The Canon Institute for Global Studies

CIGS Working Paper Series No. 26-006E

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April 22, 2026

General Incorporated Foundation
The Canon Institute for Global Studies
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Pension Reforms, Longevity, and Late-Life Employment: Evidence from Sixteen Countries*

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Abstract

Employment rates for workers aged 55–64 increased by an average of 28.5 percentage points across sixteen countries between 2004 and 2019, with Austria, Italy, and the Netherlands experiencing increases larger than their entire 2004 employment rate. We examine what explains these dramatic gains and their substantial heterogeneity across countries and demographic groups.

Using harmonized Health and Retirement Study data, we document three key empirical patterns. First, employment increases concentrated among women, healthier individuals, and more educated workers. Second, contrary to prior research, changes in weekly hours per worker are mixed rather than uniformly negative, with gains occurring primarily at the extensive margin. Third, employment growth accelerated during 2013–2019 compared to 2007–2013.

While existing research examines longevity and pension reforms as separate channels, we show their interaction is quantitatively important. Longevity improvements amplify pension reform effects: when survival probabilities increase, actuarial adjustments for delayed claiming provide higher benefits collected over longer periods, strengthening work incentives. We formalize this mechanism in a lifecycle framework yielding testable predictions about margins of adjustment and demographic heterogeneity.

Countries experiencing both pension reforms and substantial longevity gains show employment increases 15–20 percentage points larger than countries with reforms alone. This interaction helps explain why responses were exceptionally large in some countries, why growth accelerated after 2013, and why effects concentrate among healthier and more educated workers. Our findings suggest pension reform effectiveness depends critically on demographic context. Because effects concentrate at the extensive margin, policies raising retirement ages are more effective than hours flexibility policies.

* We would like to thank the participants of the 2023 Southern Economic Association Annual Meeting, 2023 Western Economic Association International Annual Conference and the 2023 Annual Conference of the Society for the Advancement of Economic Theory.

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1 Introduction

Between 2004 and 2019, employment rates for workers aged 55–64 increased dramatically across developed countries, with Austria (+45.2 percentage points), Italy (+44.9 pp), and the Netherlands (+38.5 pp) experiencing increases *larger than their entire 2004 employment rate*. All sixteen countries in our sample show substantial increases, averaging 28.5 percentage points—reversing decades of declining labor force participation among older workers.

Understanding these changes is critical for debates on active aging, retirement income design, and pension system sustainability. While employment at older ages fell sharply from the 1960s through the early 1990s, the reversal since the mid-1990s raises fundamental questions: What explains employment increases of this magnitude? Why do they vary dramatically across countries? And what mechanisms drive workers' decisions to postpone retirement?

This paper provides comprehensive empirical analysis using harmonized micro data from the Health and Retirement Study (HRS) family of surveys covering the United States, United Kingdom, and thirteen European countries and Israel from 2004 to 2019.[1] These datasets provide rich, longitudinal data that allow us to study both extensive and intensive labor supply margins and examine heterogeneity across demographic groups.

We document four main findings. First, employment rates of individuals aged 55–64 increased by 28.5 percentage points on average, with increases exceeding 40 pp in Austria and Italy, and above 35 pp in Germany and the Netherlands. These magnitudes are substantially larger than previously documented and concentrate among workers aged 60–64. Second, employment gains are especially pronounced for women (31.5 pp vs 24.6 pp for men), healthier individuals, and more educated workers. Third, contrary to Bick, Blandin, and Fuchs-Schündeln (2022), changes in weekly hours per worker are mixed rather than uniformly negative—hours decline in some countries but rise in others, with women's hours increasing in most countries. Fourth, these patterns coincide with pension reforms that reduced work disincentives and with improvements in life expectancy.

We propose that longevity improvements amplify pension reform effects—a mechanism largely overlooked in prior research despite its quantitative importance. Using a simple lifecycle framework, we show that when survival probabilities improve, actuarial adjustments for delayed claiming provide higher benefits collected over longer periods, creating stronger incentives to work longer. Countries experiencing both pension reforms and larger longevity gains show employment increases 15–20 percentage points larger than countries with reforms alone, based on cross-country patterns documented in Table 4. This complementary relationship explains why employment responses are so large in some countries, why growth accelerated during 2013–2019, and why effects are strongest among healthier and more educated workers.

Our framework yields testable predictions about which groups should respond most

[1] European countries: Austria, Germany, Sweden, Netherlands, Spain, Italy, France, Denmark, Greece, Switzerland, Belgium, Czechia, and Poland.

to pension reforms and whether responses should occur primarily at the extensive versus intensive margin. In pension systems where benefits depend on years of contributions rather than total hours, the primary adjustment should be whether to remain employed, not how many hours to work. Our findings strongly support this prediction.

We make three contributions to understanding late-life employment dynamics. First, using harmonized HRS data across sixteen countries, we document labor market outcomes consistently and extend analysis through 2019—revealing that employment increases accelerated rather than plateaued, a pattern missed by studies ending in 2013. Our finding that weekly hours changes are mixed contradicts Bick, Blandin, and Fuchs-Schündeln (2022), who report uniform declines across European countries, suggesting different mechanisms may operate specifically at older ages.

Second, we identify and quantify how longevity improvements amplify pension reform effects. While Börsch-Supan and Coile (2020) find weak direct correlations between longevity and employment changes, we show the interaction with pension reforms is substantial. This amplification mechanism operates through actuarial adjustments becoming more valuable with longer life expectancy—a channel not systematically examined in prior cross-country research. We formalize this mechanism in a simple lifecycle framework that yields testable predictions about margins of adjustment and demographic heterogeneity, which we verify in the data.

Third, our findings have direct policy implications: pension reform effectiveness depends critically on demographic context. Because employment effects concentrate at the extensive margin, policies targeting labor force participation (raising retirement ages, eliminating early retirement pathways) are more effective than policies aimed at hours flexibility. The substantial heterogeneity across health and education groups suggests that differentiated policies accounting for work capacity could improve both efficiency and equity.

The remainder of the paper is organized as follows. Section 2 reviews related literature. Section 3 presents our framework and derives testable predictions. Section 4 documents employment rates and weekly hours. Section 5 examines correlations across countries and demographic groups. Section 6 documents changes in life expectancy, income, wealth, and pension institutions. Section 7 concludes.

2 Related Literature

This paper makes contact with two strands of the macroeconomic literature. First, it is related to work that documents and interprets long-run changes in labor supply at older ages and the timing of retirement in advanced economies. Second, it connects to quantitative overlapping-generations and heterogeneous-agent models that use such empirical evidence to discipline the calibration of preferences, technology, and institutional features of pension and tax systems.

A first group of papers documents the long-run evolution of older individuals' labor-force participation and hours in OECD countries. Blundell, French, and Tetlow (2017) use OECD and UK labor force Survey data to show that employment rates of men aged 55–64 fell from the 1960s to around 1990, but have risen substantially since then in many advanced economies, with particularly large increases for women and for those aged 60–64. Rogerson and Wallenius (2021) provide a broader macroeconomic perspective on these developments using OECD data for older men in 14 countries and emphasize the need to move from aggregate series to micro data in order to understand the mechanisms behind the U-shaped pattern in employment at older ages.

A second strand of the literature, developed in the International Social Security Project, uses country-specific micro data combined with detailed information on pension and disability rules to measure retirement incentives and study their effects on behavior.[2] These studies focus on a subset of advanced economies and document strong links between implicit taxes on working longer and retirement behavior. More recent contributions, such as Coile, Milligan, and Wise (2019a), Börsch-Supan and Coile (2020), and Börsch-Supan and Coile (2025), extend this approach to later periods and additional reforms, stressing that changes in the financial incentives embedded in pension systems are key to understanding rising employment at older ages.

There is also a large microeconometric literature estimating structural life-cycle models in which retirement, hours, savings, and health are jointly determined; see, for example, French (2005) and French and Jones (2011). Related empirical work focuses on explaining rising participation of older workers in particular countries. Schirle (2008) argues that changes in spousal labor supply can explain a substantial share of the recent increase in labor-force participation of older Canadian men, while Yu (2024) quantifies the contribution of U.S. Social Security reforms to the rise in older men's labor supply. Our descriptive cross-country evidence provides additional targets for such structural models and helps to assess whether mechanisms identified in single-country settings generalize more broadly.

The empirical patterns we document in the next sections can be understood through the lens of standard retirement models in which pension rules create implicit taxes on continued work. When these implicit taxes fall—through reforms that raise retirement ages, reduce replacement rates, or strengthen actuarial adjustments—workers face stronger financial incentives to postpone retirement. The magnitude and distribution of employment responses depend on how pension benefits are structured (based on years of contributions versus lifetime earnings) and on heterogeneity in the disutility of work across demographic groups. Section 3 formalizes this intuition and derives testable predictions, but the basic economic logic helps organize the empirical patterns we present next: countries that reduced implicit taxes on work should experience rising employment at older ages, concentrated primarily at the extensive margin (whether to work) rather than the intensive margin (how many hours to work conditional on employment), with larger responses among groups facing lower costs of continued work such as healthier and more educated

[2] See Gruber and Wise (1999), Gruber and Wise (2004), Gruber and Wise (2007), Gruber and Wise (2010), Wise (2012), Wise (2016), and Wise (2017).

individuals.[3]

Our analysis complements and extends this literature in three ways. First, while Blundell, French, and Tetlow (2017) document aggregate employment trends, and Börsch-Supan and Coile (2020) and Börsch-Supan and Coile (2025) analyze ITAX effects in individual countries, we systematically examine the interaction between pension reforms and longevity improvements across countries. Second, our finding that weekly hours changes are mixed contradicts Bick, Blandin, and Fuchs-Schündeln (2022) and suggests different mechanisms may operate at older ages. Third, our extension through 2019 reveals accelerating employment growth during 2013-2019 that was invisible in earlier studies, highlighting the importance of updated evidence for understanding ongoing demographic transitions.

An important question is whether longevity improvements independently contribute to rising employment at older ages. Bloom, Canning, and Fink (2007) argue that longer life expectancy increases the period that must be financed in retirement, creating incentives to work longer and save more. However, Börsch-Supan and Coile (2020) find only weak correlations between longevity gains and employment changes across countries when examining direct effects. We contribute by examining the interaction between longevity and pension reforms: when survival probabilities improve, actuarial adjustments for delayed claiming provide higher benefits collected over longer expected periods, amplifying the employment response to pension reforms. This interaction effect has not been systematically documented in prior cross-country research, despite its quantitative importance.

3 A Theoretical Framework

Our framework is related to, but distinct from, a rich tradition of quantitative overlapping-generations models of aging, retirement and pension reform pioneered by Auerbach and Kotlikoff (1987).[4] An early example is De Nardi, İmrohoroğlu, and Sargent (1999) who develop a general equilibrium OLG model computing equilibrium transitions to study the impact of demographic aging on pension sustainability in the United States using cohort life tables projected by the Social Security Administration. Retirement in that framework is exogenous, though the paper includes policy experiments that extend the retirement age by two years—an early quantitative exploration of the very parameter

[3] One may question whether the pension system is relevant for the 55–59 age group, since early retirement ages are typically above 60. Early retirement pathways in our sample countries frequently begin before 65: Austria's *Korridorpension* is accessible from age 62, Germany's pension for long-term insured from age 63, and France's *retraite anticipée* from age 60. However, the 55–59 group is substantially affected by unemployment-bridge and disability insurance reforms that are part of the broader institutional changes we document in Section 6.

[4] Also see Hubbard and Judd (1987), İmrohoroğlu, İmrohoroğlu, and Joines (1995), Huang, İmrohoroğlu, and Sargent (1997), Conesa and Krueger (1999), and Kotlikoff, Smetters, and Walliser (1999).

at the center of the present study. İmrohoroğlu and Kitao (2012) extend this tradition by incorporating endogenous labor supply at both the intensive and extensive margins, including endogenous retirement, in a model calibrated to the United States. Heijdra and Romp (2009) develop a partial-equilibrium, life-cycle model of retirement and pensions calibrated to the Netherlands, examining how pension reform affects optimal retirement timing and welfare in that specific institutional setting.

The present framework deliberately sacrifices that institutional richness in favor of a simpler structure with a specific purpose: to generate predictions about how heterogeneity in ITAX *across countries* interacts with heterogeneity in longevity gains to produce the cross-country pattern of employment responses we document in Table 4, without requiring separate calibrations for each of our sixteen countries.

Bloom, Canning, and Moore (2014) characterize how the socially optimal retirement age rises with longevity in a representative-agent setting, emphasising that longer expected retirements create incentives to work longer. Our framework takes a complementary but different perspective: we treat institutional parameters as given and ask how improvements in survival probabilities modify workers' responses to those institutions across countries with very different pension rules, with the interaction between the two channels as the central object of interest. Crucially, this interaction is embedded directly in our framework. Equation (9) shows that the present value of postponing retirement depends on $\sum_{t=E+2}^{T} \beta^{t-1} S_t \ln(1+\alpha-\text{ITAX})$: higher survival probabilities S_t raise the weight on every future period, so the marginal value of an ITAX reduction rises with longevity. This multiplicative structure—absent from models that treat longevity and pension incentives as separate additive channels—is precisely what Prediction 4 formalises and what the cross-country evidence in Section 6 supports.

To formalize the key trade-off older workers face when deciding whether to retire or continue working, and to show how implicit taxes on continued work shape this decision, we present a simple life-cycle decision problem.

3.1 The Retirement Decision

Consider an individual who reaches an eligibility age E (early or full) for pension benefits. The individual must decide whether to retire immediately at age E or work one additional year and retire at age $E+1$. We focus on this discrete choice to illustrate the key economic forces at work.

