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RETIREMENT AND INVESTMENT DECISIONS: EVIDENCE FROM THE RECEIPT OF A LIQUIDITY INFUSION

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Abstract

I study household investment decisions to shed light on how people approach and plan for retirement. To address this topic I exploit a particular institutional context. In Italy, private and public sector employees receive a lump sum upon retirement. This exogenous shock to liquidity presents an opportunity to see how people re-balance their portfolios for retirement. Studying data from the Survey on Household Income and Wealth (SHIW) in the period 1993-2016, and comparing people marginally above and below the labor pension eligibility threshold, I find that new retirees increased investments in stocks and in housing. This result is determined by the receipt of the liquidity infusion and is robust to testing against a number of alternative explanations, including stock market entry costs and the increase in leisure time. These results suggest that newly retired have a long-term investment horizon. [1]

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1 Introduction

Elderly people hold a considerable amount of wealth. From the data of the latest wave of the European Household Finance and Consumption Survey (HFCS, 2017) it emerges that families led by a householder in the age group between 55 and 64, as well as those led by a householder in the age group between 65 and 74, have a (median) net wealth of approximately 160 thousand euros, much higher than that held by the typical (median) family, which is around 99 thousand euros. A similar result also applies to financial assets alone; the (median) value reported by the previous two groups is between 16 thousand euros and 15 thousand euros, higher than the 10.3 thousand euros of the typical (median) family. Old people are rich and tend to get even richer. Indeed, it has been widely documented that high-income families and, more generally, couples continue to save during old age, increasing their stock of wealth until very late in life (De Nardi, French, and Jones (2009) and De Nardi, French, Jones, and McGee (2021)).

Elderly people face a very different portfolio problem from working people. The transition from work to retirement determines an abrupt change in the background. Indeed, with retirement the risk to income disappears but uncertainty related to health status and life expectancy gradually worsens. Furthermore, the goal of leaving an inheritance to the partner and/or to children is presumably stronger among the elderly. Therefore, it is clear that working people and retirees face different frameworks and this is likely to affect portfolio choices.

However, the empirical literature produced so far has not highlighted this difference. Previous studies have either proposed stylized facts concerning the investment strategies of families as a whole without expanding on the issue of aging (Guiso and Sodini (2013); Arrondel, Bartiloro, Fessler, Lindner, Mathä, Rampazzi, Savignac, Schmidt, Schürz, and Vermeulen (2014)), or when studying the elderly, they have provided mainly descriptive results on housing and on the portfolio composition (Poterba, Venti, and Wise (2011); Coile and Milligan (2009)). Consequently, little or no causal evidence exists about the portfolio allocation decisions of the elderly. It is worth noticing that a causal analysis may shed light on the reasons behind the investment strategies adopted by retirees. Inferring the investment motives, and therefore the investment horizon considered, would allow us to better understand how retirees interpret the retirement phase: if in terms of a simple cake-eating problem or in terms of a more complex framework characterized by the multiplicity of motives for saving mentioned above.

This paper points exactly in this direction. Using data from the Survey on Household Income and Wealth in the period 1993-2016, I carry out a causal analysis using a research design developed around the unique feature in the Italian pension system whereby many people receive a lump sum transfer when they retire. The Italian system of law guarantees that public and private sector employees receive a sum of money at the end of their working activity. This sudden, large inflow of liquidity profoundly alters the level and the composition of the wealth of newly retired people who naturally need to re-balance their portfolios in response to this infusion. This external stimulus represents a unique possibility to track the portfolio allocation decisions of newly retired Italians. Comparing people marginally above and below the labor pension eligibility requirements, I measure the change in the participation decision regarding a number of

financial and real assets around the time of retirement.

I present several findings. First, stock-market participation increases by 8 percentage points at retirement. In the light of an average pre-retirement participation rate of 20 percent, this increase appears substantial and significant from an economic perspective. At the same time the new retirees invest in real assets too. I register an increase in home ownership by 8.4 percent and a change of 8.3 percentage points in the decision to carry out building renovation. The house of residence is the most common asset; the average pre-retirement participation rate is 79 percent. Therefore, also in this case the registered increase is substantial. These findings suggest that senior citizens re-balance their portfolios considering a long term investment horizon. Additionally, the elderly tend to diversify their portfolios toward riskier and less liquid assets.

Second, I collect evidence that supports the importance of the liquidity infusion in explaining the higher participation in the stock market. It is necessary to corroborate the interpretation of the results because of the complexity of the context considered. Indeed, other channels parallel to the receipt of the liquidity infusion, such as more leisure and/or the fall in the income risk, may explain the results collected. Therefore, trying to assess the relative importance of these channels is of primary relevance. With respect to stocks, I consider a framework à la Vissing-Jorgensen (2003) in which the stock-market participation depends on a multiplicity of factors and it is limited by the presence of entry costs. Once I have shown the stability of the costs at retirement, I split the sample according to the size of the severance pay received and the extent of labor income uncertainty faced at work. This heterogeneity analysis reveals that the lump sum plays the major role. Changes in home-ownership at retirement are related to a matter of opportunities. In fact, the phenomenon seems to be driven by the choices implemented during the '90s, a period of time in which house prices were at their minimum. Therefore, also in this case, the liquidity infusion seems to be important. Investing in home renovation is connected to leisure. It seems that people want to improve the quality of their houses at retirement, possibly because they are going to spend more time at home.

Third, I study how home-ownership and stock-holding are related to each other. Flavin and Yamashita (2011) and Cocco (2005) show that housing is a key factor in explaining the life-cycle investments in equities. In their models, stock-ownership is affected by the ratio between house value and total net wealth in such a way that the higher the ratio, the lower the liquidity available, the lower the investments in stocks. It follows that housing crowds out stocks. I perform a heterogeneity analysis on stock-holding by the time of home acquisition and I do not find any evidence of a crowding out effect. On the contrary, I find that the liquidity infusion increases the participation of both old and new-homeowners and the latter group exhibits an increase higher than the former.

Related literature. The paper refers to four streams of research. The first one is about *portfolio allocation* decisions. Most studies present essentially descriptive results. Guiso and Sodini (2013),Campbell (2006), and Arrondel, Bartiloro, Fessler, Lindner, Mathä, Rampazzi, Savignac, Schmidt, Schürz, and Vermeulen (2014), using survey data, propose a series of stylized facts on the composition of the wealth of families. Unlike previous literature, this paper proposes causal estimates on investments focusing

on particularly important segment of individuals: retirees and those who are about to retire. An RD analysis highlights how newly retired people re-optimize their portfolios in the presence of an external stimulus. This analysis therefore highlights the objectives that are pursued during retirement.

A second stream of literature to which I refer is that related to the *stock-holding puzzle*. Theoretical prescriptions, based on expected utility models such as the one in Haliassos and Bertaut (1995), state that *expected utility maximisers should always be willing to invest an arbitrarily small amount in the asset offering a higher expected return*. However, individuals seem not to conform to this result. The explanation for this behavior may lie in a multiplicity of factors such as limited knowledge of the existence of certain financial instruments (Guiso and Jappelli (2005)), or the presence of costs associated with the participation (Vissing-Jorgensen (2003)), or from personal and psychological factors (Guiso, Sapienza, and Zingales (2008)). In this paper I focus on the existence of fixed costs at entry and I propose a test of the hypothesis that can be derived from a model à la Vissing-Jorgensen (2003). By dividing people on the basis of the severance pay received and the magnitude of the labor income uncertainty faced at work, I confirm that entry costs are a major issue for individuals and that the receipt of the severance pay is crucial in joining the equity market.

Another strand of literature that is considered is that relating to the savings of the retirees. Past research (De Nardi, French, and Jones (2009) and De Nardi, French, Jones, and McGee (2021)) has highlighted how the behavior of the elderly does not conform to the canonical life-cycle model in which retirees gradually reduce their assets to finance their current expenses. On the contrary, various segments of the population tend to maintain unchanged or even to increase wealth for a large part of their old age. This is arguably driven by uncertainty about life expectancy, which hides within it the tension between the desire to consume the available resources and not wanting to remain in conditions of poverty in old age. Another reason that slows down the decumulation and generates precautionary savings is that connected with the possibility of having to face sudden large medical expenses. Finally, the desire to leave an inheritance to their family members plays a major role for couples and high-income singles. This literature provides a very detailed picture of the reasons behind late-in-life savings, however little is known about how these resources are invested. In this work I give some indications in this regard. New retirees re-balance their portfolios in favor of equities and homes, revealing an attitude toward risky assets and a long-term planning horizon.

A last stream of research considered is that relating to housing among the elderly. In the United States as well as in Europe, particularly in the Mediterranean countries, the home represents the largest share of wealth for most families. It is worth emphasizing that this type of asset has particular features because it represents both an investment and a consumption asset. A vast empirical literature has highlighted that housing wealth is particularly stable over time (Poterba, Venti, and Wise (2011); Coile and Milligan (2009)). Various explanations can be given for this result, such as: the desire to maintain constant (housing) consumption over time, interpreting property as a buffer against particularly serious shocks or as the most appropriate asset to satisfy the desire to leave a legacy to children. However, very little or nothing is as yet known about what happens at the time of retirement. This paper shows how access to retirement

and the consequent receipt of the severance pay leads to an increase in home-ownership. Furthermore, in this context, projects of home renovations are extensively carried out. These results point towards households that aim to satisfy their housing needs, possibly looking for higher quality.

The paper is structured as follows. Section 2 describe the identification strategy followed. Section 3 describes the institutional context. Section 4 provides details on the data used and the definition of the main variables of interest. Section 5 reports the analyses on the causal effect of retirement on the participation decision. Conclusions follow.

2 Identification strategy

This paper aims to estimate the causal effect of retirement on the investment decisions in financial and real assets. I now introduce the notation that is consistently used in the following sections and I illustrate the identification strategy adopted.

R is a binary indicator denoting the retirement status of the head of the household; it is equal to one for retired heads and null for those who work. Let S be the distance to/since the time of entitlement to the labour pension. This variable is assumed to be continuous, it is normalized around the time of eligibility (i.e. $S = 0$) and it assumes negative values before the entitlement and positive after it. Let $I(S \geq 0)$ be the corresponding eligibility status which denotes the achievement of the eligibility criteria for the labour pension. Individuals are eligible for retirement if and only if they satisfy that condition, namely if their score assumes non-negative values.

Let (Y_1, Y_0) be the two potential outcomes faced in the treated and non-treated statuses. In this paper, Y_1 and Y_0 represent the participation in a certain asset for the head being retired and not being retired, respectively. The causal effect of interest (β) represents the change in the outcome due to the change in the retirement status of the head of the household. This effect could be computed taking the difference between the two potential outcomes: $\beta = Y_1 - Y_0$. Unfortunately, the two potential outcomes are never observable at the same time at individual level, since retiring reveals Y_1 but conceals Y_0.

However, the causal effect of interest can still be measured by examining the characteristics of the context of interest. The eligibility rule states that the probability of being retired is null for those who have a negative score and positive for those who have a score higher than or equal to zero. Therefore, at the threshold of $S = 0$ I observe a discontinuous change in the probability of being treated. This jump is however less than one, because the eligibility refers to both the voluntary and the mandatory pension schemes. In particular, for the cohorts of interest, who exhibit very stable careers, it usually happens that the eligibility to the early, voluntary pension scheme is achieved first and after a few years the eligibility to the statutory pension is reached. The discontinuity in the likelihood of retiring helps to solve the endogenous selection into retirement.

Under the assumption that no discontinuity would take place in the outcome in the absence of retirement, Battistin and Rettore (2008) show that the causal effect of

interest could be computed locally considering the following equation:

$$E\{\beta|R=1,S=0^{+}\}=\frac{E\{Y|S=0^{+}\}-E\{Y|S=0^{-}\}}{E\{R|S=0^{+}\}} \tag{1}$$

where $S=0^{+}$ and $S=0^{-}$ refer to individuals marginally above and marginally below the eligibility threshold.

However, the data available show that a fraction of people retire before having crossed the threshold of eligibility. This scenario is due to the presence of non-classical measurement errors in the running variable. This criticism is overcome assuming that the process generating measurement errors is orthogonal to the process of interest and considering the following ratio:

$$\frac{E(Y|S=0^{+})-E(Y|S=0^{-})}{E(R|S=0^{+})-E(R|S=0^{-})}. \tag{2}$$

This implies that consistent estimates of the causal effect of retirement on the investment decision can be recovered by a simple instrumental variable strategy where the eligibility status is used to tackle the endogenous nature of the retirement status.

3 Institutional context

3.1 Italian social security system

The Italian social security pension system is structured in three pillars: *i*) a compulsory public system, *ii*) a voluntary private system, and *iii*) a supplementary pension system. The public pension system has a pay-as-you go structure: the contributions that workers and companies pay to social security institutions are used to pay the pensions of those who have left work; therefore, no accumulation of financial reserves is envisaged to meet the payment of future pensions. The second and third pillars are voluntary, have a defined contribution structure, and are fully funded. The former can be arranged and managed on an individual or collective basis while the latter is usually subscribed individually. Means tested programs, such as social assistance pension and disability pension, complete the picture.

In the present work the interest is on the *labor pension*, namely a pension benefit that has an insurance nature and that is acquired at the end of the usual working activity. In particular, there are two pensions of such a nature: the *old-age pension* (hereafter OP) and the *early pension* (hereafter EP). The first one is the standard benchmark; a person receives this remittance at the end of his working activity when possessing the necessary requirements. The second type of pension is an early exit from the labor market and it is allowed once specific conditions are met. Even if the Institutions that take care of the management and the payment of these transfers may differ across occupations (private sector employees, public sector employees and the self-employed), in the great majority of cases the provision is managed by the national social security institute (INPS).

Additional information on the Italian pension system are reported in appendix A.

3.2 Liquidity infusion

The Italian system of law provides that workers, employed in the public or private sector, receive a liquidity infusion at the end of their working activity.

This mechanism was introduced in 1927 for welfare purposes in order to support employees in the private sector dismissed without proper cause. However, as time went by, workers started receiving this sum of money more and more often at retirement as a premium rather than as a support for periods of unemployment. Therefore, law n. 297 of 1982 definitively established the so-called *severance pay*, a lump sum transfer paid at the end of the working activity that is guaranteed in any circumstance: dismissal, resignation, and working age limit.

The treatment provided is not the same for everyone; there are a number of differences. People employed in the private sector receive the so-called TFR (*trattamento di fine rapporto*) while people employed in the public sector receive the so-called TFS (*trattamento di fine servizio).* In particular, according to the law, the TFR is calculated by adding, for each year of service, a share approximately equal to one monthly salary (i.e. yearly wage divided by 13.5). These shares are accumulated by the firms which revalue them annually at a rate consisting of 1.5% on a fixed basis and 75% of the increase in the consumer price index. The computation of the TFS is different and more advantageous. The sum paid by the institutions is equal to 80% of the last monthly income multiplied by the number of years of service. Furthermore, for workers hired after 31 December 2000, different legislation applies. However, this distinction is not addressed in the present work which focuses on cohorts of older workers.

