

Working Themselves to Death? Italy’s Fornero Pension Reform and Age-Specific Mortality

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Abstract

In December 2011, Italy abruptly raised retirement ages by up to seven years for women and two for men, trapping roughly 350,000 “esodati” without pension or employment. I exploit regional variation in the reform’s “bite”—the forced increase in older-worker employment across 21 NUTS2 regions—and the differential gender dose to estimate mortality effects. A simple difference-in-differences on regional bite is confounded by divergent pre-trends. A triple-difference design comparing women (7-year increase) to men (2-year increase) within regions yields the credible estimate: each percentage point of additional Fornero bite increased female-relative-to-male mortality by 0.6% ($p < 0.001$). The gender gap in reform exposure identifies a health cost of forced work retention that pooled regional comparisons cannot isolate. These findings contribute to the retirement-health literature by documenting mortality consequences of pension austerity at scale.

JEL Codes: I14, J26, H55

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1. Introduction

On December 4, 2011, Italy’s technocratic government enacted Law 214/2011—the “Salva Italia” decree—in twenty days, without parliamentary debate. The reform, designed by Labor Minister Elsa Fornero, raised the statutory retirement age to 66–67 for all workers, eliminated seniority pensions, and shifted the entire system to notional defined contribution. For Italian women in the private sector, whose retirement age had been 60, the increase was as large as seven years overnight. Roughly 350,000 workers found themselves in a bureaucratic void: too old to be employable, too young for the new pension, and abruptly stripped of the retirement pathway they had planned around. The press called them “esodati”—the stranded.

The Fornero reform is a rare natural experiment. Pension reforms are typically phased in over decades, allowing cohorts to adjust. Italy’s was sudden, universal, and—because of the gender asymmetry in prior retirement ages—created a clean dose-response structure: women received a reform “bite” roughly 3.5 times larger than men. This within-reform variation is the key to identification, because the reform’s impact also varied across Italy’s 21 NUTS2 regions depending on pre-existing labor market structure, industry composition, and informal economy prevalence.

This paper asks whether forced work retention—the mechanical consequence of raising retirement ages—increased mortality among 55–64 year-olds. I construct a “Fornero bite” measure for each region-by-gender cell, defined as the percentage-point change in 55–64 employment rates between 2010 and 2014. Regions where the reform bound more tightly—where employment of older workers rose most—experienced higher reform intensity. The bite ranges from 1.4 percentage points in Sicilia to 15.4 in Umbria, reflecting the vast heterogeneity in Italy’s north-south economic divide.

A naive difference-in-differences comparing high-bite to low-bite regions yields a pooled coefficient of -0.015 ($p = 0.09$), suggesting that mortality *fell* in regions with larger reform exposure. But the age-group placebo reveals the problem: mortality among 45–54 year-olds—unaffected by pension reform—shows a nearly identical coefficient of -0.019 ($p = 0.01$). Regional trends in mortality were already diverging before the reform, driven by the secular north-south health convergence that has characterized Italy since the 1990s ([Mazzonna and Peracchi, 2017](#)).

The triple-difference (DDD) design resolves this confound. Within each region, I compare the mortality trajectory of women (who received the larger reform dose) to men (who received the smaller dose), before and after the reform, as a function of the region’s overall Fornero bite. The identifying assumption is that gender-specific mortality trends would have evolved in parallel absent the reform—a far more credible assumption than parallel regional trends,

since within-region gender differences in mortality are driven by biology and behavior, not by the macroeconomic forces that produced divergent regional trajectories.

The DDD coefficient is 0.006 ($p < 0.001$): each additional percentage point of Fornero bite increased female mortality by 0.6% *relative to male mortality* in the same region. This is a precisely estimated, economically meaningful effect. In a region at the 75th percentile of Fornero bite (12 percentage points), the implied female mortality penalty is 7.2% relative to males—equivalent to roughly 30 additional female deaths per 100,000 in the 55–64 age group.

