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How raising the full retirement age affects women's early retirement choices: insights from the interaction of two policies

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How raising the full retirement age affects women's early retirement choices: insights from the interaction of two policies

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How raising the full retirement age affects women's early retirement choices: insights from the interaction of two policies*

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Abstract

This paper assesses how a reform that increased statutory retirement age from 60 to 64 years has changed the incentives for early retirement among women. In the Italian context that we consider, women can anticipate retirement after age 57, if they have obtained 35 years of contributions. By using Italian administrative data, the analysis employs a novel identification strategy based on a Differences-in-Differences design, in which assignment to treatment is estimated in a Regression Discontinuity setting. By comparing women who are eligible for the early retirement scheme before and after the reform, we find that those eligible retire earlier by about 2 months after the reform is implemented. We also find that women eligible for the early retirement scheme after the reform implementation receive a 900 Euros lower annuity compared to those not affected by the reform. This effect corresponds to a 5% lifetime reduction in annuity. The effects are stronger for women with low labor market attachment and without a college education.

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Come l'innalzamento dell'età pensionabile influisce sulle scelte di pensionamento anticipato delle donne: approfondimenti dall'interazione di due politiche*

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Abstract

Questo articolo valuta come una riforma che ha innalzato l'età pensionabile da 60 a 64 anni abbia modificato gli incentivi al pensionamento anticipato tra le donne. Nel contesto italiano, le donne possono anticipare il pensionamento dopo i 57 anni, se hanno maturato 35 anni di contributi. Utilizzando dati amministrativi italiani, l'analisi impiega una nuova strategia di identificazione basata su un disegno Differences-in-Differences, in cui l'eleggibilità al trattamento è stimata in un contesto di Regression Discontinuity. Confrontando le donne che hanno diritto al pensionamento anticipato prima e dopo la riforma, scopriamo che quelle aventi diritto vanno in pensione prima di circa 2 mesi dopo l'attuazione della riforma. Inoltre, dall'analisi emerge che le donne aventi diritto al pensionamento anticipato dopo l'attuazione della riforma ricevono una rendita vitalizia inferiore di 900 euro annui rispetto a quelle non interessate dalla riforma. Questo effetto corrisponde a una riduzione del 5% della pensione nel corso della vita. Gli effetti sono più marcati per le donne con un basso attaccamento al mercato del lavoro e senza un'istruzione universitaria.

JEL Classification: J16, J20, J22, J26, H55

Keywords: pensionamento; pensionamento anticipato; attaccamento al mercato del lavoro femminile; montante contributivo; politiche pubbliche

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JEL Classification: J16, J20, J22, J26, H55

Keywords: statutory retirement; early retirement; women's labor market attachment; social security wealth; policy evaluation.

1 Introduction

In the context of aging societies, the length of working careers has become crucial for ensuring the sustainability of public pension systems. Over the past decade, Western governments have intervened by increasing the retirement age required to qualify for a pension. However, this extended working period has imposed costs on individuals approaching retirement, as the disutility of work increases with age (Gruber & Wise 1998), especially for socio-demographic groups less attached to the labor market. Sudden pension reforms may have significant implications for women nearing retirement, whose careers are already impacted by labor market interruptions and weaker attachments due to caregiving responsibilities.

This paper exploits a unique and unexpected pension reform in Italy to identify how a sharp increase in retirement eligibility affects women's incentives for early retirement. While the reform raised the retirement age by at least four years, it left the early retirement option unchanged: women with a sufficient number of contribution years could choose early retirement at the cost of receiving a substantially lower pension amount.

Our analysis focuses on the Monti-Fornero reform enacted in Italy in 2011, which unexpectedly tightened the eligibility requirements for claiming full retirement benefits. The mandated increase in retirement age varied significantly by gender: for men, the retirement age increased from 65 to 67; for women, the first cohort affected by the reform faced an increase from 60 to 64, while for the subsequent cohorts retirement age was set to 67. The minimum number of contribution years required for old-age pension remained at 20. The reform was largely unexpected due to its swift implementation, coming into force on January 1, 2012, just 25 days after its presentation in the Parliament. The reform did not alter the so-called "Opzione Donna" (OD), an early retirement option available since 2008 only for women, which allowed them to retire at 57 with at least 35 years of contributions, albeit with an annuity penalty due to its defined-contribution computation.

The analysis centers on women for two main reasons. First, the reform resulted in a larger increase in retirement age for women than for men: the requirement rose from 60 to 64 (and to 67 for subsequent cohorts), while for men it increased only from 65 to 67. Second, the

early retirement scheme was available only to women. Understanding how women's retirement behavior is specifically impacted by the increasing retirement age is critical, as women tend to live longer than men and are likely to spend much of their retirement in widowhood, often without adequate savings or annuities (Bettio et al. 2013). Moreover, although women's employment has risen throughout the 20th century (Olivetti & Petrongolo 2016), they often prioritize job attributes compatible with household responsibilities, such as flexible work schedules and shorter commutes, which can lead to worse earning opportunities (Petrongolo & Ronchi 2020). This disparity may later translate into smaller pensions. From a policy perspective, this concern is heightened by increasing longevity and changes in public pension generosity (Börsch-Supan & Coile 2021). Additionally, research indicates that women possess lower financial literacy than men (Lusardi & Mitchell 2008) and have less awareness of pension information (Angelici et al. 2022), which may influence their reactions to sudden increases in retirement age.

This paper aims to assess whether the Monti-Fornero reform has altered the incentives for early retirement among women. We adopt a novel identification strategy, based on a differences-in-differences design, in which assignment to the treatment is estimated in a Regression Discontinuity setting. In practice, we compare women who are eligible for OD with women who are not, based on the number of years of contributions they have accrued, both in the cohort which was not affected by the Monti-Fornero reform (1951) and in the first cohort which was instead affected (1952). Table 1 summarizes the pre- and post-reform requirements for the 1951 and 1952 cohorts considered in the analysis: the Monti-Fornero reform changed the full retirement age for old-age pensions starting from the 1952 cohort, while leaving OD unaffected. The assignment to the treatment is based on the fact that a woman has more or less than 35 years of contributions when the Monti-Fornero reform is implemented.

Our analysis leverages a rich set of Italian administrative data, which allows us to observe work histories and retirement choices of women working in the private sector. The data allows us to observe women's demographic characteristics and career information, such as whether they used any unemployment spell, sick leave or family leave, which we use to construct measure of labor market attachment.

Table 1: Age requirements before and after the Monti-Fornero reform by cohort

		Cohort			
Type of pension	# contributions	1951		1952	
		before	after	before	after
Old age	c≥ 20 years	60	60	60	64
Early retirement	c≥ 35 years	57	57	57	57

Notes: This table provides the age required before and after the Monti-Fornero Reform to be eligible for the old age (c≥ 20 years contribution) and the early retirement pension "Opzione Donna" (c≥ 35 years contribution) **Sources**. Authors' elaborations based on information from National Social Secuirity Institute (INPS), Circolare INPS n35 (2012)

The results show that women who are eligible for OD and are subject to the increase in statutory retirement age induced by the reform retire earlier by about 2 months compared to women who are not eligible and not subject to the reform. Even though the effect on retirement age is quite small, we also find that women who are eligible for OD and subject to the reform face a reduction in annuity by about 900 Euros per year, which corresponds to a 5% lifetime reduction. The substantial decrease in the pension amount is consistent with the fact that OD entails a computation of the annuity according to the defined-contribution scheme, while the women of the cohorts considered, if retired at statutory retirement age, would be subject to a defined-benefit or mixed pension computation scheme. These results are robust across several sensitivity analyses, including more demanding specifications, changes in bandwidth selection, and the use of placebo cutoffs. Furthermore, we uncover important heterogeneous effects. Our findings show that women with low labor market attachment and low level of education are more likely to retire earlier, indicating that those already in the most disadvantaged groups are retiring at the cost of smaller annuities. We also investigated the interaction between the retirement scheme, career progression, and retirement choice. We found that women with salaries above the median and those who were previously under the defined-benefit scheme before the Fornero reform, faced the most significant penalties when opting for early retirement. This evidence further confirms that women do not solely consider monetary compensation when making pension decisions; they also weigh other non-pecuniary factors. Finally, we also examined women's social security wealth and found that the penalty for those retiring earlier (i.e., with over 35 years of contributions) is 11% compared to women with fewer than 35 years of contribution.

The findings highlight two main policy implications. First, the reform, which aimed to extend

women's working lives, has inadvertently pushed some women toward early retirement, even at a financial cost. This indicates that women do not only consider monetary incentives when making pension choices; timing and other non-monetary factors also influence their decisions. Second, women from disadvantaged groups—such as those with low education, work interruptions, and weak labor market attachment—are more likely to exit the labor market earlier. This suggests that these already vulnerable women may be more responsive (and sensitive) to a pension reform aimed at enhancing their labor market participation, potentially facing a higher risk of poverty in old age due to these early pension choices.

This paper contributes to three strands of literature that seek to understand how individuals respond to pension reform.

First, to our knowledge, we are the first to provide causal estimates of the impact of increasing retirement age on women nearing retirement and how this has affected their incentives for early retirement. Only a few recent studies have examined the increase in the statutory retirement age (SRA) (Mastrobuoni 2009, Behaghel & Blau 2012, Staubli & Zweimüller 2013, Manoli & Weber 2016*a*, Seibold 2021, Lalive et al. 2023), while others have focused on changes in benefit generosity close to retirement (Krueger & Pischke 1992, Song & Manchester 2007, Liebman et al. 2009, Manoli & Weber 2016*b*). These studies find that individuals respond to pension reform by increasing their labor supply and delaying retirement, which contrasts with our findings in this paper. In the Italian context, most studies focus on the Monti-Fornero reform's effect on the labor market attachment of relatively young women, revealing that women responded by increasing their labor supply (Carta & De Philippis 2023). Other researchers have evaluated the spillover effects of the reform on older workers who were locked in, affecting younger workers who experienced a block in their career development (Bianchi et al. 2022, Carta et al. 2021, Boeri et al. 2022). One study specifically examined the reform's effect on individuals at least five years from retirement, finding that sick leave increased only for women (Brunello et al. 2025). Our paper differs from previous studies by assessing the impact of the reform on women nearing retirement when the reform was enacted and evaluating their response. This is particularly important from a policy perspective, as in OECD countries, among individuals over age 50 who

provide informal care, 60% are women (OECD 2023). Thus, women are more likely to bear caregiving responsibilities at an older working age.

