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Joint Retirement Decisions of Married Couples and their Effect on Food Expenditure

By

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Abstract

We examine whether husband's and wife's retirement decisions are interrelated, and whether they are positively related due to leisure complementarity or negatively related due to liquidity constraints, using SHARE survey data for Israel. We subsequently study the effects of those retirement decisions on food expenditures. To deal with the endogeneity of retirement choices, we use the legal retirement date of each spouse as an instrument for actual retirement. The 2004 retirement age reform which was applied gradually by an individual's month of birth, provides substantial heterogeneity in the legal retirement date for individuals in our sample. For dual income households, we found that the likelihood of both male and female individuals to retire increases with the retirement of their spouse, supporting the leisure complementarity hypothesis. In addition, husband's retirement reduced expenditure on food, while wife's retirement had no significant effect on food expenditure. In single income households the negative effect of the husband's retirement disappears. This may be due to changing roles of husbands in home production after retirement in dual income households, but not in single income households. We found a negative effect of retirement of single males on food expenditure but not of retirement of single females. We conclude that the effect of retirement on food expenditures is mainly due to increased home production of meals, reducing the monetary cost of meals.

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1 Introduction

Population aging is widespread in developed countries, including Israel, as a result of increased longevity and decreased fertility. Concurrently, the standard of living of the elderly population receives more public attention. Retirement is a critical point in the life cycle that is most relevant for well-being, because after retirement, individuals and families experience a change in their income portfolio as well as in their time availability. According to the classical life-cycle model, consumption should not be affected by expected income changes, and post-retirement income changes are pretty much expected. Hence, if consumption declines after retirement, as has been found in many studies (the retirement consumption puzzle)(Aguila et al. (2011)), it may be due to liquidity constraints that lead to sub-optimal savings, or to inadequate financial planning. Several studies found that unanticipated forced retirement accounts for a large share of the retirement consumption puzzle (Barrett and Brozozowski (2012), Blau (2008), Haider and Stephens (2007)). However, in an augmented life-cycle model, a decline in consumption does not necessarily reduce utility, because it could be that time is substituted for purchased goods either as leisure or as an input in home production (Aguiar and Hurst (2005), Bronnenberg et al. (2018)). Whatever the reason may be, post-retirement decline in consumption deserves public attention and perhaps policy response, because modern societies do not tolerate poverty among the elderly. The purpose of this research is to examine whether it is the retirement of the husband, the retirement of the wife, or both, that is most responsible for the decline in consumption in Israel. A related study previously examining the distributional effect of an increase in the retirement age is found in Geyer et al. (2020). They considered the effect of a change in the legal retirement age of women in Germany and found no effect on household expenditure.

In this paper, we study the effect of retirement on household food expenditure using SHARE panel data for Israeli citizens around the age of retirement. In dual income households, we observe the timing of retirement for both spouses, and household expenditure on food is declared in the before and after periods. In evaluating the effect of retirement by either spouse, we face a problem of endogeneity. This stems both from the simultaneous nature of retirement choices by both spouses, which could be negatively correlated due to income effects, or positively correlated due to leisure complementarity. Retirement decisions may also potentially depend on the relative bargaining power of each spouse. Moreover, the actual timing of retirement may depend on various employment and expected retirement conditions which may also relate to income and consumption. Michaud et al. (2019) deal with this problem by using stated retirement preferences of the spouses, regarding their own and their spouse retirement. We take a different approach by using an instrumental variable

for retirement, which allows us to use actual retirement choice data.

To deal with the endogeneity of timing of retirement, we use the legal timing of mandatory retirement as an instrument for actual retirement choices. Due to a legislatory change in the ages of mandatory retirement which was passed in 2004, and was gradually implemented by cohorts, we observe a substantial heterogeneity in the legal month (and age) of retirement among individuals with different birth dates. In the first stage analysis of retirement choices, we use the individual's own legal date of retirement as an explanatory variable, and the actual timing of retirement of the spouse instrumented with the spouse's legal retirement date. In this way, we estimate the structural retirement equations.

For dual income households, we find that the retirement of the husband reduces the total expenditure on food, while no significant effect is found for the retirement of the wife. This can be either due to the husband's larger share in the household income, which has a greater income effect on the household at retirement. Alternatively, it might be due to the husband changing roles from providing outside of the house to in-house production, reducing the expenditure on food. However, the negative effect of husband's retirement on food expenditure is only found in dual income households, and not in households where the husband is the only provider. This could support the second explanation, if in dual earning households the wife had a dual role during the work years, the husband changes roles at retirement, while in single earning households, the husband does not take up production within the house at retirement. For single individuals, we also find a negative effect of retirement for males, and no effect for females.

Several previous studies assessed the effect of increasing the legal retirement age on labor supply in Israel. BOI (2018) found that the increase in the statutory retirement age between 2004 and 2009 had a marked effect on the effective retirement age. Kimhi et al (2019) found that both labor force participation and hours of work have increased after the increase in the retirement age for both males and females. Sand and Lichtman-Sadot (2019) found that own legal retirement deferral increased labor supply for both males and females. They also found that spillover effects differed by gender, the deferral of the wife's legal retirement age had no effect on the husband's retirement age, while the deferral of the husband's legal retirement age increased the wife's labor force participation.

We contribute to this literature by testing the effect of the legal retirement date on actual retirement not only by simple regression, but also consider the dynamics around the date of retirement using an event study specification, and finally, testing the effect using a regression discontinuity design around the legal retirement date threshold. To consider the cross-effect between spouses we use both the legal retirement age in a reduced form specification, and the actual retirement of the spouse, using the IV approach. We also check

our results on the cross-effect in the regression discontinuity specification. Another related study on the spillover effect of retirement between spouses is found in Kruse (2021), using a Norwegian pension reform affecting private sector workers only. He found that women tend to be influenced by husband's retirement while the evidence for men is inconclusive.

Our results on the effect of own legal retirement on actual retirement are in line with previous results in the sense that we find a positive effect of reaching legal retirement on actual retirement for both males and females, although the relationship is found to be weaker for females. This result is consistent with the smaller effect of the reform on females found in BOI (2018) and Sand and Lichtman-Sadot (2019). For the cross-effect we find a marginally significant effect of husband's legal retirement (and actual retirement in the structural equations) on wife's retirement, but no significant effect is found for the wife's retirement in the husband's retirement equations. In the regression discontinuity design the cross-effect disappears entirely.

The remainder of the paper is organized as follows, Section 2 surveys the literature dealing with the retirement consumption puzzle, Section 3 describes the retirement age reform in Israel, Section 4 presents the data used in our analysis, Section 5 describes the empirical methodology, Section 6 presents the results and Section 7 concludes.

2 The retirement consumption puzzle: A literature review

Many empirical studies were able to identify between 4% and 20% drop in consumption after retirement in different countries. Hamermesh (1984) explained that some households simply do not save enough for retirement. Blake (2004) found that the drop in consumption is stronger as workers rely more on private rather than public pensions. Dilnot, Disney and Johnson (1994) suggested that individuals over-estimate their post-retirement income, and this leads to sub-optimal savings. Banks, Blundell and Tanner (1998) suggested that work-related expenditures such as clothing and transportation drop after retirement, but found that this cannot explain the entire drop in overall consumption. They also suggested that people are exposed to new information about medical expenditures after they retire, because their social networks change in the direction of including older people, and this leads to higher post-retirement precautionary savings. Miniaci et al. (2010) supported, using Italian data, the suggestion that work-related expenditures drop after retirement, but rejected the explanation based on over-estimation of post-retirement income. Battistin et al. (2009) also showed that work-related expenditures drop after retirement, and also showed that most of

the drop in consumption is due to the drop in the number of children living with their retired parents.

On the other hand, Ameriks, Caplin and Leahy (2007) found that households actually expect their consumption to drop after retirement and that their expectations are pretty much correct on average. Some households expect, though, that their consumption will not drop and even increase. Aguiar and Hurst (2007a) found that while work-related expenditures and food expenditures declined after retirement, leisure-related expenditures such as entertainment and charity contributions increased. Further, Aguiar and Hurst (2007b) showed that the decline in food expenditures does not mean buying less food, but rather spending more time on buying more wisely. This was also the conclusion of Chen et al. (2017), who found that food expenditures by retired males declined by about a half after retirement, but the quantity of calories consumed remained the same. Hurd and Rohwedder (2008) suggested that more time is spent on home production after retirement, replacing purchased goods. Smith (2006) found that food expenditures decline significantly after retirement only when retirement is involuntary and forced by health problems or disability, and when the retirees are less educated. Within this group, the decline in food expenditures is stronger for those who are not eligible for occupational pensions.

Borella, Moscarola and Rossi (2014) also differentiated between voluntary and involuntary retirement. They also differentiated between retirees with different levels of education and wealth. They found that consumption declined by about 4% after retirement in Italy for both voluntary and involuntary retirees, but retirees with high levels of education and wealth did not experience the decline. When wealth and education were interacted, it was found that consumption dropped by 8% for retirees with low levels of education and wealth, retirees with low education and high wealth did not experience a drop in consumption, and those with high levels of education and low wealth lost 10% of consumption after retirement, but only when retirement was involuntary. These results indicate that the drop in consumption after retirement is not homogeneous.

Bernheim, Skinner and Weinberg (2001) found that post-retirement consumption declines more for households that saved less, and in particular for households who had lower access to pension and social security payments. Hurd and Rohwedder (2008) found that post-retirement consumption remained unchanged or even increased for households in the upper half of the wealth distribution, while it declined for households in the lower half of the wealth distribution. Fisher and Marchand (2014) examined the changes in consumption after retirement along the distribution of pre-retirement consumption, and found that the drop in consumption occurred only at the upper part of the distribution, and it increased with pre-retirement consumption. This implies that consumption, and perhaps also social

welfare, becomes less unequal after retirement.

The studies mentioned above looked at retirement of the household head alone as the trigger for the change in consumption. The family context was examined by Lundberg et al. (2003), who found that the drop in consumption after retirement was significant only for married couples. They explained that women expect to live longer than their husbands and hence they have an incentive to reduce household expenditures while their husbands are alive, and they are able to do so because their husbands' bargaining power declines after they retire. Moreau and Stancaneli (2015) found quantitatively and statistically significant declines in food and clothing expenditures of couples after the husband retired, but food expenditure declined only when the wife was still working. They explained that non-working wives devoted more time to household production and hence their food expenditures were lower even before their husbands' retirement.