The survey has limited data regarding severance pay. Therefore I chose to estimate the potential severance pay considering several individual features. From the calculations carried out, the average value of the settlement received is 40 thousand euros, it is higher in the public sector than in the private sector, and both of these characteristics are in line with the anecdotal evidence. Appendix A contains further details on the characteristics of severance pay and its calculation.

4 Data and Measurement

The data of interest are from the Italian Survey on Household Income and Wealth (henceforth SHIW). This survey is carried out by the Bank of Italy every two years on a stratified random sample that is representative of the entire Italian resident population. I consider the data from the 1993 to 2016 waves, the widest time span with consistent information about retirement. I treat the data as repeated cross-sections.

From a raw dataset of approximately 95 thousand observations I highlight the sample of interest imposing several filtering criteria. In particular, I only examine

households headed by a man [2] [3] who offers complete information regarding his working history and financial accounts. Furthermore, I consider only those employees or labor pensioners who are no more than ten years away from the pension eligibility threshold [4]. The final sample counts 12,215 people. Additional information on sample selection and sample characteristics is provided in appendix B.

4.1 Outcomes

I define a set of complementary outcomes related to the possession of financial and real holdings. Indicators are specified to depict the phenomenon of *participation*. [5] A person "participates" in a certain outcome Y if he holds that asset. On the contrary, a person "does not participate" if he does not invest in Y. Binary indicators are defined for the following asset categories:

- *Short Term Government Bonds* [6];
- *Long Term Government Bonds* [7];
- *Direct and Indirect Stock-holding* [8];
- *Main Residence*;
- *Other Housing* [9];
- *House Renovation* [10];

[2] A clarification: in this work I chose to focus on the consequences of retirement on the family's investment choices considering only the retirement of the head of the family. I propose to study - in another paper - the phenomenon known as joint retirement. The literature shows that there is synchrony in the timing of retirement between head and spouse. Preliminary analyses were carried out in this regard and it was found that a member's eligibility influences their partner's propensity to retire. Furthermore, both the retirement of the head and the spouse are important in investment choices. However, the most important are those of the male head, which is why the following analysis is proposed.

[3] A clarification: in the present work I consider only the families that have a man as a reference person. This choice may seem restrictive but necessary because, as Battistin, Brugiavini, Rettore, and Weber (2009) pointed out, in the nineties, the number of working or retired women was small. Appendix B provides more information about the sample selection criteria and the choice of the head of the household. Additionally, two robustness tests are proposed in which the main analyses are retraced considering both men and women.

[4] A clarification: the sample does not contain self-employed people, unemployed people or non-labor pensioners. Among those who work I keep only private and public employees. Among those who are retired I keep only those who receive a labor pension and who were employed either in the private or in the public sector.

[5] I am also studying the sums invested in each asset. The preliminary results are consistent with those related to the decision to participate.

[6] Participation occurs if a person holds BOT and/or CTZ.

[7] Participation occurs if a person holds any of the following: CCT, BTP, BTPI, CTE or CTO.

[8] Participation occurs if a person holds directly shares and equities of Italian firms and/or if he does so through funds or managed portfolios.

[9] Participation occurs if a person owns second houses.

[10] Participation occurs if a person spends money in renovation of the primary house or of other houses.

Table 1 shows the participation rates in the various assets. The first column shows the share of participants in the entire sample. Regarding financial products, there is a greater propensity to hold risky assets: 21.1 percent of families hold stocks - directly or indirectly - while only 11.7 percent and 6.1 percent hold short-term and long-term government bonds respectively. The share of people who own the house of residence is high and equal to 80.9 percent. The fraction of households with properties other than the main residence is also significant, equal to 10.8 percent. A further common investment concerns the maintenance of owned properties: 17.2 percent of the sample carries out this type of expense. The second and third columns report information specific to the subgroup of workers and pensioners respectively. Compared to working people, new retirees exhibit a greater participation in government bonds, in shares, in the primary house and in the renovation of owned properties.

Table 1: Participation rates.

	Full sample	Workers	Retired
Short Term Government Bonds	0.117	0.112	0.123
	0.322	0.315	0.329
Long Term Government Bonds	0.061	0.058	0.064
	0.239	0.234	0.244
Stock-holding	0.211	0.208	0.214
	0.408	0.406	0.410
Main Residence	0.809	0.790	0.829
	0.393	0.408	0.376
Other Housing	0.108	0.113	0.102
	0.310	0.316	0.303
Home Renovation	0.172	0.165	0.179
	0.377	0.372	0.383
N.Obs.	12215	6292	5923

Notes: The table reports information regarding the share of families that participate in the various assets. The columns refer to the overall sample, to the subgroup of working and retired people.

Figure 5 in the appendix shows how the average participation in financial and real assets has changed over time. The subscription of Italian Government Bonds has fallen across the years; in 1993 around 30 percent (10 percent) invest in short (long) term bonds while at the end of the period considered only 4.5 percent (5) participate in such assets. The fraction of stock-holders increases over time; initially only a few households (12 percent) hold stocks in their portfolios but the fraction of subscribers rapidly increases up to a third of the sample in the early 2000s and then it remains around 20 percent afterwards. Home ownership is widespread in the early nineties (75 percent), and it becomes even more frequent in recent years with a participation above 85 percent. Other housing exhibits an unstable profile with bursts and falls within the range of 10 to 15 percent. Renovation of the main residence and other houses fluctuates between 14 and 22 percentage point showing a hump-shaped pattern: it increases until 2010 and decreases thereafter.

Figure 7 in the appendix shows the average participation in financial and real assets by total net wealth. It is clear that wealth has a propulsive role for both financial and real assets but with different intensities. The increase is almost monotonic for the great majority of the assets. For example, equity participation increases almost monotonically from one percent of the poorest to 57 percent of the richest. The ownership of the house of residence has a completely different profile. The percentage of homeowners goes from zero percent of the first decile, to 40 percent of the second decile, to 80 percent of the third decile until it becomes completely saturated shortly after.

Figure 9 in the appendix shows the participation rate in the various assets by age and employment status (i.e. worker or pensioner). In order to obtain more homogeneous profiles, the averages calculated on subgroups that were too small (i.e. bins that collected less than one percent of the distribution) were omitted. It is possible to find that retirees participate more frequently than workers in short-term government bonds, stocks and the first house. The profiles relating to long-term government bonds, property other than residential property and property renovation are less clear.

4.2 Pension eligibility

To appropriately compare people exposed to the treatment to those who are not, I need to rank the individuals according to a score that entirely determines the treatment assignment mechanism. This score is called *years to/since eligibility* and it is computed comparing the pension eligibility criteria, set by the system of law, to the characteristics accrued by the individuals.

The legislation I refer to is related to the labor pension, a benefit that can be achieved following two possible routes: the *old-age pension* (OP) and the *early pension* (EP). The theoretical conditions have to be compared to the individuals' effective characteristics: chronological age and seniority. The former is easily measured while the latter is a trickier piece of information. I measure the accrued seniority using the answer to a specific query in the SHIW questionnaire that asks people to declare the contributions paid over time [11]. Even if this piece of information is hard to remember exactly and the reported value is affected by a rounding phenomenon, there are reasons to believe that the error reduces approaching retirement. Indeed, if people choose to exit from the labor market, they will look at retirement incentives comparing the wage earnings to the present value of the future retirement income. In order to do that a person has to be aware of the exact amount of contributions paid. Consequently, it is reasonable to believe that, when approaching entitlement, working/retired people know/remember this value precisely.

With these pieces of information, I proceed with the calculation of the score for the OP and the EP. Each score represents the number of years that a person needs to become eligible or the number of years since a person became entitled to a specific

[11] The question of interest was introduced in 1995. Therefore, for 1993 I impute the declared years of contribution from the subsequent wave using the panel dimension of the sample. The same procedure applies in the subsequent waves for those (only a few) people who do not report the value.

pension. These variables are equal to zero at the time of entitlement, they take negative values before the eligibility moment and positive values after. Then I define S, the overall score, looking at the route that is reached earlier. Therefore, it is computed as:

$$S = max(S_{OP}, S_{EP}) \tag{3}$$

and it switches from negative to positive values whenever a person meets the condition for at least one exit. Figure 11 shows the densities of S, S_{OP}, and S_{EP}.

4.3 Retirement status

Retirement is the treatment of interest. A person is *Retired* if he receives a labor pension.

Figure 15 shows the fraction of retired people by year of eligibility and occupations. I detect a sudden increase in the proportion of pensioners at the cut-off ($S = 0$) that moves from 30 percent to 73 percent. As already mentioned by previous studies, the variation is not from zero to one. The proportion of the retired is positive even before the time of eligibility because of the presence of measurement errors in the running variable and the fraction does not equal one immediately after entitlement because eligible people may wish to continue working. Private employees show the biggest bounce, with a fraction of the retired that moves from 0.3 to 0.8. Public employees exhibit smaller variations, respectively about 0.27 to 0.57. This figure is consistent with the lower incentive to retire as soon as possible in the public sector because the salary continues to increase throughout the working life. Additionally, this motive is even more pronounced for people who are under the (fully) definite benefit pension scheme (i.e. those who had more than 15 years of contributions at December 31st 1995) who will receive a pension computed on the basis of the last years' earnings.

5 Participation decision

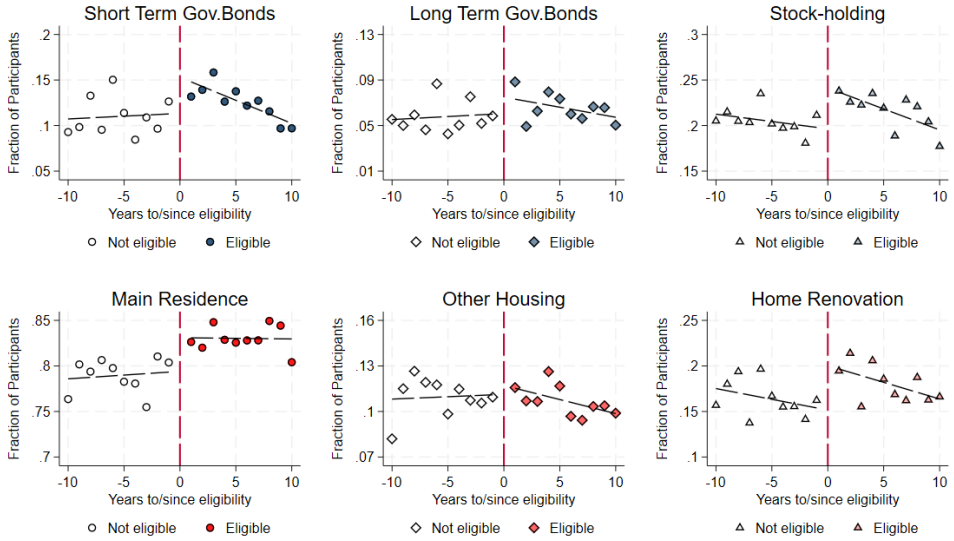
In this section, results on the causal effect of retirement on the participation in financial and real assets will be presented. As often proposed by the literature in the field, I provide graphical analysis and regression results.

5.1 Graphical Analysis

Figure 1 presents a set of plots investigating the relationship between the participation in a certain outcome and the running variable (S). Each point represents the fraction of holders for a particular year of eligibility. For descriptive purposes I interpolate the masses of dots at the two sides of the cut-off using fitted values that come from linear regressions.

The upper part of figure 1 refers to financial assets; from left to right we see graphs related to short term and long term Government bonds and (direct and indirect) stock-holding. The lower part of the figure reports the pattern concerning real assets, in particular, from left to right, main residence, other housing and home renovations. The

Figure 1: RD plot: average participation rate by year of eligibility.



Notes: The figure reports six graphs on the causal effect of retirement on financial and real investment decisions. Each marker is the average participation in a specific eligibility year. Empty markers depict ineligible people while coloured markers refer to eligible people. Each mass is interpolated with the fitted values of a linear regression. The red dashed line highlights the time of eligibility.

subscription rates for short term Italian Government bonds vary between 8 and 16 percent while those related to long term ones have a range between 4 and 9 percent. Both patterns change at retirement: they exhibit change in the slope with trends which move from increasing to diminishing; furthermore, short term bonds seem to jump at the time of eligibility. The fraction of stock-market participants is between 18 and 24 percentage points; the dynamic increases sharply at the time of eligibility maintaining its declining profile throughout the window of data. The bottom-left graph confirms widespread home-ownership around the time of retirement; the participation is very high, varying between 76 and 83 percent and exhibiting a clear jump at the cut-off. Other housing maintains its value around 11 percent, does not display a clear pattern and seems stable at the time of interest. As a further confirmation of the importance of real estate for the Italians, there is a net increase in the share of people who carry out building renovations at the time of retirement.

5.2 Regression analysis

To evaluate the causal effect of retirement on investment strategies I implement a *fuzzy* regression discontinuity design using a parametric approach. The approach is similar to that of Battistin, Brugiavini, Rettore, and Weber (2009). I carry out an instrumental variable estimation in the neighborhood of the pension eligibility cut-off (i.e. $S \in [-10, 10]$) excluding observations at the threshold (i.e. $S = 0$) because the

outcomes may refer both to pre- and post-retirement periods.

The model considered has the following structure:

$$Y_{i,t} = \tau + \beta R_{i,t} + \gamma f(S_{i,t}) + X'_{i,t}\delta + \varepsilon_{i,t} \tag{4}$$

where the dependent variable $Y_{i,t}$ is one of the outcomes of interest for the male head of the household i at time t, $R_{i,t}$ is his retirement status, $f(S_{i,t})$ is a function of the time to/since his eligibility, $X_{i,t}$ is a matrix that collects additional covariates such as dummies about the year of birth of the head of the household, dummies about the level of schooling of the head, a binary indicator on the marital status of the head, dummies on the macro-area of residence (North, Centre, South of Italy), and dummies on how the family acquired its properties, and τ a vector of year dummies. The endogenous nature of the retirement decision is tackled using the eligibility status as the instrument (i.e. $Z_{i,t} = I(S_{i,t} \geq 0)$). Consequently, the first stage of the estimation is the following:

$$R_{h,t} = \tau + \alpha_1 Z_{i,t} + \alpha_2 f(S_{i,t}) + X'_{i,t}\alpha_3 + \nu_{i,t} \tag{5}$$

The standard errors are clustered - as done in Battistin, Brugiavini, Rettore, and Weber (2009) and Celidoni and Weber (2020) - at year of eligibility and survey year [12].

Table 2 reports the core results on the pooled sample of private and public employees. The receipt of the severance pay affects people's financial decisions. While the subscription of long term Government bonds remains stable, that of the short term bonds increases by 3.1 percentage points. The effect on shares is noticeable: stock-ownership increases by 8 percentage points. In the light of an average pre-retirement participation rate of 20 percent, this increase appears substantial and significant from an economic perspective. With respect to real assets, ownership of the house of residence increases by 8.4 percentage points while no effect is displayed with respect to other housing. The house of residence is the most common asset; the average pre-retirement participation rate is above 78 percent. Therefore, also in this case the registered increase is substantial. Families seem to be taking the opportunity of retirement to renovate their properties, either the main residence or other housing; the increase in the participation is 8.3 percentage points.

