points.

These health register data can be directly linked to the Austrian Social Security Database (ASSD), which is a matched employer-employee data set to verify pension claims. These data cover all Austrian workers and provide detailed information on daily labor market activity, earnings as well as detailed information on retirement start and pathways into retirement (Zweimüller et al., 2009). Spouses are identified through the Austrian marriage and birth register as well as data on co-insurance and partner information in payslip data from the Austrian ministry of finance.

Sample Definition The sample consists of all couples with husband of birth cohorts 1940-1950 or with wives of birth cohorts 1945-1955 respectively who are insured at the Upper Austrian Health Insurance Fund. The selection of cohorts is based on the cohort rules of the pension reforms (see Figure 1) We observe each individual on a quarterly basis between 1998 and 2017, however the panel is unbalanced due to divorce, death, migration or change in insurance status. Spouses are required to have at least 180 insurance month in total in order to fulfill the minimum criterion for eligibility for retirement. We drop couples where the retiring spouse is exempted from the pension reform, i.e. has more than 540 insurance months at age 60, worked as a civil servant for more than a year or has worked as heavy labor worker. We further exclude couples who divorced before the year 2000 or where either wife or husbands show up in the data with different partners. We also restrict to couples with a age difference of more than 15 years. So we end up with two separate samples: the sample of couples with retiring husbands born between 1940-1950 consists of 15,088 husbands which corresponds to 299,795 couple-quarter observations in total; the sample of couples with wives born between 1945-1955 includes 19,400 retiring wives and 396,592 couple-quarter observations in total.[7]

Descriptives Table 1 provides summary statistics measured in the quarter before the spouse reaches the eligibility age of early retirement. Column (1) represents 19,400 couples with retiring wifes, while column (2) represents 15,088 couples with retiring husbands. As implied by the reform, the average age is lower for wifes than husbands (57.5 years vs. 61.4 years). Husbands are more likely to be already retired (70 percent due to disability or long insurance times) relative to 26 percent of wifes. When looking at the spouses, in both samples husbands are on average 2.5 to 3 years older and more likely to be retired or disabled. This is mirrored in healthcare utilization at eligibility age, where husbands

[7]The difference in the size of couples is due to a higher share of long-time insured and heavy labor workers among men.

have higher drug expenditures and prescriptions (102 euros vs. 86 euros) and significantly more inpatient days and expenditures (0.6 days and 391 euros vs. 0.4 days and 226 euros). In contrast, outpatient medical attendance is higher among wives, which points towards a higher level of preventive health behavior.

3 Identification strategy

In this section we discuss our estimation strategy to identify the causal effect of spousal retirement on healthcare utilization. We examine a series of healthcare utilization variables for the inpatient sector (length of stay and expenditures) and outpatient sector (doctor visits and drug prescriptions) for retiring wives and husbands separately.

Since retirement is clearly an endogenous decision, we exploit exogenous variation in early retirement that is due to reform-induced changes in the early retirement eligibility age. In particular, we make use of an age-based discontinuity around the cohort-specific early retirement age (ERA). As individuals can voluntarily work beyond their early retirement age or retire earlier due to disability or long insurance times, there is only partial compliance with respect to the reform, i.e. we use a fuzzy regression discontinuity design using spousal eligibility as an instrument for spousal retirement.

3.1 Estimation model

The structural equation is given by

$$Y_{iq} = \delta^S R^S_{iq} + \sum_{p=1}^{P} \gamma_p (agec^S_{iq})^p + \beta_p elig^S_{iq} (agec^S_{iq})^p + \sum_c \alpha_c \mathbb{1}\{agec_{iq} = c\} + \sum_{r=1}^{2} \kappa_r age^r_{iq} + t_q + \epsilon_{iq} \tag{1}$$

where healthcare utilization Y_{iq} of individual i in quarter q is explained by a binary variable R^S_{iq} that is equal to one if the spouse of individual i is retired in quarter q. The parameter of interest δ^S measures the effect of spousal retirement on individual i's outcome. Given the RD design our estimates have to be interpreted as short-term effects of spousal retirement on individual healthcare utilization.

We instrument spousal retirement by spousal eligibility for early retirement, $elig^S_{iq}$, which is a binary variable that is equal to one if the spouse has reached the early retirement eligibility age (era^S_i) in quarter q:

$$elig^S_{iq} = \mathbb{1}\{age^S_{iq} \geq era^S_i\}$$

For women, era^S_i ranges between age 55 and 60, for men we restrict era^S_i between age 60 and 62, as almost everyone fulfills the criterion for the corridor pension at age 62, hence making each further increase in the eligibility age non-binding. The corresponding first stage equation is given by

$$R_{iq}^S = \theta^S elig_{iq}^S + \sum_{p=1}^{P} \tau_p (agec_{iq}^S)^p + \lambda_p elig_{iq}^S (agec_{iq}^S)^p$$
$$+ \sum_c \alpha_c \mathbb{1}\{agec_{iq} = c\} + \sum_{r=1}^{R} \kappa_r (age_{iq})^r + t_q + \nu_{iq}, \quad (2)$$

where $agec_{iq}^S$ is the running variable defined as spousal age centered at the early retirement age ($agec_{iq} = age_{iq} - era_i$).We use a second-order polynomial of the running variable and interact it with the spousal eligibility indicator to allow for different trends before and after reaching the early retirement eligibility age. We also add individual centered age fixed effects ($\alpha_c \mathbb{1}\{agec_{iq} = c\}$) to account for own retirement eligibility in a reduced-form way. Furthermore, we control for quadratic trends in individual age ($\sum_{r=1}^{2} \kappa_r age_{iq}^r$) and year-quarter fixed effects (t_q). In our baseline model, we choose a bandwidth of 12 quarters before and after the eligibility cutoff defined by era_i.[8]

3.2 Identifying assumptions

Our empirical approach requires a set of identifying assumptions such that the parameter of interest δ^S can be interpreted as the *causal* effect of spousal retirement. Most importantly, we require spousal eligibility for early retirement ($elig_{iq}^S$) to have a significant effect on spousal retirement. Panels (a) and (b) of figure 3 graphically represents the first stage relationship for retiring wifes and husbands. For both groups, we see partial compliance with respect to eligibility for early retirement. This is particularly pronounced for husbands where approximately 70 percent are already retired before the eligibility age due to long insurance times or disability. The share of women being retired before the eligibility age of approximately 30 percent is substantially lower, but at the same time the share of women working beyond the eligibility age is higher, i.e. 20 percent of women still are active on the labor market 3 years after their eligibility age as compared to less than 10 percent of men. Nevertheless we see a clear discrete jump in retirement probabilities exactly at the eligibility age for early retirement. This jump is more pronounced for women. Table 2 summarizes the first stage regressions for retiring wives (panel (a)) and husbands (panel (b)) in order to quantify these discontinuities. As data on inpatient outcomes are only available for years 2005 to 2017, we also show results for the outpatient sector for this restricted time period. For wives, being eligible for early retirement increases the probability of being retired by 6.8 percentage points. This corresponds to an increase of

[8] As a robustness check we estimate our model for the full range of bandwidths between 6 to 18 quarters around the cutoff.

retirement of 18 percent. Consistent with the graphical evidence, the results for retiring husbands are symmetric but quantitatively smaller. Husband's eligibility increases retirement by 5.7 percentage points (8 percent).[9] Appendix Figures A.1 and A.3 summarize the results from various sensitivity checks. Figure A.3 shows that the first stage effect varies little with bandwidth. Figure A.1 (a) provides results for different specifications (baseline, adding spouse age fixed effects, triangular weights). We also show that there are no significant spillover effects to the alternative retirement pathway of disability pension (see Figure A.1 (b)).

We also require that individuals do not select themselves into early retirement systematically below their eligibility age, i.e. they should not be able to manipulate the eligibility status around the cutoff. Since the reform was announced in early 2000 and eligibility status is retrospectively determined by birth cohorts, this concern can be mitigated, as individuals can clearly not manipulate their quarter of birth.[10]. We further provide suggestive evidence by using pseudo-cutoffs

Finally, we require independence of individual's and spousal retirement. We provide three empirical tests which should be supportive in justifying the independence assumption. First note, that our empirical model not only instruments spousal retirement with spousal eligibility, but also controls for own eligibility in a reduced-form fashion by controlling own eligibility age in the most flexible way. Second, we directly check for joint retirement behavior in our couples. As discussed in Section , there is mixed evidence for joint retirement behavior among spouses. In our context, joint retirement behavior is less straightforward because we exploit retirement behavior due to legislative changes, hence we focus on a complier population of individuals who retire at a higher early retirement age but would have retired earlier in the absence of the pension reform. This means, that we study retirement behavior of individuals, who are still capable of working and do not have long insurance times, around the earliest possible time. Spouses can therefore only react with retirement if they have extremely long insurance times themselves or are already working beyond their own early retirement age, conditional on eligibility. Given the retirement behavior in Austria, this is typically a small fraction of the working population. So for our complier population the behavioral frame is rather restricted. Empirically, we use the fuzzy regression discontinuity design described above with spousal eligibility as an instrumental variable for spousal retirement and use individual retirement as the outcome variable. This serves as a direct test, whether spousal retirement affects individual retirement decision conditional on control variables. Table 4 summarizes results for re-

[9]Inference is based on Anderson-Rubin (AR) test, which is fully robust to weak instruments.

[10]Note that we cannot conduct the usual balancing tests to provide suggestive evidence for this assumption,because we exploit a within-individual age-discontinuity from the reform, so characteristics of individuals before and after the age threshold are by construction identical because we compare identical individuals. Therefore standard tests of smoothness in baseline characteristics will generally be uninformative as outlined by Lee and Lemieux (2010).

tiring wives (Panel (a)) and husbands (Panel (b)). For both husband and wive, we find no evidence that spousal retirement significantly affects individual retirement in a causal way. Figure 4 confirms this finding based on unconditional (and conditional) data.[11] Our third approach is the most explicit way to control for potential threats of the independence assumption by directly modeling the retirement decision of both spouses. Hence, we also estimate a specification with two endogenous variables where we instrument for both spousal and own retirement with the corresponding eligibility for early retirement. The results will be discussed in section 4.3 in detail.

4 Results

In this section we summarize the results of our analysis for retiring wives and husbands and test the sensitivity of our main estimates with respect to the choice of bandwidth, further control variables, or triangular weights.[12]

4.1 Wives' retirement and husbands' healthcare utilization

Table 5 summarizes the IV estimates for wife's retirement on outpatient healthcare utilization. Panel (a) refers to the extensive margin of healthcare utilization while panel (b) uses frequencies and panel (c) expenditures in euros as outcome variables. We do not find any significant effect for overall drug prescriptions, neither in the take-up rate nor in the number and expenditures for prescriptions.[13] We interpret drug prescriptions as a clear indicator for health status, so these results suggest no significant short-run effect of wife's retirement on husband's health status. Columns (II) and (III) study outcomes reflection health behavior rather than health status. While we do not find any significant effect for overall doctor visits, [14] Most strikingly we find that spousal retirement increases the probability to do a general health screening at the GP and PSA test for prostate cancer by 8.2 and 7.7 percentage points. Given the average probabilities of 5.6 percent and 12.2 percent respectively, the increase in screening participation is also quantitatively important. These results suggest that (i) we do not find evidence for significant lower health of husbands after their wife's retirement but a significantly improved preventive health behavior induced by retiring wives.

[11]Figure ?? in Appendix A also shows robustness with respect to triangular weights, Table ?? confirms this results in restricted sample (only considering retirement between 2005-2017).

[12]Note that all reduced-form estimates are also graphically summarized in Appendix-Figure A.5 for husband outcomes and Appendix-Figure A.7 for wife outcomes.

[13]We also do not find any significant effect for different classes of drug prescriptions according to the ATC classification. Results available upon request.

[14]we find that husbands are 6.0 percentage points more likely to go to the dentist at all. However, this does not imply inferior dental health as the number of dentist visits and expenditures for treatments at the dentist do not change.

Next we consider different components of hospitalization, length of stay and hospital expenditures. Table 6 summarizes our estimates. Overall, we do not find a significant effect of spousal retirement on hospitalization (panel (a) of column (I)) but a significant reduction in length of stay of -1.8 days or 54 percent of a standard deviation, and a significant reduction in expenditures of 1113.15 euros (40 percent of a standard deviation). These reductions are also quantitatively relevant. Columns (II) and (III) differentiate between hospitalizations due to mental and behavioral disorders and non-mental physical diseases. The probability of any hospitalization due to mental disorders is reduced by 2.3 percentage points. Expenditures and length of stay for mental diseases are reduced by 0.45 days and 144.9 euros respectively. So the availability of the wife at home tends to have a somewhat preventative effect for hospitalizations due to behavioral and mental disorders, which are mainly caused by alcohol intoxication and misuse.[15] For physical diseases the situation is different. While we do not see a change in overall hospitalizations due to physical diseases, length of stay is reduced by 1.385 days (42 percent of a standard deviation) and hospital expenditures are reduced by 968 euros. This effect is particularly driven by cardiovascular diseases (column (IV)). This implies that although there is no effect on the incidence, hence no significant effect on health status, husbands have a significant shorter hospital stay when the wife is retired. To corroborate the argument, that the plain availability of the spouse as a potential caretaker, we would expect these effects to be larger for diseases associated with a higher need for care. Therefore we specifically compare hospitalizations due to a heart attack (column (V)) and a stroke (column (VI)). While both diseases are potentially life-threatening, heart attacks typically have good rehabilitation opportunities but strokes are associated with a significant higher probability for need of care[16]. We do not see any significant changes in hospitalizations, expenditures or length of hospital stays for heart attacks, however, the length of hospital stays due to stroke is significantly reduced by 0.257 days (52 percent of a standard deviation). So the presence of a caretaker does not prevent a serious disease but tends to lead to earlier releases from hospitals into home care.

4.2 Husbands' retirement and wives' healthcare utilization

In this section we present the findings for an identical analysis of the impact of husband's retirement on wives' healthcare utilization. This analysis is based on a sample of retiring

[15] The majority of hospitalizations for mental disorders consists of $F10$-diagnoses in the ICD-10 classification (e.g. disorders due to intoxication, misuse, alcohol-related psychotic disorder...)

[16] Frimmel et al. (2023) show for individuals of similar age as in our sample that the share of individuals receiving a care allowance increases by 14 percentage points after a stroke as compared to 1.4 percentage points after a heart attack. The receipt of a care allowance must be accredited by public doctors and dependent on care requirements. Therefore care allowance receipt is a good indicator for need of care after health shocks.

women which distinguishes from the husband's retirement sample in two important aspects: (i) the retirement reform affects men at a higher age range between 60-62 years as compared to retiring wives' age range of 55 to 60 years. In case of heterogeneous treatment effects, later retirement induced at higher ages may lead to different effects; (ii) husbands are on average older, so in this case we consider the effect of retirement at older age on healthcare utilization of a younger spouse (on average 2.4 years (see Table 1) while before we studied wives' retirement at a younger age (around 57 years) on healthcare utilization of an - on average - older spouse (around 61.5 years). Hence, husband's retirement and the availability as a caretaker might be also relevant due to younger age of his spouse with on average lower needs of care.

Table 7 show results for wife's outpatient healthcare utilization. As for husband's outpatient healthcare utilization behavior, we do not find any significant effect on wives' drug prescriptions of doctor visits. However, opposite to husbands, wives do not change the probability to go to dentists nor their preventive health screening behavior is affected. In contrast to wives, husbands do not seem to change their wives' healthcare behavior in a significant way. This might not be too surprising since women have on average a substantially higher take-up rate of screenings.

When looking at the inpatient sector summarized in Table 8, differences to husbands' outcomes become evident. Overall, we do not find any significant effect of husbands' retirement on their wives' hospitalization, length of stay and hospital expenditures. Point estimates are negative and comparable to the effects of wives' retirement but very noisy and imprecisely estimated. So while for wives' retirement we could see a consistent pattern in hospitalization outcomes, we cannot detect such a caretaker effect of husband's retirement. The effect of spousal retirement for wives' hospitalization is also absent for strokes and mental health diagnosis. This absent effect could be first explained the younger average age of wives and therefore a lower likelihood for need of care, and a prevalent gender norm among affect birth cohorts, where the burden of care is mostly attributed to women rather than men Figure 5 directly compares the effects of wife's and husband's retirement. While point estimates sometimes are of similar size and direction, standard errors for wives are systematically larger and therefore leading to insignificant effects.

4.3 Robustness

In this section we summarize several robustness checks to corroborate our findings. To begin with, we want to shed more light on the complier population. Table 9 compares first-stage estimates for wife's retirement for a different labor market status of the husband. The first-stages are stronger if the wife is still employed (7.4 percentage points more likely retired vs. 5.7percentage points in case of unemployment), or the husband is out of labor force or in disability pension. Particularly the latter case is of interest, because it particularly corroborates our interpretation that the availability of the wife as a potential care-taker is a relevant mechanism of spousal retirement. Table 10 shows a comparable pattern for husbands' retirement.