3 The retirement age reform

The pension system in Israel went through rapid changes in the past two decades, reflecting the notion that individuals should bear the prime responsibility for their retirement futures (Achdut abd Spivak, 2010). The current pension system comprises of two main pillars: National insurance (universal old age allowances plus income supplement allowances for eligible individuals) and the occupational pillar (mainly defined contribution occupational pensions). Occupational pensions became compulsory in 2008: all wage earners must contribute a given share of their income to a privately managed savings instrument, which will eventually pay out the pension allowance.

The legal age of retirement, at which the employer is free to dismiss the employee who then becomes eligible to receive his pension allowance, is not equal for men and women. Before the 2004 reform, the retirement age for males was 65 and the retirement age for females was 60. In the 2004 reform the retirement age for males was raised to 67 and the retirement age for females was raised to 62. In practice, the law was gradually applied to cohorts by month of birth, according to the schedules described in Table 1 and Table 2. The retirement age for females was planned to be raised further to 64 by 2017, in order to allow women to increase their pension allowances by additional saving at high earning years, but this change was halted by legislation in 2017.

Table 1: Retirement age for male individuals born until April 1942

Month of Birth	Age of Eligibility
until March 1939	65
Apr. - Aug. 1939	65 + 4 months
Sep. 1939 - Apr. 1940	65 + 8 months
May - Dec. 1940	66
Jan. - Aug. 1941	66 + 4 months
Sep. 1941 - Apr. 1942	66 + 8 months

Source: 2004 retirement law.

Table 2: Retirement age for female individuals

Month of Birth	Age of Eligibility
until March 1944	60
Apr. - Aug. 1944	60 + 4 months
Sep. 1944 - Apr. 1945	60 + 8 months
May - Dec. 1945	61
Jan. - Aug. 1946	61 + 4 months
Sep. 1946 - Apr. 1947	61 + 8 months
May 1947 - Feb. 1956*	62

Source: 2004 retirement law; *At this point, the law was frozen beyond the age of 62, although originally planned to gradually go up to age 64. Our data includes females who would potentially be affected by the additional expansion of the law which was not executed, but not during the time of the analysis (these are younger spouses, ages 37-59 at the time of interview).

The heterogeneity in the legal retirement age by cohort enables the identification of the effect of retirement on household consumption. Since individual retirement is highly (although not perfectly) correlated with the legal retirement date (while the latter is not related to consumption expenditure), in the sense that the likelihood to retire substantially increases at the month of legal retirement (BOI (2018), Kimhi et al. (2019)), this serves as a suitable instrumental variable for individual retirement choices.

4 Data

For the empirical analysis we use data from several waves of the SHARE project (Survey of Health, Aging and Retirement in Europe). We use waves covering interviewed citizens in Israel: the first wave conducted in 2005-2006, the second wave conducted in 2009-2010,

the fifth wave from 2013 and the sixth wave from 2015. The SHARE project samples the entire population of persons ages 50 years and over at the time of sampling, whose regular residence is in the respective country. In the first wave, all household members born in 1954 and earlier were eligible for an interview. Starting at wave two, for new countries or refreshment samples, only one selected respondent per household must be born in 1956 or earlier for wave two, 1962 or earlier for wave five and 1964 or earlier for wave six. In addition - in all waves - current partners living in the same household are interviewed regardless of age. All respondents previously interviewed are also eligible in subsequent waves. New partners living in the households are also eligible regardless of age. Age eligible respondents who participated and moved within the country are traced and interviewed in subsequent waves, while young partners, new partners and partners who never participated, are not traced if they moved.

Table 3: Individuals covered in waves, by gender and marital status

	Male		Female		All		
Wave	Not married	Married	Not married	Married	Not married	Married	Total
1	145	928	389	986	534	1,914	2,448
2	204	942	520	941	724	1,883	2,607
5	241	1,004	546	999	787	2,003	2,790
6	191	753	483	758	674	1,511	2,185
Total*	781	3,627	1,938	3,684	2,719	7,311	10,030

* Summing across wave includes subsequent interviews of the same individuals.

Table 3 enumerates the individuals covered in the four SHARE waves that are used in our analysis. We define as married individuals with a declared marital status of either "Married and living together with spouse" or "Registered partnership". Individuals who declared a marital status of "Married, living separate from spouse", "Never married", "Divorced" or "Widowed" are considered not married. Since the main analysis deals with household level consumption outcomes, we construct a household level database, documenting variables of interest for both husband and wife. Here we are constrained to households where both partners responded to the interview, which leaves us with 2,902 observations (household-wave combinations). We exclude from the analysis two same sex female households which do not contribute information on the gender dynamics of interest, and remain with 2,900 observations (5,800 individual-wave combinations). We separate these households into dual-income households where both husband and wife earned an income prior to retirement (2,113 observations), and single-income households where only the husband had an income prior to

retirement and the wife was defined as working in the household (787 observations). Table 4 presents the number of women defined as working in the household out of all married women in the sample, by population group. The total is 2,890 observations, because for ten females the population group is missing. 84% of Arab-Israeli women are defined as working in the household, in this particular group the rate of participation in the work force is traditionally low among women (Yashiv and Kasir (2011)). 18% of veteran-Jewish women in our sample are defined as working in the household, and only 3% among former USSR immigrants. The low percentage among former USSR immigrants may stem from a more gender-equal employment history under the Soviet Union, but also to relatively low income jobs held by many older immigrants, making it difficult to live off of one salary. Although most of the analysis is concerned with married couples, we also present some comparative results for the group of single males and females. In the survey waves, there are 781 single-male household and 1,938 single female households. The number of single female households is higher possibly due to the higher female life expectancy.

Table 4: Females declared as working at home, by population group

Work at home / population group	Veteran Jewish	Arab-israeli	FUSSR imm.	Total
0	1,614	77	413	2,104
1	366	406	14	786
% work at home of total	*18%*	*84%*	*3%*	*27%*
Total	1,980	483	427	2,890

Tables 5 and 6 present summary statistics of the variables used in our analysis, for dual- and single-income married households, respectively. These tables describe the observations that are used in the final regression analysis. The number of observations used in the reduced form retirement equations is limited to households with non-missing values of the legal retirement status and couple and household characteristics (age, education, housing density and population group): 1,922 for the dual-income households and 568 for the single-income households. The structural equations are further limited to the households for which the actual retirement statuses are also non-missing. Finally, in the food expenditure information is available for only 1,561 of the dual-income households and 477 single-income households, further limiting the number of observations used in the expenditure equations.

The (ln) food expenditure is slightly lower in single-income households. The average number of rooms per head is also lower in single income households, 1.56 compared to 1.8 for dual-income. The share of individuals with post-secondary education is 52% and 51% for

males and females, respectively, in dual income households. In the single income households, both males and females are less educated on average but the males have a higher rate of post-secondary education (21%) compared to females (8%). The ages of both spouses are on average lower in the single-income household group, for an unknown reason. Again, the share of Arab-Israeli households is substantially higher in single-income households (43% vs. 2% in dual income households) and the share of former USSR immigrants is substantially higher in dual income households (21% vs. 2% in single income households).

Tables 7 and 8 present comparative summary statistics for the single male and single female households. The mean age is higher in both these households when compared to the married households, probably because the single status is in some cases due to the death of the spouse. The ln food expenditure is similar but slightly higher compared to the dual-income married households, 5.53 for males and 5.55 for females. Share of population groups is similar to their share in dual-income households. 0.03-0.04 Arab-Israeli and 0.17-0.23 former USSR immigrants.

Table 5: Household summary statistics, dual-income households

Variable	Obs	Mean	Std. Dev.	Min	Max
ln food expenditure	1,561	5.50	0.649	-2.14	8.53
Retired (H)	1,798	0.52	0.500	0	1
Retired (W)	1,826	0.50	0.500	0	1
Retired by law (H)	1,922	0.49	0.500	0	1
Retired by law (W)	1,922	0.56	0.497	0	1
Age (H)	1,922	67.65	9.253	49.17	94.08*
Age (W)	1,922	63.94	9.335	40.58	91.75
Post-scondary educ (H)	1,922	0.50	0.500	0	1
Post-scondary educ (W)	1,922	0.49	0.500	0	1
Rooms in house per head	1,922	1.78	0.688	0.17	5.75
Arab-Israeli	1,922	0.03	0.165	0	1
Former USSR imm.	1,922	0.21	0.405	0	1

*ages originally in months.

Table 6: Household summary statistics, single-income households

Variable	Obs	Mean	Std. Dev.	Min	Max
ln food expenditure	477	5.29	0.73	2.74	8.72
Retired (H)	473	0.55	0.50	0	1
Retired by law (H)	568	0.46	0.50	0	1
Age (H)	568	66.84	9.45	48.67	93.00
Age (W)	568	62.71	9.56	37.33	91.92
Post-scondary educ (H)	568	0.21	0.40	0	1
Post-scondary educ (W)	568	0.08	0.27	0	1
Rooms in house per head	568	1.56	0.71	0.29	5.00
Aarab-Israeli	568	0.43	0.50	0	1
Former USSR imm.	568	0.02	0.16	0	1

Table 7: Household summary statistics, single males

Variable	Obs	Mean	Std. Dev.	Min	Max
ln food expenditure	467	5.53	0.28	3.86	6.97
Retired	420	0.58	0.49	0	1
Retired by law	493	0.63	0.48	0	1
Age	493	71.80	11.67	50.58	102.17
Post-secondary educ	493	0.35	0.48	0	1
Rooms in house per head	493	2.44	0.42	0.50	4.0
Arab-Israeli	493	0.03	0.16	0	1
Former USSR imm.	493	0.17	0.38	0	1

Table 8: Household summary statistics, single females

Variable	Obs	Mean	Std. Dev.	Min	Max
ln food expenditure	1,374	5.55	0.22	3.86	6.97
Retired	1,050	0.70	0.46	0	1
Retired by law	1,386	0.79	0.40	0	1
Age	1,386	71.94	10.80	39.83	103.17
Post-secondary educ	1,386	0.38	0.49	0	1
Rooms in house per head	1,386	2.54	0.25	0.50	4.0
Arab-Israeli	1,386	0.04	0.19	0	1
Former USSR imm.	1,386	0.23	0.42	0	1