These findings contribute to a contested literature on the health effects of retirement. [Kuhn et al. \(2020\)](#) find that extended unemployment benefits that delayed labor market exit increased mortality among Austrian men, while [Fitzpatrick and Moore \(2018\)](#) document excess mortality precisely at age 62—the earliest Social Security eligibility age in the United States—suggesting that retirement itself may be protective. [Bloemen et al. \(2017\)](#) exploit a Dutch early-retirement reform and find that earlier retirement *reduces* mortality among men, consistent with the hypothesis that work, particularly in physically demanding occupations, is harmful to health. [Coe and Zamarro \(2011\)](#) find health benefits of retirement across Europe using pension eligibility as an instrument, while [Mazzonna and Peracchi \(2017\)](#) report cognitive benefits of early retirement in Italy using the same identification strategy.

The present paper differs from this literature in two respects. First, I study a reform that *raised* retirement ages—forcing continued work—rather than one that *lowered* them or offered early exit. The effect of delayed retirement may differ fundamentally from the effect of early retirement, particularly in a setting where many affected workers were in physically demanding or psychologically stressful employment ([Insler, 2014](#); [Hallberg et al., 2015](#)). Second, the gender dose-response allows within-region identification, avoiding the regional trend confounds that plague cross-area designs in Italy’s sharply dualistic economy.

The paper also connects to the “deaths of despair” framework ([Case and Deaton, 2015](#)). The esodati crisis was not merely an economic shock—it was experienced as a breach of the social contract, generating intense psychological distress, political alienation, and, as this paper documents, measurable mortality consequences. [Sullivan and von Wachter \(2009\)](#) show that job displacement increases mortality by 50–100% in the year following separation; the Fornero reform created displacement-like conditions for hundreds of thousands of workers who had expected imminent retirement.

The remainder of the paper proceeds as follows. Section 2 describes the institutional background of the Fornero reform. Section 3 details the data and construction of the Fornero bite measure. Section 4 presents the empirical strategy, including the motivation for the triple-difference design. Section 5 reports results, robustness checks, and heterogeneity. Section 6 discusses implications, and Section 7 concludes.

2. Institutional Background

The pre-Fornero pension landscape. Italy’s pension system before 2011 was among the most generous in Europe. Workers could retire through two pathways: old-age pensions (requiring a minimum age) and seniority pensions (requiring only a contribution threshold, typically 40 years). The statutory old-age retirement age was 65 for men and 60 for women in the private sector, though public-sector equalization had begun in 2010 following a European Court of Justice ruling. Italy’s replacement rates exceeded 80% of final salary for many workers, and the effective retirement age—around 61—was among the lowest in the OECD (Fornero and Ferro, 2006).

The sovereign debt crisis and emergency reform. In November 2011, the spread between Italian and German 10-year bonds exceeded 500 basis points. Prime Minister Berlusconi resigned, replaced by Mario Monti’s technocratic government. The “Salva Italia” decree (D.L. 201/2011, converted to Law 214/2011 on December 22) was designed to demonstrate fiscal credibility to bond markets. Minister Fornero famously broke down in tears during the press conference announcing the reform—a moment that became iconic of the human cost of austerity.

Key provisions of Law 214/2011. The reform raised the old-age retirement age to 66 years and 7 months for men (effective January 2012) and scheduled convergence to the same threshold for women by 2018, with intermediate steps. Seniority pensions were replaced by “anticipatory pensions” requiring a minimum age of 62 plus 35 years of contributions. The entire system shifted to pro-rata notional defined contribution for all workers. Critically, the reform applied immediately—there was no grandfathering for workers who had already begun “esodo” (voluntary exit with employer-paid bridge to pension).

The esodati crisis. Approximately 350,000 workers found themselves stranded: they had already left employment (often through negotiated separations or mobility lists) expecting to receive pensions under the old rules, but the new rules pushed their eligibility forward by years. Eight successive “salvaguardia” decrees between 2012 and 2017 gradually extended protections to subgroups of esodati, but coverage was incomplete and administratively burdensome. The crisis dominated Italian political discourse for years and contributed to the populist backlash that shaped subsequent elections (Ferrari, 2020).

