

LUISS Guido Carli University
Einaudi Institute for Economics and Finance

Department of Economics and Finance

Portfolio Effects of Pension Reforms
Raising the Minimum Retirement Age:
Evidence from Middle-Aged Italian Workers

Chair of Advanced Financial Economics

Supervisor:
Matteo Paradisi

Co-supervisor:
Luana Zaccaria

Co-supervisor:
Luigi Guiso

Student:
Martina Rocchi

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Portfolio Effects of Pension Reforms Raising the Minimum Retirement Age: Evidence from Middle-Aged Italian Workers*

Martina Rocchi

Rome Masters in Economics

EIEF and LUISS

Abstract

This study delves into the financial implications of pension reforms raising the Minimum Retirement Age (*MRA*) among middle-aged workers, leveraging the 2011 Italian Fornero Reform as a quasi-natural experiment. Although previous research has extensively investigated employment responses to such policies, the effects of a sudden and heterogeneous extension of the working horizon on expected human wealth, saving behaviours and portfolio allocations remain largely unexplored, particularly for far-from-retirement workers. The reported analysis provides evidence of *forward-looking* middle-aged Italian workers internalizing the new pension rules and validates several theoretical predictions mapping human wealth to saving patterns and risky asset allocations. Furthermore, the findings presented contribute to the ongoing debate on the pension wealth effects of the 2011 Fornero Reform and shed light on Italian workers' understanding of the mechanisms of the pension system. Finally, this research project highlights for the first time the role of public incentives in shaping the effects of pension reforms that attempt to promote long-term financial sustainability and equality of treatment within and across generations by increasing the statutory retirement age.

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1 Introduction

Due to aging populations and shrinking fertility rates, many OECD countries have implemented unpopular reforms to recover long-term financial sustainability and improve the intergenerational and intragenerational solidarity of their pension systems. One notable measure has been to raise the statutory Minimum Retirement Age (*MRA*). While existing literature has mainly examined the employment responses associated with these pension reforms, the impact on individual expectations regarding future income sources and financial decisions remains relatively unresolved. Moreover, economists have typically studied the effects of raising the statutory retirement age on workers close to retirement, specifically those who would have satisfied eligibility criteria under pre-reform rules and no longer qualify under the new ones. However, this approach neglects reactions of relatively younger individuals. Even if not eligible to retire under any scenario, also middle-aged workers experience an extension in their working horizon and may anticipate changes in their expected labor and pension wealth, especially in light of the extensive public debate surrounding these pension reforms. However, assessing the response of far-from-retirement individuals is challenging, as it requires an important economic shock (enough to be well absorbed by individual expectations) that is heterogeneous even among younger cohorts ([10] Carta and De Philippis, 2023). To date, no research has been devoted to understanding the effects of reforms that raise the *MRA* on the expected human wealth and portfolio decisions of middle-aged workers. This lack of knowledge prevents us from gaining valuable insights into the potential impact of these reforms on the level of liquid wealth available to future generations of retirees. In an effort to bridge this gap, the present study leverages a quasi-natural experiment that took place in Italy at the end of 2011, the Fornero Reform.

Raising the statutory minimum retirement age can affect savings levels and portfolio compositions, primarily mediated by changes in the present discounted value of future labor earnings and pension benefits, here referred to as expected human wealth. The effect of a *MRA* increase on savings is an empirical question depending on reform-specific employment and pension wealth channels. In particular, by requiring individuals to wait longer before becoming eligible for public pension benefits, these reforms can prompt workers to either rely solely on their existing wealth or, more commonly, to continue working for extra years. In the latter scenario, the increased human wealth resulting from additional periods of labor earnings, which typically exceed public pension benefits, and a shorter period of non-employment to be financed may generate positive income effects among far-from-retirement workers leading to higher consumption out of a current and unaffected disposable income ([17] Etgeton, Fischer and Ye, 2023; [21] García-Miralles and Leganza, 2021). To gain a comprehensive understanding of the impact on saving behaviors, this study goes

beyond the conventional focus on saving rates. In a life-cycle framework with pension shocks, households exploit savings to smooth consumption over time by choosing what proportion of lifetime wealth to consume today and what proportion to set aside for the future. As they aim to maintain a level of financial assets that aligns with their present and future total wealth, households should be primarily concerned about the proportion of their savings relative to lifetime wealth rather than current income. Consequently, this work explores the effect of unexpected increases in total lifetime wealth on individual *saving ratios*, a measure proposed by [34] Ordonez and Piguillem (2022) that quantifies the optimal stock of savings out of expected lifetime wealth predicted by standard dynamic models. Furthermore, as human wealth is typically compared to a bond endowment given its uncertainty, illiquidity and weak correlation with stock market returns, a potential positive impact of reforms raising the *MRA* on expected human wealth may also trigger changes in the household asset mix and influence the "consumable" wealth available during retirement. In accordance with diversification motives, the [30] Merton's life-cycle model (1975)¹ predicts that the optimal proportion of a portfolio invested in stocks will rise as the ratio of human wealth to financial wealth increases.

Government incentives may play a role in shaping changes in expected human wealth resulting from a *MRA* increase. If post-reform rules provide greater pension benefits as a reward for each additional working year, people can reasonably anticipate an increase in human wealth due to more periods of labor earnings and improved pension benefits at the time of retirement. When instead the working horizon extension is not accompanied by a more generous replacement rate (i.e. the ratio of the first pension benefit to the last salary), the postponed access to constant pension benefits can reduce expected pension and human wealth. Studies investigating the effects of reforms reducing expected pension benefits on consumption behaviors have consistently shown an increase in private savings, aligning with what [19] Feldstein (1974) called substitution effect: pension wealth crowds out discretionary saving. Indeed, previous evidence for Italy has found how the reduction in replacement rates following the 1992 Amato reform caused an increase in saving rates ([1] Attanasio and Brugiavini, 2003) and in the household wealth-income ratio ([7] Bottazzi, Jappelli and Padula, 2006). Moreover, [8] Bottazzi et al. (2011) showed how the decline in the expected pension wealth resulting from the Italian reforms of the 1990s led to an increase in the allocation of private wealth towards safer and real assets. In the context of reforms that raise the *MRA*, if the increase in future labor earnings is offset by a negative pension wealth channel, the impact on private wealth's different components is a priori ambiguous, further justifying my empirical analysis.

¹Merton's CRRA life-cycle model with deterministic human capital (1975) predicts a hump-shaped life-time portfolio risky share: young people should invest heavily in stocks and then rebalance with age as their ratio between human and financial wealth declines, with a concave profile until retirement. [14] Cocco et al.(2005), rationalized many anomalies predicted by Merton's CRRA model with deterministic human capital (1975) and showed how portfolio rules depends on age and wealth and lifetime portfolio risky share rules are hump-shaped also when not insurable income and pension risk are included.

The unexpected 2011 Italian pension reform provides an ideal setting to empirically test the theoretical predictions discussed so far. The Fornero reform was implemented to improve the sustainability of the Italian pension system and homogenize pension rules among different workers. Written in only 19 days at the peak of the sovereign debt crisis, the reform induced several labor and pension wealth shocks across genders and pension regimes. These sudden and heterogeneous changes in pension eligibility criteria offer a valuable opportunity to examine the response of workers’ portfolios to *MRA* increases. Furthermore, the broad public debates generated by the Fornero reform led to a widespread understanding of its effects among the population, which reinforces the validity and relevance of assessing its unexplored impact on middle-aged workers’ financial decisions. An increase in the *MRA* from 1 to 7 years represented the main change introduced by the reform. In addition to this noticeable employment shock, the objective of granting equality of treatment within and across generations created an heterogeneous system to reward people for extra working years. While individuals under an *actuarially fair* pension scheme² benefited from higher statutory replacement rates due to an increase in the annuity rates governing the pension computation in a Notional Defined-Contribution system ([6] Borella and Coda Moscarola, 2015), people enrolled in the more generous Defined-Benefit pension scheme experienced unchanged pension benefits deferred over time.

The study leverages data from the Bank of Italy’s Survey on Household Income and Wealth (SHIW). This representative biennial survey offers not only detailed information on the composition of household wealth, but also individual *expectations* of retirement age and replacement rate that allow to capture changes in the expected working horizon and pension wealth due to the reform. The analyses involve a sample of nearly 6,000 workers from repeated cross-sections spanning the period from 2006 to 2016. Results are further validated by the incorporation of a rotating panel component covering the years 2008 to 2014. The results are based on a Difference-in-Differences (DID) model which exploits the variation in the *MRA* within cells defined by the key determinants of the Italian pension eligibility: age, contribution years, gender and employment status. To address the possibility of a nonlinear impact of *MRA* increases and a limited responsiveness of middle-aged workers to small *MRA* shocks, the study takes advantage of a treatment assignment strategy that targets individuals most affected by the reform following the approach proposed by [10] Carta and De Philippis (2023). Baseline results refer to male workers, as they provide a more straightforward comparison between the treatment and control groups. The women most exposed to the Fornero reform, involving female

²An actuarially fair benefit calculation method links all life-time paid contributions to future pension benefits. In Italy, the actuarially fair Notional Defined-Contribution (NDC) regime involves “fully” all people who started working after 1995 and “partially” all workers with less than 18 contribution years in 1995. Before that year, all Italian workers were subject to the Defined-Benefit (DB) scheme, under which pension benefits strongly depend on the last five years of labor earnings independently of the number of accrued contribution years.

workers with more discontinuous working histories, represent instead a selected sample.

The main findings reveal that the reform differently affected expected human wealth depending on the pre-reform generosity of the pension regime individuals belonged to. Male workers with an important *MRA* shock experienced a puzzling reduction in their expectations of future pension benefits, which is consistent with previous results from the literature studying the pension wealth effect of the Fornero Reform. For the first time, this study shows that the decrease in expected replacement rates was driven by individuals experiencing a negative pension wealth channel due to the lack of government incentives to work extra years rather than by a lack of awareness regarding the functioning of the Italian pension system ([33] Oggero, 2022). Instead, workers under actuarially fair pension regimes experiencing important *MRA* shocks increased expected replacement rates in line with their increase of individual pension benefits, which resulted from post-reform incentives to work longer provided through higher annuity rates, as well as from more years of contributions. Concerning the impact on saving behavior and portfolio allocations, for each additional working year after the reform the average saving rate increased by 1.5 percentage points, which represents approximately 6% of the average saving rate for the control group in the pre-reform period. Triple difference-in-difference estimates show how the observed rise in savings was driven by most exposed individuals experiencing a reduction in expected pension benefits, in accordance with the substitution effect proposed by Feldstein. Conversely, workers under actuarially fair pension regimes with important *MRA* increases reduced their optimal proportion of savings out of lifetime wealth and increased their allocation to risky assets, especially stocks. This shift in portfolio composition can be attributed to the post-reform increase in their ratio of human wealth relative to financial wealth due to positive labor and pension wealth channels: these individuals not only anticipated more periods of labor income, but also more substantial pension benefits. The above findings support the idea that saving and portfolio adjustments are predominantly driven by individuals who understand how pension reforms alter financial incentives ([7] Bottazzi et al, 2006). Robustness checks include the use of panel data to ensure the reliability of the results from repeated cross-sections, as well as the examination of household-level dynamics³ to validate the main causal relationships observed.

This thesis is structured as follows. Section 2 elucidates a conceptual framework that helps understanding the possible effects of pension reforms raising the *MRA* on human wealth and financial decisions. Section 3

³The baseline results explore the gender heterogeneity of the Fornero reform's effects by leveraging the individual shocks among household heads responsible for financial decisions. As financial data are available in the Survey of Household Income and Wealth (SHIW) at the household-level, robustness analyses are needed to validate the main findings for married couples where both partners are affected by an *MRA* shock. Although based on fewer observations, these analyses account for the spillover effects of potential shocks to the household heads' partners.

provides a concise overview of the Italian pension system and highlights the key features of the 2011 Fornero reform. Section 4 introduces SHIW data and outlines the process of constructing the Fornero shock and the treatment assignment strategy. Then, this section describes several summary statistics, the empirical strategy employed and concludes with an examination of the identifying assumption needed to assess the validity of causal interpretations for the results that follow. Section 5 presents the key findings for middle-aged male workers from repeated cross-sections. This part first examines the effect of a strong increase in MRA on expected replacement rates, thereby shedding light on an important mechanism driving the observed change in human wealth due to the Fornero Reform. Subsequently, the analysis explores the impact on financial decisions and the role of government rewards for working longer to elucidate the heterogeneous results observed across different pension schemes. Next, Section 6 details the conducted robustness checks. Conclusions follow in the last section.

2 Conceptual Framework

2.1 The Impact of Pension Reforms Raising the MRA on Savings

This research project contribute to the literature addressing the implications of pension reforms that raise the statutory Minimum Retirement Age (MRA) on savings and portfolio allocations. Firstly, the empirical evidence of strong employment responses ([3] Bianchi, Bovini, Li, Paradisi and Powell, 2023; [5] Boeri, Garibaldi and Moen, 2022; [9] Carta, D’Amuri and von Wachter, 2021; [28] Manoli and Weber, 2016; Duggan, Singleton and Song, 2007; Staubli and Zweimüller, 2013)⁴, including among middle-aged individuals ([10] Carta and De Philippis, 2023) suggests that the potential impact of these reforms on financial decisions could deviate from the typical outcome emphasized in the literature analysing pension reforms that cut replacement rates, i.e. the strong *substitutability* between public pension wealth and private savings. For instance, focusing on the Italian context, several empirical studies ([1] Attanasio et al, 2003; Bottazzi et

⁴Policy reforms designed to increase the statutory retirement age encounter several concerns. Firstly, there is contention regarding the potential impact of such reforms on the employment rates of older individuals, as these policies could lead to an increase in unemployment benefits ([37] Staubli et al, 2013) and/or disability benefits ([16] Duggan et al, 2007). However, several studies provide evidence that affected individuals retain their jobs for longer periods, such as [21] García-Miralles et al. (2021) and [28] Manoli et al. (2016). The latter study also reveals no increased substitution towards alternative benefit programs, such as unemployment insurance, sick leave, or entry into disability pensions in response to these reforms. Second, fairness objections are raised, arguing that retirement at the MRA is disproportionately binding for workers with physically demanding occupations or low-income positions. Finally, the forced retention of older workers may reduce youth employment opportunities. Recent research provides mixed evidence of the impact of the Italian Fornero reform on the career paths of middle-aged workers. [3] Bianchi et al. (2023) show how retirement delays among senior workers reduced the contractual wage growth and promotion rates of younger coworkers in lower-level positions, particularly impacting middle-aged workers over 55 due to the importance of seniority as a promotion criterion. The career spillovers observed are particularly concentrated in firms with limited promotion opportunities. Additionally, [5] Boeri et al. (2022) find a post-reform crowding-out effect on middle-aged workers, which can be attributed to their greater substitutability with older employees and the relatively higher cost associated with their wage-tenure profile. However, for larger firms, [9] Carta et al (2021) document a positive impact of retirement delays on both young and middle-aged employment, as well as on total value added, suggesting how older workers could possess skills and experience that are difficult to replace.

al, [4] 2008 and [8] 2011)⁵ show how the reduction in pension benefits following the reforms of the 1990s increased private savings. However, as highlighted by [19] Feldstein (1974), the overall impact of changes in public pension wealth on private savings depends on the magnitude of the employment effect resulting from the specific policy examined. Research on the potential interaction of labor and pension wealth effects due to reforms raising the *MRA* is currently missing.

This thesis is closely related to the work of [17] Etgeton, Fischer and Ye (2023), which investigates how increases in the early retirement age affect saving decisions. Their analysis acknowledges the dual nature of individuals' reactions to an increase in the retirement age. On one hand, if individuals plan not to extend their working horizon, they can increase their private savings to offset the loss in pension income resulting from a delayed retirement. On the other hand, workers can cope with the loss in public pension wealth by extending their labor supply, especially if facing a significant increase in their *MRA*. As a consequence, they could reasonably anticipate an increase in lifetime wealth driven by (i) additional labor income, (ii) enhanced pension benefits due to more contributions and a higher replacement rate, and (iii) a shorter period of non-employment to finance. Assuming that the increased lifetime wealth more than compensates for the lag in pension benefits, the consumption smoothing hypothesis predicts a decrease in per-period savings before retirement⁶. The study by [21] García-Miralles and Leganza (2021) further underscores how the extra income stemming from such policy reforms should be spread over the life-cycle in the form of increased consumption in every period. Specifically, they predict that consumption smoothing motives should decrease savings during the anticipation period, on which this study focuses. Then, savings should increase during the years of extended employment, when the temporary increase in income outweighs a rise in consumption distributed over time, and decrease again after retirement in case of constant pension benefits⁷. [10] Carta and De Philippis (2023) not only dispute the likelihood of a scenario in which Italian workers rely exclusively on their savings, but also provide empirical evidence of how the 2011 Italian pension reform boosted the labor supply of middle-aged women⁸ subject to a strong increase in their *MRA*. Consequently, it would

⁵[1] Attanasio et al. (2003) model the response of savings exploiting how the 1992 Amato Reform affected more younger public employees with respect to older workers in the private sector. Bottazzi et al. (2008) show how the decline in replacement rates due to the Italian pension reforms of the 90es led to an increase in the stock of private wealth [4] and (2011) in the share of safe and real assets [8] for households most affected by the reforms who fully adjusted their beliefs on the new rules.

⁶In response to an increase in the early retirement age, Etgeton et al. (2023) provide empirical evidence for a labor supply adjustment absorbing the loss in pension wealth and dissaving behavior among German women

⁷The researchers employ a regression discontinuity design together with administrative data to elucidate the causal effects of a reform that created a discontinuous six-month *MRA* increase for individuals born after a specific cut-off date. As this group was not subject to changes in retirement benefits, the authors do not address related concerns. Their RD estimates find no statistically significant response in any savings vehicle in anticipation of reaching pension eligibility ages. On the other hand, they find increases in employer-sponsored retirement plans, largely driven by continued contributions at employer default contribution rates during the policy-induced periods of extended employment.

⁸It should be noted that these women were characterized by the most discontinuous work histories prior to the reform. In contrast, there was no significant labor supply response observed among men who were already well-attached to the labor market. They also find a more pronounced labor supply response among women under a Defined-Benefit scheme, suggesting that individual responses to the 2012 reform could be influenced by changes in expected pension wealth.

be reasonable to anticipate a downward trend in savings rates after the 2011 reform, particularly for most exposed middle-aged women.

However, government incentives could also influence saving decisions. If post-reform rules provide greater annuity rates as rewards for each additional working year, individuals can reasonably anticipate greater human wealth due to both extra periods of labor earnings and improved pension benefits upon retirement and reduce savings. Instead, if individuals face a postponement of constant pension benefits after such reforms, they can internalize a reduction in their expected pension wealth and increase savings in accordance with the empirical predictions of the aforementioned literature investigating negative pension wealth channels after restrictive reforms. Moreover, this work assess how middle-aged workers adjust their consumption choices when facing an exogenous permanent change in expected lifetime wealth ([25] Jappelli et al, 2010). Finally, this area of research has relevant policy implications: if workers consume more after *MRA* increases, concerns may arise about a potential mismatch between expected and realized retirement ages. For instance, inadequate savings may result from people’s overconfidence in their ability to extend their working lives. This further highlights the importance of raising awareness of the potential consequences of these pension reforms on individuals’ long-term financial security.

When it comes to defining saving rates⁹, the analysis adheres to the standard definition of savings as a fraction of disposable income ($s_t^d = \frac{y_t - c_t}{y_t}$) for the purpose of comparison with the existing literature. As an alternative specification that focuses on the potential effects of reforms raising the *MRA* on labor outcomes, savings are also evaluated relative to current labor income, namely excluding property income and transfers. However, [34] Ordoñez and Piguillem (2022) propose an additional measure of savings, defined as *saving ratio*, that captures a core prediction of theoretical models: people’s propensity to save out of total wealth, i.e. current net worth and human wealth. Indeed, to smooth consumption over time and ensure an optimal growth rate for their lifetime wealth, people should integrate saving motives not only with their current income, but with the observed growth in their financial and human wealth. As detailed in Appendix A, the fundamental drivers of the saving ratio are represented by individual discount rates, precautionary and intertemporal smoothing motives. For instance, if individuals anticipate increases in future income sources or a shorter retirement period, their previous optimal level of savings may become unnecessary to smooth consumption over time. Hence, they may reduce their savings out of total wealth. Although not consistently assessed in the literature (primarily due to the absence of a uniform methodology for quantifying financial

⁹Some economists advocate for a more restrictive approach, suggesting that only a fraction of expenditure on consumer durables should be included, that incomes should be adjusted for inflation or that savings should be considered net of capital stock depreciation ([27] Rossi and Visco, 1994).

and human wealth), the saving ratio shares close ties with the conventional saving rate. The relationship between the two is explicated using a standard dynamic consumption model where people can save in a risk-free asset b and in a risky asset a subject to *i.i.d.* idiosyncratic shocks. In particular, the authors show how saving rates do not represent a reliable indicator for the evolution of savings ratios in case of important changes in the present value of future human capital. In fact, from the definition of the saving ratio as

$$s_t = \frac{s_t^d + \chi_t}{1 + \chi_t},$$

where s_t^d stands for the standard saving rate and χ_t represents net worth and human wealth normalized by current income, it becomes clear that the dynamic properties of s_t carry over to implications for s_t^d only when financial wealth $p_t a_t + b_t$ and human wealth¹⁰ h_t remain stable.