The riskiness and durable nature of the purchased assets suggests that retirees pursue a long-term investment strategy. This type of behavior seems consistent with life expectancy at retirement. Indeed, given that the average age on leaving the labor market is between 56 and 59 years and the corresponding life expectancy is between 78 and 83 years, it follows that the typical individual can expect to enjoy the rewards of his purchase for a period of at least 20 years.

[12] Although the data are treated as repeated cross-sections, it is worth remembering that the SHIW sample also has a panel component. This sample structure could give rise to an autocorrelation at individual level. Therefore a check was carried out. Table 10 in the appendix presents the results obtained taking this possibility into account (i.e. using clustering at individual level). This methodology has no repercussions on the significance of the estimates, therefore the approach used by Battistin, Brugiavini, Rettore, and Weber (2009) and Celidoni and Weber (2020) is maintained in the other sections of the paper.

Table 2: Effect of retirement on investment decisions.

	1	2	3	4	5	6
Retired	0.031	0.016	0.080***	0.084***	-0.000	0.083***
	0.021	0.020	0.025	0.026	0.015	0.029
f(S)	Yes	Yes	Yes	Yes	Yes	Yes
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
N.Observations	12225	12225	12225	12225	12225	12225
N.Clusters	240	240	240	240	240	240
First stage F	567	567	567	567	567	567

Columns:
1. Short Term Government Bonds;
2. Long Term Government Bonds;
3. Direct and Indirect Stock-holding;
4. Main Residence;
5. Other Housing;
6. Home Renovation;

Notes: The table reports the estimated causal effect of retirement on the participation in financial and real assets. The window of the estimation is for $S \in [-10, 10]$. The retirement status is instrumented with the eligibility status ($I(S \geq 0)$). The covariates are a first order polynomial in S with a different slope at the two sides of the threshold, dummies about the year of birth of the head of the household, dummies about the level of education of the head, indicators of the area of residence, and year dummies. Standard errors are clustered at eligibility and survey year. ***, **, and * respectively denote statistical significance at the 1%, 5% and 10% levels.

5.3 Validation and falsification tests

I perform several tests to check the validity of my estimation.

Sensitivity. To test the sensitivity of the results, I carry out some robustness checks. First of all I look at alternative model specifications in order to avoid any misspecified control function leading to the detection of spurious jumps. Figure 19 in the appendix reports the causal effects of retirement on the outcomes of interest using different order polynomials of the time of eligibility. Results are consistent with the former ones both from a qualitative and a quantitative point of view. To check the stability of the estimates I consider the data in the windows between [-12,12] and [-8,8] and I interpolate them using the baseline model specification. The estimated coefficients, reported in figure 20 in the appendix, have similar magnitude and significance to those reported in table 2.

Balance test. To check the sample balance at the cut-off, I consider several predetermined demographic characteristics that, a priori, are not affected by the eligibility status and that are correlated with non observable factors linked to investment decisions. Table 11 reports a summary of the tests made. I use symbols to give an immediate

evaluation of the results of the tests: $\surd$ means success (i.e. no effect of retirement on the predetermined characteristic), $\times$ means failure (i.e. significant effect of retirement on the individual feature at 5%). I detect rare failures with respect to the household composition that are consistent with the phenomenon of children leaving the nest, a result that was already found in previous literature.

McCrary test. A crucial assumption in the RD design is the continuity of the score density around the cut-off. This condition implies that individuals do not have the ability to precisely manipulate their score and consequently their preferred treatment status. If this occurs then the number of observations just below and just above the threshold should be approximately the same. Therefore, figure 11 shows that there is no evidence of sorting around $S = 0$.

Placebo test. Then I test whether regression functions for treatment and control units are continuous at points other than the cut-off, namely, I check if there is no jump in the treatment distribution where there should not be. The results of these tests are reported in figures 21 and 22 in the appendix. Some significant effects are detected for fictitious cut-offs in S=1 and S=-1. Moving away from the original threshold, the estimates become insignificant. Detecting significant effects at points other than the cut-off is undesirable, however it can be explained in the context examined. Changes in participation before eligibility are consistent with the behavior of those who - although they have not yet received the lump sum - are able to invest by paying in advance (a part of) the amount of money needed. It is worth underlining that this type of behavior seems consistent with those who want to buy a house. Changes in participation after the cut-off could be attributable to the timing of severance pay which is not always immediate and which sometimes occurs in installments.

Robustness: household's composition. It is a well known fact that young Italian people stay with their parents for a long time, well beyond the age of twenty. This feature has many determinants; some of them may come from cultural factors, such as parents' desire for cohabitation, others are related to the economic conditions of the young, such as the difficulty of finding a secure job and/or the absence of adequate financial resources to leave the nest. However, table 11 shows that the household's composition changes at the time of retirement, in particular it reduces; an result that has already been found in the literature. Therefore, to have a reliable measurement of the causal effect of retirement on investment decisions we have to examine how the changes in outcomes and in the family size relate to each other. Battistin, Brugiavini, Rettore, and Weber (2009), who studied consumption expenditure at the time of retirement, tackled the issue making a transformation of the dependent variable of the model, namely expressing it in per capita terms. This approach cannot be followed in the present context; to gauge how changes in participation and variations in family composition are related, I propose analyses by sub-groups considering only the panel component of SHIW. The groups of interest are the following: *i)* the full sample of (panel) individuals), *ii)* the subgroup of those who have children, *iii)* the subgroup of those who have children and whose family did not register any change in the composition. Figure 23 in the appendix shows that the estimated causal effect does not differ across

groups.

Robustness: sample selection. One potential criticism is that relating to the selection of the sample. In the analyses carried out, only male heads of households (i.e. the reference persons) were considered. As previously said, this choice was motivated by the low participation in the workforce of women especially in the nineties and early 2000s. This section examines the consequences of including women in the sample. Two robustness tests are proposed. In the first, only the original reference persons, both men and women, are taken for each family. In the second, the head of the household is defined as the person with the greatest length of service (i.e. the one who will be the first to be eligible for the pension). The results appear robust to the new specifications. From a qualitative point of view, there is full agreement: when Italians retire, they increase their participation in short-term government bonds, in shares, in the residence and in renovation of the properties in their possession. From a quantitative point of view, the intensity of the effects decreases as the relative weight of the women in the sample increases. This result is likely as women tend to have less continuous careers. It should also be remembered that the increase in the number of female heads of households is a phenomenon that mainly characterizes the latest waves, a period in which both the mechanisms for calculating severance pay and pensions are less favorable. The results are shown in tables 12 and 13 in the appendix.

5.4 Interpreting results

Up to now it has been assumed that the receipt of the severance pay was the only driver generating the new investment strategies of the newly retired. However, there may be other explanations for the results observed. Indeed, retirement involves a multiplicity of changes: an injection of liquidity, an increase in free time and the elimination of the risk on labour income. In this section, tests are carried out to verify the importance of these three phenomena.

5.4.1 Stock-holding

The increase in participation in the stock market may also be attributable to factors such as the increase in leisure, a change in the risk attitudes and the change in the labor income uncertainty.

In order to interpret stock market participation decision, I consider a single period portfolio choice model with entry costs, à la Vissing-Jorgensen (2003), in which households with a certain amount of wealth can allocate their resources either to a risky asset or to a safe one [13]. To invest in the risky asset it is necessary to bear a fixed cost constituted by a monetary component, such as the fee that has to be paid to the financial intermediaries, and by a non monetary part, attributable to the time and effort necessary to take the investment decision. In such a framework, households choose the optimal share of risky assets to maximize their expected utility. The condition that

[13] A description of the model is provided in the appendix C.3.

determines the investor's decision is the following:

$$W \geq w = F\left(1 + \frac{\bar{r}}{\alpha^*(r^{ce} - \bar{r})}\right)$$

where W is the initial wealth of the individual, F is the fixed cost, $\bar{r}$ is the return of the safe asset, $(r^{ce} - \bar{r})$ the risk-adjusted equity premium, and α^* the optimal share of risky assets that depends on individual risk aversion and on the size of the background risk in income. This condition offers several testable theoretical results:

i) The greater the wealth (W), the more likely an investment in risky assets;
ii) The higher the fixed cost (F), the higher the threshold to overcome, the less likely the participation;
iii) The lower the optimal share of risky assets (α^*), the harder it is to participate.

In the previous section it was seen how participation in shares increases significantly as wealth increases and therefore it is plausible to hypothesize that it varies when an infusion of liquidity is received.

The fixed entry cost depends on a series of individual characteristics, one above all, the level of financial literacy. This characteristic could be affected by the greater free time available in retirement: new retirees could study to improve their knowledge of the financial markets and therefore - in light of a lower subjective fixed cost - decide to participate in the stock market. Some waves of SHIW contain questions that allow measuring the level of financial literacy of the respondents. Therefore it is possible to check whether this figure is significantly affected by retirement. Table 15 in the appendix shows that this feature is stable at retirement, suggesting that leisure seems to play no role in stock-market participation at retirement. All the details regarding the questions asked, the construction of the indicator, its characteristics and the regression analyses are reported in appendix C.4.

The optimal share of risky assets depends on several factors including the background risk and risk aversion of individuals. In 2004, a question was introduced in the questionnaire that allows individuals to be classified with respect to their risk attitudes. Therefore, even in this case it is possible to verify whether this trait is affected by retirement or not. Table 17 in the appendix shows that this characteristic does not change significantly at retirement. Therefore α^* is not affected by changes in the preference structure of individuals. Again, all the details on the analyses relating to risk aversion are contained in appendix C.5.

In the light of the evidence collected, it is possible to attribute the increase in shareholding to the greater wealth induced by the severance pay and possibly to the change in income risk that influences α^*. Therefore, to verify which of the two causes is more important, I divide the sample with respect to the amount of severance pay and the level of background risk. Four groups are therefore constituted depending on whether an individual will receive/has received a lump sum lower or higher than 45 thousand euros and whether he has to face a high/low risk in income (i.e. works/has worked in the private sector or in the public sector). Table 3 reports the estimates calculated on the sample of data from 2004 to 2016, a decision taken to take into account people's risk aversion. The first column reports the effect of retirement on the

overall sample: participation increases by 12 percentage points at the time of retirement, a stronger effect than that obtained on the entire sample. The second (fourth) and third (fifth) columns show the effects recorded for private (public) sector employees who received a low or high liquidity infusion. There is a clear gradient in the effect of retirement: the larger the severance pay, the greater the incentive to participate. Furthermore, it is noted that the propensity to participate is more marked in the public sector than in the private sector.

For a predetermined level of background risk, those who receive a low lump sum do not participate in shares while those who receive a large sum substantially increase the participation in stocks. Therefore, it seems that the main driver of the increase in stock-ownership is due to the liquidity infusion. Consequently, it seems appropriate to conclude that the factor driving investment decisions is the severance pay.

Table 3: Interpretation: stocks.

	1	2	3	4	5
Retired	0.122***	0.079*	0.121*	0.230	0.311**
	0.043	0.048	0.063	0.181	0.136
f(S)	Yes	Yes	Yes	Yes	Yes
Covariates	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes
N.Observations	6162	2245	1948	665	1211
N.Clusters	140	139	140	139	140
F First Stage	413	290	375	34	52

Columns:
1. Full sample;
2. Infusion= $[0, 45k]$ and High Background Risk;
3. Infusion= $[45k, 500k]$ and High Background Risk;
4. Infusion= $[0, 45k]$ and Low Background Risk;
5. Infusion= $[45k, 500k]$ and Low Background Risk;

Notes: The table reports the estimated causal effect of retirement on the participation in stocks. The window of the estimation is for $S \in [-10, 10]$ in the window 2004-2016. The retirement status is instrumented with the eligibility status ($I(S \geq 0)$). The covariates are a first order polynomial in S with a different slope at the two sides of the threshold, dummies about the year of birth of the head of the household, dummies about the level of education of the head, indicators of the area of residence, an indicator about the degree of risk aversion, and year dummies. Standard errors are clustered at eligibility and survey year. ***, **, and * respectively denote statistical significance at the 1%, 5% and 10% levels.

5.4.2 Housing

The increase in participation in home ownership can be explained by a variety of features: *i)* economic factors such as the availability of resources, *ii)* family characteristics such as the desire to live close to children to spend more time together or to take care of

grandchildren, or the *iii)* the elimination of a series of constraints that were imposed by the previous working condition.

Some of these factors are difficult to assess and only partial evidence can be offered. Table 11 shows results that do not indicate a strong propensity to move elsewhere. The distribution of people on Italian territory is not affected by retirement. In fact, with respect to residence in the various regions of Italy, the sample appears balanced around retirement. The only exceptions are represented by Lombardy - which records a reduction in the number of residents at retirement - and Friuli Venezia Giulia - which records an increase of residents at retirement. A similar result is obtained when looking at cities of different demographic size. There is no tendency to move from a large city to a small one or vice versa. However, transfers to cities of similar size cannot be ruled out. It is also not possible to verify changes of residence due to the desire to strengthen family or friendship ties or movements connected to the disappearance of constraints linked to previous employment. What I can do is try to understand the importance of the amount of liquidity received on the propensity to become homeowners. The results of this study are presented in Table 4.

Table 4: Interpretation: main residence.

	1	2	3	4	5	6
Retired	0.093***	0.124***	0.083**	0.158***	0.102*	0.036
	0.027	0.039	0.038	0.043	0.052	0.041
f(S)	Yes	Yes	Yes	Yes	Yes	Yes
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
N.Observations	12215	6236	5640	4211	4513	3491
N.Clusters	240	240	240	80	80	80
F First Stage	557	345	465	136	416	204

Columns:
1. Full sample;
2. Infusion= $[0, 45k]$;
3. Infusion= $[45k, 500k]$;
4. Year=[1993-2000];
5. Year=[2002-2008];
6. Year=[2010-2016].

Notes: The table reports the estimated causal effect of retirement on the participation in main residence. The window of the estimation is for $S \in [-10, 10]$. The retirement status is instrumented with the eligibility status ($I(S \geq 0)$). The covariates are a first order polynomial in S with a different slope at the two sides of the threshold, dummies about the year of birth of the head of the household, dummies about the level of education of the head, indicators of the area of residence, and year dummies. Standard errors are clustered at eligibility and survey year. ***, **, and * respectively denote statistical significance at the 1%, 5% and 10% levels.

The second and third columns show that the probability of becoming a homeowner at retirement increases both for the group of those who received a small settlement and

for those who received a large one. Although the behavior of those who received a sum of less than 45 thousand euros is more marked than the others, there is no significant difference between the two coefficients. This result should not be surprising as home ownership plays a role of primary importance in the collective imagination of Italians. The estimates in the fourth, fifth and sixth columns are related to different time periods. The effect of retirement is stronger in the nineties and early 2000s, a fact attributable to the trend in house prices which has grown over time. Therefore it would seem that the purchase of the primary house is - at least in part - attributable to conditions of opportunity and the injection of liquidity.