Second, we contribute to the literature on changes in the computation rules of pension benefits (Boeri & Brugiavini 2008, French 2005, Engels et al. 2017, French et al. 2022). Since the defined-contribution scheme allows for early retirement but is significantly less generous than the defined-benefit scheme, we can assess how women respond to these financial disincentives.

Third, this paper also relates to a recent strand of literature Behaghel & Blau (2012), Lalive et al. (2023), Seibold (2021), Laun & Palme (2023), Rabaté et al. (2024) that finds individuals respond to pension reforms behaviorally, in contrast to the standard optimal retirement model. Our results indicate that women do not base their retirement choices solely on financial incentives, suggesting that other factors, such as disutility from continued work, also play a role. This finding implies that, similar to trends observed in the labor market—where women tend to prioritize jobs that offer better work-life balance over higher remuneration Felfe (2012*a*,*b*), Petrongolo & Ronchi (2020)–retirement choices may also be influenced by factors beyond remuneration, further contributing to the existing gender gap in pension amounts (OECD 2021).

The rest of the paper proceeds as follows. Section 2 describes the institutional setting. Section 3 describes the data, while Section 4 presents the econometric analysis and discusses the main assumptions needed for identification. Section 5 presents the results, and the sensitivity analyses. Section 6 discusses the potential mechanisms and Section 7 the effect on the social security wealth. Finally, Section 8 concludes.

2 Institutional framework

The Italian pension system primarily relies on public pension provision, with alternative mandatory or voluntary pension funds playing a negligible role (COVIP 2022). Individuals can claim their pension through either the "old age pension," which is based on retirement age and a minimum number of years of contribution, or the "seniority" scheme, which is based solely on years of contribution. Both schemes ensure full annuity benefits for retirees, which are usually

very generous; this is partly the reason why workers retire as soon as they reach the eligibility requirements (Brugiavini 1997, 2001, Battistin et al. 2009). In the Italian system, individuals are considered retired when they begin claiming their first pension benefit.

The Italian pension system has been largely reformed since the 90s in order to ensure sustainability. While several reforms gradually increased full retirement age, this paper considers the so-called Monti-Fornero reform, which was enacted on December 2011, and induced the most substantial increase in statutory retirement age, especially for women.[1] The Monti-Fornero reform, from the names of the prime minister and the minister of labor who enacted it, was largely unexpected due to its rapid implementation, driven by pressure from the European Union to control public spending: the right-wing government resigned on November 12, 2011, and the subsequent "technocratic government", held by Prime Minister Mario Monti, took office on November 16; the pension reform was presented on December 6 and approved on December 22.

The reform resulted in a sharp and unexpected increase in eligibility requirements, aimed at reducing the pension burden on public finances. Under the pre-reform regime, female workers in the private sector could retire with the old age pension scheme at age 60, provided that they had at least 20 years of contributions. Under the new reform rules, the age requirement swiftly increased from 60 to 67 for women by 2020. Women who were eligible to retire under the pre-reform rules by December 31st, 2011, were considered as exempted from the Reform, and thus, they could still retire at age 60, provided that they had 20 years of contributions. This exemption is known as the "Grandfathering clause" and refers to women born in 1951, who turned 60 in 2011 and were thus eligible to retire at 60 years of age. While the ultimate goal of the reform was to bring retirement age to 67 years of age, women turning 60 in 2012 and with at least 20 years of contributions by 31st December 2012, faced a lower increase in retirement age, as they could retire at 64 years of age instead of 67. This gradual change in statutory retirement age was introduced by an implementing regulation issued by the Italian Social Security Institute (INPS), on March 2012.[2] Despite representing a gradual implementation of the reform, still, women born

[1] The reform also impacted the *seniority* pension scheme: under pre-reform rules, individuals could retire with 40 years of contribution with no minimum age; the new rules raised the required contributions for women from 40 to 42 years. In our analysis, we exclude individuals with 40 years of contributions or more.

[2] *Circolare INPS 35/2012.*

in 1952, turning 60 in 2012, who, according to the pre-reform rule were supposed to retire that year, suddenly realized that they must work for additional 4 years. Finally, private-sector female workers born in 1953 or later faced the new statutory retirement age of 67 years.[3]

The Monti-Fornero reform did not change the early retirement scheme, known as *Opzione Donna* (OD), which was made available to women only since 2008. According to OD regulation, women working in the private sector could retire with 35 years of contributions and at least 57 years of age.[4] As all early retirement schemes lead to a penalization in the annuity, OD entails a substantial financial penalty too. It is worth mentioning that an important reform affecting the Italian pension system was introduced in 1995 and referred to the pension computation method (i.e. the so-called Dini reform): before 1995, individuals retired under the defined-benefit scheme, according to which the annuity was an average of the last five to ten years of gross earnings; after the Dini reform, individuals with less than 18 years of contribution fell under the "mixed scheme," while those starting to work from 1996 were put under the full notional defined-contribution scheme, which is based on the amount of social security contributions accrued during the careers. Generally, pensions computed according to the full notional defined-contribution scheme are lower than those computed according to the mixed method, which again are lower than those computed according to the defined-benefit scheme (OECD, 2021). Since its introduction, OD entails that the pension amount is computed according to the defined-contribution scheme; (INPS, 2023) estimates that OD computation method may lead to a permanent reduction of about 15% in annuity for women who would have otherwise retired according to the defined-benefit or mixed schemes.

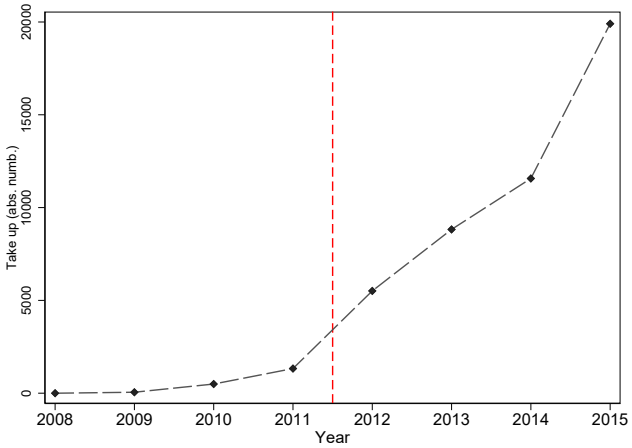
While the strong monetary penalization may have limited the take up of OD, we believe that the substantial increase in retirement age induced by the Monti-Fornero reform may have changed the incentives to early retirement, despite the financial cost. Figure 1 illustrates the OD take-up over time (in absolute numbers), since its implementation in 2008: the figure indicates

[3]Certain categories were exempted from the increase in retirement age due to the reform and could retire under special *ad-hoc* rules. This group included individuals in mobility, solidarity contracts, those in public train service, flight service, maritime service, and strenuous jobs. In our analysis, we drop the observations belonging to these categories.

[4]Nowadays OD is still in place, even though the age limit has been increased.

that the largest uptick in take-up occurred after the enactment of the Monti-Fornero reform at the end of 2011.

Figure 1: Take up of the early retirement scheme *Opzione Donna*



Notes. The graph reports the number of women working in the private sector who retired with the *Opzione Donna* early retirement scheme from 2008 until 2015. The red dashed line indicates the year (2012) in which the Monti-Fornero reform took place. **Source**: own elaborations on INPS (2016, Table 3.1)

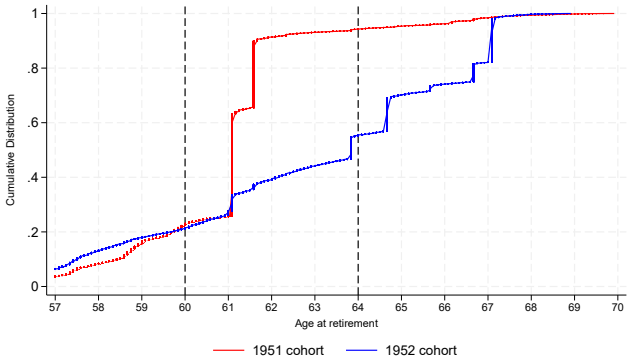
As the aim of the paper is to assess whether the take up of OD increases as a consequence of the Monti-Fornero reform, we compare the retirement behavior of the 1952 cohort, which is the first cohort affected by the SRA increase of 4 years, and the 1951 cohort, which instead was not affected by the SRA increase (conditionally on having at least 20 years of contributions). Figure 2 displays the cumulative age at retirement for both cohorts, by using the administrative data at our disposal. The figure indicates that the vast majority of women born in 1951 retired by age 62, in line with the SRA regulation in place, while about 40% of of women born in 1952 retired between 60 and 64, suggesting that the 1952 cohort did not fully comply with the reform and may have opted for early retirement options.

3 Data

The analysis is based on administrative data provided by INPS, the national social security and welfare institute in Italy.[5] In particular, we use two main sources of data: (i) pension data on

[5]More information about INPS can be obtained from https://www.inps.it/nuovoportaleinps/default.aspx?itemdir=47212.

Figure 2: Retirement age (cumulative distribution) by cohort



Notes: The graph shows the cumulative distribution of the retirement age for the cohorts 1951 and 1952; the dashed lines represent the statutory retirement ages: 60 for the 1951 cohort and 64 for the 1952 cohort. **Source**: Own elaborations on INPS data on women born in 1951 and 1952, and who retired from 2008 to 2020.

the universe of retirees, and (ii) dataset on the work history of individuals.