Second we conduct several checks for our identifying assumptions discussed in Section 3.2. First and foremost, couples may be coordinating with their retirement behavior. Such behavior would mean a violation of the independence assumption. In Section 3.2 we discussed that the inclusion of spouses' eligibility age into our main estimation model as a reduced-form control of partner's retirement does not alter our results. We also do not find a direct causal effect of own retirement on their spouses' retirement in our complier population. To corroborate the absence of joint retirement behavior in our sample, we also conduct the - in our view - most explicit check. We now enrich our specification with two endogenous variables where we instrument for both spousal and own retirement with the corresponding eligibility for early retirement. More precisely, we estimate the following empirical model:

$$Y_{iq} = \alpha^s R^s_{iq} + \sum_{p=1}^{P} \gamma^s_p (agec^s_{iq})^p + \delta^s_p R^s_{iq} (agec^s_{iq})^p +$$
$$\alpha^i R_{iq} + \sum_{p=1}^{P} \gamma^i_p (agec_{iq})^p + \delta^i_p R_{iq} (agec_{iq})^p + \mathbf{X_{iq}} \boldsymbol{\beta} + t_q + \epsilon_{iq}$$

where R_{iq} indicates whether the individual i is retired in quarter q and $(agec_{iq})^p$ is a now p^{th}-order polynomial function of individual's centered age being different before and after retirement. In this model, R_{iq} is instrumented by individual's eligibility ($elig_{iq}$), and R^s_{iq} by spousal eligibility ($elig^s_{iq}$) respectively. The first-stage of this model is show in Appendix-Figure B.1 and clearly shows a discrete jump in retirement probability at the threshold. Tables B.2 to B.5 in Appendix-B summarize our main results with two endogenous variables. For husbands, we see that own retirement is causally reducing dentist visits and the probability of a PSA test, but equivalent to our prior results, wife's retirement increases both dentist visits and screening participation significantly. For hospitalization, husband's own retirement has no significant impact on any outcome, but wife's retirement reduces length of stay for cardiovascular diseases, and mostly driven by care-related diagnoses, and significantly prevents hospitalization due to mental and behavioral diseases. For wives, own retirement slightly increases drug prescriptions and gynecological screenings, but husband's retirement has no impact on wives' healthcare utilization. So, our main conclusions entirely prevail in the more sophisticated model with two endogenous variables, and we are confident that joint retirement behavior does not violate the independence assumption in our context.

Finally, we also conduct several robustness checks to corroborate our RDD-estimates. Figures A.13 and A.15 summarizes estimates for the main outcome variables with different bandwidth choices and Figures A.9 and A.11 provide further specification tests. We use triangular weights instead of uniform weights as in our main specifications. Our results and conclusions remain unchanged by these technical modifications, giving us confidence that our results are not particularly driven by bandwidth choice or weights. Finally Figures A.17 to A.20 summarize results from using placebo cutoffs set a 8 and 4 quarters before the actual cutoff induced by the reform leading to all insignificant results when using the wrong cutoff.

5 Conclusions

Retirement is a life-changing event in an individual's life, typically affecting other household members as well. Spousal retirement is not only associated with an impact on household income and more time for joint activities, but also implies the continuous availability of a caretaker in case of need for care. Against this background, we examine the impact of spousal retirement on healthcare utilization in the outpatient and inpatient sector. Exploiting two pension reforms raising the eligibility age of early retirement for different birth cohorts, enables us to estimate the causal effect of spousal retirement on healthcare utilization within a fuzzy regression discontinuity design. For husbands we find a higher probability of dentist visits as well as an increased participation in health and prostate cancer screenings. Furthermore, wife's retirement significantly reduces length of hospital stays and significantly prevents hospitalization for mental and behavioral disorders. The reduction in length of stay is particularly driven by cardiovascular diseases associated with a higher probability for need of care, i.e. strokes. In contrast to husbands healthcare utilization, we do not find any significant impact of husband's retirement on their wives' healthcare utilization.

Our findings show that retirement may lead to unexpected spillover effects on healthcare utilization which are distinct from (mental) health effects. The availability of a caretaker not only reduces the uptake of health services and length of hospital stays particularly for more care-intensive diseases, but also may improve preventive and risky health behavior, i.e. more health screenings, fewer hospitalizations by alcohol misuse. However, our results also document a significant gender imbalance - the overall positive spillover effects on spouses are only driven by female retirees improving their husbands health behaviors and reduce hospitals stays. One limitation of the study is that we are unable to detect the exact mechanism behind these effects, i.e. we do not know whether hospital providers release patients earlier once they know about the availability of a potential caretaker, or spouses themselves initiate earlier hospital dismissals.

This study contributes to a better understanding of determinants and consequences of retirement behavior and that these effects may not necessarily beneficial for both gender. So these spillover effects should be taken into account when evaluating the effectiveness of retirement policies, which are typically revolving around the trade-off between later retirement, employability of older workers and health. In the light of ongoing labor shortages among nurses and hospital staff, this paper also provides evidence that the availability of informal care generally may avert hospitals stays and reduce the pressure on hospitals and health care systems which are restrained by labor shortages. Policies that support individuals to provide informal care, such as subsidized temporary leave of absence for care, may therefore be a useful policy to reduce the pressure on hospitals suffering from labor shortages.

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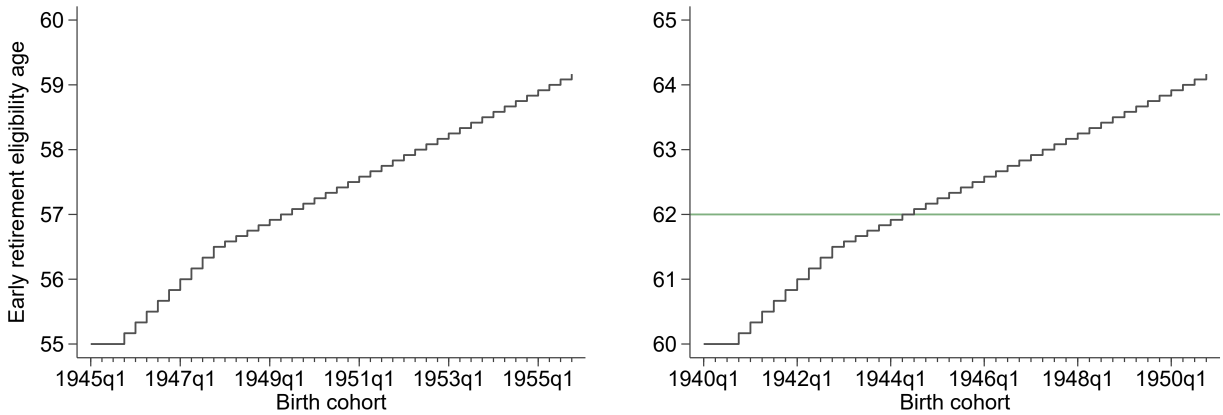
6 Figures and tables

Figure 1: Early retirement eligibility age (ERA)

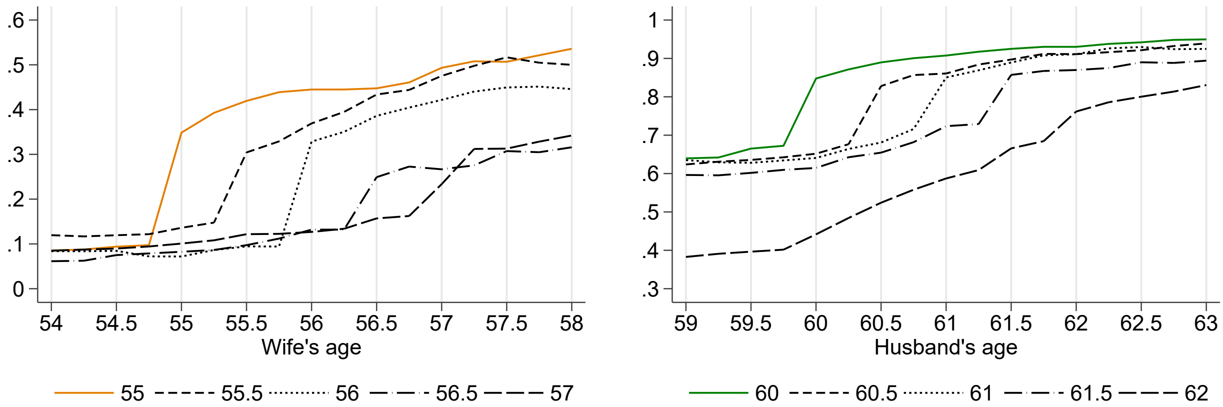
(a) Women (b) Men



Notes: The figure illustrates the stepwise increase of the early retirement eligibility age (ERA) over birth-quarter cohorts for men and women, consistent with the 2000 and 2003 pension reforms. The red horizontal line indicates the corridor pension at age 62 for men.

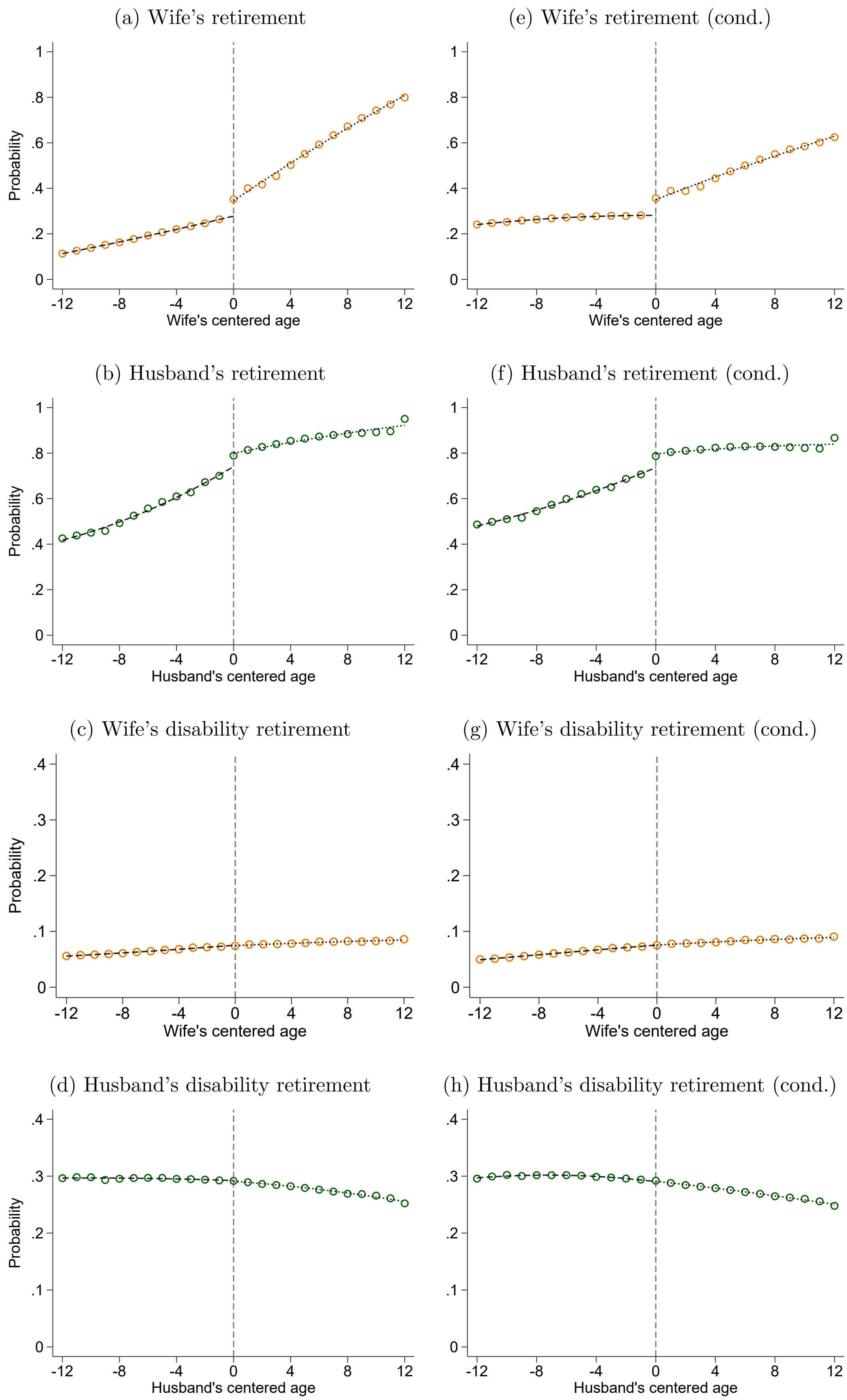
Figure 2: Retirement probability by early retirement eligibility age (ERA)

(a) Women (b) Men



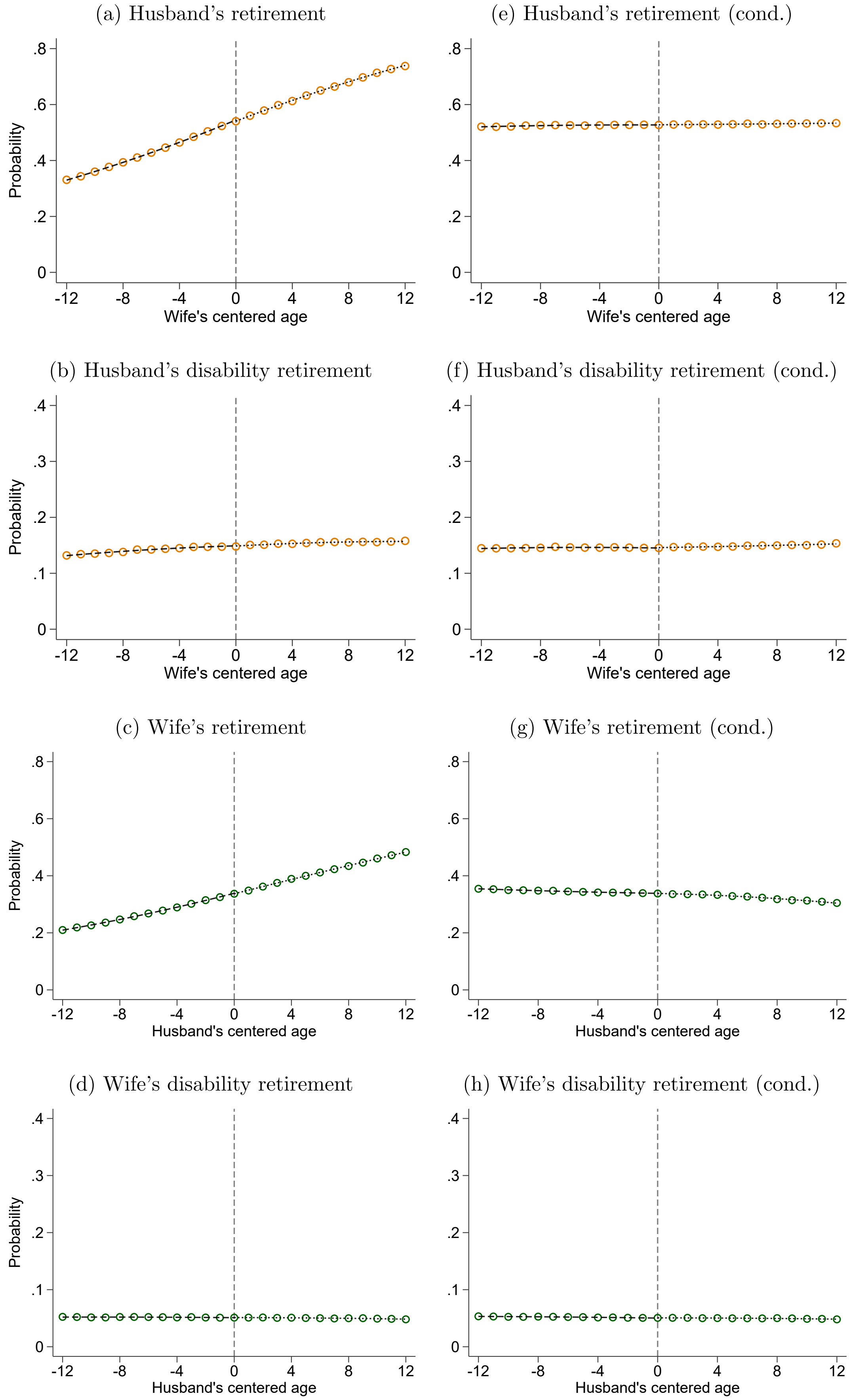
Notes: The figure illustrates . . .

Figure 3: The effect of spousal eligibility on spousal retirement (first stage)



Notes: Panels (a) - (d) show first-stage relationship around the individual-specific cutoff age for retirement and disability retirement. Panels (e) - (h) replicate after residualizing with age.

Figure 4: The effect of spousal retirement on individual retirement



Notes: Panels (a) - (d) show first-stage relationship around the individual-specific cutoff age for retirement and disability retirement. Panels (e) - (h) replicate after residualizing with age.

Table 1: Summary statistics

	Husband sample (Wife = spouse)		Wife sample (Husband = spouse)	
	Mean	Sd	Mean	Sd
Individual outcomes				
Drug prescription	0.661	0.47	0.656	0.48
Number of drug prescriptions	3.978	6.06	3.697	5.86
Drug expenditure (Euro)	100.191	388.93	85.481	327.91
Doctor visits	0.780	0.41	0.793	0.41
Number of doctor visits	3.848	4.58	4.072	4.88
Doctor expenditure (Euro)	79.201	126.85	82.965	124.91
Basic screening	0.056	0.23	0.051	0.22
Specific screening	0.125	0.33	0.152	0.36
Health screening	0.146	0.35	0.186	0.39
Hospitalization	0.087	0.28	0.064	0.24
mental disease	0.002	0.05	0.004	0.06
physical disease	0.085	0.28	0.061	0.24
cardiovascular disease	0.018	0.13	0.007	0.08
heart attack	0.003	0.05	0.001	0.02
stroke	0.001	0.03	0.000	0.02
Length of stay (days)	0.668	3.35	0.423	2.52
mental disease	0.034	0.97	0.056	1.26
physical disease	0.634	3.19	0.367	2.18
cardiovascular disease	0.141	1.55	0.045	0.96
heart attack	0.015	0.32	0.002	0.08
stroke	0.017	0.64	0.009	0.56
Inpatient expenditure (Euro)	436.994	2523.05	249.484	1826.66
mental disease	11.178	299.25	17.426	371.40
physical disease	425.816	2502.49	232.058	1783.19
cardiovascular disease	123.406	1493.62	32.481	833.53
heart attack	21.536	688.28	1.583	93.23
stroke	9.943	382.98	4.563	283.76
Individual characteristics				
Age	59.829	4.90	57.230	4.71
Early retirement age (ERA)	61.786	0.56	57.272	1.56
Eligible	0.326	0.47	0.510	0.50
Retired	0.524	0.50	0.325	0.47
Retired (disability)	0.148	0.35	0.051	0.22
Employed	0.423	0.49	0.337	0.47
Unemployed	0.023	0.15	0.026	0.16
Out of labor force	0.031	0.17	0.312	0.46
Heavy labor worker	0.160	0.37	0.047	0.21
Spouse characteristics				
Age	57.453	1.13	61.397	0.64
Early retirement age (ERA)	57.622	1.12	61.622	0.65
Retired	0.264	0.44	0.700	0.46
Retired (disability)	0.073	0.26	0.293	0.45
Employed	0.427	0.49	0.189	0.39
Unemployed	0.056	0.23	0.030	0.17
Out of labor force	0.253	0.43	0.081	0.27
Number of couples	19,400 (17,387)		15,088 (12,643)	

Notes: Summary statistics are measured in the quarter before the eligibility cutoff. Outpatient outcomes are observed from 1998 to 2017 (full sample). Inpatient outcomes are observed from 2005 to 201 (restricted sample). N gives the number of observations in the full (restricted) sample. N (couples) gives the number of couples in the full (restricted) sample.