Lastly, a similar heterogeneity analysis is performed with respect to the home renovation projects. Table 5 shows that there is no increase in the propensity to incur these expenses at retirement among those who have received a large amount of money while there is a significant increase in expenses for those who have received a smaller amount. Analyses over different time intervals do not highlight a clear pattern. These results indirectly suggest an important role of free time on the willingness to make this type of investment. Indeed, it seems reasonable to invest in making the house more comfortable in view of the increased time people will spend at home.

Table 5: Interpretation: home renovation.

	1	2	3	4	5	6
Retired	0.083***	0.142***	0.014	0.042	0.121***	0.085*
	0.029	0.036	0.042	0.056	0.047	0.050
f(S)	Yes	Yes	Yes	Yes	Yes	Yes
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
N.Observations	12215	6236	5640	4211	4513	3491
N.Clusters	240	240	240	80	80	80
F First Stage	567	348	473	136	432	204

Columns:
1. Full sample;
2. Infusion= $[0, 45k]$;
3. Infusion= $[45k, 500k]$;
4. Year=[1993-2000];
5. Year=[2002-2008];
6. Year=[2010-2016].

Notes: The table reports the estimated causal effect of retirement on the participation in home renovation. The window of the estimation is for $S \in [-10, 10]$. The retirement status is instrumented with the eligibility status ($I(S \geq 0)$). The covariates are a first order polynomial in S with a different slope at the two sides of the threshold, dummies about the year of birth of the head of the household, dummies about the level of education of the head, indicators of the area of residence, and year dummies. Standard errors are clustered at eligibility and survey year. ***, **, and * respectively denote statistical significance at the 1%, 5% and 10% levels.

5.4.3 Housing and Stocks

Cocco (2005) studies portfolio choice in the presence of housing. His model considers fixed costs at entry to the equity market and it shows how ownership of the house of residence has a decisive influence on the behavior of individuals. This type of asset can limit participation in the stock market as new homeowners, given their scarce liquidity, prefer to abstain from the stock market and put off participation till later. Furthermore, he shows how the house price risk tends to lower the relative share of shares in the financial portfolio.

To test whether home-ownership crowds out stocks, I divide the sample into two groups considering the timing of the purchase of the house of residence.

Table 6: Effect of retirement on stock-ownership by the timing of home-ownership.

	1	2	3
Retired	0.080***	0.061*	0.133***
	0.025	0.036	0.042
f(S)	Yes	Yes	Yes
Covariates	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
N.Observations	12215	8973	3242
N.Clusters	240	240	240
F First Stage	567	399	354

Columns:
1. Full sample;
2. Old Homeowner;
3. New Homeowner.

Notes: The table reports the estimated causal effect of retirement on the participation in stocks. The window of the estimation is for $S \in [-10, 10]$. The retirement status is instrumented with the eligibility status ($I(S \geq 0)$). The covariates are a first order polynomial in S with a different slope at the two sides of the threshold, a second order polynomial in the age of the head, years of education of the head, indicator of the area of residence, and year dummies. Standard errors are clustered at eligibility and survey year. ***, **, and * respectively denote statistical significance at the 1%, 5% and 10% levels.

A first group is made up of homeowner workers and retirees who bought the property before retiring. A second group is made up of non-homeowner workers and retirees who invested a part of the severance pay in the primary house. Table 6 reports the estimated causal effect of retirement on stock-ownership for the two groups. At retirement, new homeowners have a greater increase in participation in the stock market (i.e. 13.3 percent) with respect to people who already owned the house of residence (i.e. 6.1 percent). This result is only partially in contrast to what the Cocco model predicts. Indeed, a sufficiently high severance pay could allow people to participate in both assets.

6 Conclusions

Using a fuzzy regression discontinuity design, I estimate the causal effect of retirement on the investment strategies of new retirees. The analysis is developed around the unique feature of the Italian pension system whereby private and public employees receive a lump sum at the time of retirement. This liquidity infusion induces them to re-optimize their portfolios and reveals their investment horizon approaching old age.

Using micro data from the Survey on Household Income and Wealth from 1993 to 2016, I measure the change in the participation decision in financial and real assets upon retirement by exploiting the exogenous variation in eligibility for early and statutory pensions to correct for the endogenous nature of the retirement decision. The estimation is carried out under the identifying assumption that the investment choices would be the same around the threshold for pension eligibility, if the individual did not retire.

The main result is that holdings in risky and illiquid assets increase significantly upon retirement. In particular, participation in stocks increases by 8 percentage points, residential home ownership increases by 8.4 percentage points and the carrying out of home-owned renovation projects increases by 8.3 percentage points. These findings suggest that new retirees consider a long-term investment horizon.

Subsequently, by dividing the sample into subgroups, I examine to what extent these investments are induced by the liquidity infusion or by other factors such as greater free time or the absence of income risk. Through an empirical test built around the model of Vissing-Jorgensen (2003) it is shown that participation in the stock market depends primarily on the extent of the liquidity infusion. The increase in home ownership can be attributed, at least in part, to the receipt of the severance pay. Indeed, although on the one hand no substantial differences emerge between those who receive a small or large severance pay, on the other hand it is clear that this type of choice was made in a period of time in which house prices were particularly low and in which the infusion of liquidity could facilitate the purchase of real estate. However, it cannot be excluded that the purchase of the residence may depend on other factors - which are difficult to measure - such as the desire to be closer to one's children or grandchildren or the lack of need to live close to the workplace. The tendency to renovate owned properties is observed for a large part of the time horizon considered and characterizes only those who received a small severance pay. In the light of the greater amount of time one will spend at home, the investment motive would appear related to the desire to live in more comfortable properties.

Moreover, a connection between participation in the stock market and the real estate market is detected. Contrary to the belief that home-ownership crowds out stocks, the data show that the people who bought homes at retirement are also more likely to participate in the stock market than those who bought homes while working.

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Appendix

RETIREMENT AND INVESTMENT DECISIONS:
EVIDENCE FROM THE RECEIPT OF A LIQUIDITY INFUSION

Stefano Castaldo

A Appendix: Institutional context

A.1 Italian social security system

The Italian social security pension system is structured in three pillars - *i*) a compulsory public system, *ii*) a voluntary private system, and *iii*) a supplementary pension system - and it has a pay-as-you go structure.

In this work, the interest lies in the first pillar and in the implementation of the work pension. As already mentioned in the paper, in Italy there are two ways to access the work pension: the *old-age pension* (hereafter OP) - that is the standard benchmark - and the *early pension* (hereafter EP) - that is an early exit from the labor market. In recent decades, the social security system has shown deficits, due to the generosity of transfers and the progressive aging of the population. As a result, numerous regulatory interventions have taken place over time aimed at reducing the inequalities in treatment and guiding a transition from the *definite benefit* regime to a *notionally contribution benefit* one. The evolution of the criteria for accessing the pension is summarized in figures 2 and 3, respectively for men and women.

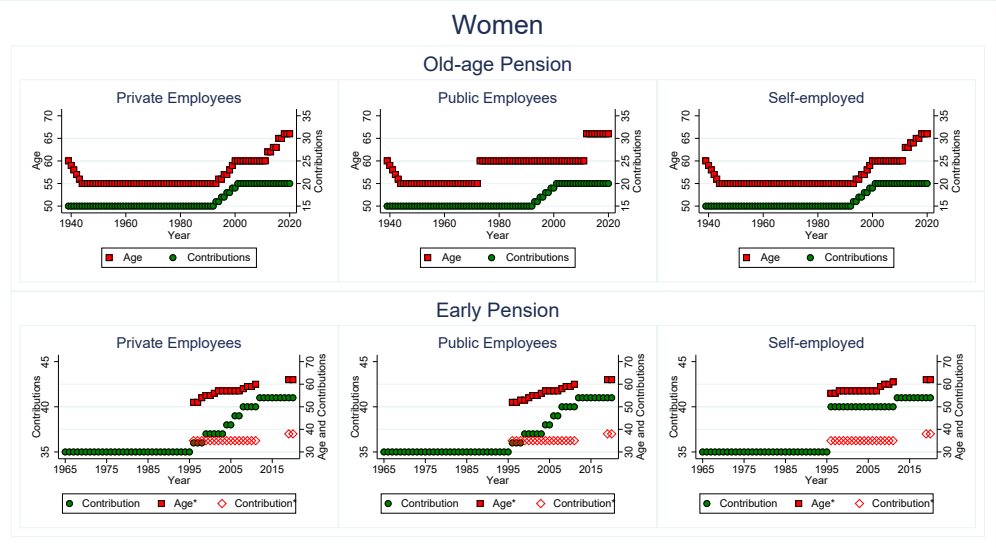
Figure 2: Eligibility criteria for men.

Notes: The figure reports the evolution of the minimum requirement to be entitled to the old-age pension (upper part) and early pension (lower part). Left figure refers to private sector employees. Central figure refers to public sector employees. Right figure refers to the self-employed. The conditions marked with an asterisk must hold jointly.

A.2 Liquidity infusion

The Italian system of law provides that workers, employed in the public or private sector, receive a liquidity infusion at the end of their working activity.

Figure 3: Eligibility criteria for women.



Notes: The figure reports the evolution of the minimum requirement to be entitled to the old-age pension (upper part) and early pension (lower part). Left figure refers to private sector employees. Central figure refers to public sector employees. Right figure refers to the self-employed. The conditions marked with an asterisk must hold jointly.

This mechanism was introduced in 1927 with a welfare purpose in order to give support to employees in the private sector dismissed without proper cause. However, as time went by, workers started receiving this sum of money more and more often at retirement as a premium rather than as a support for periods of unemployment. Therefore, law n. 297 of 1982 definitively established the so-called *severance pay*, a lump sum transfer paid at the end of the working activity that is guaranteed in any circumstance: dismissal, resignation, and working age limit.

The type of payment is different depending on the sector of employment: people employed in the private sector receive the so-called TFR (*trattamento di fine rapporto*) while people employed in the public sector receive the so-called TFS (*trattamento di fine servizio)*. The differences are not limited only to definitional aspects but also concern substantial aspects connected to the calculations. Indeed, according to the law, the TFR is calculated by adding, for each year of service, a share approximately equal to one monthly salary (i.e. yearly wage divided by 13.5). These shares are accumulated by the firms which revalue them annually at a rate consisting of 1.5% on a fixed basis and 75% of the increase in the consumer price index. The computation of the TFS is different and more advantageous. In fact, the sum paid by the institutions is equal to 80% of the last monthly income multiplied by the number of years of service.

The survey considered collects information on the severance pay, but the data collection has two main limitations. The first problem is related to the type of question proposed to elicit this figure. Instead of using a retrospective query, the question is whether, in the current year, transfers related to the end of the employment relationship have been received. This means that only those who retired in the interview year can

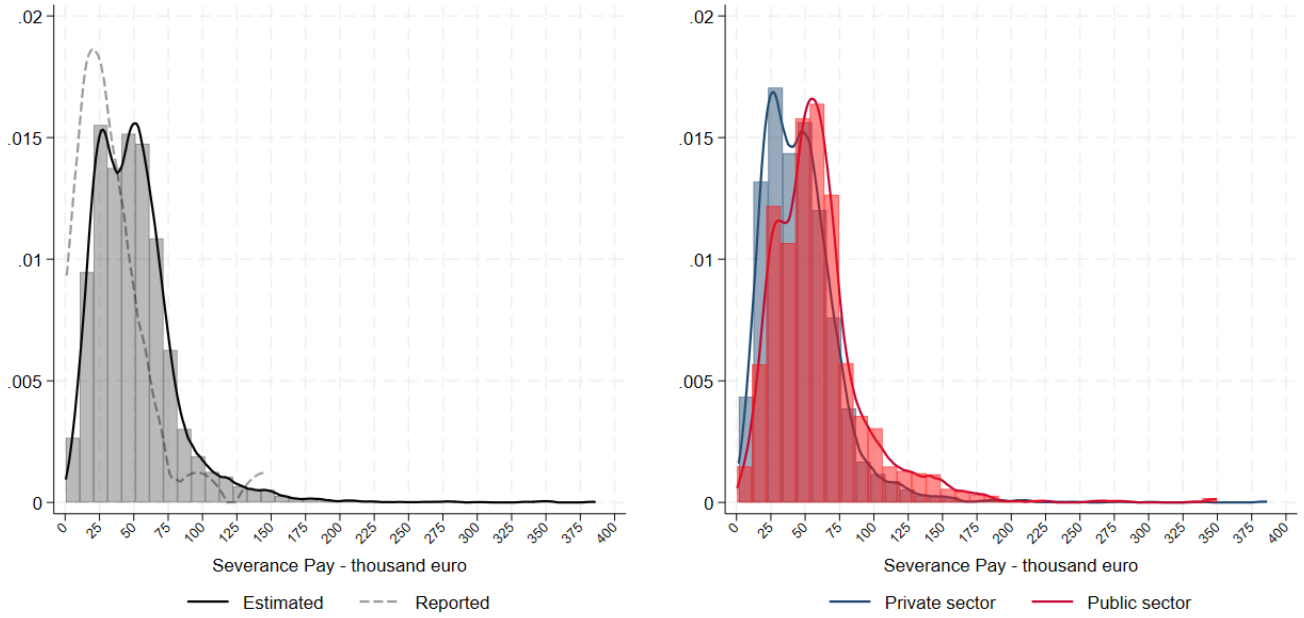
answer the question. The second problem concerns misreporting. Only 13 percent of potential respondents (i.e. 189 people out of 1451 potential respondents) answer the question and only 8 percent of them report a value greater than zero. The propensity to respond appears to differ between employment sectors. Indeed, approximately three quarters of those reporting useful values were employed in the private sector and only a quarter in the public sector. Regarding the amount of the sum received, the data show that approximately half of the respondents receive a transfer of less than 25 thousand euros, but ten percent of the respondents receive a sum greater than 60 thousand euros.

In the light of the problems related to the survey data, I have chosen to estimate the potential severance pay using a variety of information contained in the questionnaire. It is necessary to underline that these estimates are only indicative as they are obtained under a series of assumptions on the employment history of individuals. The first assumption concerns the trend of wages over time. A completely static career environment is assumed: no salary progression or mobility between employment sectors. This means that, regardless of when an individual is observed, it is assumed that he has always worked/will continue to work in the same job and has always received/will continue to receive the same reference salary [14]. Although this assumption is quite strong, it can be reasonably applied to all types of public sector employees who are close to retirement, to blue-collar workers who do not show a significant increase in wages over time, and is acceptable for simple white collar workers, who show modest wage progression. The second assumption concerns the other crucial element of the calculation: the number of years spent in the last job. For those who are still at work, it is assumed that they will continue to work until they reach the pension eligibility age. If they have never changed jobs, the number of years of employment is equal to the sum of the annual contributions paid plus the difference between the eligibility age and their current age. If they have changed jobs, I use self-reported information about the age at which they started their last job and compare this piece of information with their eligibility age. Similar reasoning applies to retirees.