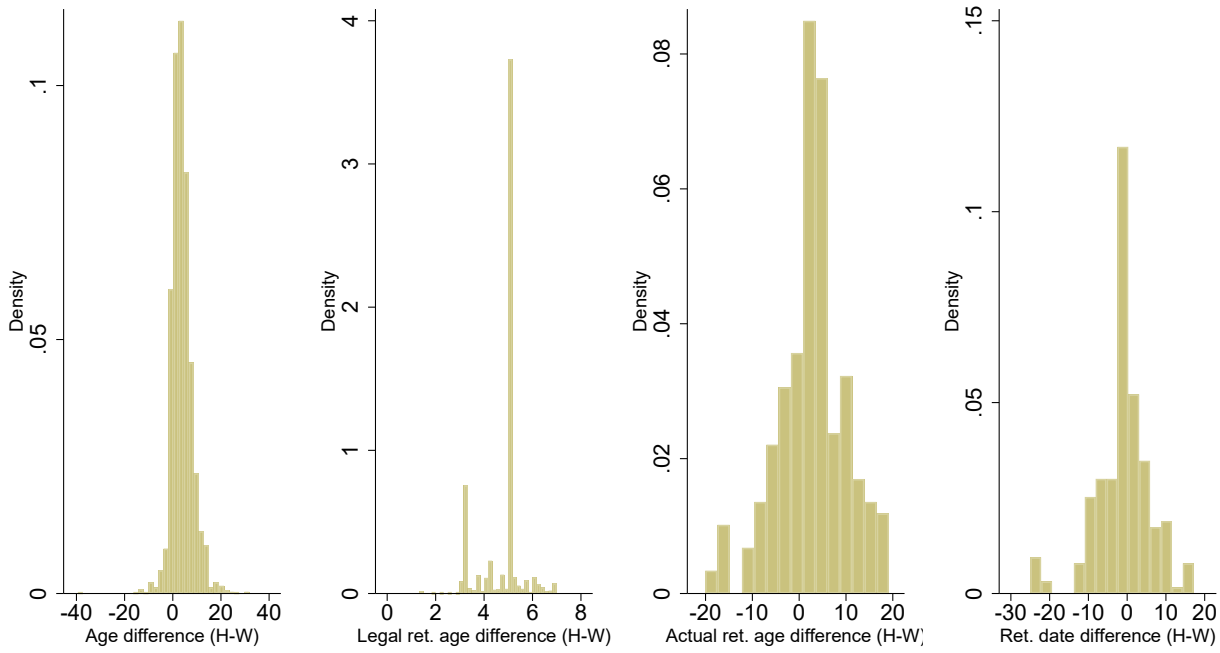
Table 9: Actual retirement and legal retirement status, by gender

	Male				Female			
	Eligible		Non-eligible		Eligible		Non-eligible	
Retired	747	86%	146	17%	779	79%	102	14%
Not retired	117	14%	716	83%	202	21%	643	86%
Total	864	100%	862	100%	981	100%	745	100%

Actual retirement status is defined as retired for individuals who reported "retired" as their current job situation. Other statuses: "employed/self-employed", "unemployed", "permanently sick/disabled", "homemaker" and "other", were considered not retired. To define an individual's legal retirement eligibility we construct a new variable "Retired by law" taking the value 1 if the individual's age at the time of the interview exceeds their legal retirement age according to the reform (Tables 1 and 2), and 0 otherwise. Table 9 presents actual retirement status of the individuals in our data by their legal retirement status and by gender. There is an obvious correlation between the legal status and the actual retirement choice. For males, 86% of eligible individuals have retired, and 83% of non-eligible individuals have not retired. Females, both eligible and non-eligible, retired less often than men. 79% of eligible females retired, and 86% of non-eligible females did not retire.

Figure 1 presents histograms of the age difference among couples (husband's age minus wife's age) and the differences in the legal and the actual retirement ages and dates (given that both spouses retired during the period of analysis), and Table 10 presents corresponding summary statistics. Age difference and legal retirement age difference are available for all couples in the sample, while actual retirement age and actual retirement date differences are only available for couples that both spouses retired. In the table we show the first two variables both for the full sample and for the couples that both retired. The average difference in age between husband and wife in our data is 3.67 years (std 3.83) in favor of the husband in the full sample and the average legal retirement age difference in the full sample is 4.78 (std 0.72) years in favor of the husband. These figures in the small sub-sample are not strikingly different, 3.61 and 4.97, respectively. The average difference in the actual retirement age (for the sub sample) is lower than the legal retirement age difference, 2.93 (std 7.29) , which implies a tendency to retire closer to the spouse's retirement. We observe this also in the retirement date difference combining information of age difference and retirement ages: there is a large mass very close to 0 in the graph (couples who retired during the same year), the mean difference is -0.68 years (std 7.14).

Figure 1: Age differences and retirement age differences between spouses



The first figure from the left is a histogram of the age difference between husband and wife. A large portion of the density is in the area of several years in favor of the husband. The third graph from the left is a histogram of actual retirement age difference (for couples that both retired in the sample). A striking mass is at around five years in favor of the husband, which corresponds with the difference in the legal eligibility status of men and women, which is shown in the second figure. The rightmost graph shows the difference in the actual retirement date for the couple that both retired during the sample (this is a combination of the age difference and retirement date) a large mass is very close to zero, showing that many couples actually retire around or during at the same year.

Table 10: Age and retirement age differences between spouses in dual-income households

Variable	Obs	Mean	Std. Dev.	Min	Max
Full sample					
Age difference	1,726	3.67	3.83	-13.5	31.75
Legal retirement age difference	1,726	4.78	0.72	1.33	7
Both retired in sample					
Age difference	193	3.61	3.66	-4	22.08
Legal retirement age difference	193	4.97	0.46	3	6.33
Actual retirement age difference	193	2.93	7.29	-20.08	19.17
Retirement date difference	193	-0.68	7.14	-25	17.17

5 Methodology

Individual retirement choices may be endogenous both with regard to the spouse's retirement choice, for married couples, and with regard to consumption expenditure. Leisure complementarity may lead couples to retire around the same time, while income considerations may cause one spouse to delay retirement as the other spouse retires. These effects may also vary by the relative bargaining power each spouse holds within the household. To the extent that consumption expenditure relates to income, the timing of retirement may be chosen at the time most desirable considering work related conditions and the expected income after retirement.

In order to deal with these concerns regarding the identification of the effect of spouses' retirement on household consumption, we use each spouse's legal retirement age as an instrumental variable for actual retirement.

5.1 Retirement choices

In the retirement choice analysis we use two structural retirement equations, for males and females, where the retirement choice of an individual depends on the legal eligibility status of the individual for retirement at the time of the survey which we consider to be exogenous, and on the retirement choice of the spouse, which is considered endogenous. To deal with the endogeneity of the spouse's retirement status, we use the spouse's legal eligibility status for retirement as an instrument. The structural equations are specified in equations (1) and (2):

$$Retired_{Hit} = \alpha_0 + \alpha_1 Eligible_{Hit} + \alpha_2 Retired_{Wit} + \alpha_3 X_{Hit} + \alpha_4 X_{Wit} + \alpha_5 X_{it} + \epsilon_{Hit} \quad (1)$$

$$Retired_{Wit} = \gamma_0 + \gamma_1 Eligible_{Wit} + \gamma_2 Retired_{Hit} + \gamma_3 X_{Wit} + \gamma_4 X_{Hit} + \gamma_5 X_{it} + \epsilon_{Wit} \quad (2)$$

where $Retired_{Hit}$ and $Retired_{Wit}$ stand for the retirement status of husband and wife in household i at time t, respectively. $Eligible_{Hit}$ and $Eligible_{Wit}$ stand for the legal eligibility of husband and wife. Both actual retirement and legal eligibility are binary variables. X_{Hit} and X_{Wit} are individual characteristics which include the level of education, the age at the time of the interview, and population group affiliation. X_{it} are household characteristics - in our case: housing density. ϵ_{Hit} and ϵ_{Wit} are standard errors clustered at the level of the individual, to account for error correlation across time (survey waves). We estimate each equation twice, once using linear probability models for the retirement choices in both stages of the 2SLS, and once using probit specifications. To obtain standard errors for the probit 2SLS, we use an empirical bootstrap procedure (with 100,000 repetitions).

The reduced form equations for the retirement models are shown in equations (3) and (4). Here we let retirement choices depend only on the exogenous eligibility statuses of the individual and of the spouse, and the additional individual and household characteristics:

$$Retired_{Hit} = \alpha_0 + \alpha_1 Eligible_{Hit} + \alpha_2 Eligible_{Wit} + \alpha_3 X_{Hit} + \alpha_4 X_{Wit} + \alpha_5 Xit + \epsilon_{Hit} \quad (3)$$

$$Retired_{Wit} = \gamma_0 + \gamma_1 Eligible_{Wit} + \gamma_2 Eligible_{Hit} + \gamma_3 X_{Wit} + \gamma_4 X_{Hit} + \gamma_5 Xit + \epsilon_{Wit} \quad (4)$$

Again, we estimate both linear probability and probit models for these specifications.

5.2 Expenditure equation

To estimate the household expenditure equation as a function of both retirement statuses, of the husband and of wife, we use the models for retirement choices as first stage equations. This way, we take advantage of the legal eligibility statuses as instruments for the otherwise endogenous retirement choices. The second stage expenditure equation is then estimated at the household level, taking the following form:

$$lexp_{it} = \beta_0 + \beta_1 Retired_{Hit} + \beta_2 Retired_{Wit} + \beta_3 X_{Hit} + \beta_4 X_{Wit} + \beta_5 X_{it} + \epsilon_{it} \quad (5)$$

Here, $lexp_{it}$ is (log) per resident food expenditure of household i at time t. $Retired_{Hit}$ and $Retired_{Wit}$ are retirement statuses of the husband and the wife. Again, we include husband, wife and household characteristics and cluster the error terms at the household level. For the 2SLS procedure, in specifications where the first stage is a probit equation, or is a 2SLS on its own, we obtain standard errors using empirical bootstrap.