Table 2: The effect of spousal eligibility on spousal retirement (first stage)

	A. Husband sample — wife's retirement		B. Wife sample — husband's retirement	
Sample	full	restricted	full	restricted
Wife eligible	0.068***	0.055***		
	(0.003)	(0.003)		
Husb eligible			0.057***	0.030***
			(0.003)	(0.004)
Mean outcome	0.373	0.418	0.702	0.702
N	396,592	319,261	299,795	217,928
N couples	19,400	17,387	15,088	12,643

Notes: Each column shows the results of a separate linear regression with uniform weights, a bandwidth of 12 quarters, and quadratic trends in the spouse's centered age on either side of the discontinuity. Control variables include year-quarter fixed effects, individual centered age fixed effects and quadratic trends in individual age. The full sample includes all quarters in the period 1998-2017; the restricted sample includes all quarters in the period 2005-2017. item Robust standard errors clustered at the individual level are shown in parenthesis. ***, ** and * indicate statistical significance at the 1, 5 and 10 percent significance level. AR test (p) gives the p-value of the Anderson-Rubin test.

Table 3: The effect of spousal eligibility on spousal disability retirement

	A. Husband sample — wife's disability retirement		B. Wife sample — husband's disability retirement	
Sample	full	restricted	full	restricted
Wife eligible	−0.000	0.001		
	(0.001)	(0.001)		
Husb eligible			0.001	−0.005*
			(0.002)	(0.002)
Mean outcome	0.072	0.068	0.286	0.309
N	396,592	319,261	299,795	217,928
N couples	19,400	17,387	15,088	12,643

Notes: Each column shows the results of a separate linear regression with uniform weights, a bandwidth of 12 quarters, and quadratic trends in the spouse's centered age on either side of the discontinuity. Control variables include year-quarter fixed effects, individual centered age fixed effects and and quadratic trends in individual age. The full sample includes all quarters in the period 1998-2017; the restricted sample includes all quarters in the period 2005-2017.

Robust standard errors clustered at the individual level are shown in parenthesis. ***, ** and * indicate statistical significance at the 1, 5 and 10 percent significance level. AR test (p) gives the p-value of the Anderson-Rubin test.

Table 4: The effect of spousal retirement on individual retirement

	A. Husband sample — husband's retirement		B. Wife sample — wife's retirement	
Sample	full	restricted	full	restricted
Wife retired	0.008	−0.001		
	(0.026)	(0.039)		
Husb retired			0.007	−0.013
			(0.034)	(0.088)
AR test (p)	0.763	0.979	0.830	0.879
Mean outcome	0.528	0.560	0.336	0.371
N	396,592	319,261	299,795	217,928
N couples	19,400	17,387	15,088	12,643

Notes: Each column shows the results of a separate linear regression with uniform weights, a bandwidth of 12 quarters, and quadratic trends in the spouse's centered age on either side of the discontinuity. Spousal retirement is instrumented by spousal eligibility for early retirement. Control variables include year-quarter fixed effects, individual centered age fixed effects and quadratic trends in individual age. The full sample includes all quarters in the period 1998-2017; the restricted sample includes all quarters in the period 2005-2017.

Robust standard errors clustered at the individual level are shown in parenthesis. ***, ** and * indicate statistical significance at the 1, 5 and 10 percent significance level. AR test (p) gives the p-value of the Anderson-Rubin test.

Table 5: The effect of wifes' retirement on husbands' outpatient healthcare utilization

	Drug prescriptions	Doctor visits	Health screening: Basic	Health screening: PSA test	Health screening: Any
(a) Incidence					
Wife retired	0.041	0.037	0.082***	0.077*	0.094**
	(0.047)	(0.046)	(0.031)	(0.041)	(0.045)
AR test (p)	0.373	0.418	0.008	0.061	0.035
Mean outcome	0.655	0.778	0.056	0.122	0.143
SD outcome	0.475	0.415	0.230	0.327	0.350
(b) Number					
Wife retired	−0.513	0.215			
	(0.424)	(0.523)			
AR test (p)	0.226	0.681			
Mean outcome	3.971	3.795			
SD outcome	6.145	4.560			
(c) Expenditure					
Wife retired	5.122	1.360			
	(61.073)	(15.610)			
AR test (p)	0.933	0.931			
Mean outcome	108.122	78.736			
SD outcome	630.489	125.817			
N	396,592	396,592	396,592	396,592	396,592
N couples	19,400	19,400	19,400	19,400	19,400

Notes: Wife's retirement instrumented by wife's eligibility for early retirement. Based on linear regressions with uniform weights, a bandwidth of 12 quarters, and quadratic trends in wifes' centered age on each side of the discontinuity. Control variables include year-quarter fixed effects, husbands' centered age fixed effects and quadratic trends in husbands' age.

Robust standard errors clustered at the individual level are shown in parenthesis. ***, ** and * indicate statistical significance at the 1, 5 and 10 percent significance level. AR test (p) gives the p-value of the Anderson-Rubin test.

Table 6: The effect of wife's retirement on husband's inpatient healthcare utilization

	Any disease	Mental	Physical	Cardiovascular diseases: All	Cardiovascular diseases: Heart attack	Cardiovascular diseases: Stroke
(a) Hospitalization						
Wife retired	−0.092*	−0.023**	−0.076	−0.033	−0.007	−0.011*
	(0.054)	(0.011)	(0.053)	(0.025)	(0.010)	(0.007)
AR test (p)	0.086	0.036	0.149	0.196	0.473	0.084
Mean outcome	0.086	0.002	0.084	0.016	0.002	0.001
SD outcome	0.280	0.048	0.277	0.126	0.049	0.031
(b) Length of stay						
Wife retired	−1.836***	−0.451**	−1.385**	−0.584*	−0.039	−0.257**
	(0.679)	(0.223)	(0.635)	(0.300)	(0.065)	(0.131)
AR test (p)	0.006	0.041	0.028	0.050	0.555	0.048
Mean outcome	0.660	0.036	0.623	0.120	0.013	0.012
SD outcome	3.421	1.030	3.248	1.371	0.344	0.492
(c) Expenditure						
Wife retired	−1113.148**	−144.937**	−968.211**	−378.997	−21.540	−126.910
	(499.433)	(67.420)	(492.758)	(294.401)	(96.672)	(92.102)
AR test (p)	0.025	0.030	0.048	0.197	0.824	0.167
Mean outcome	431.997	11.923	420.074	105.836	15.052	8.333
SD outcome	2757.308	323.610	2734.326	1444.700	452.680	406.278
N	319,261	319,261	319,261	319,261	319,261	319,261
N couples	17,387	17,387	17,387	17,387	17,387	17,387

Notes: Wife's retirement instrumented by wife's eligibility for early retirement. Based on linear regressions with uniform weights, a bandwidth of 12 quarters, and quadratic trends in wife's centered age on each side of the discontinuity. Control variables include year-quarter fixed effects, husband centered age fixed effects and quadratic trends in husband's age.

Robust standard errors clustered at the individual level are shown in parenthesis. ***, ** and * indicate statistical significance at the 1, 5 and 10 percent significance level. AR test (p) gives the p-value of the Anderson-Rubin test.

Table 7: The effect of husband's retirement on wife's outpatient healthcare utilization

	Drug prescriptions	Doctor visits	Health screening		
			Basic	Gyn/mam/col	Any
(a) Incidence					
Husb retired	−0.042	−0.002	0.013	−0.038	−0.004
	(0.067)	(0.062)	(0.042)	(0.065)	(0.071)
AR test (p)	0.529	0.968	0.750	0.561	0.952
Mean outcome	0.652	0.789	0.051	0.153	0.188
SD outcome	0.476	0.408	0.221	0.360	0.391
(b) Number					
Husb retired	0.396	−0.604			
	(0.580)	(0.758)			
AR test (p)	0.494	0.425			
Mean outcome	3.683	3.987			
SD outcome	5.917	4.753			
(c) Expenditure					
Husb retired	−35.678	−12.402			
	(36.813)	(20.619)			
AR test (p)	0.331	0.547			
Mean outcome	84.869	83.022			
SD outcome	368.931	135.148			
N	299,795	299,795	299,795	299,795	299,795
N couples	15,088	15,088	15,088	15,088	15,088

Notes: Husband's retirement instrumented by husband's eligibility for early retirement. Based on linear regressions with uniform weights, a bandwidth of 12 quarters, and quadratic trends in husband's centered age on each side of the discontinuity. Control variables include year-quarter fixed effects, wife's centered age fixed effects and quadratic trends in wife age. Robust standard errors clustered at the individual level are shown in parenthesis. ***, ** and * indicate statistical significance at the 1, 5 and 10 percent significance. AR test (p) gives the p-value of the Anderson-Rubin test.

Table 8: The effect of husband's retirement on wife's inpatient healthcare utilization

	Any disease	Mental health	Physical health	Cardiovascular disease Any	Heart attack	Stroke
(a) Hospitalization						
Husb retired	−0.186*	−0.021	−0.172	−0.063	−0.008	−0.009
	(0.111)	(0.025)	(0.108)	(0.040)	(0.013)	(0.008)
AR test (p)	0.086	0.406	0.106	0.107	0.520	0.245
Mean outcome	0.065	0.003	0.062	0.008	0.001	0.000
SD outcome	0.246	0.055	0.242	0.089	0.027	0.018
(b) Length of stay						
Husb retired	−0.567	−0.407	−0.160	−0.575	−0.061	−0.197
	(1.228)	(0.590)	(1.044)	(0.378)	(0.065)	(0.154)
AR test (p)	0.644	0.489	0.878	0.119	0.347	0.195
Mean outcome	0.458	0.048	0.410	0.053	0.004	0.004
SD outcome	2.703	1.204	2.413	0.887	0.185	0.278
(c) Expenditure						
Husb retired	−970.991	−107.314	−863.676	−597.188*	−38.324	−26.510
	(801.260)	(172.658)	(760.362)	(347.144)	(66.552)	(112.009)
AR test (p)	0.220	0.533	0.251	0.076	0.563	0.813
Mean outcome	267.734	15.408	252.325	37.157	3.533	2.666
SD outcome	1772.314	356.790	1734.420	876.561	251.793	198.317
N	217,928	217,928	217,928	217,928	217,928	217,928
N couples	12,643	12,643	12,643	12,643	12,643	12,643

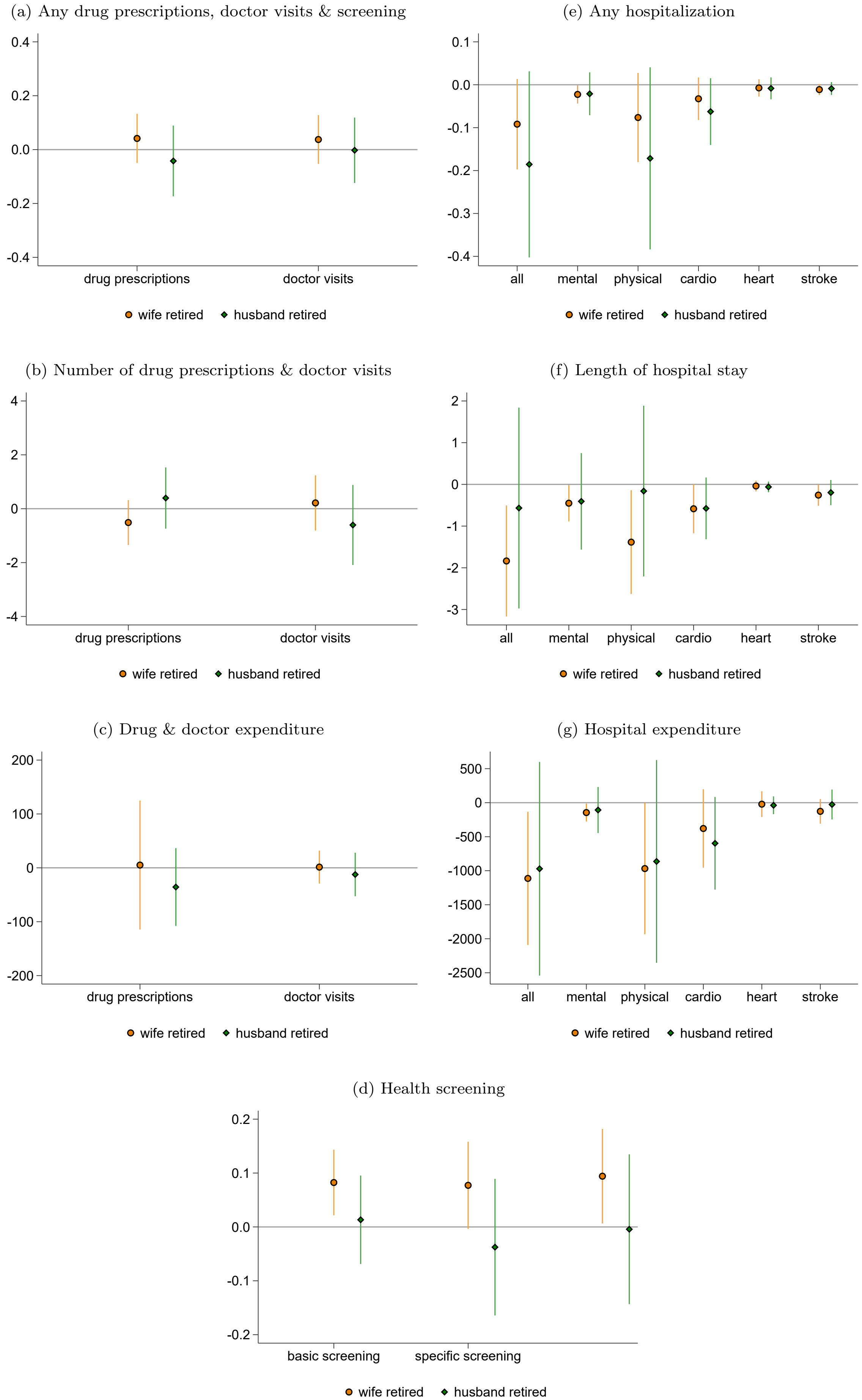
Notes: Husband's retirement instrumented by husband's eligibility for early retirement. Based on linear regressions with uniform weights, a bandwidth of 12 quarters, and quadratic trends in husband's centered age on each side of the discontinuity. Control variables include year-quarter fixed effects, wife's centered age fixed effects and quadratic trends in wife's age.
Robust standard errors clustered at the individual level are shown in parenthesis. ***, ** and * indicate statistical significance at the 1, 5 and 10 percent significance level. AR test (p) gives the p-value of the Anderson-Rubin test.

Table 9: Heterogeneity — The effect of wife's eligibility on wife's retirement

	All	0	1
Wife is employed (at age 50)	0.068***	0.057***	0.074***
	(0.003)	(0.004)	(0.004)
Mean of outcome	0.373	0.274	0.430
Wife is in labor force (at age 50)	0.068***	0.053***	0.076***
	(0.003)	(0.004)	(0.004)
Mean of outcome	0.373	0.259	0.430
Husband is employed (at age 55)	0.068***	0.099***	0.056***
	(0.003)	(0.006)	(0.003)
Mean of outcome	0.373	0.353	0.382
Husband is in labor force (at age 55)	0.068***	0.100***	0.057***
	(0.003)	(0.006)	(0.003)
Mean of outcome	0.373	0.345	0.383
Husband in disability retirement (before)	0.068***	0.066***	0.079***
	(0.003)	(0.003)	(0.007)
Mean of outcome	0.373	0.367	0.400
N	396,592	320,870	75,722
N individuals	19,400	15,766	3,634

Notes: Based on linear regressions with uniform weights, a bandwidth of 12 quarters, and quadratic trends in wife's centered age on each side of the discontinuity. Control variables include year-quarter fixed effects, husband's centered age fixed effects and quadratic trends in husband's age.
Robust standard errors clustered at the individual level are shown in parenthesis.
***, ** and * indicate statistical significance at the 1, 5 and 10 percent significance level.

Figure 5: The effect of spousal retirement on individual healthcare utilization



Notes: This figure depicts the estimated coefficients from Tables 5, 6, 7 and 8. See table notes for details.

Table 10: Heterogeneity — The effect of husbands' eligibility on husbands' retirement

	All	0	1
Husband is employed (at age 50)	0.057***	0.084***	0.033***
	(0.003)	(0.005)	(0.005)
Mean of outcome	0.702	0.765	0.649
Husband is in labor force (at age 50)	0.057***	0.081***	0.040***
	(0.003)	(0.005)	(0.005)
Mean of outcome	0.702	0.755	0.667
Wife is employed (at age 55)	0.057***	0.068***	0.044***
	(0.003)	(0.005)	(0.005)
Mean of outcome	0.702	0.727	0.673
Wife is in labor force (at age 55)	0.057***	0.066***	0.047***
	(0.003)	(0.005)	(0.005)
Mean of outcome	0.702	0.727	0.676
Wife in disability retirement (before)	0.057***	0.055***	0.076***
	(0.003)	(0.004)	(0.011)
Mean of outcome	0.702	0.696	0.770
N	299,795	276,288	23,507
N individuals	15,088	13,907	1,181

Notes: Based on linear regressions with uniform weights, a bandwidth of 12 quarters, and quadratic trends in wife's centered age on each side of the discontinuity. Control variables include year-quarter fixed effects, husband's centered age fixed effects and quadratic trends in husband's age. Robust standard errors clustered at the individual level are shown in parenthesis. ***, ** and * indicate statistical significance at the 1, 5 and 10 percent significance level.