Under these assumptions, the severance pay is calculated as the product of the reference income - appropriately revalued - and the number of years of work in the last job. The average value of the settlement received at the time of retirement is approximately equal to 50 thousand euros, while the median value is around 43 thousand euros. In the left panel of figure 4, the distribution of actual severance pay values (i.e. those directly elicited in the survey) is compared with the estimated ones. The distribution is bell-shaped with a rather elongated right tail. Three-quarters of individuals receive a severance pay of less than 60 thousand euros while 99 percent of individuals receive a sum of less than 160,000 euros. The right panel of figure 4 presents a comparison - by sector - of the estimated distributions and highlights how public sector employees benefit from a higher severance pay than those in the private sector.

[14] A clarification: the reference salary is defined according to the information available. For a private sector employee interviewed several times I consider the median labour income. For a private sector employee interviewed only once, I consider the current salary if still working or the last month's salary if retired. For a public sector employee I consider the latest income available.

Figure 4: Severance pay at retirement



Notes: The figure provides information about the severance pay. The sums are expressed in thousands of euro and are deflated using the 2016 CPI.

B Appendix: Data and Measurement

Table 7 informs on the filtering criteria I apply to highlight the sub-sample of interest. The selection procedure is the following:

1. *Step 1:* For each family in the sample, I consider only the households headed by a male *head*, defined as the person primarily responsible for or most knowledgeable about the household budget;
2. *Step 2:* The individuals of interest are employees who exhibit a certain attachment to the labour force, who are either working or retired. Consequently, I remove from the sample non-labour pensioners, disabled people, unemployed people and self-employed people. In particular, among the retirees, I choose only labour pensioners: people entitled to early or statutory retirement. To carry out our exercise, I need a collection of information about the head's characteristics such as: socio-demographic, economic features and his/her working history. All the units with missing characteristics are removed from the sample.
3. *Step 3:* Lastly, I keep people who are no more than 10 years away from the pension eligibility cut-off.

Table 7: Filtering criteria.

Sample	Raw	Step 1	Step 2	Step 3
	Count	Count	Count	Count
1993	8089	6000	1151	571
1995	8135	6048	2544	1250
1998	7147	5411	2433	1158
2000	8001	5327	2548	1232
2002	8011	5038	2443	1214
2004	8012	4885	2411	1119
2006	7768	4896	2360	1084
2008	7977	4934	2365	1096
2010	7951	4335	2019	969
2012	8151	4457	2072	885
2014	8156	4236	1925	854
2016	7421	3901	1727	783
N.Obs.	94819	59468	25998	12215

Notes: The table reports the step-wise sample selection procedure. Step 1: number of heads. Step 2: number of households with useful information. Step 3: $S \in [-10, 10]$ and $S \neq 0$.

Table 8 shows why I chose to focus on male householders.

Table 8: Filtering criteria.

Sample	Step 1		Step 2		Step 3	
	Men	Women	Men	Women	Men	Women
	Count	Count	Count	Count	Count	Count
1993	6000	2089	1153	171	573	84
1995	6048	2087	2548	458	1253	207
1998	5411	1736	2441	445	1163	179
2000	5327	2674	2553	686	1236	285
2002	5038	2973	2449	809	1218	350
2004	4885	3127	2417	848	1124	344
2006	4896	2872	2352	795	1082	346
2008	4934	3043	2350	806	1087	387
2010	4335	3616	2007	919	965	490
2012	4457	3694	2069	911	884	407
2014	4236	3920	1928	963	855	406
2016	3901	3520	1722	820	779	375
Total	59468	35351	25989	8631	12219	3860
N.Obs.	59468	35351	25989	8631	12219	3860

Notes: The table reports the step-wise sample selection procedure. The number of male and female heads is shown for each set of filtering criteria imposed.

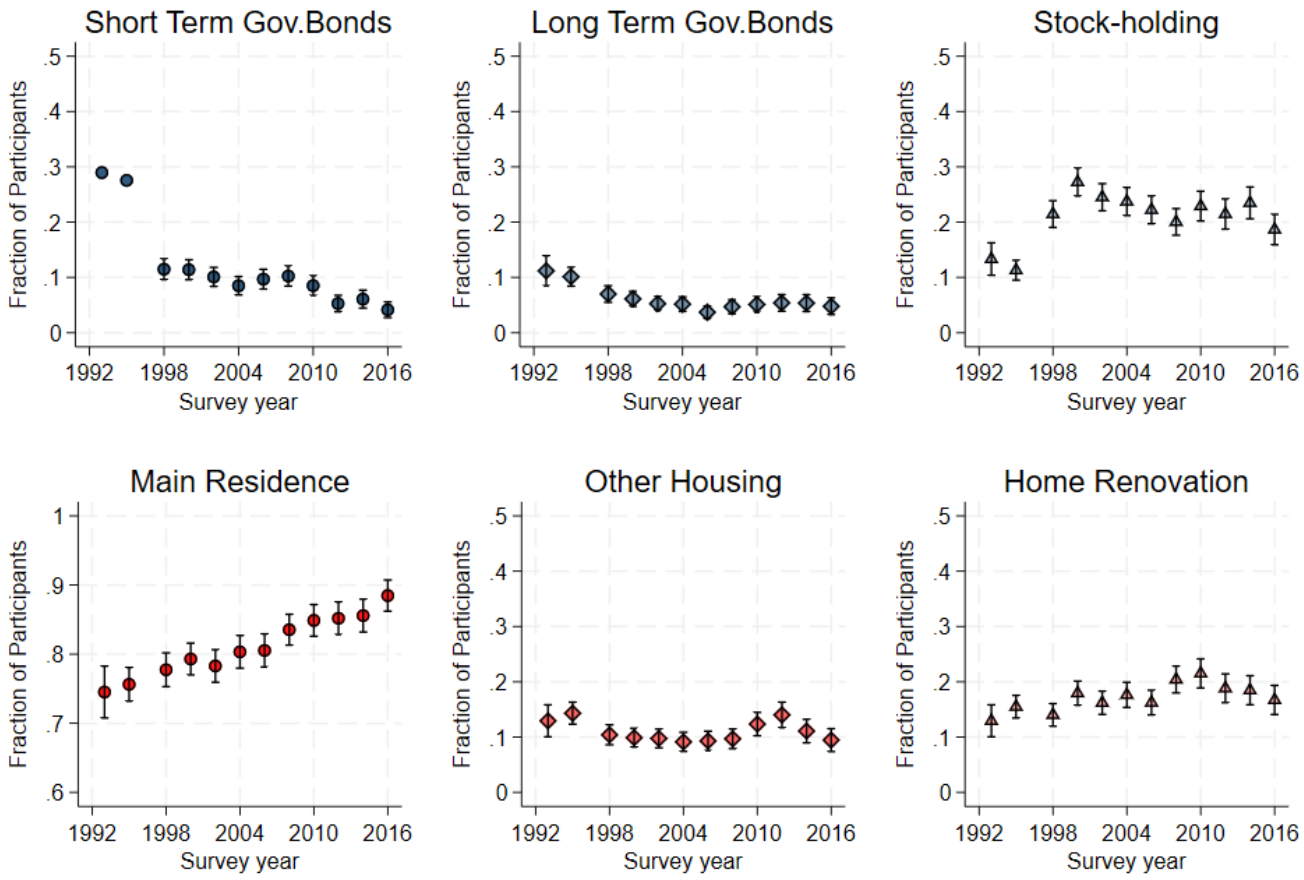
Table 9: Descriptive statistics.

Sample	Step 1		Step 2		Step 3	
Variables	Mean	SD	Mean	SD	Mean	SD
Male	1.000	0.000	1.000	0.000	1.000	0.000
Age	55.964	14.874	58.469	11.282	58.320	6.418
Diploma	0.353	0.478	0.362	0.480	0.360	0.480
Degree	0.099	0.299	0.087	0.282	0.089	0.285
Married	0.817	0.386	0.861	0.346	0.874	0.331
Active	0.561	0.496	0.475	0.499	0.496	0.500
Retired	0.422	0.494	0.509	0.500	0.485	0.500
Family Size	2.879	1.253	2.929	1.196	3.017	1.166
N.Children	0.943	1.035	0.980	1.019	1.048	0.998
Total Net Wealth	284.590	526.134	253.151	240.431	264.584	245.333
Total Net Income	39.355	30.639	40.710	22.171	43.002	23.346
Total Consumption	28.836	17.672	29.699	15.107	30.868	15.880
N.Obs.	59531		25998		12215	

Notes: The table reports Mean/Percentage and Standard Deviation of several demographic and economic variables. Economic variables are expressed in thousands of euros and are deflated using 2016 CPI. I report three samples that refer to the three steps in the sample selection section.

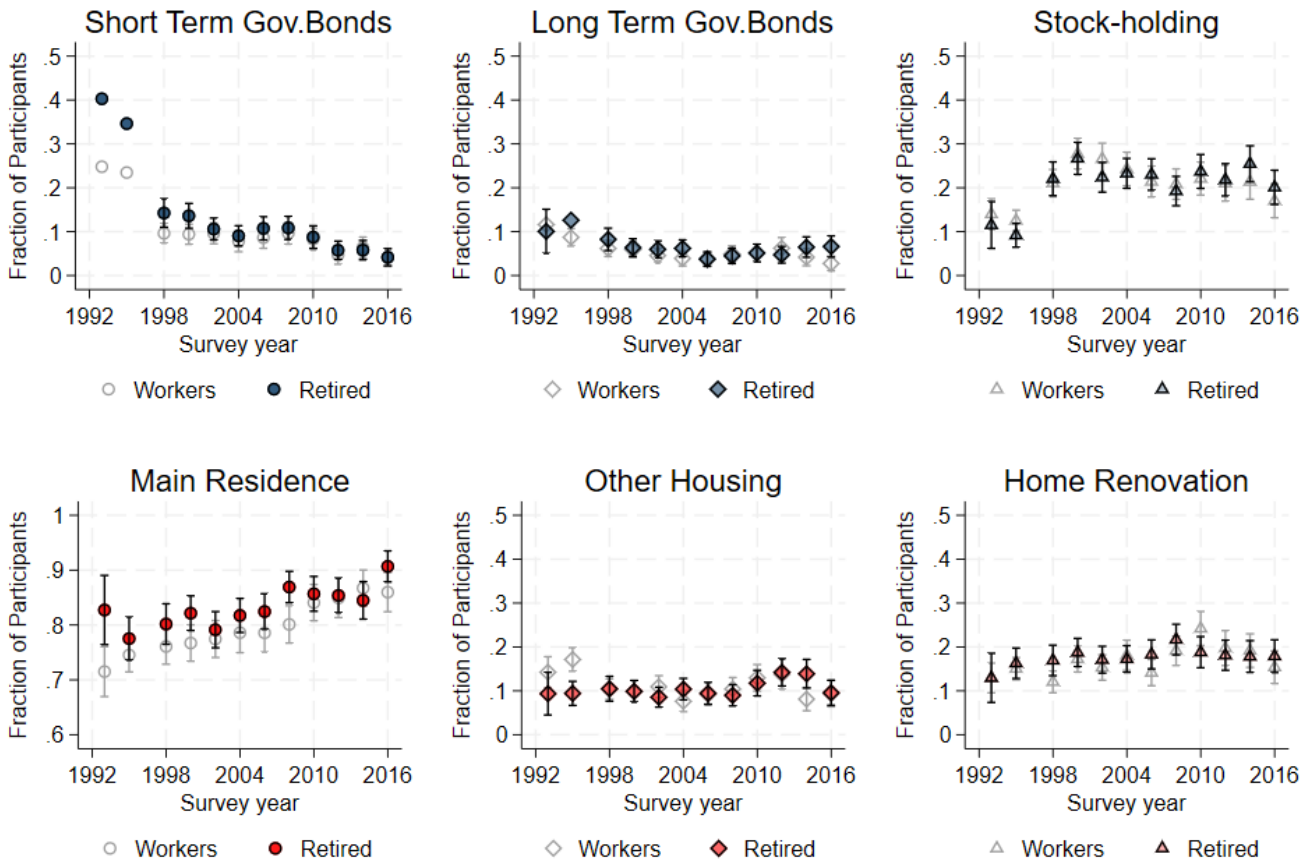
B.1 Outcomes

Figure 5: Participation rates by survey year.



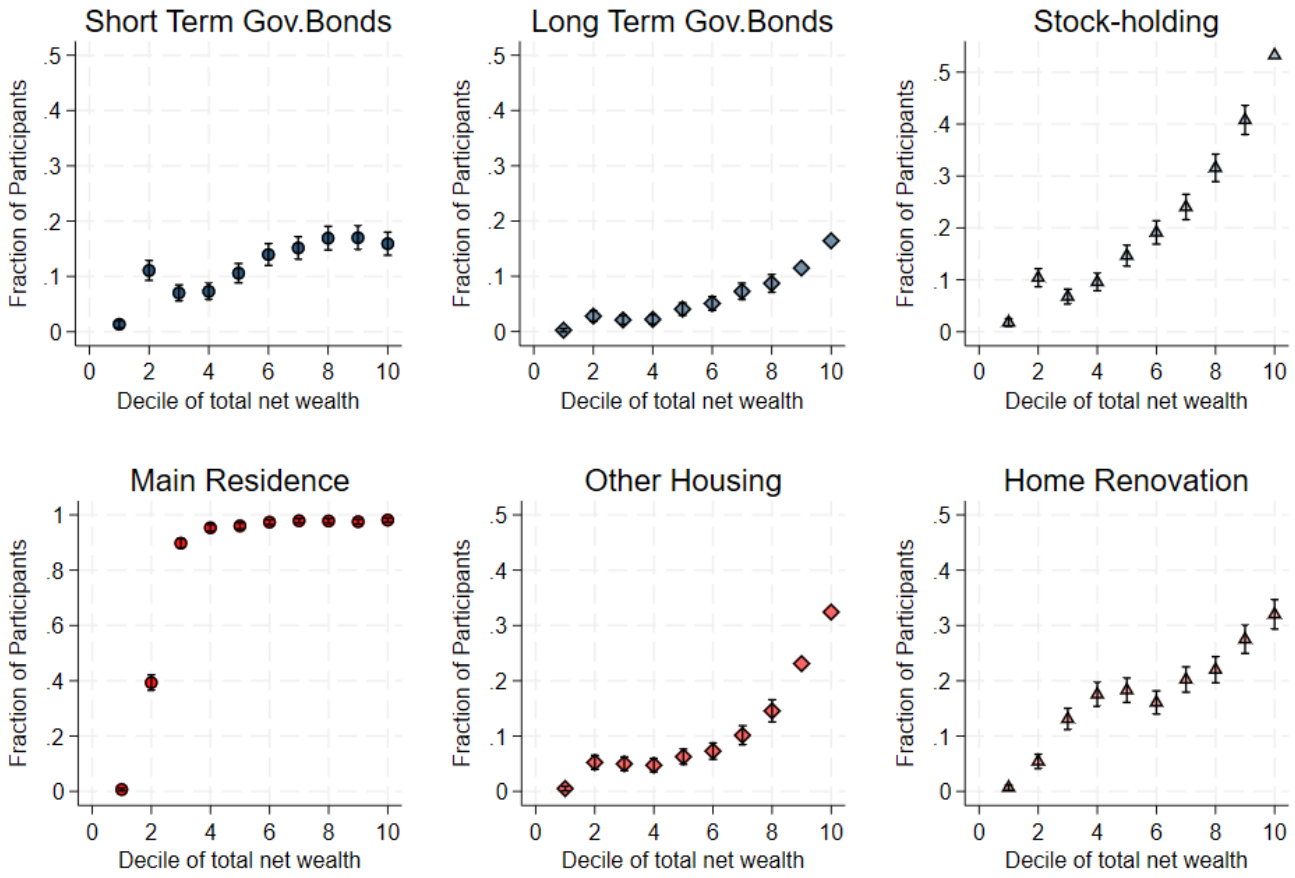
Notes: The figure reports the average participation by survey year.

