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Andrea Marini

Updating the retirement-consumption puzzle in Italy: who are the most affected?

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Abstract

In this paper I investigate the retirement-consumption puzzle in Italy for the period 2010-2016, using SHIW data. In order to address the endogeneity of the retirement decision, I estimate the effect of retirement by exploiting the exogeneity of pension eligibility in an instrumental variable approach; the IV regression is then applied in a regression discontinuity design where only households close to the eligibility point are considered. The eligibility-instrument is found to be a strong predictor of the retirement decision, and the estimated non-durable consumption drop is equal to 12.3%. When households are distinguished according to the gender of the household head, female-led households are found to undergo a consumption decline that is more than double that estimated for households with male heads. The data and the literature on the subject indicate that this large difference is likely related to the gender pay-gap that translates into a gender pension-gap. Moreover, the consumption decline appears to be concentrated in households in the lower part of the wealth distribution. Nonetheless, households in the lowest wealth quintile, do not show a significant consumption decline. The data suggests that this might be due to the impossibility for these households to further reduce their consumption at retirement, as they are mostly composed of essential expenditures.

JEL classification: E2, E21, E24, J26, C01

Keywords: Household economics, Expenditures, Inequality, Regression discontinuity design, Instrumental variable regression

Non-technical summary

The world age is increasing at a fast pace, with estimates projecting the number of people with 60 year or more of age surpassing the number of children under the 10 years of age by 2030. At the same time, consumption is by far the largest component in a country GDP, accounting for around 55% in the EU countries, 62% in Canada and U.S. and accounting for 60% of the GPD, on average, worldwide.

When combining these two facts, it is clear to see why understanding what the consumption dynamics of the elderly population is important, an aspect that is, and will be in the near future, increasingly crucial for both monetary and fiscal policies motives. The importance of the relationship between elderly population and their consumption levels is then further underlined by a phenomenon dubbed as the "retirement-consumption puzzle", a term emerged from the literature that studies the household consumption dynamics of the elderly part of the population, which have found, from the data of different surveys on the household finances, that due and after retirement, a sharp expenditure decline occurs.

With this paper I investigate the retirement-consumption (RCP) puzzle by focusing on the Italian household's population. I use data from the Survey on Household Income and Wealth (SHIW) by the Bank of Italy, with the aim of "updating" the situation for the RCP with recent data, given that the most recent study focusing on Italy used data from the late 20th century. After having estimated the negative effect of retirement on consumption, through an IV regression applied in a RDD, for a recent period (between 2010 and 2016), I focus on the heterogeneity of this negative effect of retirement on expenditures, with the aim of answering the question of "who are the most affected?". I do this by focusing on the differences in gender and wealth distribution, with results that highlight a large degree of heterogeneity in how the RCP affect the Italian population with respect to these two major dimensions.

1 Introduction

An increasing number of research papers study the consumption behaviour of retirees and near-retirement households. The growing academic interest in the elderly's consumption habits rests on both theoretical and pragmatic reasons. By 2030 the world population over 60 years of age is projected to be more than the number of children under 10 years of age (1.41 billion versus 1.35 billion) and to be over 2.1 billion by 2050. If one takes into consideration that in modern economies consumption is the largest and steadiest component of a country GPD, it is easy to understand why retirees and elderly consumption is extremely relevant from a macroeconomic perspective and for fiscal, monetary and distributive policies in particular.

From the theoretical point of view, the topic of elderly consumption has attracted the attention of several scholars due to the divergence between the (i) general economic theory which, under the life-cycle/permanent income hypothesis (Modigliani and Brumberg, 1957; Friedman, 1957), predicts that retiree inflation-adjusted expenditure should remain stable over time, and (ii) the empirical evidence of the last decades that highlights, instead, that retirees' expenditure tends to decrease prior to and after retirement, a phenomenon named the "retirement-consumption puzzle".

This paper revisits the retirement-consumption puzzle in Italy by using recent data, between 2010 and 2016, from the Survey on Household Income and Wealth by the Bank of Italy. The period considered is in the midst of the fallout of two major economic crises: the 2008 Global Financial Crisis (GFC) originated in the US and the 2011-2012 European Sovereign Debt Crisis (ESDC). Due to the resulting economic downturn, the European governments were forced to introduce a series of pension system reforms with the objective of tackling public debt by reducing the aggregate public spending. In Italy, this was achieved through the 2012 "Fornero reform", that ultimately led to a substantial tightening in the requirement for accessing the public pension. Furthermore, the crises have led most European economies into a prolonged phase of deflation and depressed consumer spending. In light of this, I believe that establishing if the retirement-consumption puzzle has been present during this period can give a valuable point of view on the condition and the vulnerability of the retiring population, especially after considering that the share of the European elderly population at risk of poverty[1] has been steadily increasing since 2014, from 13.3%, the lowest point since this measure started to be collected, to 16.5% in 2021.

Most of the academic papers on the subject have generally focused on estimating the size of the consumption decline and then tested different hypothesis aimed at identifying the causes behind the retirement-consumption puzzle, and how these can be reconciled with the LC/PIH models. This paper adopts a different approach: after establishing the size of the consumption drop, the main objective is to study the heterogeneity of the negative effect of retirement on consumption by assessing which parts of the retiring population are the most affected. Specifically, the focus is twofold: on the gender of the household head and on the household wealth. The consumption decline is separately estimated for (i) households having a male vs. female household head, and for (ii) households at different quintile of the wealth distribution.

A usual problem in these kinds of analyses is the endogeneity of the retirement decision, as the decision of when to retire is determined by individual unobservable characteristics that are likely correlated with consumption decisions. In order to control for this endogeneity and estimate the potential causal effect of retirement on spending, I follow the methodology devised by Battistin, Brugiavini, Rettore and Weber (2009) and construct an instrument, that is the eligibility to retirement, computed by considering the requirements for accessing the public pension in Italy. I then exploit the instrument exogenous impact on the retirement decision in a regression discontinuity approach.

Using the above-mentioned estimation method, I estimate a 12.3 percent decline in non-durable consumption expenditure caused by the eligibility induced retirement. This result is in line with previous findings in the literature, while however underlining

[1] Elderly population includes any individual with 65 or more year of age; households are identified as being at risk of poverty if their equivalized disposable income is less than 60 % of the national median equivalized disposable income after social transfers have been taken into account. Source: Eurostat.

an increase in the size of the negative consumption decline for the Italian population, as the most recent finding preceding this is a 9.8 percent decline estimated by Battistin, Brugiavini, Rettore and Weber (2009).

Distinguishing between male and female household heads yield a non-durable expenditure decline equal to 19.9 percent for households where the head is female, which is more than double the estimated drop for the male counterparts. This large discrepancy is likely due to the gender pension-gap, as supported by a rich literature on the subject that underline the gender pay-gap as the major culprit for the lower pension-checks perceived by female retirees. The lower pay received during the working life is ultimately translated into lower pension contribution payments and then lower pension benefits, as the latter are proportional to the first. This is also supported by the analysis performed in this work, where being female is associated with a more than 20 percent lower pension check, while the pay-gap during the working life is estimated to be around 7 percent.

With respect to the wealth distribution, the differences in the consumption decline highlight a left-skewed negative effect of retirement on consumption, where the second and third wealth quintiles are the only parts of the wealth distribution with a statistically significant estimate. The second wealth quintile undergoes a 29.3 percent consumption decline, which is about three times larger than the decline of the third quintile. The counter-intuitive absence of a consumption drop for households in the first, and poorest, wealth quintile is possibly due to the impossibility for this part of the retiring population to further reduce their expenses; as the data suggest, the monthly income of these households is mostly spent to pay for the bare minimum essentials, like food and shelter, leaving no room for more spending reduction after retirement.

Lastly, a few qualitative questions of the SHIW are exploited, to study the subjective point of view on the quality of life of the retirees with respect to those still at work but near to the retirement threshold. The aim is to detect whether the first ones perceive to be worse-off than the latter. The results suggest that there are no significant differences between the two groups; in fact, retirees report slightly less often to have "unusually low" consumption or income than workers.

The paper is organized as follows. Section 2 reviews the literature on the retirement-consumption. Section 3 presents the estimation strategy and main assumptions. Section 4 summarizes the data and its main characteristics, describes the outcomes of interest and the construction of the instrument for retirement. Section 5 presents the main results; Section 6 presents a robustness check performed with an alternative estimation strategy and Section 7 discuss the economic interpretation of the obtained results. Finally, Section 8 concludes.

2 Literature

Different authors have estimated the expenditure changes at retirement; however, the results vary from application to application. In the following literature review I present the magnitude of the estimated consumption drop from various studies in chronological order, and the different explanations that researchers have tested as possible causes of the retirement-consumption puzzle. Table 2.1 offers a summary of the literature findings discussed below.

Banks, Blundell and Tanner (1998), using UK data, were among the first to estimate a decline of around 3% in consumption at retirement, which could not be reconciled within the life-cycle model. Later, Bernheim, Skinner and Weinberg (2001) noted a similar effect for the US using panel data on food consumption from the Panel Study of Income Dynamics (PSID); for food away from home, they measure a mean reduction in spending after retirement of about 14% and estimate a 24% and 56% change in consumption one and two years after retirement for the lowest wealth quartile in their sample, respectively. In addition, they note that the consumption drop is present also for the other wealth quartiles, but at a diminishing rate with the increase in wealth. Similarly, again for the US, Hurd and Rohwedder (2003) using the Consumption and Activities Mail Survey (CAMS) in combination with the Health and Retirement Survey

(HRS), measure a 12% and 17% reduction in spending for couples and singles, respectively, by comparing pre-post retirement mean expenditures of the head of the households. By exploiting qualitative questions on expected consumption after retirement from the CAMS, they find that 92% of the near-retirement workers anticipate a consumption drop of about 20%, for both singles and couples, which is a larger drop than the realized one. Heider and Stephens (2004) also investigate the role of expectations, using the Retirement History Survey (RHS), the Health Retirement Study (HRS) and the Panel Study of Income Dynamics (PSID) information on food consumption; via OLS regressions, they estimate a consumption drop between 7 to 11 percent for those workers that retired when they expected to, a result the authors suggest being incompatible with the LC/PIH model.

Fisher et. al (2008) use the United States Consumer Expenditure Survey (CEX) and compute the difference between the average expenditure of retired individuals, with age between 65 and 69, and that of the same individuals when they were close to retirement, i.e., between 60 and 64yo. They find a consumption drop of about 6% for food expenditures and of 2.5% when including also other non-durable consumption categories; in addition, they find evidence that total non-durable expenditure continues to decline at a rate of around 1% per year in the years after retirement. Similar results are found by Battistin, Brugiavini, Ettore and Weber (2009) for Italy; they estimate a consumption drop at retirement of about 14% for food expenditures and of almost 10% when including other non-durable expenditures. Specifically, using the pension eligibility threshold as an instrument for retirement, they implement a regression discontinuity approach on the Survey on Household Income and Wealth (SHIW) data for the period 1993-2004. They also assess that the drop could not be caused by liquidity constraints arising at retirement since most Italian workers receive a lump-sum payment upon it. Instead, they show that retirement is associated with a reduction in the number of components of the households, suggesting this as a possible cause of the estimated expenditure decrease. Miniaci, Monfardini and Weber (2010), also for the Italian case, implement a cohort regression analysis to test for the presence of intercept shifts for retired households with respect to all other households for the period 1985-1996; they estimate a 5.4% consumption fall at retirement as a lower bound estimate, and produce evidence indicating that work-related expenditures are those that decrease at retirement while home production of food and other goods increase.