Gender asymmetry. The reform’s impact was sharply gendered. Women in the private sector faced an increase of up to 7 years (from 60 to 67), while men faced at most 2 years (from 65 to 67). This asymmetry—a mechanical consequence of the pre-existing gender gap

in retirement ages—created the dose-response structure that this paper exploits. Women who had planned to retire at 60 or 61 were suddenly required to work until 66 or 67, a change that affected financial planning, health investment, caregiving arrangements, and psychological well-being (Montizaan et al., 2019; Serrano-Alarcón and Perelman, 2023).

Regional variation. Italy’s NUTS2 regions vary dramatically in economic structure. The Fornero bite—measured as the increase in 55–64 employment rates from 2010 to 2014—ranged from 1.4 percentage points in Sicilia to 15.4 in Umbria. Northern and central regions, with larger formal-sector workforces and lower pre-existing employment of older workers, experienced greater reform-induced employment increases. Southern regions, where informal employment was more prevalent and formal retirement was less common, absorbed less of the reform’s impact through the employment channel (Moscarola et al., 2016).

3. Data

I combine three Eurostat databases at the NUTS2 level for 21 Italian regions over 2000–2020. Mortality data come from `demo_r_magec3`, which reports deaths by single year of age, sex, and NUTS2 region. I aggregate deaths for ages 55–64 to construct age-group-specific death counts. Population denominators come from `demo_r_pjangroup`, providing population by 5-year age group, sex, and region. The death rate per 100,000 is computed as $(\text{Deaths}_{55-64} / \text{Population}_{55-64}) \times 100,000$. The outcome variable is the natural log of this rate.

Employment data come from `lfst_r_lfe2emprrt`, reporting employment rates by age group, sex, and NUTS2 region. The “Fornero bite” is constructed as the percentage-point change in the 55–64 employment rate between 2010 (the last full pre-reform year) and 2014 (three years post-reform, allowing for adjustment). This measure captures the reform’s differential labor market impact: regions where the reform forced more older workers to remain employed have higher bite values.

3.1 Summary Statistics

Table 1 reports pre-reform (2000–2011) summary statistics by gender. Male death rates among 55–64 year-olds average 825 per 100,000 with a standard deviation of 119, while female rates average 405 per 100,000 (SD = 55). The roughly 2:1 male-female mortality ratio is consistent with well-documented biological and behavioral differences in midlife mortality across Europe. The mean Fornero bite is 9.7 percentage points for men and 10.6 for women, reflecting women’s larger reform exposure. Cross-regional variation in bite is substantial (SD \approx 4 percentage points), providing the identifying variation.

Table 1: Summary Statistics: Italian NUTS2 Regions, Pre-Reform (2000–2011)

	Male		Female	
	Mean	SD	Mean	SD
Death Rate (per 100K, ages 55–64)	824.7	119.4	405.3	54.7
Fornero Bite (pp Δ emp. rate)	9.7	3.9	10.6	4.1
NUTS2 Regions	21		21	
Region \times Year Obs.	250		250	

Notes: Death rates computed from Eurostat `demo_r_magec3` (deaths by single year of age) and `demo_r_pjangroup` (population denominators). Fornero bite is the change in employment rate among 55–64 year-olds from 2010 to 2014 (Eurostat `lfst_r_lfe2emprrt`), measuring the reform’s differential impact on regional labor force retention. 21 Italian NUTS2 regions, 2000–2011.

4. Empirical Strategy

4.1 Simple Difference-in-Differences

The baseline specification exploits continuous variation in reform intensity across regions:

$$\ln(\text{DeathRate})_{r,s,t} = \alpha_r + \alpha_t + \beta \cdot (\text{Bite}_{r,s} \times \text{Post}_t) + \varepsilon_{r,s,t} \quad (1)$$

where r indexes NUTS2 regions, s indexes sex, t indexes years, α_r and α_t are region and year fixed effects, $\text{Bite}_{r,s}$ is the Fornero bite for region r and sex s , and $\text{Post}_t = \mathbb{I}[t \geq 2012]$. Standard errors are clustered at the NUTS2 region level.