2.2 Portfolio Effects of Pension Reforms Increasing Human Wealth

In a CRRA model with no labor income, volatile stock returns and time-separable preferences, changes in social security wealth should not affect portfolio rules ([29] Merton, 1969; [31] Mossin, 1968; [35] Samuelson, 1975);¹¹. To address the empirical discrepancies of this framework and acknowledge that the evolution of total lifetime wealth is likely to affect optimal portfolio choice, it is necessary to relax the assumption of the absence of human capital, typically defined as the present value of future labor earnings discounted at the risk-free rate. Under the assumptions of deterministic labor income, CRRA preferences and complete markets, [30] Merton (1975) shows that the optimal portfolio allocation to risky assets is positively related to the ratio of human to financial wealth $H(a, \tau)/W_{i,a}$ ¹². Specifically, this model predicts a hump-shaped life-cycle portfolio risky share: young people should invest heavily in stocks and then rebalance with age as the ratio between human and financial wealth declines, with a concave profile until retirement. The rationale behind this pattern is that riskless and tradable human capital is assumed to act like a large endowment

¹⁰Appendix B provides a detailed description of the measure employed to assess expected human wealth.

¹¹The Merton-Mossin-Samuelson seminal dynamic framework predicts individual participation at all ages and an age-wealth-independent share in risky assets, contradicting both the *participation puzzle* observed in the data at all ages and the conventional financial advice that encourages young individuals to invest in stocks and to gradually reduce their exposure to risk as they approach retirement.

¹²The portfolio risky share for an investor i of age a is the proportion of lifetime wealth invested in risky financial assets

$$\frac{\alpha_{i,a} W_{i,a}}{H_{a,\tau} + W_{i,a}} = \frac{(\mu - r_f)}{\gamma_i \sigma_i^2},$$

where total wealth is the combination of human wealth and accumulated assets, $(\mu - r_f)$ denotes the risk premium, σ_i the volatility of risky returns and γ_i the individual constant relative risk aversion. The optimal risky share as a fraction of financial wealth can be calculated as

$$\alpha_{i,a} = \frac{(\mu - r_f)}{\gamma_i \sigma_i^2} \cdot \left(1 + \frac{H(a, \tau)}{W(a)} \right),$$

where the ratio $H(a, \tau)/W_{i,a}$, namely the age-dependent relative importance of human versus financial wealth, positively affects the optimal allocation to risky assets.

of risk-free bonds. Thus, his important presence at a young age creates strong incentives for stock market investing. This feature has been observed consistently in calibrated optimal portfolio choice models over the life-cycle, also aimed at rationalizing many anomalies¹³ predicted by the Merton’s CRRA model with deterministic human capital (1975): in particular, [14] Cocco et al.(2005) show how life-time portfolio risky share rules are hump-shaped even when not insurable income and pension risk are included.

One of the objectives of this study is to empirically investigate the degree to which SHIW data align with the prediction of the Merton’s model concerning the relationship between human wealth and the optimal portfolio risky share. This examination is relevant also in light of the potential wealth redistribution resulting from reforms raising the *MRA*, which can influence the amount of consumable wealth available to individuals during retirement, as different wealth components are not perfect substitutes¹⁴ for one another. Relaxing the assumption of complete markets¹⁵, theory suggests that portfolio allocations respond to the wealth effects of pension reforms depending on the composition of private wealth. For example, if a pension reform leads to an increase in housing wealth, the adjustment in the allocation of risky assets will depend on whether the crowding-out effect or the hedge effect dominates ([2] Bottazzi, Jappelli and Padula, 2011): while housing wealth serves as a hedge against rent uncertainty ([36] Sinai and Souleles, 2005), the risk associated with housing price fluctuations may deter individuals from investing in stocks, especially those with low financial net worth ([13] Cocco, 2005). Moreover, since pension risk is inherently unavoidable, reforms targeted at addressing pension systems’ imbalance and mitigating the risk associated with social security wealth may lead to a decrease in background risk, which may correlate with an increase in portfolios’ allocation to risky assets ([22] Guiso, Jappelli and Terlizzese, 1996). Finally, the standard life-cycle model for portfolio choices assumes perfect information, which may not accurately reflect real-world scenarios. Information frictions related to the pension system can rationalize poor saving responses to reforms affecting lifetime wealth, as well as different individual levels of pessimism regarding retirement prospects can lead to reactions not aligned with a positive human wealth channel. Indeed, my study is also closely related to the literature ([7] Bottazzi et al, 2006)¹⁶ exploring the heterogeneous accuracy of subjective expectations regarding retirement

¹³Merton’s influential model faces limitations in its prediction of financial market participation at all ages and risky portfolio shares for young investors too high to be consistent with the data. Researchers have suggested the inclusion of multiple factors that may deter youth financial risk: borrowing costs, endogenous habit formation preferences, a positive correlation between labor income and stock returns, a counter-cyclical volatility for idiosyncratic income risks or a variation in perceived background risk able to generate time-varying risk aversion ([23] Guiso and Sodini, 2013). Moreover, the Merton’s model fails to account for the possibility of exiting the stock market. To address this limitation, economists have proposed to introduce small per-period participation costs, relatively high risk aversion, a small age-invariant probability of disasters and mistrust ([18] Fagereng, Gottlieb and Guiso, 2017).

¹⁴Financial assets are readily available for consumption, while real assets can be converted into cash at a cost.

¹⁵In a hypothetical complete market economy, all assets would yield equivalent risk-adjusted returns, making the composition of investors’ portfolios irrelevant. However, real-world factors such as borrowing constraints, bequest motives, short-sightedness, liquidity constraints, uninsurable risks, illiquid future benefits and transaction costs come into play and make this assumption a rather unrealistic benchmark.

¹⁶[7] Bottazzi et al.(2006) highlight the role played by financial education and beliefs in shaping individual portfolio allocations

age and social security benefits across the population. In summary, while theory predicts portfolio allocations responsive to pension reforms affecting human wealth, the direction of the effect remains ambiguous, further justifying the relevance of empirical investigations in this research area.

3 Institutional Background

3.1 The Italian Pension System

Prior to the reforms of the 1990s, the Italian social security system featured generous earnings-based benefits, high replacement rates and favorable schemes for early retirement. In 1992 the public pension spending reached nearly 16 percent of the Italian GDP, the highest among OECD countries. Since the Amato (1992) and Dini (1995) reforms aimed at improving the financial sustainability of the pay-as-you-go first pillar system, Italian workers have been divided into three different pension schemes. Those who contributed for more than 18 years at the end of 1995 retained the generous provisions of the pre-1992 regime: they were subject to an earning-based method, the so-called Defined-Benefit scheme, where pension benefits were determined based on the average salaries of the final stages of people’s careers, regardless of accrued contributions. People who started working after 1995 were covered by a Notional Defined-Contribution system, where pension benefits were calculated as the sum of all contributions revalued at the GDP growth rate and annualized according to the projected life expectancy upon retirement. This calculation method implies that deferring retirement improves the adequacy of pension benefits by increasing the underlying annuity rate. Finally, workers who contributed for less than 18 years at the end of 1995 were subject to the mixed Pro-Rata system, which involved a weighted average of DB and NDC benefits.

The right to claim full retirement is based on age (age-based pensions), contributions or a combination of the two (seniority-based pensions). Pension wealth is maximized when claiming state benefits as soon as eligibility is reached. Indeed, substantial evidence indicates that approximately 70 percent of Italians opt to retire as soon as eligible for their full¹⁷ retirement benefits ([2] Battistin et al, 2009; [9] Carta et al, 2021; [11] Ciani, 2016). It is also worth noting that Italy has historically imposed a significant tax burden on labor income once individuals reach eligibility to retire ([15] Di Nicola et al, 2017). Governments have also tried to promote the development of the second pillar, which refers to supplementary pension schemes. Since 2007, the severance pay flows of private employees has been automatically redirected to these schemes

following the Italian pension reforms of the 1990s. Their study reveals that people better informed about the reform show saving behaviors more in line with theoretical predictions.

¹⁷*Opzione donna* is the only scheme that allows one to claim pension benefits before meeting the eligibility criteria and is available only to women, but is not very popular as it implies an average pension cut of almost 35 percent ([24] INPS, 2016).

unless individuals explicitly choose not to participate. Still, enrollment rates in private pension schemes remain relatively low, reaching in 2012 only 25.5 percent of the total working population ([6] Borella and Coda Moscarola, 2015).

3.2 The Fornero Reform

Since 2000, Italy has spent the largest share of national income on pensions among OECD countries: 14.1 percent of GDP ([32] OECD, 2011). The Fornero reform was presented at the end of 2011, only 20 days after the appointment of a new technocratic government. The financial markets exhibited significant reactions upon the announcement of the reform, highlighting its unforeseen nature. Effective from January 1, 2012, the primary objective of the reform was to avoid a financial default in the context of the European sovereign debt crisis: in order to reach financial stability, the government decided to cut pension expenditure by around 20 percentage points of GDP over the period 2012-2050. New rules (i) increased pension eligibility requirements for the old age and seniority pension schemes and homogenized requisites across genders and working schemes, (ii) increased average replacement rates for actuarially fair pension regimes, especially for the youngest purely NDC cohorts, (iii) abolished the quota system, an early¹⁸ retirement option that allowed to retire up to five years before reaching the old age requirement through a combination of age and contributions, (iv) extended the pro-rata mechanism to DB workers for contributions paid starting from 2012 onward.

The *MRA* increase varied significantly based on gender, cohort and previously accrued years of contributions, while new rules for self-employed workers¹⁹ followed the same pattern. Younger generations faced a larger increase in their average retirement age, with the exception of the 1955 cohort²⁰ for women, for whom not only the quota option was suppressed but also the old-age requirement was increased in order to gradually match male requirements by 2018. All else being equal, the Fornero shock disproportionately affected female workers who had accumulated fewer years of contributions: under old rules these women could have retired at 60 under the old age scheme and after the reform they had to wait till 67. Less exposed women were those who accrued more contributions: before the reform they could have retired with 40 contributions years and had to reach 42 afterwards. With regards to men, those with an intermediate number of contribution years who would have retired under the quota system experienced the largest shock. Conversely, men with the most and least continuous working lives were less impacted by the reform: the

¹⁸The reform left unaltered the early retirement scheme for women. Despite its take-up slightly increased after the reform, it remained less than 20 percent in 2015.

¹⁹Still, for this group of workers the increase in replacement rates was particularly relevant, as in Italy they face a higher risk of not accruing adequate pension benefits: under the NDC system, they contribute with a lower payroll tax rate (20 percent) compared to employees (33 percent).

²⁰This cohort of women faced the greatest increase in *MRA* and benefited from an increase of 13.2 percentage points in their replacement rates ([6] Borella and Coda Moscarola, 2015).

former could have retired with 40 years of contributions under pre-reform rules and had to reach 43 after 2011, while the latter could have retired under the old age scheme at 65 and then had to wait till 67, as women. Lastly, it is important to highlight that people under the Defined-Benefit method, by moving to the Notional Defined-Contribution scheme for all working years starting from 2011, resulted in a mixed regime after the reform. As the share of each system within their pension calculation hinged on the period of time spent under each scheme and as Defined-Benefit (DB) workers tend to be older and closer to their *MRA*, their more generous pension benefits remained nearly unchanged. On the other hand, workers subject to more actuarially fair pension regimes, i.e. the Notional Defined-Contribution (NDC) and Pro-Rata schemes, witnessed an increase in retirement benefits proportional to their *MRA* shock.

4 Empirical Analysis

4.1 Data and Sample

The analysis leverages data from the Survey of Household Income and Wealth (SHIW), a representative biennial survey of the Italian population carried out by the Bank of Italy. The most recent surveys involve a sample of around 8,000 households and present a rotating panel component which includes almost half of the original sample. The panel size is halved for each new wave included. Hence, although panel data offer several advantages for the implementation of a Differences-In-Differences (DID) methodology, the constraints posed by the reduced sample size²¹ and the potential for standard sample selection issues justify their use as a valuable complementary source to conduct robustness checks. This dimensionality issue also explains why panel analyses exploit only the survey waves from 2008 to 2014, while repeated cross-sections span from 2006 to 2016. Instead, to improve the sample's representativeness, survey weights are employed for descriptive statistics. Despite the acknowledged limitations²² explored in existing literature, SHIW data offer several notable advantages for the selected empirical strategy. First, they provide information on the determinants of the Italian *MRA* and on individual expectations regarding retirement age and replacement rate²³, so to capture how workers internalized the reform. Indeed, these data allow to compute both the statutory and the expected retirement delays, alongside changes in the expected pension wealth. Second, SHIW data offer

²¹In particular, the constrained size of the panel sample hinders the ability to conduct analyses by civil status. The scarcity of observations for NDC and Pro-rata workers within the control group precludes also the feasibility of conducting separate regressions for different pension schemes. Additionally, the limited number of respondents who reported their expected replacement rate (253 individuals) prevents the identification of the factors that influenced their financial decisions.

²²It should be noted that the Survey of Household Income and Wealth is prone to non-response or low participation of wealthy families, measurement errors and misreporting, particularly with respect to financial assets. The survey also suffers from inconsistencies related to the starting year of working life due to recall problems and question ambiguity. Furthermore, only a minority of respondents declare to hold risky assets, which happens to be an important variable of interest in this study.

²³The questions on the survey are the following: When do you expect to retire? Think about when you will retire, and consider only the public pension (that is, exclude private pensions, if you have one). At the time of retirement, what fraction of labor income will your public pension be?

a full picture of the comprehensive constituting household wealth, as well as detailed insights into sources of income and expenditure: this global perspective enables to study changes in savings and portfolio allocations due to new pension rules. Third, these data are available for a long time span, allowing to assess the dynamic effects of the reform and support the identifying assumption of parallel trends for the DID analysis.

The empirical strategy aims to evaluate the impact of raising the *MRA* on financial decisions for individuals not eligible to retire before the reform. Aligned with the framework outlined by [10] Carta and De Philippis (2023), the analyses involve men aged less than 64 and women aged less than 59, both having less than 40 years of contributions in 2010. This filtering criterion excludes individuals already eligible to retire under the old-age or the seniority schemes before 2011. All retired people are dropped from the sample. Moreover, workers with $MRA_{pre} < age$ are assigned a Fornero shock equal to 0, as the MRA shock was not binding for individuals who opted to remain in the workforce despite being eligible to retire under pre-reform rules. Finally, in order to neglect people too far from retirement, the analyses omit people under 45. Results are robust to small changes in the sample, such as excluding individuals with less than 10 years of accrued paid contributions.

4.2 The Treatment Variable: Constructing the Fornero Shock

To ascertain the extent to which each individual is affected by the policy, q cells are built based on the interaction of the key factors determining the Italian *MRA* (age, gender, years of contributions and employment status). Then, following [10] Carta and De Philippis (2023), a cell-specific and time-invariant metric of exposure to the reform is constructed: Tq is the number of additional years each cell q has to work before becoming eligible to retire after the 2011 reform and is defined as the discrepancy between the statutory *MRA* under post-reform and pre-reform rules ($MRAq, post - MRAq, pre$). Once interacted with a post-2011 dummy, the continuous treatment Tq allows to estimate the average treatment effect of a linear *MRA* increase after the Fornero reform on several variables. Figure 1 illustrates the distribution of the statutory *MRA* increases for male and female household heads in charge of financial decisions resulting from repeated cross-sections. The reform, aimed at equalizing pension rules across genders by 2018, led to an average *MRA* increase of 3.8 years for men and 5.3 years for women in SHIW data. Given the importance of a relevant *MRA* shock to be credibly internalized by middle-aged individuals not close to retirement, the treated group is defined as men (women) who experienced an *MRA* increase greater than the average, specifically 4 (6) years. This treatment definition allows to compare groups with a similar dimensionality and aligns with the research approach undertaken by [10] Carta and De Philippis (2023). It's worth mentioning that a specific

subset of workers fell under the typical *grandfathering clause*, which preserves pre-reform rules for workers eligible to the social security system in the year a pension reform is implemented. Hence, in the following analysis, workers who qualify for retirement in 2011 are assigned to a $Tq = 0$ and included in the control group.

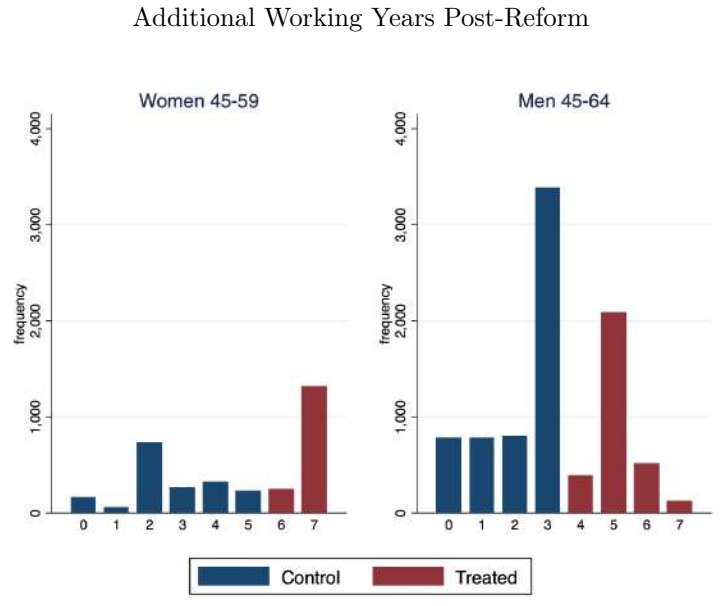


Figure 1: Source: SHIW 2006-2016

NOTE - Distribution of the post-reform *MRA* increases by gender. The sample includes household heads who had not retired and were not eligible to retire by 2010 following [10] Carta and De Philippis (2023). Women are aged between 45-59 and men between 45-64 in 2010. Both have less than 40 and more than 10 years of accrued paid contributions. Women (men) are defined as treated if they experience an increase in their *MRA* of at least 6 (4) years after the reform.

To identify Tq as the actual post-reform *MRA* increase, this study assumes that workers accumulate contributions continuously from the survey year: although this assumption may be less realistic for individuals with more fragmented work histories, such as women, it tends to underestimate their true *MRA* extent. Moreover, to claim that the Fornero shock truly affected middle-aged individuals' working horizon, the analysis assumes that workers retire as soon as they reach their *MRA*, understand the reform and modify their expected retirement age in accordance with the new rules. The initial assumption is well supported by prior empirical research for the Italian context, as discussed in Section 3.1. Additionally, Figure 13 from Appendix C validates the last assumptions by showing a larger average increase in the reported expected retirement age for treated men and women.

4.3 Descriptive Statistics: Repeated Cross-Sections

The sample from repeated cross-sections comprises nearly 44,000 household heads surveyed between 2006 and 2016. Among them, 30,612 individuals are directly affected by the Fornero reform, with 20,767 men and 9,845 women in charge of household financial decisions. Among individuals who were not eligible to retire before the reform, a subset of 4,575 men and 2,291 women experienced a *MRA* increase: the majority of these male workers belonged to the generous DB system, while a significant proportion of female workers was subject to the Pro-Rata scheme. 727 men and 151 women were grandfathered, almost all DB workers. In order to examine the heterogeneous impact of the Fornero reform by gender, individual shocks can be constructed in SHIW data mainly for household heads. However, Section 6 presents the analysis²⁴ of changes in household financial outcomes stemming from household-level shocks, which takes into account spillover effects from the potential *MRA* shock of the householder’s partner. These checks validate the baseline results drawn from individual-level shocks, suggesting that the *MRA* increase experienced by the household head, typically the primary earner, has a greater impact on the allocation of household wealth.

Before delving into different empirical specifications, it is useful to first grasp the rationale behind the Fornero shock’s heterogeneity across genders: Tables 1 and 2 from Appendix D report pre-reform descriptive statistics for women and men more and less exposed to the 2011 changes in pension rules. The *MRA* increase was more important for women with fewer contribution years who planned to retire under the old age scheme, which required women with at least 20 years of contributions to be 60 before the reform and 67 afterwards as detailed in Section 3.2. Consistently, Table 1 shows that women most exposed to the reform had an average of 7 years less in contributions compared to the control group. Hence, the female treated group²⁵ comprises a selected sample of women with more discontinuous working histories. This is in line with a higher proportion of unemployed women observed in SHIW data within the treated group. Table 2 reveals a dissimilar situation for men, as more²⁶ and less exposed male workers appear to be similar across most of the evaluated dimensions, supporting the focus on this category in the baseline results presented in this study. In fact, due to the similarities between the pre and post-reform rules governing the old age and seniority schemes for men, the control group involves both workers with more and less discontinuous work histories. In contrast, the treated group comprises men with intermediate levels of work discontinuity, who

²⁴Moreover, the main findings remain robust when focusing on single-shock households, which comprise household heads who are single, separated, divorced, or married to a retired partner.

²⁵The higher expected replacement rate observed within the control group before the reform can be explained by the larger presence of Defined-benefit workers, who benefited from a more generous pension scheme. As the Defined-Benefit system covered workers with more than 18 years of contributions in 1996, the female control group includes on average older women, with lower levels of education and a higher proportion of women married to a retired partner.

²⁶On average, men within the treated group exhibit a higher likelihood of attaining a university degree and residing in the South. Additionally, the male treated group features a greater proportion of workers under a Defined Benefit (DB) scheme, which contributes to their higher average pre-reform replacement rate when compared to the control group.

intended to retire under the quota system abolished by the reform. Finally, Tables 1 and 2 underline the absence of substantial pre-reform differences between treated and control groups with regard to most of the financial variables examined in Section 5, particularly²⁷ for male workers. Overall, contribution years played a greater role in determining the cross-sectional variation of the shock for women than for men. In order to validate the financial impact of the Fornero shock by gender, some specifications exploit different accrued contribution years within cohorts for women and different cohorts with comparable years of contributions for men as a source of variation for the exogenous *MRA* increase. Indeed, age does not represent a confounding factor for women, while contributions for men. To further mitigate related concerns, Appendix E examines the extent to which these independent variables influence the *MRA* increase by comparing the degree of skewness towards 0 in the distributions of residuals resulting from continuous treatment regressions on age and accrued years of contributions. The figures reported confirm that age predominantly explains the male *MRA* shock (*ceteris paribus*, treated men are typically older) and that contribution years play a stronger explanatory role for women.