More recently, Li, Shi and Wu (2015) exploit China's mandatory retirement policy and using a regression discontinuity approach estimate a 19% reduction of non-durable expenditure right after retirement; specifically, they find that work-related consumption and food consumed at home decrease significantly, while leisure and entertainment expenditures do not.

In another recent paper, Olafsson e Pagel (2018) use highly detailed panel data on personal finances for the Icelandic population to monitor how spending, liquid savings and consumer debt change around retirement. They fit a fixed effect regression model and show that the overall spending decreases between 9 to 13% upon retirement, and that both work-related consumption (fuel, ready-made food and clothing) and leisure-related consumption (sports and other activities) drop substantially, while other spending categories, such as alcohol bought in store and pharmacy spending, all decrease by a similar but lower amount.

Overall, from the literature it emerges that the estimated consumption drops upon retirement range between 2.5 to 19% for non-durables and between 7 to 14% for food expenditures. This variability in the results is likely to be influenced by the different countries considered, the different surveys used which have each their own measures of consumption, as well as the different periods considered, and estimation methods employed. For the Italian case, Battistin, Brugiavini, Rettore and Weber (2009) are able to implement an effective estimation strategy, which is the same strategy applied in this work, using the eligibility to retirement as an instrument for retirement, while Miniaci, Monfardini and Weber (2010) are able to exploit detailed household consumption information using the Italian Survey on Family Budget, but are limited by the lack of information on employment and retirement statuses.

Table 2.1 – Literature summary

Authors	Data and country	Empirical Strategy	Estimated change
Banks, Blundell and Tanner (1998)	FES 1968-1992 UK	Estimated a predictive consumption growth model and compare it with actual consumption growth.	Consumption after retirement (63 years of age) is 3% lower than the predicted levels.
Bernheim, Skinner and Weinberg (2001)	PSID and CEX 1978-1990 US	Estimated a consumption Euler equation accounting for fixed and time-variant households characteristics.	Consumption for food away from home decrease by 14% 1 year after retirement and the consumption drop increases as wealth decreases.
Hurd and Rohwedder (2003)	HRS and CAMS 1993-1998 US	Compared the before and after retirement expected and realized expenditure changes.	Near-retirement households expected a consumption decline of about 20% while the realized one was between 12 to 17%.
Heider and Stephens (2004)	HRS - 1992-2000 RHS - 1969-1977 US	Exploited the near-retirement individual expected retirement age as instrument for retiring.	Food expenditures decreased by 7 to 11% after retirement also for those that retired when they expected to.
Fisher et al. (2008)	CEX 1984-2003 US	Measured the mean difference in food and other non-durable expenditures for individuals of the same cohort before and after retirement.	Food expenditures decreased by 6% after retirement while other non-durable expenditures decreased by 2.5%.
Battistin et al. (2009)	SHIW 1993-2004 Italy	Exploited the eligibility for retirement as an instrument for retiring in a regression discontinuity design.	Total non-durable consumption falls by 9.8% after retirement while food expenditures fall by 14%.
Miniaci, Monfardini and Weber (2010)	SFB 1985-1996 Italy	Implemented a regression analysis to test for the presence of intercept shifts for households whose head is retired compared to all other households.	Total consumption falls at retirement by 5.44% while home production of food and other goods increases.
Li, Shi and Wu (2015)	UHS 2002-2009 China	Exploited China's mandatory retirement policy to implement a regression discontinuity design using age as an instrument.	Households' non-durable expenditures drop by 19% after mandatory retirement.
Olafsson and Pagel (2018)	Meniga 2011-2017 Iceland	Implemented a fixed effect regression model to compare individuals to themselves before and after retirement.	Total non-durable expenditures decreased between 9 to 13% after retirement and both work-related and leisure related expenses decline after retiring.

Source: author's own elaboration.

3 Methodology

The objective of this work is to establish the causal relationship between a treatment, that is retirement, and an outcome or a set of outcomes of interest, namely the households' consumption. For this purpose, I employ a research design devised by Battistin, Brugiavini, Rettore and Weber (2009) (hereafter BBRW), explained in further details in what follows. In the case of a treatment such as retirement, we need to deal with the major issue of self-selection into the treatment that is induced by unobservable individual characteristics. These can be for example the health condition of the individual, an information that is not included in the SHIW, or whether the households are "ants or grasshoppers", namely the subjective perception of the savings and consumption expectations, that in turn have an influence on the consumption and the "when to retire" decisions. In order to deal with this endogeneity, I apply a regression discontinuity design, where the retirement decision is instrumented by an exogenous binary variable; this dummy takes the value of one if the individual is eligible for retirement and is equal to zero otherwise.

Let Y_1, Y_0 be respectively the expenditures levels of an individual in case of retirement or not. The causal effect of retirement on the expenditure levels is hence defined as $\beta = Y_1 - Y_0$. However, β is unobservable, since, as the individual retires, Y_1 is known while Y_0 is the unknown counterfactual.

The retirement status, defined as R, is represented by a binary variable with $R = 1$ when the individual is retired and $R = 0$ when the individual is not retired. A regression discontinuity design occurs when R depends on an observable variable, D, and there exists a known point in D where the probability of being retired changes abruptly. If we define $\bar{d}$ as the discontinuity point along D, then a regression discontinuity is defined if:

$$\Pr\{R = 1 \mid \bar{d}^+\} \neq \Pr\{R = 1 \mid \bar{d}^-\} \quad (1)$$

Where $\bar{d}^+$ and $\bar{d}^-$ are values of D marginally above and below the threshold $\bar{d}$, respectively. In the analysis presented here, D is the distance in number of years to and from the individual's eligibility for retirement. It follows that the distance to/from D can take both positive or negative values, depending on whether the individual age or number of years of public pension contributions is above or below the threshold needed to access retirement, and that individuals are allowed to retire only when $D \geq 0$.

Being eligible for retirement does not always force the individual to retire. If individuals were obliged to retire as soon as they are eligible, there would be a *sharp* discontinuity in the probability of retirement, where the probability of retirement goes from zero to one conditional on having a certain age or number of years of contribution, or formally $\Pr(R) = 1 \mid D \geq 0$. Such environment of mandatory retirement is exactly what Li, Shi and Wu (2015) exploit to estimate the effect of retirement on consumption in the Chinese population.

In the context of this paper, being eligible implies that the probability of retirement is lower than one, given that individuals can decide to continue working even after they gain the ability to retire. This environment describes a *fuzzy* discontinuity in the probability of receiving the treatment.

Following the seminal work by Imbens and Lemieux (2008) and the empirical implementation by BBRW, the average causal effect of retirement on consumption for those individuals around $\bar{d}$ can be estimated from the ratio between (i) the difference of the average consumption of individuals marginally above and below $\bar{d}$ and (ii) the share of retired individuals marginally above $\bar{d}$:

$$E\{\beta | R = 1, \bar{d}^{+}\} = \frac{E\{Y | \bar{d}^{+}\} - E\{Y | \bar{d}^{-}\}}{E\{R | \bar{d}^{+}\}} \tag{2}$$

In order for (2) to yield the average causal effect on consumption it is required that in the counterfactual world where there is no retirement, there is no discontinuity of consumption around $\bar{d}$.

In the SHIW dataset, the identification of β from (2) is unfortunately undermined by measurement error in D, as a share of individuals self-report to be retired despite having a negative value of *D*, and hence being non-eligible for retirement (this issue is further analyzed in sub-section 4.4 and 4.5). This is potentially due to both a measurement error in the retirement status *R* and/or in the distance to and from eligibility *D.* However, given the SHIW questionnaire design and the definition[2] of R, a measurement error in *R* is unlikely; therefore, all inconsistencies in the data are assumed to be due to measurement error in *D*.

In order to recover the causal effect of retirement on consumption described by (2), specific conditions for the error generating process in *D* are needed; this can be done by assuming that the observed eligibility variable is a mixture of values measured correctly and incorrectly. Formally, is assumed that:

$$D = D^t Z + D^e (1 - Z) \tag{3}$$

Where D^t and D^e are the true and error-ridden measurements of the eligibility, respectively, and Z is a dummy variable equal to one for the correct values. This model for the error generating process is known as the *contaminated sampling model*, discussed by Horowitz and Manski (1995). Under this key assumption it is possible to identify the causal effect of retirement on consumption by the following ratio:

$$E\{\beta \middle| R = 1, \bar{d}^+\} = \frac{E\{Y \middle| D = \bar{d}^+\} - E\{Y \middle| D = \bar{d}^-\}}{E\{R \middle| D = \bar{d}^+\} - E\{R \middle| D = \bar{d}^-\}} \tag{4}$$

Which corresponds to an IV regression where the retirement status is instrumented with the eligibility variable.[3] The practical application of this estimation strategy is reported in Section 5, along with the formal equations for the first and second stage regressions.

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[2] In the SHIW questionnaire there are two survey questions that allow to assess if the respondent is retired from work; a first question asks about the respondent employment status, and a second question asks if the individual draws a job-related public pension.

[3] For a detailed breakdown of the conditions necessary to obtain (4) see Battistin, Brugiavini, Rettore and Weber (2009) where they deal with the same issue on the same survey but in different waves. See also

4 Data

4.1 The Survey on Household Income and Wealth

I use four adjacent waves of the Survey on Household Income and Wealth, covering the period from 2010 to 2016[4].

The SHIW began in the 1960s with the aim of collecting data on income and wages of the Italian households; over the years, it started to include more variables to investigate a wider range of aspects of households' economic and financial behaviour, including in depth information regarding consumption, liquid and illiquid wealth, extensive demographic information, methods of payments, debts and loans.

The survey has been conducted annually on independent surveys until 1987, while from 1989 onward it became biennial; since then, 50 percent of the sample is re-interviewed every subsequent wave, in order to create a panel component. For every wave around 8,000 households are interviewed; the unit of observation is the family, defined as all the individuals living in the same dwelling, related by blood, marriage, common-law marriage or adoption.

In this analysis the retirement and eligibility statuses are related to the head, while consumption is taken at the household level. Only workers and pensioners are included, excluding household with any other occupational category (e.g., unemployed, disabled, student, etc.) and excluding any retired household head that reports to have stopped working after the year in which they retired. In addition, the top and bottom 1% of the distribution of the total non-durable consumption are excluded in order to account for outliers. The panel component of the SHIW is not exploited for the main analysis, as it is not needed in this regression discontinuity framework, although it is used in the robustness check analysis in Section 6.

Andrew and Chesher (2009) for an analysis on the impact of measurement error in the eligibility for the treatment variable.

[4] I could not include the 2018, 2020 and 2022 waves because as of today they are not available due to the COVID-19 pandemic, which completely prevented the elaboration of the 2018 wave and hindered the information gathering of the 2020 and 2022 waves.

Table 4.1 – Sample composition and mean differences in consumption

Year	Males			Females		
	Retired, %	Δ cons., %	N. obs.	Retired, %	Δ cons., %	N. obs.
2010	41.97	-9.14	3,495	36.81	-18.96	1,842
2012	43.61	-8.41	3,522	39.48	-17.13	1,892
2014	46.17	-6.86	3,392	42.45	-11.80	1,941
2016	43.25	-5.12	2,853	40.06	-9.40	1,700

Note: the sample is composed of either workers or retirees, hence the residual share is the percentage of workers. The difference in consumption is computed by considering the total non-durable consumption. Source: author's own elaboration.