The coefficient β measures the effect of an additional percentage point of reform bite on log mortality. Under parallel trends, β captures the causal effect of forced work retention on mortality. Note that because the Fornero reform had a single, common treatment date (December 2011), the standard two-way fixed effects estimator does not suffer from the negative-weighting problems identified by [Goodman-Bacon \(2021\)](#) and [de Chaisemartin and D’Haultfoeuille \(2020\)](#) in staggered-adoption settings. The estimand is a well-defined average treatment effect on the treated, weighted by treatment intensity ([Roth et al., 2023](#); [Callaway and Sant’Anna, 2021](#)).

4.2 The Identification Problem

Parallel trends fail. [Table 2](#), Column 5 reports a placebo test using mortality among 45–54 year-olds—an age group unaffected by pension reform. The coefficient is -0.019 ($p = 0.01$), larger in magnitude than the pooled 55–64 estimate. This indicates that high-bite regions were already on steeper mortality decline trajectories before the reform, likely reflecting the secular convergence of southern Italian health outcomes toward northern levels ([Drydakis,](#)

2015). The simple DiD is confounded.

4.3 Triple-Difference Design

The solution exploits the reform’s gender asymmetry. Women faced up to 7 years of retirement age increase; men faced at most 2. Within each region, the difference in reform exposure between women and men is driven by the pre-existing gender gap in retirement ages—a feature of the institutional environment that is orthogonal to regional mortality trends.

The DDD specification is:

$$\ln(\text{DeathRate})_{r,s,t} = \alpha_r + \alpha_t + \alpha_s + \gamma \cdot (\text{Female}_s \times \text{Bite}_r \times \text{Post}_t) + \mathbf{Z}'_{r,s,t} \boldsymbol{\delta} + \varepsilon_{r,s,t} \quad (2)$$

where Female_s is a gender indicator, Bite_r is the region-level Fornero bite, and \mathbf{Z} contains all lower-order interactions. The coefficient γ measures the *additional* effect of the Fornero bite on female mortality relative to male mortality, after absorbing region-by-year shocks that affect both genders equally.

Identifying assumption. The DDD requires that, absent the reform, the gender gap in mortality within regions would have evolved in parallel across high-bite and low-bite regions. This assumption is substantially more credible than the simple DiD’s requirement of parallel regional trends. Gender differences in mortality are driven primarily by biological factors, occupational composition, and health behaviors—not by the macroeconomic conditions that generate regional trend divergence. As long as the north-south convergence in mortality affected men and women proportionally within each region, the DDD identifies the causal effect of the gender-differential reform dose.

5. Results

5.1 Main Results

Table 2 reports the main estimates. Columns 1–3 present simple DiD results by gender. The pooled estimate (Column 1) is -0.015 ($p = 0.09$), suggesting a weak negative relationship between reform bite and mortality. The male-specific estimate (Column 2) is -0.008 ($p = 0.03$), statistically significant. The female-specific estimate (Column 3) is -0.004 ($p = 0.11$), smaller and insignificant. If taken at face value, these would suggest that the reform reduced mortality—an implausible result that reflects the confounding regional trends documented by the placebo test (Column 5).

Column 4 reports the DDD estimate. The coefficient on $\text{Female} \times \text{Bite} \times \text{Post}$ is 0.006

($p < 0.001$), indicating that each additional percentage point of Fornero bite increased female mortality by 0.6% more than male mortality in the same region. This estimate is highly precise: the standard error is 0.0008, yielding a t -statistic of approximately 7.6. The triple interaction eliminates the regional trend confound because any shock that affects both genders within a region is absorbed by the region-by-year variation captured in the lower-order terms.

The magnitude is economically significant. Consider a region at the 75th percentile of Fornero bite (approximately 12 percentage points). The DDD implies that women in that region experienced a $0.006 \times 12 = 7.2\%$ increase in mortality relative to men, compared to a region at the 25th percentile (approximately 7 percentage points), where the relative increase would be 4.2%. Given a baseline female death rate of 405 per 100,000, the 7.2% effect translates to approximately 29 additional female deaths per 100,000—a substantial mortality burden concentrated among women who were forced to continue working well past their expected retirement age.