The individual has logarithmic utility over consumption c and experiences disutility $\chi > 0$ from work, with lifetime utility:

$$U = \sum_{t=1}^{T} \beta^{t-1} S_t \left[\ln(c_t) - \mathbf{1}_{t \leq E} \cdot \chi\right], \tag{1}$$

where β is the discount factor, S_t is the cumulative survival probability to age t (with $S_1 = 1$), $\mathbf{1}_{t \leq E}$ indicates working periods, $\chi > 0$ governs the disutility of labor, and T is the maximum possible lifespan.

While working, the individual earns a time-invariant wage w and pays payroll tax τ that funds the pension system:

$$c_t = (1-\tau)w \quad \text{when working.} \tag{2}$$

There is no saving or uncertainty. Upon retirement, the individual receives pension benefits b that depend on when retirement occurs:

$$c_t = b \quad \text{when retired.} \tag{3}$$

3.2 Pension Benefits and the Implicit Tax on Work

The pension benefit is determined by two factors: the replacement rate θ (the fraction of average lifetime earnings replaced by the pension) and various adjustments for early or delayed claiming. If the individual retires at the eligibility age E, the pension is:

$$b_E = \theta \cdot \bar{w}, \tag{4}$$

where $\bar{w}$ represents average lifetime earnings.

If the individual postpones retirement by one year, many pension systems provide an actuarial adjustment $\alpha \geq 0$ to account for the shorter period over which benefits will be paid. However, pension rules often include features that effectively tax continued work—caps on the number of years of earnings counted toward benefits, earnings tests that reduce current benefits for workers above the eligibility age, failure to fully adjust benefits for additional contributions, and several other features that are idiosyncratic to each country's pension and tax rules. Following the empirical literature [Gruber and Wise (1999), Börsch-Supan and Coile (2020), and Börsch-Supan and Coile (2025)], we capture these features by an implicit tax on continued work, $\text{ITAX}_E = -(SSW_{E+1} - SSW_E)/\text{Earn}_E$, where SSW_E denotes social security wealth if retiring at age E and Earn_E represents net earnings. The pension for retiring at $E+1$ is then:

$$b_{E+1} = \theta \cdot \bar{w} \cdot (1 + \alpha - \text{ITAX}). \tag{5}$$

When $\alpha > \text{ITAX}$, postponing retirement increases lifetime pension wealth, creating an incentive to work longer. When $\alpha < \text{ITAX}$, postponing retirement decreases pension wealth, creating an incentive to retire early.

3.3 When Will Workers Postpone Retirement?

The value of retiring at age E is:

$$V_E = \sum_{t=1}^{E} \beta^{t-1} S_t \left[\ln((1-\tau)w) - \chi\right] + \sum_{t=E+1}^{T} \beta^{t-1} S_t \ln(\theta \bar{w}). \tag{6}$$

The value of working until age $E+1$ is:

$$V_{E+1} = \sum_{t=1}^{E+1} \beta^{t-1} S_t \left[\ln((1-\tau)w) - \chi\right] + \sum_{t=E+2}^{T} \beta^{t-1} S_t \ln(\theta \bar{w}(1+\alpha - \text{ITAX})) . \tag{7}$$

The individual postpones retirement if $V_{E+1} > V_E$. Taking the difference and simplifying yields:

$$V_{E+1} - V_E = \beta^E S_{E+1} \left[\ln\left(\frac{(1-\tau)w}{\theta \bar{w}} \right) - \chi \right] + \sum_{t=E+2}^{T} \beta^{t-1} S_t \ln(1+\alpha - \text{ITAX}). \tag{8}$$

Rearranging, the individual works longer if:

$$\underbrace{\ln\left(\frac{1-\tau}{\theta} \right) - \chi}_{\text{Current period net benefit}} \quad + \underbrace{\frac{1}{\beta^E S_{E+1}} \sum_{t=E+2}^{T} \beta^{t-1} S_t \ln(1+\alpha - \text{ITAX})}_{\text{Change in pension wealth}} > 0. \tag{9}$$

This expression reveals the fundamental trade-off. The first term captures the immediate benefit of working (earning $(1-\tau)w$ instead of receiving pension $\theta\bar{w}$) minus the disutility of labor. The second term captures the present value of the change in lifetime pension wealth from postponement.

3.4 Implications of Theory

This framework yields several predictions that we can examine in the data.

Prediction 1: Reductions in ITAX increase employment at older ages.

When pension systems reduce ITAX—either by increasing the actuarial adjustment α or removing penalties for delayed claiming—the term $\ln(1+\alpha-\text{ITAX})$ rises, making $V_{E+1} - V_E$ more likely to be positive. This creates incentives for workers to postpone retirement. We therefore expect that countries reducing net replacement rates or raising normal pension ages experience employment increases at older ages.

Prediction 2: Effects should be concentrated at the extensive margin.

The model focuses on the discrete retirement decision (work or not work) rather than hours adjustments conditional on working. In pension systems where benefits depend on years of contributions rather than total hours worked, the primary margin of adjustment is whether to remain employed, not how many hours to work. We therefore expect to see larger changes in employment rates than in weekly hours per worker.

Prediction 3: Employment responses should be larger for certain groups.

The disutility of work χ varies across individuals. Those with lower χ—such as healthier individuals, more educated workers in less physically demanding occupations, and those with strong labor force attachment—are more responsive to changes in ITAX because working longer is less costly for them. We therefore expect larger employment increases among (i) healthier individuals, (ii) more educated individuals, (iii) workers in less physically demanding occupations, and (iv) those with continuous work histories.

Prediction 4: Increases in longevity amplify employment responses.

The second term in equation (9) shows that the benefit of postponing retirement depends on remaining life expectancy through the survival probabilities S_t: more periods $t \in [E+2, T]$ with higher S_t means a longer expected period over which to collect the higher pension. As survival probabilities improve over time, the present value of postponement increases for a given level of ITAX. This means: (i) for a fixed ITAX, individuals with better survival may choose to postpone retirement even when earlier cohorts with lower survival would have retired early; (ii) longevity improvements shift the critical ITAX upward, creating a range of ITAX values where postponement becomes optimal solely due to improved survival; and (iii) this mechanism potentially explains accelerating employment growth over time as successive cohorts with better survival reach retirement age and increasingly recognize the need to finance longer retirements.

Prediction 5: Heterogeneous responses across countries.

Countries differ in replacement rates θ, eligibility ages E, actuarial adjustments α, and ITAX. They also differ in wage levels, longevity, and the distribution of χ across the population. The model therefore predicts substantial heterogeneity in employment responses across countries, even after accounting for pension reforms. Country-specific combinations of pension incentives, economic conditions, labor market institutions, and demographic trends should jointly determine outcomes.

These five predictions provide testable implications that we evaluate in the empirical analysis using harmonized HRS data for sixteen countries over 2004–2019.

3.5 A Demand-Side Extension

The framework above is a supply-side model: conditional on the worker preferring to remain employed, employment materialises. In practice, however, observed employment rates are equilibrium objects that reflect both workers' willingness to supply labor and employers' willingness to retain or re-engage them. This distinction matters because employment protection legislation (EPL) raises the cost to firms of dismissing older workers, making it less likely that a firm will initiate a separation before the statutory retirement age.

We capture this in the simplest possible way by introducing a job-retention probability $\lambda \in [0, 1]$ that reflects the probability the employer keeps the worker at age E, increasing in the stringency of EPL in the worker's country. Employment at age E then requires both the worker and the employer to be willing:

$$\text{Employed}_i = \underbrace{\mathbf{1}\{V^i_{E+1} - V^i_E > 0\}}_{\text{worker prefers to stay}} \times \underbrace{D_i(\lambda)}_{\text{employer retains}}, \tag{10}$$

where $D_i(\lambda) = 1$ with probability λ and 0 otherwise. The aggregate employment rate at age E becomes:

$$e(\text{ITAX}, \lambda) \;=\; \lambda \cdot \Pr(V_{E+1} > V_E \mid \chi)\,. \tag{11}$$

Equation (11) makes two points transparent. First, higher EPL ($\uparrow \lambda$) raises the employment rate directly, holding pension incentives constant. Second, and more important for our cross-country analysis, EPL and pension reforms are *complementary*: a reduction in ITAX raises $\Pr(V_{E+1} > V_E)$, and this supply-side response is amplified when λ is larger. Countries with stringent EPL therefore exhibit a larger employment response to any given pension reform. This provides a new prediction:

Prediction 6: Stricter employment protection amplifies the employment response to pension reforms.

Countries in which employers face high dismissal costs for older workers will exhibit both higher baseline employment rates at the eligibility age and a larger employment response to reductions in ITAX, because the demand constraint λ scales the entire supply-side margin. This prediction is consistent with Geyer, Haan, Lorenz, Pfister, and Zwick (2022), who show for Germany—a country with rigid continuing wages Dustmann and Schönberg (2009) and especially high dismissal costs for older employees Jahn (2009)—that employers with stronger collective bargaining coverage and lower R&D intensity allow workers to remain employed longer after a pension reform rather than routing them into unemployment before retirement. Lorenz, Zwick, and Bruns (2022) extend this finding and show that financial incentives targeted at employees alone may fail to prolong employment when employer-side barriers are not addressed. More generally, Chéron, Hairault, and Langot (2011) show theoretically that the employment effect of firing taxes is magnified by proximity to retirement, precisely because the shorter remaining tenure of older workers reduces the expected future cost to the firm of retaining them.

We do not alter the simulations in Section 3.6 to incorporate equation (10), as that exercise is designed to isolate the supply-side pension-incentive and longevity channels. The demand channel enters as a country-specific scalar λ that shifts all employment levels proportionally; it does not alter the *comparative statics* with respect to ITAX or survival probabilities that are the focus of Tables 2 and 3. Quantifying the cross-country variation in λ and its interaction with ITAX reductions is an important avenue for future research.

3.6 Numerical Illustration

To illustrate the magnitudes involved, consider a calibrated example using parameters typical of countries in our sample, shown in Table 1. For this initial calculation, we set all survival probabilities $S_t = 1$ for all ages t, which corresponds to a deterministic lifespan scenario. This allows us to isolate the pure effect of ITAX on retirement decisions. Section 3.6.1 below incorporates realistic survival probabilities to examine how longevity improvements affect retirement behavior.

Table 1: Calibrated Parameters for Numerical Illustration

Parameter	Value
Minimum age	21
Maximum age T	100
Eligibility age E	65
Annual discount factor β	0.97
Disutility of labor $\bar{\chi}$	1.30
Log-normal scale σ_χ	0.80
Payroll tax rate τ	0.15
Replacement rate θ	0.50
Actuarial adjustment α	0.08
Survival probabilities S_t	1 for all t

Notes: $\bar{\chi} = 1.3$ serves both as the representative worker's disutility of labor and as the median of the log-normal distribution used in the heterogeneous-population simulation, implying a population mean of $1.3 \times e^{0.32} \approx 1.79$. The scale parameter $\sigma_\chi = 0.8$ is chosen so that all three standard four-percentage-point reform windows yield an employment response of approximately 30 percentage points.

Using equation (9), we evaluate the value difference between postponing retirement to work at age 66 versus retiring early at age 65. With $S_t = 1$ for all t, consider a pre-reform scenario with ITAX = 6%, representative of the pre-reform levels documented for countries in our sample. This yields a net pension adjustment of $1 + \alpha - \text{ITAX} = 1.08 - 0.06 = 1.02$, a two-percent increase in lifetime pension wealth. The value difference is $V_{E+1} - V_E = -0.097$, and the optimal decision is to retire at age $E = 65$.

Now consider a post-reform scenario with ITAX = 2%, representative of the post-reform levels documented in Table 8. The net pension adjustment rises to $1.08 - 0.02 = 1.06$, a six-percent increase, and the value difference becomes $V_{E+1} - V_E = +0.107$. The optimal decision is now to postpone retirement and work until age 66. The critical ITAX at which the representative worker is indifferent between retiring at 65 versus 66 is approximately 0.041: reforms reducing ITAX below this threshold induce postponement. The critical threshold rises from $\chi^*(\text{ITAX} = 0.06) = 0.93$ to $\chi^*(\text{ITAX} = 0.02) = 1.71$; any worker with $0.93 < \chi \leq 1.71$ switches from retiring to working, which is exactly the margin captured by the heterogeneous-population simulation below.

To capture heterogeneity across the population, we simulate individuals with varying disutility of work, drawing χ from a log-normal distribution with $\ln(\chi) \sim \mathcal{N}(\ln 1.3,\ 0.8^2)$. For each of 10,000 simulated individuals with their own χ_i, we calculate $V^i_{E+1} - V^i_E$ using equation (8) with $S_t = 1$ for all t, and set $\text{Employed}_i = \mathbf{1}\{V^i_{E+1} - V^i_E > 0\}$.

The scale $\sigma_\chi = 0.8$ is the key calibration choice. A tighter distribution (e.g. $\sigma_\chi = 0.5$) concentrates the employment response in one narrow region of ITAX space; the wider distribution ensures that the same $\sim$30 percentage point response is obtained across the three standard four-percentage-point reform windows covering $\text{ITAX} \in [0.02, 0.10]$:

ITAX window	Pre-reform emp. rate	Post-reform emp. rate	Δ
$0.10 \rightarrow 0.06$	0.2%	33.9%	+33.7 pp
$0.08 \rightarrow 0.04$	13.2%	50.9%	+37.7 pp
$0.06 \rightarrow 0.02$	33.9%	63.4%	+29.5 pp

All three windows yield approximately 30 percentage points, making the calibration robust to the specific pre- and post-reform ITAX levels. This range is comparable to the employment rate increases documented in Table 4 for countries such as Belgium (+39.7 pp), Germany (+34.9 pp), and Denmark (+30.1 pp).