4.2 Consumption and retirement status information

The information used for the households' expenditures comes from three different variables: (i) an aggregated measure of consumption computed by the Bank of Italy, containing every household's non-durable expense, which includes any food and non-food non-durable expenditures, bills and utilities and spending for travel and holidays, and excludes purchases of jewelry or any other durable goods, extraordinary maintenance of the household main residence, mortgage payments and any insurance policies payments, (ii) spending for food at home and (iii) spending for food out of home. Note, however, that the last two spending categories for food are not separately available for the year 2010, where there is a single variable for spending for food at and outside of home. Information on the retirement status comes from two questions, the first asking the respondents their occupational status, and the second asking if they draw any public job-related pension. A household head is considered as retired if the answer to the first question is "pensioner" and the answer to the second question is "Yes".

Summary statistics reporting the share of retired household heads and the percentage differences for the total non-durable consumption between the two groups are reported in Table 4.1, distinguishing between male and female heads. Roughly, four out of ten households in the sample are composed of retired individuals, although among female household heads the share of workers is higher that it is for men in every year. The mean difference in the total non-durable expenditures is larger for female heads than it is for male heads, and there is a noticeable decreasing trend over time for both groups, going from a reduction of 9 percent for males in 2010, to a 5 percent reduction in 2016; for female household heads the reduction goes from 18 percent in 2010 to 9 percent in 2016. The complete sample contains 20,637 observations, of which 64.26% are male and 42.32% are retired.

4.3 The Italian pension system

In order to accurately compute *D*, the distance in years to and from being eligible for retirement, it is necessary to consider how the requirements for retiring evolved over time, starting from the very beginning of the first form of social pension for workers in Italy, in 1919.

From 1919 to 1938, the only requirement for accessing the public job-related pension was having and age of 65 years. In this period, this age requirement was well above the average life expectancy of the Italian population, which ranged between 50 to 60 years of age. As a matter of fact, this first social pension was designed as an insurance in case the individual reached such old age, and therefore would have lost its ability to work.

From 1939 the age requirements for accessing retirement were reduced and differentiated between men and women, with 60 years of age for men and 55 years of age for women. These age requirements remained unchanged until 1991, after which a series of pension system reforms started, the first being the "Amato reform"[5], with the objective of reducing the cost of the public pension system by increasing the age required to access the old-age retirement, and the number of years of pension contribution required to access early-retirement; the latter was introduced in 1970, and heavily benefited the public sector workers until 1991, as this category of workers needed only 20 years of pension

[5] After the name of the Italian President of the Council of Ministers at the time. The same holds true for the "Dini reform"; while for the "Fornero reform" the name is after the labour minister at the time.

Table 4.2-part 1/2 – Pension requirement history in Italy

Year	Public sector				Private sector				Self-employed			
	Male		Female		Male		Female		Male		Female	
	Old age retirement	Early retirement	Old age retirement	Early retirement	Old age retirement	Early retirement	Old age retirement	Early retirement	Old age retirement	Early retirement	Old age retirement	Early retirement
1919-1938	65	/	65	/	65	/	65	/	65	/	65	/
1939-1969	60	/	55	/	60	/	55	/	60	/	55	/
1970-1991	60	20	55	20	60	35	55	35	60	35	55	35
1992	60	35	55	35	60	35	55	35	60	35	55	40
1993	60	35	55	35	60	35	55	35	60	35	55	40
1994	61	35	56	35	61	35	56	35	61	35	56	40
1995	62	35	57	35	62	35	57	35	62	35	57	40
1996	53 and 35	36	53 and 35	36	54 and 35	36	54 and 35	36	57 and 35	40	57 and 35	40
1997	53 and 35	36	53 and 35	36	54 and 35	36	54 and 35	36	57 and 35	40	57 and 35	40
1998	53 and 35	36	53 and 35	36	54 and 35	36	54 and 35	36	57 and 35	40	57 and 35	40
1999	53 and 35	37	53 and 35	37	55 and 35	37	55 and 35	37	57 and 35	40	57 and 35	40
2000	54 and 35	37	54 and 35	37	55 and 35	37	55 and 35	37	57 and 35	40	57 and 35	40
2001	55 and 35	37	55 and 35	37	56 and 35	37	56 and 35	37	58 and 35	40	58 and 35	40
2002	55 and 35	37	55 and 35	37	57 and 35	37	57 and 35	37	58 and 35	40	58 and 35	40
2003	56 and 35	37	56 and 35	37	57 and 35	37	57 and 35	37	58 and 35	40	58 and 35	40

Source: Author's own elaboration on "Variazioni su Temi di Diritto del Lavoro" – Enrico Gragnoli (2017 – No. 1).

Table 4.2-part 2/2 – Pension requirement history in Italy

Year	Public sector				Private sector				Self-employed			
	Male		Female		Male		Female		Male		Female	
	Old age retirement	Early retirement	Old age retirement	Early retirement	Old age retirement	Early retirement	Old age retirement	Early retirement	Old age retirement	Early retirement	Old age retirement	Early retirement
2004	57 and 35	38	57 and 35	38	57 and 35	38	57 and 35	38	58 and 35	40	58 and 35	40
2005	57 and 35	38	57 and 35	38	57 and 35	38	57 and 35	38	58 and 35	40	58 and 35	40
2006	57 and 35	39	57 and 35	39	57 and 35	39	57 and 35	39	58 and 35	40	58 and 35	40
2007	57 and 35	39	57 and 35	39	57 and 35	39	57 and 35	39	58 and 35	40	58 and 35	40
2008	57 and 35	40	57 and 35	40	57 and 35	40	57 and 35	40	58 and 35	40	58 and 35	40
2009	58 and 35	40	58 and 35	40	57 and 35	40	57 and 35	40	58 and 35	40	58 and 35	40
2010	59 and 36	40	59 and 36	40	59 and 36	40	59 and 36	40	59 and 36	40	59 and 36	40
2011	60 and 36	40	60 and 36	40	60 and 36	40	60 and 36	40	60 and 36	40	60 and 36	40
2012	66	42	66	41	66	42	62	41	66	42	63	41
2013	66	42	66	41	66	42	63	41	66	42	63	41
2014	66	42	66	41	66	42	63	41	66	42	64	41
2015	66	42	66	41	66	42	63	41	66	42	64	41
2016	66	42	66	41	66	42	65	41	66	42	66	41
2017	66	42	66	41	66	42	65	41	66	42	66	41
2018	66	42	66	41	66	42	66	41	66	42	66	41
2019	67	43	67	42	67	43	67	42	67	43	67	42
2020	67	43	67	42	67	43	67	42	67	43	67	42

Source: Author's own elaboration on "Variazioni su Temi di Diritto del Lavoro" – Enrico Gragnoli (2017 – No. 1).

contribution, against the 35 needed for private and self-employed workers[6]. In 1996 a second major reform is applied, the "Dini reform", which introduced the requirement of having both a minimum age and a minimum number of years of pension contribution to access old-age retirement. The requirements for both old-age and early-retirement were set to gradually increase over time, until 2011, when the European sovereign debt crisis struck Europe.

At the wake of the crisis, the Italian pension system underwent another series of changes under the Monti government. These changes are known as the "Fornero reform" and aimed at drastically reducing the pension burden on the aggregate public spending while levelling the differences in pension requirements between men and women and between public workers, private sector workers and self-employed. The result was a general tightening of the eligibility requirements for both old-age and early-retirement. For the old-age pension, the reform set in motion a gradual increase in the legal age requirement, in order to obtain parity conditions between men and women by 2018 across all sectors. These adjustments, linked to the increase in life expectancy, were applied every three years from 2012 to 2018, and are applied every two years since 2019. Moreover, the reform imposed a gradual increase in the number of required years of contributions, with the objective of having a requirement of 46 years and 45 years of contribution by 2050 for men and women, respectively. Table 4.2 summarizes the requirements for old-age pension and for early-retirement for men and women in the public and private sectors and for the self-employed in Italy over the last century.

4.4 Eligibility status and pension requirements

In order to define the distance in years to and from the retirement eligibility D, a series of variables have been used, referred to the household head: age, number of years of pension contribution, work starting age and the year in which the individual retired; all these variables are essential to apply the right set of pension requirements. The distance D is computed by considering the requirements for each year of observations (from 2010 to 2016) for the workers and considering the year in which the household head went

[6] In some specific cases the years of contribution required were 15 (e.g. magistrates, judges or university professors).

into retirement for the retired observations; the applied requirements are the ones displayed in Table 4.2.

To clarify this process with examples, let's consider a self-employed male worker in the observation year 2014, at that point in time he is 64 years old and has 29 years of pension contribution; his distance D will be equal to -2 years when considering his age (64-66), and equal to -13 when considering the years of pension contribution (29-42); his distance D from being eligible for retirement is therefore -2 years, the higher value between the two, as the individual will first be eligible for old-age pensions once he has at least 66 years of age. In another example, let's consider a male retired individual that previously worked as a private sector worker. In the year of observation 2016 he is 78 years old and has 38 years of pension contribution. The year in which he stopped working is 1990, and therefore the rules applied for computing D will be those in force between 1970 and 1991. His distance D from the eligibility is equal to -8 (52-60) considering the age he had when he stopped working, and equal to 3 (38-35) considering the years of pension contribution. The distance D from being eligible for retirement for this observation is 3, given that this individual has been first eligible for retirement when he reached 35 years of contribution, and is once again the higher value between the two.

Finally, the eligibility status E is simply achieved whenever the household head D is equal to or greater than zero, $E = 1 \mid D \geq 0$.

4.5 Special cases

Apart from the requirements displayed in Table 4.2, over the last half century different Italian governments introduced various exceptions or derogations for accessing the public retirement, under specific conditions. With the available information in the SHIW, I have been able to include six of these exceptions, defined here as "special cases". These special cases have been applied after having applied the general requirements of Table 4.2, and only on those observations that declared themselves as retired, despite not being eligible for retirement. The distance to and from the eligibility D is also computed according to the different requirements within these special cases.

(i) Former public sector workers

Although in the SHIW it is possible to determine whether a worker works in the public sector, or in the private sector or is self-employed, the same is not true for all retirees, who are classified either as former self-employed or former employee, the latter possibly being as a former private sector employee or a former public sector employee[7]. To account for at least some of these observations, any retired household head that stopped working between 1970 and 1991 and has a number of years of contribution that is between 15 and 20, is considered a former public sector employee, and his or her distance from the eligibility D is computed accordingly.

(ii) Minimum old age pension – Law n. 214/2011

In 2011, together with the Fornero reform, a minimum pension was introduced, accessible to every individual with at least 70 years of age and 5 years of pension contribution. Any non-eligible but retired individual of at least 70 years of age, with 5 years of pension contribution and that reports to be retired in any year after 2010, is considered eligible under this special case.

(iii) A.PE. – Anticipo PEnsionistico – Pension Advance

Introduced in 2016 with the law n. 232/2016 the "APE" allows any individual with at least 63 years of age to access old-age retirement by receiving an advance payment of his/her pension, which shall be paid back in 20 years after the normal age requirement for old-age retirement is achieved. The pension check received through the APE cannot exceed €1,500 per month. It follows that any household head that is retired despite not being eligible but has at least 63 years of age and receives a monthly pension check lower than €1,500, is considered as eligible under this special case.