5.3 Regression Discontinuity Design

To complement our discrete analysis, we also attempt a regression discontinuity specification which is commonly applied in the retirement literature (Battistin et al. (2009), Stancanelli and van Soest (2012), Moreau and Stancanelli (2015), Chen et al. (2017)). The legal retirement age provides an exogenous cutoff point around which the probability to retire changes dramatically. For each spouse, we define a count variable: months since legal eligibility to retire, accepting the value zero at the month of eligibility, negative values before eligibility, and positive values after first eligibility. The graphs in Figure 2 plot the quadratic fit of the propensity to retire for male and female spouses over own and spouse's count variable. No control variables are included, so these are merely data inspection graphs to support the regression discontinuity approach. In the top panel, the jump in propensity to retire around

the date of legal retirement is visible for both males and females, although more substantial for the males. In the bottom panel, no substantial jump is detected around the spouse's date of legal retirement. Over all, propensity to retire increases from left to right in all graphs, capturing the effect of age.

In the retirement equation of each spouse (Equations 6 and 7), we include own legal-retirement-status and a function of the count variable[1] as well as the retirement status of the other spouse, instrumented using their own legal retirement status. Wife, husband and household characteristics are added as additional controls.

$$Retired_{Ht} = \alpha_0 + \alpha_1 Eligible_{Ht} + f(\text{Months to eligibility}_H) + \alpha_2 \widehat{Retired}_{Wt} + \\ + \alpha_3 X_{Ht} + \alpha_4 X_{Wt} + \alpha_5 Xit + \varepsilon_{Ht} \tag{6}$$

$$Retired_{Wt} = \gamma_0 + \gamma_1 Eligible_{Wt} + f(\text{Months to eligibility}_W) + \gamma_2 \widehat{Retired}_{Ht} + \\ + \gamma_3 X_{Wt} + \gamma_4 X_{Ht} + \gamma_5 Xit + \varepsilon_{Wt} \tag{7}$$

For the expenditure equation, since the "treatment" of interest i.e. actual retirement is alotted only in increased probability at the threshold of the count variable (representing time since legal eligibility to retire), we employ a Fuzzy-RD specification.[2] Here the retirement status of the spouses are instrumented with their legal retirement status. Functions of the count variables months-to-retirement of each spouse and husband, wife and household characteristics appear as included control variables.

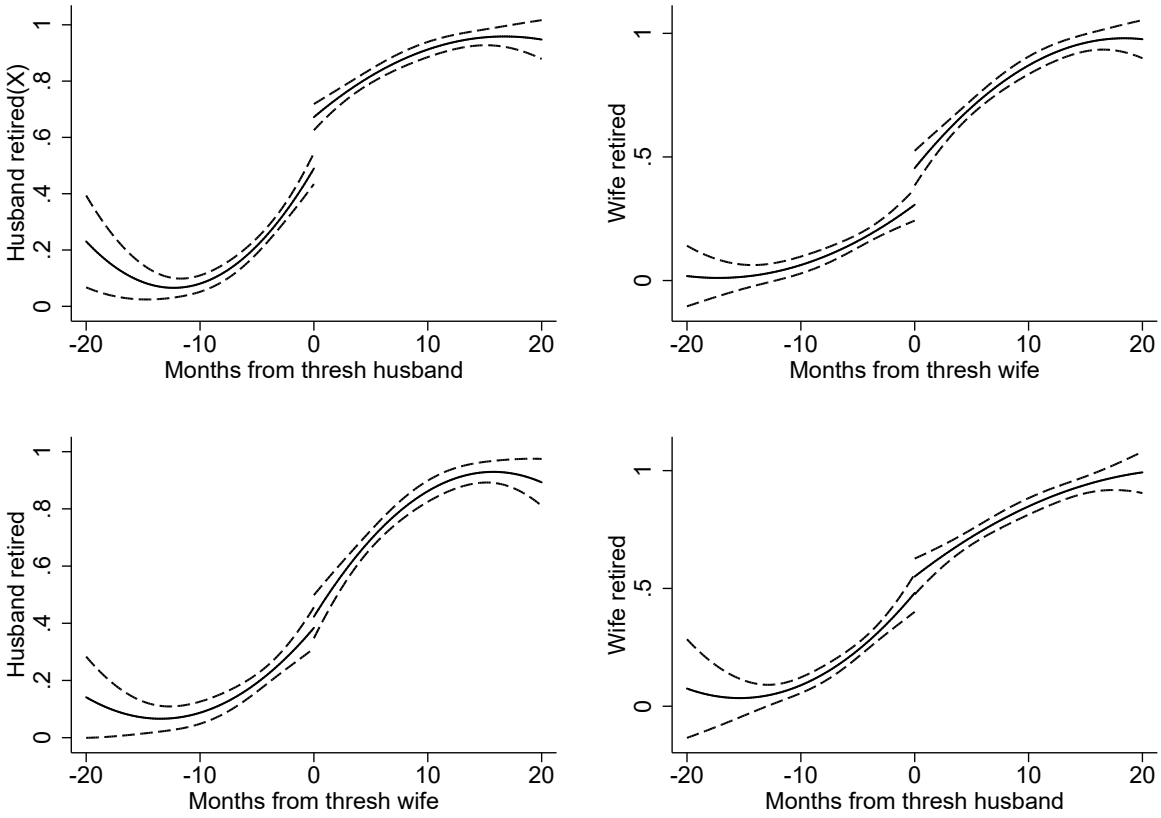
$$lexp_{it} = \beta_0 + \beta_1 \widehat{Retired}_H + \beta_2 \widehat{Retired}_W + f_1(\text{Months to eligibility}_H) + \\ + f_2(\text{Months to eligibility}_W) + \beta_3 X_{Ht} + \beta_4 X_{Wt} + \beta_5 X_{it} + \varepsilon_{it} \tag{8}$$

The graphs in Figure 3 plot the quadratic fit of the log food expenditure over the wife's and husband's count variables. lfood seems to drop slightly around the husband's date of legal-retirement, but slightly increase around the wife's date of legal retirement. lfood seems to drop from left to right after period zero. Before the husbands retirement, lfood increases from left to right, while to the left of the wife's time period zero it reaches a peak

[1] We tried a linear and a quadratic specification, with interactions allowing for a different fit in the before and after periods.

[2] In the retirement equations the RD is simple, since the treatment of interest is legal retirement which is alotted in certainty at the threshold of the count variable.

Figure 2: Retirement on months to legal retirement, quadratic fit



and slightly drops. Again, these are merely data inspection graphs. The complete RDD analysis is presented in the Results section. Figure 4 presents a graphical falsification test for the regression discontinuity design[3]. Here we plotted the predicted probabilities to retire regressed on all other control variables other than age, legal retirement status and time to legal retirement, against the husband's and wife's count variables. There is no substantial jump around the time period 0, which supports the RDD requirement that other controls are not the cause of the jump around the threshold.

[3]A similar test appears in Moreau and Stancanelli (2015).

Figure 3: Food expenditure plots, quadratic fit

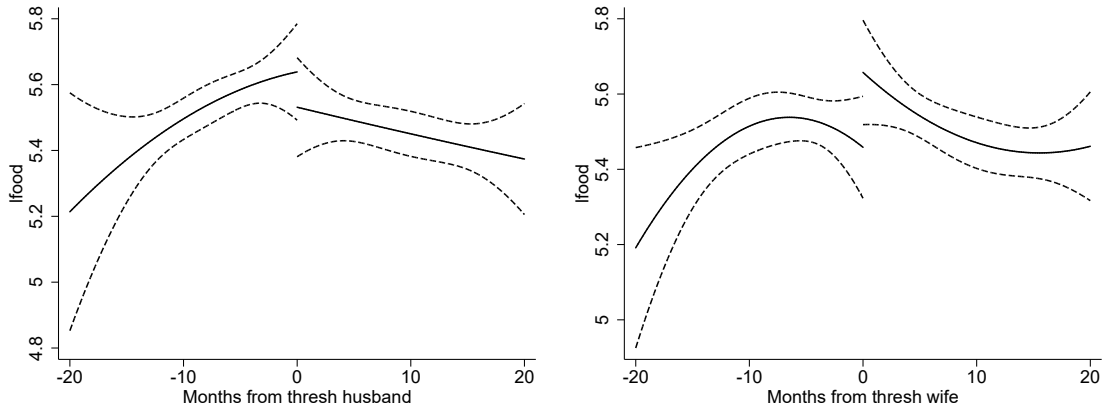
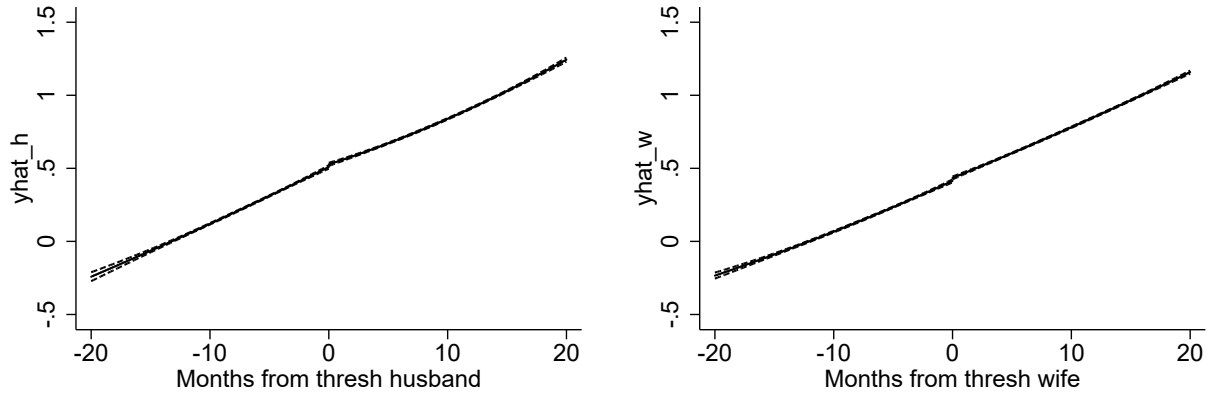


Figure 4: Falsification test



6 Results

The results section consists of several subsections. We first present event studies of the dynamics of the propensity to retire in the months leading to and following the legal retirement event, to support the notion of using legal retirement as an instrument for actual retirement (this is different from the RD approach later employed because the timing enters non-parametrically). Next, we present the retirement equations, in the reduced-form and IV versions. Then we show the results for the expenditure equations, once using the exogenous retirement eligibility, and once with the instrumented actual retirement status. Finally, we repeat the retirement and consumption expenditure analysis using the regression discontinuity approach.