Dataset (i) includes all retired individuals from 1998 onward and include information on the age at which retirement benefits are collected, the type of pension (i.e. whether old age, seniority or survivor's pension), the number of years of contributions accrued at retirement, the annuity computation method (i.e. whether defined-benefit, mixed or defined-contribution) as well as the benefit amount. We use this dataset to construct the main dependent variables of the analysis: age at retirement (in months), and monthly pension amount (expressed in 2020 Euros). Moreover, we use this dataset to control for whether the woman receives a survivor's benefit, which is particularly important in the Italian setting where 85% of this type of pension are paid to women (INPS 2023), as well as to control for the type of the pension computation method the woman is entitled to, depending on when she started working. Regarding the pension computation method, it should be noticed that the women considered in the analysis (born in 1951 or in 1952) are either subject to the defined-benefit scheme or to the mixed scheme, hence in any case they would face a substantial penalty if retired with OD which entails the defined-contribution method.

Dataset (ii) provides employment histories of the universe of private sector workers (excluding agriculture) in Italy for individuals born from 1950 onward. The data include employee demographics, marital status, region of residence, periods of sickness or family leave during their career, and earnings and type of contract (i.e., part-time vs full-time). We use this dataset to

construct control variables on the individual's region of residence and marital status;[6] moreover, we define a binary variable equal to one if the woman had any family or sick leave, or unemployment spell in the last 15 years, and we label this variable as *Low labor market attachment*; furthermore, we define an indicator variable for whether the woman's wage at the last job was above the median in the female working population, and an indicator variable for whether the last job was part-time.

Importantly, dataset (ii) on the work history of individuals allows us to recover the number of years of contributions accrued by each individual at every point in time/age. This allows us to overcome a crucial issue that, instead, we face in the pension dataset. In fact, dataset (i) does not provide information on whether the woman retired with OD or with another scheme. In the analysis, we tackle this issue by using the fact that women are eligible for OD only if they have at least 35 years of contributions. More precisely, we define a woman as eligible for OD if she has 35 years of contributions or more at a specific age. We select the age by following the Reform implementation laws: in particular, women of the 1951 cohort were exempted from the SRA increase, provided that they had at least 20 years of contributions by 31st December 2011, because they turned 60 in 2011; instead, women of the 1952 cohort, turning 60 in 2012, faced a SRA of 64 instead of 60, provided that they had at least 20 years of contributions by 31st December 2012, otherwise the SRA would be 67 years of age, as for the subsequent cohorts.[7] We thus define a variable representing the months of contributions accrued by women on December 31, 2011, for the 1951 cohort, and on December 31, 2012, for the 1952 cohort, and we consider a woman as eligible for OD if she has more than 35 years of contributions at age 60, corresponding to 420 months.[8]

From the INPS data, we can recover two additional pieces of information, which, however, are not available for the entire population. First, after 2010, employers started to disclose to INPS information about educational attainment for all contracts that opened, changed, or closed; we

[6] Although we know that couples could have joint decisions to retire (Banks et al. 2010, Stancanelli & Soest 2012, Hospido & Zamarro 2014, Ciani 2016, Stancanelli 2017), we cannot identify the partner in the data due to privacy reason, and, hence, we cannot control for any partner's characteristics.

[7] See Law 214/2011 and INPS interpretative norm number 35/2012.

[8] For the construction of the number of years/months of contributions accrued at a specific point in time, we follow the procedure adopted by Bianchi et al. (2022).

thus observe the level of education for about one third of the individuals. Second, for a 13% sample of individuals, we observe the sector of employment in the last job. We use the level of education and the last sector of employment as control variables in robustness checks presented in Section 5.2 below.

For our analysis, we select women born in 1951 or 1952, who retired with either an old age or seniority pension. We included women retiring between 2011 and one year after the statutory retirement age, i.e. until 2013 for the 1951 cohort and until 2017 for the 1952 cohort.[9]

The identification strategy, detailed in Section 4 below, is based on the comparison of women with a number of months of contributions above and below the threshold of 420 months; to ensure such comparability we focus on the sample of women within one year from the 35-year of contribution cutoff, comprising 6,708 observations for which we observed all variables of interest. Table 2 reports descriptive statistics on the outcome variables considered in the analysis, by eligibility status to OD (given by the number of years of contributions being above or below the 35 cutoff) and by cohort. The table clearly shows that retirement age (in months) increases for the 1952 cohort, however women born in 1952 with more than 35 years of contributions at age 60 have a slightly lower retirement age compared to those below the cutoff. For annuity, we observe that, on average, women of the 1952 cohort receives a larger pension (due to the longer working horizon) and also that the pension amount increases with years of contributions.

Table 2: Descriptive statistics on retirement age and annuity, by eligibility status to OD and cohort.

	1951		1952	
	Below 35YoC	Above 35YoC	Below 35YoC	Above 35YoC
Retirement age (months)	735	735	762	759
Annuity	1146.9	1222.5	1277.9	1335.2
N	1803	1979	1312	1614

Notes: The table reports the average values of the outcome variables considered in the analysis for women with more or less than 35 years (420 months) of contributions at age 60, and by cohort. We consider a sample of women with months of contributions at age 60 ranging between 408 and 432. **Source**: Own elaborations on INPS data.

[9]The sample selection implies that we focused on women who had not yet retired in 2011. Concerning the 1951 cohort this implies that they haven't used any early retirement schemes before the Monti-Fornero reform was enacted. Figure 2 reassures us that this should not be an issue in this setting, because the trend in retirement age before the age of 60 is similar for the 1951 and the 1952 cohorts.

4 Identification Strategy

The aim of the paper is to assess whether women who are eligible for OD are more likely to retire early after the increase in SRA induced by the Monti-Fornero reform, and what would be the effect of such anticipation on the annuity they receive.

As anticipated in Section 3 above, we define a woman as being eligible for OD if she has more than 35 years of contributions at age 60. More precisely, we consider the information on months of contributions as the running variable of the analysis, and focus on women who have between 408 months (34 years) and 432 months (36 years) of contributions at age 60. Hence, one potential empirical strategy could be a regression discontinuity design around the 35-year-of-contributions cutoff on the sample of women born in 1952, who are the first cohort subject to the Monti-Fornero reform. However, we should also take into account the fact that OD was already available before the Reform, and thus any discontinuity we may observe at the 35-year-of-contributions cutoff for the 1952 cohort could depend on pre-reform trends. We tackle this issue by also using the 1951 cohort, which was not affected by the Monti-Fornero reform.

Our analysis is thus based on a differences-in-differences strategy, in which the assignment to the treatment is estimated in a regression discontinuity setting. The treatment is the eligibility for OD and is associated with the fact that the woman has 35 years of contributions or more at age 60. The 1952 cohort represents the *post* period (in a diff-in-diff setting), and allows us to measure the take up of OD when the SRA increase takes place, while the 1951 cohort proxies the take-up of OD in absence of the SRA increase. Our empirical strategy differs from the difference-in-discontinuities model proposed by Grembi et al. (2016) and adopted in cohort analyses by, among others, Carneiro et al. (2015) and Canaan et al. (2024). Their setting features a double policy treatment at a single threshold, and the identification strategy is designed to isolate the effect of one policy from the pre-existing one. In our context, however, the 35-year-of-contributions cutoff is relevant only for OD eligibility, and the two cohorts represent the periods before and after the reform's implementation.

Figure 3 graphically illustrates the variation in retirement age and annuity induced by the 35-year of contribution cutoff for each cohort. In terms of retirement age, Panel (a) shows

no jump for the 1951 cohort, suggesting that women unaffected by the Monti-Fornero reform had no incentive to retire earlier. For women born in 1952, whose SRA increased to 64, we observed a decrease in retirement age once the 35-year contribution threshold is crossed from below, indicating that early retirement is more appealing for these women despite the penalty. This implication is further highlighted in Panel (b), which shows that women of the 1952 cohort affected by the Monti-Fornero reform, who had more than 35 years of contributions at age 60, face a reduction in their annuity compared to women with fewer than 35 years of contribution, who were forced to comply with the reform regulation.

Before presenting our formal estimation equation, we further discuss the key assumption underlying our strategy: that eligibility for the OD scheme can be proxied by having accrued over 35 years of contributions by age 60. A potential challenge to this assumption's validity is the existence of other early retirement schemes targeting women with similar contribution histories. However, other relevant programs, such as the 'APE' (State Pension Advance), were introduced only in 2017, when the women in our sample were all eligible for the standard old-age pension. Furthermore, our focus on a narrow 12-month bandwidth around the 35-year contribution threshold minimizes the likelihood of confounding effects from other policies. Crucially, the OD scheme is unique in its use of a 35-year contribution requirement. This feature, combined with our observation of a sharp, simultaneous jump in both retirement age and annuity payments at this precise threshold (see Figure 3), provides strong evidence that the observed effect is driven by the OD scheme. This conclusion is consistent with the program's design, which explicitly incorporates a financial penalty on the annuity.