The heterogeneity in χ captures the fact that healthier, more educated workers with less physically demanding jobs may find continued work less costly and therefore respond more strongly to financial incentives—precisely the pattern we document in Section 5. Furthermore, Börsch-Supan and Coile (2021) document that the decline in ITAX in the countries studied in the NBER's ISS project is substantial. For example, the ITAX for Germany for men fell from about 40% in the early 1980s to about 0% by 2007, and the unweighted average across all countries declined from about 35% to about 20%.

3.6.1 Longevity and Retirement Decisions

The framework above incorporates survival probabilities S_t that can vary across cohorts, allowing us to examine how longevity improvements affect retirement behavior independently of pension reforms. To illustrate this mechanism, we compare two cohorts from the United States with different survival probabilities: a 1950 cohort with lower life expectancy and a 1980 cohort with higher life expectancy.[5]

Individuals who reach age 65 in the 1950 cohort can expect to live an additional 18.4 years (to age 83.4), while those in the 1980 cohort can expect to live 20.3 more years (to age 85.3)—an increase of 1.9 years, or 10.2%. This longevity improvement reflects SSA's projected mortality improvements for these cohorts and is consistent with the long-run trends documented across our sixteen countries in Table 9.

Table 2 shows how the critical ITAX—the value at which individuals are indifferent between retiring at 65 versus 66—shifts with improved survival probabilities.

The critical ITAX rises from the 1950 cohort to the 1980 cohort. This shift creates a "postponement zone" for ITAX values between the two critical thresholds (0.0159 to 0.0209): workers in the 1950 cohort would retire at 65, while workers in the 1980 cohort would work until 66, *even though pension rules are identical*. This demonstrates that longevity improvements alone can induce later retirement, as Figure 1 illustrates. Note also that both cohort thresholds lie well below the deterministic benchmark of 0.0412. This reflects a mortality discount: when survival to older ages is uncertain, the expected present value of future pension increments is lower than under certainty, so workers require a lower implicit tax before finding postponement worthwhile.

[5] We use cohort life tables from the Social Security Administration and take the simple average of the survival probabilities of males and females.

Table 2: Critical ITAX by Cohort

Scenario	Critical ITAX	Interpretation
$S_t = 1$ (deterministic)	0.0412	Baseline, no mortality risk
1950 birth cohort	0.0159	Lower survival probabilities
1980 birth cohort	0.0209	Higher survival probabilities
Difference (1980 − 1950)	0.0050	+31.4% increase

Notes: The critical ITAX is the value of the implicit tax on postponement at which $V_{E+1} - V_E = 0$ for a worker with $\chi = \bar{\chi} = 1.3$. Survival probabilities are cohort life tables from the Social Security Administration (average of males and females). Life expectancy at age 65 is 18.4 years for the 1950 cohort and 20.3 years for the 1980 cohort.

The economic mechanism is transparent from equation (9): improved survival probabilities raise the present value of the pension increment from postponement, as the higher benefit is now collected over a longer expected horizon. The sum $\sum_{t=E+2}^{T} \beta^{t-1} S_t \ln(1 + \alpha - \text{ITAX})$ rises with higher S_t, making individuals willing to tolerate a higher implicit tax before choosing early retirement.

To assess the aggregate employment impact, we simulate 10,000 individuals with heterogeneous disutility of work $\chi \sim \text{LogNormal}(\ln 1.3,\ 0.8)$ and calculate employment rates at age 65 for both cohorts across the full range of ITAX values. Table 3 reports the results.

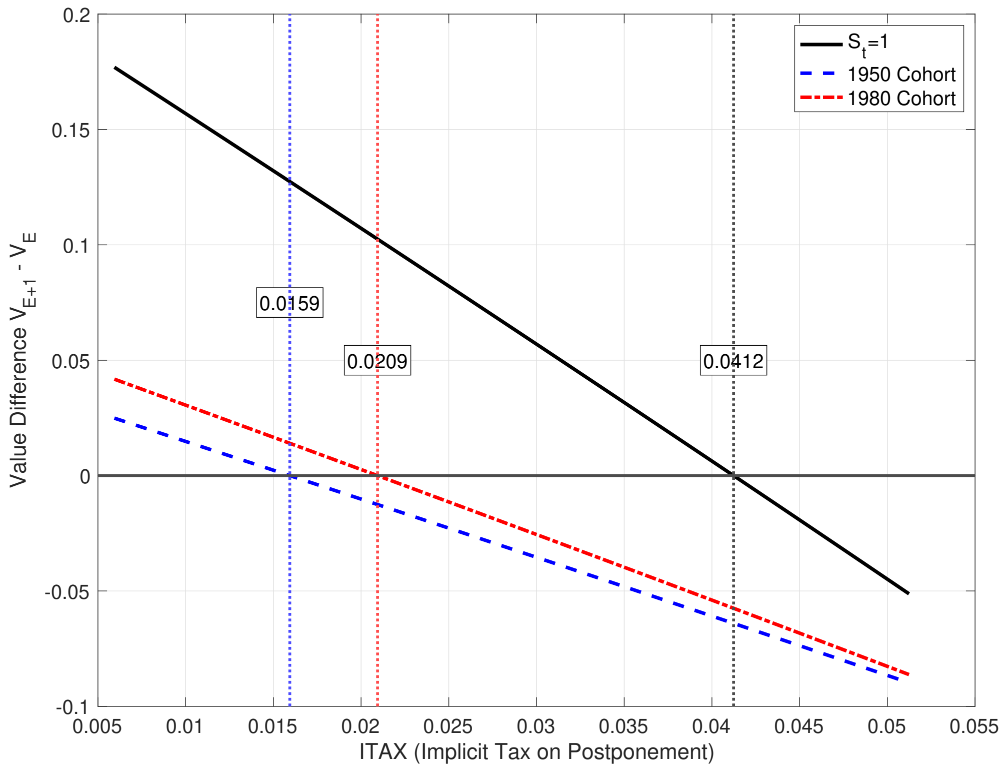


Figure 1: Retirement Decisions and Longevity Effects

Notes: The figure shows the value difference $V_{E+1} - V_E$ as a function of ITAX for three scenarios: certain survival ($S_t = 1$ for all t, black solid line), 1950 cohort survival probabilities (blue dashed line), and 1980 cohort survival probabilities (red dash-dot line). The vertical dotted lines mark the critical ITAX at which each scenario crosses zero—the point at which individuals are indifferent between retiring at age 65 versus 66. Improved survival probabilities shift the indifference threshold rightward: the 1980 cohort is willing to continue working at implicit tax rates that would induce the 1950 cohort to retire early, creating a "postponement zone" between the two cohort thresholds. Survival probabilities are cohort life tables from the Social Security Administration (average of males and females). Parameters are as in Table 1.

Table 3: Employment Rates by Cohort and ITAX

ITAX	1950 Cohort	1980 Cohort	Longevity Effect
0.00	56.4%	58.9%	+2.6 pp
0.02	47.6%	50.2%	+2.6 pp
0.04	37.0%	39.1%	+2.0 pp
0.06	25.8%	26.8%	+1.1 pp
0.08	13.2%	13.2%	0.0 pp
0.10	2.9%	2.5%	−0.5 pp

Notes: Employment rates are computed from a simulated population of $N = 10{,}000$ workers with $\chi \sim \text{LogNormal}(\ln 1.3,\ 0.8)$ (random seed 12345). The "Longevity Effect" column reports the difference in employment rates between the 1980 and 1950 cohorts at each ITAX level, holding pension rules constant. The negative entry at ITAX = 0.10 reflects simulation noise: at near-zero employment rates the two cohorts are indistinguishable and small differences in realized χ draws can reverse the sign.

Table 3 shows that longevity improvements generate modest but meaningful employment increases even without any change in pension rules. The pure longevity effect—the employment rate difference between the 1980 and 1950 cohorts holding ITAX fixed—ranges from 1.1 to 2.6 percentage points across the relevant range of ITAX values and is largest when ITAX is low, where many workers are near the margin of postponement. Importantly, the longevity improvement in the countries we study is larger than that for the United States, so this effect may be more pronounced in our sample.

Comparing the two channels, the reform from ITAX = 0.06 to ITAX = 0.02 raises employment by 29.5 percentage points in the deterministic baseline, while the pure longevity effect at a fixed ITAX of 0.04 amounts to 2.0 percentage points. The ITAX channel thus dominates, but the two mechanisms are complementary rather than additive: when both improvements occur simultaneously, more workers cross the postponement threshold, amplifying the employment response beyond what either channel produces in isolation. This complementarity supports Predictions 4 and 5 and provides an explanation for three empirical patterns: countries experiencing both pension reforms and larger longevity gains show substantially larger employment increases (as we document in Section 6); employment growth accelerated in 2013–2019 relative to 2007–2013 as successive cohorts with better survival reached retirement age; and effects concentrate among healthier and more educated workers—precisely those groups experiencing both larger longevity gains and lower costs of continued work.

3.7 Discussion

This simple framework abstracts from several important features that a complete analysis would include. First, we abstract from saving and wealth accumulation. Individuals can save while working and draw down assets in retirement, affecting the consumption profile and retirement incentives. Wealth heterogeneity may explain differential employment responses. Second, spousal labor supply may be important. Retirement decisions are often made jointly by couples, and one spouse's pension claiming decision affects household income and the other spouse's work incentives. Third, disability and health insurance typically precede benefit claiming. Alternative pathways to retirement through disability insurance interact with pension rules and vary across countries. Fourth, uncertainty plays a large role in life-cycle decisions. Individuals face uncertainty about future wages, health, mortality, and pension rules, which affects their retirement planning. Finally, occupational pensions may interact with public pensions. Many workers have access to employer-provided pensions with their own eligibility rules and incentives.

Despite these limitations, the framework provides intuition for the empirical patterns we document and highlights the key role of ITAX in shaping retirement behavior. A full structural model incorporating these features would be needed to quantify the relative contributions of pension reforms, longevity increases, income changes, and wealth shocks to the employment increases we observe—an important avenue for future research building on the empirical facts we establish.

Employment rates are equilibrium objects, determined jointly by labor supply and labor demand. While the bulk of the theoretical and empirical literature on late-life employment—including the framework developed above—focuses on the supply side, a growing body of evidence shows that employer behavior is a quantitatively important independent driver of whether older workers remain employed.

The demand side operates through at least two channels. The first is employment protection legislation. In many Continental European countries, dismissal costs rise with worker age and tenure: longer statutory notice periods, higher severance payments, and collective bargaining provisions that make it costly for firms to initiate separations before the statutory retirement age. High dismissal costs effectively make older workers "too expensive to fire," keeping them in employment even in the absence of supply-side pension incentives to remain. Chéron, Hairault, and Langot (2011) show formally that the employment effect of firing taxes is amplified by proximity to retirement, because the shorter expected remaining tenure of older workers reduces the option value of dismissal for the firm. The implication for our cross-country evidence is direct: part of the variation in employment rates documented in Table 4—in particular the high levels in countries such as Germany, Austria, and the Netherlands—may reflect the demand-side anchor of strong EPL rather than, or in addition to, pension-reform incentives.

The second channel is labor demand in the narrower sense of employers' willingness to accommodate the higher labor supply of older workers induced by pension reforms. Geyer, Haan, Lorenz, Pfister, and Zwick (2022) show for Germany that employer heterogeneity is a first-order determinant of the employment effects of a pension reform: employers with a high share of older worker inflow, those in sectors with high collective bargaining coverage, and those in sectors with low R&D intensity allow their workers to remain employed longer after the reform, offering partial retirement rather than routing workers into unemployment. Lorenz, Zwick, and Bruns (2022) extend this finding and demonstrate that financial incentives directed at employees may fail to translate into employment gains when the employer is unwilling or unable to retain older workers. These findings imply that our estimates of pension-reform effects in Table 4 should be interpreted as *lower bounds* in high-EPL countries, where demand constraints are less binding, and potentially as *upper bounds* in low-EPL countries, where firms can more freely adjust their age structure in response to workers' changed retirement incentives.

A third, longer-run demand channel is demographic scarcity. As population aging reduces the supply of younger workers, firms in labor-scarce economies face increasing incentives to retain older workers regardless of pension-system parameters. This channel may help explain why employment growth accelerated between 2013 and 2019 (Table 6) relative to the earlier period: successive cohorts with better survival and longer expected working lives enter the market precisely as demographic pressures intensify, aligning supply and demand incentives. A full decomposition of the relative contributions of supply-side pension incentives, EPL, and demographic scarcity to the employment increases we document requires a structural model with an explicit firm side—an important direction for future research building on the empirical facts we establish here.

4 Employment Rates and Weekly Hours

Table 4 documents the changes in employment rates and weekly hours per worker in the 55-64 age group for the 2004-2019 period using harmonized HRS data.[6,7]

[6]For details of the harmonized HRS data used in this paper, see appendix A. The listing of the countries in 4 follows the EUShare ordering of the countries, followed by the US and the UK.

[7]In Appendix B we show the employment rates of older workers using the Rand HRS, Census Bureau, and, PSID data sets for the U.S. to demonstrate that the measures of labor market outcomes are quite similar in all three micro data sets.