6.1 Event studies

To illustrate the appropriateness of the individual's legal retirement age as an instrument for actual retirement, we conduct an event study analysis, looking at the effects of time-dummies around the month of gaining legal retirement eligibility, on the probability of actual retirement. This helps to shed light on the dynamics of the choice to retire around this event. We define dummy variables for the months since entering the legal retirement age. This timing is different for every individual, according to their age and their cohort in the 2004 retirement law. One month prior to the actual month of eligibility (t=-1) is chosen as the base-level, and the coefficients for the other time periods (t<-1 or t>-1), obtained from LPM regressions, are relative to this period. The full regression results for both husbands and wives are shown in table 17 in the appendix.

Figure (5) plots the coefficients for these dummies from the retirement LPM regression for males. The probability to retire is not significantly different than in t=-1 for all pre-eligibility months. Starting from t=0, the legal retirement month, we observe a jump in the probability to retire of 32% compared to t=-1. The increased probability remains significant up to 13 months after gaining eligibility and then returns to being not significantly different than one month prior to gaining eligibility. Figure (6) presents the coefficients from a similar specification for females. Again, all marginal effects prior to period t=-1 are not statistically significant. Now we find an increase in the probability to retire at t=1, one month after legal eligibility, of 25.8% compared to t=-1. Then there is an increased probability to retire at t=3, t=5 and between t=7 and t=13, all around 25%-30% higher than at t=-1. These results, although not surprising, confirm the relationship between the legal retirement status and actual retirement choices, and support our choice of the legal retirement date as an instrumental variable for retirement.

Figure 5: Months to legal eligibility effect on probability to have retired, husband

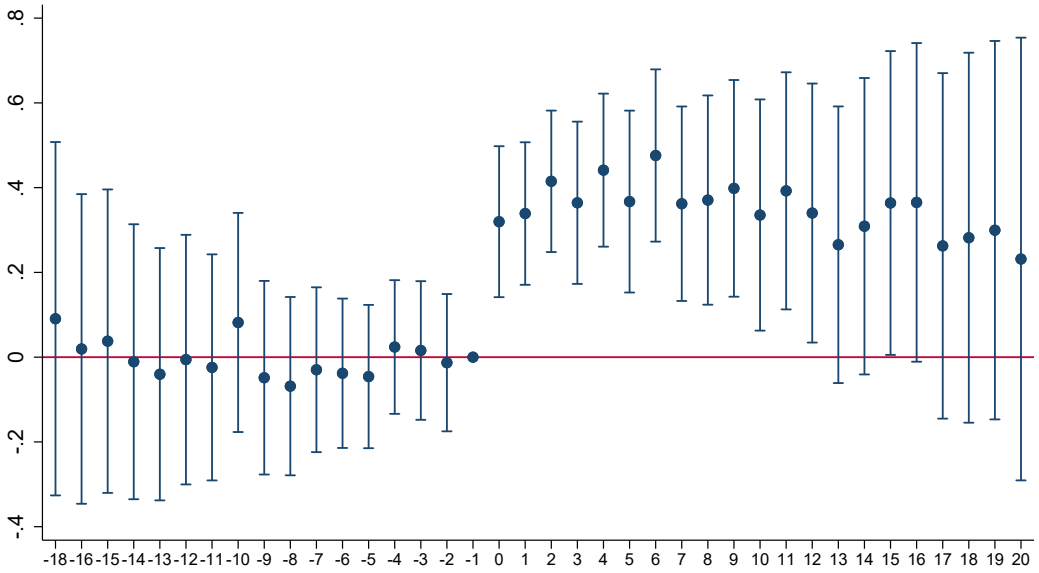
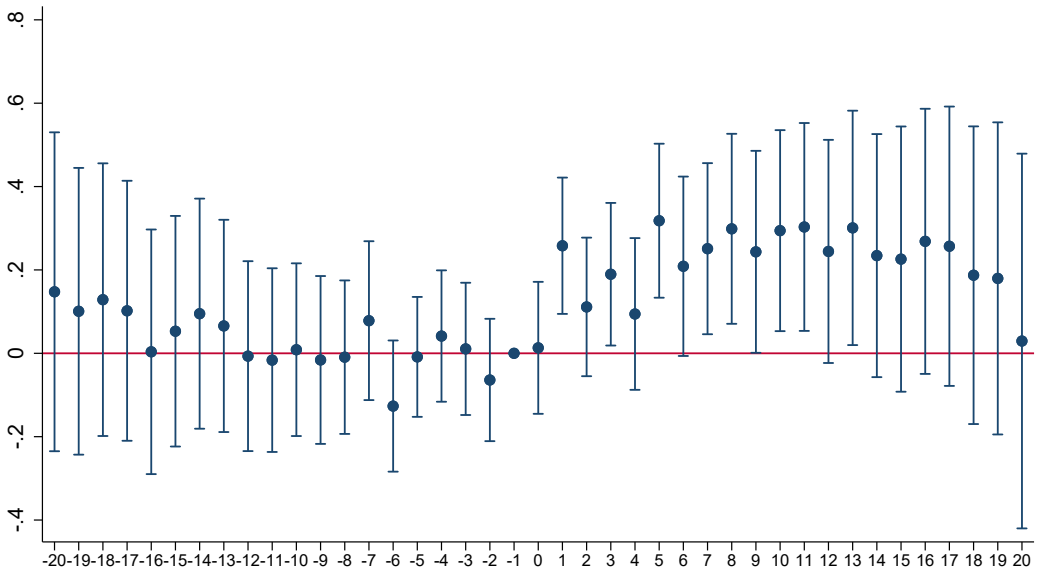


Figure 6: Months to legal eligibility effect on probability to have retired, wife



6.2 Retirement choices

First we present results on retirement choices of spouses regressions on own legal eligibility status and the eligibility or retirement status of the spouse, for dual income households (Table 11). Column 1 and column 5 present OLS (LPM) regressions, for males and females

Table 11: Retirement choices, double-income households

VARIABLES	(1) OLS-males	(2) PROBIT-males	(3) ivreg-males	(4) ivprobit-males	(5) OLS-females	(6) PROBIT-females	(7) ivreg-females	(8) ivprobit-females
Retired by law	0.396***	0.173***	0.378***	0.172***	0.292***	0.119***	0.277***	0.111***
	(0.0434)	(0.0298)	(0.0476)	(0.0318)	(0.0413)	(0.0312)	(0.0447)	(0.0313)
Retired by law (spouse)	0.0679*	0.0275			0.0810*	0.0113		
	(0.0372)	(0.0290)			(0.0437)	(0.0317)		
Retired-hat (spouse)			0.230*	0.0616			0.206*	0.0733
			(0.126)	(0.0945)			(0.110)	(0.0867)
Age	0.0176***	0.0197***	0.0165***	0.0194***	0.0158***	0.0199***	0.0162***	0.0203***
	(0.00324)	(0.00362)	(0.00316)	(0.00318)	(0.00290)	(0.00383)	(0.00277)	(0.00321)
Age (spouse)	-0.00160	-0.000574	-0.00524	-0.00121	0.00484	0.00527	0.00120	0.00288
	(0.00302)	(0.00342)	(0.00389)	(0.00383)	(0.00304)	(0.00352)	(0.00392)	(0.00429)
Post-secondary educ	-0.0427	-0.0384	-0.0437	-0.0394*	0.0420	0.0418	0.0370	0.0426**
	(0.0288)	(0.0279)	(0.0283)	(0.0207)	(0.0289)	(0.0283)	(0.0279)	(0.0206)
Post-secondary educ (spouse)	0.0242	0.0207	0.0145	0.0179	0.00429	0.00517	0.0130	0.00645
	(0.0309)	(0.0290)	(0.0296)	(0.0214)	(0.0277)	(0.0279)	(0.0276)	(0.0211)
Rooms in house per head	-0.0235	-0.0238	-0.0253	-0.0241*	0.00847	0.0137	0.0133	0.0168
	(0.0171)	(0.0159)	(0.0170)	(0.0139)	(0.0195)	(0.0184)	(0.0193)	(0.0147)
Arab-Israeli	0.0877	0.0765	0.0469	0.0667	0.177***	0.184***	0.159***	0.177***
	(0.0612)	(0.0513)	(0.0607)	(0.0536)	(0.0631)	(0.0584)	(0.0598)	(0.0529)
Former USSR imm.	-0.0285	-0.0283	-0.0314	-0.0292	0.0101	0.0165	0.0154	0.0190
	(0.0295)	(0.0299)	(0.0280)	(0.0243)	(0.0326)	(0.0326)	(0.0309)	(0.0254)
Constant	-0.753***		-0.504**		-1.085***		-0.930***	
	(0.113)		(0.204)		(0.118)		(0.171)	
Observations	1,726	1,726	1,726	1,726	1,729	1,729	1,729	1,729
R-squared	0.519		0.532		0.493		0.508	

$^{***}p < 0.01, ^{**}p < 0.05, ^{*}p < 0.1$; standard errors are clustered at the individual level. Columns (4) and (8) represent 2sls specifications with a probit in both stages, here standard errors are bootstrapped, clustered at the individual level, number of repetitions=100,000; Average marginal effects are presented in the table for all probit specifications (columns (2) (4) (6) (8)).

respectively, of retirement status, on the exogenous variables of own and spouse legal retirement statuses. Own eligibility increases the probability to retire by 39.6% in males, and by 29.2% in females. Spouse's eligibility increases the probability to retire by 6.8% in males and by 8.1% in females. Age increases the probability to retire by 1.76% in males and by 1.58% in females. The age of the spouse does not significantly affect retirement in both genders, beyond their legal eligibility status. Own and spouse post-secondary education has no significant effect for both genders. Belonging to the Arab-Israeli population group increases the probability to retire for females by 17.7% compared to the veteran-Jewish group, while the former USSR immigrants group is not statistically different from the comparison group. No significant difference is found between the population groups for males.