After the Fornero reform, no pension regime experienced a reduction in statutory replacement rates. Nonetheless, SHIW data reveal an average reduction after 2011 in expected replacement rates among workers not eligible to retire by 2010. Figure 13 from Appendix C shows how different pension schemes may be an important drivers of such pattern, which suggests a potential role for government incentives in shaping changes in expected pension wealth after reforms raising the *MRA*. For both genders, individuals enrolled in the more actuarially fair NDC and Pro-Rata schemes exhibited a gradual increase in average expected replacement rates during the period following the reform, in line with the 2011 increase in their statutory replacement rates. Conversely, female workers under the generous Defined-Benefit scheme witnessed a strong decrease in expected replacement rates after 2011, while DB male workers experienced a strong reduction only in 2012, with a partial recovery in the following years. This negative pension wealth effect among DB individuals may be rationalized by the postponement of constant pension benefits outlined in Section 2, which contrasts the more generous annuity rates offered to actuarially fair workers after the Fornero reform. The average decline in expected replacement rates observed especially among DB workers could also suggest a narrative of expectation shock: the reform might have been internalized as a bad signal regarding the stability of the Italian pension system. This perception may have raised concerns about the potential for future administrations to implement additional measures aimed at ensuring the long-term financial sustainability of the system, such as reforms reducing replacement rates similar to the ones witnessed in the 1990s. Then,

²⁷Women more exposed to the 2011 reform invest a higher share of their wealth in deposits and a lower one in real assets and stocks.

the larger reduction in expected pensions for workers who were benefiting more from pre-reform rules could be attributed not only to the first-order effect of unchanged pension benefits deferred over time, but also to their apprehension about being the most vulnerable group to potential future cuts.

4.4 Specifications

This research project aims at studying how an exogenous extension in the working horizon affects the savings and wealth composition of the next generations of retirees. A Difference-In-Differences model is employed to examine the relationship between retirement delays and financial decision-making. This leverages the variation in the *MRA* within cells of similar middle-aged workers, as described in Section 4.2. The specification exploiting repeated cross-sections for an individual i in year t and within cell q is

$$Y_{iqt} = \sum_{t=2006}^{2016} \beta_t (Treat_q \cdot time_t) + \sum_{t=2006}^{2016} \gamma_t (X_{i2006} \cdot \alpha_t) + \alpha_t + \alpha_q + \epsilon_{iqt}, \quad (1)$$

where β_t is the coefficient of interest that estimates the average difference in the dependent variable Y_{iqt} between cells that experienced larger and smaller *MRA* increases. In the baseline specification, the treatment variable $Treat_q$ is represented by a dummy taking value 1 for $T_q \geq 4$ and $T_q \geq 6$ respectively for men and women, as detailed in Section 4.2. Moreover, to account for the varying intensities of the *MRA* shocks, this study further employs $T_q = MRA_{q,post} - MRA_{q,pre}$ as a continuous treatment variable for robustness checks. Indeed, this approach assumes a linear effect of each additional year of *MRA* on the outcome variables, which may not necessarily hold. Moreover, it is more reasonable to expect significant responses from far-from-retirement workers when faced with important shocks. The treatment variable is interacted with a time variable that can take the form of a post-reform dummy ($Post2011_t$) or a full set of year fixed effects (α_t). The former strategy estimates the average treatment effect for the post-reform period, while the latter assesses how the treatment effect evolves over time. To control for nonlinear trends that may interact with the characteristics presented in Section 4.3 that were not balanced before the reform between treated and control groups, individual-level controls²⁸ measured in 2006 and interacted with year dummies (α_t) are further introduced in the analysis. Additionally, year fixed effects (α_t) are used to absorb time-variant factors that affect uniformly the sample, while cell fixed effects (α_q) are employed to account for all the pre-reform differences associated with gender, years of experience, age and sector of employment. Standard errors are clustered at the cell level. Finally, the specifications include age in X_{i2006} to leverage contribution years as a source of variation in the female shock, while accrued contribution years are controlled to exploit the *MRA* shock heterogeneity across male cohorts. When analyzing the panel, the same

²⁸The vector of controls X_{i2006} includes civil status, region of residence, employment status, education level, number of family members, wealth quartiles, share of illiquid wealth and expected replacement rates.

specifications are employed with a time interval spanning from 2008 to 2014.

To examine the heterogeneity of the effects of the 2011 pension reform across different pension regimes, a triple-difference specification is estimated as

$$\begin{aligned}
Y_{iqt} = & \delta_1 Treat_q \cdot DB_i + \sum_{t=2006}^{2016} \delta_t^{MRA} (Treat_q \cdot time_t) + \sum_{t=2006}^{2016} \delta_t^{DB} (DB_i \cdot time_t) \\
& + \sum_{t=2006}^{2016} \beta_t (Treat_q \cdot DB_i \cdot time_t) + \sum_{t=2006}^{2016} \gamma_t (X_{i2006} \cdot \alpha_t) + \kappa_i DB_i + \alpha_t + \alpha_q + \epsilon_{iqt}, \quad (2)
\end{aligned}$$

where the dummy variable DB_i is set to 1 for Defined-Benefit workers and to 0 for people under the Pro-Rata and Notional Defined-Contribution schemes. β_t denotes the coefficient of interest, which reflects whether an important *MRA* increase has a differential effect on the dependent variable Y_{iqt} for workers under the Defined-Benefit scheme, who experienced a reduction in expected pension wealth, with respect to those individuals that received incentives to work additional years.

4.5 Identifying Assumption

To interpret the DID estimates as indicative of the causal impact of a reform raising the *MRA*, the untestable parallel trend assumption needs to hold: in the absence of the treatment, the evolution of the dependent variable Y_{iqt} would have been the same for treated and control workers. Although the counterfactual cannot be observed, this assumption can gain credibility if there are no statistically significant pre-trends among individuals subject to different retirement delays. In order to show parallel pre-trends, equation (1) is estimated with $time_t$ representing a complete set of year dummies (α_t): to validate the observed DID effects as the average treatment effects of the Fornero reform for most exposed workers (ATT), the interaction coefficients β_t should not be statistically different from zero in the pre-reform years. In other words, the treatment variable should not predict any changes in the variables of interest before 2011.

5 Results

The main objective of this research project is to examine the influence of pension reforms raising the *MRA* on expected human wealth (Section 5.1), the savings rates typically examined in the existing literature and the saving ratios predicted by theoretical models (Section 5.2), as well as on real and financial wealth (Section 5.3). These results allow to test several empirical predictions, including: whether workers experiencing a significant increase in expected human wealth adjust their consumption patterns and reduce their savings

out of an unchanged current income or out of their lifetime wealth; whether workers respond to a negative pension wealth channel by increasing their savings as a form of compensation; whether the proportion of stocks out of net worth is increasing in the ratio of human wealth to financial wealth. The baseline results presented focus on middle-aged male household heads in charge of financial decisions for all the reasons detailed in Section 4.3.

5.1 Expected Human Wealth

The analysis starts by estimating equation (1) to study the effect of increasing the *MRA* on expected replacement rates among middle-aged male workers not qualified to retire prior to 2011 and most affected by the new pension rules. On average, men with a *MRA* increase of at least 4 years anticipated less generous pension benefits after the Fornero reform. This average reduction in expected replacement rates after 2011 is already documented in the literature: [33] Oggero (2022) suggests that individuals may not understand the functioning of a Defined Contribution pension system, particularly the principle that delaying retirement leads to higher pension benefits. However, Figure 2 illustrates the role played by different pension regimes in shaping changes in the expected generosity of the Italian social security system. The triple difference-in-difference estimates obtained from Equation (2) show how an important *MRA* increase reduced expected pension wealth for men covered by the generous Defined-Benefit scheme, in line with less years of constant pension benefits. Conversely, the reform did increase expected pension benefits for men under actuarially fair pension regimes, subject to enhanced statutory replacement rates: these individuals witnessed a 5-unit increase in expected replacement rates, which corresponds to an approximate 100 euro increase in expected monthly pension benefits based on the average labor earnings reported in SHIW data. This finding suggests that Italian workers have a solid understanding of the mechanics behind their pension formula and have internalized not only their deferred retirement, but also the distinct rewards offered by the state for each additional year of work.

Table 7 from Appendix G presents the effect of the 2011 reform on the present discounted value of future labor earnings and pension benefits derived from the continuous treatment specification. Results for men indicate that each additional year of working life is associated with an increase in expected human wealth equal to 22,664, which is equivalent to a growth of 4 percentage points with respect to the average value for the control group in the pre-reform period. To discern whether the influence of the *MRA* increase on expected human wealth was linear or mainly concentrated among workers experiencing the most important shocks, the study refers to Table 3 from Appendix F. Together with the dynamic difference-in-difference estimates

presented in Figure 2, this Table illustrates how men more exposed to the reform witnessed a 17% increase in expected human wealth compared to their baseline level. Considering both the triple differences (Figure 2) and the double differences obtained by splitting the sample by pension regime (Table 3), this average increase was driven by individuals covered by the Notional Defined-Contribution and Pro-Rata schemes in accordance with their positive labor and pension wealth channels. Conversely, individuals enrolled in the generous Defined-Benefit scheme did not experience a significant²⁹ change in their expected human wealth, suggesting that the negative pension wealth channel due to the absence of incentives to work longer may offset the potential positive income channel resulting from more years of labor earnings. The following sections elaborate on the role played by the expected human wealth channel in influencing financial decision-making processes.

²⁹When estimating standard difference-in-difference coefficients separately for the subsamples of actuarially fair workers and Defined-Benefit workers, results indicate a significant decrease in expected human wealth for DB workers.

Expected Replacement Rate and Expected Human Wealth - Men
 Effects of Increased *MRA* among Middle-aged Workers

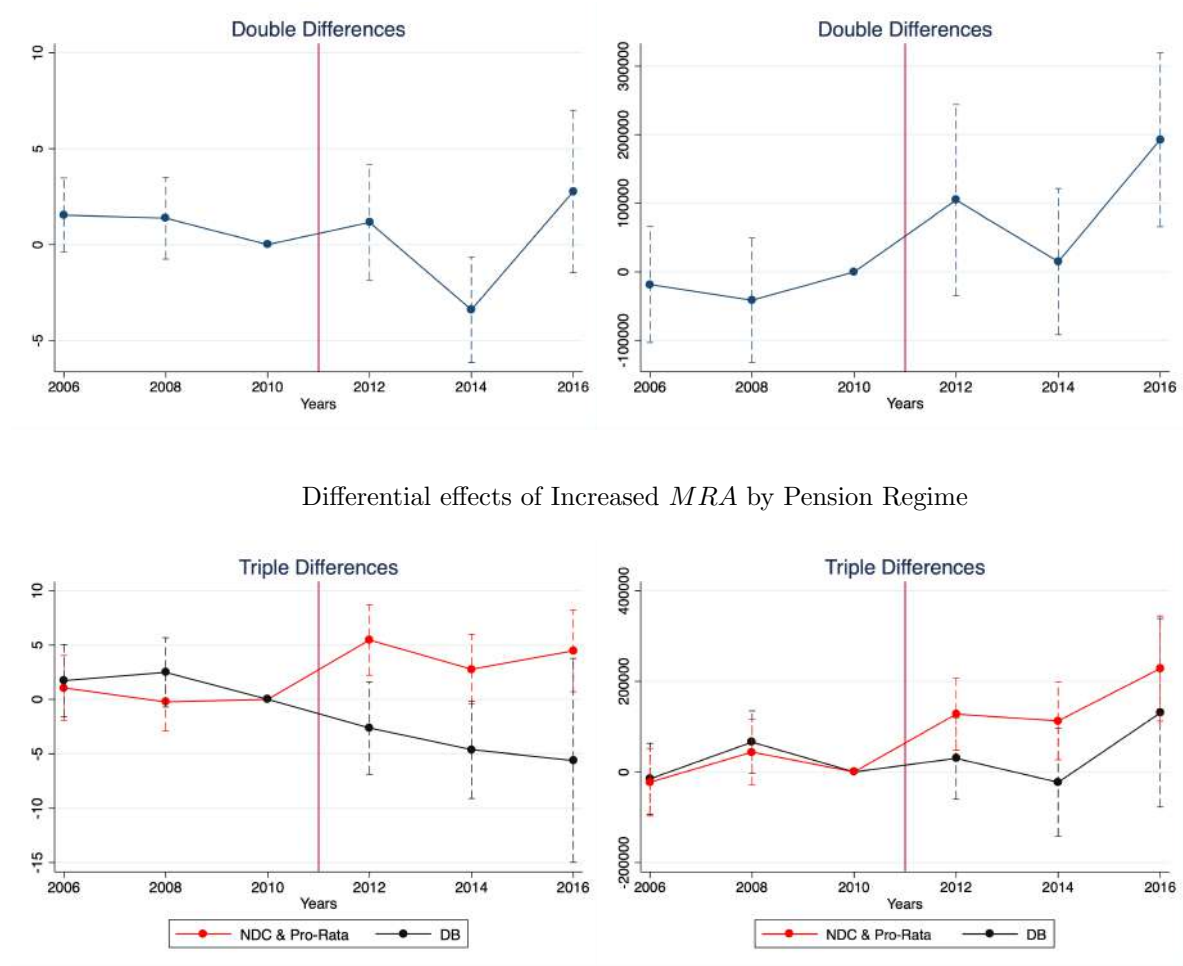


Figure 2: Source: SHIW 2006-2016

NOTE - The upper panels report the estimated double DID coefficients of the average impact of the extended working horizon ($Treat_q \cdot \alpha_t$) for most exposed middle aged male workers who had not retired and were not eligible to retire by 2010 following [10] Carta and De Philippis (2023). The lower panels report the estimated triple DID coefficients of the effects of a *MRA* increase for most exposed individuals under the Notional Defined Contribution and Pro-Rata regimes ($Treat_q \cdot \alpha_t$), as well as the differential effect for most exposed workers under the more generous Defined Benefit regime ($Treat_q \cdot DB_i \cdot \alpha_t$). The left panels present the effects of the Fornero reform on the expected generosity of future pension benefits. Replacement rates are defined as the ratio of the first expected pension benefit to the last expected salary. The right panels illustrate the impact on expected labor earnings and pension benefits: expected human wealth is defined in section B. Male household heads aged between 45-64, with less than 40 and more than 10 years of accrued paid contributions, are defined as treated if they experienced an increase in their *MRA* of at least 4 years after the reform. The specification controls for year and cell fixed effects. The additional control variables are assessed at the 2006 level and interacted with time dummies. Standard errors are clustered at the cell level.

5.2 Saving Rates and Saving Ratios

This section elucidates the impact of the Fornero reform on savings³⁰ for middle-aged male workers in charge of financial decisions. Table 7 illustrates how each additional year of deferred retirement eligibility increased the average saving rate by 1.5 percentage points, accounting for 6.5% of the average pre-reform level saving rate for the control group. Focusing on savings related to current labor earnings only, column 2 shows how the average increase in savings out of labor income was all driven by DB workers who experienced an increase of 3.52 percentage points translating into 10% of their baseline level. This result is consistent with their negative pension wealth channel and validates the empirical predictions advanced so far. Table 3 offers insights into saving responses when relaxing the assumption of a linear impact of a *MRA* increase on financial decisions and shows how the above results are concentrated among most exposed male workers: men encountering a shock greater than 4 years raised their savings out of current disposable and labor income by 5.7 and 8.9 percentage points respectively. A disaggregation of the latter ratio in columns 3 and 4 reveals that the reform significantly influenced the level of savings, while leaving current labor income unaffected. Figure 3 illustrates the impact of the reform on saving rates and saving ratios for most exposed men, as well as the differential impact by pension regime: the significant increase in saving rates post-reform was driven by workers experiencing a negative pension wealth channel. On the other hand, while men under actuarially fair pension schemes did not exhibit a significant decrease in saving rates after the reform (contrary to women), they did witness a 5 percentage points decline in their savings out of total wealth. This reduction corresponds to approximately 6% of their baseline level and drives the average fall in saving ratios following 2011 among most exposed men. In other words, when faced with an increase in lifetime wealth, workers may perceive it as unnecessary to save as predicted by their pre-reform optimal saving rule, in accordance with the intertemporal smoothing motives outlined in Section 2.1. The reduction in the proportion of savings out of lifetime income compensates their increased lifetime wealth, resulting in no significant impact on the overall level of savings after the reform. Although this last result may seem contradictory to the finding of constant saving rates, it should be noted that (i) the Survey of Household Income and Wealth suffers from a severe underestimation of consumption data potentially leading to an overestimation of savings rates ([12] Cifaldi and Neri, 2013)³¹, (ii) after unexpected shocks to lifetime wealth, standard dynamic models predict savings to change as a proportion of lifetime wealth, (iii) saving rates may not be a reliable indicator for the evolution of savings ratios when there are important changes in the present value of future human capital

³⁰Figure 13 presents the trends in savings with respect to current disposable income and lifetime wealth over the sample period: while the former recorded a noticeable average decline in 2012, saving ratios result more stable.

³¹The authors find how SHIW data present an underestimation of consumption far more severe than the one for income. Indeed, the former measure involves broad categories of expenditure which makes precise quantification more complex. This distortion in saving rates should be particularly noticeable for households belonging to low-income classes, as income measurement errors are proportionally larger for high incomes, while consumption data are typically a less sensitive topic.

([34] Ordoñez and Piguillem, 2022).

Saving Rates and Saving Ratios - Men

Effects of Increased *MRA* among Middle-aged Workers

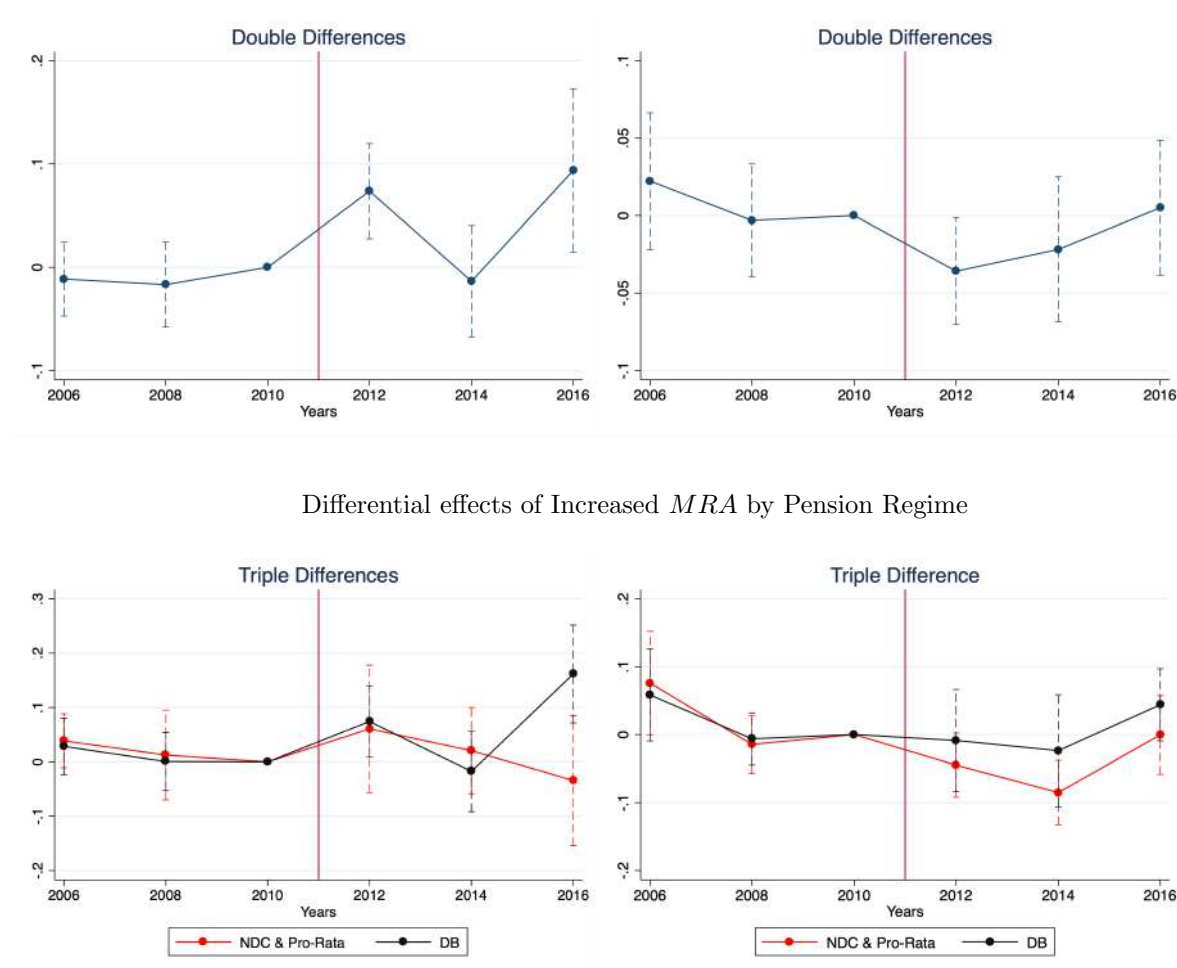


Figure 3: Source: SHIW 2006-2016

NOTE - The upper panels report the estimated double DID coefficients of the average impact of the extended working horizon ($Treat_q \cdot \alpha_t$) for most exposed middle aged male workers who had not retired and were not eligible to retire by 2010 following [10] Carta and De Philippis (2023). The lower panels report the estimated triple DID coefficients of the effects of a *MRA* increase for most exposed individuals under the Notional Defined Contribution and Pro-Rata regimes ($Treat_q \cdot \alpha_t$), as well as the differential effect for most exposed workers under the more generous Defined Benefit regime ($Treat_q \cdot DB_i \cdot \alpha_t$). The left panels report the effects on the standard saving rate, namely savings out current disposable income, while the right panels present the impact on the optimal saving rule predicted by standard dynamics models, i.e. the saving ratio proposed by [34] Ordoñez and Piguillem (2022). Male household heads aged between 45-64, with less than 40 and more than 10 years of accrued paid contributions are defined as treated if they experienced an increase in their *MRA* of at least 4 years after the reform. The specification controls for year and cell fixed effects. The additional control variables are assessed at the 2006 level and interacted with time dummies. Standard errors are clustered at the cell level.