(iv) Law n. 604/1966

In 1966 the Italian government, under the second Moro government, introduced the possibility to access an anticipated old-age pension with at least 30 years of contribution

[7] Within the "former employee" classification there is a specification for the former working sector (NACE); for those household heads that state that their former working sector is "Public administration" the rules applied are the ones of Table 4.2 and are not considered to be under any of the "special cases".

under two cases: (a) the worker is unemployed following the termination of the employment relationship due to dismissal or collective dismissal, resignation for just cause or consensual termination; (b) the worker suffers a reduction in working capacity of at least 74%, or the worker assists the spouse or a first degree relative living in the household with an impairing disability. Under this special case, any worker that is retired despite not being eligible, and has at least 30 years of pension contribution and refers to be receiving a disability support allowance from a public institution, or has been unemployed, is considered eligible.

(v) Deroga Amato – Amato exception

An exception introduced in 1992 together with the Amato reform that is still active as of today, allows a worker to retire with at least 15 years of contribution and 67 years of age. The requirements are that the 15 years of contribution are placed before 1993, and that the worker received the authorization for voluntary contribution scheme before 1993. Hence, any worker that has at least 15 years of contribution paid before 1993, is 67 or older and is retired despite not being eligible as per the Table 4.2 requirements, is considered as eligible under this special case.

(vi) Opzione contributiva Dini – Dini contributive option

Similarly to the previous special case, in 1996 an exception was introduced alongside the Dini reform. This exception allowed any individual with at least 15 years of pension contribution to retire, under these rules: having less than 18 years of pension contribution, having at least one year of pension contribution placed before 1996 and having at least 5 years of pension contribution from 1996 onward. Therefore, any worker that has more than 15 but less than 18 years of contribution, of which at least one is placed before 1996 and 5 after 1996, and is retired despite not being eligible, is considered as eligible under this special case.

4.6 Distance to and from eligibility

Table 4.3 shows the average share of retired heads by the distance to and from their eligibility, limited to ±5 years, for the complete sample and distinguished between males and females household heads. Figure 4.1 displays the same share of retired household heads over the distance to and from their eligibility, limited to ±10 years, for male and female heads distinguishing for each year of observation.

From the two figures it can be observed that there is indeed a relatively small but non-negligible share of individuals that are retired though not yet eligible for retirement. However, as anticipated in Section 3, this does not prevent us to obtain the causal effect of retirement on consumption when the retirement status is instrumented by the eligibility status. Indeed, as can be seen from the discontinuous jump in the share of retired household heads as soon as their distance from the eligibility point is at or greater than zero (Table 4.3 and Figure 4.1) it is clear that the eligibility has a strong explanatory power on the retirement decision. There seems to be no significant differences between the share of retired males and females heads, and also across the different years of observation, except for the year 2010, where the share of retired heads jumps to less than 80%, instead of at/over 80% for the remaining years.

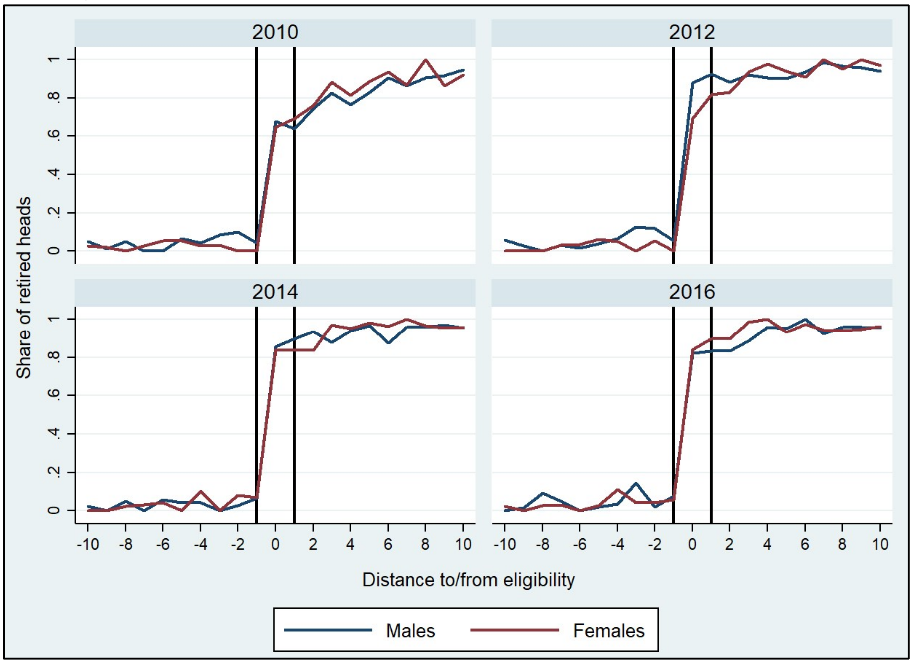
The share of retired households over the distance to and from the eligibility obtained by Battistin, Brugiavini, Rettore and Weber (2009) for the years of observation 1993-2004 also displays a significant jump in the probability of retirement at the threshold, going from 2.5% of retired individuals at $D = -1$ to 62.6% at $D = 1$. However, the discontinuous jump obtained in this work is 18% larger, from 4.8% to 82.8%. This is likely the consequence of the tightening of the requirements to access the public pension applied over the last decades, especially with the Fornero reform. More stringent requirements in terms of age and years of contribution increase the probability that a worker will work until the first are met and will retire as soon as he or she can. On the contrary, with easier requirements to access retirement, meaning a lower age and/or less years of contribution like in the pre-Fornero reform, there is a higher probability that a worker will continue to work some more years simply because is still perfectly capable to do so, physically and mentally and may still enjoy working. This is also reflected in the share of retired heads over the years: in the year 2010, before the Fornero reform, the share of retirees exactly at the eligibility point $D = 0$ is smaller, around 67%, while it is over 80% in the years after the reform.

Table 4.3 – Share of retired heads over distance to/from eligibility

Distance to/from eligibility	Total	Males	Females
-5	0.0411	0.0444	0.0357
-4	0.0529	0.0453	0.0666
-3	0.0625	0.0851	0.0200
-2	0.0554	0.0606	0.0425
-1	0.0478	0.0555	0.0349
0	0.8013	0.8167	0.7612
1	0.8279	0.8300	0.8230
2	0.8466	0.8547	0.8309
3	0.9098	0.8809	0.9452
4	0.9111	0.8950	0.9409
5	0.9184	0.9093	0.9385

Notes: the distance to and from eligibility is measured in years and is computed as described in sub-section 4.4 and 4.6. Source: author's own elaboration from SHIW data.

Figure 4.1 – Share of retired male and female heads by year



Source: author's own elaboration from SHIW data.

5 Results

As discussed in Section 3, the Local Average Treatment Effect of retirement on consumption can be estimated from equation (4), which corresponds to an instrumental variable regression in which the treatment, that is retirement, is instrumented by the eligibility status, and by considering only observations that are close to the threshold point $D = 0$. The IV regression is implemented by considering cells, rather than the single observations, composed of sample averages by year of observation and distance to and from the eligibility. For the complete sample and considering only cells within ±10 years from the eligibility and excluding those exactly at the eligibility point at zero, for which the questions on consumption could refer to both pre and post retirement, the total number of observations is 8,725, with an average number of observations per cell of 109, a minimum of 38 and a maximum of 209, for a total of 80 cells[8]. Formally, the first-stage of the IV regression takes the following form:

$$R_{d,t} = \beta_0 + \beta_1 E + \beta_2 D + \beta_3 D^2 + \varepsilon_{d,t} \qquad (5)$$

Where $R_{d,t}$ is share of retired heads taken as sample average by the survey year, t, and by the distance, d, to and from the eligibility. E is the dummy variable for the eligibility status, which instruments the retirement status, and is equal to one whenever the individual distance D from the eligibility point is equal or greater than zero, and is equal to zero otherwise. $\beta_2 D + \beta_3 D^2$ is a quadratic polynomial in D. The second-stage equation the is equal to:

$$Y_{d,t} = \delta_0 + \delta_1 \hat{R}_{d,t} + \delta_2 D + \delta_3 D^2 + \eta_{d,t} \qquad (6)$$

Where $Y_{d,t}$ are the consumption outcomes considered, which are again taken as sample averages by the survey year, t, and by the distance, d, to and from the eligibility. $\hat{R}_{d,t}$

[8] For the year 2010 the information on spending for food at home and away from home are not separately available. Hence the year 2010 is excluded for those outcomes and the number of cells is therefore equal to 60, with an average of 108 observations per cell, a maximum of 209 and a minimum of 38.

is the estimated retirement status from the first stage regression (5), which is again indexed by t and d to stress out that is defined as sample averages by survey year and distance to/from the eligibility. Lastly, $\beta_2 D + \beta_3 D^2$ is again the same quadratic polynomial in D as in the first-stage regression (5). Both the first and second stage equations also include year dummies. The sample is restricted to values of D within -10 and 10 years, excluding those exactly at $D = 0$ since for them the information on consumption could be referred to both pre and post retirement periods.

5.1 First-stage regression

As anticipated by Figure 4.1, the instrument eligibility does have a strong predicting value on the retirement decision; the coefficient for the eligibility is equal to 0.7753 and is highly significant, with a standard error of 0.0248 and an R-squared of 0.9927, as shown in Table 5.1. This result indicates that being eligible for retirement increases the household head probability of retirement by 77.53%.

These results are similar to the one estimated by Battistin, Brugiavini, Rettore and Weber (2009): they obtain an R-squared of 0.92, and a highly significant (t-value of 11.45) eligibility coefficient, which is however smaller and equal to 0.435. This once again suggests that the increase in the requirements for accessing the public pensions has on average pushed more workers to work until they reached the necessary age or years of contribution, rather than working until they can or want to.

5.2 The effect of retirement on consumption

Results presented here are for the log of (i) non-durable expenditure, (ii) spending for food at home and (iii) spending for food out of home, and are reported in Table 5.2. The estimated coefficients show that retirement causes a drop in non-durable consumption equal to 12.27%, significant at the 1% level. Spending for food at home also shows a negative sign, although with a smaller coefficient, equal to 3.7% and not statistically significant. Lastly, spending for food out of home is the outcome that decreases the most, with a 30.58% reduction that is significantly different form zero at the 1% level. Figure 5.1 depicts the causal effect of the eligibility on the non-durable expenditures.

Table 5.1 – First-stage regression result

	Coefficient	Std. Err.	t-value	P > | t |
Eligibility	0.7753	0.0248	31.15	0.000
D	0.0090	0.0017	5.19	0.000
D^2	0.0003	0.0001	2.31	0.024
R-squared	0.9927			

Notes: results of the regression of retirement on the eligibility and a quadratic polynomial in *D*, as discussed in Section 5. Standard errors are heteroskedasticity-consistent. Source: author's own elaboration from SHIW data.

The estimated effects of retirement on the non-durable consumption are generally in line with previous findings in the literature, albeit in the upper part of the estimated consumption drops. This is possibly due to the fact that the period considered is right after a major economic recession, characterized by a deflationary environment and depressed consumer confidence, which led to larger consumption declines associated with the retirement-consumption puzzle than the ones estimated toward the end of the 19th century. To confirm this, however, more research on the retirement-consumption puzzle that focuses on recent data from other countries is needed.

Results for the food at home spending are at odds with previous findings, which often find evidence of significant declines for food expenditure after retirement. See for example Bernheim, Skinner and Weinberg (2001), Heider and Stephens (2004), Fisher et al. (2008) and BBRW; the latter estimated a 14% reduction in spending for food in Italy, in the period 1993-2004.