Columns (2) and (6) present average marginal effects from similar specifications using probit regressions. Compared to the LPM, both own and spouse eligibility statuses have slightly smaller effects. Own eligibility increases probability of retirement for males by 17.3% and by 11.9% for females. In this specification the spouses' eligibility is not significant for both genders. The effects for the control variable are very similar to those obtained in the LPM. Columns (3) and (7) present 2SLS specifications where retirement status depends on own eligibility status and the actual retirement status of the spouse, instrumented by their eligibility status (the structural equations). The first stages for these regressions are, in effect, represented by the LPM regression of the opposite gender. The effects of own eligibility status on retirement choices is very similar to the ones obtained in the LPM (37.8% for males and 11.9% for females). The effect of the actual spouse retirement status is much larger than the effect of the spouse's eligibility status. This is expected, since the eligibility is only the possibility for the retirement event, while the retirement is its actual realization. For males it is 23%, which is still smaller than the effect of own eligibility status. For females, it is 20.6% which is close in magnitude to the effect of own eligibility status. The results for the additional control variables are again similar to the previous specifications. Columns (4) and (8) present similar IV specifications, only now both the first and the second stage are probit regressions. We obtain standard errors by an empirical bootstrap with 100,000 repetitions. Compared to the LPM 2SLS, we again obtain slightly smaller effects for own eligibility status and for the spouse's actual retirement status. Own eligibility increases the probability to retire by 17.2% for males and by 11.1% for females. As in the reduced form probit, spouses' retirement are again not significant in these specifications. Results for other controls are similar to the LPM 2SLS results.

6.3 Food Expenditure

Now we present results for the expenditure equations, estimating the effect of retirement on household food expenditure.[4] Table 12 presents the expenditure equation for the dual income (Columns 1-2) and for single income households (Columns 3-4). The outcome variable is the (log) food expenditure. Columns (1) and (3) present OLS regressions for lfood on the exogenous variables of legal retirement status. In the dual income households, the husband's legal retirement eligibility is found to have a negative effect on total food expenditure of 12.4%. The wife's legal retirement status is not found to have a significant effect on expenditure. In the single income households, where only the husband earns an income prior to retirement, the husband's legal retirement is not found to have a significant effect on food expenditure.

Columns (2) and (4) present the 2SLS results for the same outcome variables, using actual retirement choices instrumented by the legal retirement statuses. Actual retirement of the husband is found to reduce lfood by 44.5%. A substantially larger effect than legal eligibility to retire. As in the OLS results, no significant effect is found for the retirement of the wife. Rooms per head in the household, as a measure of wealth, is found to have a positive effect on expenditure of between 38-57% in all specifications.

[4]We also tried to conduct this analysis separately for food consumed at home and the probability to eat outside of the home. However, the results for total expenditure appeared to be driven almost entirely by food consumed at home, while eating outside of the home added little additional information.

Table 12: Expenditure equations - 2SLS, dual-income households

VARIABLES	(1) lfood dual-income (OLS)	(2) lfood dual-income (IV)	(3) lfood single-income (OLS)	(4) lfood single-income (IV)
Retired by law (H)	-0.124**		-0.086	
	(0.055)		(0.109)	
Retired by law (W)	0.027			
	(0.054)			
Retired (H)		-0.445**		-0.241
		(0.197)		(0.283)
Retired (W)		0.175		
		(0.229)		
Age (H)	0.006	0.015**	0.016**	0.018
	(0.005)	(0.007)	(0.008)	(0.013)
Age (W)	-0.001	-0.004	-0.008	-0.004
	(0.005)	(0.008)	(0.006)	(0.007)
Post-scondary educ (H)	0.02	-0.021	-0.008	0.008
	(0.036)	(0.039)	(0.071)	(0.089)
Post-scondary educ (W)	-0.008	-0.015	0.045	0.005
	(0.036)	(0.040)	(0.113)	(0.140)
Rooms in house per head	0.384***	0.383***	0.564***	0.570***
	(0.030)	(0.034)	(0.048)	(0.061)
Arab-Israeli	0.098	0.232	-0.105	-0.029
	(0.151)	(0.176)	(0.071)	(0.079)
Former USSR imm.	-0.048	-0.051	0.090	0.095
	(0.047)	(0.050)	(0.127)	(0.150)
Constant	4.520***	4.299***	3.922***	3.563***
	(0.214)	(0.385)	(0.336)	(0.532)
Observations	1,594	1,404	477	392
R-squared	0.179	0.143	0.355	0.343

Standard errors in parentheses are clustered at the husband id level;
$^{***}p < 0.01,^{**}\ p < 0.05,^{*}\ p < 0.1$

6.4 Results for singles

Up until this point we considered married individuals only. For a matter of comparison, we now present results for individuals who are declared single at the time of the survey. Table 13 presents retirement choices as a function of own legal retirement status, age, education, housing density and population group. Retirement is strongly related to the legal retirement age for both males and females. Retirement is also positively related to age for males but not for females. Post secondary education increases females probability to retire. Belonging to the Arab-Israeli population group reduces the probability of females to retire (contrary to the situation for married females) and increases the probability for males to retire. Belonging to the former USSR immigrants group increases the probability to retire for single females

but not for males, compared to the comparison group.

Table 13: Retirement choices, singles

VARIABLES	(1) Retired (M)	(2) Retired (F)
Retired by law	0.562***	0.493***
	(0.078)	(0.047)
Age	0.007**	0.003
	(0.003)	(0.002)
Post-secondary education	0.042	0.094***
	(0.051)	(0.034)
Housing density	0.061	-0.058
	(0.048)	(0.041)
Arab-Israeli	0.172*	-0.349***
	(0.089)	(0.053)
Former USSR imm.	0.039	0.138***
	(0.061)	(0.034)
Constant	-0.550**	0.057
	(0.216)	(0.159)
Observations	478	1,346
R-squared	0.497	0.264

$^{***}p < 0.01,^{**}\ p < 0.05,^{*}\ p < 0.1$; standard errors are clustered at the individual level.

In the food expenditure results (Table 14), the retirement of single males has a negative effect on food expenditure in the IV specification (-14.6%). For women, retirement has a positive effect on food expenditure (5.6% in the OLS and 9.9% in the IV specification). This result is interesting when compared to the results obtained for the married couples households. In married households we saw that the event of the male retirement reduced food expenditure but only in the dual income households, while it had no effect in the single-income households where the husband was the sole wage earner pre-retirement. We again see a negative effect of the male's retirement on food expenditure in the single-males' households. Does this negative effect represent a reduction in the amount or quality of food consumed? If so, then we might not expect such a difference between dual-income and single-income households, and also not between single males and single females. These results might alternatively reflect some difference in the division of home work load between the different types of households. Perhaps, in the dual earning households, retired husbands take on the role of home food production after retirement, while no such role-switching is present in the single-earning households. If so, the reduction in expenditure might well be a result of a reduction in costs rather than quantity or quality of the food consumed. Of

course, this requires further investigation in a setting with more information available about time spent on home production.

Table 14: Food Expenditure, singles (IV)

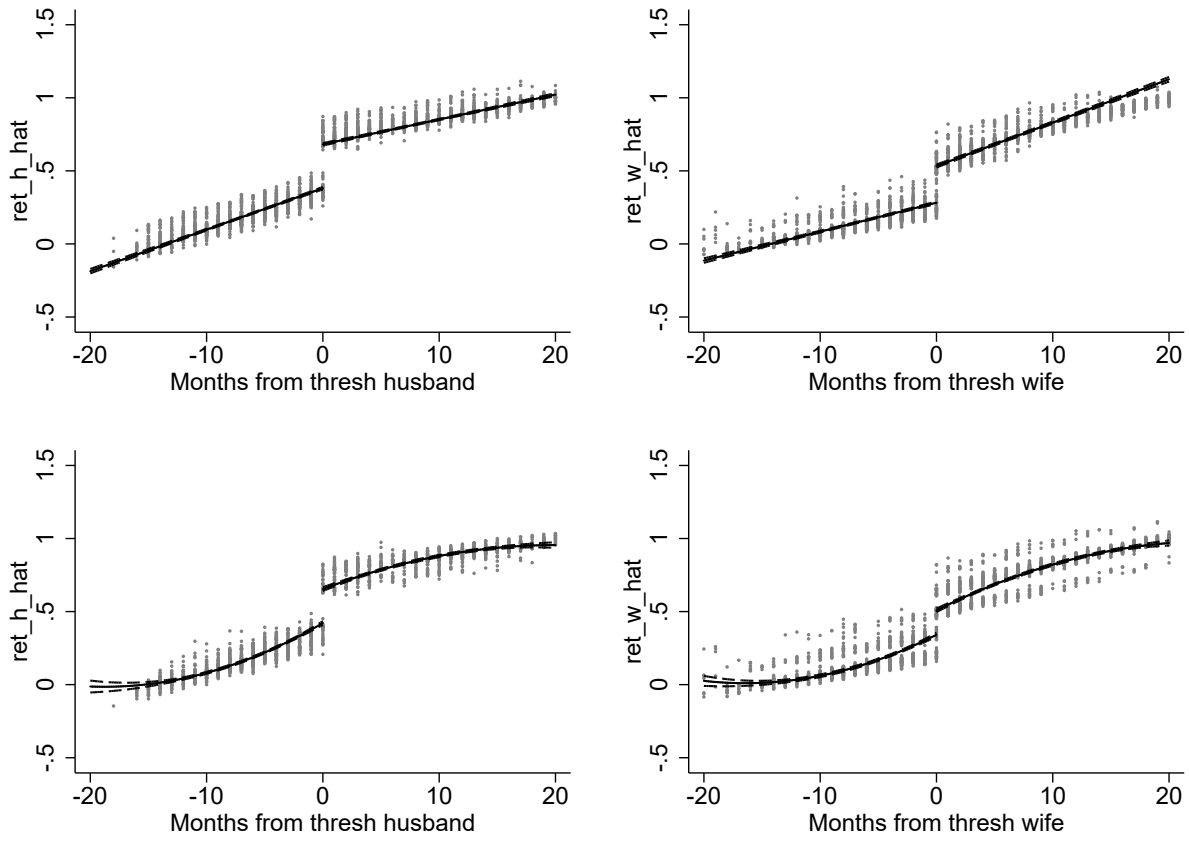
	(1) lfood (M) (OLS)	(2) lfood (F) (OLS)	(3) lfood (M) (IV)	(4) lfood (F) (IV)
Retired by law	-0.081	0.056***		
	(0.049)	(0.020)		
Retired			-0.146*	0.099**
			(0.078)	(0.046)
Age	0.005***	0.002**	0.006***	0.0005
	(0.002)	(0.001)	(0.002)	(0.001)
Post-secondary education	0.019	0.018	0.034	0.031**
	(0.029)	(0.013)	(0.034)	(0.015)
Housing density	0.168**	0.167**	0.145	0.201**
	(0.077)	(0.082)	(0.097)	(0.097)
Arab-Israeli	0.015	0.083***	0.021	0.013
	(0.129)	(0.021)	(0.139)	(0.068)
Former USSR imm.	0.022	0.018	0.034	0.02
	(0.037)	(0.017)	(0.040)	(0.018)
Constant	4.822***	4.938***	4.786***	4.911***
	(0.226)	(0.210)	(0.282)	(0.255)
Observations	467	1,374	398	1,038
R-squared	0.062	0.071	0.055	0.045

$^{***}p < 0.01, ^{**}p < 0.05, ^{*}p < 0.1$; standard errors are clustered at the individual level.