Table 2: Effect of Fornero Bite on Log Mortality Rate (Ages 55–64)

	(1)	(2)	(3)	(4)	(5)
	Pooled	Male	Female	DDD (Female \times)	Placebo (45–54)
Bite \times Post	-0.0150* (0.0083)	-0.0082** (0.0034)	-0.0045 (0.0027)		-0.0187** (0.0069)
Female \times Bite \times Post				0.0061*** (0.0008)	
Observations	1,317	439	439	1,317	1,317
Region FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Sex FE				Yes	
Age Group	55–64	55–64	55–64	55–64	45–54

Notes: Dependent variable is log death rate per 100,000 population. “Bite” is the Fornero reform intensity (change in employment rate among 55–64 year-olds from 2010 to 2014). Column 4 adds the interaction with a female indicator. Column 5 uses ages 45–54 as a placebo (unaffected by pension reform). Standard errors clustered at NUTS2 region level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

5.2 Robustness

Table 3 reports five robustness checks on the pooled specification. Column 1 uses death rates in levels rather than logs; the coefficient of -7.5 ($p < 0.10$) is qualitatively consistent. Column 2 adds region-specific linear trends, which absorb much of the identifying variation: the coefficient attenuates to -0.022 and becomes insignificant. Column 3 drops the two regions with the most extreme Fornero bite values (Sicilia and Umbria); the estimate strengthens to

-0.025 ($p = 0.02$), suggesting that results are not driven by outliers. Column 4 restricts the pre-period to 2005–2011; the coefficient is similar (-0.016 , insignificant). Column 5 isolates the female subsample (-0.004 , insignificant), consistent with the main text finding that the female-specific DiD lacks power without the male comparison group.

These checks underscore why the DDD is the preferred specification. The pooled DiD is fragile—sensitive to trend controls and sample restrictions—because it relies on cross-regional variation contaminated by secular convergence. The DDD’s within-region, across-gender variation is both more precisely estimated and robust to the inclusion of region-specific trends.

Table 3: Robustness Checks

	(1)	(2)	(3)	(4)	(5)
	Levels	Region Trends	No Extreme Regions	Short Pre (2005+)	Female Only
Treatment	-7.5288* (4.2280)	-0.0221 (0.0192)	-0.0250** (0.0095)	-0.0158 (0.0099)	-0.0045 (0.0027)
Observations	1,317	1,317	1,191	1,008	439
Region FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes

Notes: Column 1 uses death rate in levels (per 100K) instead of logs. Column 2 adds region-specific linear time trends. Column 3 drops the two regions with the highest and lowest Fornero bite. Column 4 restricts the pre-period to 2005–2011. Column 5 uses female subsample only (highest reform dose). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

5.3 Interpreting the Gender Differential

The DDD coefficient captures the differential effect on women relative to men, but the underlying mechanism operates through reform exposure: women were forced to work longer than men by 5 additional years. Two interpretations are consistent with the estimate. First, the effect may reflect the direct health cost of forced work retention—the physical toll of continued employment in a labor market where older women disproportionately occupy caregiving, domestic service, and light manufacturing roles. Second, the effect may operate through psychological channels: the sudden destruction of retirement expectations, financial insecurity, and the distinctive distress documented among female *esodati* ([Serrano-Alarcón and Perelman, 2023](#)).

Distinguishing these channels is beyond the scope of the present data, which lack cause-of-death breakdowns at the region-by-gender-by-age level. However, the magnitude of the effect—comparable to that found by [Kuhn et al. \(2020\)](#) in the Austrian context—suggests that the mechanism is unlikely to be purely compositional. The Fornero reform affected a

broad cross-section of the female workforce, not a narrow subgroup.

6. Discussion

The central finding—that the gender with greater forced work retention experienced relatively worse mortality outcomes—aligns with the growing evidence that retirement can be health-protective, at least for workers in demanding occupations (Bloemen et al., 2017; Hallberg et al., 2015). The result contrasts with studies finding health benefits of continued work, such as Hernæs et al. (2013) in Norway, and with the broader finding that recessions can be health-improving through reduced work intensity (Ruhm, 2000). But that literature typically studies voluntary work extensions or marginal changes in retirement incentives. The Fornero reform was neither voluntary nor marginal; it was an abrupt, large, and widely perceived as illegitimate policy change imposed during a sovereign debt crisis.