5.3 Portfolio Effects

This section aims to test the predictions of the Merton's (1975) model discussed in Section 2.2, which suggests that individuals experiencing an increase in their ratio of human wealth to financial wealth should invest more in stocks in accordance with diversification motives. Prior to the reform, both treated and control groups exhibited an average ratio of human wealth to financial wealth approximately equal to 31. After 2011, this average ratio increased to 37 for men experiencing a *MRA* increase of at least 4 years. In line with theory, Table 4 reports an average increase of 1.53 percentage points in the share of stocks out of net wealth for most exposed men, which represents 50% with respect to their baseline level. Figure 4 shows triple difference-in-difference estimates by pension regime: the average increase in the proportion of stocks out of net worth was solely driven by most affected workers under actuarially fair pension regimes, who raised their share of risky assets and stocks by 5.59 and 4.45 percentage points. Consistently with Merton's predictions, their ratio of human wealth out of financial wealth increased to 38³² after the reform. Conversely, according to the double differences reported in Table 4 from Appendix F treated Defined-Benefit workers experienced no significant change in their financial portfolios after a post-reform decrease in the ratio of human wealth to financial wealth, which went from 31 to 29³³. Nevertheless, the triple DID estimates shown in Figure 4 reveal a significant reduction in bond holdings. Moreover, Figure 4 present the effects of the 2011 reform on a decomposition of household net wealth: real assets, financial liabilities and financial assets, where the latter category is further divided into safe (such as deposits) and risky (such as stocks and bonds) financial assets. While the left panels provide the triple DID estimates, the right ones present the same estimates normalized with respect to the average level of each variable studied for the control group in the years prior to the reform, categorized by pension regime. On average, NDC and Pro-Rata workers doubled their share of stocks compared to their baseline level during the post-2011 period, while the reduction in the share of bonds for DB workers accounts for more than 50% of their baseline. The dynamic effects of the Fornero reform on the share of risky assets for actuarially fair versus generous pension regimes are reported in Figure 15 from Appendix H. Finally, it is worth noting that both the direction and the statistical significance of the results mentioned above remain consistent when normalizing the different components of private wealth by current disposable or labor income.

³²Before the reform, treated workers under NDC and Pro-rata regimes exhibit average human wealth and financial wealth equal to 733719.72 and 25806.22, respectively.

³³The average pre-reform expected human wealth and financial wealth for treated DB workers 602,634.47 and 19,232.31, respectively.

Wealth Decomposition and Financial Assets - Men
Differential effects of Increased *MRA* by Pension Regime

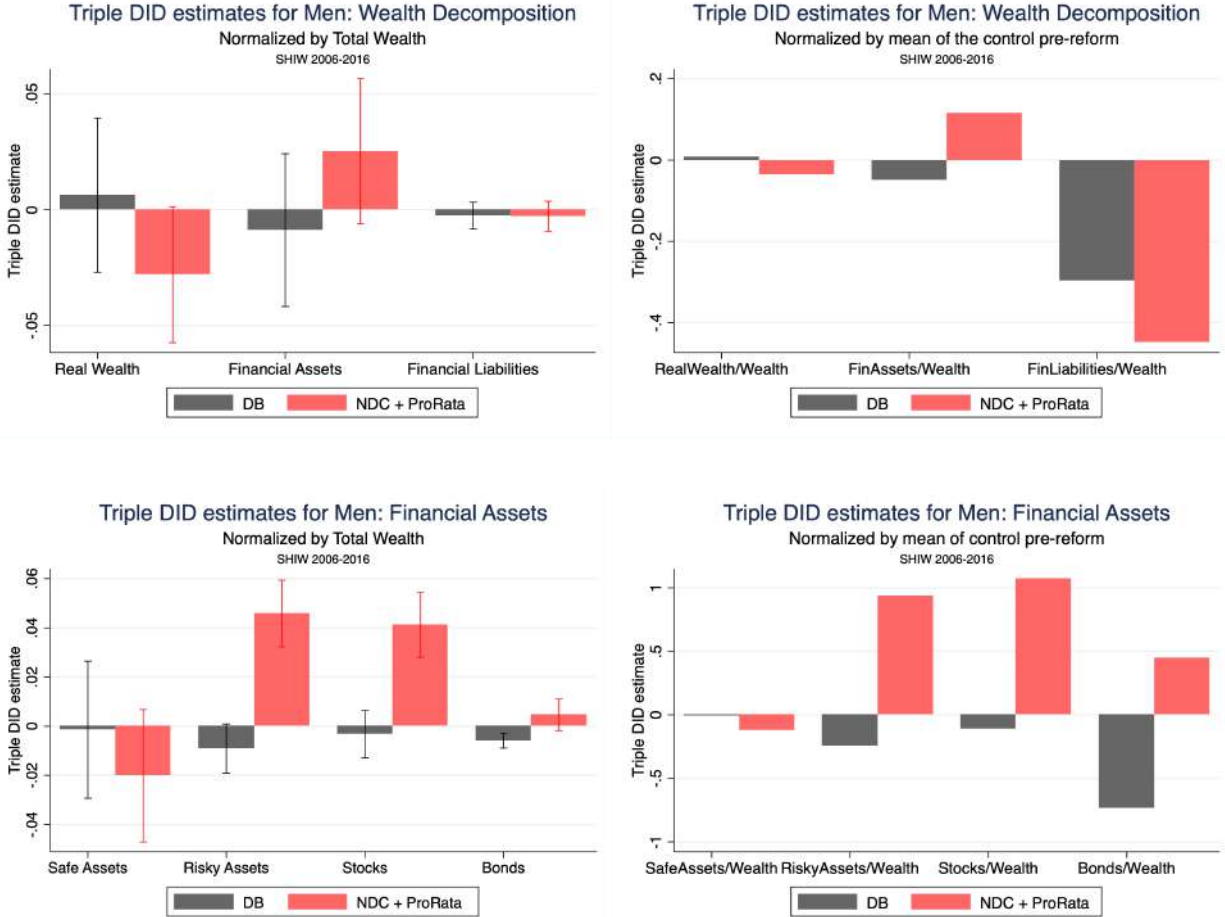


Figure 4: Source: SHIW 2006-2016

NOTE - The left panels report the DID coefficients of the impact of the extended working horizon for individuals under the Notional Defined Contribution and Pro-Rata regimes ($Treat_q \cdot \alpha_t$), as well as the differential effects of increasing the *MRA* for workers under the Defined Benefit regime ($Treat_q \cdot DB_i \cdot \alpha_t$). DB workers were the sole group that encountered a negative pension wealth shock after the implementation of the Fornero reform. The right panels report the same estimates related to the average value of the variable of interest for the control group in the pre-reform period. The upper panels present the effects of the 2011 reform on the decomposition of household net wealth: real assets, financial assets and financial liabilities. The lower panels present the impact on the decomposition of household financial assets: the first two groups of bars represent the effects on the share of safe and risky financial assets, while the last two groups of bars decompose risky financial assets in stocks and bonds. The sample includes household heads who had not retired and were not eligible to retire by 2010 following [10] Carta and De Philippis (2023). Men aged between 45-64, with less than 40 and more than 10 years of accrued paid contributions are defined as treated if they experienced an increase in their *MRA* of at least 4 years after the reform. The specifications control for year and cell fixed effects, with each cell being assigned based on age, years of contributions, gender and employment status. The additional control variables include marital status, area of residence, employment status, level of education, family size, wealth quartiles and whether the individual's partner is retired or not. These variables are assessed at the 2006 level and interacted with time dummies. Standard errors are clustered at the cell level.

5.4 Women

On average, the selected sample of middle-aged women more exposed to the *MRA* increase reduced their expected replacement rates after the Fornero reform, in line with the existing literature presented so far suggesting information frictions concerning the functioning of the Italian pension system. However, Figure 5 further underscores the role played by different pension regimes in shaping this outcome also for female workers: the decline in expected pension benefits was predominantly driven by women subject to a negative pension wealth channel. However, unlike men, women who experienced positive labor and pension wealth channels did not exhibit significant increases in expected pension benefits. For a detailed analysis of the present discounted value of future labor earnings and pension benefits, continuous treatment specifications are presented in Table 8 in Appendix G. These findings reveal that each additional year of working life leads to an increase in expected human wealth of 6,609, equivalent to a 1.5 percentage point rise relative to the average value for the control group in the years prior to the reform. This effect is particularly pronounced among women who experienced a *MRA* increase of at least 6 years, the average female shock: Table 5 from Appendix F illustrates how treated women witnessed an increase in expected human wealth corresponding to 17% of their baseline level. Across all specifications, the increase in expected human wealth is concentrated among NDC and Pro-Rata women, while workers covered by the more generous pension scheme have not undergone significant changes (Figure 5).

To understand the impact of the 2011 pension reform on the saving behavior of middle-aged female workers responsible for financial decisions, Table 8 reports how a unit increase in *MRA* led to a 1.37 percentage points reduction in the saving rate, 6.9% of their baseline level. Moreover, in line with the decline in savings rates, women record a 2.37 percentage points decrease in savings when compared only to their labor income, which represents approximately 6.6% of the baseline. Also these result to be concentrated among most exposed female workers: Table 5 shows that women facing a working horizon extended for at least 6 years decreased their savings out of disposable and labor income by 7.9 and 11 percentage points respectively. Figure 5 illustrates the differential impact of the reform by pension regime³⁴ also on saving rates and saving

³⁴This study also delves into additional dimensions of heterogeneity, such as wealth and marital status. The results reveal that treated women below the first income quartile increased their expected replacement rates compared to those above the third income quartile. One possible explanation is that economically advantaged women might foresee the potential for future reforms aimed at reducing pension benefits in order to enhance the system's sustainability, which typically target wealthier individuals with higher pension amounts. Moreover, [10] Carta and De Philippis (2023) document how liquidity-constrained women, characterized by lower wealth and education, increased their labor supply more after the reform. Hence, the stronger increase in human wealth resulting from both positive labor and pension wealth channels may explain the larger rise in consumption rates observed among women with weaker economic conditions. Furthermore, results from [10] Carta and De Philippis (2023) and [17] Etgeton et al. (2023) suggest that married couples could experience an enhanced lifetime wealth due to inter-partner spillover effects, which may lead to a more substantial increase in consumption. However, this study finds that the contraction in female saving rates is concentrated among actuarially fair single and divorced women most exposed to the reform, consistently with their larger increase in expected pension benefits relative to married women. This positive pension wealth channel may be attributed to the fact that the Fornero reform had a full impact on unmarried women's income sources, whereas married

ratios for most exposed women. Consistently with the continuous treatment specifications and the theoretical predictions from Section 2, women under the NDC and Pro-Rata schemes with an increase in *MRA* of at least 6 years drove the average decline in savings. Specifically, this group saw a reduction in saving rates and savings out of labor income of 11 and 14 percentage points respectively, due to a reduction in the level of savings equal to almost 20% of the baseline level. Furthermore, similar to the findings for treated actuarially fair male workers, women who experienced a positive human wealth channel reduced their saving ratios. To rationalize their significant rise in consumption, contrary to men, it's worth noting that most exposed middle-aged women encountered not only a more severe shock following the Fornero reform, but also an increase in labor market participation and an improvement in employment conditions which men did not experience³⁵ ([10] Carta and De Philippis, 2023). Indeed, as detailed in Section 4, these women had the most discontinuous pre-reform work histories, leading to lower participation rates and higher labor supply elasticity compared to most exposed middle-aged male workers (typically more consistently involved in the Italian labor market). It is also important to acknowledge that the estimated increase in expected human wealth may be underestimated at the household level due to the evidence of spillover effects among partners of women most affected by the Fornero reform ([10] Carta and De Philippis, 2023)³⁶. On the other hand, women enrolled in the Defined-Benefit scheme did not show an increase in their saving rates as observed among their male counterparts. However, they did exhibit an increase in their saving ratios, which suggests that these women may perceive the need to allocate a larger proportion of their lifetime wealth towards savings in order to achieve consumption smoothing over time after their decline in expected pension wealth.

The portfolio effects of the reform for female household heads align with the patterns observed for men. Before the reform, women exhibit an average ratio of human wealth to financial wealth equal to 34 if more exposed to the reform and 36 if less exposed. After 2011, this ratio increased on average to 40³⁷ for treated female workers. When focusing specifically on most exposed female workers under the NDC/Pro-rata (Defined-Benefit) schemes, this average ratio was 32 (43) before the reform and increased (decreased) to 38 (37)³⁸ afterwards. In terms of portfolio choices, NDC/Pro-rata women subject to a *MRA* increase of at least 6 years not only experienced a significant 5.57 percentage points rise in the proportion of their net

women may experience some mitigation of the reform's effects through their partners' earnings. Also for unmarried women, the anticipation of more generous pension benefits appears to catalyze a larger decline in savings, despite the absence of partners' working horizon extensions due to leisure complementarities.

³⁵Carta and De Philippis detect no labor market response to the Fornero reform among most exposed middle-aged men. Conversely, women who experienced an extension in their working horizon of at least seven-years were more likely to secure a high-wage and full-time employment, as well as to benefit from permanent contracts.

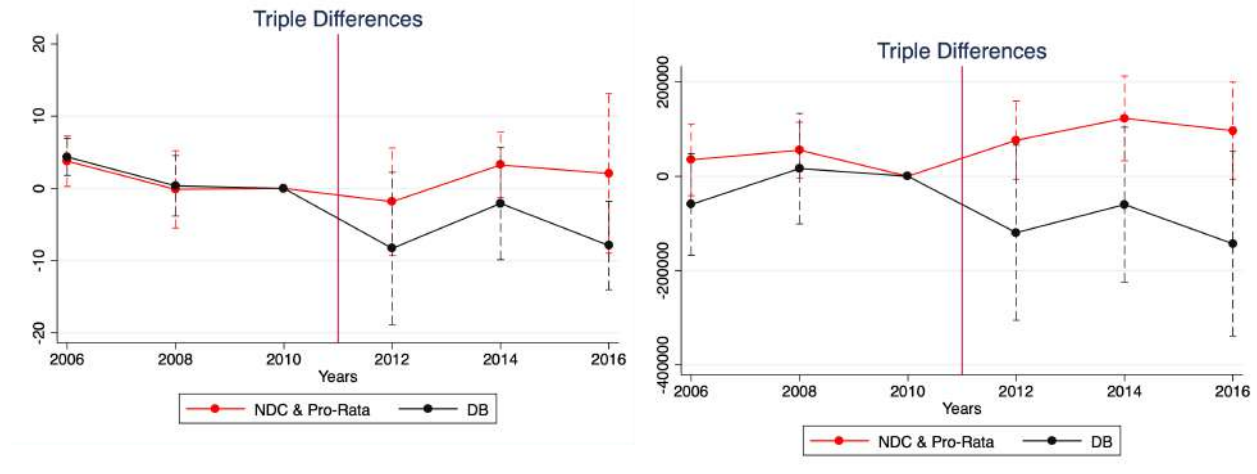
³⁶Their findings suggest that men who had the option to retire prolonged their working horizon due to leisure complementarities within the household.

³⁷Before the reform treated women exhibit an average human wealth and financial wealth equal to 457,563.93 and 13,475.35.

³⁸NDC/Pro-rata female workers show an average human wealth and financial wealth equal to 478,531.66 and 15,085.02 before the reform, while for DB women these measures amount to 390,208.67 and 8,871.55.

Differential effects of Increased *MRA* by Pension Regime - Women

Expected Replacement Rate and Expected Human Wealth



Saving Rates and Saving Ratios

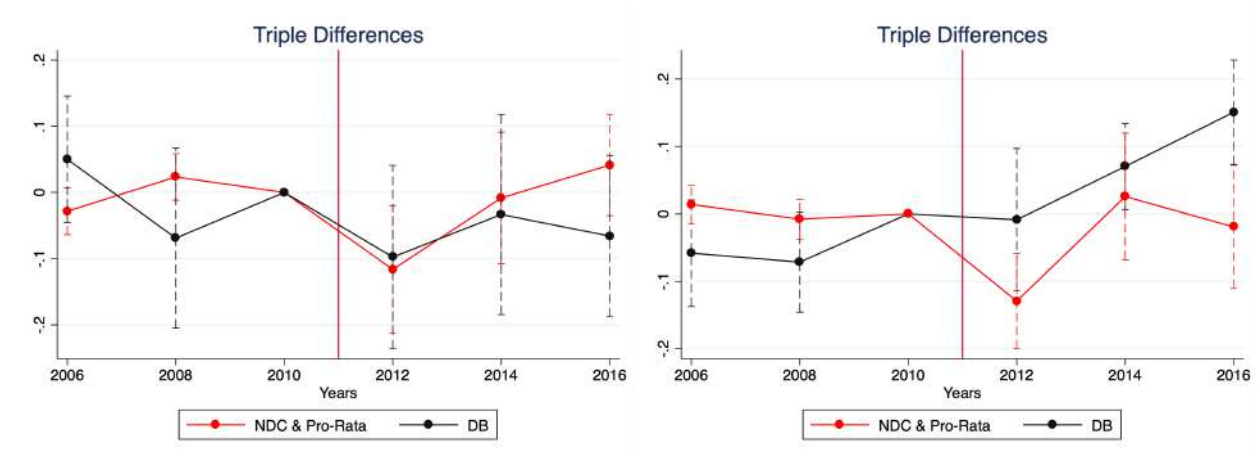


Figure 5: Source: SHIW 2006-2016

NOTE - The panels reports the estimated triple DID coefficients of the impact of the extended working horizon for most exposed individuals under the Notional Defined Contribution and Pro-Rata regimes ($Treat_q \cdot \alpha_t$), as well as the differential effects of increasing the *MRA* for most exposed workers under the more generous Defined Benefit regime ($Treat_q \cdot DB_i \cdot \alpha_t$). DB workers were the sole group that encountered a negative pension wealth shock after the implementation of the Fornero reform. The first panel reports the effects of the Fornero reform on the expected generosity of future pension benefits. Replacement rates represent the ratio of the first expected pension benefit to the last expected salary. The second panel presents the effect on expected labor earnings and pension benefits: expected human wealth is defined in section B. The lower panels presents the effects on the standard saving rate and the saving ratios proposed by [34] Ordoñez and Piguillem (2022). The sample includes household heads who had not retired and were not eligible to retire by 2010 following [10] Carta and De Philippis (2023). Women aged between 45-59, with less than 40 and more than 10 years of accrued paid contributions are defined as treated if they experienced an increase in their *MRA* of at least 6 years after the reform. The specifications control for year and cell fixed effects, with each cell being assigned based on age, years of contributions, gender and employment status. The additional control variables include marital status, area of residence, employment status, level of education, family size, wealth quartiles and whether the individual's partner is retired or not. These variables are assessed at the 2006 level and interacted with time dummies. Standard errors are clustered at the cell level.

worth invested in risky assets, primarily driven by a 4.89 percentage points increase in their share of stocks as observed for their male counterparts, but they also more than doubled their financial liabilities compared to their baseline level and reduced their holdings of real illiquid assets. Conversely, women enrolled in the DB scheme witnessed a significant decline in their financial liabilities, amounting to more than 50% of their baseline level. The dynamic effects of the share of risky assets out of net wealth are illustrated for different pension regimes in Figure 15 from Appendix H. Lastly, it is worth emphasizing the consistency of these findings when normalizing the various components of private wealth by either current disposable income or labor income.

Wealth Decomposition and Financial Assets - Women Differential effects of Increased *MRA* by Pension Regime

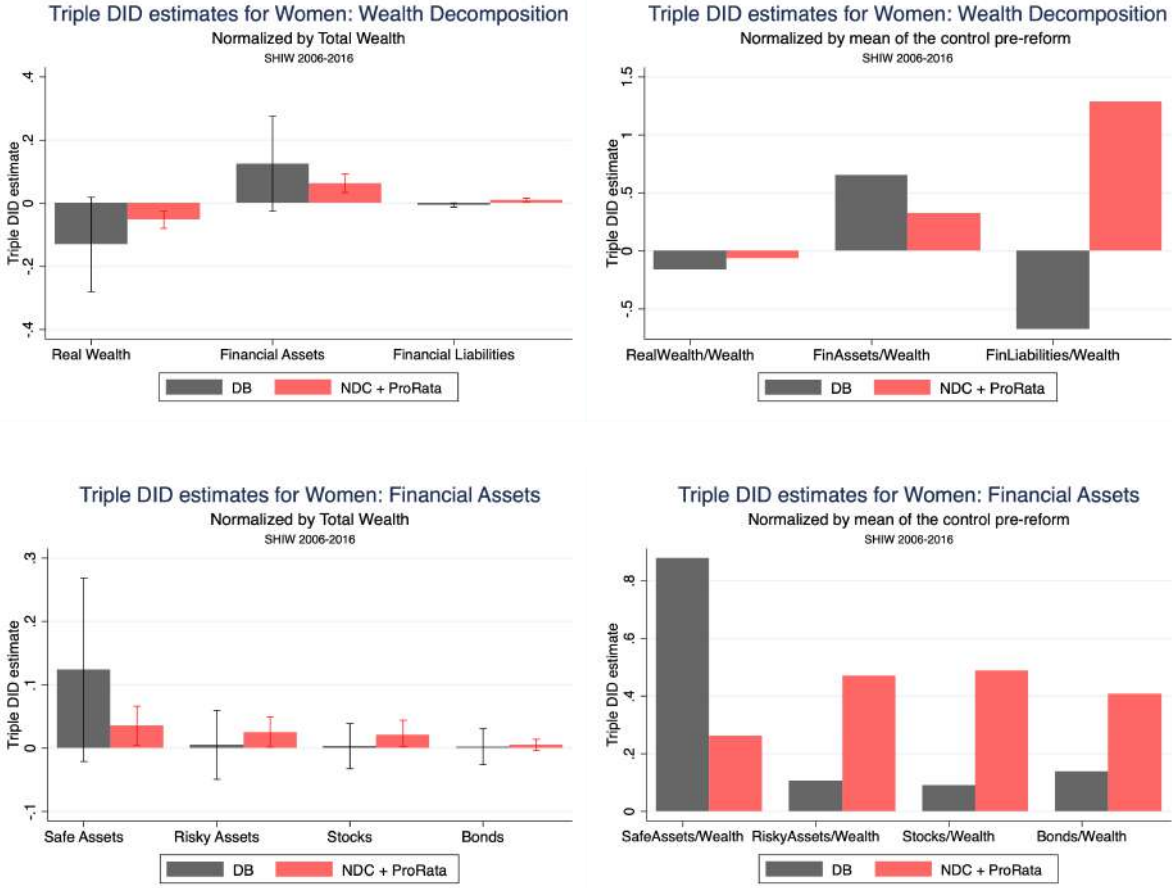


Figure 6: Source: SHIW 2006-2016

NOTE - The left panels report the DID coefficients of the impact of the extended working horizon for individuals under the Notional Defined Contribution and Pro-Rata regimes ($Treat_q \cdot \alpha_t$), as well as the differential effects of increasing the *MRA* for workers under the Defined Benefit regime ($Treat_q \cdot DB_i \cdot \alpha_t$). DB workers were the sole group that encountered a negative pension wealth shock after the implementation of the Fornero reform. The right panels report the same estimates related to the average value of the variable of interest for the control group in the pre-reform period. The upper panels present the effects of the 2011 reform on the decomposition of household net wealth: real assets, financial assets and financial liabilities. The lower panels present the impact on the decomposition of household financial assets: the first two groups of bars represent the effects on the share of safe and risky financial assets, while the last two groups of bars decompose risky financial assets in stocks and bonds. The sample includes household heads who had not retired and were not eligible to retire by 2010 following [10] Carta and De Philippis (2023). Women aged between 45-59, with less than 40 and more than 10 years of accrued paid contributions are defined as treated if they experienced an increase in their *MRA* of at least 6 years after the reform. The specifications control for year and cell fixed effects. The additional control variables are assessed at the 2006 level and interacted with time dummies. Standard errors are clustered at the cell level.