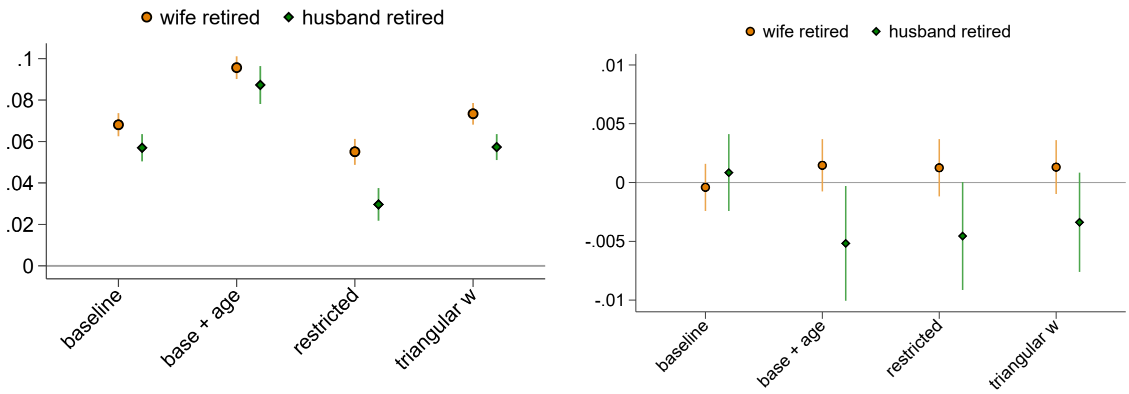
Web appendix

This Web appendix (not for publication) provides additional material discussed in the unpublished manuscript '...' by Wolfgang Frimmel and Martina Zweimüller.

A Further figures and tables

Figure A.1: Sensitivity — spousal retirement (first stage)

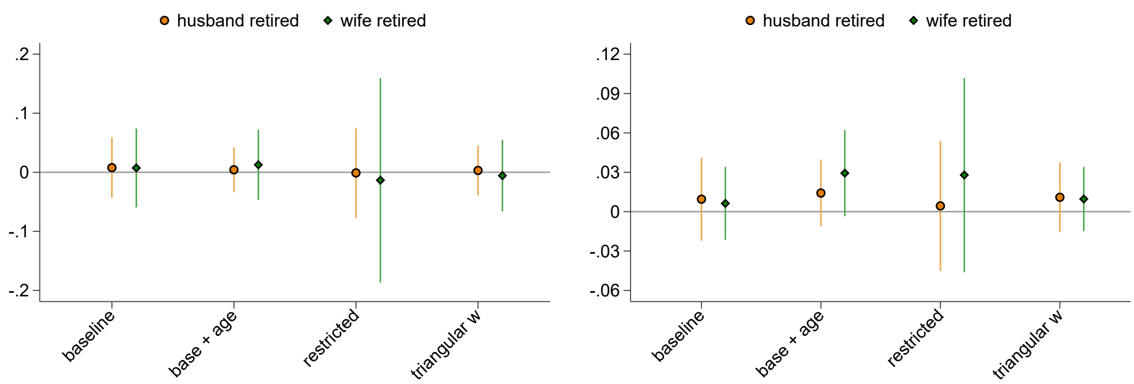
(a) Spousal retirement (first stage) (b) Spousal disability retirement (reduced form)



Notes: This figure compares the estimated coefficients for wives and husbands for different specifications or using triangular weights.

Figure A.2: Sensitivity — Individual retirement (IV)

(a) Individual retirement (b) Individual disability retirement



Notes: This figure compares the estimated coefficients for wives and husbands on own retirement or disability retirement.

Table A.1: Sensitivity bandwidth — The effect of spousal eligibility on spousal retirement (first stage)

	A. Husband sample — wife's retirement					
	full sample		+ triangular weights		restricted sample	
Wife eligible	0.068***	0.096***	0.073***	0.089***	0.055***	0.088***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
H centered age FE	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
H quadratic age	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
W age FE	*No*	*Yes*	*No*	*Yes*	*No*	*Yes*
Mean outcome	0.373	0.373	0.360	0.360	0.418	0.418
F-stat	291.0	282.3	239.9	246.6	295.5	275.9
N	396,592	396,592	396,592	396,592	319,261	319,261
N couples	19,400	19,400	19,400	19,400	17,387	17,387
	B. Wife sample — husband's retirement					
	full sample		+ triangular weights		restricted sample	
Husb eligible	0.057***	0.087***	0.057***	0.084***	0.030***	0.040
	(0.003)	(0.005)	(0.003)	(0.004)	(0.004)	(0.030)
W centered age FE	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
W quadratic age	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
H age FE	*No*	*Yes*	*No*	*Yes*	*No*	*Yes*
Mean outcome	0.702	0.702	0.722	0.722	0.702	0.702
F-stat	67.8	65.1	58.2	61.6	64.5	62.5
N	299,795	299,795	299,795	299,795	217,928	217,928
N couples	15,088	15,088	15,088	15,088	12,643	12,643

Notes: Each column shows the results of a separate linear regression with uniform weights (unless otherwise indicated), a bandwidth of 12 quarters, and quadratic trends in the spouse's centered age on either side of the discontinuity. Each specification includes year-quarter fixed effects. Further control variables: H/W centered age FE = husband/wife centered age fixed effects; H/W age FE = husband/wife age fixed effects. H/W quadratic age = quadratic trends in husband's/wife's age. The full sample includes all quarters in the period 1998-2017; the restricted sample includes all quarters in the period 2005-2017.
Robust standard errors clustered at the individual level are shown in parenthesis. ***, ** and * indicate statistical significance at the 1, 5 and 10 percent significance level.

Table A.2: Sensitivity — The effect of spousal retirement on individual retirement

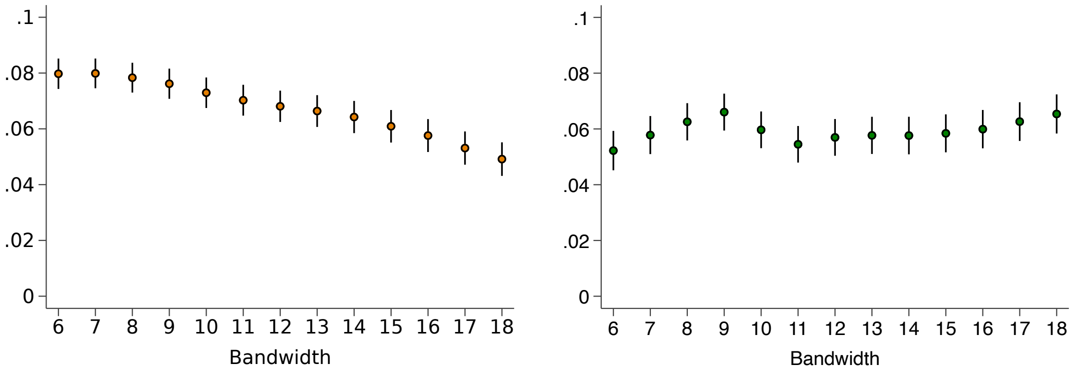
	A. Husband sample — husband's retirement					
	full sample		+ triangular weights		restricted sample	
Wife retired	0.008	0.004	0.003	−0.000	−0.001	0.004
	(0.026)	(0.019)	(0.022)	(0.019)	(0.039)	(0.026)
H centered age FE	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
H quadratic age	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
W age FE	*No*	*Yes*	*No*	*Yes*	*No*	*Yes*
AR test (p)	0.763	0.826	0.885	1.000	0.979	0.877
Mean outcome	0.528	0.528	0.534	0.534	0.560	0.560
N	396,592	396,592	396,592	396,592	319,261	319,261
N couples	19,400	19,400	19,400	19,400	17,387	17,387

	B. Wife sample — wife's retirement					
	full sample		+ triangular weights		restricted sample	
Husb retired	0.007	0.013	−0.006	−0.014	−0.013	−0.204
	(0.034)	(0.030)	(0.031)	(0.026)	(0.088)	(0.578)
W centered age FE	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
W quadratic age	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
H age FE	*No*	*Yes*	*No*	*Yes*	*No*	*Yes*
AR test (p)	0.830	0.675	0.855	0.590	0.879	0.713
Mean outcome	0.336	0.336	0.336	0.336	0.371	0.371
N	299,795	299,795	299,795	299,795	217,928	217,928
N couples	15,088	15,088	15,088	15,088	12,643	12,643

Notes: Each specification includes year-quarter fixed effects. Each column shows the results of a separate linear regression with uniform weights (unless otherwise indicated), a bandwidth of 12 quarters, and quadratic trends in the spouse's centered age on either side of the discontinuity. Spousal retirement is instrumented by spousal eligibility for early retirement. Each specification includes year-quarter fixed effects. Further control variables: H/W centered age FE = husband/wife centered age fixed effects; H/W age FE = husband/wife age fixed effects. H/W quadratic age = quadratic trends in husband's/wife's age. The full sample includes all quarters in the period 1998-2017; the restricted sample includes all quarters in the period 2005-2017.
Robust standard errors clustered at the individual level are shown in parenthesis. ***, ** and * indicate statistical significance at the 1, 5 and 10 percent significance level.

Figure A.3: Sensitivity bandwidth — spousal retirement (first stage)

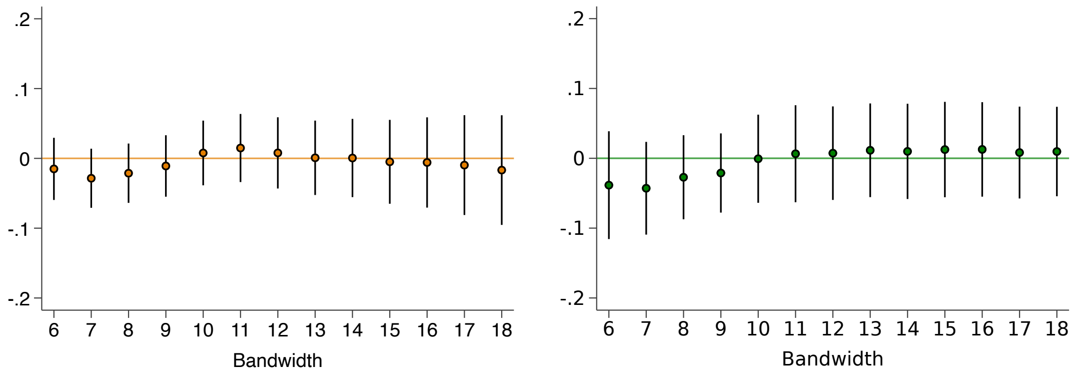
(a) Wife is spouse (b) Husband is spouse



Notes: Panel (a) shows first-stage coefficients for wife's (Panel (b) for husband) retirement using different bandwidth

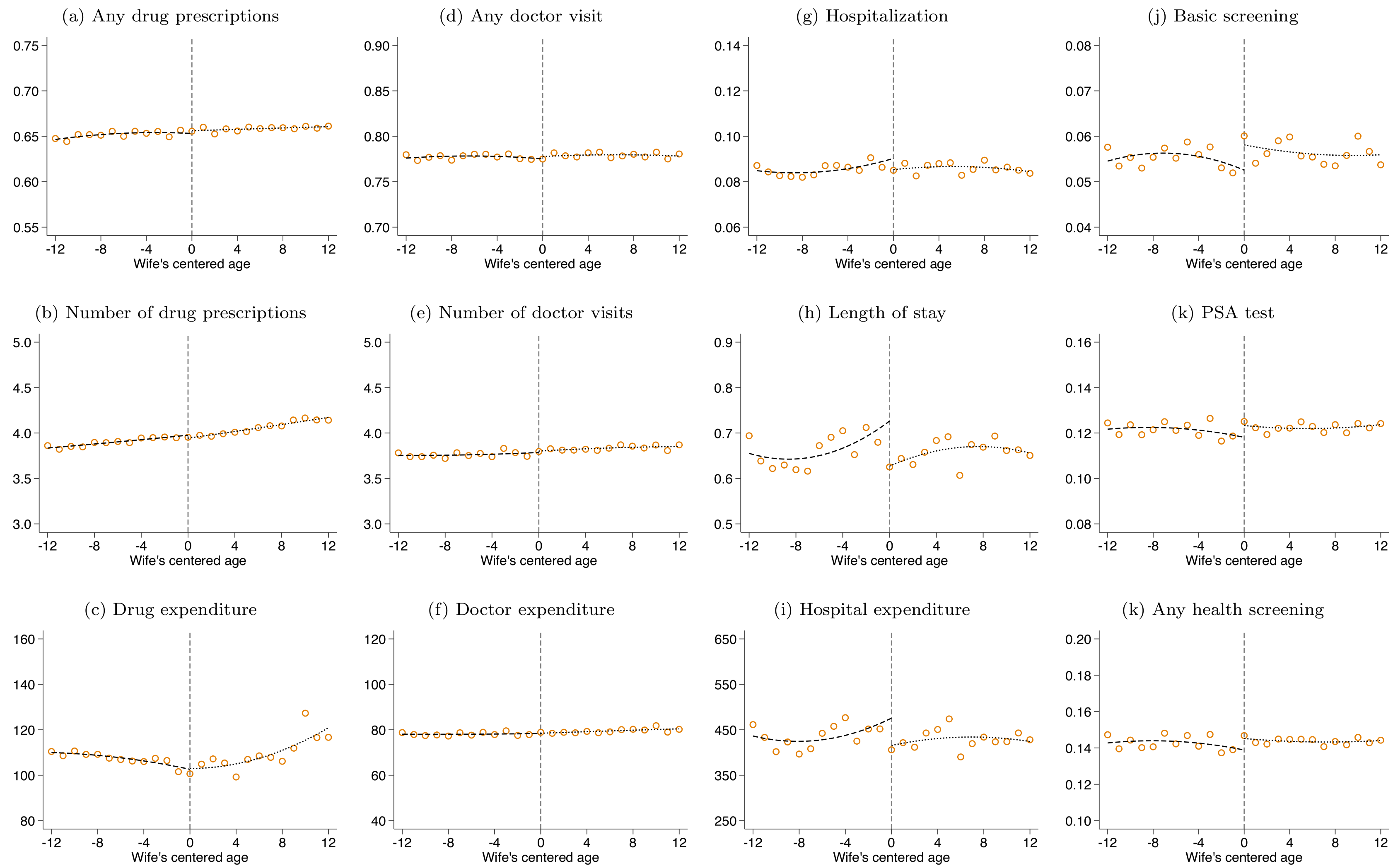
Figure A.4: Sensitivity bandwidth — individual retirement (IV)

(a) Wife is spouse (b) Husband is spouse



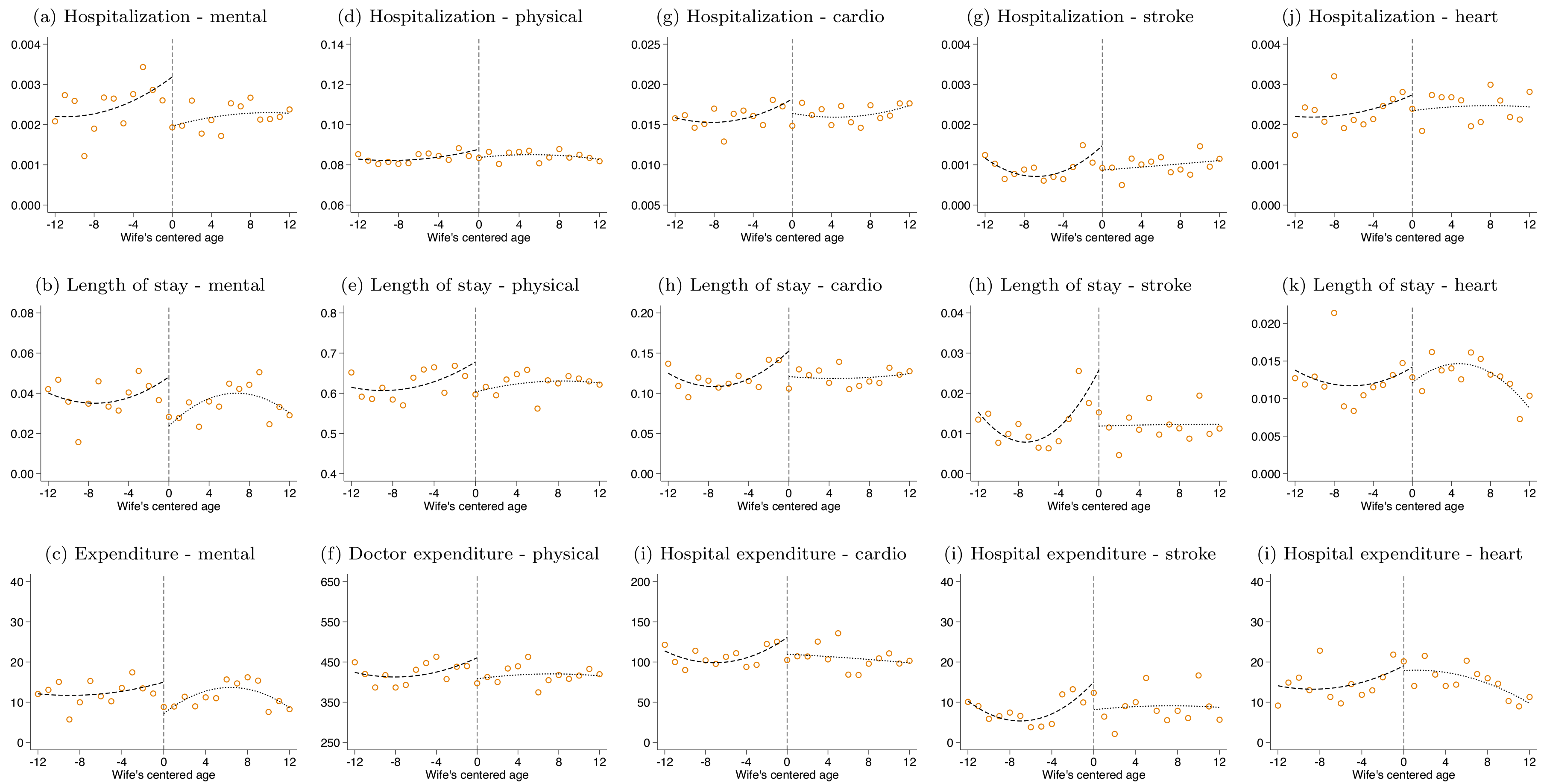
Notes: Panel (a) shows estimates for joint retirement behavior using different bandwidth