Table 4: Employment Rates of 55-64 Year Old Individuals: 2004-2019

	Δ in employment rates			Δ in weekly hours per worker		
	All	Men	Women	All	Men	Women
Austria (AT)	45.2	39.3	50.2	−3.8	−2.7	−1.7
Germany (DE)	36.4	29.5	42.7	−2.9	−5.0	0.4
Sweden (SE)	21.0	21.2	20.8	2.1	0.2	4.0
Netherlands (NL)	38.5	35.2	40.0	2.4	2.6	3.0
Spain (ES)	21.1	16.7	24.5	−0.8	1.2	−3.1
Italy (IT)	44.9	44.5	42.6	2.5	0.4	7.5
France (FR)	32.2	29.8	34.5	−1.8	−3.9	0.2
Denmark (DK)	30.1	25.2	34.0	0.1	0.9	−0.8
Greece (GR)	18.8	14.8	21.3	5.8	5.8	6.4
Switzerland (CH)	26.1	17.0	35.1	0.1	0.6	1.3
Belgium (BE)	39.7	37.2	41.7	−1.6	−1.6	0.4
Israel (IL)	25.6	18.7	31.4	3.0	−3.4	10.9
Czechia (CZ)	34.0	32.6	33.6	2.4	1.2	4.8
Poland (PL)	31.2	24.5	35.3	1.7	0.0	7.3
United States (US)	3.1	1.9	4.3	−0.3	−1.0	0.5
United Kingdom (UK)	7.9	5.8	11.3	−0.8	−2.0	1.2
Average	28.5	24.6	31.5	0.5	−0.4	2.6

UK & US 2004-2018, BE 2005-2019, IL 2006-2019, CZ & PL 2007-2019.
Data Source: HRS for the United States, ELSA for the United Kingdom, SHARE for European countries and Israel.

There have been massive increases in the employment rates of individuals between ages 55 and 64. In nine of the sixteen countries listed in Table 4 (AT, DE, NL, IT, FR, DK, BE, CZ and PL), the overall increases are more than 30 percentage points. In five of the remaining countries (SE, ES, GR, CH and IL), the overall rise in the extensive margin is near or above 20 percentage points. The smallest increases are in the US (3.1 pp) and the UK (7.9 pp). The average increase in the employment rate is 28.5 pp. Excluding the US and UK, the thirteen EU countries and Israel show an average increase of 31.8 pp.

These large employment increases are strongly consistent with Prediction 1 that reductions in ITAX increase employment at older ages. As we document in Section 6, eleven of sixteen countries reduced net replacement rates between 2005 and 2019, and nine countries raised normal pension ages—both changes that make continued employment more financially attractive relative to early retirement. The magnitudes we observe suggest that pension incentives play an important role, though substantial cross-country heterogeneity remains (as anticipated by Prediction 5).

The increases in the female employment rates are larger than those for men in 14 out of the 16 countries. In IT, male and female employment rates show nearly equal increases

(44.5 and 42.6 pp). In five countries (AT, DE, CH, IL and PL), the increases in women's employment rates are more than 10 pp larger than those of men's. The mean increase in the female employment rates, 31.5 pp, is larger than that for males at 24.6 pp. This suggests a mostly female-driven rise in the employment rates.

The changes in the intensive margin, measured by weekly hours per worker, on the other hand, are mixed. In seven out of the 16 countries (AT, DE, ES, FR, BE, US and UK), there are decreases in weekly hours worked. Some changes are fairly small, less than 1 hour either way (ES, DE, CH, US and UK).

This pattern—large increases at the extensive margin combined with mixed or modest changes at the intensive margin—is what Prediction 2 anticipates when pension systems base benefits on years of contributions rather than total hours worked. In such systems, workers respond to reduced implicit taxes on work by postponing retirement (the extensive margin) rather than by adjusting hours conditional on working (the intensive margin). The finding that employment rates rise substantially while hours per worker change little or decline modestly suggests that pension reforms have been effective at inducing workers to remain employed longer, but have not systematically increased work intensity among those already working.

The decreases in weekly hours are mostly driven by men. The declines for women are in only three countries (AT, ES, and DK). In ES, there is an increase for men (1.2 hours) but a sizable decline for women (3.1 hours). In NL, IT, IL, CZ, and PL, there are large increases in weekly hours for women. In DE and FR, there are large declines in weekly hours for men but slight increases for women. Broadly speaking, both margins of labor supply for women show increases.[8]

Our finding of large increases in employment rates in these countries is consistent with those in Blundell, French, and Tetlow (2017) that show substantial increases in employment rates in several OECD countries with the exception of UK, New Zealand, Japan and US over the 2007-2013. Their Table 2.2 shows increases in excess of 10 percentage points in Germany and the Netherlands.

However, our finding of mixed changes in weekly hours per worker for 55-64 year old individuals using the harmonized HRS data is different than that of Bick, Blandin, and Fuchs-Schündeln (2022) who find a uniform decline in hours per worker in 18 European countries and the US from late 1990s to late 2010s. They use the IPUMS version of the Current Population Survey (CPS) for the US and the European Union Labor Force Survey (EULFS) for 18 European countries and look at all individuals 15 and older.[9] For the 55-64 age group, Bick, Blandin, and Fuchs-Schündeln (2022) find decreases in all countries in our sample with the exception of the US.

In Table 5, we use the harmonized HRS data over a shorter period, 2007-2013, to show employment trends, re-ordering the countries with the highest total change in employment rates to the lowest.

[8]In unreported figures, we document that the increase in the employment rate is also present in disaggregated data along marital status, educational attainment, gender, and health status.

[9]In Sweden and Norway, their sample excludes those over 74.

Table 5: Employment Rates of 55-64 Year Old Individuals: 2007-2013

	Δ in employment rates				2013
	All	Men	Women	2007	All
Poland	27.6	18.7	33.9	23.2	50.8
Italy	16.5	15.0	17.5	35.5	52.0
France	15.6	17.1	13.9	45.7	61.3
Austria	10.8	4.6	18.2	40.2	51.0
Belgium	10.5	9.0	12.4	41.9	52.4
Switzerland	9.2	8.4	10.4	74.4	83.6
Israel	8.8	3.9	13.0	57.4	66.2
Czech	8.6	2.1	14.2	47.8	56.4
Spain	6.5	−0.3	12.2	46.3	52.8
Netherlands	6.3	3.9	10.5	57.1	63.4
Germany	6.2	3.9	8.7	62.6	68.8
Denmark	4.0	5.1	3.0	71.7	75.7
Sweden	3.0	0.8	5.2	80.6	83.6
Greece	−2.6	−8.6	3.2	48.5	45.9
United Kingdom	1.8	1.4	2.3	59.8	61.6
United States	0.2	−1.5	1.8	64.4	64.6

UK and US: 2006 to 2012, Greece and Poland: 2007-2015, Israel: 2006-2013.
Data Source: HRS for the United States, ELSA for the United Kingdom, SHARE for European countries and Israel.

Similar to Blundell, French, and Tetlow (2017) we find little change in the overall employment rates in the UK and US in this time period. In Greece there is a slight decline. For other countries, there are increases and in some cases very large rises in the employment rates, as large as 27.6% for Poland and more than 10 percentage points for Italy, France, Austria, and Belgium.

Compared with the countries listed in Blundell, French, and Tetlow (2017), our calculations are lower for Germany and the Netherlands, larger for Italy, France and Belgium, and very similar for Sweden, Denmark, US, UK, and Spain.

Table 6: Employment Rates of 55-64 Year Old Individuals: 2013-2019

	Δ in employment rates				2019
	All	Men	Women	2013	All
Czech	25.4	15.0	19.4	56.4	81.8
Italy	23.0	24.5	19.0	52.0	75.0
Austria	21.5	20.8	21.8	51.0	72.5
Belgium	21.0	21.1	20.3	52.4	73.4
Netherlands	20.0	17.5	20.0	63.4	83.4
Israel	16.9	14.8	18.4	66.2	83.1
Greece	15.8	14.8	14.9	45.9	61.7
France	14.7	10.6	18.8	61.3	76.0
Germany	14.6	11.3	17.7	68.8	83.4
Denmark	12.8	9.8	15.1	75.7	88.5
Spain	9.8	12.0	7.7	52.8	62.6
Switzerland	9.6	7.0	11.0	83.6	93.2
Sweden	9.0	8.3	9.6	83.6	92.6
Poland	3.6	4.2	1.4	50.8	54.4
United Kingdom	6.3	4.0	8.5	61.6	67.9
United States	3.2	4.6	2.0	64.6	67.8

UK and US: 2012-2018, Poland: 2015-2019, Greece: 2015-2019.
Data Source: HRS for the United States, ELSA for the United Kingdom, SHARE for European countries and Israel.

Table 6 uses the harmonized HRS data to show the changes in employment rates over the more recent period, from 2013 to 2019, and reports substantial increases in the employment rates for most countries. Even in the US, there is an overall 3.2 percentage point rise. Increases in employment are about 9 to 20+ percentage points in the rest of the economies, with the Czech Republic leading the way at 25.4%. The increase in the labor supply reported in Blundell, French, and Tetlow (2017) and displayed in Table 5 seem to have continued even more strongly from 2013 to 2019.

So far we have documented the empirical findings from the 55-64 year old group. Börsch-Supan and Coile (2021) and the papers cited in that volume study the behavior of the 60-64 year old workers. In Table 7, we summarize the employment rates and the weekly hours per worker using the 60-64 year old individuals.

Table 7: Employment Rates of 60-64 Year Old Individuals: 2004-2019

	Δ in employment rates			Δ in weekly hours per worker		
	All	Men	Women	All	Men	Women
Austria (AT)	54.5	55.1	53.1	−0.6	−2.5	6.0
Germany (DE)	51.5	44.4	57.7	−2.5	−3.5	1.0
Sweden (SE)	31.0	30.1	31.9	0.6	−1.1	2.8
Netherlands NL)	50.8	50.4	51.0	1.5	−1.0	7.5
Spain (ES)	42.3	38.2	43.9	2.9	1.7	4.4
Italy (IT)	50.7	55.3	45.7	0.9	−0.7	8.3
France (FR)	44.0	43.0	44.9	−1.2	−0.6	−1.9
Denmark (DK)	45.1	34.9	54.5	0.9	0.2	3.7
Greece (GR)	20.2	18.3	18.9	7.6	8.3	6.5
Switzerland (CH)	38.1	29.1	46.5	0.4	2.5	−1.5
Belgium (BE)	49.9	56.1	42.6	1.5	0.1	3.5
Israel (IL)	34.0	39.8	34.2	−0.2	−15.1	17.6
Czechia (CZ)	40.3	43.3	38.4	3.6	2.9	6.9
Poland (PL)	28.5	29.5	25.4	1.9	2.0	4.0
United States (US)	5.2	2.4	7.8	0.7	0.1	1.7
United Kingdom (UK)	15.7	10.9	20.3	−0.1	−1.5	3.7

UK & US 2004-2018, BE 2005-2019, IL 2006-2019, CZ & PL 2007-2019.
Data Source: HRS for the United States, ELSA for the United Kingdom, SHARE for European countries and Israel.

Compared to the 55-64 year old individuals, the increases in the employment rates for the 60-64 year old individuals are even larger, suggesting stronger responses to the reforms to public pensions, changes in taxes or other shocks in these countries.

Furthermore, the weekly hours per worker decline in only five out of the 16 countries and these are driven by men's weekly hours worked. The only overall declines over 1 hour per week are in France and Germany. Women's weekly hours decline in only France and Switzerland. In Israel, there are large increases in women's hours and large decreases in men's weekly hours worked.

Our findings suggest that 1) most of the increases in the employment rates of older workers are driven by the 60-64 year old individuals, 2) women contribute significantly to these increases, 3) increases in the more recent 2013-2019 period are broadly larger than those in the earlier 2007-2013 period, 4) weekly hours rise in most countries and mostly because of increases in women's weekly hours, and 5) there are large variations in labor responses in these countries and across gender.[10]

[10] Time series graphs for disaggregated results on all countries and demographic groups (gender, marital status, health status, and educational attainment) are available on request.

4.1 Extended Age Groups

In the section, we extend the analysis beyond the original 55–64 and 60–64 age groups by also reporting results for ages 55–69 in Table 8 and 65–69 in Table 9. Comparing these tables shows that the main pattern is unchanged. The rise in employment is already strong for ages 55–64 and especially 60–64, but it does not disappear once individuals above age 65 are included.

For ages 55–69, employment rates continue to rise broadly across countries, although in some cases the magnitudes are somewhat smaller than for ages 55–64, which is natural once the sample includes individuals above age 65. More importantly, the results for ages 65–69 show that employment growth extends well into ages traditionally associated with retirement. Employment rises for every country in this group as well, with especially large increases in Sweden, the Netherlands, Germany, Denmark, and Israel. At the same time, changes in weekly hours per worker remain mixed across age groups. Taken together, these results suggest that the increase in later-life labor supply operates primarily through the extensive margin rather than through a uniform increase in hours conditional on work.

Table 8: Employment Rates of 55-69 Year Old Individuals: 2004-2019

	Δ in employment rates			Δ in weekly hours per worker		
	All	Men	Women	All	Men	Women
Austria (AT)	40.8	38.9	42.2	−3.3	−2.4	−1.5
Germany (DE)	40.6	37.2	43.7	−3.0	−4.8	0.3
Sweden (SE)	29.4	28.6	30.1	0.7	−0.9	2.5
Netherlands (NL)	39.0	39.6	37.0	1.7	1.6	2.3
Spain (ES)	25.8	24.9	26.0	0.0	1.1	−0.5
Italy (IT)	42.2	44.1	38.4	2.2	0.7	6.4
France (FR)	29.9	28.9	30.9	−2.1	−4.2	0.1
Denmark (DK)	29.8	27.3	31.1	0.4	1.3	−0.6
Greece (GR)	22.2	22.4	21.0	5.1	5.5	5.0
Switzerland (CH)	28.4	20.9	34.9	0.8	1.5	1.7
Belgium (BE)	38.8	38.3	38.7	−1.1	−1.2	0.8
Israel (IL)	25.7	21.8	28.7	2.6	−3.2	10.3
Czechia (CZ)	25.8	23.1	26.7	2.0	0.6	4.5
Poland (PL)	23.9	21.0	25.4	1.4	0.2	5.7
United States (US)	1.8	0.6	2.9	−0.7	−1.0	−0.1
United Kingdom (UK)	7.7	6.1	9.1	−1.1	−2.4	1.0

UK & US 2004–2018, BE 2005–2019, IL 2006–2019, CZ & PL 2007–2019.
Data Source: HRS for the United States, ELSA for the United Kingdom, SHARE for European countries and Israel.