However, these studies, except for Bernheim, Skinner and Weinberg (2001), use aggregated measures of food expenditure that include both food at home and out of home. The issue with using aggregated food expenditures is that spending for food at home is affected by leisure time, which increases after retirement and allows pensioners to spend less for food at home while maintaining the same level of perceived utility, by cooking more at home or having more time to shop for bargains.

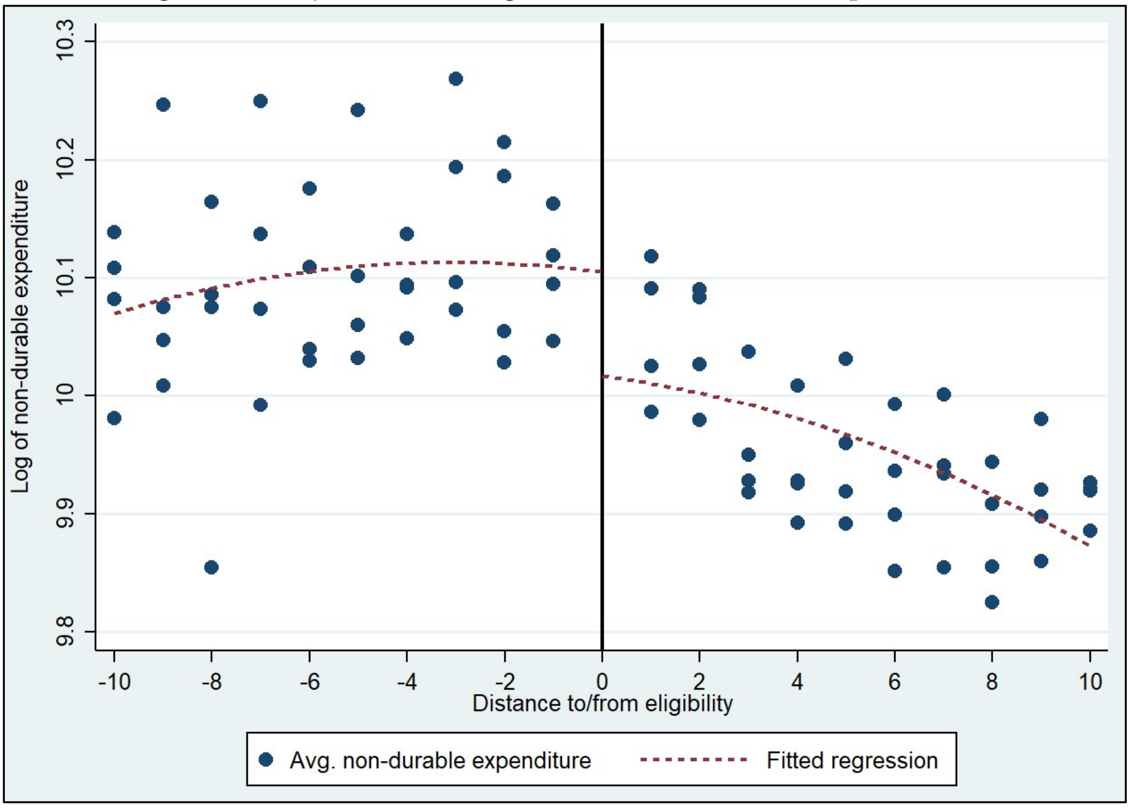
On the contrary, spending for food out of home is generally considered as a work-related expense (e.g., eating at restaurants near the workplace, or at the office/factory canteen), and is expected to decline at retirement. This work-related hypothesis is confirmed by the second-stage results, with a large and significant reduction in spending for food outside.

Table 5.2 – Second-stage regressions results

	Coefficient	Std. Err.	t-value	P > | t |
Non-durable cons.				
Retired	-0.1227	0.0348	-3.52	0.000
D	-0.0020	0.0026	-0.76	0.448
D^2	-0.0006	0.0002	-2.88	0.004
Food at home				
Retired	-0.0373	0.0514	-0.73	0.468
D	-0.0060	0.0041	-1.45	0.148
D^2	-0.0004	0.0003	-1.24	0.217
Food out of home				
Retired	-0.3058	0.0789	-3.87	0.000
D	0.0006	0.0056	0.12	0.904
D^2	-0.0008	0.0005	-1.79	0.073

Notes: non-durable consumption, spending for food at home and spending for food out of home are taken as log values. The coefficients for spending for food at home and out of home are estimated excluding the year 2010, for which the information on food expenditure is available only in aggregated form. Standard errors are heteroskedasticity-consistent. Source: author's own elaboration from SHIW data.

Figure 5.1 – Quadratic-fit regression of non-durable expenditure



Source: author's own elaboration from SHIW data.

Changing the depth of the year-band chosen affects the magnitude of the estimated coefficients while not influencing their direction, with the negative effect of retirement decreasing as the year-band also decreases. For distances for ±5, 6, 7, 8 and 9 years the drops for non-durables are equal to 6.8, 9.8, 9.7, 10.7 and 12.6 percent, significant at the 10, 5, 5, 5 and 1 percent, respectively. Over the ±10-year distance threshold the estimated coefficients remain stable, ranging between 12 to 13.3%, while the t-values increase marginally.

5.3 Male versus female household head

A dimension that has been overlooked in the literature on the retirement-consumption puzzle is the gender of the retiree. To the best of my knowledge, there has been no paper that investigated how the effect of retirement changes when the household head is female instead of male, and in the literature the households considered have exclusively been those with male head, including the work by Battistin et al. (2009), from which this paper inherits the methodological framework. While this choice is understandable for the sake of the sample homogeneity, understanding if the effect of retirement on the household's expenditure changes and how when considering male versus female retirees, is vital to assess which parts of the retiring population are most at risk of struggling to make ends meet, and in light of the ever-growing evidence on gender inequalities.

To assess the presence of a gender difference in the negative effect of retirement on consumption, the sample is divided between male and female household heads and equations (5) and (6) are estimated separately. Information on the observations that compose the cells of the two groups are reported in Table 5.3.

Table 5.3 – Cells composition for male vs. female household heads

	Male	Female
N. observations	6,167	2,558
Average	71	37
Min	19	15
Max	148	101

Notes: information on observations that compose the cells; the average, minimum and maximum values are referred to 80 cells, computed by distance to/from eligibility and calendar year, distinguishing between male and female household heads. Source: author's own elaboration from SHIW data.

The coefficients for the eligibility from the first-stage regressions are equal to 0.7564, with an R-squared of 0.9904, and 0.7986, with an R-squared of 0.9912, for men and women, respectively. From these first-stage results it appears that being eligible for retirement has a slightly stronger effect on women than on men, where the former has a higher probability to retire as soon as they are eligible than the latter.

Table 5.4 reports the effects of retirement on the non-durable consumption for men and women separately. From the estimated coefficients it appears that households with a female head experience a consumption drop caused by retirement that is more than double than the drop estimated for men: 8.22% drop for the latter, significant at the 5% level, versus 19.90% drop for female retirees, significant at the 1% level. Figure 5.2 shows the change in non-durable consumption over distance to and from the eligibility for men and women separately.

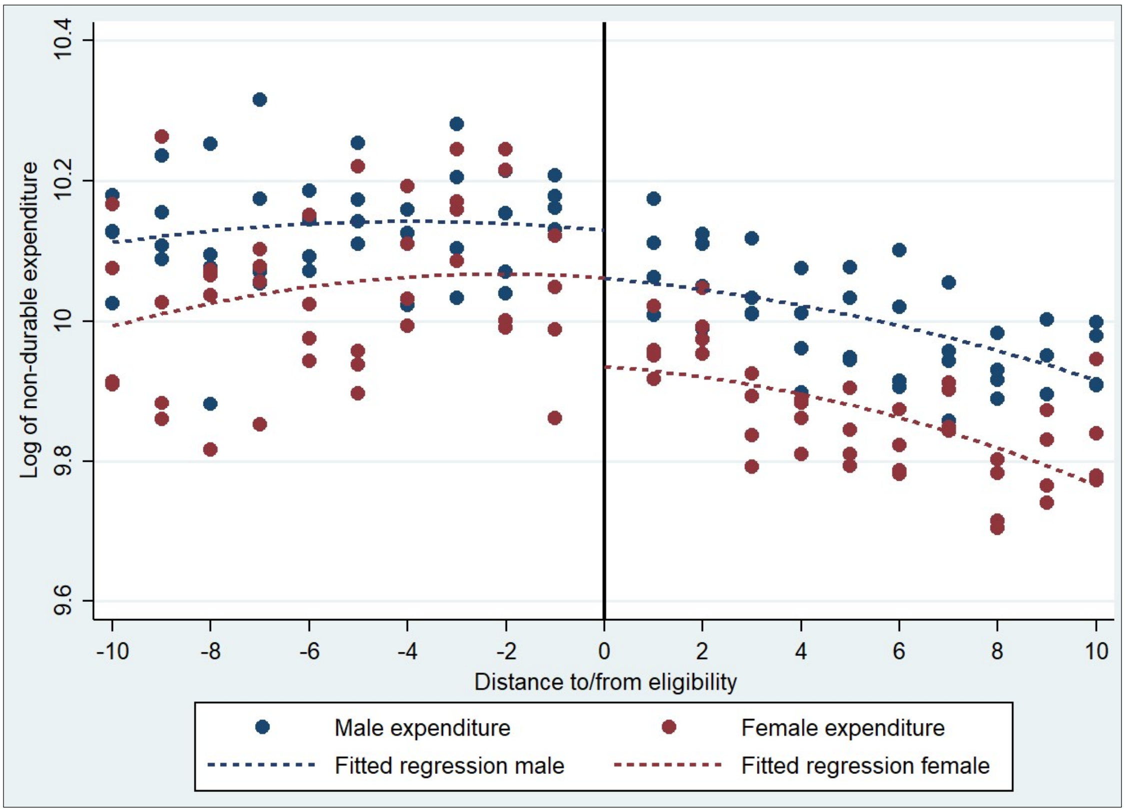
From this graph it can be observed that the difference in consumption between man and women for negative values of D is smaller than for positive values of D; the observed pre-eligibility difference between the two groups is possibly due to the gender pay-gap, which, during the working life, leads to lower pension payments for women than for men, and ultimately translates into lower pension benefits, leading to the observed wider difference in consumption for values of D above zero. This potential transmission mechanism is investigated in more details in Section 7. These results highlight that the magnitude of the negative effect of retirement on expenditures does depend on the household head gender, and that households in which the head is female endure a sharper spending decline than male heads.

Table 5.4 – Effect of retirement on consumption for male vs. female

	Coefficient	Std. Err.	t-value	P > | t |
Male				
Non-durable cons.				
Retired	-0.0822	0.0370	-2.22	0.026
D	0.0041	0.0027	-1.51	0.130
D^2	-0.0006	0.0002	-2.92	0.004
Female				
Non-durable cons.				
Retired	-0.1990	0.0542	-3.67	0.000
D	0.0007	0.0041	0.18	0.857
D^2	-0.0008	0.0003	-2.30	0.021

Notes: non-durable consumption is taken as log value. Standard errors are heteroskedasticity-consistent. Source: author's own elaboration from SHIW data.

Figure 5.2 – Quadratic-fit regression of non-dur. exp. for male vs. female



Source: author's own elaboration from SHIW data.