Figure A.5: Husbands' healthcare utilization (reduced form)



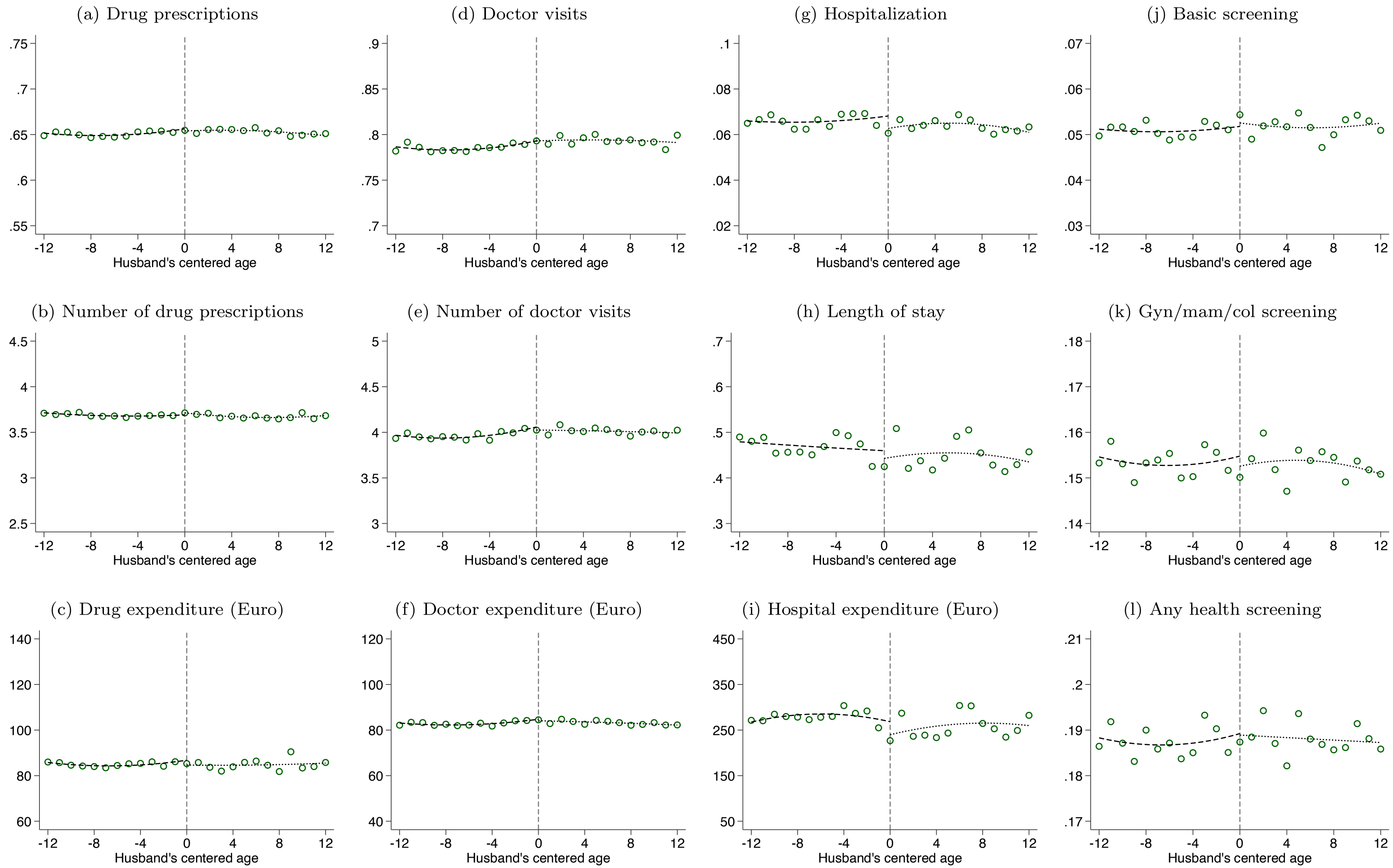
Notes: Outcomes are residualized and adding the mean of the outcome variable

Figure A.6: Husbands healthcare utilization (reduced form) — disaggregated



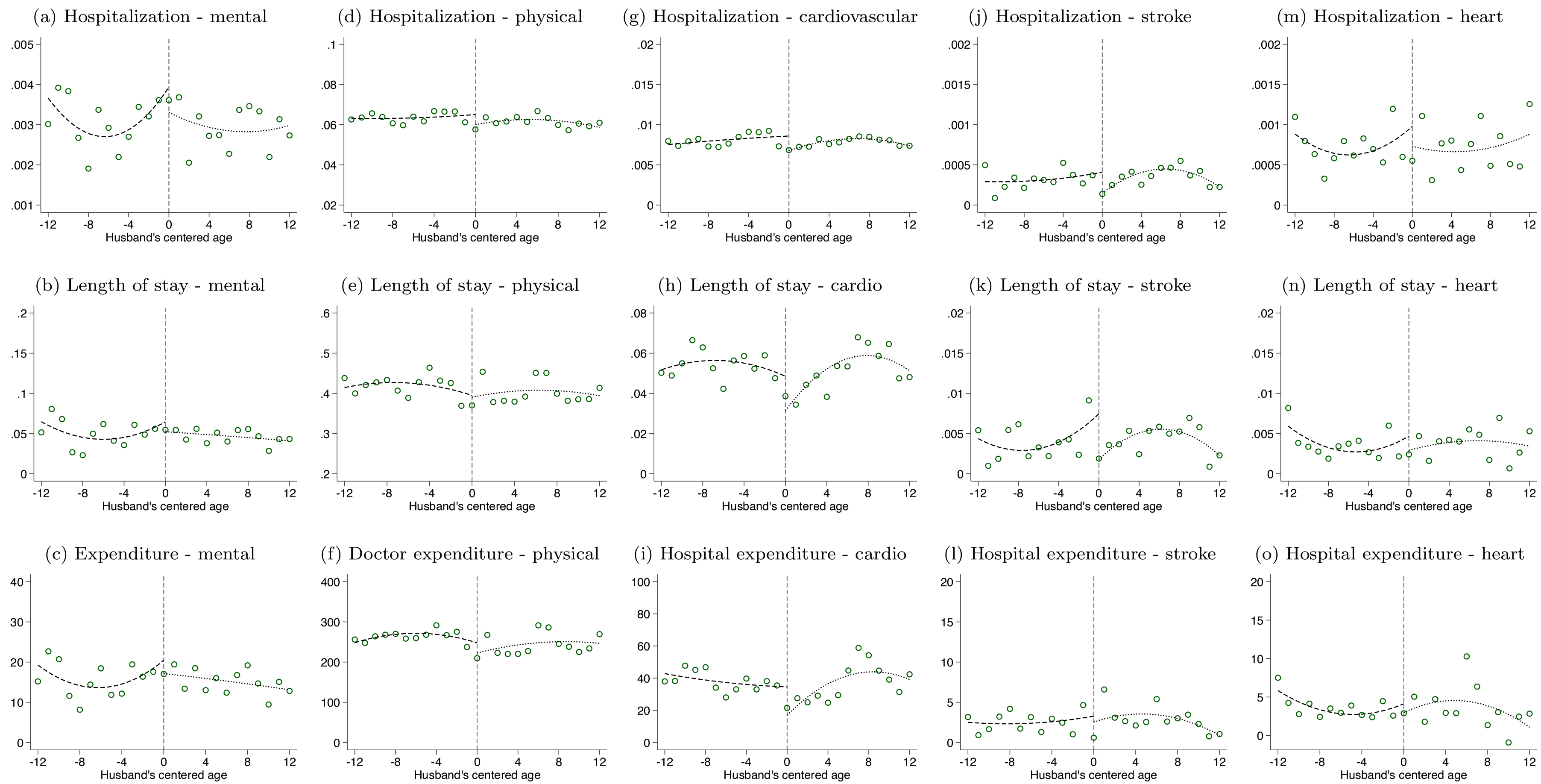
Notes: Outcomes are residualized and adding the mean of the outcome variable

Figure A.7: Wifes' healthcare utilization (reduced form)



Notes: Outcomes are residualized and adding the mean of the outcome variable

Figure A.8: Wifes' healthcare utilization (reduced form) — disaggregated



Notes: Outcomes are residualized and adding the mean of the outcome variable

Figure A.9: Sensitivity — The effect of wifes' retirement on husbands' healthcare utilization

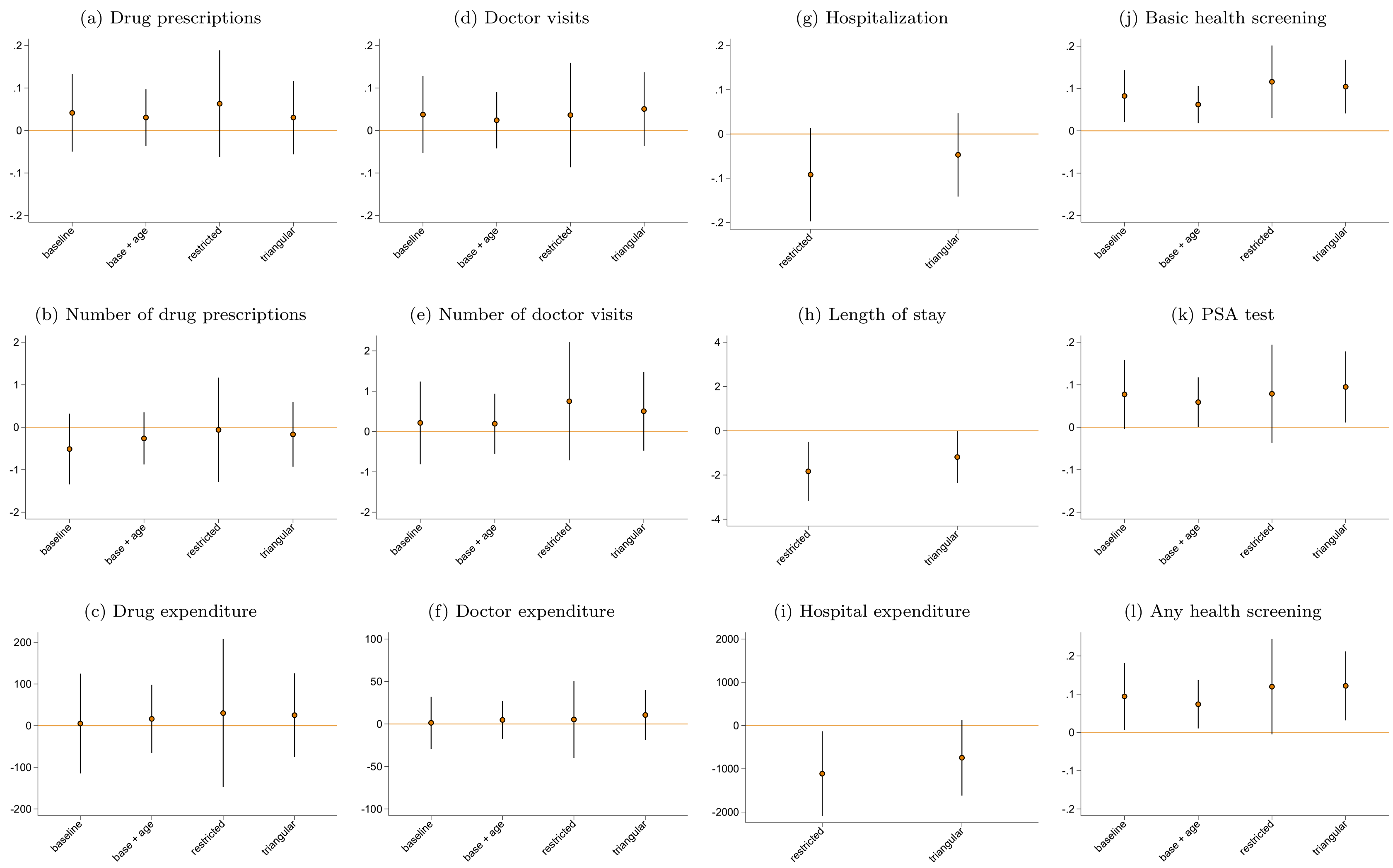
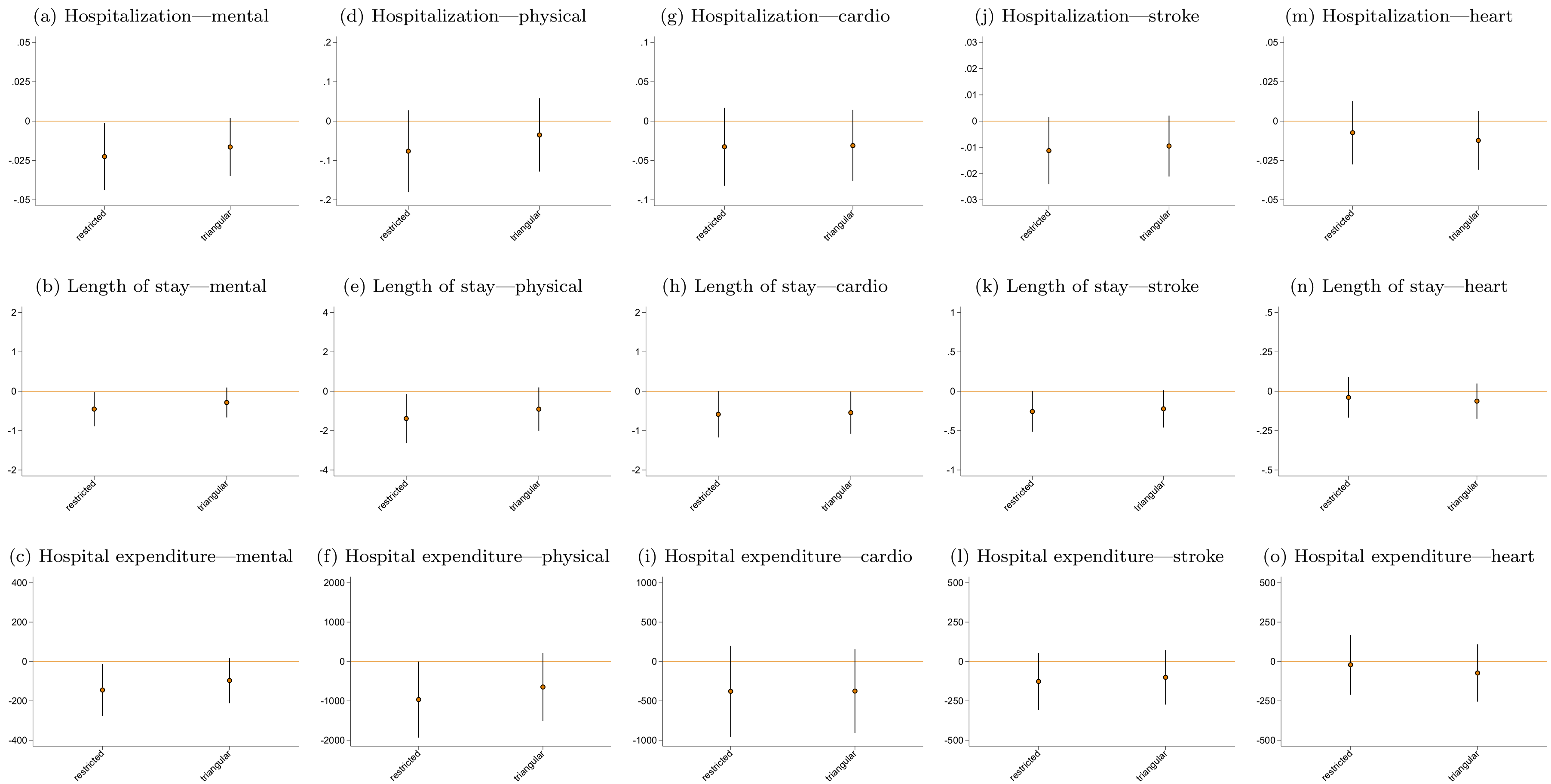


Figure A.10: Sensitivity bandwidth — The effect of wifes' retirement on husbands' healthcare utilization (disaggregated)



(a) Hospitalization—mental

(d) Hospitalization—physical

(g) Hospitalization—cardio

(j) Hospitalization—stroke

(m) Hospitalization—heart

(b) Length of stay—mental

(e) Length of stay—physical

(h) Length of stay—cardio

(k) Length of stay—stroke

(n) Length of stay—heart

(c) Hospital expenditure—mental

(f) Hospital expenditure—physical

(i) Hospital expenditure—cardio

(l) Hospital expenditure—stroke

(o) Hospital expenditure—heart

Figure A.11: Sensitivity — The effect of husbands' retirement on wifes' healthcare utilization