Table 9: Employment Rates of 65-69 Year Old Individuals: 2004-2019

	Δ in employment rates			Δ in weekly hours per worker		
	All	Men	Women	All	Men	Women
Austria (AT)	10.6	16.0	6.2	−3.9	1.6	−12.6
Germany (DE)	35.0	36.7	33.7	−4.3	−5.9	0.9
Sweden (SE)	51.9	49.7	53.9	1.7	1.1	2.6
Netherlands (NL)	40.7	50.5	30.9	4.0	7.1	−1.9
Spain (ES)	14.0	12.7	15.1	12.1	−4.2	21.8
Italy (IT)	16.2	17.7	15.2	−2.4	1.7	−7.2
France (FR)	14.0	13.7	14.4	−3.7	−11.2	14.1
Denmark (DK)	32.4	34.5	30.6	7.6	8.1	7.0
Greece (GR)	19.3	27.2	13.0	−3.5	1.7	−31.7
Switzerland (CH)	22.1	19.4	24.0	0.1	2.4	0.0
Belgium (BE)	17.3	22.2	12.4	6.4	5.5	8.5
Israel (IL)	30.1	31.9	27.0	2.6	−2.7	12.9
Czechia (CZ)	16.1	14.7	16.5	2.9	0.7	6.5
Poland (PL)	10.8	14.6	7.8	4.9	12.8	−18.2
United States (US)	4.5	3.6	5.3	0.2	1.0	−0.4
United Kingdom (UK)	9.0	11.1	6.7	1.0	0.3	1.9

UK & US 2004–2018, BE 2005–2019, IL 2006–2019, CZ & PL 2007–2019.
Data Source: HRS for the United States, ELSA for the United Kingdom, SHARE for European countries and Israel.

4.2 Part Time Issue?

Bick, Blandin, and Fuchs-Schündeln (2022) report an increase in the share of 55-64 year old individuals working part-time, defined as working strictly less than 35 hours in a usual work week in most of the 18 European countries and the US between the average values in 1997 to 1999 and the average values in 2017 to 2019. For example, they report that in Austria, Denmark, Spain, Italy and the Netherlands, the increase in the share working part-time is between 5 to 13 percentage points. These findings lead them to suggest a mechanism driven by preference heterogeneity and declining disutility of work (perhaps due to increased work-from-home options).

We report our findings on the share of part-time work in Table 10 where we define part-time work as strictly under 20 hours per week in addition to 35 hours a week. When we use the definition used by Bick, Blandin, and Fuchs-Schündeln (2022), namely, part-time work defined as less than 35 hours a week, we see only a few countries with increased share of part-time work such as Germany, Belgium, UK and US. In fact, only Belgium shows a meaningful increase at 7.5%. In Italy, Greece, Israel and Poland, the declines in part-time shares are very large, between 16.5% and 24.9%.

Three country-specific institutional features are worth noting when interpreting these patterns. First, Germany's *Minijob* regime classifies employment paying below a monthly earnings threshold as part-time in administrative records, but SHARE captures these workers as employed on usual weekly hours; this definitional difference may slightly inflate Germany's measured employment gain at the margin. Second, Austria's *Altersteilzeit* (gradual retirement) scheme allows workers to draw a partial pension while working reduced hours, blurring the boundary between employment and retirement in ways that affect both employment levels and hours in our data. Third, the Netherlands has a long-standing culture of structural part-time work across all age groups, so the hours patterns in Table 4 partly reflect pre-existing institutional features rather than new retirement transitions induced by pension reform. These nuances reinforce the importance of interpreting cross-country hours comparisons with awareness of differing part-time regimes.

Table 10: Share of Part-Time Workers 55-64: 2004-2019

	Hours < 20	Hours < 35
Austria	−3.2	−2.1
Germany	−3.6	0.6
Sweden	−2.5	−8.4
Netherlands	−9.1	−5.8
Spain	−6.6	−5.0
Italy	−14.6	−21.5
France	−3.8	−4.7
Denmark	−3.6	−5.6
Greece	−19.5	−24.9
Switzerland	−9.6	−3.3
Belgium	−3.1	7.5
Israel	−0.9	−18.0
Czech	−5.4	−4.9
Poland	−10.2	−16.5
United States	−0.1	−1.0
United Kingdom	−2.8	2.2

UK & US 2004-2018, BE 2005-2019, IL 2006-2019, CZ & PL 2007-2019.
Data Source: HRS for the United States, ELSA for the United Kingdom, SHARE for European countries and Israel.

If we use the definition of less than 20 hours a week as part-time work, then Table 10 shows a decline in the share for all economies in our sample, and, in some cases like Italy, Greece and Poland significant declines that exceed 10 percentage points. These findings are in contrast to those in Bick, Blandin, and Fuchs-Schündeln (2022) and suggest that different mechanisms may be at play.

4.2.1 Part-Time by Gender

In this section, we report the change in the share of workers who are part-time separately for women and men for ages 55–64. As shown in Table 11, separating by gender does not materially change the broad clustering of countries in the data.

For the under-35-hours definition, the main pattern in the original table remains: the largest declines are still concentrated in countries such as Italy, Greece, Poland, and Israel, and these declines are present for both men and women, though they are often substantially larger for women. At the same time, the few countries that showed stable or slightly rising part-time shares in the aggregate continue to do so only in a limited way once we split by gender. In particular, the modest increases under the under-35-hours definition are concentrated mostly among men in Germany (+4.1), Belgium (+8.0), and the United Kingdom (+2.5), while for women the changes are generally flat or negative, with only very small increases in Belgium (+0.2) and Denmark (+0.1).

For the under-20-hours definition, the conclusion is even stronger: declines are nearly universal for both women and men. The only exceptions are quantitatively very small increases for women in Spain (+1.6) and the United States (+0.8) and for men in Israel (+2.2). The largest declines again remain concentrated in the same countries as in the aggregate table, especially Italy, Greece, and Poland, with larger declines generally observed for women.

Overall, the gender breakdown does not overturn the original cross-country clustering. If anything, it sharpens it by showing that the large negative changes are common to both sexes but are typically stronger among women, while the few modest increases in part-time work are mostly driven by men in a small number of countries.

Table 11: Share of Part-Time Workers 55-64 by Gender: 2004-2019

	Hours < 20		Hours < 35	
	Women	Men	Women	Men
Austria	−11.2	−1.9	−6.8	−6.3
Germany	−7.5	−1.3	−6.6	4.1
Sweden	−3.0	−2.0	−11.5	−5.0
Netherlands	−16.6	−4.9	−2.0	−10.1
Spain	1.6	−12.8	−2.6	−8.9
Italy	−23.2	−10.7	−39.9	−14.3
France	−7.5	0.1	−5.5	−4.0
Denmark	−1.1	−5.7	0.1	−10.1
Greece	−21.2	−18.8	−28.1	−24.2
Switzerland	−15.2	−7.1	−2.5	−7.5
Belgium	−11.0	−0.1	0.2	8.0
Israel	−4.7	2.2	−32.1	−7.4
Czech	−8.3	−3.6	−7.1	−3.9
Poland	−18.1	−7.0	−28.8	−11.8
United States	0.8	−1.1	−1.2	−1.3
United Kingdom	−6.4	−0.7	−1.1	2.5

UK & US 2004-2018, BE 2005-2019, IL 2006-2019, CZ & PL 2007-2019.
Data Source: HRS for the United States, ELSA for the United Kingdom, SHARE for European countries and Israel.

5 Correlations between Changes in Employment Rates and Weekly Hours Worked

In this section, we show scatter diagrams of changes in the employment rates in 16 countries (Austria, Germany, Sweden, Netherlands, Spain, Italy, France, Denmark, Greece, Switzerland, Belgium, Israel, Czechia, and Poland, and the U.K. and U.S.).

We start with Figure 2 which is a scatter diagram of the change in the rate of employment measured along the horizontal axis and the change in weekly hours worked measured along the vertical axis.

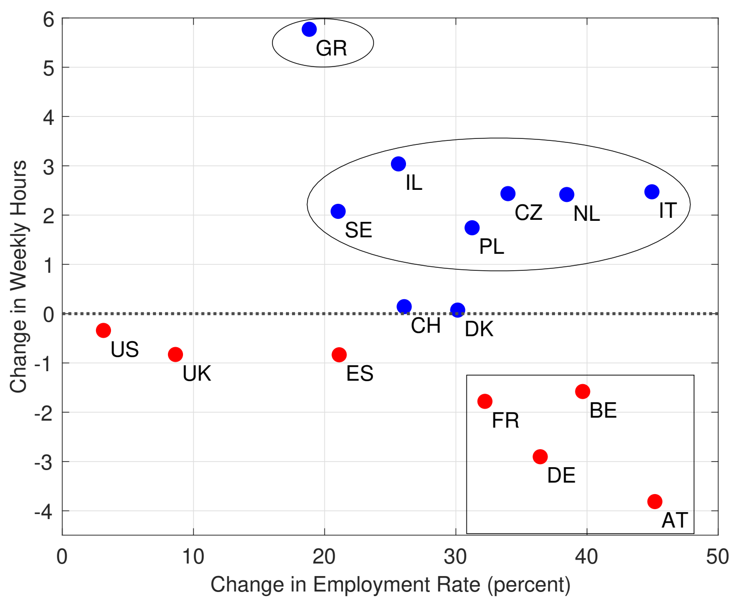


Figure 2: Changes in Employment Rates and Weekly Hours per Worker

Data Source: HRS for the United States, ELSA for the United Kingdom, SHARE for European countries and Israel.

There are increases in the employment rates in all countries, including the US, from 2004 to 2019. Other than the US and the UK, the increases are very large, about 20 percentage points or more. In a few economies, the employment rates rise by 40 or more percentage points for this age group.

The change in the intensive margin, on the other hand, produces a mixed result. Weekly hours per worker falls a little in the UK and Spain, with little change in the US, Switzerland and Denmark. Greece seems an outlier with a nearly 6 hour per week increase per worker.

5.1 Identifying Country Patterns

The scatter plot in Figure 2 reveals three distinct clusters of countries based on their joint employment and hours responses:

The Rectangle Group (declining hours, large employment gains): France, Belgium, Germany, and Austria form a distinct cluster (indicated by the rectangle in Figure 2) characterized by substantial increases in employment rates (ranging from 32.2 to 45.2 percentage points) combined with declines in weekly hours per worker (ranging from −1.6 to −3.8 hours). This pattern suggests that pension reforms in these countries successfully induced workers to postpone retirement (the extensive margin), but workers who remained employed reduced their work intensity. This could reflect several factors: (1) increased availability and take-up of part-time work arrangements near retirement age, (2) gradual retirement policies that allow workers to draw partial pensions while working reduced hours, or (3) compositional effects as the newly employed workers (who might be older or in poorer health) work fewer hours than incumbent workers.

The similarity of this pattern across these four Continental European countries suggests common institutional features may be at play. All four have well-developed systems of partial retirement and gradual transition schemes, and all implemented significant pension reforms during this period that raised retirement ages while simultaneously expanding flexibility in how individuals could combine work and pension receipt.

The Ellipse Group (rising hours, large employment gains): A second distinct cluster (indicated by the ellipse in Figure 2) includes Sweden, Israel, Poland, Czechia, the Netherlands, and Italy. These countries experienced both substantial employment increases (ranging from 21.0 to 44.9 percentage points) and increases in weekly hours per worker (ranging from 1.7 to 5.8 hours). This pattern indicates that labor supply expanded along both the extensive and intensive margins—not only did more older workers remain employed, but those who were employed also increased their work hours.

This dual expansion of labor supply could reflect: (1) pension reforms that created particularly strong financial incentives for continued full-time work, (2) labor market conditions or policies that facilitated increased hours for older workers, or (3) compositional shifts toward healthier, more educated workers who both continued employment longer and worked more hours. The heterogeneity within this group is notable: Sweden and the Netherlands are affluent Nordic/Western European countries with relatively generous welfare states, while Poland, Czechia, and to some extent Italy are transition or Southern European economies with different institutional structures. This suggests that multiple pathways can lead to increased labor supply on both margins.

Countries Near the Horizontal Axis (minimal hours changes): The United States, United Kingdom, Spain, Switzerland, and Denmark cluster near the horizontal axis with employment increases but very small changes in weekly hours per worker (between −0.8

and +0.1 hours). This pattern is consistent with pension systems that base benefits primarily on years of contributions rather than total hours worked: in such systems, employment responses occur predominantly at the extensive margin (whether to work) rather than the intensive margin (how many hours to work).

The US and UK are particularly interesting cases because they experienced the smallest employment increases in our sample (3.1 and 7.9 percentage points respectively) alongside minimal hours changes. This likely reflects two factors: (1) these countries had less dramatic pension reforms during our sample period compared to Continental European countries, and (2) they already had relatively high employment rates among older workers at the start of the period (64.4% and 59.8% in 2007 for ages 60-64, compared to 40-50% in many European countries), leaving less room for growth.