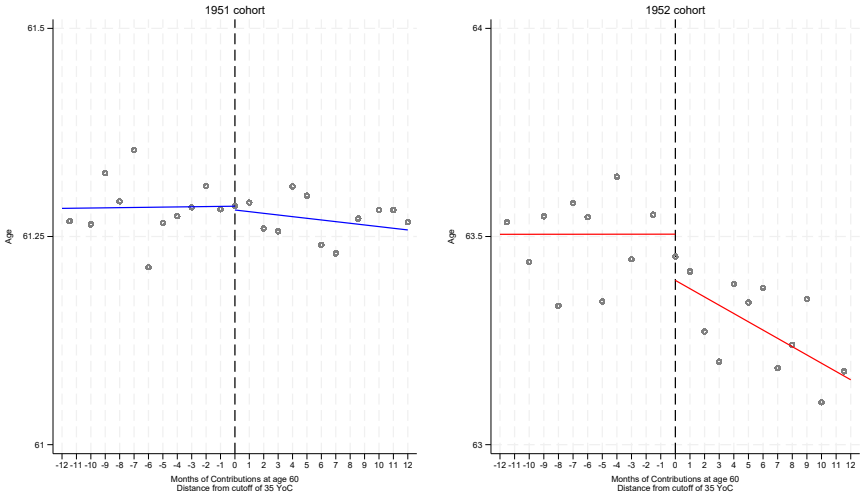
Formally, we estimate the following econometric model:

$$\begin{aligned} Y_{ij} = \gamma_0 + \gamma_1 Above35_{ij} + \gamma_2 f(C_{ij} - c) + \gamma_3 f(C_{ij} - c)(Above35_{ij}) \\ + \gamma_4 f(C_{ij} - c)(Above35_{ij} - 1) + \gamma_5 Post_{ij} + \gamma_6 Above35_{ij} Post_{ij} + \xi_{ij} \end{aligned} \tag{1}$$

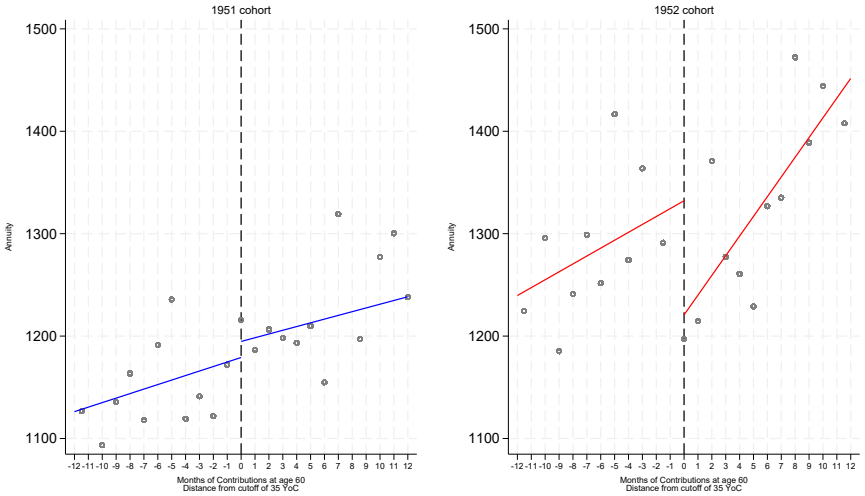
where Y_{ij} is the outcome for woman i born in cohort j, which can be either the retirement age or the pension annuity. The variable C_{ij} is the running variable, which is the number of months

Figure 3: Graphical evidence at the 35-year-of-contribution cutoff: age at retirement and annuity

(a) Retirement age



(b) Annuity



Notes: These graphs show the variation in the age of retirement (a) and the annuity (b) by cohort. We centered the analysis at 35 years of contribution, represented at 0 in the pictures. We consider a 12-month bandwidth from each side of the cutoff. **Source**: Own elaborations on INPS data.

of contribution at age 60.[10] The dummy variable $Above35_{ij}$ indicates whether the woman has more than 35 years of contribution at age 60. $Post_{ij}$ is a binary variable indicating whether the woman belongs to the 1952 cohort, affected by the Monti-Fornero reform. In the specification, we allow for different slopes on both sides of the cutoff, which are captured by the coefficients γ_3 and γ_4.

The coefficient of interest for our analysis is γ_6, which captures the effect of being eligible for OD in the post-reform era, with a SRA equal to 64. This coefficient indicates whether women subject to the increase in SRA, who had more than 35 years of contribution at age 60, anticipate retirement through OD, despite the penalty in the annuity imposed by the defined-contribution scheme. On the contrary, we expect that women with fewer than 35 years of contribution, who are not eligible for any form of early retirement scheme, are thus compelled to remain in the labor market.

The model was estimated using a first-order polynomial (Gelman & Imbens 2019), and we used a triangular kernel (Cheng et al. 1997). Standard errors were clustered at the running variable level (i.e., months of contribution). Because we estimated the effect of the reform parametrically, the choice of bandwidth was crucial. In the baseline analysis, we adopt a bandwidth of one year of contribution but we repeated the analysis using a bandwidth of 9 to 15 months of contribution.[11]

Our identification strategy relies on two key assumptions. First, individuals cannot precisely manipulate the running variable, ensuring its continuous distribution around the cutoff for each cohort. Second, women just above and below the cutoff must be comparable in their observable characteristics, and the two cohorts should not exhibit substantial pre-existing differences.

We test the first assumption in several ways. A density plot of the running variable (Appendix Figure A-1) shows no substantial discontinuities at the cutoff for either the 1951 or 1952 cohort, suggesting an absence of sorting.[12] Furthermore, precise manipulation of the running

[10] The running variable was normalized around the cutoff of 35 years of contribution (which correspond to 420 months), so that $c = 0$ at the cutoff.

[11] See Section 5.2.

[12] A formal test, estimating Equation 1 with the share of women at each level of the running variable as the dependent variable, confirms that the coefficient γ_6 is not statistically different from zero. Results available upon request.

variable—lifetime months of contributions—is unlikely, as it is a stock variable accumulated over a long career and cannot be easily adjusted near retirement. We also address a potential confounding channel, due to the fact that, in Italy, years of tertiary education can be counted as years of contributions.[13] Since this could provide an alternative path to early retirement for more educated women, in Section 5.2 we present a sensitivity analysis in which we control for the woman's education level.[14]

To test the second assumption, we perform balance tests on a range of pre-determined characteristics. Using the same specification as in Equation 1, we check for significant jumps at the cutoff for the covariates described in Section 3. The results, shown in Appendix Figure A-2, confirm that women on either side of the 35-year threshold are largely comparable and that there are no significant pre-existing differences between the cohorts for most variables. While our baseline analysis already controls for region of residence, marital status, and survivor's pension receipt, we confirm in Section 5.2 that our findings are robust to including the other observable characteristics as additional controls.

5 Results

5.1 Baseline results on retirement age and annuity upon retirement

Table 3 reports the baseline results of the analysis. We refer to age at retirement (defined in months) in Panel A and to the monthly annuity women receive upon retirement in Panel B. We present four specifications, in which we add progressively region of residence fixed effects, the woman's marital status and information on whether she receives a survivor's pension. Our preferred specification is the (iv) one.

The coefficient of variable *Post* corresponds to coefficient γ_5 in Equation 1 and identifies the effect of belonging to the 1952 cohort, thus being affected by the Monti-Fornero reform, provided that these women have less than 35 years of contribution at age 60 and are not eligible

[13] Law 114/1974

[14] Furthermore, our baseline results hold when excluding women with a tertiary degree from the sample. Results are available upon requests to the author.

for early retirement with OD. In other words, the coefficients γ_5 give us the *intended* effect of the Monti-Fornero reform. The results show that women born in 1952, with less than 35 years of contribution, retired 26 months (2 years and 2 months) later than the 1951 cohort with less than 35 years of contribution. Considering that the average retirement age for the 1951 cohort is 61.8 years, this result implies that the 1952 cohort without an early retirement option retired at age 64, indicating full compliance with the intentions of the reform. The longer working career implies that these women earned 144 euros more per month (see Panel B), which corresponds to an 11% increase in monthly annuity compared to the average annuity received by women born in 1951 with fewer than 35 years of contribution at age 60.

The coefficient of the variable *Above* refers to γ_1 in Equation 1 and represents the effect of having more than 35 years of contribution for the 1951 cohort; in other words, this coefficient captures any potential take-up of the early retirement scheme OD for the 1951 cohort. The coefficients reported in Table 3 suggest that OD was barely adopted by the cohort not affected by the Monti-Fornero reform. In both panels, the coefficients are small and positive, but not statistically significant. This finding is not surprising: OD could be adopted from age 57 onward, and the SRA before the Monti-Fornero reform was 60. Considering the monetary penalty associated with the take-up of OD, and the very small distance between the two age limits (57 vs. 60), most women may have decided to wait until the statutory retirement age to obtain the full annuity.[15]

Our primary coefficient of interest is on the interaction term *AbovePost*, denoted as γ_6 in Equation 1. This coefficient identifies the differential effect of OD eligibility (having over 35 contribution years) for the 1952 cohort, which was subject to the Monti-Fornero pension reform, relative to the 1951 cohort.

[15] A further potential explanation for our findings relates to the sample selection criteria, which could introduce a selection bias. Our analysis is restricted to women who were not yet retired in 2011. For instance, a woman born in 1951 who utilized the OD scheme to retire at age 59 in 2010 would not be in our sample. However, such a scenario is unlikely to confound our estimates. For this woman to be eligible for retirement at 59, she would have needed to accumulate over 35 years of contributions. Consequently, by age 60—the age at which we measure her contribution history for the analysis—she would have accrued more than 36 years of contributions. This would place her well outside the ±1 year bandwidth around the 35-year threshold used in our research design. Therefore, the narrow bandwidth of our empirical strategy inherently mitigates the risk that our results are biased by the sample selection criterion.

Concerning retirement age (panel A), our results show that the reform narrowed the gap in retirement age between OD-eligible and ineligible women by two months. This suggests an increased take-up of the early retirement option among women facing a later statutory retirement age, although this behavioral response is modest. When considering pension annuity (panel B), we find that the annuity differential between eligible and ineligible women decreases by €66 per month for the post-reform cohort, implying an annual annuity reduction of approximately €900. By taking into account the small effect we found for retirement age, such a monetary penalization can be justified only by the different computation method imposed to women opting for OD, and we thus interpret this negative coefficient as further evidence of increased OD enrollment. The overall magnitude of this effect is considerable: this represents a 5% loss relative to the full pension obtainable under the standard old-age scheme. In Section 7, we investigate whether this immediate penalty also translates into a reduction in women's overall lifetime contributions.