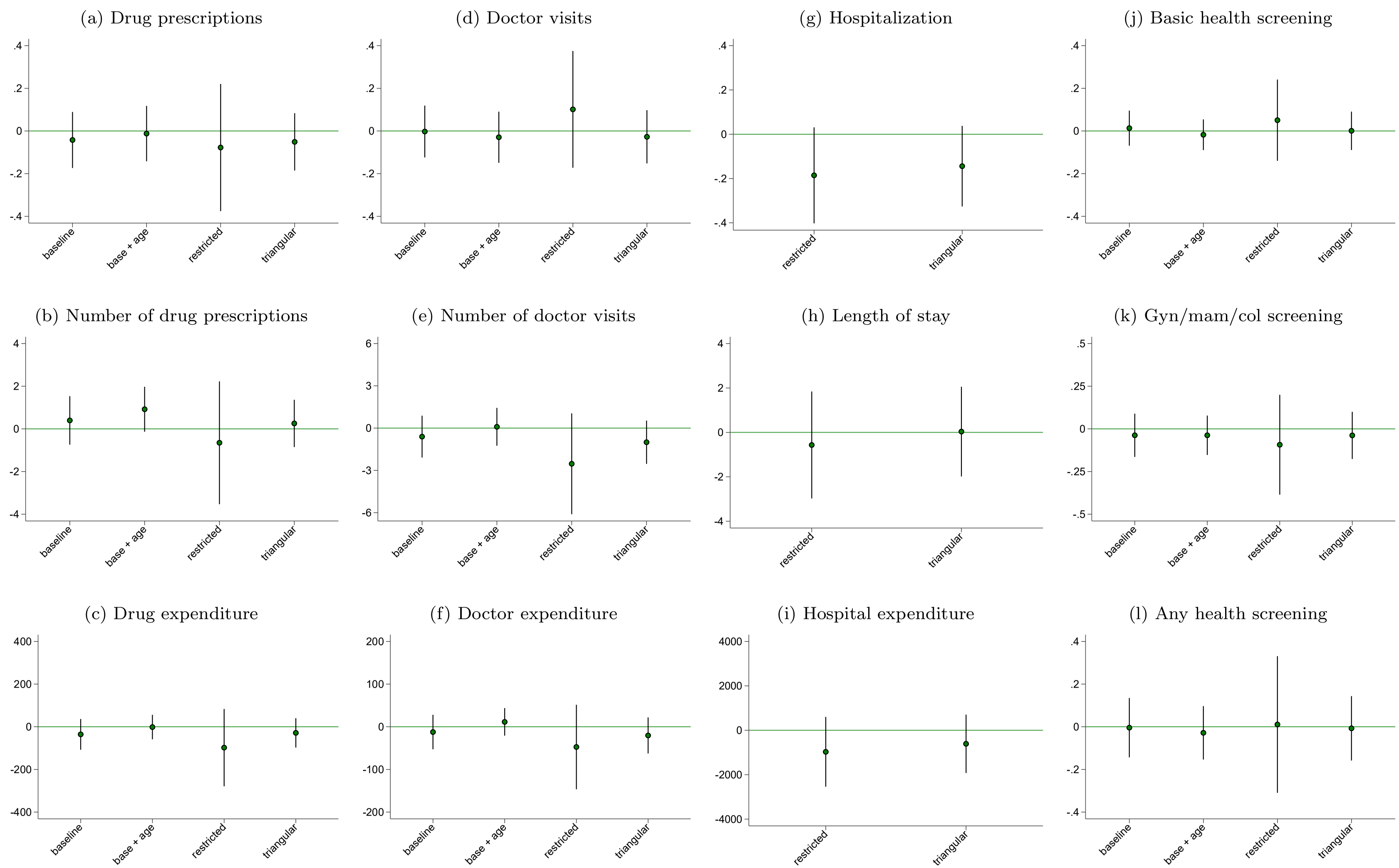


Figure A.12: Sensitivity bandwidth — The effect of husbands' retirement on wifes' healthcare utilization (disaggregated)

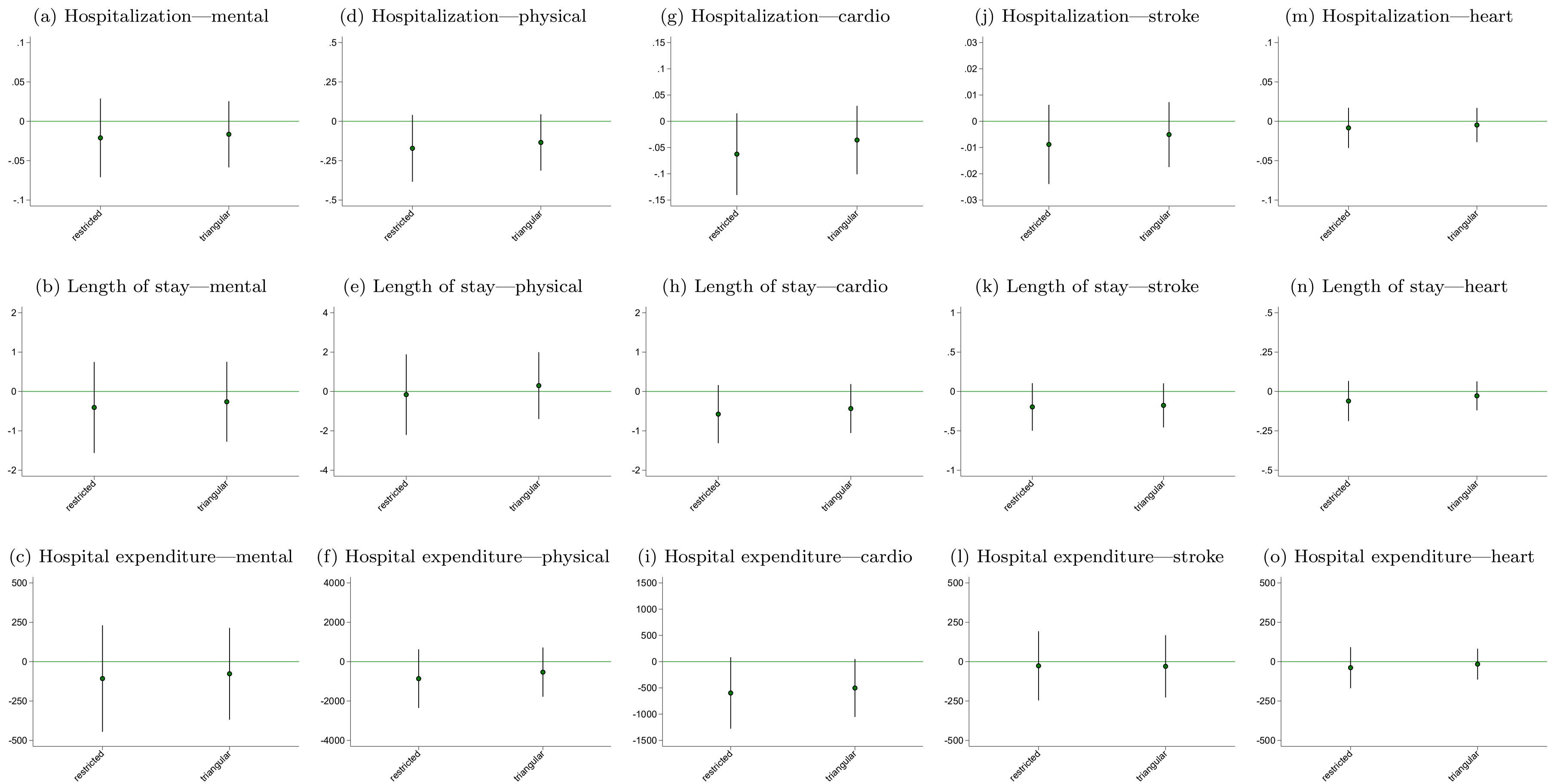
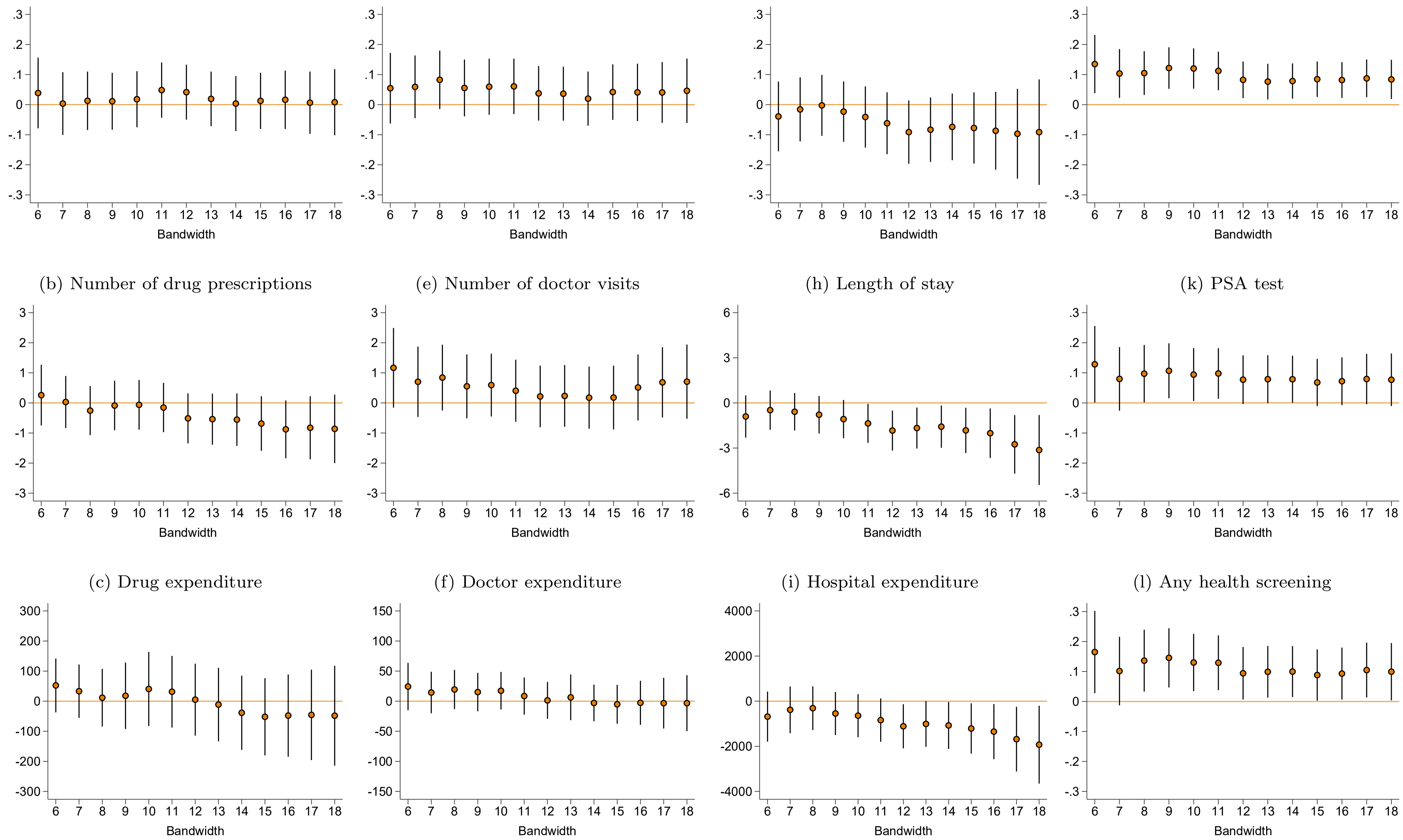


Figure A.13: Sensitivity bandwidth — The effect of wifes' retirement on husbands' healthcare utilization



(a) Drug prescriptions

(b) Number of drug prescriptions

(c) Drug expenditure

(d) Doctor visits

(e) Number of doctor visits

(f) Doctor expenditure

(g) Hospitalization

(h) Length of stay

(i) Hospital expenditure

(j) Basic health screening

(k) PSA test

(l) Any health screening

Figure A.14: Sensitivity bandwidth — The effect of wifes' retirement on husbands' healthcare utilization (disaggregated)

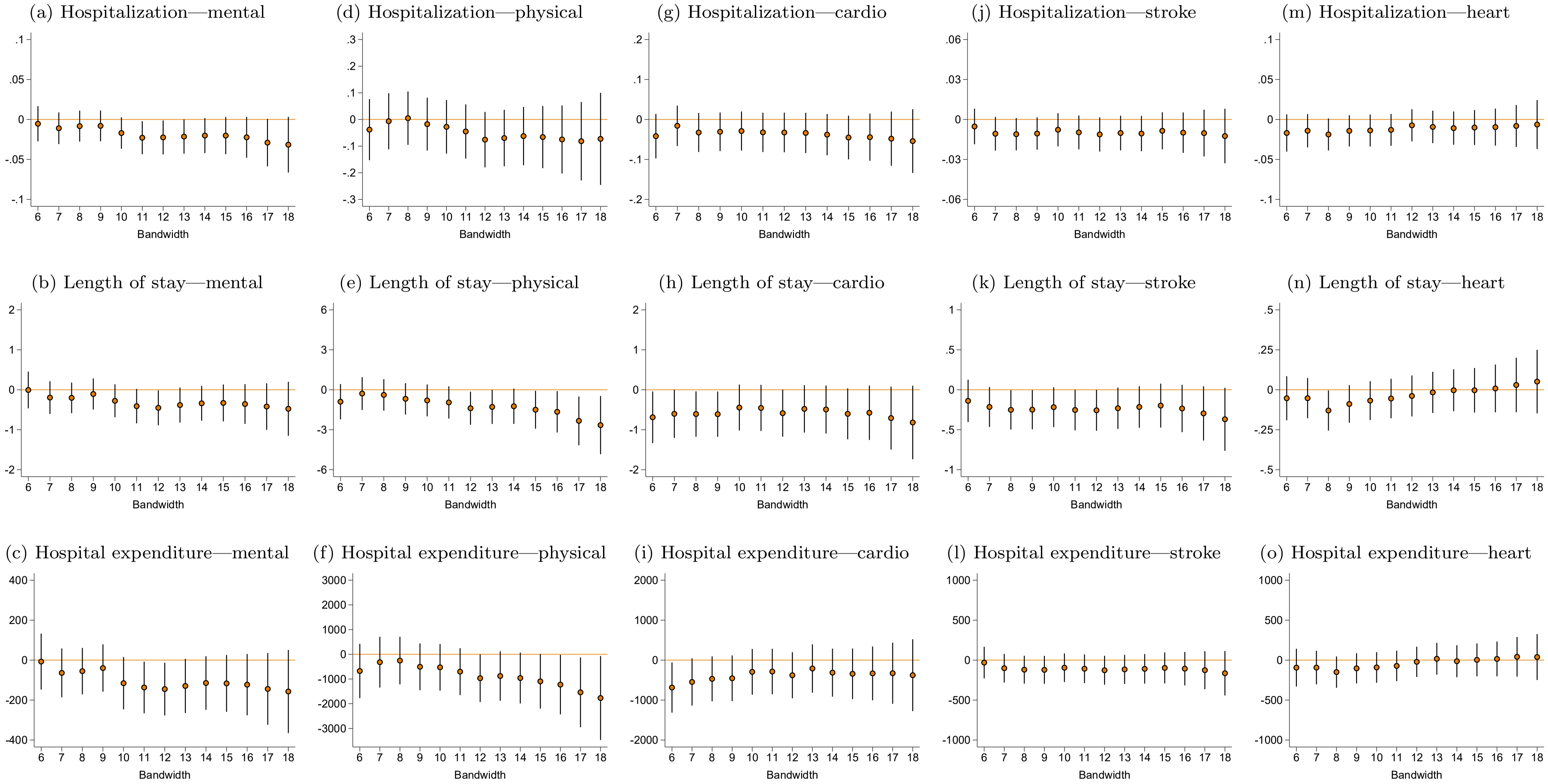
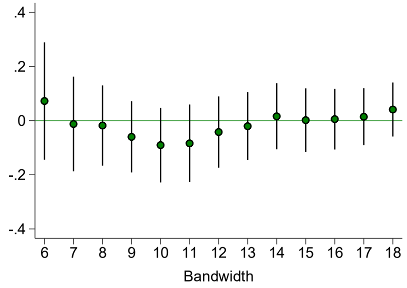
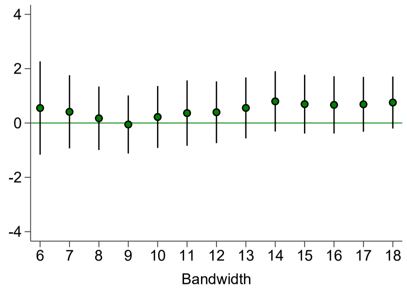


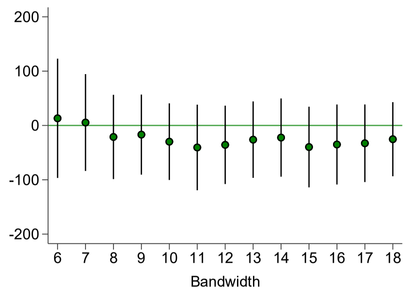
Figure A.15: Sensitivity bandwidth — The effect of husbands' retirement on wifes' healthcare utilization