6.5 Regression discontinuity design

Next we present the results for the regression discontinuity analysis. Table 15 presents the results for the retirement equations. Columns (1) and (2) present a linear fit on both sides of the RD threshold for both spouses. Columns (3) and (4) present a quadratic fit. In addition to the cutoff, we also allow the slope to differ on the two sides of the cutoff, by including interactions with the retirement status. The retirement status of the other spouse is included in every regression instrumented using their own legal retirement date.

Figure 7: RDD Retirement Plots



The jump around the legal retirement cutoff is statistically significant for both male and female spouses in both specifications. In the linear specification we find a 37.5% increase in the probability to retire for males at their legal retirement date, and 29.2% increase for females. In the quadratic specification, both jumps are smaller: 23.3% for males and 17.4% for females. The (instrumented) retirement status of the other spouse has no significant effect on the probability to retire for both males and females in both specifications.

Figure 7 presents the graphic description of the results. In general, the linear and quadratic specifications turn out with quite similar outcomes. The jump around the threshold is larger for males than it is for females; The probability to retire generally increases from left to right in all graphs (probably also capturing the effect of age); Interesting to note that for males, the slope appears to slightly flatten after their threshold, while for females the slope becomes steeper. This can be explained by the smaller response of female to their exact legal retirement date, which seems to spread their retirement events across later time periods.

Table 15: RDD Retirement choices

	Linear RD		Quadratic RD	
VARIABLES	Retired (H) (1)	Retired (W) (2)	Retired (H) (3)	Retired (W) (4)
Retired by law (H)	0.375***		0.233***	
	(0.047)		(0.060)	
Retired by law (W)		0.292***		0.174***
		(0.043)		(0.049)
Retired (H)		0.155		-0.00004
		(0.115)		(0.122)
Retired (W)	0.118		-0.055	
	(0.123)		(0.141)	
Months from threshold (H)	0.016		0.031	
	(0.019)		(0.024)	
Months from threshold (W)		0.014		-0.008
		(0.017)		(0.020)
Months from threshold $(H)^2$			0.003***	
			(0.001)	
Months from threshold $(W)^2$				0.001
				(0.0004)
Months from threshold (H)	-0.011***		-0.028**	
×Retired by law (H)	(0.004)		(0.014)	
Months from threshold (W)		0.004		0.031***
×Retired by law (W)		(0.004)		(0.011)
Months from threshold $(H)^2$			-0.004***	
×Retired by law (H)			(0.001)	
Months from threshold $(W)^2$				-0.002***
×Retired by law (W)				(0.000)
Observations	1,726	1,726	1,726	1,726
R-squared	0.535	0.507	0.517	0.502

Spouse retirement choices instrumented using spouse legal retirement status; Included control variables: husband and wife education and age, housing density, population group dummies; $^{***}p < 0.01,^{**}p < 0.05,^{*}p < 0.1$; standard errors are clustered at the individual level.

Table 16 presents the RD results for the food expenditure equations. This is a fuzzy spec-

ification since the event of retirement increases in probability around the legal retirement threshold, rather than representing a certain treatment at time period 0. We report results from quadratic specifications for lfood. Column (1) presents results for double-earning households, and column (2) presents results for single earning households. Figure 8 presents the corresponding graphs for the double-earning households columns.

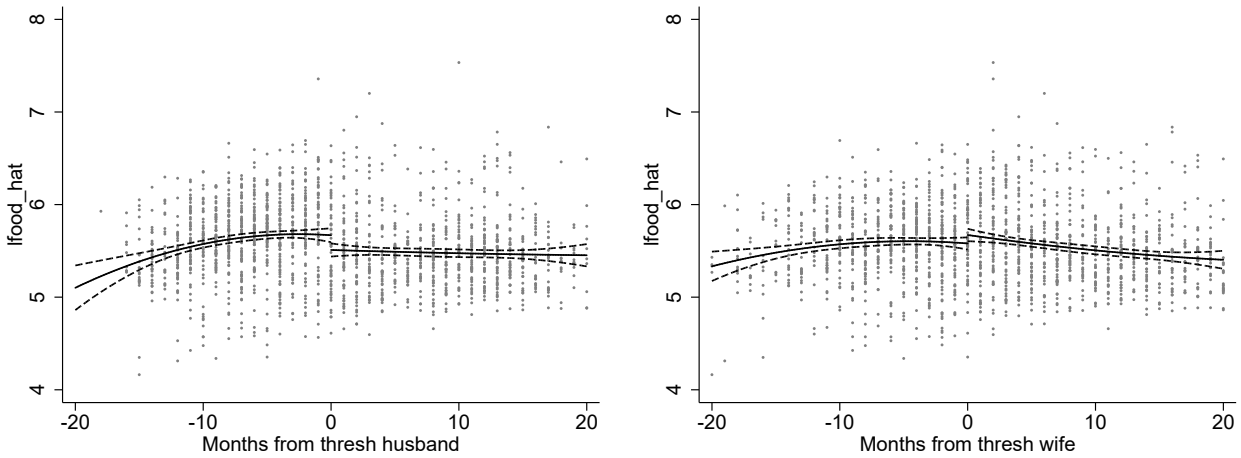
Table 16: RDD Food Expenditure Equations

VARIABLES	(1) lfood dual-income	(2) lfood single-income
Retired (H)	-0.863*	0.820
	(0.466)	(0.653)
Retired (W)	0.204	
	(0.694)	
Months from threshold (H)	-0.015	-0.129
	(0.058)	(0.107)
Months from threshold (W)	-0.156***	-0.273***
	(0.045)	(0.086)
Months from threshold $(H)^2$	0.001	-0.005**
	(0.002)	(0.002)
Months from threshold $(W)^2$	-0.001	-0.005**
	(0.002)	(0.002)
Months from threshold (H)	0.020	0.006
× Retired (H)	(0.044)	(0.061)
Months from threshold $(H)^2$	-0.003	0.008**
× Retired (H)	(0.003)	(0.004)
Months from threshold (W)	0.028	0.170**
× Retired (W)	(0.033)	(0.069)
Months from threshold $(W)^2$	-0.001	-0.001
× Retired (W)	(0.003)	(0.002)
Observations	1,231	337
R-squared	0.035	0.296

Spouse retirement choices instrumented using spouse legal retirement status; Included controls: husband and wife education and age, housing density, population group dummies; $^{***}p < 0.01,^{**}p < 0.05,^{*}p < 0.1$; standard errors are clustered at the individual level.

Only in the case of the male spouses, there is a marginally significant drop around the threshold of ln of total food expenditure (around the wife's threshold, there is a positive but not statistically significant jump). In this case, we find a 56.4% drop in the food expenditure (using the exponent transformation) at the threshold. Inspecting the shape of the curves on both sides of the threshold, we observe a slight positive slope on the left of the threshold in both graphs and which turns into a steady or very slightly decreasing slope on the right.

Figure 8: RDD Food Expenditure Plots



7 Conclusion

We studied the effect of retirement on household food expenditure using SHARE panel data for Israeli citizens around the age of retirement. In dual income households, we observe the timing of retirement for both spouses, and household expenditure on food is declared in the before and after periods. In evaluating the effect of retirement by either spouse, we face a problem of endogeneity. This stems both from the simultaneous nature of retirement choices by married couples, which could be negatively correlated due to income effects, or positively correlated due to leisure complementarity. Retirement decisions may also potentially depend on the relative bargaining power of each spouse.

To deal with the endogeneity of timing of retirement, we used an instrumental variable approach, using the legal age of mandatory retirement as an instrument for actual retirement choices. Due to a legislatorial change in the ages of mandatory retirement which was passed in 2004, and was gradually implemented by cohorts, we observe a substantial heterogeneity in the legal month (and age) of retirement among individuals with different birth dates. In the analysis of retirement choices, we used the individual's own legal date of retirement as an explanatory variable, and the actual timing of retirement of the spouse instrumented with the spouse's legal retirement date. In this way, we estimated the structural retirement equations. We complement the IV specification with a regression discontinuity design around the legal dates of retirement of the spouses.

In the IV specification we found that for dual income households, the likelihood of both male and female individuals to retire increases with the retirement of their spouse, supporting

the leisure complementarity explanation. However, in the regression discontinuity analysis, the cross effect disappeared entirely. We found that the retirement of the husband reduces the total expenditure on food. We do not find a statistically significant effect of the retirement of the wife on food expenditure. This can be either due to the husband's larger share in the household income, which has a greater income effect on the household at retirement. Alternatively, it may be due to the husband changing roles from providing outside of the house to in-house production, reducing the expenditure on food. However, the negative effect of husband's retirement on food expenditure is only found in dual income households, and not in households where the husband is the only provider. This could support the second explanation, if in dual earning households the wife had a dual role during the work years, the husband changes roles at retirement, while in single earning households, the husband does not take up production within the house at retirement. For single individuals, we also found a negative effect of retirement for males, and no effect for females.

So what have we learned on the retirement-consumption puzzle? As in some previous studies we found evidence of a drop in food expenditure following retirement. By considering different income structures before retirement, we get a glimpse into some gender dynamics of this phenomenon. The reduction in expenditure is found only following the male spouse's retirement, and only in the dual income (and single male) households. We might not expect such a difference between households and genders were the reduction only due to a negative income shock. We conjecture that at least some of the effect is due to switching to home production by the male partners in dual income households.

References

[1] Achdut, Leah, and Avia Spivak. "The pension system in Israel after 15 years of reforms." Van Leer Institute, Policy Studies 8 (2010).

[2] Aguiar, M. and E. Hurst, "Consumption vs. Expenditure," Journal of Political Economy, 113(5), 919-948, 2005.

[3] Aguiar, M. and E. Hurst, "Deconstructing Lifecycle Expenditure," NBER Working Paper, 13893, 2007a.

[4] Aguiar, M. and E. Hurst, "Lifecycle Prices and Production," American Economic Review, 97(5), 1533-1559, 2007b.