Table 3: Baseline results on the age of retirement and the annuity

	(i)	(ii)	(iii)	(iv)
Panel A. Retirement Age (months)				
Above	0.1757	0.2337	0.1997	0.2468
	(0.3224)	(0.3154)	(0.3205)	(0.3166)
Post	26.7644***	26.7391***	26.7661***	26.7368***
	(0.3939)	(0.4145)	(0.3913)	(0.4138)
Above×Post	-2.2131***	-2.1728***	-2.2134***	-2.1663***
	(0.5190)	(0.5314)	(0.5217)	(0.5332)
Panel B. Annuity (2020 Euros)				
Above	0.2931	2.5516	-6.4008	-1.8187
	(22.7216)	(18.4562)	(23.1060)	(18.5953)
Post	144.7474***	147.3507***	141.9041***	144.8512***
	(14.9601)	(14.6407)	(15.0377)	(14.3837)
Above×Post	-60.5231*	-69.5766**	-56.1814*	-66.3480**
	(29.3801)	(28.2538)	(29.0978)	(27.8664)
Region FE		✓		✓
Married/Survival pension			✓	✓
N	6708	6708	6708	6708

Notes: The table reports the results of a parametric estimation of Equation 1, with retirement age (in months) as dependent variables in panel A and annuity amount (in 2020 Euros) in Panel B. The variable *Above* indicates whether the woman has more than 35 years of contributions at age 60; *Post* whether the woman belongs to the 1952 cohort; and *AbovexPost* indicates women who belong to the 1952 cohort (and hence are subject to the Monti-Fornero reform) and have more than 35 years of contributions at age 60. Standard errors are clustered at the months of contribution level. The bandwidth is 12 months from the cutoff of 420 months of contributions at age 60. P-values: * p<0.10, ** p<0.05, *** p<0.01
Source: Own elaborations on INPS data.

5.2 Sensitivity analysis

We tested the robustness of our results across three main dimensions: (i) we controlled for potential variables that may systematically jump at the 35-year-contribution cutoff (as reported in Figure A-2 in Appendix), (ii) we changed the bandwidth selection, and (iii) we perform a placebo analysis using other cutoffs than the 35-year-of-contribution one.

Table 4 reports the baseline results when we controlled for additional characteristics of the women in the sample. In column (i), we control for whether the woman has a low labor market attachment; column (ii) controls for having the last wage above the median wage, column (iii) for being under the mixed computation scheme, and column (iv) for being a part-time worker in the last job. Finally, in column (v), we control for the sector of the workers, although this is available for a subsample, and for having college education in column (vi). Panel A shows the results for the age of retirement for the coefficient of interest: the results confirm an effect of about 2 months of anticipation for the treated cohort with more than 35 years of contribution, in line with the baseline findings in Table 3. Panel B of the table reports evidence for the annuity, and again the results are robust to the inclusion of women's individual characteristics.

Table 4: Sensitivity analysis on retirement age and annuity: control for women's characteristics.

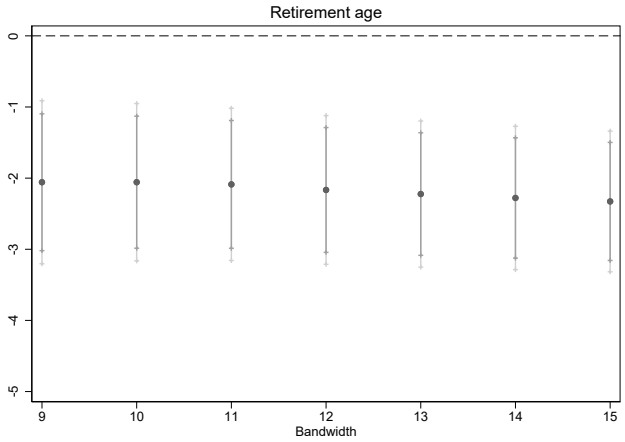
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Panel A. Retirement Age						
Above×Post	-2.1235***	-2.1662***	-2.1645***	-2.1776***	-7.8600***	-3.2009***
	(0.5557)	(0.5302)	(0.5332)	(0.5312)	(2.2997)	(0.8064)
Panel B. Annuity						
Above×Post	-62.4443**	-73.4161**	-65.9585**	-67.2537**	-185.8279*	-75.0580*
	(27.7374)	(28.9793)	(27.9904)	(27.7259)	(94.9791)	(41.6116)
Low labor mkt attachment	✓					
Last wage above median		✓				
Mixed contribution scheme			✓			
Last job Part-time				✓		
Sector of last empoyment					✓	
College education						✓
N	6708	6708	6708	6708	1537	2906

Notes. The table reports the results of a parametric estimation of Equation 1, for age at retirement (Panel A) and annuity (Panel B). We control for marital status, survivor's pension, region and add additional controls one by one, as reported in the bottom of the table. In particular we control for having a low labor market attachment, having the last wage above the median, being under the mixed contribution scheme, being a part-time worker in the last job, sector fixed-effect and having a college education. Standard errors are clustered at the months of contribution. p-values: * p<0.10, ** p<0.05, *** p<0.01
Source: Own elaborations on INPS data.

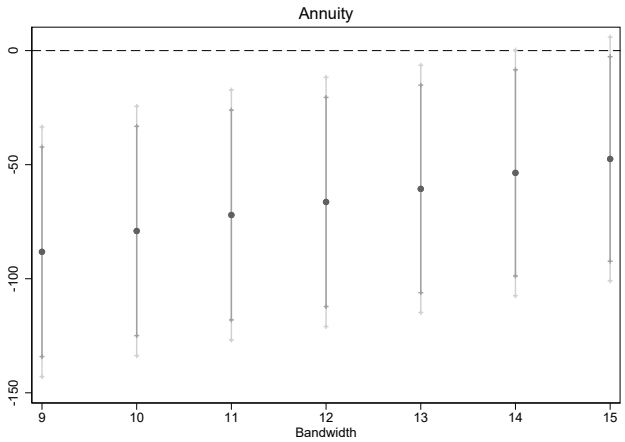
Second, we test the sensitivity of the results to the choice of bandwidth. We run the baseline model with different bandwidth specifications, selecting bandwidths from 9 to 15 months and reporting the estimated coefficients of interest for parameter γ_6 in Figure 4. We observe that the effect on both retirement age and annuity are stable across the specifications.

Figure 4: Sensitivity analysis on retirement age and annuity: bandwidth selection.

(a)



(b)



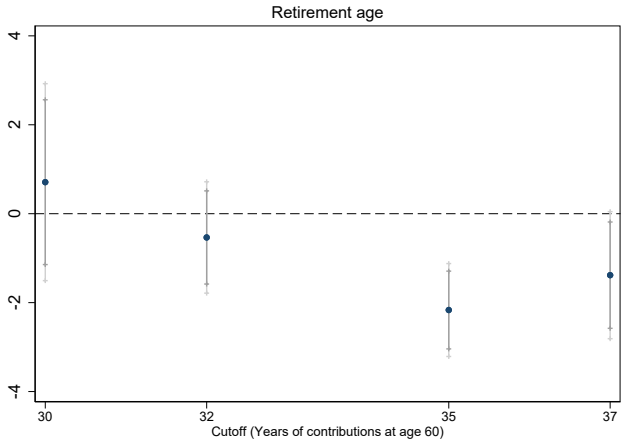
Notes The figures report the results of a parametric estimation of Equation 1, with the age of retirement as dependent variables in Figure (a) and the annuity amount in Figure (b), with a bandwidth selection ranging between 9 and 15 months, as reported on the horizontal axis. We report the estimates for the coefficient of interest γ_6 at 5% and 10% level of significance. **Source**: Own elaborations on INPS data.

Third, we perform a series of placebo analysis in which we vary the cutoff considered, to address the concern that our results are not picking up the OD effect but others of alternative early retirement scheme. In particular, we consider the cutoffs of 30, 32, and 37 years of con-

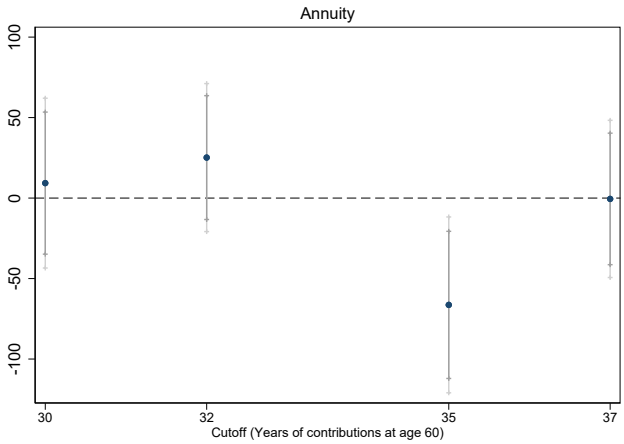
tributions, in addition to the one of 35 which is considered in the baseline analysis. Figure 5 reports the results for both retirement age and annuity, and show that neither cutoff (apart from the 35-year-of-contribution one) gives a statistically significant effect. This result is reassuring that the effect found at the 35-year contribution threshold captures the effect of the OD scheme.

Figure 5: Placebo analyses on different cutoffs

(a)



(b)



Notes The figures report the results of a parametric estimation of Equation 1 (baseline specification), with the age of retirement as dependent variable in Figure (a) and the annuity amount in Figure (b). We report the coefficient of interest for γ_6 (Above×Post) estimates. We select cutoffs 30-32-35-37 years of contribution, as reported on the horizontal axis. Results are reported at 10% and 5% significance level. Standard errors are clustered at the months of contribution level. **Source**: Own elaborations on INPS data.