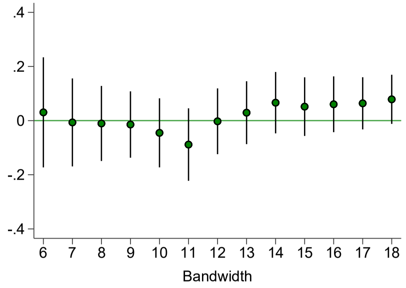
(a) Drug prescriptions



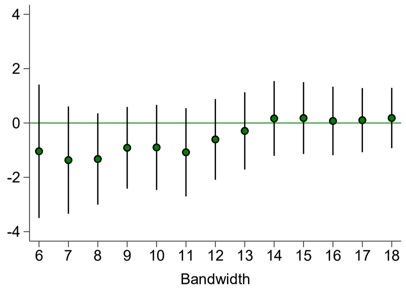
(b) Number of drug prescriptions



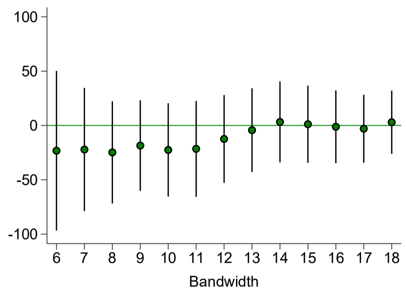
(c) Drug expenditure



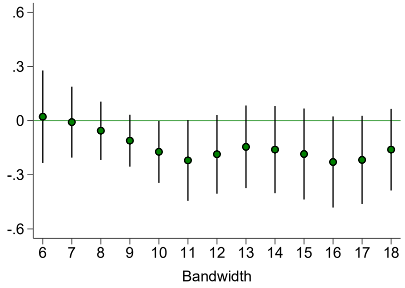
(d) Doctor visits



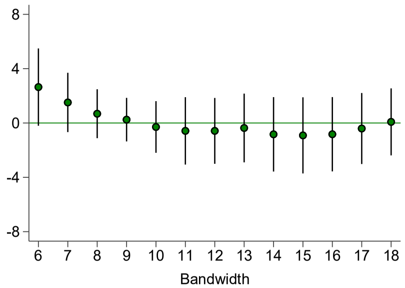
(e) Number of doctor visits



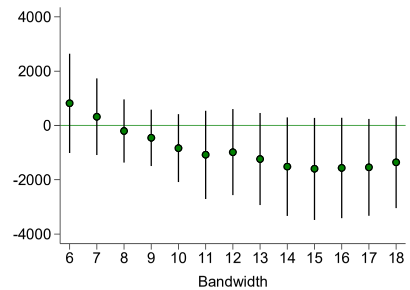
(f) Doctor expenditure



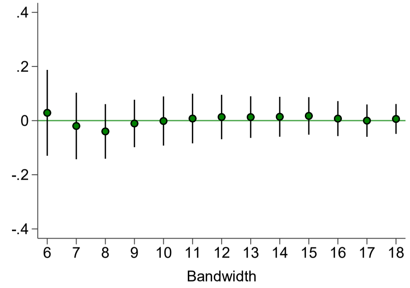
(g) Hospitalization



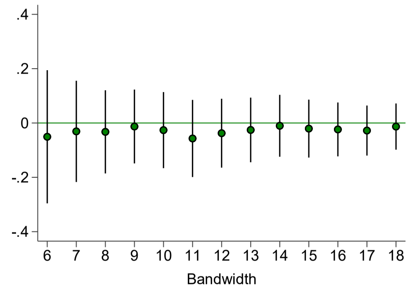
(h) Length of stay



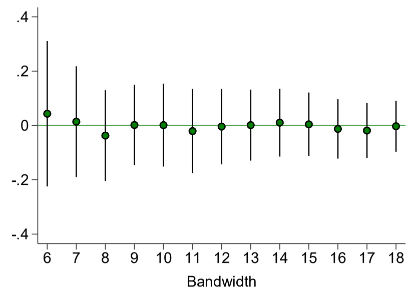
(i) Inpatient expenditure



(j) Basic health screening



(k) Gyn/man/col screening



(k) Any health screening

Figure A.16: Sensitivity bandwidth — The effect of husbands' retirement on wifes' healthcare utilization (disaggregated)

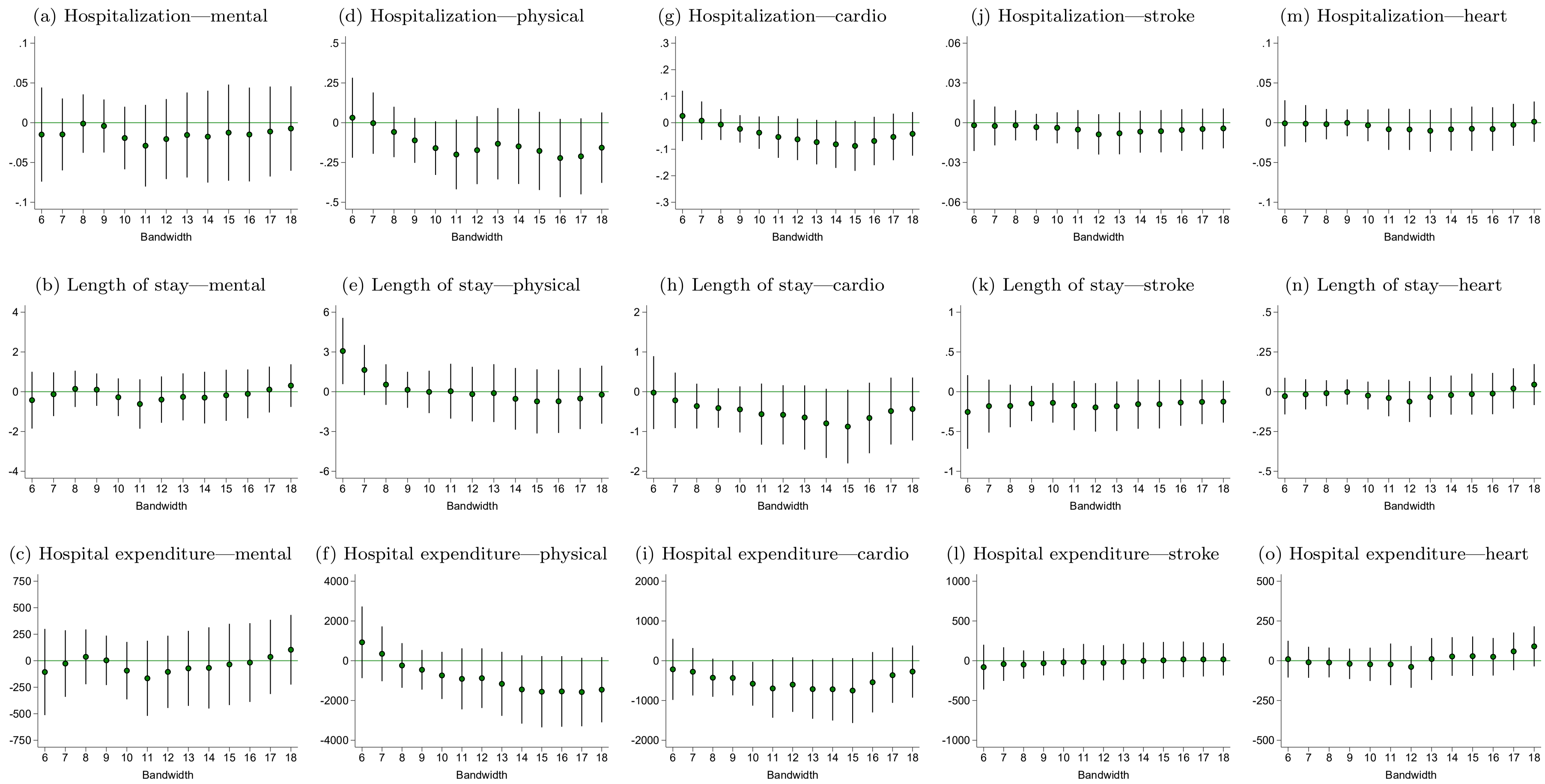
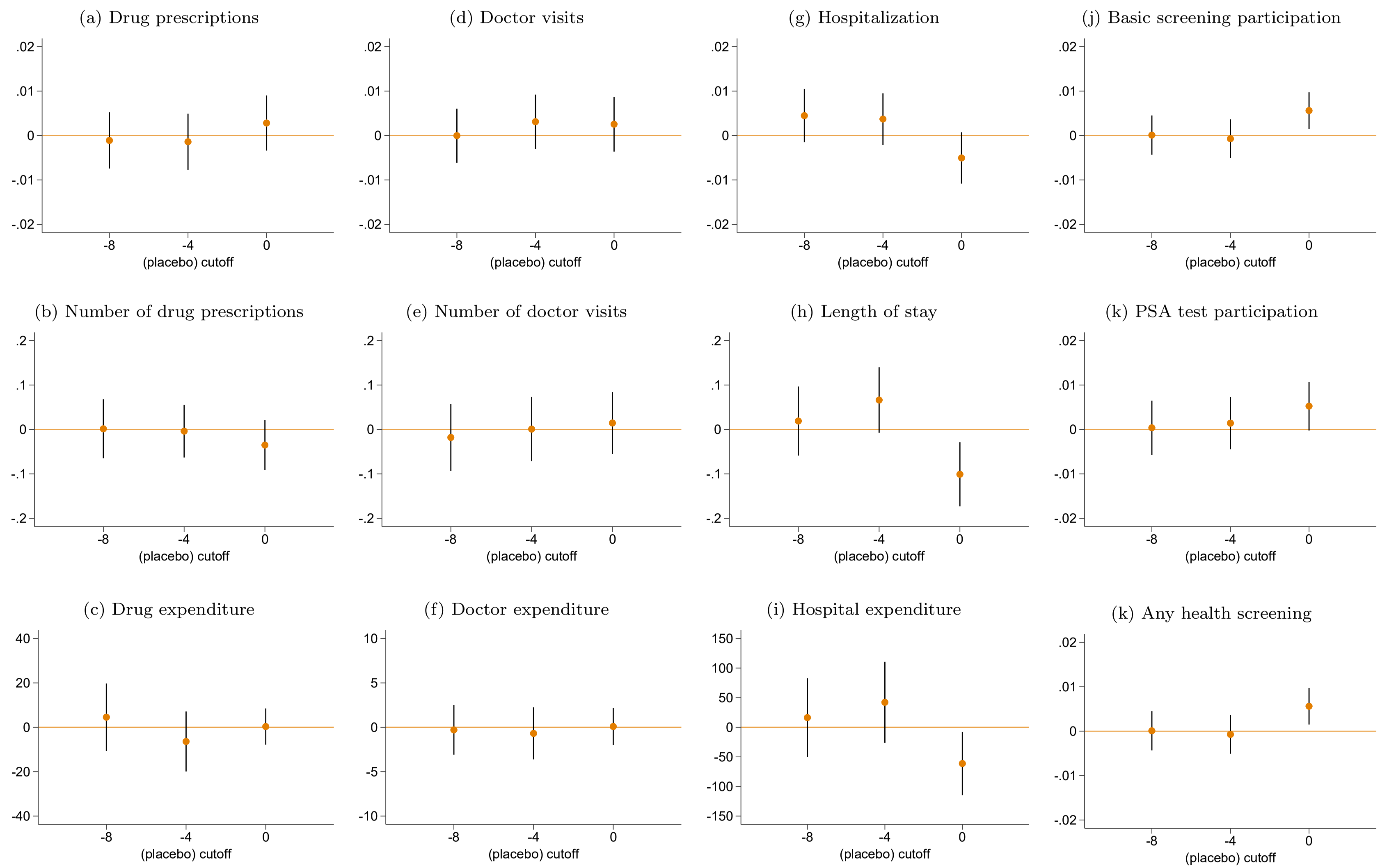
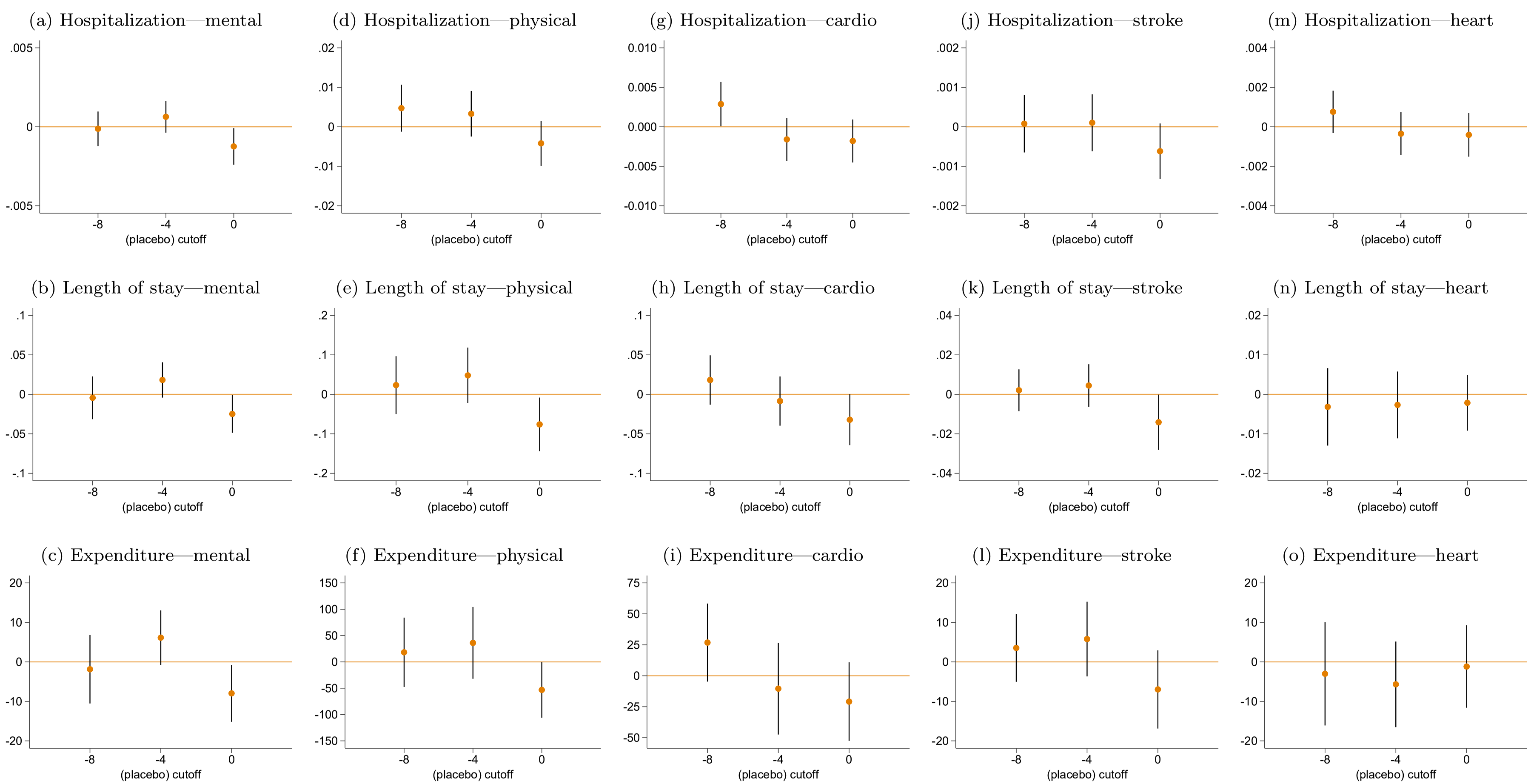


Figure A.17: Sensitivity placebo cutoffs — The effect of wifes' eligibility on husbands' healthcare utilization



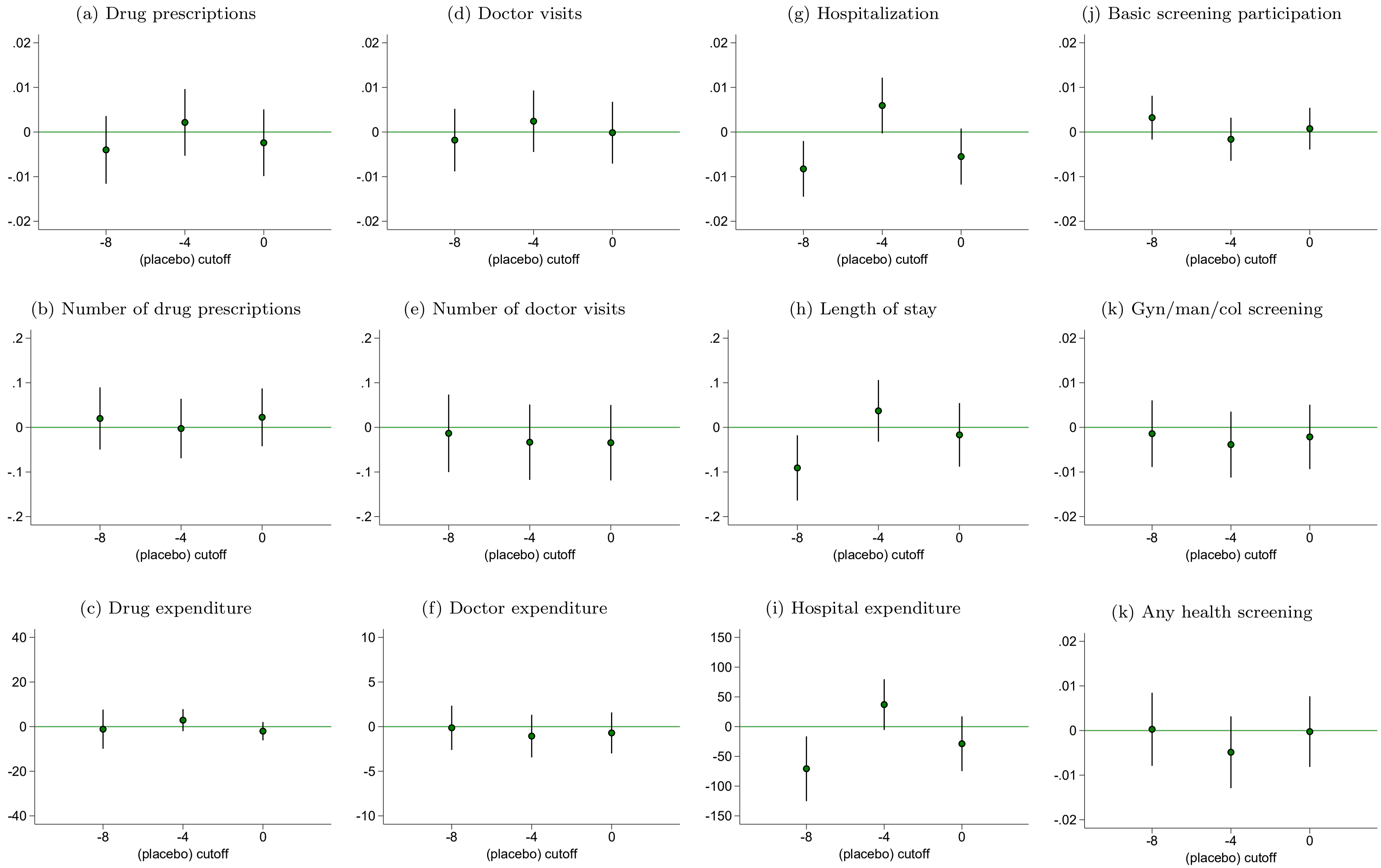
Notes: Regressions with placebo cutoffs set at 8 quarters and 4 quarters before the actual cutoff.