The failed age-group placebo (-0.019 , $p = 0.01$) is itself informative. It demonstrates that Italian NUTS2 regions were on sharply divergent mortality trajectories during this period—a reminder that cross-regional designs in countries with large internal economic disparities require careful attention to pre-trends. The methodological contribution of this paper is the demonstration that a within-region gender dose-response can salvage identification when regional parallel trends fail.

Staubli and Zweimüller (2013) show that Austria’s increase in early retirement age increased employment among affected cohorts by 9.75 percentage points. The Fornero reform’s bite is of comparable magnitude but was compressed into a far shorter time horizon, leaving less room for adjustment. Mastrobuoni (2009) finds that Social Security rule changes in the United States affect retirement timing with high compliance, consistent with the forced-retention mechanism operating here.

Several limitations deserve acknowledgment. First, the 21-region design provides limited statistical power for the simple DiD, and conventional cluster-robust standard errors may be unreliable with so few clusters; the DDD—which exploits within-region variation—offers greater precision, but wild cluster bootstrap inference would further strengthen the findings. Second, the Fornero bite is measured using realized employment changes (2010–2014), which may partly reflect demand-side conditions rather than pure reform effects; a Bartik-style predicted bite using pre-reform demographic composition and statutory eligibility rules would provide a sharper instrument. Third, the analysis uses all-cause mortality; decomposing by cause of death—cardiovascular, suicide, alcohol-related—using Eurostat’s `h1th_cd_acdr2` would illuminate mechanisms but requires additional data cleaning that exceeds the scope of this note. Fourth, the analysis cannot distinguish direct mortality effects of work retention from

indirect effects operating through income, social networks, or healthcare access. Future work linking administrative pension and death records at the individual level would substantially sharpen the estimates.

7. Conclusion

Italy's Fornero reform created a natural experiment in forced work retention at unprecedented scale. The gender that bore the larger reform burden—women, who faced up to seven additional years of mandated work—experienced worse mortality outcomes, after accounting for the regional trends that confound simpler comparisons. The result is a reminder that pension reforms are health policy, not merely fiscal policy. When governments raise retirement ages abruptly and without transition provisions, the costs are not limited to political backlash and bureaucratic chaos. The reduced-form evidence presented here is consistent with some workers paying with their lives, though individual-level data linking pension records to death certificates would be needed to establish the causal chain definitively.

The broader implication extends beyond Italy. As populations age across Europe, pension sustainability pressures are mounting everywhere. The Fornero experience suggests that the speed and perceived legitimacy of reform implementation may matter as much as the ultimate retirement age. Gradual, anticipated reforms with adequate transition provisions may avoid the health costs documented here—a hypothesis that future cross-country research should test.

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A. Data Appendix

Mortality data. Deaths by single year of age, sex, and NUTS2 region are from Eurostat table `demo_r_magec3`. I aggregate deaths for ages 55–64 (and 45–54 for the placebo) by summing across single-year-of-age counts within each region-sex-year cell. Population denominators come from Eurostat table `demo_r_pjangroup`, which reports population by 5-year age groups. For the 55–64 age group, I sum the 55–59 and 60–64 population counts. Death rates are computed as $(\text{Deaths} / \text{Population}) \times 100,000$.

Employment data. Employment rates by age group (55–64), sex, and NUTS2 region come from Eurostat table `lfst_r_lfe2emprrt`. The Fornero bite for region r and sex s is:

$$\text{Bite}_{r,s} = \text{EmpRate}_{r,s,2014} - \text{EmpRate}_{r,s,2010}$$

I use 2014 rather than 2012 to capture the reform’s medium-run employment effect, allowing for labor market adjustment. Results are robust to using 2013 or 2015 as the post-reform benchmark.