5.4 Differences in wealth

Another relatively overlooked dimension in the literature on the retirement-consumption puzzle is the household wealth and how the consumption decline due to retirement varies across different level of it. An exception is Bernheim, Skinner and Weinberg (2001) who observe that the average expenditure decline at retirement increases as wealth decreases. Estimating how the consumption drop caused by retirement varies with the wealth of the household allows one to assess the role played by wealth in the puzzle, and to pin down the consumption drop across wealthy and poor households.

Similarly to sub-section 5.2, to study the relationship between the wealth distribution and the consumption drop at retirement the sample is divided into five wealth quintiles[9] and equations (5) and (6) are estimated for each wealth-group. Table 5.5 reports the information on the observations that compose the cells of these five groups. Each group is composed of 1,745 observations with a mean of 21.81 observations per cell.

The five first-stage regressions resulted in a coefficient for the eligibility equal to: 0.7275, 0.8367, 0.7946, 0.7756 and 0.7175; and a R-squared equal to: 0.9780, 0.9912, 0.9854, 0.9822 and 0.9733; listed from the first to the fifth wealth quintile, respectively. The coefficients remain high, even though with some variation, especially for the fifth wealth quintile that has the lowest coefficient for the eligibility.

Table 5.6 report the second-stage regression coefficients for the effect of retirement on non-durable consumption for each wealth quintile separately. These results show that for retirees in the poorest and richest wealth quintiles there is no significant negative effect of retirement on non-durable expenditures, while there is a strong and highly significant negative effect for the second wealth quintile, with a 29.27% spending decline. The third wealth quintile also displays a spending reduction, about 11.7%, significant at the 1% level, while the second richest quintiles, that is the fourth quintile, presents a 7.5% decline that is however only weakly significant.

[9] The wealth quintiles are computed after having removed observations over the ±10-year distance and from the eligibility point and at $D = 0$, as described in Section 5.

Table 5.5 – Sample composition of wealth quantiles

	W1	W2	W3	W4	W5
Median	21	20	20	20	20
Std. Dev.	8.6	9.17	10.03	8.63	9.31
Min	6	6	5	4	8
Max	44	46	51	48	55

Notes: information on the observations that compose the cells; median, standard deviation, minimum and maximum are related to 80 cells, computed by distance to/from eligibility and by calendar year, distinguishing between wealth quintiles where W1 is the first wealth quintile and W5 is the fifth wealth quintile. Source: author's own elaboration from SHIW data.

From these results it appears that the negative effect of retirement on spending is largely concentrated in the center-bottom part of the wealth distribution, where a significative and negative sign is observed for the second and third quintiles, while also being strongly skewed toward the lower quintiles and the poorest part of the retiring population, due to the very high and highly significant coefficient estimated for the second quintile.

While not observing a consumption decline for the fifth wealth quintile can be expected, the absence of a negative effect on the first wealth quantile is instead at odds with previous findings in the literature and seems rather counter-intuitive. An explanation for this result could lie in the fact that for this part of the household population is actually rather difficult to reduce consumption, simply because most of their household spending is for essential items like food, shelter and bills and utilities[10]. This aspect is further analyzed in Section 7.

[10] A similar remark is often made to explain why poor households finds it difficult to protect themselves against rising inflation.

Table 5.6 – Effect of retirement on consumption for wealth quintiles

	Coefficient	Std. Err.	t-value	P > | t |
		1st Wealth quintile		
Non-durable cons.				
Retired	-0.0546	0.0761	-0.72	0.473
D	-0.0085	0.0055	-1.56	0.118
D^2	-0.0001	0.0040	-0.25	0.802
		2nd Wealth quintile		
Non-durable cons.				
Retired	-0.2927	0.0515	-5.68	0.000
D	0.0037	0.0035	1.06	0.282
D^2	-0.0006	0.0003	-2.24	0.025
		3rd Wealth quintile		
Non-durable cons.				
Retired	-0.1167	0.0375	-3.11	0.002
D	-0.0029	0.0027	-1.06	0.290
D^2	-0.0006	0.0002	-2.65	0.008
		4th Wealth quintile		
Non-durable cons.				
Retired	-0.0753	0.0506	-1.49	0.137
D	-0.0041	0.0036	-1.13	0.256
D^2	-0.0004	0.0003	-1.51	0.130
		5th Wealth quintile		
Non-durable cons.				
Retired	-0.0166	0.0652	-0.26	0.798
D	-0.0071	0.0041	-1.72	0.086
D^2	-0.0001	0.0003	-0.26	0.797

Notes: non-durable consumption is taken as log value. Standard errors are heteroskedasticity-consistent. Source: author's own elaboration from SHIW data.

6 Alternative estimation strategy

The estimation strategy presented in Section 3 does not exploit the panel component of the SHIW, as it is not necessary for the estimation of the parameters of interest. In order to exploit the time dimension that the data offers and also to provide a robustness check to the main results presented in Section 5, a novelty estimation strategy is proposed, where the treatment of interest is identified by the passage, for the household head, from being a worker in a survey year to being retired in the subsequent survey year. In other words, when the household head changes status between one survey year and the next. A propensity score in then used, estimated from the probability of retiring giving a set of covariates, to match the treated observations with untreated observations that have similar individual characteristics. The Average Treatment Effect on the Treated is estimated by calculating the mean difference of the expenditures level, taken at the time of the treatment assignment, between the two groups. The use of a propensity score allows to tackle the endogeneity problem due to self-selection related to the retirement decision, while also exploiting the panel-data dimension of the SHIW, which gives the possibility to estimate the propensity score using covariates measured before the treatment assignment and therefore reduce any endogeneity issue between treatment and controls.

6.1 Sample selection

Nine adjacent waves of the SHIW are used, from 2000 to 2016, and as for the main analysis, the unit of observation is the head of the household. The sample is selected following the same rules applied in sub-section 4.1, with the difference that only panel observations are kept and a further selection based on the age of the household head is applied, where any individual whose age is less than 50 or more than 80 years is excluded from the analysis[11]. This is done in order to avoid comparing young individual that have

[11] From the literature, no clear preferences emerge for the age selection of the sample: Banks et al. (1998) apply an arbitrary ±7 years from the official age of retirement. Hurd and Rohwedder (2003) exclude individuals below 50 and above 80 years of age. Fisher et al. (2008) excludes individuals below 50 years of age. Olafsson and Pagel (2018) exclude individuals below 60 years of age.

a very low probability of retiring with older individuals that have a high probability of retiring. The final sample contains only individuals that either went from the working status to the retirement status or that remained in the working status in two subsequent years of observations. In total we are left with 3,670 observations of which 582 are treated, resulting in 6.3 potential controls for each treated individual.

6.2 Treatment status

The treatment status is identified whenever a household head is working at time t and is retired at time $t+1$, where the treatment is assigned at $t+1$. On the contrary, any household head that is working at time t and is still working at time $t+1$ is considered as a control in the period $t+1$. To fix ideas with examples, imagine there is an individual that is working in 2008 and is then retired in 2010; this individual will receive the treatment status in the year 2010. If instead, and individual is working in both 2008 and 2010, it will be considered as a control in the year 2010.

The analysis is conducted on the nine waves altogether, instead of being performed separately every two waves, due to the low number of treated observations present in each adjacent wave.

6.3 Empirical strategy and implementation

To establish the causal relationship between retirement and consumption while controlling for the self-selection bias attached to the retirement decision, a matching score is estimated, which allows to obtain a control group with similar characteristics as the treatment group. Formally, the Average Treatment Effect on the Treated (ATT) is given by:

$$ATT = E[Y(1)|T = 1] - E[Y(0)|T = 1] \tag{7}$$

Where T is the treatment indicator that equals one if the individual goes from being a worker to being retired and zero otherwise. The second term of (7) is the mean outcome for the treated in a world where they have not received the treatment and is the unobservable counterfactual. A possible substitute for this counterfactual term is the mean outcome of the untreated, namely $E[Y(0)|T = 0]$. This can be used under the validity of one assumption, namely the Conditional Independence Assumption (CIA), which states that, conditional on a set of observed characteristics *X*, the outcomes of interest in case of treatment *Y(1)* or not-treatment *Y(0)*, are independent of the treatment status. Under this assumption, the ATT is then given by:

$$ATT \mid X \; = E[Y(1)|X, T = 1] - E[Y(0)|X, T = 1] \tag{8}$$

Where *X* is a highly dimensional vector composed of a wide range of the household head individual and family characteristics that need to be accounted for to obtain unbiased estimates of the effect of retirement on consumption. To deal with this dimensionality problem, as Rosenbaum and Rubin (1983) suggest with their Propensity Score Theorem (PST), a balancing score is used (the propensity score), that is the probability of receiving the treatment given the individual observed covariates *X*. The PST is a corollary of the CIA, which can be written as:

$$Y(0), Y(1) \;\perp\!\!\!\perp\; \mathrm{T} \mid P(X), \forall\, X \tag{8}$$

Where the outcomes in case of treatment and non-treatment are independent of the treatment itself if conditioned on the probability of receiving the treatment, given the set of controls *X*.

Given the above premises, the probit[12] regression model for the estimation of the propensity score is the following:

$$T_i = \gamma_0 + \gamma_1 C_i + \gamma_2 X_{i,t} + \gamma_3 Z_{i,t-1} + \tau_i \tag{9}$$

Where T_i is a binary variable that equals one if the household head went from working to being retired and equal to zero if he or she continued working. C_i is a categorical variable that marks from which coupled waves the observation *i* originates from, going from a value of 1 for the years 2000-2002 up to a value of 8 for the years 2014-2016. C_i

[12] When the treatment is binary, logit and probit models yield similar results (Caliendo and Kopeining, 2008).

is used to account for time-effect. $X_{i,t}$ is a vector of time invariant characteristics whose values are taken at time t (e.g., for the coupled years 2008-2010, time invariant characteristics of the household are taken in the year 2010) and account for gender, years of education, the area of residence, expressed as north, centre or south, the number of income perceivers in the household and a dummy variable for the ownership of the household main residence. While $Z_{i,t-1}$ is a vector of time variant characteristics whose value as taken at time *t-1* (e.g., for the couple years 2008-2010, time variant characteristics of the household are taken in the year 2008) and account for age, years of pension contribution and income.[13]

After the estimation of the propensity score, the next step is the matching between treated and control individuals. Different matching algorithm can be used; in this case, the matching algorithm chosen is the nearest neighbour (NN) matching algorithm with replacement and without oversampling. With the NN matching the individual from the control group chosen as a match for the treated individual is simply the one with the closest propensity score. With replacement means that the same untreated individual can be used more than once as a match, and without oversampling means that the treated individual will be compared to only one untreated, instead of a number *n* of untreated individuals. NN is the chosen matching algorithm due to it being the most straightforward and widely used matching method in the literature[14].

6.4 Results

Similarly to the main results presented in Section 5, the effect of retirement on consumption is estimated three times: (i) for the complete sample, (ii) by distinguishing between male and female heads and (iii) by excluding the first and bottom tertile of the wealth distribution[15]. The outcome for consumption considered is the total non-durable consumption. The results for the estimated ATT are reported in table 6.1.

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[13] Time variant variables are taken before the assignment of the treatment to avoid a potential endogeneity issue in which these time-varying characteristics are influenced by the treatment itself, if taken at the time of the treatment (Caliendo and Kopeinig, 2005).