Greece: Greece stands apart as an outlier with both a substantial employment increase (18.8 percentage points) and a very large increase in weekly hours per worker (5.8 hours). This exceptional pattern likely reflects Greece's unique economic circumstances during this period. The country experienced severe fiscal crisis and implemented dramatic pension reforms that sharply reduced replacement rates (from 99.9% to 51.1%, the largest decline in our sample as shown in Table 8) and cut benefits. These reforms created powerful incentives for continued work, while the broader economic crisis may have generated financial necessity that induced both continued employment and increased work hours among those who remained employed. The Greek case illustrates how extreme economic shocks combined with major policy reforms can generate labor supply responses that exceed those predicted by pension incentives alone.

5.2 Implications of Country Clustering

Given this heterogeneity in observed labor market outcomes, it is difficult to rationalize these patterns with a single shock or factor. More likely, there have been different changes in tax policy or pension parameters that may have generated these different outcomes. The country groupings we identify suggest that:

1. Pension reform design matters: The contrast between the Rectangle Group (declining hours) and the Ellipse Group (rising hours) suggests that how pension reforms are structured—particularly whether they include partial retirement options and how actuarial adjustments are calibrated—affects not just whether people work longer, but how intensively they work.

2. Institutional complementarities: Countries with similar institutional structures tend to cluster together, suggesting that pension reforms interact with broader labor market institutions (employment protection, part-time work regulations, age discrimination laws) in ways that shape the nature of labor supply responses.

3. Economic context matters: The Greek example demonstrates that labor supply responses to pension reforms depend critically on the broader economic environment. Countries facing fiscal crises or economic downturns may see different patterns than countries reforming pensions during periods of economic stability.

4. Baseline conditions constrain responses: The US and UK cases suggest that countries with already high elderly employment rates have less scope for further increases, regardless of pension incentives.

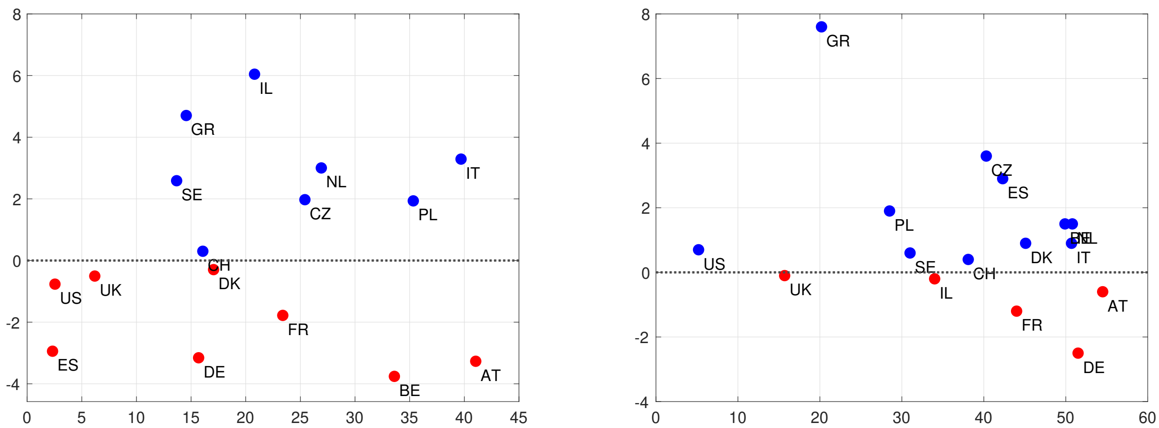
These patterns motivate the more detailed analysis in Section 6, where we examine how changes in life expectancy, income, wealth, and specific pension parameters correlate with the employment and hours patterns documented here. They also underscore the need for country-specific institutional analysis—as undertaken in the International Social Security Project volumes—to fully understand the mechanisms behind the aggregate patterns we observe.

5.3 Age Disaggregation

When we split our sample of individuals into 55-59 and 60-64 year old individuals, the decline in weekly hours in Figure 2 seems to be driven by the younger of the two groups of workers, depicted in Figure 3. The 60-64 year old individuals display larger responses along the extensive margin for all the countries considered in our study.[11]

In a small number of countries—most notably France and Austria—the employment increase for the 55–59 age group exceeds that for the 60–64 group. The primary explanation lies in the timing of early retirement pathway closures. Many countries eliminated or tightened access to unemployment-bridge and disability pathways that were disproportionately used by the 55–59 group: Germany's *58er-Regelung*, Austria's *Invaliditätspension* tightening, and France's *préretraite progressive* all targeted this younger group specifically. These reforms pushed the effective labor-market exit age up within the 55–59 cohort before the 60–64 group—which was already closer to the statutory retirement age and therefore less reliant on bridge pathways—could be comparably affected. A cohort-composition effect reinforces this: the 60–64 group in 2019 (born 1955–1959) entered the labor market under earlier institutional conditions, while the 55–59 group (born 1960–1964) came of age after major structural shifts in labor markets and female participation norms. Countries where 55–59 gains exceed those for 60–64 are precisely those that had the most generous pre-reform bridge routes for the younger group.

[11] Figure 3 uses harmonized aging-survey microdata from SHARE, ELSA, and HRS over our sample period. These data differ from official Eurostat EU-LFS statistics in survey design, sample coverage, and time period. Accordingly, Figure 3 is intended to document broad cross-country patterns in later-life employment in our harmonized survey data, rather than to replicate official Eurostat employment series. See Appendix C for details.



(a) Ages 55-59 (b) Ages 60-64

Figure 3: Changes in Employment Rates and Weekly Hours per Worker by Age Group

Data Source: HRS for the United States, ELSA for the United Kingdom, SHARE for European countries and Israel.

5.4 Disaggregated Changes in Employment Rates and Hours Worked

In this section we explore the correlations between employment and weekly hours per worker along the gender, education, marital status and health dimensions.

5.4.1 Gender

Figure 4 shows that women's weekly hours fell only in Spain and Austria while their hours increased in Israel, Italy, Greece, Sweden, Czechia and the Netherlands For men, we see increases in Greece and the Netherlands. It seems that most of the declines in weekly hours in the few countries we see are due to men's hours.

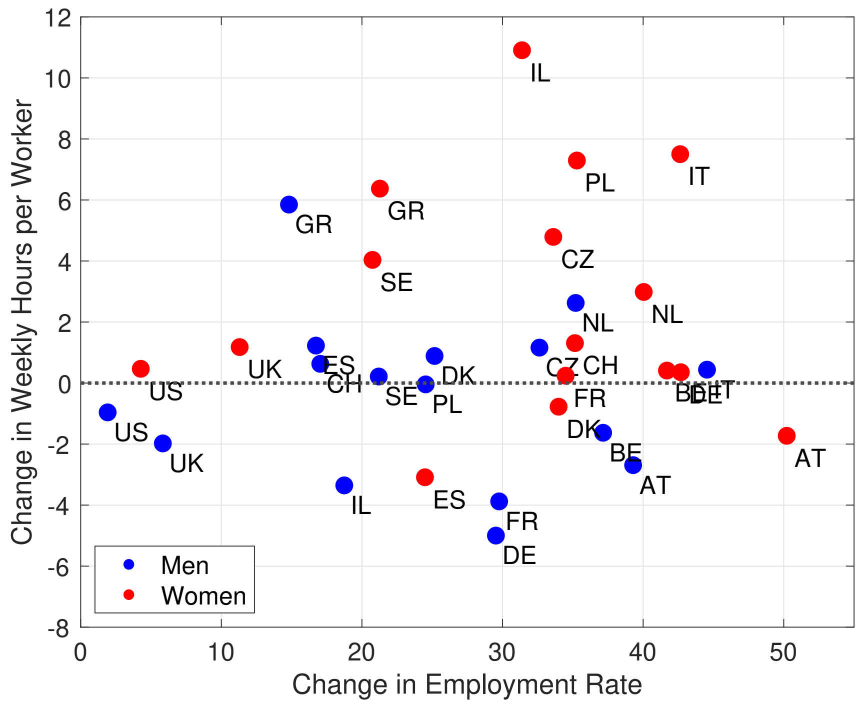


Figure 4: Changes in Employment Rates and Weekly Hours: Gender

Data Source: HRS for the United States, ELSA for the United Kingdom, SHARE for European countries and Israel.

These gender differences align with Prediction 3 that groups facing lower costs of continued work should respond more to pension reforms. The fact that both employment rates and weekly hours increased more for women than men (Table 4 shows women's employment increased 31.5 pp vs. 24.6 pp for men) suggests two mechanisms may be at work. First, women may have faced larger reductions in implicit taxes on work due to pension reforms that equalized retirement ages across genders (as occurred in Austria, Germany, and Italy). Second, changing social norms and improved health may have reduced the disutility of work for older women relative to older men, making them more responsive to financial incentives created by pension reforms.

The decline in the intensive margin for women is significant in Spain and Austria, with a very small decline in France. For men, however, the declines show up in Germany, France, Austria, Belgium, Denmark, Israel, in addition to the US and UK. Furthermore, the increase in weekly hours worked in Israel, Sweden, Poland, Czechia, and Italy (in the elliptical group (minus the Netherlands) in Figure 2) seems to be driven by females. In the Netherlands, males and females show about the same increase in the intensive margin.

5.4.2 Marital Status

Figure 5 is the scatter diagram for changes in employment rates and weekly hours for married and single 55-64 year old individuals. The declines in weekly hours depicted in Figure 2 in France, Belgium, Germany and Austria seem to be present in both married and single individuals in Figure 6. Overall, more countries show increases in the intensive margin by single individuals.

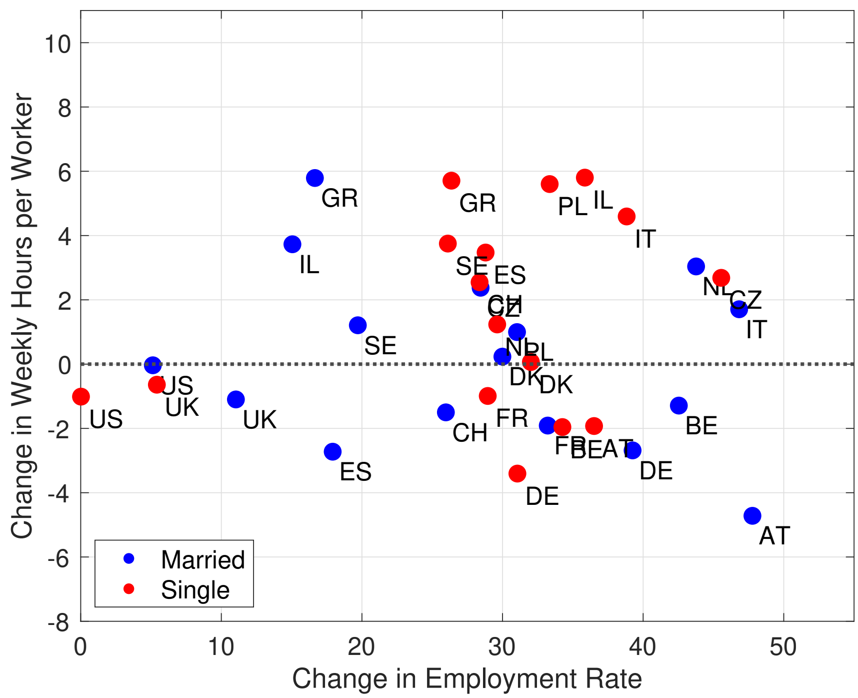


Figure 5: Changes in Employment Rates and Weekly Hours: Marital Status

Data Source: HRS for the United States, ELSA for the United Kingdom, SHARE for European countries and Israel.

5.4.3 Educational Attainment

The overall changes in employment rates and weekly hours seem to be somewhat similar among college educated individuals versus non college educated individuals according to Figure 6.

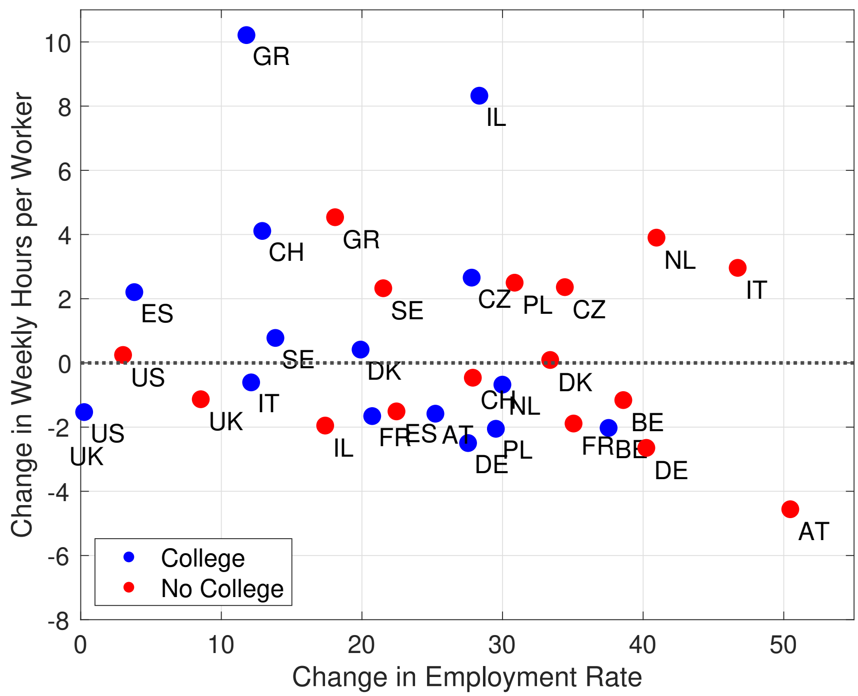


Figure 6: Changes in Employment Rates and Weekly Hours: Education

Data Source: HRS for the United States, ELSA for the United Kingdom, SHARE for European countries and Israel.