Figure 6: Participation rates by survey year and retirement status.



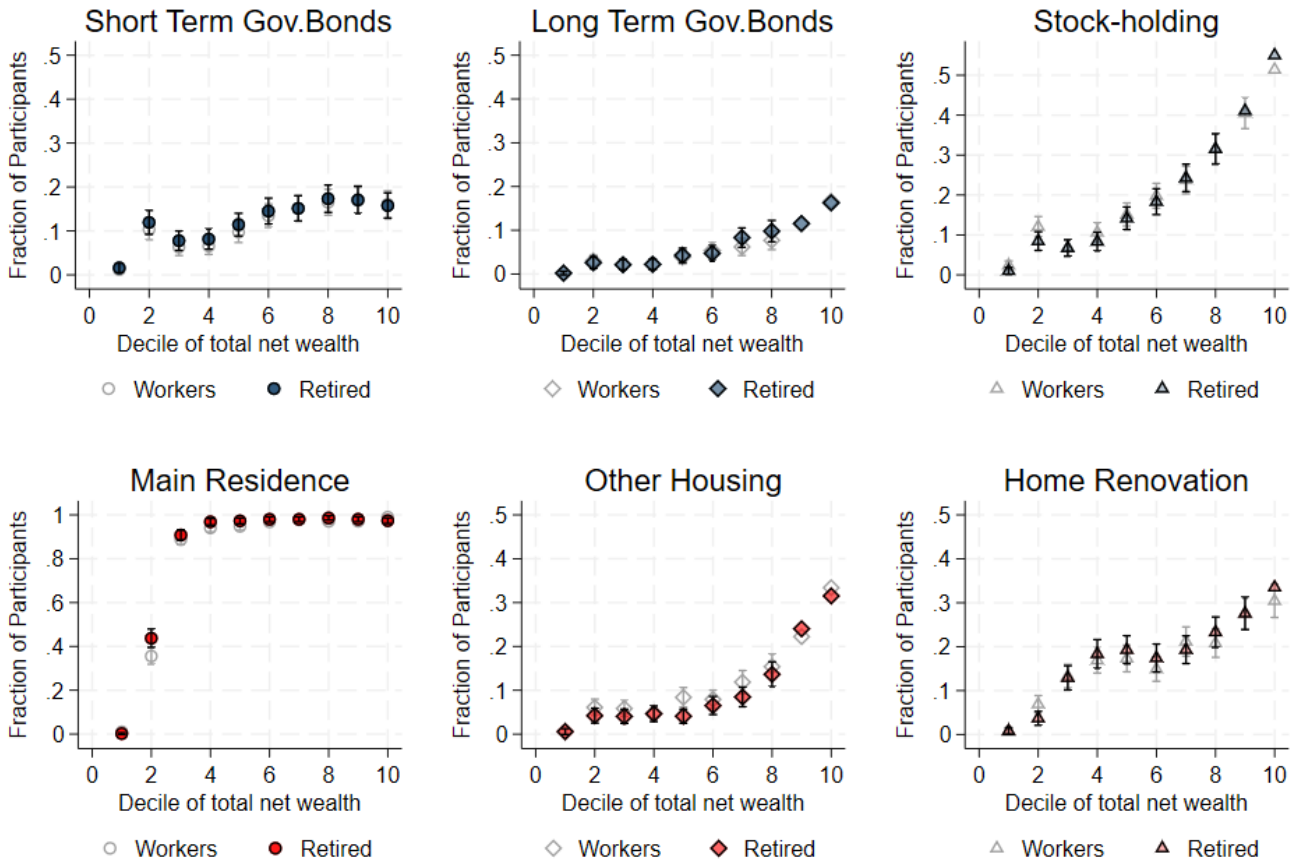
Notes: The figure reports the average participation by survey year and retirement status. Empty dots refer to workers while coloured dots refer to retirees.

Figure 7: Participation rates by decile of total net wealth.



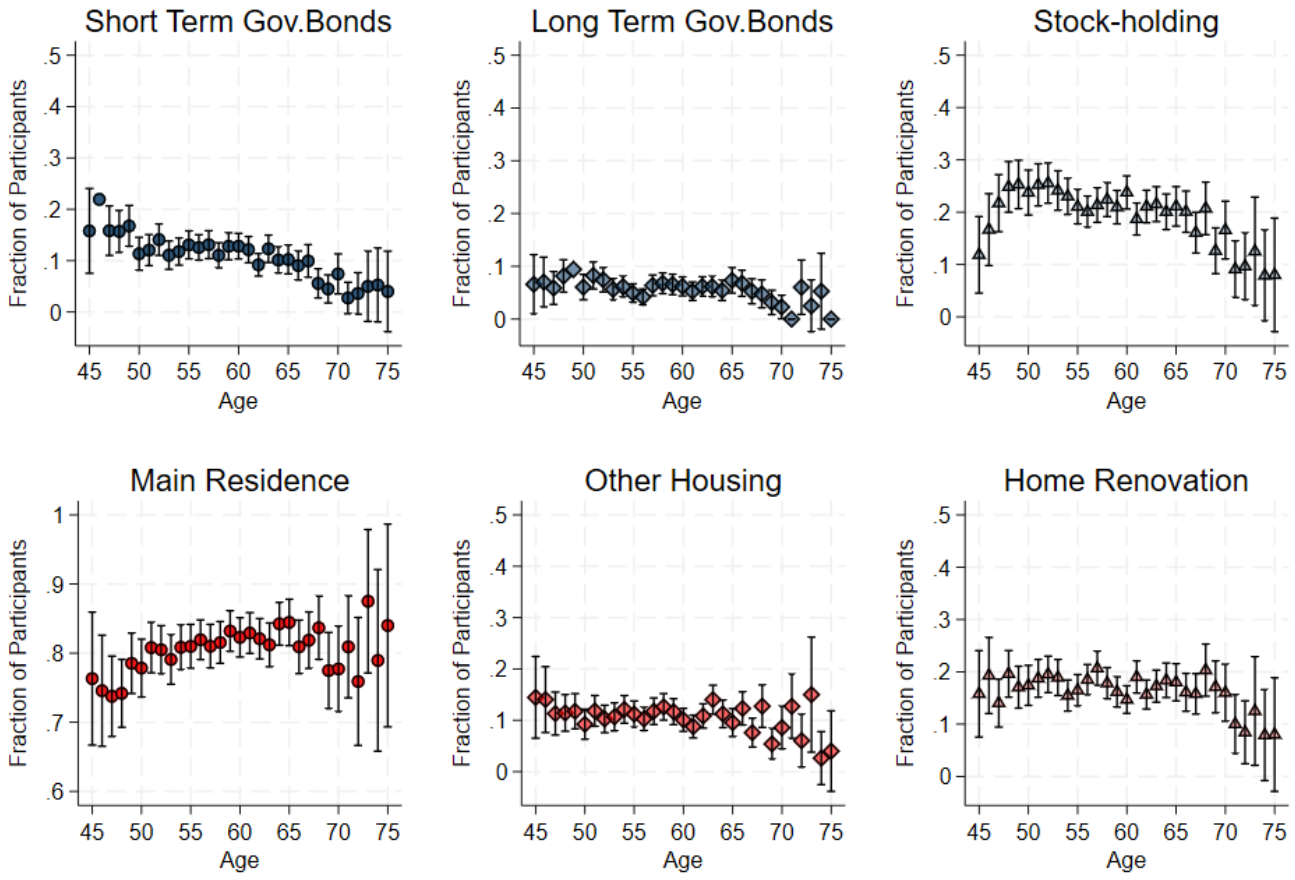
Notes: The figure reports the average participation by decile of total net wealth.

Figure 8: Participation rates by decile of total net wealth and retirement status.



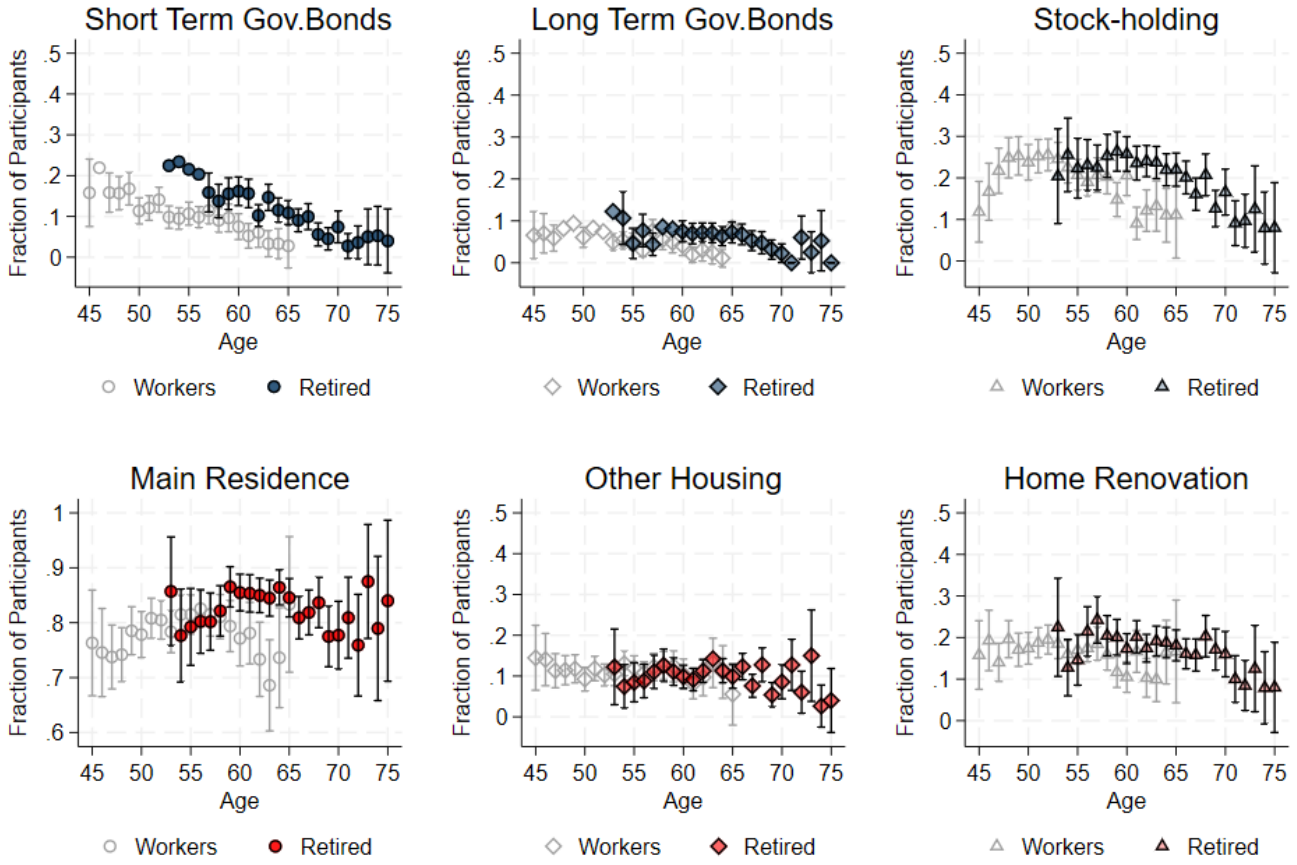
Notes: The figure reports the average participation by decile of total net wealth and retirement status. Empty dots refer to workers while coloured dots refer to retirees.

Figure 9: Participation rates by age.



Notes: The figure reports the average participation by year of age.

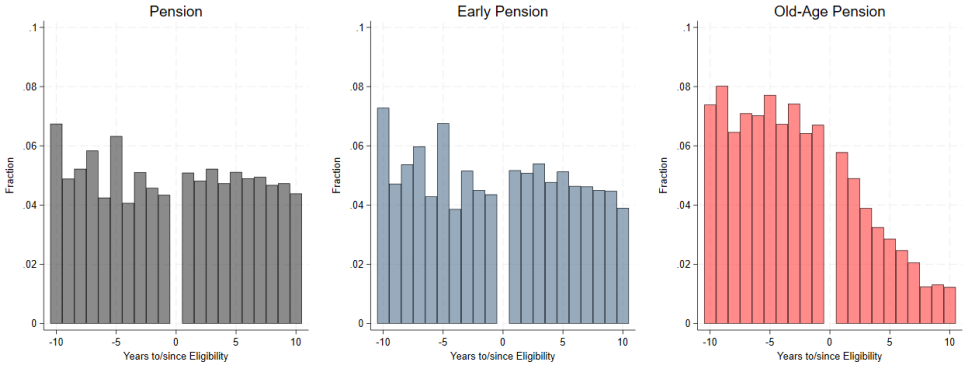
Figure 10: Participation rates by age and retirement status.



Notes: The figure reports the average participation by year of age and working status. Empty dots refer to workers while coloured dots refer to retirees.

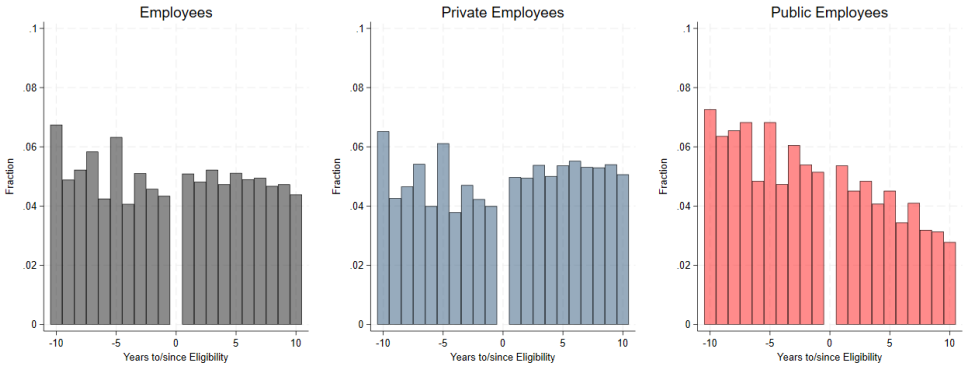
B.2 Pension eligibility

Figure 11: Years to/since eligibility.