6 Mechanisms

As the baseline results point to a modest anticipation effect, which, however, has substantial implications for the annuity received by women, in this section, we shed light on the potential mechanisms that could explain such an effect. In what follows, we present the results by dividing the sample in subgroups which can be informative of different channels at play: (i) by using the information on labor market attachment that we have derived from the presence of sick leave, family leave or unemployment spell, we distinguish between women with low or high labor market attachment; (ii) we exploit the information on the working time of the last job before retirement, to distinguish between women working part time or full time; (iii) we use the information on the computation scheme women will be subject to upon retirement and distinguish between those entitled to a defined-benefit (DB) scheme and those entitled to a mixed scheme, the latter implying a lower pension amount than the former. Classification (i) aims at identifying women who have less opportunities in the labor market and weaker careers. Classification (ii) aims at identifying whether the choice to anticipate retirement is due to time constraints, which may indicate a difficulty to reconcile work with other care duties at home: this is particularly important in the Italian setting, where between 15 and 20 percent of people aged 50 or older provide informal care and the majority of informal carers are women, who may be juggling caregiving duties for elderly parents alongside paid work and other family responsibilities (Tur-Sinai et al. 2020). Classification (iii) instead wants to shed light on whether women respond to financial incentives when making retirement decisions: while all women in our sample would receive a higher annuity should they retire with the old age pension scheme, those entitled to a DB scheme would loose more from opting for OD than those entitled to a mixed computation method.

First, we analyze women's labor supply response to the Monti-Fornero reform, and whether such response was potentially affected by the eligibility for OD. In particular, we compute the semi-elasticity of the labor supply of women treated by the reform.[16] The idea is that the

[16]We refer to semi-elasticity instead of elasticity because we do not know the respective monetary amount of the additional years of contribution that the reform had foreseen.

reform aimed at keeping women born in 1952 at least four more years in the labor market, by increasing the retirement age for the old age pension. We follow Bozio (2008) and compute the semi-elasticity as follow:

$$Semi\text{-}elasticity = \frac{\Delta Age}{\Delta Years of Contribution} \tag{2}$$

Where $\Delta Age = \widehat{Age_{52}}$ - $\widehat{Age_{51}}$ is the difference between the estimated age for each cohort and, respectively, for women below and above the cutoff of 35 years of contributions. $\Delta Years of Contribution$ equals four, which is the minimum number of additional years required by the reform to access the old age pension. If women align their labor supply to the reform requirements, we should see a *semi-elasticity* equal to 1; if women supply less (more) than what the reform aimed, then *semi-elasticity*$<$ ($>$)1.

Table 5: Semi-elasticity of women's labor supply by eligibility status to OD: overall sample and by subgroups.

		Below 35YoC	Above 35YoC
All sample		0.55	0.51
Lbr mkt attachment	Low	0.60	0.52
	High	0.53	0.53
Working time	Part time	0.56	0.56
	Full time	0.56	0.51
Contribution scheme	DB	0.58	0.48
	Mixed	0.54	0.54

Notes. The table reports the estimated semi-elasticity of labor supply, according to formula 2, for the all sample considered for the analysis ($N = 6708$) and for specific subgroups. **Source**: Own elaborations on INPS data.

Table 5 reports the results for women with more or less than 35 years of contributions at age 60, which determines the eligibility status to OD. The first row reports the semi-elasticity of labor supply for the overall sample used for the analysis: the values suggest that neither women not eligible for the early retirement scheme fully comply with the reform requirement (as the estimated semi-elasticity is always lower than 1), but, as already indicated by the results presented in Section 5, women who are eligible for OD supply less labor than required by the reform. When considering the different subgroups, the results reported in Table 5 indicate that women eligible for OD, with more than 35 years of contributions at age 60, in all cases supply

less labor than required by the reform, and the groups with a lower semi-elasticity are those with a low labor market attachment, working full time or subject to a DB contribution scheme.

Second, we repeat the baseline analysis on the different subgroups of the sample defined before. The results are reported in Table 6. In Panel A, when examining the effect on age of retirement, women with low labor market attachment, those working full-time, and those under the defined-benefit scheme are the ones retiring earlier compared to the other groups. This evidence is in line with the results reported in Table 5 above. When looking at Panel B, we observe that the early retirement behavior induces a substantial penalization in the annuity, which, again, confirms that anticipation is likely to be due to the fact that early retirement with OD entails a defined-contribution scheme which leads to lower annuity.

By taking together the results presented in this section, we can conclude that women who already have lower labor market attachment and weaker careers are more likely to be further penalized by such early retirement scheme. Women working full time also find it convenient to exit from the labor market, despite the monetary penalization, which suggests potential difficulties in combining work and other family or care responsibilities that, instead, women working part time do not face. Finally, the analysis by type of contribution scheme indicates a potentially counterintuitive result: we find that women who are entitled to a DB scheme, which would lead to a larger annuity compared to the mixed scheme, anticipate more retirement and face larger losses due to the use of OD. This result seems in line with recent evidence that Italian women lack awareness of their pension rights and have limited retirement planning (Angelici et al. 2022, Fornero et al. 2019).[17] However, it could also suggest that women, when making retirement choices, value not only the financial aspects of such decision, but also non-pecuniary aspects, such as the easiness of combining the economic activity with the informal one, as women in Italy remain primarily those in charge of childcare and family care at all ages of their life cycle (Ciani 2016, Brugiavini et al. 2017). While this result has been extensively shown for labor market decisions (Petrongolo & Ronchi 2020, Felfe 2012*a*), rarely there has been evidence for retirement choices.

[17]Indeed, economists point to a lack of basic financial literacy for women, which plays a major role in making financially sustainable forward-looking choices (Lusardi & Mitchell 2008).

Table 6: Heterogeneous effects by labor market attachment, working time and contribution scheme.

	(i)	(ii)	(iii)	(iv)	(v)	(vi)
	Lbr mkt attachment		Working time		Contribution scheme	
	Low	High	Part time	Full time	Defined-benefit	Mixed
Panel A. Retirement Age						
Above×Post	-3.8748***	-0.4946	-1.9469	-2.3193***	-3.8216***	-1.1461
	(1.0606)	(0.7513)	(1.6501)	(0.7107)	(0.8959)	(0.8845)
Panel B. Annuity						
Above×Post	-139.4822***	-1.5680	-36.8912	-79.8125**	-67.9116*	-54.9768
	(35.6745)	(33.6960)	(52.1425)	(33.3139)	(38.5675)	(44.5785)
N	2952	3756	1482	5226	2787	3921

Notes. The table reports the results of a parametric estimation of Equation 1 (baseline specification), for age at retirement (Panel A) and annuity (Panel B). Standard errors are clustered at the months of contribution. p-values: * p<0.10, ** p<0.05, *** p<0.01
Source: Own elaborations on INPS data.

7 Early retirement effects on social security wealth

In this section, we analyze whether the higher take-up in OD induced by the Monti-Fornero reform affects women's social security wealth (SSW). The social security wealth is the expected discounted value of future benefits (Feldstein 1974, Gruber & Wise 1998, 2004, 2008, Belloni et al. 2020). We define the SSW following Lalive et al. (2023):

$$SSW_i = \sum_{j=R}^{\Omega} P_{i,j}\pi(j|a)\beta^{(a-j)} \tag{3}$$

Where i is the individual, R her age of retirement, Ω is the maximum age alive (set at 110 years), a is the age after retirement, $\pi(.)$ are the survival probabilities and β is the discount factor. $P_{i,j}$ is the public annuity at the annual level. The survival probabilities are computed following the Human Mortality Database (2023). The β is set at 0.98. Understanding the effect of OD on the SSW is particularly interesting because, as other scholars have pointed out, SSW is essential to understand retirement behaviors (Stock & Wise 1990), or the erosion of private savings (Gale 1998, Attanasio & Brugiavini 2003, Kapteyn et al. 2005, Alessie et al. 2013, Belloni & Alessie 2013). We run the analysis of Equation 1 on the SSW as outcome. Results are shown in Table 7. We observe that the coefficient of Above×Post is negative and significant at 5% level. The magnitude of the effect is a reduction of Euro 28,270, which suggests that women born in 1952

who are eligible for OD have a SSW of Euro 226,730 compared to women born in 1952 who are not eligible, with a SSW of Euro 255,000, hence the difference is about 11.7%. Overall, the results on SSW align with the one found for the annuity and confirm the penalty for women who opt for the early retirement option.

Table 7: Results on the Social Security Wealth

Dep. Var: SSW Wealth	(i)	(ii)	(iii)	(iv)
Above	14191.461**	14709.994**	12716.198*	13753.935**
	(6836.159)	(6068.8737)	(6755.4856)	(6006.6830)
Post	41205.3045***	41968.749***	40519.5434***	41359.5314***
	(6081.478)	(6160.132)	(6201.0110)	(6263.338)
Above×Post	-27131.105**	-29078.4146***	-26068.5675**	-28269.254**
	(10131.878)	(10147.244)	(10334.429)	(10295.1856)
Region FE		✓		✓
Married/Survival pension			✓	✓
N	6708	6708	6708	6708

Notes. The table reports the results of a parametric estimation of Equation 1 (baseline specification), with the social security wealth (SSW) as dependent variable. Standard errors are clustered at the months of contribution. p-values: * p<0.10, ** p<0.05, *** p<0.01
Source: Own elaborations on INPS data.

8 Conclusion

The increasing retirement age for pensions has been crucial in many Western countries over the last few decades. However, understanding how older workers respond to such reforms is essential for better designing social security systems.

This paper investigates the response of close-to-retire women affected by a sharp increase in the statutory retirement age, in the context of an Italian pension reform. The design of the reform pushed the treated women to work for at least four more years. Otherwise, the only possibility to exit the labor market was with penalized annuities for a lifetime.