6 Robustness Checks

This section presents the main robustness checks conducted and is organized as follows. The first part examines the rotating panel component of the Survey of Household Income and Wealth to validate the findings obtained from the repeated cross-sectional analysis. The second part leverages the expanded sample size available through repeated cross-sections to explore the potential impact of the householder’s partner shock on financial outcomes. Specifically, it investigates whether the key results remain consistent when focusing on households where both partners are subject to a working horizon extension and belong to either an actuarially fair pension scheme or to the generous Defined-Benefit scheme.

6.1 Panel Analysis

The panel analysis examines a dataset of 996 households observed between 2008 and 2014. Among these, 367 households were affected by the Fornero reform: within this subset, 242 households are headed by men and 125 by women. Restricting the attention to a sample of middle-aged household heads not eligible to retire by 2010, 254 individuals were subject to a *MRA* shock ranging from 1 to 7 years. Most of them are under the Pro-Rata system, followed by Defined-Benefit and Notional Defined-Contribution workers. In contrast, 45 individuals experienced no increase in their *MRA* due to the *grandfathering clause*, with the majority of them belonging to the DB scheme. In order to account for potential non-linear effects, as well as to maintain consistency with the repeated cross-section analysis and the research carried out by [10] Carta and De Philippis (2023), men and women are defined as treated if they experienced an increase in their *MRA* of at least 4 and 6 years after the reform. Figure 8 illustrates the response to the new pension rules of middle-aged individuals’ reported expected retirement age: workers experiencing a larger *MRA* increase raised more their expectations. The distribution of the shock presented in Figure 7 and the summary statistics for treated and control groups remain consistent across both panel data and repeated cross-sectional analyses, which suggests the presence of a panel dataset with minimal selection bias³⁹. Despite no group experienced a reduction in statutory replacement rates after the reform, the analysis of panel data reveals an average decline in expected pension benefits following the 2011 reform, particularly among workers enrolled in the DB scheme. This finding is consistent with the trends discussed in Section 4.3. SHIW panel data further highlights the strong influence of age on the observed shock among male workers and the more important explanatory role of contribution years for female workers, which justifies the adoption of distinct controls by

³⁹Among women who experienced a *MRA* shock of at least 6 years, the average number of accrued contribution years is 6 years lower with respect to the control group, while there is no significant difference in terms of age. Additionally, the female treated group has a higher proportion of unemployed women compared to the control group. Conversely, men most exposed to the reform are on average 3 years older and have 2 years of contributions less than the control group, with no significant differences in terms of labor market activity.

gender: contribution years at the 2008 level for men and age at the 2008 level for women.

Additional Working Years Post-Reform

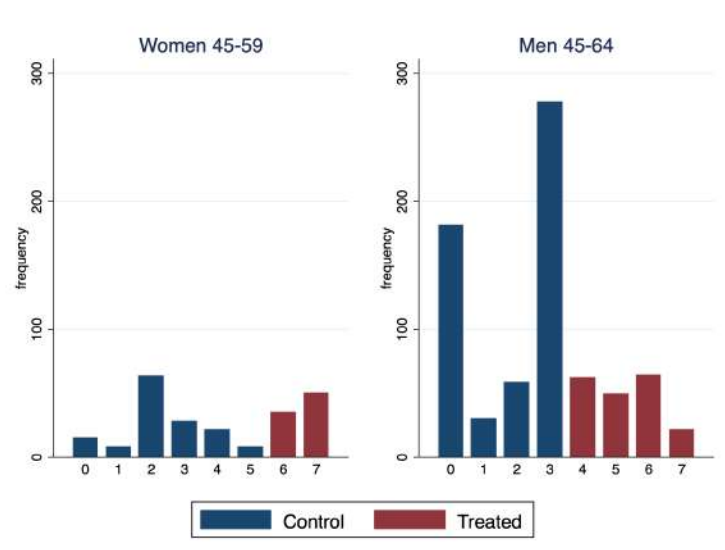


Figure 7: Source: SHIW Panel 2008-2014

NOTE - Distribution of the post-reform *MRA* increases by gender. The sample includes household heads who had not retired and were not eligible to retire by 2010. Women (men) are aged between 45-59 (45-64) and are defined as treated if they experienced an increase in their *MRA* of at least 6 (4) years after the reform.

Expected Retirement Age

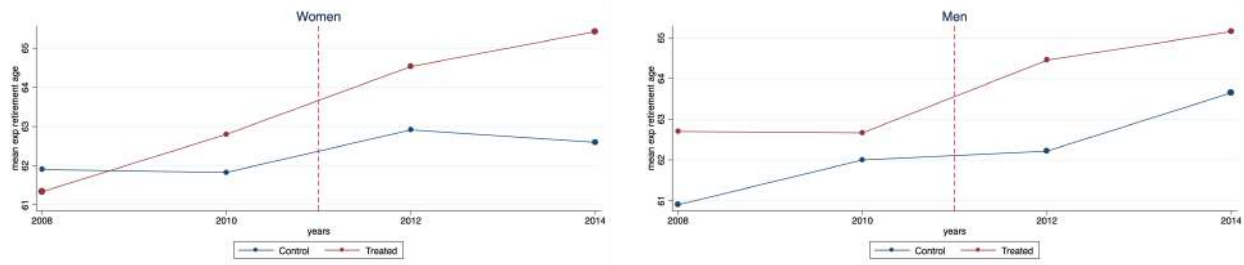


Figure 8: Source: SHIW Panel 2008-2014

NOTE - Expected Retirement Age by treatment group and gender. The sample includes household heads who had not retired and were not eligible to retire by 2010. Women are aged between 45-59 and men between 45-64. Women (men) are defined as treated if they experienced an increase in their *MRA* of at least 6 (4) years after the reform.

The results from the panel analysis are documented for middle-aged male workers, as the female sample suffers from limited data size and selection bias, and validate the findings presented in Section 5. Figure 9 illustrates how actuarially fair men who experienced an increase in their *MRA* of at least 4 years and rewards from the government to work longer raised their expectations of future pension benefits. The simultaneous increase in expected labor earnings and replacement rates led to a substantial enhancement in their expected

human wealth, whose magnitude⁴⁰ aligns with the findings from the repeated cross-sectional analysis. In contrast, workers under the generous Defined-Benefit scheme reduced their expectations of the pension system’s generosity after the reform, can be attributed to delayed constant pension benefits and concerns about being more vulnerable to potential future pension cuts. Figure 9 illustrates how this negative pension wealth channel offsets the positive income channel resulting from an extended working horizon, ultimately leading to no significant change in their expected human wealth. These results help elucidate the patterns observed for savings: in line with repeated cross-sections⁴¹, Figure 9 reveals a significant increase in saving rates for workers in the Defined-Benefit scheme and a significant decrease in saving ratios for workers in the Notional Defined Contribution and Pro-Rata schemes. Specifically, the continuous treatment specifications indicate that, among DB workers, every additional working year resulted in a 2.85 percentage points increase in the saving rate, which represents 12% of the average saving rate for the control group during pre-reform years. On the other hand, NDC and Pro-Rata workers reduced their saving ratio by 0.729 percentage points, which amounts to about 0.85% of the baseline level. Hence, aiming to achieve consumption smoothing over time, middle-aged men who internalized a longer working horizon and higher statutory replacement rates reduced the proportion of their increased lifetime wealth to set aside for the future. Conversely, treated men facing a negative pension wealth channel due to the lack of incentives to work longer increased savings compared to their relatively unaffected current incomes. Lastly, Figure 12 provides insights into the impact of the reform on all components of private wealth. The results unveil that the sole statistically significant impacts pertain to risky assets and stocks: while NDC and Pro-Rata workers raised their share of stocks by 4 percentage points after the reform, individuals under the generous DB scheme reduced their stock allocation by 1.7 percentage points. Hence, SHIW panel data further supports how treated men who experienced an increase in their ratio of human to financial wealth allocated a greater portion of their portfolios to stocks. This further validates the conclusions derived from repeated cross-sections and aligns with the theoretical predictions outlined so far.

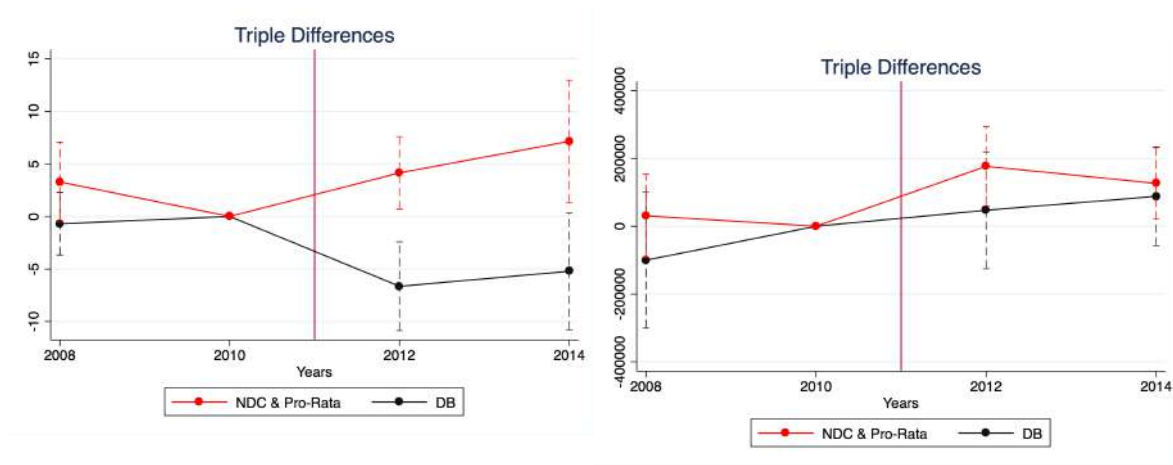
6.2 Household-level Fornero Shocks

To reinforce the pivotal role of the household head’s shock, this section studies how household financial decisions respond when both middle-aged partners, who were not eligible for retirement before the reform year,

⁴⁰To improve the dimensionality of the panel analyses, the construction of expected human wealth incorporates statutory replacement rates when expected rates are absent, as detailed in Appendix B. Since expected replacement rates were generally lower than the statutory ones, the estimates presented on the change in expected human wealth may be biased upwards.

⁴¹Trends in savings relative to current disposable income and lifetime wealth throughout the sample period show a higher level of consistency compared to the cross-sectional analysis. Both indicators display a decline in 2012, followed by a recovery in 2014.

Differential effects of Increased MRA by Pension Regime - Men
 Expected Replacement Rate and Expected Human Wealth



Saving Rates and Saving Ratios

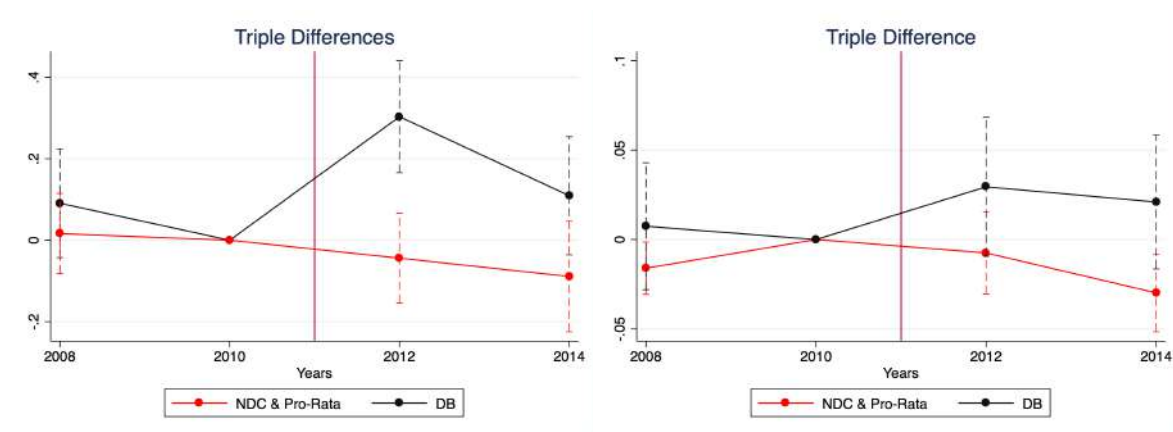


Figure 9: Source: SHIW Panel (2008-2014)

NOTE - The panels reports the estimated triple DID coefficients of the average effects of the extended working horizon for most exposed individuals under the Notional Defined Contribution and Pro-Rata regimes ($Treat_q \cdot \alpha_t$), as well as the differential effect of increasing the MRA for most exposed workers under the more generous Defined Benefit regime ($Treat_q \cdot DB_i \cdot \alpha_t$). The first panel reports the effects of the Fornero reform on the expected generosity of future pension benefits. Replacement rates represent the ratio of the first pension benefit to the last salary. The second panel presents the effect on the expected human wealth defined in section B. The lower panels presents the effects on the standard saving rate and the saving ratios proposed by [34] Ordoñez and Piguillem (2022). The sample includes household heads who had not retired and were not eligible to retire by 2010 following [10] Carta and De Philippis (2023). Men aged between 45-64 are treated if they experienced an increase in their MRA of at least 4 years after the reform. The specifications control for year and cell fixed effects. The control variables are assessed at the 2008 level and interacted with time dummies. Standard errors are clustered at the cell level.

experience a substantial increase in their *MRA*. Given the limited size of the analyzed subsample⁴², the subsequent specifications leverage repeated cross-sections. The analysis examines household-level dynamics by selecting families where both partners are enrolled in either the Notional Defined-Contribution/Pro-Rata systems or the Defined-Benefit regime and distinguishing those with a male or female household head. Figure 10 illustrates the distribution of the average shock experienced by the two partners within such households. To better understand the response of substantially affected households headed by a middle-aged worker, these specifications classify families as "treated" if their household-level average *MRA* increase amounts to at least 5 years, as this threshold represents the average shock observed by gender of the worker responsible for financial decisions. Subsequently, the determination of household expected human wealth involves aggregating individual measurements and the analysis of household savings is conducted with regard to both disposable and labor income available within each family. Due to the limited data available regarding

Additional Working Years Post-Reform

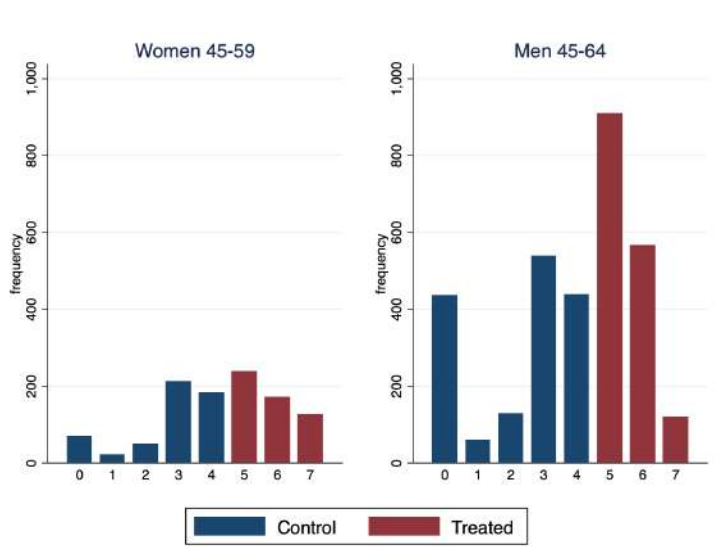


Figure 10: Source: SHIW 2006-2016

NOTE - Distribution of the post-reform increases in the average *MRA* of the two married partners classified by the gender of the household head. The analysis includes a sample of families where the household head was not eligible to retire by 2010: women in charge of financial decisions are aged between 45-59 and men between 45-64. Households are defined as treated if they experience an increase in their average *MRA* of at least 5 years after the Fornero reform.

household-level shocks when women assume financial decision-making roles, subsequent findings direct attention towards men responsible for economic choices within households where both partners are affected by the Fornero reform.

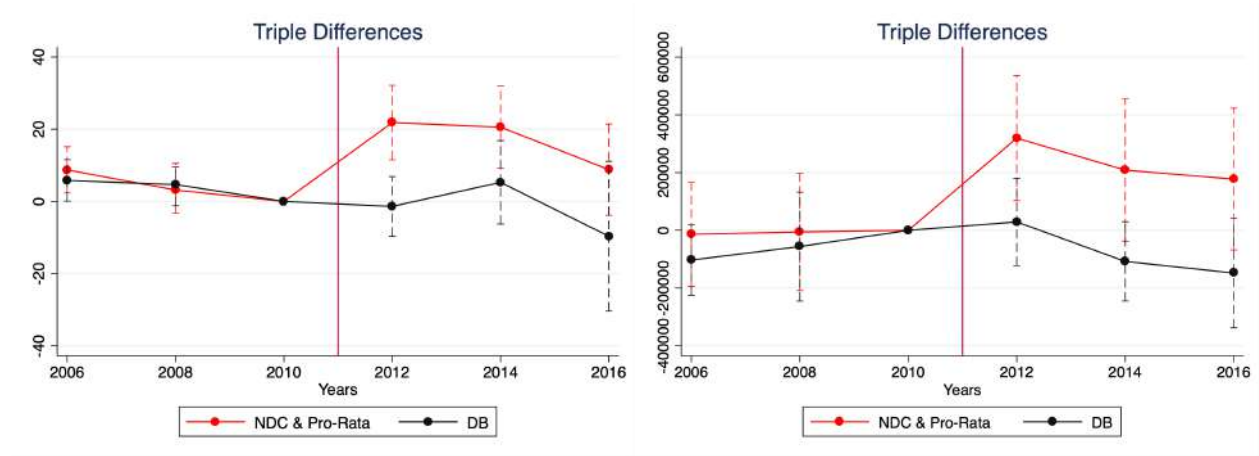
⁴²Approximately 40% of the households analyzed in SHIW data provide individual information for both partners. Among these families, around one-third has one partner enrolled in a Defined-Benefit (DB) pension regime and the other one covered by an actuarially fair pension regime. These observations are omitted from the following analyses to focus on the role of different pension regimes.

The triple difference-in-difference estimates by pension regime presented in Figures 11 and 12 provide further support for the conclusions drawn in Section 5 for male workers. Within treated households with both partners enrolled in an actuarially fair pension regime, the analysis uncovers that male household heads raised their expected replacement rates by 10.7 points, which corresponds to an approximate monthly pension benefit rise of 200 euros, based on the average male labor income documented in SHIW data. This increase is roughly twice the magnitude found when considering individual-level shocks. Conversely, in households with Defined-Benefit partners, expected replacement rates decreased by nearly 4 points, translates to a decrease of around 70 euros per monthly pension benefit for the male household head. The results for their partners exhibit consistent patterns. The differential effects by pension regime on expected pension wealth have relevant implications for the changes in the household expected human wealth. Specifically, treated families with NDC/Pro-Rata partners observed an average increase of 250503 euros, whereas treated DB families did not undergo any significant change in their expected future labor earnings and pension benefits. The impact on financial decisions is also noteworthy. Consistent with the main findings of this study, the DB families most affected by the Fornero reform increased savings as a percentage of household current disposable income by 7.6 percentage points. Conversely, the most affected NDC/Pro-Rata families did not save enough out of their increased expected human wealth to align with their pre-reform optimal rule, resulting in a decrease in savings as a proportion of household lifetime wealth of 3.4⁴³ percentage points after the 2011 reform. In terms of portfolio effects, households enrolled in actuarially fair pension regimes increased their allocation to risky assets by 3.6 percentage points. This adjustment was driven by a rise in their share of stocks and bonds out of net wealth equal to 2.3 and 1.2 percentage points, respectively. Finally, these findings remain robust when analyzing a subgroup of single-shock households where only the member responsible for financial decisions is influenced by the reform. This sample includes household heads who are single, separated or married to a retired partner.