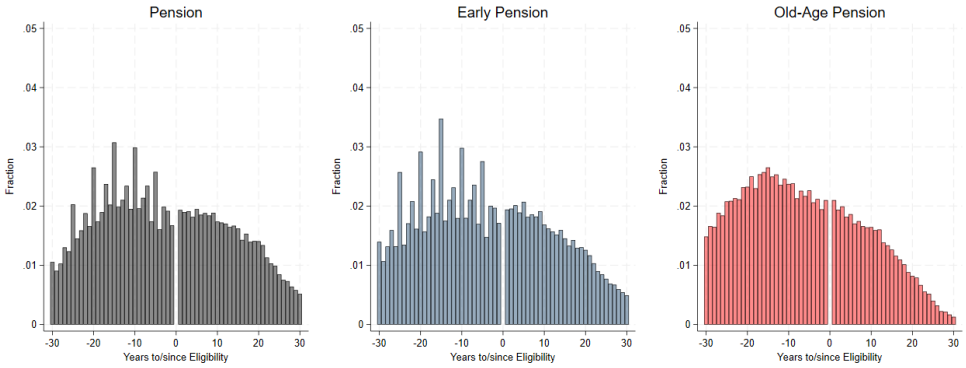
Notes: The figure shows the distributions of the time to/since eligibility. Left figure shows S as computed in equation 3, central figure shows the years of eligibility for early pension (EP), and right figure shows the years of eligibility for old-age pension (OP).

Figure 12: Years to/since eligibility across occupations.



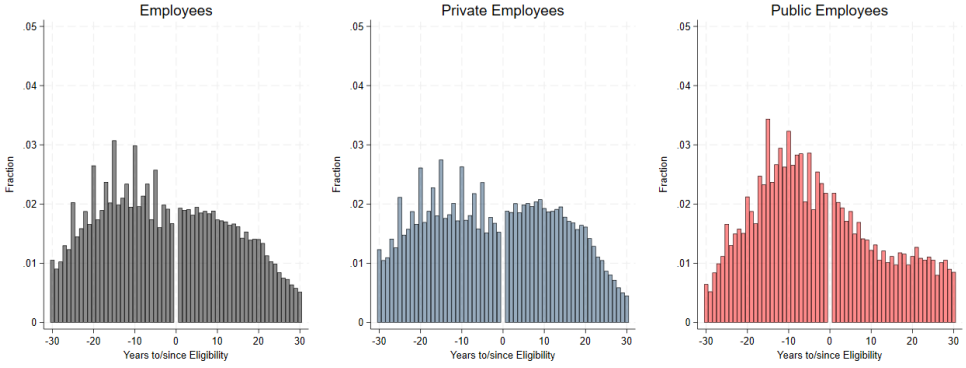
Notes: The figure shows the distributions of the time to/since eligibility. Left figure shows S as computed in equation 3, central figure shows the years of eligibility for private sector employees, and right figure shows the years of eligibility for public sector employees.

Figure 13: Years to/since eligibility.



Notes: The figure shows the distributions of the time to/since eligibility. Left figure shows S as computed in equation 3, central figure shows the years of eligibility for early pension (EP), and right figure shows the years of eligibility for old-age pension (OP).

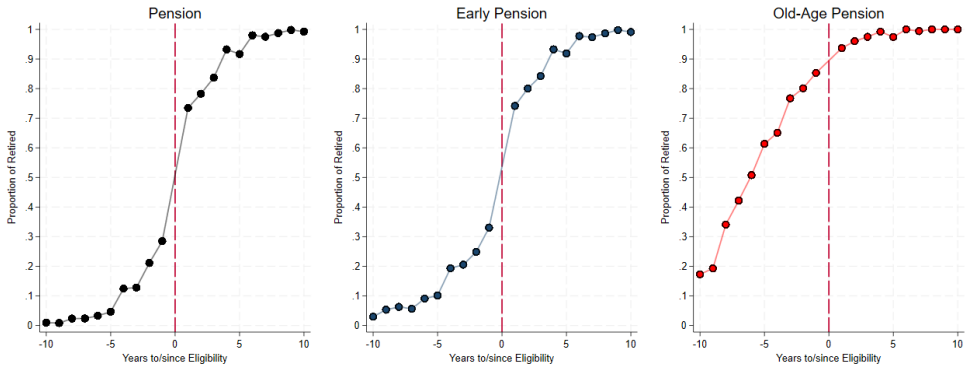
Figure 14: Years to/since eligibility across occupations.



Notes: The figure shows the distributions of the time to/since eligibility. Left figure shows S as computed in equation 3, central figure shows the years of eligibility for private sector employees, and right figure shows the years of eligibility for public sector employees.

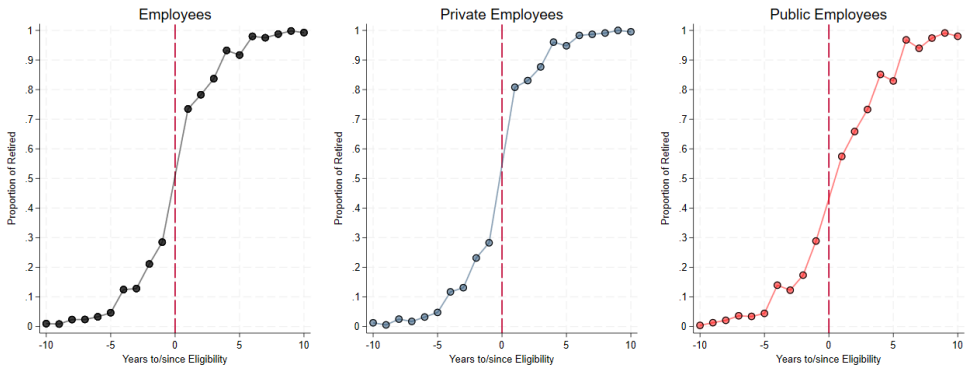
B.3 Retirement status

Figure 15: Treatment exposure.



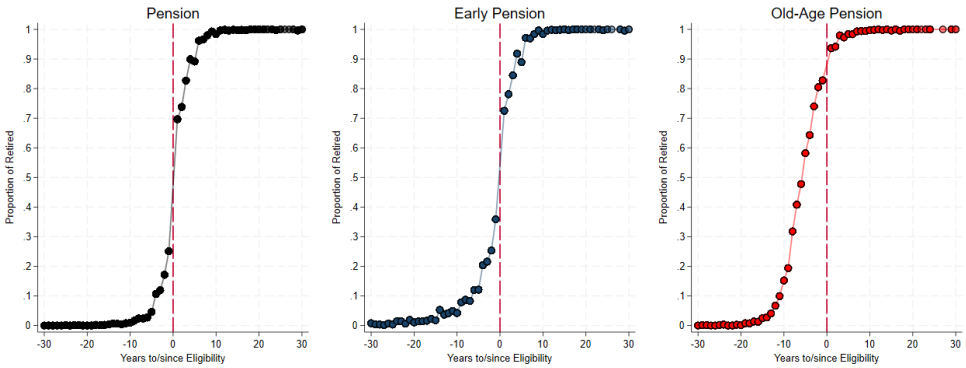
Notes: The figure reports treatment exposure by year of eligibility. Each dot refers to the fraction of retired people in a specific year of eligibility. Left figure refers to the full sample, central figure refers to early pension (EP), and right figure refers to old-age pension (OP).

Figure 16: Treatment exposure across occupations.



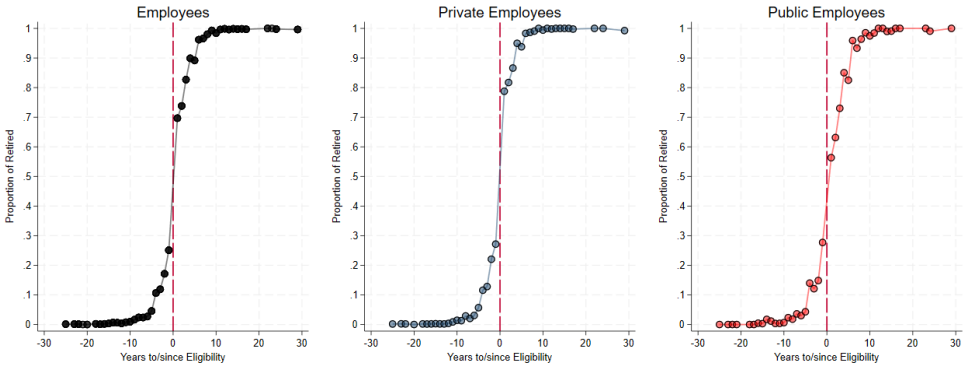
Notes: The figure reports treatment exposure by year of eligibility. Each dot refers to the fraction of retired people in a specific year of eligibility. Left figure refers to the full sample, central figure refers to current/previous private sector employees, and right figure refers to current/previous public sector employees.

Figure 17: Treatment exposure.



Notes: The figure reports treatment exposure by year of eligibility. Each dot refers to the fraction of retired people in a specific year of eligibility. Left figure refers to the full sample, central figure refers to early pension (EP), and right figure refers to old-age pension (OP).

Figure 18: Treatment exposure across occupations.



Notes: The figure reports treatment exposure by year of eligibility. Each dot refers to the fraction of retired people in a specific year of eligibility. Left figure refers to the full sample, central figure refers to current/previous private sector employees, and right figure refers to current/previous public sector employees.

C Appendix: Participation decision

C.1 Regression analysis

Table 10 reports the main estimates (i.e. similar to those shown in Table 2) obtained using individual-level clustering.

Table 10: Effect of retirement on investment decisions.

	1	2	3	4	5	6
Retired	0.031	0.016	0.080***	0.084***	-0.000	0.083***
	0.024	0.019	0.029	0.030	0.017	0.029
f(S)	Yes	Yes	Yes	Yes	Yes	Yes
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
N.Observations	12225	12225	12225	12225	12225	12225
N.Clusters	7496	7496	7496	7496	7496	7496
First stage F	1205	1205	1205	1205	1205	1205

Columns:
1. Short Term Government Bonds;
2. Long Term Government Bonds;
3. Direct and Indirect Stock-holding;
4. Main Residence;
5. Other Housing;
6. Home Renovation;

Notes: The table reports the estimated causal effect of retirement on the participation in financial and real assets. The window of the estimation is for $S \in [-10, 10]$. The retirement status is instrumented with the eligibility status ($I(S \geq 0)$). The covariates are a first order polynomial in S with a different slope at the two sides of the threshold, dummies about the year of birth of the head of the household, dummies about the level of education of the head, indicators of the area of residence, and year dummies. Standard errors are clustered at individual level. ***, **, and * respectively denote statistical significance at the 1%, 5% and 10% levels.

C.2 Validation and falsification tests

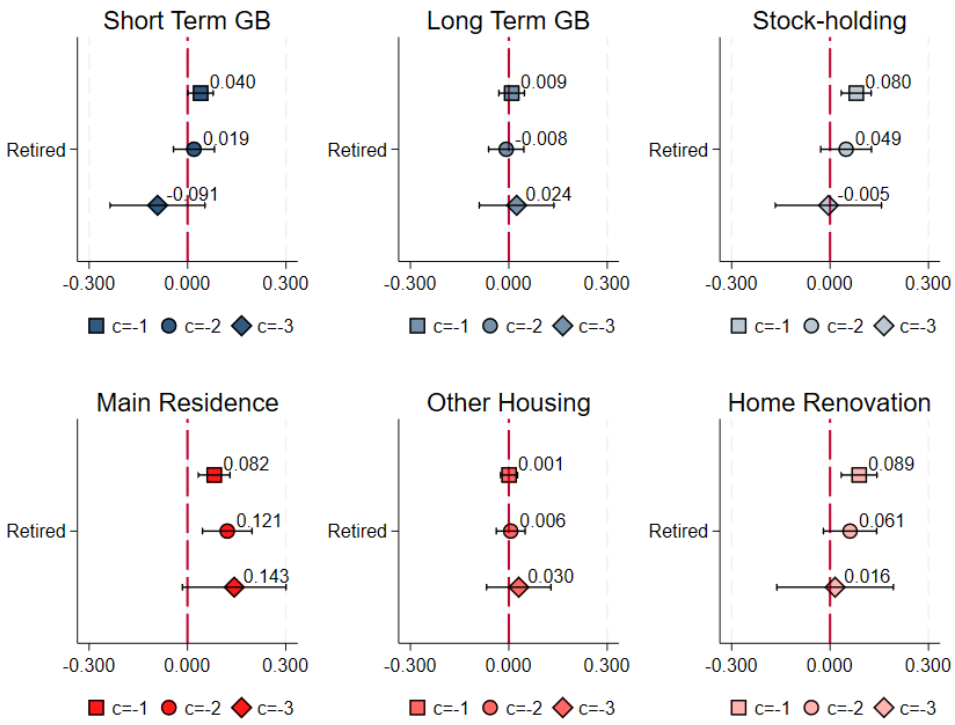
Figure 19: Validation and falsification tests: Sensitivity to the functional form.

Notes: The figure contains six graphs which report the estimated causal effect of retirement on the participation in financial and real assets. Each marker in each figure refers to a specific polynomial form: "square" first order polynomial with same slope at the cut-off, "circle" first order polynomial with different slope at the cut-off, "rhomboid" second order polynomial with same slope at the cut-off, "triangle" second order polynomial with different slope at the cut-off.

Figure 20: Validation and falsification tests: Sensitivity to the bandwidth.

Notes: The figure contains six graphs which report the estimated causal effect of retirement on the participation in financial and real assets. Each marker in each figure refers to a different bandwidth.

Figure 21: Validation and falsification tests: Placebo test.

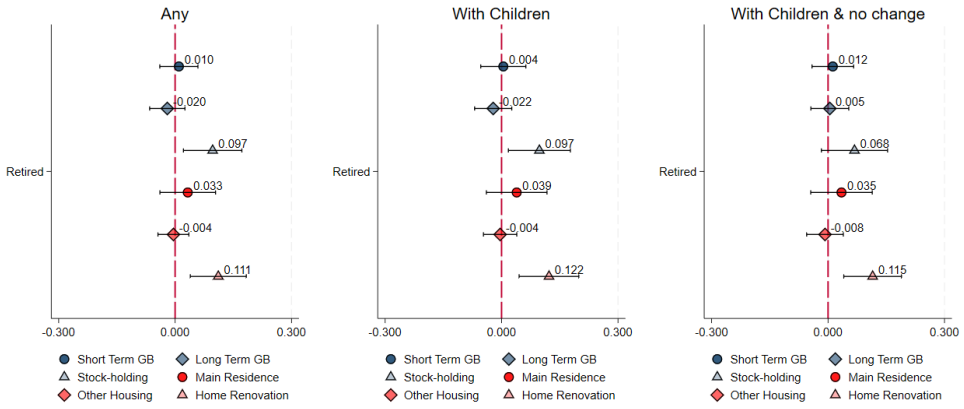


Notes: The figure contains six graphs which report the estimated causal effect of retirement on the participation in financial and real assets considering a fictitious threshold. Each marker in each figure refers to a different alternative threshold: "square" cut-off=-1, "circle" cut-off=-2, "rhomboid" cut-off=-3.

Figure 22: Validation and falsification tests: Placebo test.

Notes: The figure contains six graphs which report the estimated causal effect of retirement on the participation in financial and real assets considering a fictitious threshold. Each marker in each figure refers to a different alternative threshold: "square" cut-off=1, "circle" cut-off=2, "rhomboid" cut-off=3.