Our empirical strategy focused on women with the same years of contribution, specifically around the 35-year cutoff, but with different demographic ages. The reform exempted women born in 1951, who were already 60 years old, while it affected women born in 1952, the first treated cohort. With this setting, we applied a difference-in-difference approach together with a regression-discontinuity design, which compares treated and control groups based on differences in years of contribution. We found that the treated women were more likely to retire earlier before the SRA, although the effect is small and of about 2 months difference. When examining the annuity amount, we found a significant negative effect for women treated by the reform who were eligible for the early retirement option, with a penalty of about 5% per year for life. This evidence represents only a lower bound of the penalty because we focused on women who were about to retire and were pushed to stay an additional four years. After the reform, the average woman was forced to stay an additional seven years (as the age of retirement for the old age pension shifted from 60 to 67). Thus, future research could focus on the average annuity penalty for women with a longer retirement gap who decide to retire earlier with OD. Furthermore, we uncovered substantial heterogeneous effects: we show that women with low labor market attachment and low level of education are the ones more likely to retire earlier, and thus who face the largest annuity penalization.

Our most striking result was the early retirement observed in the first cohort affected by the retirement decision. This evidence is particularly important for several reasons. First, the reform aimed to encourage women to remain longer in the labor market to reduce budget spending on

the pension system. However, our results indicate that women attempted, when possible, to leave the labor market earlier. Second, the choice to retire early came with a monetary cost for these women, who could have retired without penalty under the pre-reform rules. Finally, claiming early despite the financial penalty suggests that women respond to the reform without being driven solely by financial incentives. This implies that women do not behave as predicted by the classical option value model; instead, they are influenced by other preferences or behavioral responses. This aligns with recent evidence from Behaghel & Blau (2012), Seibold (2021), Lalive et al. (2023). Women could value more the early retirement option if they face caregiving activities and family responsibilities in late life (Maura & Profeta 2025).

Our findings have significant policy implications. Women generally live longer than men and are more likely to spend part of their retirement in widowhood. However, sudden and unexpected pension reforms may work against them and their decisions to remain in the labor market longer. In particular, if the only early retirement option includes a monetary penalty, women close to retirement may feel inclined to leave the labor market earlier, even at a cost, rather than stay additional years. Women in vulnerable groups, such as those with low education and low labor market attachment, appear to be more sensitive to these decisions. This choice may raise concerns and expose them to difficult financial situations later in life. Policymakers should take this evidence into account when implementing welfare reforms.

References

Alessie, R., Angelini, V. & van Santen, P. (2013), 'Pension wealth and household savings in europe: Evidence from sharelife', *European Economic Review* **63**, 308–328.

Angelici, M., Del Boca, D., Oggero, N., Profeta, P., Rossi, M. C. & Villosio, C. (2022), 'Pension information and women's awareness', *The Journal of the Economics of Ageing* **23**, 100396.

Attanasio, O. P. & Brugiavini, A. (2003), 'Social security and households' saving', *the Quarterly Journal of economics* **118**(3), 1075–1119.

Banks, J., Blundell, R. & Rivas, M. C. (2010), 'The dynamics of retirement behavior in couples: Reduced-form evidence from england and the us', *University College London, mimeo* .

Battistin, E., Brugiavini, A., Rettore, E. & Weber, G. (2009), 'The retirement consumption puzzle: evidence from a regression discontinuity approach', *American Economic Review* **99**(5), 2209–2226.

Behaghel, L. & Blau, D. M. (2012), 'Framing social security reform: Behavioral responses to changes in the full retirement age', *American Economic Journal: Economic Policy* **4**(4), 41–67.

Belloni, M. & Alessie, R. (2013), 'Retirement choices in italy: What an option value model tells us', *Oxford Bulletin of Economics and Statistics* **75**(4), 499–527.

Belloni, M., Brugiavini, A., Buia, R. E., Carrino, L., Cavapozzi, D., Orso, C. E. & Pasini, G. (2020), 'What do we learn about redistribution effects of pension systems from internationally comparable measures of social security wealth?', *Journal of Pension Economics & Finance* **19**(4), 548–566.

Bettio, F., Betti, G. & Tinios, P. (2013), *The gender gap in pensions in the EU*, Publications Office.

Bianchi, N., Bovini, G., Li, J., Paradisi, M. & Powell, M. (2022), 'Career Spillovers in Internal Labour Markets', *The Review of Economic Studies* **90**(4), 1800–1831.

Boeri, T. & Brugiavini, A. (2008), 'Pension reforms and women retirement plans', *Journal of Population Ageing* **1**, 7–30.

Boeri, T., Garibaldi, P. & Moen, E. R. (2022), 'In medio stat victus: Labor demand effects of an increase in the retirement age', *Journal of Population Economics* **35**(2), 519–556.

Börsch-Supan, A. & Coile, C. C. (2021), *Social security programs and retirement around the world: Reforms and retirement incentives*, University of Chicago Press.

Bozio, A. (2008), 'Impact evaluation of the 1993 french pension reform on retirement age', *Pensions: An International Journal* **13**, 207–212.

Brugiavini, A. (1997), Social security and retirement in italy, Working Paper 6155, National Bureau of Economic Research.

Brugiavini, A. (2001), 'Early retirement in europe', *European Review* **9**(4), 501–515.

Brugiavini, A., Carrino, L., Orso, C. E. & Pasini, G. (2017), *Vulnerability and long-term care in Europe: An economic perspective*, Springer.

Brunello, G., De Paola, M. & Rocco, L. (2025), 'Pension reforms, longer working horizons, and absence from work', *Journal of Population Economics* **38**(9).

Canaan, S., Fischer, S., Mouganie, P. & Schnorr, G. (2024), 'Keep me in, coach: The short- and long-term effects of a university coaching intervention'.

Carneiro, P., Løken, K. V. & Salvanes, K. G. (2015), 'A flying start? maternity leave benefits and long-run outcomes of children', *Journal of Political Economy* **123**(2), 365–412.
URL: *http://www.jstor.org/stable/10.1086/679627*

Carta, F., D'Amuri, F. & von Wachter, T. M. (2021), Workforce aging, pension reforms, and firm outcomes, Working Paper 28407, National Bureau of Economic Research.

Carta, F. & De Philippis, M. (2023), 'The Forward-Looking Effect of Increasing the Full Retirement Age*', *The Economic Journal* p. uead051.

Cheng, M.-Y., Fan, J. & Marron, J. S. (1997), 'On automatic boundary corrections', *The Annals of Statistics* **25**(4), 1691–1708.

Ciani, E. (2016), 'Retirement, pension eligibility and home production', *Labour Economics* **38**, 106–120.

COVIP (2022).

Engels, B., Geyer, J. & Haan, P. (2017), 'Pension incentives and early retirement', *Labour Economics* **47**, 216–231.

Feldstein, M. (1974), 'Social security, induced retirement, and aggregate capital accumulation', *Journal of political economy* **82**(5), 905–926.

Felfe, C. (2012*a*), 'The motherhood wage gap: What about job amenities?', *Labour Economics* **19**(1), 59–67.

Felfe, C. (2012*b*), 'The willingness to pay for job amenities: Evidence from mothers' return to work', *ILR Review* **65**(2), 427–454.

Fornero, E., Oggero, N. & Puglisi, R. (2019), *Information and financial literacy for socially sustainable NDC pension schemes*, World Bank.

French, E. (2005), 'The effects of health, wealth, and wages on labour supply and retirement behaviour', *The Review of Economic Studies* **72**(2), 395–427.

French, E., Lindner, A. S., O'Dea, C. & Zawisza, T. A. (2022), Labor supply and the pension-contribution link, Technical report, National Bureau of Economic Research.

Gale, W. G. (1998), 'The effects of pensions on household wealth: A reevaluation of theory and evidence', *Journal of Political economy* **106**(4), 706–723.

Gelman, A. & Imbens, G. (2019), 'Why high-order polynomials should not be used in regression discontinuity designs', *Journal of Business & Economic Statistics* **37**(3), 447–456.

Grembi, V., Nannicini, T. & Troiano, U. (2016), 'Do fiscal rules matter?', *American Economic Journal: Applied Economics* **8**(3), 1–30.

Gruber, J. & Wise, D. (1998), 'Social security and retirement: An international comparison', *The American Economic Review* **88**(2), 158–163.

Gruber, J. & Wise, D. (2004), 'Social security and retirement around the world: Micro-estimates'.

Gruber, J. & Wise, D. A. (2008), *Social security and retirement around the world*, University of Chicago Press.

Hospido, L. & Zamarro, G. (2014), 'Retirement patterns of couples in europe', *IZA Journal of European Labor Studies* **3**(1), 1–18.

Human Mortality Database, H. (2023).
URL: *https://www.mortality.org/Home/Index*

INPS (2016), Xv rapporto annuale, Technical report, Istituto Nazionale Previdenza Sociale (INPS).

INPS (2023), Xxii rapporto annuale, Technical report, Istituto Nazionale Previdenza Sociale (INPS).

Kapteyn, A., Alessie, R. & Lusardi, A. (2005), 'Explaining the wealth holdings of different cohorts: Productivity growth and social security', *European Economic Review* **49**(5), 1361–1391.

Krueger, A. & Pischke, J.-S. (1992), 'The effect of social security on labor supply: A cohort analysis of the notch generation', *Journal of Labor Economics* **10**(4), 412–37.

Lalive, R., Magesan, A. & Staubli, S. (2023), 'How social security reform affects retirement and pension claiming', *American Economic Journal: Economic Policy* .

Laun, L. & Palme, M. (2023), Pension reform, incentives to retire and retirement behavior: Empirical evidence from swedish micro-data, Working Paper 31800, National Bureau of Economic Research.

Liebman, J. B., Luttmer, E. F. & Seif, D. G. (2009), 'Labor supply responses to marginal social security benefits: Evidence from discontinuities', *Journal of Public Economics* **93**(11-12), 1208–1223.

Lusardi, A. & Mitchell, O. S. (2008), 'Planning and financial literacy: How do women fare?', *American economic review* **98**(2), 413–417.

Manoli, D. S. & Weber, A. (2016*a*), The effects of the early retirement age on retirement decisions, Working Paper 22561, National Bureau of Economic Research.

Manoli, D. & Weber, A. (2016*b*), 'Nonparametric evidence on the effects of financial incentives on retirement decisions', *American Economic Journal: Economic Policy* **8**(4), 160–182.