⁴³Section 5 provides clarification on the absence of a significant decrease in savings rates.

Differential effects of Increased Household *MRA* by Pension Regime - Male Household Heads

Expected Replacement Rate and Expected Human Wealth



Saving Rates and Saving Ratios

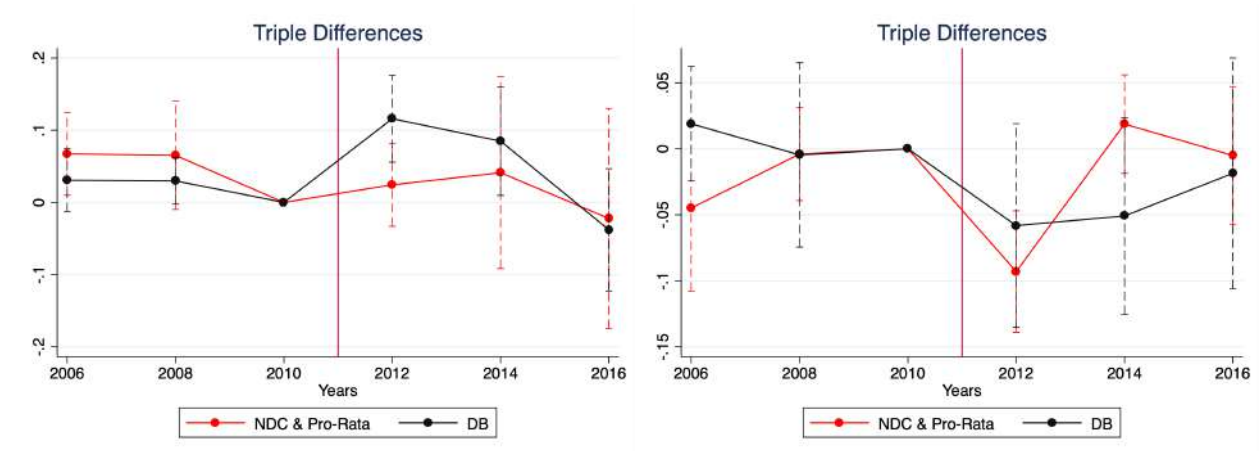
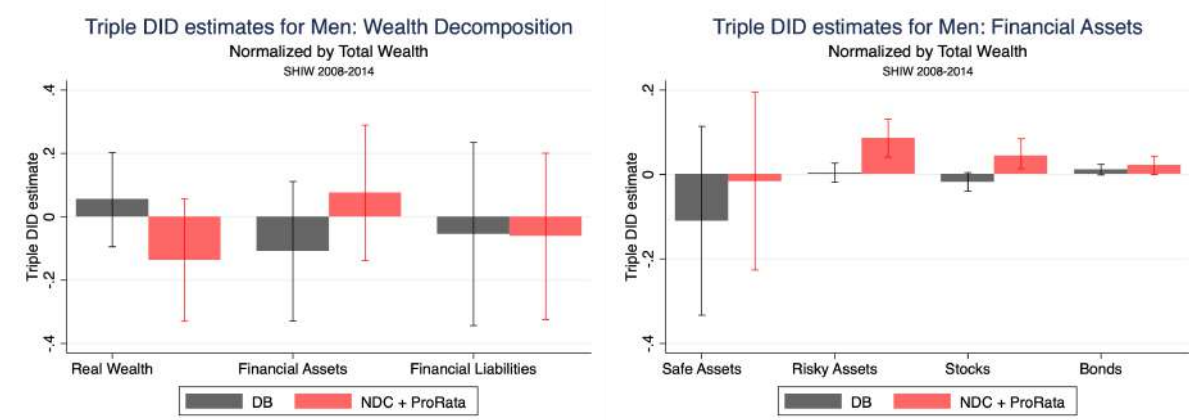


Figure 11: Source: SHIW 2006-2016

NOTE - The panels report the estimated triple DID coefficients of the average effects of the extended working horizon for most exposed individuals under the Notional Defined Contribution and Pro-Rata regimes ($Treat_q \cdot \alpha_t$), as well as the differential effects of increasing the *MRA* for most exposed workers under the more generous Defined Benefit regime ($Treat_q \cdot DB_i \cdot \alpha_t$). DB workers were the sole group that encountered a negative pension wealth shock after the implementation of the Fornero reform. The first panel reports the effects of the Fornero reform on the expected generosity of future pension benefits of the household heads. Replacement rates represent the ratio of the first expected pension benefit to the last expected salary. The second panel presents the effects on expected labor earnings and pension benefits aggregated at the household level. The lower panels show the effects on the standard measure of savings out of household income and the saving ratios proposed by [34] Ordoñez and Piguillem (2022). The sample includes families where the household head is a middle aged men between 45-64 who had not retired, was not eligible to retire by 2010 following [10] Carta and De Philippis (2023) and has a partner who is also subject to a *MRA* increase. Households are defined as treated if they experienced an increase in their average *MRA* of at least 5 years after the reform. The specification controls for year and cell fixed effects, with each cell being assigned based on age, years of contributions, gender and employment status. The additional control variables are assessed at the 2006 level and interacted with time dummies. Standard errors are clustered at the cell level.

Wealth Decomposition and Financial Assets
Differential effects of Increased *MRA* by Pension Regime

Male workers (Panel, 2008-2014)



Male Household Heads (Repeated Cross-Sections, 2006-2016)

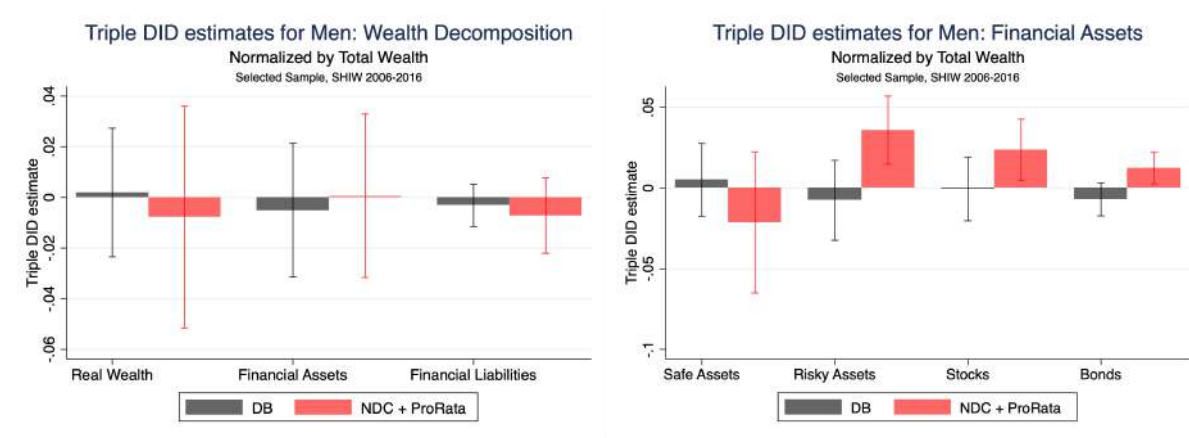


Figure 12: Source: SHIW Panel 2008-2014 & SHIW 2006-2016

NOTE - The panels report the triple DID coefficients of the average effects of the extended working horizon for individuals under the Notional Defined Contribution and Pro-Rata regimes ($Treat_q \cdot \alpha_t$), as well as the differential effect of increasing the *MRA* for workers under the Defined Benefit regime ($Treat_q \cdot DB_i \cdot \alpha_t$). DB workers were the sole group that encountered a negative pension wealth shock after the implementation of the Fornero reform. The left panels present the effects of the 2011 reform on the decomposition of individual net wealth: real assets, financial assets and financial liabilities. The right panels present the effects of the 2011 reform on the decomposition of individual financial assets: the first two groups of bars represent the effects on the share of safe and risky financial assets, while the last two groups decompose the latter category in stocks and bonds. The sample includes individuals who had not retired and were not eligible to retire by 2010 following [10] Carta and De Philippis (2023). The upper panels involve men aged between 45-64, with less than 40 and more than 10 years of accrued paid contributions, defined as treated if they experienced an increase in their *MRA* of at least 4 years after the reform. The lower panels include families where the household head is a middle aged men between 45-64 who has a partner also subject to a *MRA* increase. Households are defined as treated if they experienced an increase in their average *MRA* of at least 5 years after the reform. The specifications control for year and cell fixed effects. The control variables are assessed at the 2008 (2006) level and interacted with time dummies. Standard errors are clustered at the cell level.

7 Conclusions

This research project presents the first comprehensive evidence of the impact of reforms raising the Minimum Retirement Age (*MRA*) on expected human wealth, savings and portfolio allocations for workers relatively far from retirement. These reforms extend the years of labor earnings, shorten the period of non-employment to be financed and, under actuarially fair pension regimes, typically improve pension benefits. The resulting positive income shock would suggest post-reform increases in expected pension benefits ([20] Fornero et al, 2019) and decreases in saving rates ([17] Etgeton et al, 2023; [21] García-Miralles and Leganza, 2021). However, the analysis of the Italian Survey of Household Income and Wealth reveals some puzzling results also highlighted by previous research. The 2011 reform resulted in a reduction of expected pension benefits for most exposed workers. A possible explanation advanced in the literature was the lack of awareness among Italian workers regarding the functioning of an actuarially fair pension system, where pension benefits increase with extra contribution years ([33] Oggero, 2022). This study contributes to the ongoing debate on the pension wealth effects of the Fornero reform by providing a new perspective: the results show that the average decrease in expected replacement rates after 2011 was driven by individuals with large *MRA* increases under the most generous Italian pension regime, who experienced a negative pension wealth shock mainly due to an important delay of constant pension benefits. Conversely, most exposed workers under actuarially fair pension regimes raised their expected pension benefits in line with their pension formula and post-reform government rewards. These findings suggest that workers, on average, have a good understanding of the rules governing the pension system and their implications for future income sources.

The proposed pension wealth channel further explains the different impact of the Fornero reform on expected human wealth across pension regimes observed in SHIW data. In accordance with positive labor and pension shocks, most exposed workers under actuarially fair pension regimes increased their expected labor earnings and pension benefits after 2011. On the other hand, people under the generous Defined-Benefit regime experienced no significant change in terms of expected human wealth, as lower expected replacement rates compensated for the additional years of labor earnings. Then, this study uncovers the role of expected human wealth in shaping saving and investment dynamics, thus providing a rationale for the average increase in savings observed in SHIW data after such reform, already noted by [10] Carta and De Philippis (2023) and in stark contrast to the narrative of enhanced lifetime wealth resulting from reforms raising the *MRA*. The results of this work reveal that individuals who concurrently experienced an extension in their working horizon and a reduction in their expected pension wealth drove the aforementioned increase in savings, in accordance with the literature on the substitutability between private and pension wealth. Conversely, workers

experiencing a significant increase in lifetime wealth reduced their optimal proportion of savings out of total wealth, aligning with intertemporal smoothing motives, and raised their risky holdings, which validates the life-cycle models' prediction of stock investments increasing in the ratio of human wealth to financial wealth.

In conclusion, this research project provides evidence of *forward-looking* middle-aged Italian workers internalizing the new rules imposed by the Fornero reform and adjusting their financial behavior in accordance with economic theories. By studying the impact of a reform raising the Minimum Retirement Age on saving and investment choices, this work fills a gap in the literature and sheds light on how changes in expected lifetime wealth affect the composition of private wealth, carrying potentially significant implications for the "consumable" wealth of the next generations of retirees. Moreover, the observed heterogeneity in the impact of the Fornero reform across differently rewarded pension regimes not only validates the theoretical predictions mapping human wealth to savings and portfolio allocations, but also emphasizes the importance of government incentives in shaping workers' responses to an increase in their *MRA*. By designing pension reforms that reward individuals for extending their working horizon, policy makers can generate positive human wealth effects with the potential to foster an increase in consumption and equity investments. Conversely, raising the *MRA* without incorporating such incentives can lead to a decline in expected pension wealth, which can prompt workers to increase savings and reduce their exposure to risky assets.

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Appendix

A Appendix

Saving Rates and Saving Ratios

This section presents a discrete-time dynamic consumption model with no aggregate risk from [34] Ordoñez and Piguillem (2022) to clarify the relation between standard saving rates and saving ratios. People can save in a risky asset a , financial or non-financial (e.g., housing) and subject to *i.i.d.* idiosyncratic risk, and a risk-free asset b . Assuming households have CRRA preferences, they maximize consumption c_t over the life-cycle subject to a budget constraint and a natural debt limit (they can borrow up to the present value of their human capital) with the following optimization problem:

$$\begin{aligned} \max_{c_t, a_{t+1}, b_{t+1}} \quad & \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \frac{c_t^{1-\sigma}}{1-\sigma} \\ \text{s.t.} \quad & c_t + a_{t+1}p_t + b_{t+1} \leq \pi_t^i a_t p_t + R_t b_t + \omega_t \\ & a_t \geq 0 \\ & b_t \geq h_t \end{aligned} \tag{3}$$

where ω_t is labor income, labor supply is fixed and normalized to 1, R_t is the relative price of the risk-free asset, p_t is the relative price of the risky asset and π_t^i its idiosyncratic return (capital plus dividends). The authors assume $\pi_t^i = (1 + \pi_t)\epsilon_i$ to simplify notation, but they show that the distribution of the stochastic process is inconsequential to their results as long as it is *i.i.d.* over time. Human wealth h_t is defined as the discounted sum of future wages from period t on, namely

$$h_t = \sum_{j=1}^{\infty} \frac{\omega_{t+j}}{\prod_{l=1}^j R_{t+l}}.$$

The stochastic household total wealth in each period t is

$$W_t^i = p_t^i a_t p_t + R_t b_t + \omega_t + h_t. \tag{4}$$

Hence, higher wealth is driven by increases in p_t or h_t . The solution has the form

$$c_t = (1 - s_t)W_t^i \tag{5}$$

$$p_t a_{t+1}^i = \phi_t s_t W_t^i, \tag{6}$$

where s_t represents the saving ratio and ϕ_t the proportion of savings allocated to the risky asset. From the assumption of homothetic preferences and *i.i.d.* idiosyncratic shocks, both measures are independent of consumers' wealth and income shocks, which is useful for tractability. The choice of s_t ensures that total wealth grows optimally: a household with wealth W_t^i chooses financial assets such that next period ($t+1$), after the shock realization, total wealth satisfies

$$W_{t+1}^i = \underbrace{\left(\phi_t \pi_{t+1}^i \frac{p_{t+1}}{p_t} + (1 - \phi_t) R_{t+1} \right)}_{r_{t+1}^i} s_t W_t^i. \tag{7}$$

s_t can be rewritten recursively as

$$(1 - s_t)^{-1} = 1 + \beta^{1/\sigma} [\mathbb{E} r_{t+1}^{1-\sigma}]^{1/\sigma} (1 - s_{t+1})^{-1},$$

so that the stationary solution becomes

$$s = \beta^{1/\sigma} [\mathbb{E} r^{1-\sigma}]^{1/\sigma}. \quad (8)$$

This expression reveals the fundamental drivers of the saving ratio: the discount rate β and the precautionary and intertemporal smoothing motives governed by σ . If β increases, as in the case of an increase in life expectancy, people care more about the future and want to save more out of total wealth.

The return component can be written as

$$\left([\mathbb{E} r_{t+1}^{1-\sigma}]^{\frac{1}{1-\sigma}} \right)^{\frac{1-\sigma}{\sigma}},$$

where the certainty equivalent term $[\mathbb{E} r_{t+1}^{1-\sigma}]^{\frac{1}{1-\sigma}}$ captures the role that σ plays in affecting risk aversion, while the remaining part represents the inverse of the elasticity of substitution under CRRA preferences. Risk aversion affects precautionary motives: the larger is σ , the more people want to save out of total wealth to smooth consumption across states. Intertemporal smoothing depends on the elasticity of substitution: if $\sigma > 1$ and people expect higher future returns, they will reduce savings out of total wealth to smooth consumption over time. Assuming R_t and ω_t are after-tax prices, $y_t = \pi_t a_t p_t + (R_t - 1)b_t + \omega_t$ represents the average disposable income. Then, the budget constraint can be rewritten as

$$c_t + a_{t+1}p_t + b_{t+1} = a_t p_t + b_t + y_t,$$

where $a_t p_t + b_t$ is the households' net worth. Note that the standard measure of saving rates is defined as

$$s_t^d = \frac{(y_t - c_t)}{y_t} = \frac{p_t(a_{t+1} - a_t) + (b_{t+1} - b_t)}{y_t}. \quad (9)$$

Replacing in the budget constraint equation (2) and (3), the law of motion of assets becomes

$$\begin{aligned} a_{t+1}p_t + b_{t+1} &= s_t W_t - h_t \\ a_{t+1}p_t + b_{t+1} &= s_t(a_t p_t + b_t + y_t + h_t) - h_t \\ \frac{p_t(a_{t+1} - a_t) + (b_{t+1} - b_t)}{y_t} &= (s_t - 1) \frac{a_t p_t + b_t + h_t}{y_t} + s_t. \end{aligned}$$

Substituting the definition of the saving rate in the last equation, the relation between the two can be obtained as

$$s_t^d = (s_t - 1) \frac{a_t p_t + b_t + h_t}{y_t} + s_t. \quad (10)$$

Finally, defining $\chi_t = \frac{p_t a_t + b_t + h_t}{y_t}$, equation (9) can be rewritten as

$$s_t = \frac{s_t^d + \chi_t}{1 + \chi_t}. \quad (11)$$

This formula helps to grasp the economics behind the potential discrepancy between saving rates and saving ratios: the dynamic properties of s_t carry over to implications for s_t^d only if financial wealth $p_t a_t + b_t$ and human wealth h_t remain stable.

B Appendix

Expected Human Wealth

Households rely on two key resources over their lifetime: tangible wealth and human capital. The latter is defined as the present discounted value of the future flows of disposable labor income and pension benefits and represents a major part of total wealth (92% according to [26] Lustig, Van Nieuwerburgh and Verdelhan, 2013). Its inherent uncertainty and illiquidity impose significant constraints on households seeking to access credit markets when alternative forms of wealth, such as savings or inheritance, are not available. In particular, the uncertainty in future labor earnings and the limited opportunities for insurance introduce risk into the returns on human capital. As a result, it represents a source of background risk with substantial impact on investor portfolio decisions. Moreover, the empirical evidence suggests that its returns are poorly correlated with those of the stock market, leading to its characterization as a "risk-free bond". This feature affects the willingness to undertake financial risk and represents a crucial factor for understanding portfolio rebalancing over the life-cycle, as outlined in Section 2. Pension reforms raising the *MRA* can enhance human wealth by extending periods of labor income and increasing pension benefits upon retirement. To investigate whether the 2011 Fornero reform elicited similar effects in Italy, this appendix introduces the measure used to evaluate changes in individual expected human wealth.

Assessing the value of human capital is complex as it requires predicting future earnings, a task inherently fraught with uncertainty. To address this challenge, the study assumes that labor income y_{it} grows at an age-gender-employment-specific rate g determined from Eurostat data⁴⁴. Expected pension benefits are estimated by multiplying individual salaries by their expected replacement rate⁴⁵. The expected human wealth for individual i with age a and expected retirement age $\tau + 1$ is defined as

$$H_{ia\tau} = \underbrace{y_i \beta (1+g) \left(\frac{1 - [\beta(1+g)]^{(\tau-a)}}{1 - \beta(1+g)} \right)}_{\text{PDV of future labor income up to year } \tau} + \underbrace{\beta^{(\tau-a)} \left(\frac{[y_i(1+g)^{(\tau-a)}] \cdot \text{expected replacement rate}}{1 - \beta} \right)}_{\text{PDV of pension wealth from year } \tau + 1},$$

where the discount rate incorporates a gender-specific probability of survival and is measured as $\beta = \frac{1 - \frac{1}{\text{life expectancy}}}{1+r_f}$. The analysis adopts the average life expectancy for men and women during the years 2006-2016, i.e. 82 and 85 years respectively, along with an interest rate of 4%⁴⁶. In order to examine the impact on expected human wealth of the increase in the expected retirement age ($\tau + 1$) and heterogeneous changes in statutory replacement rates across different pension regimes, this study focuses on individuals with a positive number of working years remaining until retirement (namely with $(\tau + 1 - a) > 0$).

⁴⁴The effects of the Fornero reform on expected human wealth are further validated by using an age-gender-employment-specific constant rate of income growth estimated from SHIW data

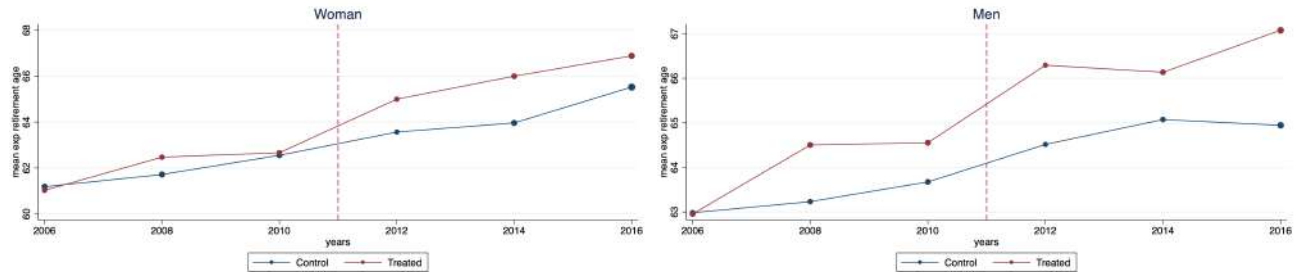
⁴⁵In the panel analysis the scarcity of data on expected replacement rates is particularly relevant. Hence, in those specifications the missing information is replaced with gender-employment-specific statutory replacement rates obtained from the microsimulation of [6] Coda Moscarola and Borella (2015), which were affected by the new pension rules as outlined in Section 3.2. It is worth noting that post-reform expected replacement rates were on average lower than the statutory ones, which implies that the panel coefficients of changes in expected human wealth may exhibit upward bias.