There are a few exceptions. In Israel, the increase in weekly hours is entirely from the highly educated group of individuals, raising the overall intensive margin despite the decline for the less educated individuals. In Greece, we see a similar pattern with a larger increase in the intensive margin for college educated individuals than that for individuals with no college education. The overall increases in the intensive margin in Italy and Poland are driven by less educated individuals.

5.4.4 Health Status

Bad health individuals show significant decreases in weekly hours in Figure 7. In particular, there are large declines in hours in Israel, Czechia and Austria. In Czechia, the overall increase in the intensive margin in Figure 2 is driven by good health individuals, overcoming the decline from bad health individuals. The same is true for Israel. For France, the decline in weekly hours worked is due entirely to the decrease in the intensive margin in the good health individuals.

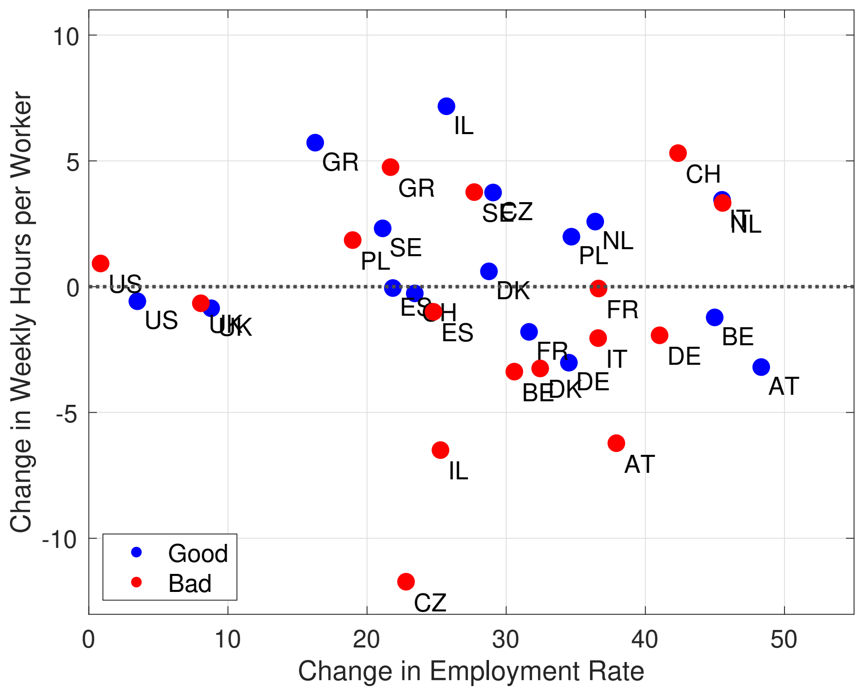


Figure 7: Changes in Employment Rates and Weekly Hours: Health

Data Source: HRS for the United States, ELSA for the United Kingdom, SHARE for European countries and Israel.

Looking at the disaggregated correlations between changes in the employment rates and weekly hours produces more heterogeneity in labor market outcomes in the sixteen countries considered.

The heterogeneity we document—particularly the larger employment increases among more educated and healthier workers (Figures 6 and 7)—is consistent with Prediction 3. Healthier individuals face lower disutility of work and therefore respond more elastically to reductions in implicit taxes on continued employment. Similarly, more educated workers in less physically demanding occupations find continued work less costly, explaining their larger employment responses. This pattern suggests that pension reforms have been most effective at extending working lives for those who face the lowest costs of postponing retirement—a finding with important implications for the distributional effects of pension policy.

The country-specific heterogeneity we observe emphasizes the importance of detailed institutional analysis along the lines of Börsch-Supan and Coile (2025) and the papers in that volume. While our framework identifies ITAX as a key mechanism, the full effect of pension reforms depends on interactions with disability insurance generosity, tax policies, health insurance arrangements, and labor market institutions that vary substantially across countries—as Prediction 5 anticipates.

6 Changes in Life Expectancy, Income, Wealth, and Pensions Over Time

The dramatic employment increases documented in Sections 3 and 4 raise a natural question: what economic and institutional changes over the 2004–2019 period can account for these patterns? The literature points to several potential mechanisms, which we examine in turn using data for our sixteen countries.

First, *increasing longevity* extends the retirement period that must be financed, creating incentives to work longer and accumulate more savings (Bloom, Canning, and Fink (2007)). However, Börsch-Supan and Coile (2020) find only weak correlations between longevity gains and employment changes across countries, suggesting this mechanism alone cannot explain the observed patterns. Our analysis shows why longevity effects may appear weak when examined in isolation: the primary channel operates through interaction with pension reforms rather than as a direct effect. When countries reduce ITAX without longevity improvements, employment increases are modest. When longevity improves without pension reforms, effects are weak (as Börsch-Supan and Coile (2020) found). Countries experiencing both large ITAX reductions and above-average longevity gains — such as Austria, Italy, and the Netherlands — show employment increases 15–20 percentage points larger than countries with modest reforms and below-average longevity gains, such as the United States and United Kingdom. This explains why prior research found weak direct effects while missing the quantitatively important interaction.

Second, *pension reforms* have fundamentally altered retirement incentives. Facing fiscal pressures from population aging, most OECD countries reformed their pension systems between the 1990s and 2010s by raising eligibility ages, reducing replacement rates, strengthening actuarial adjustments for delayed claiming, and tightening disability insurance access (Gruber and Wise (1999), Gruber and Wise (2004)). These reforms reduce the implicit tax on continued work, making employment more financially attractive relative to early retirement. Indeed, the International Social Security Project has documented strong statistical links between the decreases in the implicit tax on working longer (ITAX) and rising employment in individual countries (Coile, Milligan, and Wise (2019b), Börsch-Supan and Coile (2020), Börsch-Supan and Coile (2025)).

Third, *income and wealth effects* may influence retirement decisions. Negative wealth shocks (as occurred during the 2008 financial crisis in several countries) can induce workers to postpone retirement to rebuild savings (Coile and Levine (2015)). Conversely, rising incomes may allow earlier retirement if leisure is a normal good, though this effect appears dominated by substitution effects in most empirical studies (French (2005)).

Fourth, *labor market institutions and demand-side factors* shape the ease with which older workers can remain employed. Countries differ substantially in age discrimination protections, mandatory retirement rules, availability of part-time work, workplace accommodations for older workers, and employer attitudes toward aging employees (Rogerson and Wallenius (2021)). Technological change may also affect older workers differently depending on their skills and occupations (Jaimovich (2021)).

Fifth, *changes in the nature of work* may reduce the disutility of employment at older ages. The shift from physically demanding manufacturing and agricultural jobs to service-sector and knowledge-based occupations may make continued work more feasible for older individuals (Rogerson and Wallenius (2021)). Improvements in health and medical technology have also reduced disability rates among older workers in many countries (Wise (2012), Wise (2016), Wise (2017)).

Finally, *changing social norms* around retirement and older women's labor force participation may have shifted preferences. The stigma associated with working past traditional retirement ages has declined, while female labor force attachment has strengthened across cohorts (Schirle (2008)).

Table 12 documents the increases in life expectancy at age 65 over time. Over the longer period 1974 to 2019, the increase in longevity at age 65 ranges from 3.9 years in Czechia to 6.6 years in Israel. Indeed, most of the countries have had increases around 6 years. Consistent with Prediction 4, this longevity increase amplifies the value of postponing retirement, as the higher pension from delayed claiming is now collected over more years. This mechanism may help explain why employment increases accelerated in the 2013–2019 period (Table 6) relative to 2007–2013 (Table 5): workers increasingly recognize the need to finance longer retirements. Although Börsch-Supan and Coile (2020) find weak direct correlation between longevity gains and employment changes, the interaction of longevity with ITAX reductions predicted by our framework may be important.

Table 12: Change in Life Expectancy at age 65 from 2004 to 2019

	1974	1989	2004	2019	2019-1974
Austria	14.2	16.4	18.8	20.2	6.0
Belgium	14.3	16.3	18.5	20.3	6.0
Czech	14.4	13.6	16.2	18.3	3.9
Denmark	15.4	16.2	17.5	19.7	4.3
France	15.5	17.8	20.1	21.6	6.1
Germany	14.1	16.2	18.5	19.7	5.6
Greece	15.6	17.1	18.3	19.6	4.0
Italy	15.1	17.1	19.6	21.1	6.0
Israel	14.4	17.6	19.2	21.0	6.6
Netherlands	15.6	16.8	18.2	20.1	4.5
Poland	14.3	14.5	16.5	18.3	4.0
Spain	15.1	17.5	19.4	21.5	6.4
Sweden	15.7	17.4	19.1	20.8	5.1
Switzerland	15.6	17.8	19.8	21.4	5.8
United Kingdom	14.5	15.8	18.2	20.2	5.7
United States	15.6	17.1	18.4	19.7	4.1

Source: World Population Prospects 2024, United Nations.

The raw correlation between the change in life expectancy at age 65 and the change in the employment rate across our sixteen countries is $r = 0.27$, positive but modest. Rather than undermining our argument, this weak direct correlation is precisely what the model predicts. Equation (9) shows that the present value of postponing retirement depends on the product $\sum_{t=E+2}^{T} \beta^{t-1} S_t \ln(1 + \alpha - \text{ITAX})$: the longevity term $\sum \beta^{t-1} S_t$ and the pension incentive $\ln(1 + \alpha - \text{ITAX})$ enter multiplicatively, not additively. When ITAX is high—as in pre-reform systems—$\ln(1+\alpha-\text{ITAX})$ is small or negative, so additional years of expected life do little to raise the value of postponement: workers are already penalized into retiring early, and more years simply extend a retirement that has already begun. Conversely, when pension reforms drive ITAX down, the same longevity improvement now multiplies a meaningfully positive pension increment, generating an employment response substantially larger than either channel would produce in isolation. Börsch-Supan and Coile (2020) find exactly this pattern at the country level: the direct correlation between longevity gains and employment changes is weak, while countries that combined ITAX reductions with longevity improvements show the largest employment responses. Our model formalizes why: longevity amplifies pension reform rather than substituting for it.

The cross-country data are consistent with this amplification mechanism, as the following country comparisons illustrate. Austria and Italy have nearly identical longevity gains over the period (1.4 and 1.5 years, respectively, from Table 12) yet both record the two largest employment increases in the sample (45.2 and 44.9 percentage points). Both countries underwent major pension-eligibility-age reforms during this period—the Sacconi and Fornero reforms in Italy and the gradual equalization of retirement ages in Austria—that substantially reduced ITAX through the NRA channel even as net replacement rates changed little. The interaction of even moderate longevity gains with these large ITAX reductions generates the outsized employment response the model predicts. At the other end of the sample, the United States and the United Kingdom record the two smallest employment increases (3.1 and 7.9 percentage points) and also display modest longevity gains (1.3 years for the US and 2.0 years for the UK) alongside modest pension reforms relative to Continental Europe. With both factors weak, the amplification mechanism has little to work with, and employment responses remain limited. A more pointed comparison is Poland versus Greece: both experienced large net replacement rate cuts (34.6 and 48.8 percentage points, respectively), but Poland's longevity gain was 1.8 years against Greece's 1.3 years, and Poland's employment response (31.2 pp) exceeded Greece's (18.8 pp) despite a smaller reform—directionally consistent with stronger amplification where longevity improvement was larger.[12]

A fully clean empirical test of the interaction would require country-level ITAX series for all sixteen countries across the 2004–2019 period, allowing a direct assessment of whether the LE–employment correlation is stronger within the subset of countries that experienced large ITAX reductions. Such an exercise lies beyond the descriptive scope of

[12] Greece's unusually large NRR cut also reflects the acute fiscal crisis of 2010–2012, which compressed the highest pensions disproportionately and may have introduced labor-supply responses not well captured by the standard pension-incentive channel.

this paper and is an important direction for the structural estimation we call for in the conclusion. What the data do establish is that the direct LE–employment correlation is weak ($r = 0.27$), which is consistent with the model's prediction that longevity operates primarily as an amplifier of pension reform rather than as an independent driver of late-life employment.

The aggregate life expectancy figures in Table 12 mask substantial within-country heterogeneity in longevity by socioeconomic status, education, and gender. A large literature documents that higher-income and more educated individuals live substantially longer than their lower-income counterparts, with Chetty, Stepner, Abraham, Lin, Scuderi, Turner, Bergeron, and Cutler (2016) estimating a gap of more than ten years in life expectancy between the top and bottom income quartiles in the United States. If higher-SES workers both live longer and face lower disutility of work—as implied by the occupational gradient in physically demanding labor—then the within-country amplification of pension reform effects through longevity is likely larger than the aggregate cross-country correlation suggests.

The gender dimension of this heterogeneity offers a partial and instructive within-sample test of the amplification mechanism. Table 4 documents that women's employment rates rose by 31.5 percentage points on average, compared to 24.6 percentage points for men. At the same time, the life expectancy data show that men gained more remaining years of life than women in all sixteen countries over this period, with men's gains exceeding women's by an average of approximately 0.5 years. If the *direct* longevity channel were the primary driver of employment growth—longer life creating a stronger incentive to keep working—one would expect the group experiencing larger longevity gains (men) to show larger employment increases. The opposite is true.