Mastrobuoni, G. (2009), 'Labor supply effects of the recent social security benefit cuts: Empirical estimates using cohort discontinuities', *Journal of public Economics* **93**(11-12), 1224–1233.

Maura, F. & Profeta, P. (2025), 'Women's caring penalty at retirement in europe', **SHARE Working Paper Series 95**.

OECD (2021), *Pensions at a Glance 2021*.
URL: *https://www.oecd.org/en/publications/pensions-at-a-glance-2021*$_c$*a*401*ebd* − *en.html*

OECD (2023), *Health at a Glance 2023*.

Olivetti, C. & Petrongolo, B. (2016), 'The evolution of gender gaps in industrialized countries', *Annual Review of Economics* **8**(1), 405–434.

Petrongolo, B. & Ronchi, M. (2020), 'Gender gaps and the structure of local labor markets', *Labour Economics* **64**, 101819.

Rabaté, S., Jongen, E. & Atav, T. (2024), 'Increasing the retirement age: Policy effects and underlying mechanisms', *American Economic Journal: Economic Policy* **16**(1), 259–91. **URL:** *https://www.aeaweb.org/articles?id=10.1257/pol.20210101*

Seibold, A. (2021), 'Reference points for retirement behavior: Evidence from german pension discontinuities', *American Economic Review* **111**(4), 1126–65.

Song, J. G. & Manchester, J. (2007), 'New evidence on earnings and benefit claims following changes in the retirement earnings test in 2000', *Journal of Public Economics* **91**(3-4), 669–700.

Stancanelli, E. (2017), 'Couples' retirement under individual pension design: A regression discontinuity study for france', *Labour Economics* **49**, 14–26.

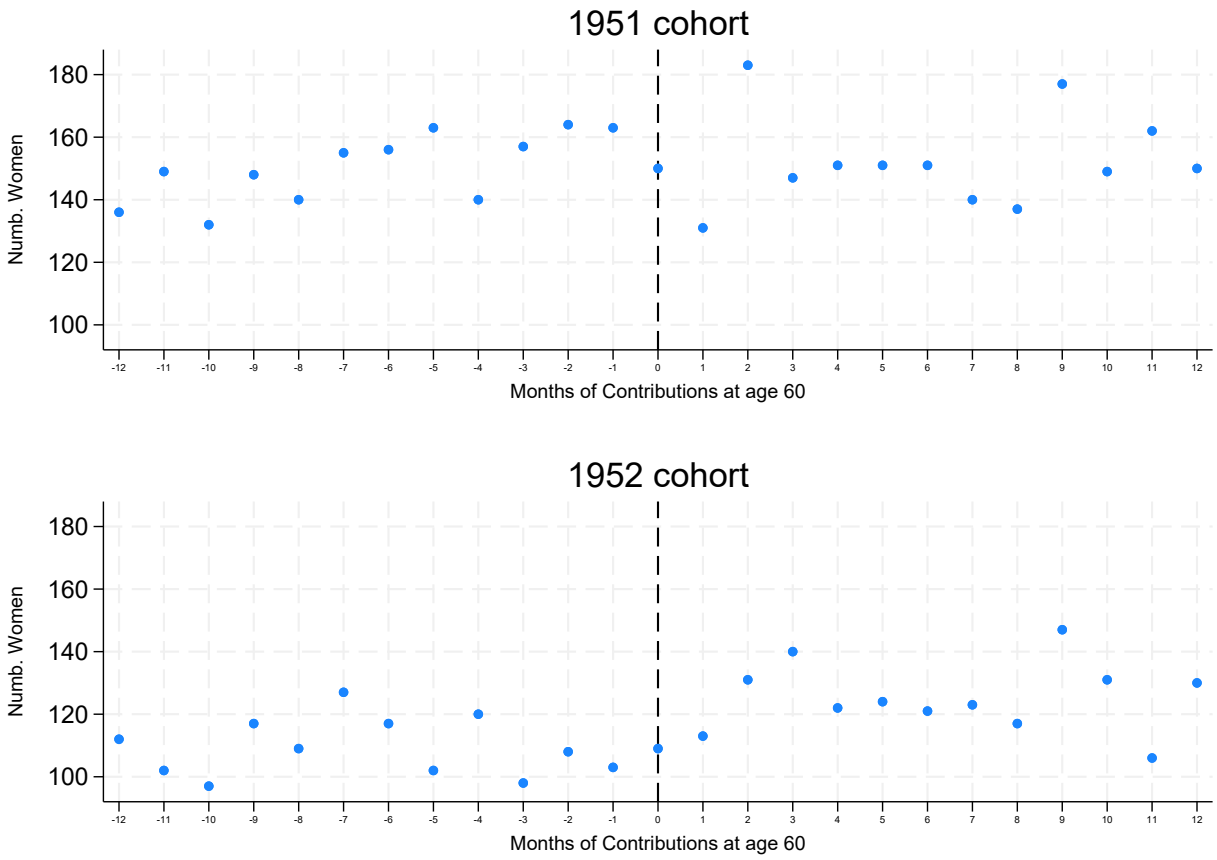
Stancanelli, E. & Soest, A. V. (2012), 'Retirement and home production: A regression discontinuity approach', *American Economic Review* **102**(3), 600–605.

Staubli, S. & Zweimüller, J. (2013), 'Does raising the early retirement age increase employment of older workers?', *Journal of public economics* **108**, 17–32.

Stock, J. H. & Wise, D. A. (1990), The pension inducement to retire: An option value analysis, *in* 'Issues in the Economics of Aging', University of Chicago Press, 1990, pp. 205–230.

Tur-Sinai, A., A., T., A., R., V., H. & Giovanni, L. (2020), 'How many older informal caregivers are there in europe? comparison of estimates of their prevalence from three european surveys', *Int J Environ Res Public Health* **17**(24), 9531.

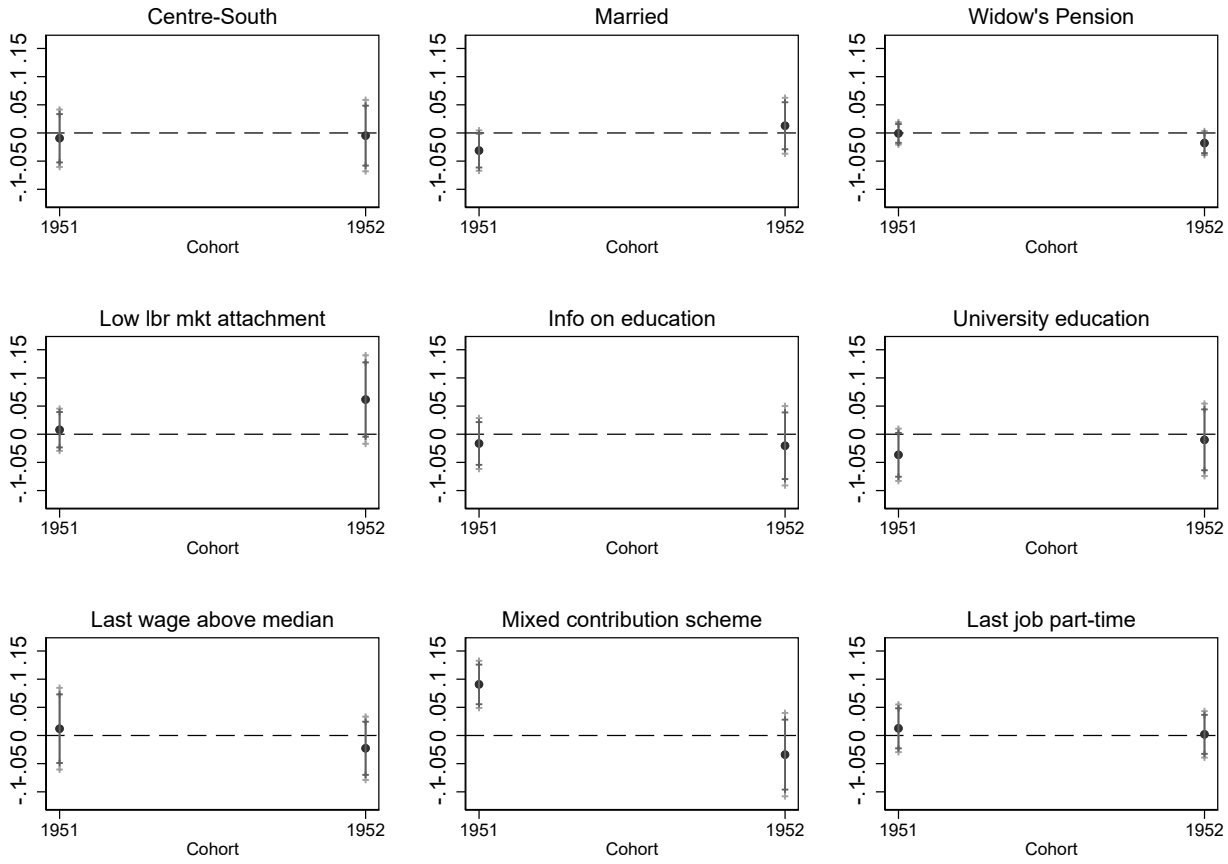
Figure A-1: Density of the running variable at the threshold



Notes. The graphs report, for each cohort, the number of women with a certain number of months of contributions at age 60. The cutoff of 35 years of contributions (corresponding to 420 months) has been reported as 0 (dashed line). The sample includes women with a number of months of contributions between 408 and 432 months of contributions, corresponding to a bandwidth of one year. **Source**: own elaborations on INPS data.

A Appendix A

Figure A-2: Continuity of the covariates at the 35-year-of-contribution cutoff by cohort



Notes: The Figures report the test for the continuity of the individuals' characteristics in the baseline analysis. We plot the RD coefficient (35 years of contribution cutoff), with its confidence intervals. We run the analysis separately by cohort. Each sub-figure report the dependent variable in the Title.
Source: Own elaborations on INPS data.