[14] Other matching methods have also been tested (e.g., radius with different calipers, NN with and without replacement/oversampling, etc.) but the resulting ATT was similar to the one presented here.

[15] Due to the low number of treated observations, any further subdivision of the sample (e.g., quartiles or quintiles) would result in unbalanced treatment and control groups, yielding biased estimates.

For the complete sample the consumption drop is equal to 8.23 percent and is significant at the 5% level. When controlling for gender no significant drop is estimated for both groups, while when excluding the richest part of the sample, meaning those in the third wealth tertile, the negative effect of retirement is equal to 8.65 percent significant at the 5% level, and equal to 5.6 percent significant at the 10% level when the poorest, i.e., the first tertile, households are excluded.

The estimated effect of retirement on consumption using the propensity score estimation strategy is overall lower than the estimates from the regression discontinuity design. This is likely due to the fact that with the PS strategy the change in expenditures due to retirement is measured right after retirement happen, while with the RDD the effect is estimated within a 10-year distance from the eligibility point. This is supported also by the estimates obtained when reducing the distance to and from the eligibility point: the negative effect of retirement increases from 6.8% with a ± 5-year distance to a 12.3% estimated drop with a ±10-year distance.

The differences with respect to the gender of the household head are very low and non-significant, which is at odds with the findings in the RDD estimates; this could be due to the composition of the two sub-samples, given that, for households with a male head, household income is unbalanced between the treated and matched controls, while for the households with a female head the unbalance is for the number of income perceivers in the household, the geographic area of residence and for the years-controls, on top of a low number of treated observations. The results based on wealth are instead in line with the RDD estimates, although of a smaller magnitude, likely again for the reason explained above. The direction of the estimated effect seems to confirm the general hypothesis that households with less disposable wealth will be forced to decrease their consumption more due to retirement than richer households.

Except for the male versus female comparison, in all the other cases the groups of treated and controls are balanced for every time-variant and time-invariant controls included in (9). The tests results for the means of the controls versus treated are reported in the appendix from Table A.1 to Table A.5

Table 6.1 – PS estimation results

	Cons. drop	Std. Err.	# Treated	# Untreated
Complete sample	-0.0823**	0.0319	582	3,088
Male	-0.0316	0.0372	446	2,197
Female	-0.0384	0.0687	136	891
>1st tertile	-0.0560*	0.0322	425	2,095
<3rd tertile	-0.0865**	0.0397	353	1,961

Notes: ***1% significance level, **5% significance level and *10% significance level. The # of treated and untreated is referred to the number of treated observations and the number of potential controls. Source: author's own elaboration from SHIW data.

7 Results' economic interpretation

In Section 5 it has been estimated that the expenditure decrease associated with retirement is (i) larger for those households that have a female head relative to household with male heads, and (ii) for the lower-wealth households relative to higher-wealth households. In this section, the mechanisms behind these findings are investigated. In addition, an array of qualitative subjective questions is also exploited, with the objective of exploring how retirees perceive their overall quality of life with respect to workers. The sample considered is the same used for the RDD estimations of Section 5.

7.1 Gender pay-gap translates into gender pension-gap

A possible explanation for the gander-based difference estimated in sub-section 5.2 could lie in the gender pay-gap. During the working life, the lower salary perceived by women is translated into lower pension contribution payments, on which part of the pension check is ultimately computed, leading to lower disposable income and, ceteris paribus, lower consumption levels. This transmission mechanism is corroborated by a rich literature that studies the gender pension-gap (Zhao and Zhao, 2018; Amarante, Colacce and Manzi, 2017; Smith-Carrier, Penner, Cecala and Agòcs, 2021); this literature indicates as major culprits for the lower pension benefits received by women (i) the lower female labour market participation, (ii) the temporary career interruptions due to pregnancies and (iii) the lower pension contribution payments related to the gender pay-gap, of which the latter is considered to be the main explanation for the gender pension-gap (Frericks and Maier, 2008; Bonnet, Meurs and Rapoport, 2020).

Within the SHIW questionnaire there are unfortunately no questions regarding the amount of pension contributions paid, an information that could have been used to investigate the first step in the above-mentioned mechanism that leads to lower pension checks for women. To investigate this hypothesis an OLS regression is run on a sub-sample of household heads that have a distance from the eligibility point between 1 and 5 years. The OLS regression has the log of the monthly pension allowance as the dependent variable, and gender (equal to one for female and zero otherwise) as the independent variable of interest, plus a lengthy list of controls[16] including demographic and economic characteristics and any variable that has an influence on the amount of the pension allowance, like the years of pension contribution, the job before retiring and the year in which the individual retired, among others.

The estimated coefficient for gender is equal to -0.2016, significant at the 0.1% level, indicating that being female is associated with a more than 20% lower pension check than the male one. If instead only households with a distance to the eligibility point between -1 and -5 and are considered, and an OLS regression with the job-income as dependent variable and gender as the independent variable of interest plus the same set of controls (except for the year in which the individual retired) is ran, the coefficient for gender is equal to 0.0775 significant at the 5% level, indicating a 7.75% gander pay-gap.

These results highlight that, after retirement, there is indeed a widening of the difference in the income perceived based on the gander of the household heads, which likely contributes to the larger consumption decline estimated for women in sub-section 5.2.

[16] The complete set of controls includes: the education level, age, the geographic area of residence, number of family components, number of income perceivers, income, wealth, ownership of the household main residence, job had before retiring, years of pension contribution, year in which the individual retired, calendar year and the distance from the eligibility point.

7.2 Essential spending and negative buffer-stock

The magnitude of the expenditure drop caused by retirement is inversely correlated with wealth, where the poorer the household, the larger the consumption decline, as discussed in sub-section 5-3. This is also what Bernheim, Skinner and Weinberg (2001) find for the US, where the consumption drop after retirement increases as the pre-retirement disposable wealth decreases. However, the findings in this analysis highlight a large discontinuity in the consumption decline between the first and second wealth quintile, where for the first quintile there is a non-significant 5.4% reduction and for the second quintile the reduction is around 29% and is highly significant.

The explanation for this counter-intuitive discrepancy could lie in the fact that the first wealth quantile households are unable to further reduce their spending simply because their consumption is mostly composed of essential expenses, like spending for food, bills and utilities and debt repayments.

To explore this hypothesis three measures are computed; the first is the share of essential consumption over total non-durable consumption, where essential consumption is defined as the sum of spending for food at home, spending for food out of home, spending for bills and utilities, mortgage payments and rent and other annexed fees[17], and the total non-durable is the same used throughout this paper, defined in sub-section 4.2. The second measure makes use of a qualitative question present in the SHIW, which asks to the household head the following: "In your opinion, how much does it take a month for a family like yours to live without luxuries but without depriving yourselves of the essential?". This information can be interpreted as a subjective poverty line and is used to compute the buffer-stock of the household[18]. The third measure also makes use of a qualitative question in the SHIW, that asks to the household head if, in the last year, there have been any delays of ninety days or more in the payment of the household bills. Table 7.1 presents these three measures for those households that have a distance from the eligibility between 1 and 10, divided with respect to the wealth quintile.

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[17] This measure of essential consumption it is not intended as complete, as there are other essential expenses that are unfortunately not included in the SHIW, such as spending for health and medicines.

[18] The "buffer stock" measure is computed using the following equation: buffer stock = (monthly income ÷ subjective essential income)-1; the result is then multiplied by 100 to express it as a percentage.

Table 7.1 – Comparison between wealth quintiles

	Essential share (%)	Buffer-stock (%)	Arrears bills (%)
1st Wealth quintile	65.01	-3.20	6.99
2nd Wealth quintile	52.38	17.35	1.71
3rd Wealth quintile	46.42	35.84	1.71
4th Wealth quintile	43.81	52.49	0.60
5th Wealth quintile	41.99	102.78	0.59

Notes: The wealth quintiles are defined after having excluded any household over a ±10-year distance to and from the eligibility point and after having excluded those exactly at zero. Source: author's own elaboration from SHIW data.

From the three measures it can be observed that the first quintile has the largest share of essential consumption, equal to 65 percent of the total non-durable consumption, and that there is a substantial gap between the latter and the remaining four wealth quintiles. This could indicate that for these households their consumption is already close to the minimum necessary for living, and hence cannot be reduced further. This is also supported by the buffer-stock measure, where the first wealth quantile is the only part of the household population that has a negative buffer-stock, meaning that their perceived income is lower than the self-reported amount of income needed to live without luxuries but with all the essentials. Lastly, the third measure indicates that for households in the first wealth quintile it is more than four times more likely to be at least ninety days late in paying bills than households in the second wealth quintile; this again indicates an increased likelihood for the first wealth quantile households of having inadequate disposable resources to sustain even the essential expenses.

7.3 Subjective measures

In this last sub-section, a series of subjective qualitative questions is taken into consideration, in order to assess if there are any changes in the perception of the disposable resources and general quality of life of retirees with respect to workers. The questions used are six in total and are shown and discussed below.

(Question 1 – Make end meets)

Question: “The monthly income available to your family allows you to make end meets…”

Possible answers:

1 – With much difficulty

2 – With difficulty

3 – With some difficulty

4 – Easily enough

5 – Quite easily

6 – Very easily

From this question a dummy variable is computed, which is equal to one whenever the household answer is equal to three or lower, and equal to zero otherwise.

(Question 2 – Unusual low consumption)

Question: “You told me that the average household monthly expenditure in [current year of observation] for all consumption was equal to [total non-durable consumption]. Would you say that this level of spending in [current year of observation] was unusually high, unusually low, or normal compared to what you would have thought of spending in a ‘normal’ year?”

Possible answers:

1 – Unusually high

2 – Normal

3 – Unusually low

From this second question another dummy variable is computed, equal to one whenever the household answer is equal to three and equal to zero otherwise.

(Question 3 – Unusual low income)

Question: "By taking into consideration your overall household income in [current year of observation], would you say that it was unusually high, unusually low or in line with the annual income you thought you would have in a 'normal' year?"

Possible answers:

1 – Unusually high

2 – Normal

3 – Unusually low

Similarly to question number two, a dummy variable is computed that is equal to one whenever the household answer is three and equal to zero otherwise.

(Question 4 – Not saved)

Question: "Think about all the sources of income of your family. Could you tell me if in [current year of observation] your family…"

Possible answers:

1 – Has spent less than the annual income, managing to increase savings

2 – Has spent all the available income, without being able to save

3 – Has spent more than the annual income, having to liquidate savings or get into debt

From this question a dummy variable is computed, equal to one when the household answer is equal to two or three, and equal to zero otherwise.

(Question 5 – Windfall lottery saved)

Question: "Suppose you suddenly receive a refund equal to what your family earns in a month. Of this sum, how much would you save and how much would you spend? Please indicate the percentage that would be saved and the percentage that would be spent".

From this question the percentage saved by the household is used as the measure of interest. This question has been asked only in the 2016 and 2010 wave, hence the reported value will be with respect to those two years of observation only.

(Question 6 - Happy)

Question: "Taking into consideration all aspect of your life, how happy do you feel? Answer by giving me a grade from 1 to 10, where 1 means 'extremely unhappy' and 10 means 'extremely happy' and the intermediate values serve to grade your answers". From this question the average score is used as the measure of interest.

Table 7.2 report the resulting measures from the qualitative questions just described, distinguishing between workers and retirees, and considering only households in which the head is within a ± 10-year distance to and from the eligibility point and excluding those household exactly at zero.