Figure 23: Validation and falsification tests: Robustness - Household's composition.



Notes: The figure contains three graphs which report the estimated causal effect of retirement on the participation in financial and real assets. Each marker refers to an independent regression.

Table 11: Validation and Falsification Tests - Sample Balance.

Variables	[-12,12]	[-11,11]	[-10,10]	[-9,9]	[-8,8]
Age	√	√	√	√	√
Diploma	√	√	√	√	√
Degree	√	√	√	√	√
Married	√	√	√	√	√
Divorced	√	√	×	√	√
Widowed	√	√	√	√	√
Family Size	×	√	√	√	√
N. Children	×	×	×	×	√
Northern Area	√	√	√	√	√
Central Area	√	√	√	√	√
Southern Area	√	√	√	√	√
Piemonte	√	√	√	√	√
Valle d'Aosta	√	√	√	√	√
Lombardia	√	×	×	√	√
Trentino	√	√	√	√	√
Veneto	√	√	√	√	√
Friuli Venezia Giulia	×	×	×	×	×
Liguria	√	√	√	√	√
Emilia Romagna	√	√	√	√	√
Toscana	√	√	√	√	√
Umbria	√	√	√	√	√
Marche	√	√	√	√	√
Lazio	√	√	√	√	√
Abruzzo	√	√	√	√	√
Molise	√	√	√	√	√
Campania	√	√	√	√	√
Puglia	√	√	√	√	√
Basilicata	√	√	√	√	√
Calabria	√	√	√	√	√
Sicilia	√	√	√	√	√
Sardegna	√	√	√	√	√
City below 20k inh.	√	√	√	√	√
City [20 inh., 40k inh.]	√	√	√	√	√
City [40 inh., 500k inh.]	×	×	√	√	√
City above 500k inh.	√	√	√	√	√

Notes: The table reports the estimated causal effect of retirement on socio-demographic features. The dependent variables are shown in the left column. The covariates are the retirement status, a first order polynomial in S with a different slope at the two sides of the threshold and year dummies. The retirement status is instrumented with the eligibility status ($I(S \geq 0)$). × is reported if retirement has an effect significant at 5%, √ otherwise. Standard errors are clustered at eligibility and survey year.

Table 12: Validation and Falsification Tests: Robustness - Sample selection.

	1	2	3	4	5	6
Retired	0.038**	0.008	0.073***	0.060***	0.007	0.069***
	0.019	0.017	0.022	0.021	0.011	0.023
f(S)	Yes	Yes	Yes	Yes	Yes	Yes
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
N.Obs.	17494	17494	17494	17494	17494	17494
N.Clusters	480	480	480	480	480	480
F First Stage	699	699	699	699	699	699

Columns:
1. Short Term Government Bonds;
2. Long Term Government Bonds;
3. Direct and Indirect Stock-holding;
4. Main Residence;
5. Other Housing;
6. Home Renovation;

Notes: The table reports the estimated causal effect of retirement on the participation in financial and real assets. The sample considered is the one in which the head is defined as the SHIW reference person, therefore it could be either a man or a woman. The window of the estimation is for $S \in [-10, 10]$. The retirement status is instrumented with the eligibility status ($I(S \geq 0)$). The covariates are a first order polynomial in S with a different slope at the two sides of the threshold, a second order polynomial in the age of the head, years of education of the head, indicator of the area of residence, and year dummies. Standard errors are clustered at eligibility and survey year. ***, **, and * respectively denote statistical significance at the 1%, 5% and 10% levels.

Table 13: Validation and Falsification Tests: Robustness - Sample selection.

	1	2	3	4	5	6
Retired	0.043**	0.000	0.059**	0.058**	0.007	0.060**
	0.019	0.017	0.024	0.023	0.011	0.024
f(S)	Yes	Yes	Yes	Yes	Yes	Yes
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
N.Obs.	15220	15220	15220	15220	15220	15220
N.Clusters	480	480	480	480	480	480
F First Stage	686	686	686	686	686	686

Columns:
1. Short Term Government Bonds;
2. Long Term Government Bonds;
3. Direct and Indirect Stock-holding;
4. Main Residence;
5. Other Housing;
6. Home Renovation;

Notes: The table reports the estimated causal effect of retirement on the participation in financial and real assets. The sample considered is the one in which the head is defined as the person in the household with the longest working career, therefore it could be either a man or a woman. The window of the estimation is for $S \in [-10, 10]$. The retirement status is instrumented with the eligibility status ($I(S \geq 0)$). The covariates are a first order polynomial in S with a different slope at the two sides of the threshold, a second order polynomial in the age of the head, years of education of the head, indicator of the area of residence, and year dummies. Standard errors are clustered at eligibility and survey year. ***, **, and * respectively denote statistical significance at the 1%, 5% and 10% levels.

C.3 Interpretation - Portfolio choice model

Consider a single period portfolio choice model. Households possess a certain amount of *wealth* (W) that can be allocated in two assets: one *risky* ($\tilde{r}$) and one *safe* ($\bar{r}$). However, in order to invest in risk assets it is necessary to bear a fixed cost F constituted by a monetary component, such as the fee that has to be paid to the financial intermediaries, and by a non monetary part, attributable to the time and effort necessary to take the investment decision. Households choose the optimal share of risky assets (α^*) to maximize their expected felicity from wealth and have a utility function that is monotonically increasing and concave.

The maximization problem is the following:

$$Max_{\alpha} E\{U((W-F)(\alpha\tilde{r}+(1-\alpha)\bar{r}))\}$$

deriving with respect to α we get:

$$E\{U'((W-F)(\alpha\tilde{r}+(1-\alpha)\bar{r}))(W-F)(\tilde{r}-\bar{r})\}=0$$

With a positive risk premium and initial wealth higher than the participation cost, the optimal share of risky asset (α^*) is strictly positive. Given α^*, the investor will buy risky assets if the expected utility from having a diversified portfolio is higher than the one obtaining from investing exclusively in the safe asset. This condition can be expressed as follows:

$$E\{U((W-F)(\bar{r}+\alpha^*(\tilde{r}-\bar{r})))\}\geq U(W\bar{r})$$

Replacing the right hand side with its certainty equivalent we get:

$$U((W-F)(\bar{r}+\alpha^*(r^{ce}-\bar{r}))\geq U(W\bar{r})$$

then knowing that the utility is monotonically increasing in its argument, it follows that:

$$\begin{aligned}(W-F)(\bar{r}+\alpha^*(r^{ce}-\bar{r}))&\geq W\bar{r}\\(W-F)(\alpha^*(r^{ce}-\bar{r}))&\geq F\bar{r}.\end{aligned}$$

The left hand side of the relationship can be interpreted as the net benefit from investing $\alpha*(W-F)$ euro in the risky asset, while the right hand side represents the cost avoidable by not investing in riskier securities. Therefore, individuals will participate if the net benefit is higher than the cost and in particular, rearranging the terms, if:

$$W\geq F\left(1+\frac{\bar{r}}{\alpha^*(r^{ce}-\bar{r})}\right)=w.$$

Therefore, an individual participates if his level of initial wealth (W) is higher than the threshold (w). It follows that: i) the higher the fixed cost (F), the higher the threshold to overcome, ii) the higher the risk-adjusted premium ($r^{ce}-\bar{r}$), the lower the cut-off, iii) the higher the optimal share (α^*), the less easy it is to participate, and iv) because α^* is a function of the risk attitudes of the individuals: the higher the relative risk aversion, the lower the optimal share, the harder it is to participate.

C.4 Interpretation - Financial literacy

One of the determinants of participation in the stock market is the presence of a fixed entry cost. This cost is at least partly attributable to individual characteristics such as financial education. Some waves of SHIW contain questions that allow measuring the level of financial literacy of the respondents. In particular, at least one of the following questions was included in the 2004, 2006, 2008, 2010 and 2016 waves:

Inflation. Imagine leaving 1,000 euros in a current account that pays 1% interest and has no charges. Imagine that inflation is running at 2%. Do you think that if you withdraw the money in a year's time you will be able to buy the same amount of goods as if you spent the 1,000 euros today?

1. *Yes;*
2. *No, I will be able to buy less;*
3. *No, I will be able to buy more;*
4. *Don't know;*
5. *No answer.*

Mortgage. Which of the following types of mortgage do you think would allow you from the very start to fix the maximum amount and number of instalments to be paid before the debt is extinguished?

1. *Floating-rate mortgage;*
2. *Fixed-rate mortgage;*
3. *Floating-rate mortgage with fixed instalments;*
4. *Don't know;*
5. *No answer.*

Investment strategies. Which of the following investment strategies do you think entails the greatest risk of losing your capital?

1. *Investing in the shares of a single company;*
2. *Investing in the shares of more than one company;*
3. *Don't know;*
4. *No answer.*

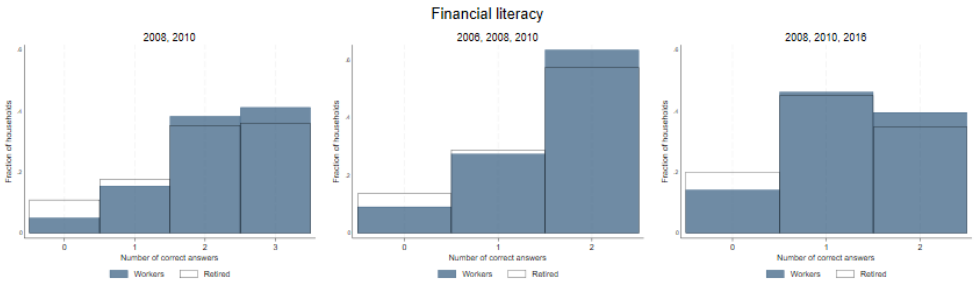
Three indicators were created by counting the number of correct answers: a first that uses all three questions for the years 2008 and 2010, a second that uses the first and second questions in the years 2006, 2008 and 2010, and a third that uses the second and third questions in the years 2008, 2012 and 2016. Table 14 reports some descriptive statistics of these indicators while Figure 24 offers a comparison between the distributions of values obtained from workers and those obtained from pensioners.

Table 14: Financial literacy.

	Count	Mean	SD
Financial literacy$_{2008,2010}$	2065	2.058	0.934
Financial literacy$_{2006,2008,2010}$	2637	1.489	0.693
Financial literacy$_{2008,2010,2016}$	2848	1.199	0.710

Notes: The table reports the number of observations, the average value and the standard deviation of the three financial literacy indicators.

Figure 24: Financial literacy



Notes: The figure shows the distributions of values of the three financial literacy indicators. The distributions obtained by workers are represented in blue while those obtained by pensioners are transparent.

Lastly, regression analyses are proposed to verify whether the greater free time associated with retirement determines a significant change in the level of financial literacy. Table 15 reports the results of the analyses. None of the coefficients are significant, therefore it is concluded that this characteristic is invariant with respect to retirement.

Table 15: Effect of retirement on financial literacy.

Financial Literacy	1	2	3
Retired	0.027	0.052	0.096
	0.065	0.056	0.106
f(S)	Yes	Yes	Yes
Covariates	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes
N.Observations	2065	2637	2848
N.Clusters	40	60	60
First stage F	179	231	243

Notes: The table reports the estimated causal effect of retirement on Financial Literacy. The outcome is computed using SHIW data waves from 2006 to 2010. The dependent variable is equal to the count of correct answers. The retirement status is instrumented with the eligibility status ($I(S \geq 0)$). The covariates are a first order polynomial in S with a different slope at the two sides of the threshold, a second order polynomial in the age of the head, years of education of the head, indicator of the area of residence, and year dummies. The window of the estimation is for $S \in [-10, 10]$. Standard errors are clustered at eligibility and survey year. ***, **, and * respectively denote statistical significance at the 1%, 5% and 10% levels.

C.5 Interpretation - Risk aversion

Risk aversion is one of the factors that influences the optimal share of stocks in the portfolio and ultimately participation in the stock market. Starting from 2004, the SHIW data has a question that allows people to be classified on the basis of their risk attitudes. The question is the following:

Risk attitudes. In managing your financial investments, would you say you have a preference for investments that offer:

1. *very high returns, but with a high risk of losing part of the capital;*
2. *a good return, but also a fair degree of protection for the invested capital;*
3. *a fair return, with a good degree of protection for the invested capital;*
4. *low returns, with no risk of losing the invested capital.*

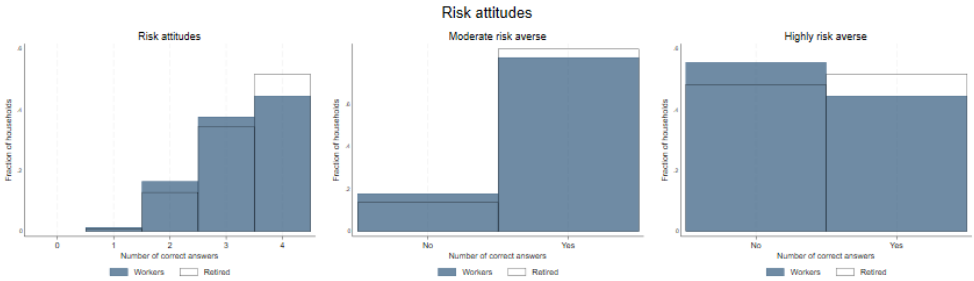
Using the answers provided, two binary indicators of risk aversion were created which highlight moderately risk averse people (i.e. answer 3 or 4) and highly risk averse people (i.e. answer 4). Table 16 shows the share of people who fall into these two categories. Graph 25 compares the share of risk averse people before and after retirement.

Table 16: Risk aversion.

	Count	Mean	SD
Moderate risk averse	6152	0.843	0.364
Highly risk averse	6152	0.483	0.500

Notes: The table reports the number of observations, the average value and the standard deviation of the two risk aversion indicators.

Figure 25: Risk aversion



*Notes:*The figure shows the distributions of values of the three financial literacy indicators. The distributions obtained by workers are represented in blue while those obtained by pensioners are transparent.

Lastly, regression analyses are proposed to verify whether retirement determines a significant change in the risk propensity. Table 17 reports the results of the analyses. None of the coefficients are significant, therefore it is concluded that this characteristic is invariant with respect to retirement.

Table 17: Effect of retirement on risk aversion.

Financial Literacy	1	2
Retired	0.015	-0.069
	0.041	0.054
f(S)	Yes	Yes
Covariates	Yes	Yes
Year Dummies	Yes	Yes
N.Observations	6162	6162
N.Clusters	140	140
First stage F	421	421

Notes: The table reports the estimated causal effect of retirement on Risk Aversion. The outcome is computed using SHIW data waves from 2004 to 2016. The dependent variable is a binary indicator for being risk averse. The retirement status is instrumented with the eligibility status ($I(S \geq 0)$). The covariates are a first order polynomial in S with a different slope at the two sides of the threshold, dummies on the year of birth of the head, years of education of the head, indicator of the area of residence, and year dummies. The window of the estimation is for $S \in [-10, 10]$. Standard errors are clustered at eligibility and survey year. ***, **, and * respectively denote statistical significance at the 1%, 5% and 10% levels.