⁴⁶This rate aligns with the estimated average real human wealth returns of 3.8% reported by [26] Lustig, Van Nieuwerburgh and Verdelhan (2013). The selection of the interest rate is further informed by an average real interest rate of 3.5% prevailing in Italy during the period 2006-2016: given the assumption that human wealth is akin to an illiquid bond, its returns are expected to be riskier.

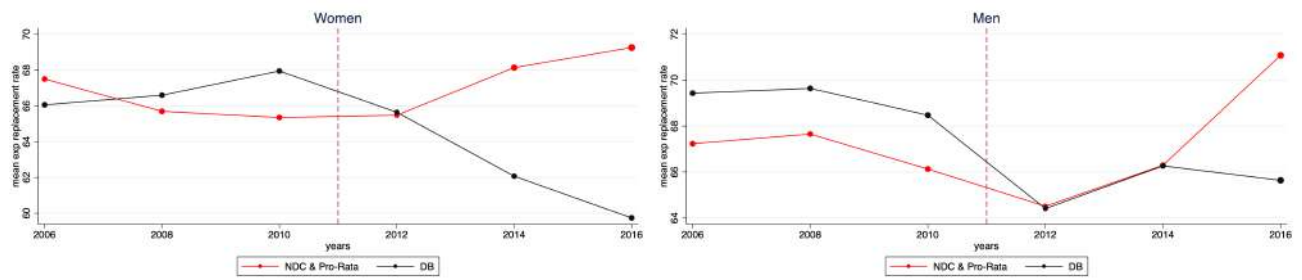
C Appendix

Descriptive Trends: Repeated Cross-Sections (2006-2016)

Expected Retirement Age by Treatment Group and Gender



Expected Replacement Rate by Pension Regime and Gender



Saving Rates and Saving Ratios by Gender

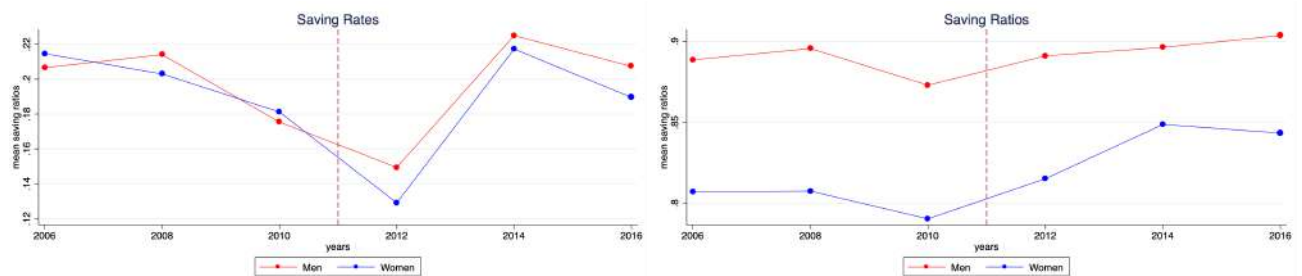


Figure 13: Source: SHIW 2006-2016

NOTE - The upper panels show trends in expected retirement age by treatment and gender. The middle panels present trends in expected replacement rate by pension regime and gender. DB workers were the sole group that encountered a negative pension wealth shock after the implementation of the Fornero reform. The lower panels represent trends in saving rates and saving ratios by gender: their relation is detailed in Appendix A. The sample includes household heads who had not retired and were not eligible to retire by 2010 following [10] Carta and De Philippis (2023). Women are aged between 45-59 and men between 45-64 in 2010. Both have less than 40 and more than 10 years of accrued paid contributions.

D Appendix

Summary Statistics

Pre-Reform Summary Statistics - Women

	(1)			(2)			(3)			difference
	All		count	Treated (MRA \geq 6y)		count	Control			
	mean	sd		mean	sd		mean	sd	count	count
Age	49.49	5.49	2447	49.23	5.54	835	50.61	3.97	792	-1.380***
Contributions Years	20.62	9.64	1943	19.06	7.81	835	26.07	7.95	792	-7.010***
Statutory MRA	59.98	2.03	1677	60.10	0.44	835	59.83	2.68	792	0.269***
Expected Retirement Age	62.20	3.89	1133	62.85	4.27	457	61.26	3.02	503	1.589***
Expected Replacement Rate	64.40	16.19	1133	63.55	14.92	457	67.26	14.48	503	-3.707***
Share DB Workers	0.38	0.48	1943	0.30	0.46	835	0.50	0.50	792	-0.203***
Share Married	0.57	0.50	2447	0.50	0.50	835	0.57	0.50	792	-0.069***
Share with Retired Partner	0.20	0.40	2447	0.15	0.36	835	0.23	0.42	792	-0.079***
Family Members	2.88	1.27	2447	2.71	1.29	835	2.76	1.17	792	-0.041
Share High Education	0.10	0.30	2447	0.17	0.38	835	0.08	0.27	792	0.092***
Share South Italy	0.37	0.48	2447	0.31	0.46	835	0.21	0.40	792	0.102***
Share Active	0.61	0.49	2447	0.74	0.44	835	0.83	0.37	792	-0.092***
Share Unemployed	0.33	0.47	2447	0.20	0.40	835	0.17	0.37	792	0.038**
Human Wealth	461883	365084	1133	457864	340264	457	465907	329305	503	-8042
Financial Wealth	11290.79	62276.92	2447	13475.35	73564.65	835	12988.90	59010.44	792	486.452
Saving Rate	0.18	0.32	2447	0.19	0.31	835	0.20	0.35	792	-0.011
Net Wealth	239101	426809	2447	250266	500413	835	271719	348826	792	-21453
Share Real Wealth	0.85	1.26	2447	0.80	1.07	835	0.88	0.73	792	-0.082*
Share Financial Liabilities	0.04	1.35	2447	0.01	1.12	835	0.07	0.80	792	-0.060
Share Financial Assets	0.20	0.49	2447	0.21	0.40	835	0.19	0.37	792	0.022
Share Bonds	0.01	0.05	2447	0.01	0.05	835	0.01	0.05	792	-0.001
Share Stocks	0.03	0.10	2447	0.03	0.09	835	0.04	0.11	792	-0.009*
Share Deposits	0.16	0.47	2447	0.18	0.38	835	0.14	0.34	792	0.033*
Observations	2447			835			792			

Table 1: Source - SHIW 2006-2016

NOTE - Column 1 reports means, standard deviations and number of observations during pre-reform years for all the sample of women aged between 45-59 in 2010, including those already eligible to retire under the seniority or quota schemes; Columns 2 and 3 report means, standard deviations, number of observations and average differences during pre-reform years for treated and control women 45-59 not eligible to retire by 2010. Female household heads are defined as treated if they experienced an increase in their *MRA* of at least 6 years after the reform. The high education variable is a dummy indicating whether women have at least a university degree. To analyze the composition of household assets, the financial variables are presented as a share of net wealth.

Pre-Reform Summary Statistics - Men

	(1)			(2)			(3)			difference
	mean	sd	count	mean	sd	count	mean	sd	count	
Age	53.03	6.34	6203	52.31	5.64	1063	50.99	5.03	2936	1.315***
Contributions Years	28.18	8.89	6076	26.56	4.88	1063	27.12	7.78	2936	-0.559**
Statutory <i>MRA</i>	62.61	3.32	5696	63.36	1.76	1063	61.45	3.69	2936	1.909***
Expected Retirement Age	63.32	4.02	3285	64.39	3.04	727	62.84	4.25	2013	1.554***
Expected Replacement Rate	67.72	15.70	3285	69.76	14.99	785	67.73	15.34	2013	2.027***
Share DB Workers	0.66	0.48	6076	0.75	0.44	2067	0.59	0.49	2936	0.156***
Share Married	0.86	0.35	6203	0.87	0.34	1063	0.86	0.35	2936	0.012
Share with Retired Partner	0.15	0.36	6203	0.09	0.29	1063	0.08	0.27	2936	0.016
Family Members	3.19	1.21	6203	3.29	1.22	1063	3.32	1.19	2936	-0.021
Share High Education	0.12	0.32	6203	0.20	0.40	1063	0.10	0.31	2936	0.097***
Share South Italy	0.33	0.47	6203	0.41	0.49	1063	0.30	0.46	2936	0.118***
Share Active	0.74	0.44	6203	0.96	0.20	1063	0.95	0.21	2936	0.007
Share Unemployed	0.04	0.20	6203	0.04	0.20	1063	0.05	0.21	2936	-0.007
Human Wealth	638650	460554	3285	650014	449893	785	645428	478819	2013	4586
Financial Wealth	22372	129752	6203	21166	102040	1063	21199	141859	2936	-32.478
Saving Rate	0.20	0.40	6203	0.19	0.40	1063	0.19	0.38	2936	0.001
Net Wealth	337000	719337	6203	379088	1073551	1063	334426	671712	2936	44661
Share Real Wealth	0.84	1.45	6203	0.91	0.59	1063	0.86	0.82	2936	0.049*
Share Financial Liabilities	-0.00	1.93	6203	0.09	0.66	1063	0.03	1.25	2936	0.066
Share Financial Assets	0.16	1.18	6203	0.18	0.43	1063	0.17	0.85	2936	0.017
Share Bonds	0.01	0.06	6203	0.01	0.06	1063	0.01	0.06	2936	0.001
Share Stocks	0.03	0.11	6203	0.03	0.10	1063	0.03	0.11	2936	-0.006
Share Deposits	0.11	1.17	6203	0.14	0.40	1063	0.12	0.84	2936	0.021
Observations	6203			1063			2936			

Table 2: Source - SHIW 2006-2016

NOTE - Column 1 reports means, standard deviations and number of observations during pre-reform years for all the sample of men aged between 45-64 in 2010, including those already eligible to retire under the seniority or quota schemes; Columns 2 and 3 report means, standard deviations, number of observations and average differences during pre-reform years for treated and control men 45-64 not eligible to retire by 2010. Male household heads are defined as treated if they experienced an increase in their *MRA* of at least 4 years after the reform. The high education variable is a dummy indicating whether men have at least a university degree. To analyze the composition of household assets, the financial variables are presented as a share of net wealth.

E Appendix

Role of Age and Contribution Years on the Treatment Variable

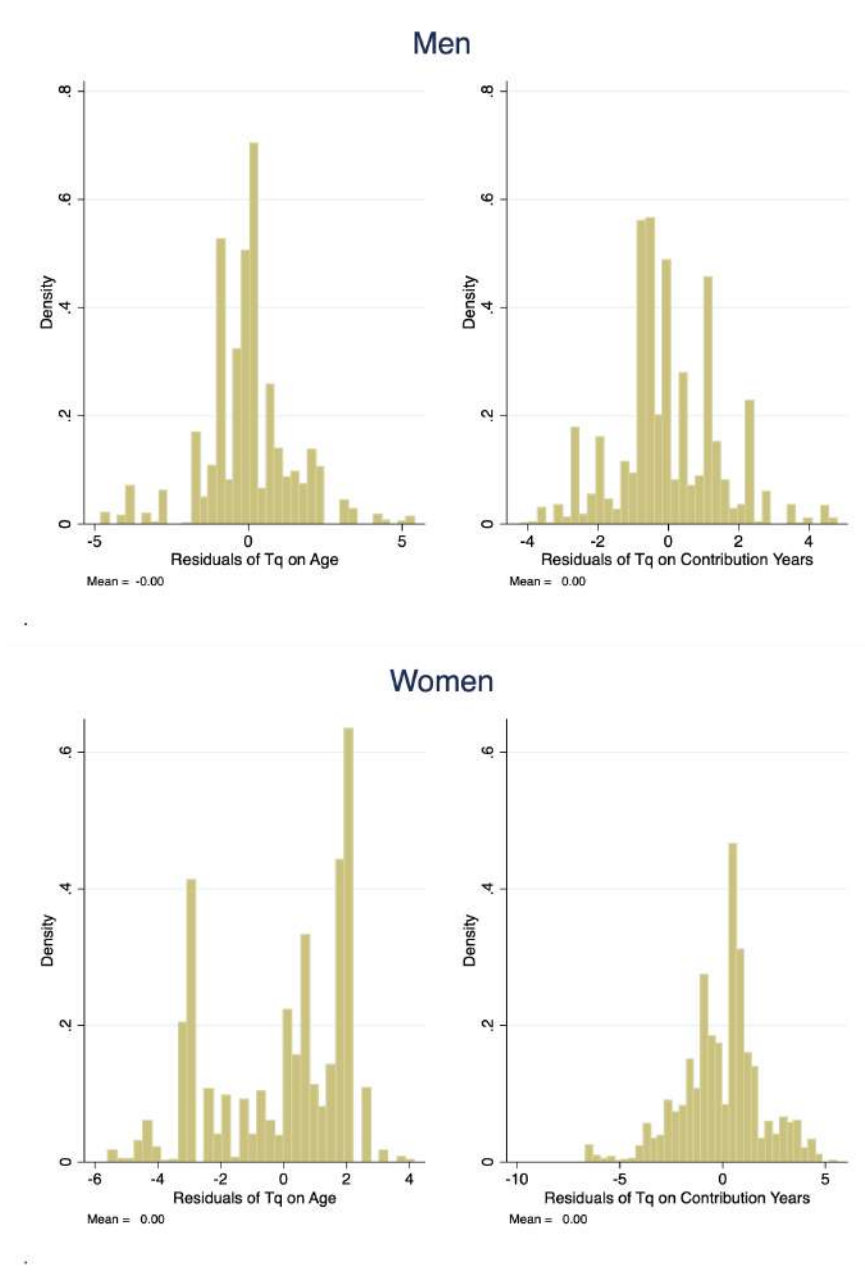


Figure 14: Source: SHIW 2006-2016

NOTE - The left (right) panel reports the distribution of the residuals from a regression of the continuous treatment $T_q = MRA_{q,post} - MRA_{q,pre}$ on age (contribution years) at the 2006 level. The upper and lower figures includes respectively men 45-64 and women 45-59 not eligible to retire by 2010. The extent to which the control variable accounts for the observed increase in MRA can be inferred from the degree of skewness towards zero in the distributions of the residuals. The figures suggest that age plays a stronger explanatory role for increases in male MRA , while contribution years have a greater impact for female shocks.

F Appendix

Baseline Results: Tables

Effects of Increased *MRA* among Most Exposed Men
Saving Rates and Saving Ratios

	Saving Rates				Saving Ratios		
	SavRates (1)	Sav/LaborIncome (2)	Savings (3)	LaborIncome (4)	ExpHumWealth (5)	FinWealth (6)	SavRatios (7)
All							
$\Delta MRA \geq 4y$ -post	0.0566** (0.0239)	0.0885* (0.0475)	3121.0* (1572.8)	-738.6 (2500.7)	118180.6* (61247.0)	-6924.9 (7149.2)	0.0149 (0.0209)
<i>N</i>	4013	4013	4013	4013	3204	4013	4013
Mean Control Pre-reform	0.150	0.203	11392.8	22901.2	659184.6	26557.9	0.883
NDC & Pro-Rata Workers							
$\Delta MRA \geq 4y$ -post	-0.0207 (0.0444)	0.0119 (0.0552)	-111.1 (3159.1)	-5403.4 (5012.3)	194568.9* (105885.2)	-17166.7 (13071.9)	-0.0225 (0.0369)
<i>N</i>	1701	1701	1701	1701	1576	1701	1701
Mean Control Pre-reform	0.135	0.155	11169.4	22676.5	746798.5	15535.3	0.928
DB Workers							
$\Delta MRA \geq 4y$ -post	0.0636** (0.0311)	0.127* (0.0714)	1697.4* (893.0)	-1955.9 (1633.5)	-39908.8 (54265.7)	-2335.7 (7819.3)	0.0107 (0.0323)
<i>N</i>	2406	2406	2406	2406	1646	2406	2406
Mean Control Pre-reform	0.164	0.245	11592.1	23101.7	615082.7	31106.8	0.865
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cell FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ContributionYears_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
EducationLevel_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Area_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Occupation_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CivilStatus_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RetiredPartner_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Illiquidity_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FamilyMembers_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WealthQuartiles_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 3: Source - SHIW 2006-2016

NOTE - The table reports the DID estimates of the average effects of the extended working horizon due to the Fornero reform for the most exposed male workers. Men are defined as treated if they experienced an increase in their *MRA* of at least 4 years after the reform. The first panel involves all male household heads 45-64 with less than 40 years of accrued paid contributions and not eligible to retire by 2010 following [10] Carta and De Philippis (2023). The second and third panels split the sample among NDC & Pro-Rata workers and DB workers respectively. DB workers were the sole group that encountered a negative pension wealth shock after the implementation of the Fornero reform. The specifications control for year and cell fixed effects, with each cell being assigned based on age, years of contributions, gender and employment status. The additional control variables include marital status, area of residence, employment status, level of education, family size, wealth quartiles and whether the individual's partner is retired or not. These variables are assessed at the 2006 level and interacted with time dummies. Standard errors are clustered at the cell level.

*** Statistically significant at 1% level.

** Statistically significant at 5% level.

* Statistically significant at 10% level.

Effects of Increased *MRA* among Most Exposed Men
Wealth Decomposition and Financial Assets
Variables normalized by Net Wealth

	Wealth			Financial Assets		Risky Assets	
	RealAssets (1)	FinancialAssets (2)	FinancialLiab. (3)	Safe (4)	Risky (5)	Stocks (6)	Bonds (7)
All							
$\Delta MRA \geq 4y\text{-post}$	-0.00560 (0.0203)	-0.000765 (0.0201)	-0.00636* (0.00379)	-0.0171 (0.0170)	0.0151** (0.00750)	0.0153*** (0.00601)	-0.000198 (0.00414)
<i>N</i>	4962	4962	4962	4962	4962	4962	4962
Mean Control Pre-reform	0.816	0.191	0.00686	0.145	0.0401	0.0312	0.00888
NDC & Pro-Rata Workers							
$\Delta MRA \geq 4y\text{-post}$	-0.0391 (0.0366)	0.0313 (0.0383)	-0.00778 (0.00831)	-0.0202 (0.0312)	0.0559* * * (0.0143)	0.0445* * * (0.0122)	*0.0114 (0.00909)
<i>N</i>	2064	2064	2064	2064	2064	2064	2064
Mean Control Pre-reform	0.788	0.218	0.00625	0.165	0.0494	0.0387	0.0107
DB Workers							
$\Delta MRA \geq 4y\text{-post}$	0.0242 (0.0279)	-0.0306 (0.0272)	-0.00639 (0.00432)	-0.0321 (0.0236)	-0.00356 (0.00841)	0.000369 (0.00693)	-0.00392 (0.00401)
<i>N</i>	2886	2886	2886	2886	2886	2886	2886
Mean Control Pre-reform	0.839	0.169	0.00735	0.128	0.0327	0.0253	0.00745
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cell FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ContributionYears_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
EducationLevel_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Area_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Occupation_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CivilStatus_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RetiredPartner_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Illiquidity_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FamilyMembers_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WealthQuartiles_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 4: Source - SHIW 2006-2016

NOTE - The table reports the DID estimates of the average effects of the extended working horizon due to the Fornero reform on a decomposition of household wealth for most exposed male workers. Men are defined as treated if they experienced an increase in their *MRA* of at least 4 years after the reform. The first panel involves all male household heads 45-64 with less than 40 years of accrued paid contributions and not eligible to retire by 2010 following [10] Carta and De Philippis (2023). The second and third panels split the sample among NDC & Pro-Rata workers and DB workers respectively. DB workers were the sole group that encountered a negative pension wealth shock after the implementation of the Fornero reform. The first three columns depict the impact of the reform on net wealth, which encompasses real and financial assets minus financial liabilities. Column 4 captures the effects on deposits, denoted as safe assets, while column 5 presents the impact on risky financial assets, i.e. stocks and bonds, further analyzed in columns 6 and 7. All variables are normalized with respect to net wealth. The specifications control for year and cell fixed effects, with each cell being assigned based on age, years of contributions, gender and employment status. The additional control variables include marital status, area of residence, employment status, level of education, family size, wealth quartiles and whether the individual's partner is retired or not. These variables are assessed at the 2006 level and interacted with time dummies. Standard errors are clustered at the cell level.

*** Statistically significant at 1% level.

** Statistically significant at 5% level.

* Statistically significant at 10% level.

Effects of Increased *MRA* among Most Exposed Women
Saving Rates and Saving Ratios

	Saving Rates				Saving Ratios		
	SavRates (1)	Sav/LaborIncome (2)	Savings (3)	LaborIncome (4)	ExpHumWealth (5)	FinWealth (6)	SavRatios (7)
All							
$\Delta MRA \geq 6y$ -post	-0.0788** (0.0373)	-0.110** (0.0524)	-2989.7** (1395.0)	-1540.5 (1375.1)	81055.2** (30715.7)	12642.4 (8970.8)	0.00417 (0.0218)
<i>N</i>	1644	1644	1644	1644	1241	1644	1644
Mean Control Pre-reform	0.198	0.335	10555.5	21915.9	471832.7	12988.90	0.798
NDC & Pro-Rata Workers							
$\Delta MRA \geq 6y$ -post	-0.106** (0.0420)	-0.142** (0.0551)	-2019.4* (1164.7)	-1867.9 (1662.6)	96495.1* * * (30721.8)	9800.9 (10410.8)	-0.0499** (0.0235)
<i>N</i>	1037	1037	1037	1037	833	1037	1037
Mean Control Pre-reform	0.191	0.290	10406.0	22872.3	519026.9	10346.47	0.824
DB Workers							
$\Delta MRA \geq 6y$ -post	0.000823 (0.0619)	-0.0302 (0.129)	-583.3 (2863.5)	-3805.7 (2530.7)	-54157.5 (70950.7)	-3179.0 (18968.7)	0.0826 (0.120)
<i>N</i>	600	600	600	600	393	600	600
Mean Control Pre-reform	0.204	0.373	10679.0	21126.4	426717.5	15659.59	0.775
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cell FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
EducationLevel_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Area_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Occupation_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CivilStatus_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RetiredPartner_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Illiquidity_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FamilyMembers_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WealthQuartiles_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 5: Source - SHIW 2006-2016

NOTE - The table reports the DID estimates of the average effects of the extended working horizon due to the Fornero reform for the most exposed female workers. Women are defined as treated if they experienced an increase in their *MRA* of at least 6 years after the reform. The first panel involves all female household heads 45-59 with less than 40 years of accrued paid contributions and not eligible to retire by 2010 following [10] Carta and De Philippis (2023). The second and third panels split the sample among NDC & Pro-Rata workers and DB workers respectively. DB workers were the sole group that encountered a negative pension wealth shock after the implementation of the Fornero reform. The specifications control for year and cell fixed effects, with each cell being assigned based on age, years of contributions, gender and employment status. The additional control variables include marital status, area of residence, employment status, level of education, family size, wealth quartiles and whether the individual's partner is retired or not. These variables are assessed at the 2006 level and interacted with time dummies. Standard errors are clustered at the cell level.