Overall, between workers and retirees it appears that there aren't any particularly large differences in the answers to the qualitative subjective questions considered. However, even if by small margins, some differences do emerge; with respect to workers, retirees report slightly less often to struggle to make ends meets and to have an unusual low consumption or income. This is in a way in contrast to the results obtained in Section 5 and 6, suggesting that the consumption drop do exist and can be measured objectively, but that retirees may not experience it from a subjective point of view.

The share of households that report to not being able to increase their savings is instead essentially the same between the two groups, and the same can be said for the 'happy' score. Lastly, retirees report a slightly higher share of windfall lottery saved than workers, although again the difference between the two groups is relatively small.

Table 7.2 – Responses to subjective questions for workers vs retirees

	Retired	Worker
Can't make ends meets (%)	51.92	53.87
Unusual low consumption (%)	1.94	3.26
Unusual low income (%)	9.01	15.39
Not saved (%)	63.15	63.38
Windfall lottery saved (%)	57.45	53.59
Happy (1-10)	7.06	7.14

Source: author's own elaboration from SHIW data.

8 Conclusions

This paper analyses the reduction in consumption that is caused by retirement in Italy, with a particular focus on the heterogeneity of this latter with respect to the gender of the household head, and the household wealth. The data exploited are four waves from 2010 to 2016 of the Survey on Households Income and Wealth (SHIW), which collects micro data on households spending and other demographic and wealth information. In order to tackle the endogeneity related to the retirement decision, this work follows the estimation strategy devised by Battistin et al. (2009), where the exogeneity of the eligibility for retirement is used as an instrument for the retirement decision. This instrumental variable strategy is then applied in a regression discontinuity design approach, where only households close to the eligibility threshold are considered. A substantial share of the household heads retires as soon as they are eligible, with the fraction of pensioners jumping from 4.8% one year before being eligible, to 82.8% one year after being eligible.

The estimated eligibility-induced retirement consumption drop is equal to 12.3%, when considering non-durable consumption, equal to 3.7% for food at home expenditures, albeit non statistically significant, and equal to 30.6% for food out-of-home spending. These results highlight that, first a consumption decline associated with retirement is still present in a more recent period in Italy, and second, that there is an increase in the magnitude of the negative effect of retirement on consumption, since the previous study (Battistin et al., 2009) that analyzed the Italian population for the period 1993-2004 using the same data source and estimation strategy, found a 9.8% decline in non-durables expenses.

The small and non-significant decline in food at home spending and the large and highly significant decline for food out-of-home expenditures also highlight that some of the previous findings in the literature related to the estimated food spending decline (e.g., Heider and Stephens, 2004; Fisher et al., 2008; Battistin et al., 2009) were possibly due to the food out-of-home component, rather than the food at-home component, as the distinction between the two is a feature that has been introduced relatively recently in households surveys. Out-of-home food spending is generally considered a work-related expense, which consequently falls once the individual stops working; an explanation that is in line with the sharp reduction estimated in this work for this spending category.

When considering the gender of the household heads separately, a wide gap in the negative effect of retirement is found. Households with female heads decrease their non-durable consumption by almost 20%, while for the male counterparts the reduction is more than a half, around 8.2%. This gender pension-gap is likely due to the gender pay-gap: the amount of pension contributions paid during the working life is what ultimately determines the size of the pension check received after retiring; as female workers generally have lower wages, due to the gender pay-gap, this translates in a lower total amount of pension contributions paid with respect to male workers, which then leads to a lower pension-income. This mechanism is underlined as one of the major culprit of the gender pension-gap by recent literature on the subject (Frericks and Maier, 2008; Bonnet, Meurs and Rapoport, 2020). The present work also corroborates this explanation: the gender-pay gap estimated for workers not eligible for retirement is around 7%, while the gender gap in the perceived pension check after being eligible for retirement is estimated to be almost three times larger and equal to 20%.

When considering the wealth distribution and dividing the households sample into five wealth quintiles, the estimated non-durable consumption drops due to retirement turn out to be skewed towards the lower wealth quintiles, and heavily present in the second and third quintiles, with consumption declines of 29.3% and 11.7% respectively; whereas for the first, fourth and fifth wealth quintile no statistically significant spending decline is estimated. While it is reasonable and expected to not have a consumption drop in the richest part of the population, namely the fourth and fifth wealth quintile, this does not hold true for the poorest part of the population in the first wealth quintile. This counterintuitive finding could be explained by the fact that the poorest part of the retiring population simply has no room for further spending reduction, as its expenses are almost entirely composed of essential expenditures like food, shelter (rent and/or mortgage), bills and utilities. This is confirmed by the data, where, for the first wealth quantile households, (i) spending for essentials is made up of 64% of the total non-durable expenditures, (ii) they display a negative "buffer-stock"[19] and (iii) they are four times more likely to have had arrears payments for bills and utilities with respect to the second wealth quantile households.

The analysis from this work confirms that the retirement-consumption puzzle is very much still alive, at least in Italy. Future research on the phenomenon should put particular attention on the heterogeneity of the effect of retirement on consumption, with respect to gender and wealth, but possibly also with respect to other individual or households' characteristics such as ethnicity or civil status history (e.g., households with divorced or widowed members). These differences can help understand which parts of the population are more at risk of suffering from consumption inequality and, more generally, from deteriorated financial and economic condition once entering retirement. The final aim is that, on the basis of these results, policy makers can design and enforce measures to effectively target those in need. Expanding this research to other countries, especially in Europe, where the share of the elderly population is growing relatively faster than in other parts of the world, would also provide a more comprehensive understanding of this phenomenon and of its possible sources and consequences.

[19] Computed using the following equation: buffer stock = (monthly income ÷ subjective essential income) - 1; see sub-section 7.2 for more details.

Appendix

Table A.1 – PS mean tests for treated vs. controls – complete sample

Variable	Treated mean	Control mean	t-value
Year 00-02	0.0828	0.1001	-1.49
Year 02-04	0.1082	0.0996	0.48
Year 04-06	0.1477	0.1494	-0.08
Year 06-08	0.1271	0.1254	0.09
Year 08-10	0.1443	0.1580	-0.65
Year 10-12	0.1374	0.1288	0.43
Year 12-14	0.1202	0.1030	0.93
Year 14-16	0.1323	0.1357	-0.17
Gender (female)	0.2336	0.2302	0.14
Years of education	10.13	10.53	-1.57
North	0.5173	0.5551	-1.59
Center	0.2388	0.2405	-0.07
South	0.2439	0.2044	1.62
N. income perceivers	1.90	1.93	-0.63
Homeowner	0.8367	0.8178	0.85
Age	60.27	60.35	-0.26
Years of pension contribution	29.31	29.79	-0.53
Income	48520	51311	-1.35

Notes: tests for differences in the mean of the control variables for the treated versus control group; related to the complete sample, in Table 6.1. Source: author’s own elaboration from SHIW data.

Table A.2 - PS mean tests for treated vs. controls – males only

Variable	Treated mean	Control mean	t-value
Year 00-02	0.0764	0.0720	0.11
Year 02-04	0.0919	0.0919	0.00
Year 04-06	0.1345	0.1367	-0.10
Year 06-08	0.1188	0.0964	1.08
Year 08-10	0.1524	0.1502	0.09
Year 10-12	0.1435	0.1681	-1.01
Year 12-14	0.1278	0.1435	-0.68
Year 14-16	0.1547	0.1412	0.57
Years of education	9.94	9.84	0.34
North	0.5248	0.5180	0.21
Center	0.2264	0.2197	0.24
South	0.2488	0.2623	-0.46
N. income perceivers	1.93	1.87	1.32
Homeowner	0.8430	0.8430	0.00
Age	60.22	60.02	0.49
Years of pension contribution	29.41	30.132	-0.89
Income	49214	45391	2.22

Notes: tests for differences in the mean of the control variables for the treated versus control group; related to the males-only sample, in Table 6.1. Source: author's own elaboration from SHIW data.

Table A.3 - PS mean tests for treated vs. controls – females only

Variable	Treated mean	Control mean	t-value
Year 00-02	0.1029	0.0809	0.71
Year 02-04	0.1617	0.1250	0.86
Year 04-06	0.1911	0.1617	0.63
Year 06-08	0.1544	0.2352	-1.69
Year 08-10	0.1176	0.0514	1.97
Year 10-12	0.1176	0.2058	-1.98
Year 12-14	0.0955	0.1029	-0.20
Year 14-16	0.0588	0.0367	0.85
Years of education	10.75	10.90	-0.28
North	0.4927	0.5810	-1.78
Center	0.2794	0.1838	1.87
South	0.2279	0.2352	-0.14
N. income perceivers	1.78	1.63	1.70
Homeowner	0.8161	0.7573	1.18
Age	60.43	60.26	0.28
Years of pension contribution	29.50	30.52	-0.79
Income	46244	44029	0.59

Notes: tests for differences in the mean of the control variables for the treated versus control group; related to the males-only sample, in Table 6.1. Source: author's own elaboration from SHIW data.

Table A.4 - PS mean tests for treated vs. controls – >1 st tertile

Variable	Treated mean	Control mean	t-value
Year 00-02	0.0870	0.0565	1.59
Year 02-04	0.1129	0.1294	-0.74
Year 04-06	0.1623	0.1623	0.00
Year 06-08	0.1317	0.1505	-0.79
Year 08-10	0.1388	0.1482	-0.39
Year 10-12	0.1341	0.1152	0.83
Year 12-14	0.1058	0.1129	-0.33
Year 14-16	0.1270	0.1247	0.10
Years of education	10.67	10.75	-0.24
North	0.5225	0.4704	0.99
Center	0.2658	0.2352	1.03
South	0.2117	0.2352	-0.82
N. income perceivers	2.02	1.99	0.52
Homeowner	0.9741	0.9741	0
Age	60.37	60.41	-0.10
Years of pension contribution	29.27	30.12	-1.03
Income	54485	55505	-0.41

Notes: tests for differences in the mean of the control variables for the treated versus control group; related to the households above the first wealth tertile, in Table 6.1. Source: author's own elaboration from SHIW data.

Table A.5 - PS mean tests for treated vs. controls – $<3^{rd}$ tertile

Variable	Treated mean	Control mean	t-value
Year 00-02	0.0849	0.0849	0.00
Year 02-04	0.1189	0.1218	-0.12
Year 04-06	0.1303	0.1473	-0.65
Year 06-08	0.1218	0.1189	0.12
Year 08-10	0.1303	0.1076	0.93
Year 10-12	0.1246	0.1614	-1.40
Year 12-14	0.1359	0.1161	0.79
Year 14-16	0.1529	0.1416	0.42
Years of education	9.23	9.56	-1.10
North	0.4930	0.4930	0.00
Center	0.2181	0.1926	0.84
South	0.2889	0.3144	-0.74
N. income perceivers	1.80	1.85	-0.93
Homeowner	0.7450	0.7535	-0.26
Age	59.95	59.93	0.06
Years of pension contribution	29.83	30.06	-0.28
Income	41229	43179	-0.90

Notes: tests for differences in the mean of the control variables for the treated versus control group; related to the households below the third wealth tertile, in Table 6.1. Source: author's own elaboration from SHIW data.

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Andrea Marini
European Central Bank, Frankfurt am Main, Germany; email: Andrea.Marini@ecb.europa.eu

Postal address 60640 Frankfurt am Main, Germany
Telephone +49 69 1344 0
Website www.ecb.europa.eu

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