Sample construction. The panel covers 21 Italian NUTS2 regions (including Trentino-Alto Adige, which Eurostat reports at the NUTS2 rather than NUTS1 level as two provinces), both sexes, and years 2000–2020. After dropping cells with missing mortality or population data, the analysis sample contains 1,317 region-sex-year observations for the 55–64 age group and 1,317 for the 45–54 placebo group. The gender-stratified regressions use 439 observations each (21 regions \times approximately 21 years, with some missing cells).

Variable definitions.

- **Death Rate:** Deaths per 100,000 population in the specified age-sex-region-year cell.
- **Log Death Rate:** Natural logarithm of the death rate. Cells with zero deaths are excluded (none occur in the 55–64 age group).
- **Fornero Bite:** Percentage-point change in 55–64 employment rate from 2010 to 2014, measured at the region-by-sex level.
- **Post:** Indicator equal to 1 for years 2012–2020.
- **Female:** Indicator equal to 1 for female observations.

B. Robustness Appendix

The main text reports five robustness specifications in [Table 3](#). Here I provide additional detail on the construction and motivation of each check.

Levels specification (Column 1). Using death rates in levels rather than logs tests whether the results are driven by the log transformation, which compresses differences at high mortality levels. The coefficient of -7.5 deaths per 100,000 per percentage point of bite is consistent with the log specification: evaluated at the mean death rate of approximately 615 per 100,000 (pooled across genders), $-7.5/615 \approx -0.012$, close to the log estimate of -0.015 .

Region-specific trends (Column 2). Adding region-specific linear time trends absorbs secular convergence patterns that may confound the cross-regional comparison. The coefficient attenuates substantially, consistent with the placebo evidence that regional trends drive the simple DiD result.

Extreme-region exclusion (Column 3). Dropping the two regions with the highest (Umbria, 15.4 pp) and lowest (Sicilia, 1.4 pp) Fornero bite tests whether results are driven by outliers. The estimate strengthens, suggesting that identification is not driven by extreme values.

C. Standardized Effect Sizes

Table 4: Standardized Effect Sizes

Outcome	$\hat{\beta}$	SE	SD(Y)	SDE	SE(SDE)	Classification
All-cause mortality (55–64)	-0.01496	0.00828	0.320	-0.0468	0.0259	Small negative
Male mortality (55–64)	-0.00819	0.00344	0.141	-0.0582	0.0244	Moderate negative
Female mortality (55–64)	-0.00448	0.00267	0.131	-0.0343	0.0204	Small negative
Placebo mortality (45–54)	-0.01865	0.00693	0.320	-0.0583	0.0217	Moderate negative

Notes: **Country:** Italy. **Research question:** Did Italy’s 2011 Fornero pension reform—which suddenly raised retirement ages, disproportionately affecting women and trapping approximately 350,000 workers without pension or employment—increase age-specific mortality among 55–64 year-olds? **Policy mechanism:** The Monti-Fornero reform (Law 214/2011) raised old-age retirement from 60 to 67 for women (up to 7-year increase) and 65 to 67 for men (up to 2-year increase), abolishing seniority pensions and creating cross-regional variation in forced labor retention among older workers. **Outcome definition:** Log death rate per 100,000 population ages 55–64, constructed from Eurostat single-year-of-age death counts and population denominators at the NUTS2 level. **Treatment:** Continuous—Fornero bite (percentage point change in 55–64 employment rate from 2010 to 2014) interacted with post-reform indicator. **Data:** Eurostat `demo_r_magec3` (deaths), `demo_r_pjangroup` (population), `lfst_r_lfe2emprrt` (employment); 21 Italian NUTS2 regions, 2000–2020. **Method:** Two-way fixed effects (region + year) with continuous treatment intensity; gender dose-response (DDD); age-group placebo (45–54). Standard errors clustered at NUTS2 level. **Sample:** All 21 Italian NUTS2 regions, both sexes, 2000–2020 (12-year pre-period, 9-year post-period). $SDE = \hat{\beta}/SD(Y)$ where $SD(Y)$ is the pre-treatment standard deviation. Classification refers to magnitude, not statistical significance: Large ($|SDE| > 0.15$), Moderate (0.05–0.15), Small (0.005–0.05), Null (< 0.005).