[5] Aguila, E., O.P. Attanasio and C. Meghir, "Changes in Consumption at Retirement: Evidence from Panel Data," Review of Economics and Statistics, 93(3), 1094-1099, 2011.

[6] Ameriks, J., A. Caplin and J. Leahy, "Retirement Consumption: Insights from a Survey," Review of Economics and Statistics, 89(2), 265-274, 2007.

[7] Bank of Israel (2018). "Welfare and Social Policy Issues". Chapter 8 in Bank of Israel Annual Report, 221-251.

[8] Banks, J., R. Blundell and S. Tanner, "Is There a Retirement-Savings Puzzle?" American Economic Review, 88(4), 769-788, 1998.

[9] Battistin, E., A. Brugiavini, E. Rettore and G. Weber, "The Retirement Consumption Puzzle: Evidence from a Regression Discontinuity Approach," American Economic Review, 99(5), 2209-2226, 2009.

[10] Barrett, G.F. and M. Brzozowski, "Food Expenditure and Involuntary Retirement: Resolving the Retirement-Consumption Puzzle, American Journal of Agriculture Economics," 94(4), 945-955, 2012.

[11] Bernheim, B.D., J. Skinner and S. Weinberg, "What Accounts for the Variation in Retirement Wealth Among U.S. Households?" American Economic Review, 91(4), 832-857, 2001.

[12] Blake, D., "The Impact of Wealth on Consumption and Retirement Behaviour in the UK," Applied Financial Economics, 14(8), 555-576, 2004.

[13] Blau, D.M., "Retirement and Consumption in a Life Cycle Model," Journal of Labor Economics, 26(1), 35-71, 2008.

[14] Borella, M., F.C. Moscarola and M. Rossi, " (Un)expected Retirement and the Consumption Puzzle," Empirical Economics, 47:733-751, 2014.

[15] Bonsang, Eric, and Arthur van Soest. "Time Devoted to Home Production and Retirement in Couples: A Panel Data Analysis." Labour Economics (2020): 101810.

[16] Bronnenberg, Bart, Tobias J. Klein, and Yan Xu. "Consumer Time Budgets and Grocery Shopping Behavior." (2018).

[17] Buchinsky, M., "Recent Advances in Quantile Regression Models: A Practical Guideline for Empirical Research," Journal of Human Resources, 33(1), 88-126, 1998.

[18] Chen, Q., T. Deng, J. Bai and X. He, "Understanding the Retirement-Consumption Puzzle Through the Lens of Food Consumption - Fuzzy Regression-Discontinuity Evidence from Urban China." Food Policy 73, 45-61, 2017.

[19] Dilnot, A., R. Disney., P. Johnson., and E. Whitehouse, "Pensions policy in the UK," London: Institute for Fiscal Studies, 1994.

[20] Firpo, S., N.M. Fortin and T. Lemieux, "Unconditional Quantile Regressions," Econometrica, 77(3), 953-973, 2009.

[21] Fisher, J.D. and J.T. Marchand, "Does The Retirement Consumption Puzzle Differ Across the Distribution?" Journal of Economic Inequality, 12(2), 279-296, 2014.

[22] Fisher, J.D., D.S. Johnson J.T. Marchand, T.M. Smeeding and B.B. Torrey, "The Retirement Consumption Conundrum: Evidence from a Consumption Survey," Economics Letters, 99(3), 482-485, 2008.

[23] Geyer, Johannes, et al. "Labor market and distributional effects of an increase in the retirement age." Labour Economics (2020): 101817.

[24] Haider, S.J. and M. Stephens, Jr., "Is There a Retirement-Consumption Puzzle? Evidence Using Subjective Retirement Expectations," Review of Economics and Statistics, 89(2), 247-264, 2007.

[25] Hamermesh, D.S., "Consumption during Retirement: The Missing Link in the Life Cycle," Review of Economics and Statistics, 66(1), 1-7, 1984.

[26] Hurd, D.M. and S. Rohwedder, "The Retirement Consumption Puzzle: Actual Spending Change in Panel Data," NBER Working Paper 13929, 2008.

[27] Hurst, E., "The Retirement of a Consumption Puzzle," NBER Working Paper, 13789, 2008.

[28] Kimhi, Ayal, Reut Avioz, and Beata Itin-Shwartz (2019). The Effects of Increasing the Formal Retirement Age on Labor Supply: Gender and Family Considerations. Paper Presented at the 10th International Research Meeting in Business and Management, Nice, France.

[29] Kimhi, A. and M. Sandel, "Religious Schooling, Secular Schooling, and Household Income Inequality in Israel." In Nabil Khattab, Sami Miaari and Haya Stier (eds.), Socioeconomic Inequality in Israel: A Theoretical and Empirical Analysis, Palgrave Macmillan, pp. 59-72, 2016.

[30] Koenker, R. and G. Bassett, "Regression Quantiles," Econometrica, 46(1), 33-50, 1978.

[31] Koenker, R. and K.F. Hallock, "Quantile Regression," Journal of Economic Perspectives, 15(4), 143-156, 2001.

[32] Kruse, Herman. "Joint retirement in couples: evidence of complementarity in leisure joint retirement in couples." The Scandinavian Journal of Economics (2021).

[33] Lundberg, S., R. Startz and S. Stillman, "The Retirement-Consumption Puzzle: A Marital Bargaining Approach," Journal of Public Economics, 87(5-6), 1199-1218, 2003.

[34] Michaud, Pierre-Carl, Arthur Van Soest, and Luc Bissonnette. "Understanding joint retirement." Journal of Economic Behavior & Organization (2019).

[35] Miniaci, R., C. Monfardini and G. Weber, "How Does Consumption Change Upon Retirement?" Empirical Economics, 38(2), 257-280, 2010.

[36] Modigliani, F. and R. Brumberg, "Utility Analysis and the Consumption Function: An Interpretation of Cross-Section Data," K. Kurihara, ed., Post-Keynesian Economics, Rutgers University Press, New Brunswick, 1954.

[37] Moreau, N. and E. Stancanelli, "Household Consumption at Retirement: A Regression Discontinuity Study on French Data." Annals of Economics and Statistics, 117-118, 253-276, 2015.

[38] Sand, Edith and Lichtman-Sadot, Shirlee, The Effects of a Retirement Age Reform on Couples' Labor Supply Decisions (May 30, 2019). Available at SSRN: https://ssrn.com/abstract=3395663 or http://dx.doi.org/10.2139/ssrn.3395663

[39] Schwerdt, G., "Why Does Consumption Fall at Retirement? Evidence from Germany," Economics Letters, 89(3), 300-305, 2005.

[40] Smith, S., "The Retirement-Consumption Puzzle and Involuntary Early Retirement: Evidence from the British Household Panel Survey," The Economic Journal, 166(510), C130-C148, 2006.

[41] Stancanelli, E., and A. Van Soest, "Retirement and Home Production: A Regression Discontinuity Approach." The American Economic Review, 102(3), 600-605, 2012.

[42] Stephens Jr, M., and T. Unayama, "The Impact of Retirement on Household Consumption in Japan," Journal of the Japanese and International Economies, 26(1), 62-83, 2011.

[43] Yashiv, Eran and Kasir, Nitsa, Patterns of Labor Force Participation among Israeli Arabs (2011). Israel Economic Review, Vol. 9, No. 1, 53-101.

Table 17: Retirement choice dynamics, months around legal eligibility

VARIABLES	(1) Retired (H)	(3) Retired (W)	VARIABLES	(1-cont.) Retired (H)	(2-cont.) Retired (W)
Retired spouse	0.160***	0.161***	0	0.320***	0.013
	(0.034)	(0.034)		(0.091)	(0.081)
Age (W)	-0.005*	0.024**	1	0.339***	0.258***
	(0.003)	(0.010)		(0.086)	(0.083)
Age (H)	0.021*	-0.001	2	0.415***	0.111
	(0.012)	(0.003)		(0.085)	(0.085)
Educ (H)	-0.010	0.009	3	0.364***	0.190**
	(0.011)	(0.010)		(0.098)	(0.087)
Educ (W)	-0.003	0.003	4	0.441***	0.094
	(0.012)	(0.010)		(0.092)	(0.093)
Housing density	-0.027	0.021	5	0.367***	0.318***
	(0.018)	(0.021)		(0.109)	(0.094)
Arab Israeli	0.045	0.154***	6	0.476***	0.209*
	(0.059)	(0.058)		(0.104)	(0.110)
Former USSR immig.	-0.036	0.022	7	0.362***	0.251**
	(0.030)	(0.032)		(0.117)	(0.105)
			8	0.371***	0.299**
-14	-0.011	0.095		(0.126)	(0.116)
	(0.165)	(0.141)	9	0.398***	0.243**
-13	-0.040	0.066		(0.130)	(0.123)
	(0.152)	(0.130)	10	0.335**	0.294**
-12	-0.006	-0.007		(0.139)	(0.123)
	(0.150)	(0.116)	11	0.392***	0.303**
-11	-0.024	-0.016		(0.143)	(0.127)
	(0.136)	(0.112)	12	0.340**	0.244*
-10	0.082	0.009		(0.156)	(0.136)
	(0.132)	(0.106)	13	0.265	0.301**
-9	-0.049	-0.016		(0.166)	(0.143)
	(0.116)	(0.103)	14	0.309*	0.234
-8	-0.068	-0.009		(0.178)	(0.149)
	(0.107)	(0.094)	15	0.364**	0.226
-7	-0.030	0.078		(0.183)	(0.162)
	(0.099)	(0.097)	16	0.365*	0.269*
-6	-0.038	-0.127		(0.192)	(0.162)
	(0.090)	(0.080)	17	0.263	0.257
-5	-0.046	-0.009		(0.208)	(0.171)
	(0.086)	(0.073)	18	0.282	0.187
-4	0.024	0.041		(0.222)	(0.182)
	(0.080)	(0.080)	19	0.300	0.180
-3	0.016	0.011		(0.227)	(0.191)
	(0.083)	(0.081)	20	0.232	0.029
-2	-0.013	-0.064		(0.266)	(0.229)
	(0.083)	(0.075)			
Observations	1,726	1,726	Observations	1,726	1,726
R-squared	0.569	0.540	R-squared	0.569	0.540
Month-Year FE	Yes	Yes	Month-Year FE	Yes	Yes

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; standard errors are clustered at the individual level.