Figure A.18: Sensitivity placebo cutoffs — The effect of wifes' eligibility on husbands' healthcare utilization (disaggregated)



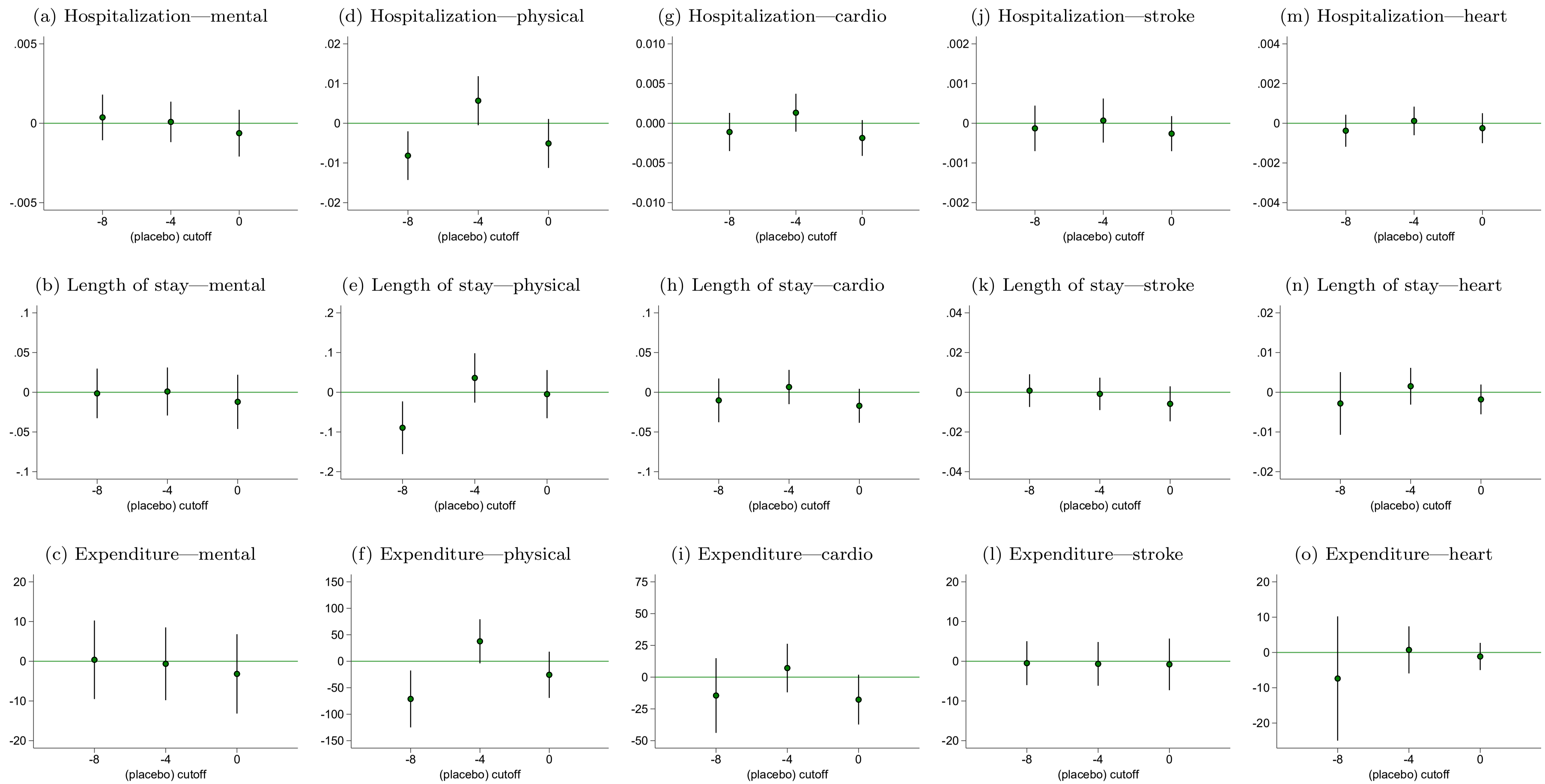
Notes: Regressions with placebo cutoffs set at 8 quarters and 4 quarters before the actual cutoff.

Figure A.19: Sensitivity placebo cutoffs — The effect of husbands' eligibility on wifes' healthcare utilization



Notes: Regressions with placebo cutoffs set at 8 quarters and 4 quarters before the actual cutoff.

Figure A.20: Sensitivity placebo cutoffs — The effect of husbands' eligibility on wifes' healthcare utilization (disaggregated)

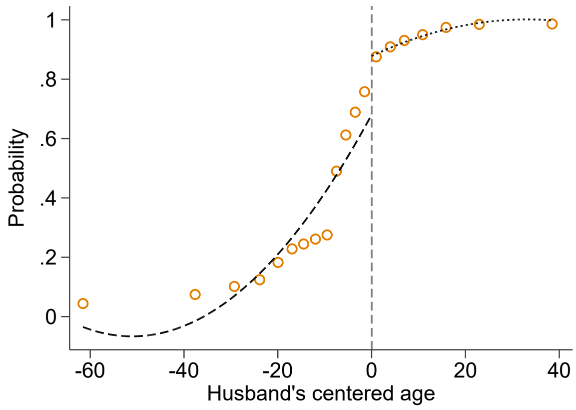


Notes: Regressions with placebo cutoffs set at 8 quarters and 4 quarters before the actual cutoff.

B Joint retirement

Figure B.1: The effect of individual eligibility on individual retirement (first stage)

(a) Husband



(b) Wife

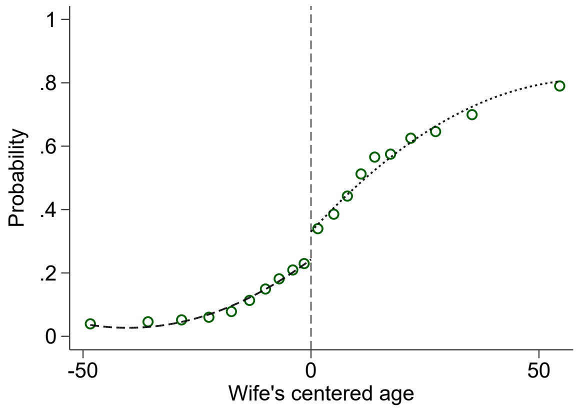


Table B.1: **The effect of eligibility on retirement (first stages)**

	A. Husband sample — retirement		**B. Wife sample** — retirement	
	wife	husband	wife	husband
(a) Full sample				
Wife eligible	0.068***	0.000	0.061***	0.001
	(0.003)	(0.002)	(0.008)	(0.008)
Husb eligible	0.025***	0.166***	0.000	0.057***
	(0.006)	(0.005)	(0.002)	(0.003)
Mean outcome	0.373	0.528	0.336	0.702
F-stat	648.9	784.6	146.4	156.2
N	396,592	396,592	299,795	299,795
N couples	19,400	19,400	15,088	15,088
(b) Restricted sample				
Wife eligible	0.055***	−0.001	0.046***	0.000
	(0.003)	(0.002)	(0.008)	(0.008)
Husb eligible	0.020***	0.113***	−0.000	0.029***
	(0.006)	(0.005)	(0.003)	(0.004)
Mean outcome	0.418	0.560	0.371	0.702
F-stat	763.6	868.1	185.3	184.8
N	319,261	319,261	217,928	217,928
N couples	17,387	17,387	12,643	12,643

Notes: Each column shows the results of a separate linear regression with uniform weights, a bandwidth of 12 quarters, and quadratic trends in individual's and spouse's centered age on either side of the discontinuity. Control variables include year-quarter fixed effects and quadratic trends in individual age. The sample includes all quarters in the period 1998-2017 (full sample).
Robust standard errors clustered at the individual level are shown in parenthesis. ***, ** and * indicate statistical significance at the 1, 5 and 10 percent significance level.

Table B.2: The effect of wife's and husband's retirement on husband's outpatient healthcare utilization

	Drug prescriptions	Doctor visits	Health screening		
			Basic	PSA test	Any
(a) Incidence					
Wife retired	0.064	0.040	0.117***	0.080	0.121*
	(0.064)	(0.063)	(0.044)	(0.059)	(0.064)
Husb retired	0.001	−0.019	−0.002	−0.045*	−0.038
	(0.047)	(0.039)	(0.017)	(0.026)	(0.028)
AR test (p)	0.583	0.777	0.012	0.156	0.125
Mean outcome	0.678	0.800	0.057	0.131	0.152
SD outcome	0.467	0.400	0.233	0.338	0.359
(b) Number					
Wife retired	−0.052	0.783			
	(0.627)	(0.746)			
Husb retired	−0.356	−0.576			
	(0.683)	(0.462)			
AR test (p)	0.864	0.355			
Mean outcome	4.223	3.997			
SD outcome	6.389	4.654			
(c) Expenditure					
Wife retired	31.702	6.095			
	(90.614)	(23.069)			
Husb retired	−17.366	−16.247			
	(85.090)	(13.101)			
AR test (p)	0.933	0.460			
Mean outcome	118.206	85.527			
SD outcome	694.499	133.506			
N	319,261	319,261	319,261	319,261	319,261
N couples	17,387	17,387	17,387	17,387	17,387

Notes: Wife's retirement instrumented by wife's eligibility for early retirement and husband's retirement instrumented by husband's eligibility. Based on linear regressions with uniform weights, a bandwidth of 12 quarters, and quadratic trends in wife's centered age and husband's centered age on each side of the discontinuity. Control variables include year-quarter fixed effects and quadratic trends in husband's age.
Robust standard errors clustered at the individual level are shown in parenthesis. ***, ** and * indicate statistical significance at the 1, 5 and 10 percent significance. AR test (p) gives the p-value of the Anderson-Rubin test for the coefficient of wife's retirement.

Table B.3: The effect of wife's and husband's retirement on husband's inpatient health-care utilization

	Any disease	Mental disease	Physical disease	Cardiovascular Any	Cardiovascular Heart attack	Cardiovascular Stroke
(a) Hospitalization						
Wife retired	−0.091*	−0.023**	−0.075	−0.032	−0.008	−0.011*
	(0.054)	(0.011)	(0.053)	(0.025)	(0.010)	(0.007)
Husb retired	−0.001	0.004	−0.003	−0.008	−0.004	0.003
	(0.026)	(0.005)	(0.026)	(0.011)	(0.004)	(0.003)
AR test (p)	0.187	0.102	0.289	0.170	0.204	0.216
Mean outcome	0.086	0.002	0.084	0.016	0.002	0.001
SD outcome	0.280	0.048	0.277	0.126	0.049	0.031
(b) Length of stay						
Wife retired	−1.818***	−0.450**	−1.368**	−0.573*	−0.040	−0.255*
	(0.678)	(0.223)	(0.634)	(0.300)	(0.065)	(0.131)
Husb retired	0.046	0.072	−0.026	0.050	−0.026	0.028
	(0.345)	(0.100)	(0.321)	(0.117)	(0.025)	(0.042)
AR test (p)	0.016	0.123	0.057	0.139	0.306	0.139
Mean outcome	0.660	0.036	0.623	0.120	0.013	0.012
SD outcome	3.421	1.030	3.248	1.371	0.344	0.492
(c) Expenditure						
Wife retired	−1101.117**	−145.058**	−956.059*	−375.589	−23.055	−126.364
	(498.524)	(67.331)	(491.862)	(294.276)	(96.413)	(92.618)
Husb retired	−139.177	27.632	−166.809	−78.127	−54.062	−0.441
	(272.188)	(31.077)	(268.015)	(123.671)	(34.662)	(33.906)
AR test (p)	0.025	0.093	0.044	0.163	0.151	0.286
Mean outcome	431.997	11.923	420.074	105.836	15.052	8.333
SD outcome	2757.308	323.610	2734.326	1444.700	452.680	406.278
N	319,261	319,261	319,261	319,261	319,261	319,261
N couples	17,387	17,387	17,387	17,387	17,387	17,387

Notes: Wife's retirement instrumented by wife's eligibility for early retirement and husband's retirement instrumented by husband's eligibility. Based on linear regressions with uniform weights, a bandwidth of 12 quarters, and quadratic trends in wife's centered age and husband's centered age on each side of the discontinuity. Control variables include year-quarter fixed effects and quadratic trends in husband's age.
Robust standard errors clustered at the individual level are shown in parenthesis. ***, ** and * indicate statistical significance at the 1, 5 and 10 percent significance. AR test (p) gives the p-value of the Anderson-Rubin test for the coefficient of wife's retirement.

Table B.4: The effect of husband's and wife's retirement on wife's outpatient healthcare utilization

	Drug prescriptions	Doctor visits	Health screening: Basic	Health screening: Gyn/mam/col	Health screening: Any
(a) Incidence					
Husb retired	−0.042	−0.003	0.015	−0.038	−0.004
	(0.067)	(0.062)	(0.042)	(0.065)	(0.071)
Wife retired	0.166	0.135	0.009	0.120**	0.130**
	(0.105)	(0.088)	(0.029)	(0.055)	(0.061)
AR test (p)	0.233	0.309	0.897	0.071	0.087
Mean outcome	0.652	0.789	0.051	0.153	0.188
SD outcome	0.476	0.408	0.221	0.360	0.391
(b) Number					
Husb retired	0.385	−0.597			
	(0.583)	(0.759)			
Wife retired	1.809	1.200			
	(1.444)	(1.015)			
AR test (p)	0.358	0.367			
Mean outcome	3.683	3.987			
SD outcome	5.917	4.753			
(c) Expenditure					
Husb retired	−33.002	−11.999			
	(36.309)	(20.699)			
Wife retired	−22.408	44.020			
	(96.671)	(26.898)			
AR test (p)	0.625	0.206			
Mean outcome	84.869	83.022			
SD outcome	368.931	135.148			
N	299,795	299,795	299,795	299,795	299,795
N couples	15,088	15,088	15,088	15,088	15,088

Notes: Wife's retirement instrumented by wife's eligibility for early retirement and husband's retirement instrumented by husband's eligibility. Based on linear regressions with uniform weights, a bandwidth of 12 quarters, and quadratic trends in wife's centered age and husband's centered age on each side of the discontinuity. Control variables include year-quarter fixed effects and quadratic trends in wife's age.
Robust standard errors clustered at the individual level are shown in parenthesis. ***, ** and * indicate statistical significance at the 1, 5 and 10 percent significance level based on Anderson-Rubin test.

Table B.5: The effect of husband's and wife's retirement on wife's inpatient healthcare utilization

	Any disease	Mental disease	Physical disease	Cardiovascular disease: Any	Cardiovascular disease: Heart attack	Cardiovascular disease: Stroke
(a) Hospitalization						
Husb retired	−0.185*	−0.021	−0.171	−0.063	−0.008	−0.009
	(0.111)	(0.026)	(0.109)	(0.040)	(0.013)	(0.008)
Wife retired	−0.044	−0.026	−0.026	−0.037	−0.002	−0.000
	(0.076)	(0.016)	(0.073)	(0.025)	(0.006)	(0.004)
AR test (p)	0.186	0.172	0.253	0.059	0.745	0.519
Mean outcome	0.065	0.003	0.062	0.008	0.001	0.000
SD outcome	.246	.0547	.242	.0886	.0269	.0183
(b) Length of stay						
Husb retired	−0.565	−0.415	−0.150	−0.578	−0.059	−0.197
	(1.238)	(0.596)	(1.049)	(0.382)	(0.065)	(0.156)
Wife retired	−1.137	−0.613*	−0.524	−0.424*	−0.017	0.021
	(0.772)	(0.340)	(0.652)	(0.248)	(0.031)	(0.054)
AR test (p)	0.257	0.118	0.700	0.050	0.507	0.337
Mean outcome	0.458	0.048	0.410	0.053	0.004	0.004
SD outcome	2.7	1.2	2.41	.887	.185	.278
(c) Expenditure						
Husb retired	−962.595	−110.251	−852.345	−597.771*	−36.410	−26.273
	(806.653)	(173.962)	(764.693)	(352.638)	(66.447)	(113.470)
Wife retired	−655.668	−140.298	−515.370	−497.359	−24.082	31.103
	(594.666)	(93.253)	(574.213)	(337.194)	(30.482)	(31.289)
AR test (p)	0.247	0.230	0.349	0.144	0.504	0.469
Mean outcome	267.734	15.408	252.325	37.157	3.533	2.666
SD outcome	1772	357	1734	877	252	198
N	217,928	217,928	217,928	217,928	217,928	217,928
N couples	12,643	12,643	12,643	12,643	12,643	12,643

Notes: Wife's retirement instrumented by wife's eligibility for early retirement and husband's retirement instrumented by husband's eligibility. Based on linear regressions with uniform weights, a bandwidth of 12 quarters, and quadratic trends in wife's centered age and husband's centered age on each side of the discontinuity. Control variables include year-quarter fixed effects and quadratic trends in wife's age effects.

Robust standard errors clustered at the individual level are shown in parenthesis. ***, ** and * indicate statistical significance at the 1, 5 and 10 percent significance level based on Anderson-Rubin test.