*** Statistically significant at 1% level.

** Statistically significant at 5% level.

* Statistically significant at 10% level.

Effects of Increased *MRA* among Most Exposed Women
Wealth Decomposition and Financial Assets
Variables normalized by Net Wealth

	Wealth			Financial Assets		Risky Assets	
	RealAssets (1)	FinancialAssets (2)	FinancialLiab. (3)	Safe (4)	Risky (5)	Stocks (6)	Bonds (7)
All							
$\Delta MRA \geq 6y$ -post	-0.0582** (0.0222)	0.0685* * * (0.0227)	0.0103** (0.00496)	0.0389* (0.0228)	0.0294 (0.0208)	0.0224 (0.0181)	0.00696 (0.00749)
<i>N</i>	1157	1157	1157	1157	1157	1157	1157
Mean Control Pre-reform	0.815	0.193	0.00825	0.139	0.0514	0.0373	0.0140
NDC & Pro-Rata Workers							
$\Delta MRA \geq 6y$ -post	-0.0809** (0.0312)	0.0974* * * (0.0318)	0.0165* * * (0.00609)	0.0403 (0.0313)	0.0557** (0.0255)	0.0489* (0.0254)	0.00680 (0.00506)
<i>N</i>	654	654	654	654	654	654	654
Mean Control Pre-reform	0.813	0.193	0.00661	0.136	0.0542	0.0422	0.0120
DB Workers							
$\Delta MRA \geq 6y$ -post	-0.182* (0.103)	0.176* (0.102)	-0.00597 (0.00593)	0.158 (0.101)	0.0189 (0.0435)	0.00568 (0.0259)	0.0132 (0.0228)
<i>N</i>	493	493	493	493	493	493	493
Mean Control Pre-reform	0.817	0.193	0.00939	0.141	0.0494	0.0340	0.0155
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cell FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
EducationLevel_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Area_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Occupation_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CivilStatus_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RetiredPartner_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Illiquidity_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FamilyMembers_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WealthQuartiles_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 6: Source - SHIW 2006-2016

NOTE - The table reports the DID estimates of the average effects of the extended working horizon due to the Fornero reform on a decomposition of household wealth for most exposed female workers. Women are defined as treated if they experienced an increase in their *MRA* of at least 6 years after the reform. The first panel involves all female household heads 45-59 with less than 40 years of accrued paid contributions and not eligible to retire by 2010 following [10] Carta and De Philippis (2023). The second and third panels split the sample among NDC & Pro-Rata workers and DB workers respectively. DB workers were the sole group that encountered a negative pension wealth shock after the implementation of the Fornero reform. The first three columns depict the impact of the reform on net wealth, which encompasses real and financial assets minus financial liabilities. Column 4 captures the effects on deposits, denoted as safe assets, while column 5 presents the impact on risky financial assets, i.e. stocks and bonds, further analyzed in columns 6 and 7. All variables are normalized with respect to net wealth. The specifications control for year and cell fixed effects, with each cell being assigned based on age, years of contributions, gender and employment status. The additional control variables include marital status, area of residence, employment status, level of education, family size, wealth quartiles and whether the individual's partner is retired or not. These variables are assessed at the 2006 level and interacted with time dummies. Standard errors are clustered at the cell level.

*** Statistically significant at 1% level.

** Statistically significant at 5% level.

* Statistically significant at 10% level.

G Appendix

Continuous Treatment Specifications: Tables

Linear Effects of Increased *MRA* among Men
Saving Rates and Saving Ratios

	Saving Rates				Saving Ratios		
	SavRates (1)	Sav/LaborIncome (2)	Savings (3)	LaborIncome (4)	ExpHumWealth (5)	FinWealth (6)	SavRatios (7)
All							
T_q .post	0.0152* * *	0.0236	806.2**	145.9	22664.7**	-855.6	-0.0144
	(0.00572)	(0.0154)	(333.5)	(634.5)	(10030.3)	(3093.0)	(0.00942)
<i>N</i>	4013	4013	4013	4013	3204	4013	4013
Mean Control Pre-reform	0.233	0.328	15233.0	24870.5	553278.3	39158.1	0.841
NDC & Pro-Rata Workers							
T_q .post	0.0232	0.00173	950.2	110.2	22617.6	-5555.5	0.00885
	(0.0158)	(0.0258)	(1265.8)	(1311.3)	(28061.0)	(4826.2)	(0.00757)
<i>N</i>	1701	1701	1701	1701	1576	1701	1701
Mean Control Pre-reform	0.201	0.308	12001.9	18726.9	563234.8	7851.4	0.927
DB Workers							
T_q .post	0.00933	0.0352**	260.0	-738.9	-1317.5	264.4	-0.0158
	(0.00629)	(0.0177)	(231.2)	(708.7)	(7986.8)	(3025.3)	(0.0100)
<i>N</i>	2406	2406	2406	2406	1646	2406	2406
Mean Control Pre-reform	0.234	0.326	15415.7	25299.0	558251.3	40896.6	0.838
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cell FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ContributionYears_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
EducationLevel_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Area_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Occupation_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CivilStatus_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RetiredPartner_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Illiquidity_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FamilyMembers_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WealthQuartiles_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 7: Source - SHIW 2006-2016

NOTE - The table reports the DID estimates of the average linear impact of the extended working horizon due to the Fornero reform for forward-looking male workers. T_q represents the number of additional working years faced after the reform. The first panel involves all male household heads 45-64 with less than 40 years of accrued paid contributions and not eligible to retire by 2010 following [10] Carta and De Philippis (2023). The second and third panels split the sample among NDC & Pro-Rata workers and DB workers respectively. DB workers were the sole group that encountered a negative pension wealth shock after the implementation of the Fornero reform. The specifications control for year and cell fixed effects, with each cell being assigned based on age, years of contributions, gender and employment status. The additional control variables include marital status, area of residence, employment status, level of education, family size, wealth quartiles and whether the individual's partner is retired or not. These variables are assessed at the 2006 level and interacted with time dummies. Standard errors are clustered at the cell level.

*** Statistically significant at 1% level.

** Statistically significant at 5% level.

* Statistically significant at 10% level.

Linear Effects of Increased *MRA* among Women
Saving Rates and Saving Ratios

	Saving Rates				Saving Ratios		
	SavRates (1)	Sav/LaborIncome (2)	Savings (3)	LaborIncome (4)	ExpHumWealth (5)	FinWealth (6)	SavRatios (7)
All							
T_q ·post	-0.0137** (0.00671)	-0.0237* (0.0130)	-439.6 (280.7)	-155.8 (287.0)	6609.4 (7534.0)	2462.4 (1913.5)	0.00552 (0.00512)
<i>N</i>	1644	1644	1644	1644	1241	1644	1644
Mean Control Pre-reform	0.197	0.358	10251.2	21216.7	430849.5	14068.1	0.763
NDC & Pro-Rata Workers							
T_q ·post	-0.0134 (0.0120)	-0.0284 (0.0322)	-1109.0 (735.1)	-745.7 (448.4)	12111.5 (7521.6)	883.5 (2367.1)	-0.0151** (0.00710)
<i>N</i>	1037	1037	1037	1037	833	1037	1037
Mean Control Pre-reform	0.185	0.303	9681.4	22015.1	488367.0	6815.9	0.784
DB Workers							
T_q ·post	0.00890 (0.0148)	0.00684 (0.0366)	-128.9 (485.3)	-89.03 (619.7)	-30918.4** (13831.4)	2630.8 (3585.2)	0.0103 (0.0241)
<i>N</i>	600	600	600	600	393	600	600
Mean Control Pre-reform	0.198	0.375	10177.7	21106.1	405740.8	19200.4	0.763
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cell FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
EducationLevel_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Area_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Occupation_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CivilStatus_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RetiredPartner_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Illiquidity_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FamilyMembers_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WealthQuartiles_2006*year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 8: Source - SHIW 2006-2016

NOTE - The table reports the DID estimates of the average linear impact of the extended working horizon due to the Fornero reform for forward-looking female workers. T_q represents the number of additional working years faced after the reform. The first panel involves all female household heads 45-59 with less than 40 years of accrued paid contributions and not eligible to retire by 2010 following [10] Carta and De Philippis (2023). The second and third panels split the sample among NDC & Pro-Rata workers and DB workers respectively. DB workers were the sole group that encountered a negative pension wealth shock after the implementation of the Fornero reform. The specifications control for year and cell fixed effects, with each cell being assigned based on age, years of contributions, gender and employment status. The additional control variables include marital status, area of residence, employment status, level of education, family size, wealth quartiles and whether the individual's partner is retired or not. These variables are assessed at the 2006 level and interacted with time dummies. Standard errors are clustered at the cell level.

*** Statistically significant at 1% level.

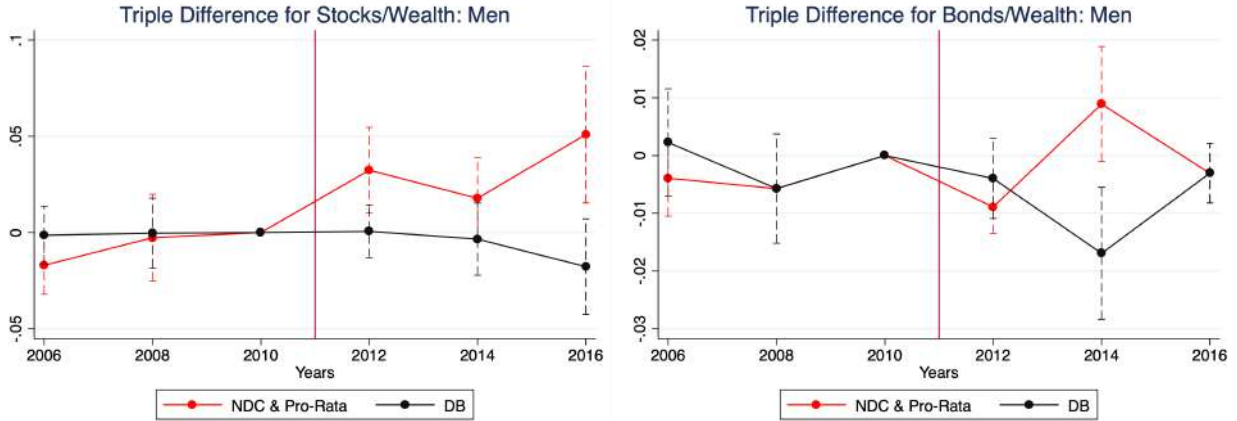
** Statistically significant at 5% level.

* Statistically significant at 10% level.

H Appendix

Differential effects of Increased *MRA* by Pension Regime on the Allocation of Risky Assets

Share of Stocks and Bonds - Men



Share of Stocks and Bonds - Women

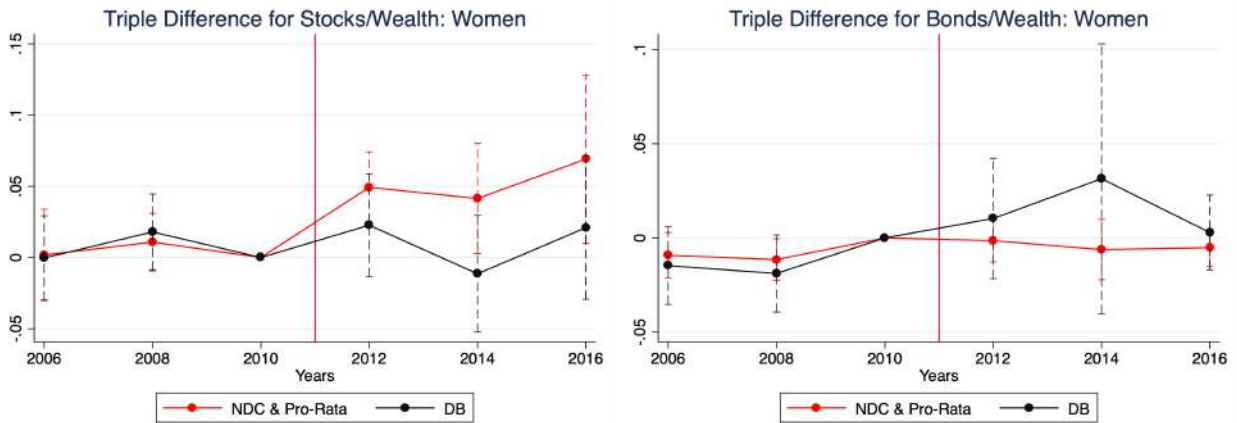


Figure 15: Source: SHIW 2006-2016

NOTE - The panels report the triple DID coefficients of the average effects of the extended working horizon for individuals under the Notional Defined Contribution and Pro-Rata regimes ($Treat_q \cdot \alpha_t$), as well as the differential impact of increasing the *MRA* for workers under the Defined Benefit regime ($Treat_q \cdot DB_i \cdot \alpha_t$). The left panels report estimates for the changes in the share of stocks out of net wealth among the middle-aged male and female household heads most exposed to the reform, while the right panels present results for the changes in their share of bonds. The sample includes individuals who had not retired and were not eligible to retire by 2010 following [10] Carta and De Philipphis (2023). Men aged between 45-64 (women aged between 45-59), with less than 40 and more than 10 years of accrued paid contributions, are defined as treated if they experienced an increase in their *MRA* of at least 4 (6) years after the reform. The specifications control for year and cell fixed effects, with each cell being assigned based on age, years of contributions, gender and employment status. The additional control variables are assessed at the 2006 level and interacted with time dummies. Standard errors are clustered at the cell level.

Summary

Most pension systems need to recover long-term financial sustainability and grant equality of treatment within and across generations. Recent decades have witnessed the prevalent adoption of reforms reducing future pension benefits or implementing *actuarially fair* regimes that link state pensions to accrued contributions, whose impact on savings and portfolio allocations has been extensively studied in the literature. However, in response to the demographic challenges posed by aging populations and declining fertility rates, governments have started to implement another policy tool: raising the Minimum Retirement Age (*MRA*). While the important labor effects of extending people’s working horizons have been well-documented by existing research, little attention has been paid to the consequences for financial decisions. Furthermore, although such reforms change pension eligibility rules for a broad spectrum of workers and generate widespread public debate, research efforts have disproportionately focused on the responses of close-to-retirement individuals, thus neglecting middle-aged workers. By leveraging the 2011 Italian Fornero reform as a quasi-natural experiment, the following study aims to address these gaps.

The effect of raising the *MRA* on individual expected human wealth, and consequently on financial choices, is an empirical question. Indeed, these reforms have the potential to influence the discounted present value of future labor earnings and pension benefits through two main channels: labor responses and government incentives. Requiring workers to wait longer to be eligible for public pension benefits can prompt them to either rely solely on their existing wealth or, more commonly, to prolong their working horizons for additional years. Among far-from-retirement workers, the potential positive income channel ([17] Etgeton et al, 2023) due to such increase in expected labor earnings could boost consumption levels, so that an unchanged current income would suggest a decrease in saving rates. However, considering that standard dynamic consumption models posit that households should be primarily concerned with the proportion they save out of their total wealth rather than solely out of their current income in order to ensure consumption smoothing over time, this study examines conventional saving rates and further explores individual *saving ratios*, a measure of the optimal stock of savings out of lifetime wealth proposed by [34] Ordonez and Piguillem (2022). Moreover, as human capital is typically compared to a bond endowment given its uncertainty, illiquidity and weak correlation with stock market returns, changes in expected labor earnings and pension benefits resulting from such reforms can also influence portfolio decisions. Specifically, in accordance with diversification motives, an increase in the ratio of human wealth out of financial wealth could raise stock investments ([30] Merton, 1975). Government incentives can also play a significant role in shaping the impact of pension reforms raising the *MRA* on expected human wealth. If post-reform rules increase the annuity

rates governing pension formulas as a reward for each additional working year, individuals could anticipate enhanced human wealth due to both extra periods of labor earnings and improved pension benefits upon retirement. Conversely, individuals facing a postponement of constant pension benefits could internalize a reduction in their expected pension wealth. The impact of negative pension wealth channels on financial decisions has been extensively studied in the literature, with the main empirical result being the substitution effect proposed by [19] Feldstein (1974): pension wealth crowds out discretionary wealth. Consequently, a decrease in the expected generosity of the pension system typically leads to higher saving rates ([1] Attanasio and Brugiavini, 2003) and portfolio shifts towards safer and real assets ([8] Bottazzi et al, 2010). The 2011 Italian pension reform provides an ideal setting to comprehensively test all these empirical predictions for the first time.

The Fornero reform suddenly and heterogeneously increased the *MRA* up to 7 years and created different pension wealth shocks across pension regimes. Specifically, in order to harmonize pension rules among workers, the government introduced incentives to work longer for individuals under *actuarially fair* pension regimes: each additional working year was rewarded by higher statutory replacement rates. Conversely, individuals enrolled in the more generous Defined-Benefit scheme experienced a negative pension wealth shock mainly due to the postponement of constant pension benefits. Hence, this work aims to disentangle the roles played by positive labor shocks and negative pension wealth channels on financial decisions for middle-aged workers. The analysis leverages data from the Bank of Italy’s biannual Survey on Household Income and Wealth, which provides information on individual expectations of retirement age and replacement rate, as well as the composition of household wealth. The main results rely on repeated cross-sectional data collected from 2006 to 2016 involving a sample of nearly 6,000 workers not eligible to retire before the reform and are further validated by a rotating panel component covering the years 2008 to 2014. To examine the impact of the Fornero reform, this work employs a difference-in-difference methodology that leverages the variation in *MRA* within cells built on the key determinants of the Italian pension eligibility: age, contribution years, gender and employment status. To account for the potential nonlinear impact of such *MRA* increases and the limited responsiveness to small shocks of middle-aged workers, the study adopts a treatment assignment strategy that focuses on the workers most affected by the 2011 reform following the approach proposed by [10] Carta and De Philippis (2023). The baseline results presented refer to male workers, as they allow for a more straightforward comparison between treatment and control groups.

On average, after 2011 men with important *MRA* shocks reduced their expectations of future pension benefits: this puzzling result aligns with previous research, which proposed a potential explanation rooted in

a lack of awareness regarding the functioning of an *actuarially fair* pension system, wherein pension benefits increase with additional contribution years ([33] Oggero, 2022). However, this study provides an alternative perspective: a pension wealth channel driven by government incentives to work for extra years. Indeed, the results show that the decrease in expected replacement rates observed after the Fornero reform was primarily driven by workers exposed to relevant *MRA* increases covered by the generous Defined-Benefit method, who experienced a negative pension wealth channel due to an *important* delay of unchanged pension benefits. This reduction in expected pension benefits offset the positive income channel resulting from additional periods of labor earnings, leading to no significant change in their expected human wealth. On the other hand, *actuarially fair* workers exposed to large *MRA* increases raised their expected replacement rates in line with post-reform rules: the consequent positive shocks on both labor and pension incomes explain their post-reform significant increase in expected human wealth. Then, the study uncovers the role of changes in expected human wealth in shaping financial dynamics and provides a rationale for the average increase in savings observed in SHIW data after 2011 for the workers most exposed to the Fornero reform, already noted by [10] Carta and De Philippis (2023) and in stark contrast to the narrative of enhanced lifetime wealth resulting from reforms raising the *MRA*. Triple DID estimates analyzing the impact of *MRA* shocks by pension regime illustrate how the observed increase in savings was driven by people experiencing a negative pension wealth channel, consistent with the previously mentioned Feldstein’s substitution effect. On the other hand, individuals experiencing a positive human wealth channel reduced their optimal proportion of savings out of lifetime wealth, in line with intertemporal smoothing motives, and nearly doubled their portfolio allocation to stocks. Lastly, the use of SHIW panel data coupled with an examination of female and household dynamics further validate the main casual relationships obtained from repeated cross-sectional analyses.

This research project presents the first empirical findings of the impact of reforms raising the *MRA* on expected human wealth and private wealth’s components for middle-aged workers. The results align with the theoretical predictions linking changes in human wealth to financial decisions and provide evidence of *forward-looking* middle-aged Italian workers internalizing the new rules imposed by the 2011 reform. Furthermore, this project contributes to the ongoing debate on the pension wealth effects of the Fornero reform by showing that individuals, on average, possess a comprehensive understanding of the Italian pension system, including the implications of pension reforms on their future sources of income. Finally, the heterogeneity of the new rules across pension regimes allows the study to disentangle the role of public incentives in shaping workers’ expectations and financial decisions. By designing pension reforms that reward individuals for prolonging their working careers, governments can generate positive human wealth effects, which could in turn lead to reductions in current savings and increases in stock holdings potentially impacting retirement savings.

On the other hand, pension systems that lack incentives or resources to reward longer working horizons can result in negative pension wealth channels, which could prompt workers to increase current savings and allocate a larger portion of their wealth towards safer options.