This reversal is consistent with the amplification mechanism: the primary driver of women's larger employment response is pension reform, specifically the equalization of normal retirement ages across our sample countries, which reduced ITAX more sharply for women than for men. Longevity improvements then amplified these larger reform incentives, but the reform effect dominated. Men, facing smaller ITAX reductions because their retirement ages were already higher, saw smaller employment gains despite larger longevity improvements. The gender cross-pattern therefore helps identify the two channels: it is difficult to reconcile with a story in which longevity drives employment independently of pension reform, but is naturally explained by a model in which longevity amplifies reform incentives that differ across groups. Constructing group-specific life expectancy estimates from the HRS-family surveys and correlating them with group-specific employment responses within countries would provide a more formal test of this mechanism; we leave that exercise for future research.

Income and Wealth Table 13 shows the changes in mean and median income and wealth, and, the changes in the extensive and intensive margins of labor supply. There is considerable heterogeneity among the countries regarding the changes in income and wealth. Switzerland, Czechia, Austria, Sweden, Israel and Poland display large increases in both income and wealth. Italy, France, Greece, and US show decreases.

Table 13: Changes in Income, Wealth, and Labor

Country	$\%\Delta Y_{mean}$	$\%\Delta Y_{med}$	$\%\Delta W_{mean}$	$\%\Delta W_{mean}$	Δ Hours	Δ Emp Rate
AT	25.7	29.6	61.8	32.6	−3.8	45.2
DE	8.2	11.1	2.3	7.4	−2.9	36.4
SE	35.1	46.4	72.2	124.2	2.1	21.0
NL	23.3	22.7	−10.9	6.6	2.4	38.5
ES	22.7	25.4	−14.4	11.6	−0.8	21.1
IT	−8.1	0.1	−35.4	−19.0	2.5	44.9
FR	−17.0	−13.2	−22.5	−3.4	−1.8	32.2
DK	−0.7	−6.4	88.9	99.4	0.1	30.1
GR	−45.2	−39.3	−54.6	−51.8	5.8	18.8
CH	86.4	164.7	61.7	59.4	0.1	26.1
BE	−1.1	35.6	24.2	37.7	−1.6	39.7
IL	51.9	54.8	148.4	72.4	3.0	25.6
CZ	70.9	86.6	80.0	34.4	2.4	34.0
PL	22.0	9.1	67.6	84.5	1.7	31.2
US	−5.6	−17.3	−26.8	−52.9	−0.3	3.1
UK	9.4	7.4	17.7	13.0	−0.8	8.6

Public Pensions Since 1980s, there have been numerous changes in public pension rules in the OECD countries and others. Early eligibility age (EEA), statutory eligibility age (SEA) (also called the normal or full retirement age, the replacement rate and many related parameters have changed. As a result it is difficult to portray a representative change that would apply to all the countries under consideration. Table 14 summarizes the key aspects of these pensions.

Table 14: Changes in Basic Pension Parameters[13]

	Net Replacement Rate		Normal Pension Age		
	2005	2019	2005	2019	Future
Austria	93.2	89.9	65 (60)	65	65
Belgium	63.1	66.2	65	65	67
Czech	58.2	60.3	63 (59-63)	63.2	65
Denmark	54.1	70.9	65	65	74
France	68.8	73.6	60	63.3	66
Germany	71.8	51.9	65	65.5	67
Greece	99.9	51.1	65	62	62
Italy	88.8	91.8	65	67	71.3
Israel	81.1	57.8	65 (60)	67	67
Netherlands	84.1	80.2	65	65.8	71.3
Poland	69.7	35.1 (27.3)	65 (60)	65	65
Spain	88.3	83.4	65	65	65
Sweden	68.2	53.4	65	65	65
Switzerland	67.3	44.3 (43)	65 (64)	65	65
United Kingdom	47.6	28.4	65	65	68
United States	51	49.4	67	66	67

Source: OECD Pensions at a Glance 2019 and 2005.

Pensions and Predictions 1 and 5: In eleven out of sixteen countries shown in Table 14, net replacement rate has decreased from 2005 to 2019, suggesting a cut in benefits and therefore an incentive to work more or longer in the life cycle.[14] In some cases such as Greece, Germany, Israel, Poland the UK, the declines are very large—strongly consistent with Prediction 1. Countries with the largest cuts in replacement rates (Greece: −48.8 percentage points; Germany: −19.9 pp; Poland: −34.6 pp) experienced substantial employment increases (18.8 pp, 36.4 pp, and 31.2 pp respectively from Table 4).

[13]The NRR figures cover mandatory public and quasi-mandatory occupational pensions only; voluntary private schemes are excluded. For Germany, the large decline from 71.8% to 51.9% partly reflects the Riester reform, which introduced voluntary private top-ups outside the mandatory system, so the decline in the public NRR overstates the reduction in total retirement income replacement for workers who take up Riester contracts. Cross-country NRR comparisons should also account for occupational pension coverage rates, which differ substantially—near-universal in the Netherlands and Switzerland, much lower in Greece and Poland. Despite these limitations, the NRR is the standard cross-country comparator used by Börsch-Supan and Coile (2020), Börsch-Supan and Coile (2025) and the NBER ISS project, so our use is consistent with the prior literature.

[14]The net replacement rate is defined as the individual net pension entitlement divided by net pre-retirement earnings, taking account of personal income taxes and social security contributions paid by workers and pensioners.

In addition, future SEA is expected to rise in nine out of the sixteen countries, again indicating a cut in retirement benefits, and suggesting that this change may also play a role in the increase in employment rates.

It would be useful to cast the increase in longevity in a structural model together with the many changes in the pension rules, perhaps summarized by the ITAX calculations initiated by Börsch-Supan and Coile (2020) and Börsch-Supan and Coile (2025) to quantify the contributions of each aspect in the environment to the increase in the employment rates. This is left for future research.

7 Concluding Remarks

Employment rates for workers aged 55–64 increased by an average of 28.5 percentage points across sixteen countries between 2004 and 2019, with Austria (+45.2 pp), Italy (+44.9 pp), and the Netherlands (+38.5 pp) experiencing gains *larger than their entire 2004 employment rate*. Using harmonized HRS data, we document that these increases were concentrated among women, healthier individuals, and more educated workers, and occurred primarily at the extensive margin rather than through increased hours per worker. While Börsch-Supan and Coile (2020) find only weak direct correlations between longevity and employment changes, we show that the interaction of longevity with pension reforms is quantitatively large and explains substantial cross-country variation.

Our primary contribution is comprehensive descriptive evidence on these dramatic changes. We document novel patterns that existing research has missed: the magnitude of employment increases in some countries, mixed rather than uniformly declining hours per worker, and substantial heterogeneity across demographic groups. We relate these patterns to pension reforms that reduced work disincentives and to improvements in life expectancy, proposing that improved survival probabilities amplify pension reform effects by increasing the present value of benefits from delayed claiming.

This longevity amplification mechanism helps explain three puzzles: why employment responses are exceptionally large in some countries (e.g., Netherlands, Austria, Italy), why growth accelerated during 2013–2019 compared to 2007–2013, and why effects are strongest among healthier and more educated workers.

Our findings have important policy implications. First, pension reforms that reduce implicit taxes on work postponement effectively increase late-life employment, but magnitudes depend critically on demographic context. Second, because increases concentrate at the extensive margin, policies targeting labor force participation (raising retirement ages, eliminating early retirement pathways) are more effective than policies aimed at hours flexibility. Third, substantial heterogeneity across health and education groups implies that differentiated policies accounting for work capacity may improve both efficiency and equity.

Several questions remain for future research. A quantitative structural model incorporating realistic institutional detail is needed to decompose the relative contributions of pension reforms, longevity improvements, income changes, and wealth effects. Understanding the welfare consequences of increased late-life employment—both for individuals and society—requires analyzing job characteristics, wage dynamics, and the tradeoffs between consumption smoothing and work disutility. The empirical patterns we establish provide natural targets for such structural analysis.

References

Auerbach, A. J. and L. J. Kotlikoff (1987). *Dynamic Fiscal Policy*. Cambridge: Cambridge University Press.

Bick, A., A. Blandin, and N. Fuchs-Schündeln (2022). Reassessing economic constraints: Maximum employment or maximum hours? Working Paper.

Bloom, D. E., D. Canning, and G. Fink (2007). Disease and development revisited. *Journal of Political Economy 115*(6), 1103–1140.

Bloom, D. E., D. Canning, and M. Moore (2014). Optimal retirement with increasing longevity. *Scandinavian Journal of Economics 116*(3), 838–858.

Blundell, R., E. French, and G. Tetlow (2017). Retirement incentives and labor supply. In A. Woodland and J. Pigggott (Eds.), *Handbook of the Economics of Population Aging*, Volume 18, Chapter 1. Amsterdam: Elsevier.

Börsch-Supan, A. and C. Coile (2021). Introduction to social security programs and retirement around the world: Reforms and retirement incentives. In A. Börsch-Supan and C. Coile (Eds.), *Social Security Programs and Retirement around the World: Reforms and Retirement Incentives*, Chapter 0. Chicago: University of Chicago Press.

Börsch-Supan, A. and C. C. Coile (Eds.) (2020). *Social Security Programs and Retirement around the World: Reforms and Retirement Incentives*. University of Chicago Press.

Börsch-Supan, A. and C. C. Coile (Eds.) (2025). *Social Security Programs and Retirement around the World: The Effects of Reforms on Retirement Behavior*. University of Chicago Press.

Chéron, A., J.-O. Hairault, and F. Langot (2011). Age-dependent employment protection. *Economic Journal 121*(557), 1477–1504.

Chetty, R., M. Stepner, S. Abraham, S. Lin, B. Scuderi, N. Turner, A. Bergeron, and D. Cutler (2016). The association between income and life expectancy in the United States, 2001–2014. *Journal of the American Medical Association 315*(16), 1750–1766.

Coile, C. C. and P. B. Levine (2015). Recessions, retirement, and social security. *American Economic Review: Papers & Proceedings 105*(5), 1–5.

Coile, C. C., K. Milligan, and D. A. Wise (Eds.) (2019a). *Social Security Programs and Retirement around the World: Working Longer*. University of Chicago Press.

Coile, C. C., K. Milligan, and D. A. Wise (Eds.) (2019b). *Social Security Programs and Retirement around the World: Working Longer*. Chicago: University of Chicago Press.

Conesa, J. C. and D. Krueger (1999). Social security reform with heterogeneous agents. *Review of Economic Dynamics 2*(4), 757–795.

De Nardi, M., S. İmrohoroğlu, and T. J. Sargent (1999). Projected U.S. demographics and social security. *Review of Economic Dynamics 2*(3), 575–615.

Dustmann, C. and U. Schönberg (2009). Training and union wages. *Review of Economics and Statistics 91*(2), 363–376.

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

French, E. and J. B. Jones (2011). The effects of health insurance and self-insurance on retirement behavior. *Econometrica 79*(3), 693–732.

Geyer, J., P. Haan, S. Lorenz, M. Pfister, and T. Zwick (2022). The role of labor demand in the labor market effects of a pension reform. *Industrial Relations: A Journal of Economy and Society 61*(2), 152–192.

Gruber, J. and D. A. Wise (Eds.) (1999). *Social Security Programs and Retirement around the World*. University of Chicago Press.

Gruber, J. and D. A. Wise (Eds.) (2004). *Social Security Programs and Retirement around the World: Microestimation*. University of Chicago Press.

Gruber, J. and D. A. Wise (Eds.) (2007). *Social Security Programs and Retirement around the World: The Relationship to Youth Employment*. University of Chicago Press.

Gruber, J. and D. A. Wise (Eds.) (2010). *Social Security Programs and Retirement around the World: Fiscal Implications of Reform*. University of Chicago Press.

Heijdra, B. J. and W. E. Romp (2009). Retirement, pensions, and ageing. *Journal of Public Economics 93*(3–4), 586–604.

Huang, H., S. İmrohoroğlu, and T. J. Sargent (1997). Two computations to fund social security. *Macroeconomic Dynamics 1*(1), 7–44.

Hubbard, R. G. and K. Judd (1987). Social security and individual welfare: Precautionary saving, borrowing constraints, and the payroll tax. *American Economic Review 177*(4), 630–646.

İmrohoroğlu, A., S. İmrohoroğlu, and D. H. Joines (1995). A life cycle analysis of social security. *Economic Theory 6*(1), 83–114.

İmrohoroğlu, S. and S. Kitao (2012). Social security reforms: Benefit claiming, labor force participation, and long-run sustainability. *American Economic Journal: Macroeconomics 4*(3), 96–127.

Jahn, E. J. (2009). Do firms obey the law when they fire workers? Social criteria and severance payments in Germany. *International Journal of Manpower 30*(7), 672–691.

Jaimovich, N. (2021). Comment on shocks, institutions, and secular changess in employment of older individuals. *NBER Maroeconomics Annual 36*, 217–233.

Kotlikoff, L. J., K. Smetters, and J. Walliser (1999). Privatizing U.S. social security—a simulation study. *Review of Economic Dynamics 2*(3), 532–574.

Lorenz, S., T. Zwick, and M. Bruns (2022). Beware of the employer: Financial incentives for employees may fail to prolong old-age employment. *Journal of the Economics of Ageing 21*, 100363.

Rogerson, R. and J. Wallenius (2021). Shocks, institutions, and secular changess in employment of older individuals. *NBER Maroeconomics Annual 36*, 177–216.

Schirle, T. (2008). Why have the labor force participation rates of older men increased since the mid-1990s? *Journal of Labor Economics 26*(4), 549–594.

Wise, D. A. (Ed.) (2012). *Social Security Programs and Retirement Around the World: Historical Trends in Mortality and Health, Employment, and Disability Insurance Participation and Reforms*. Chicago: University of Chicago Press.

Wise, D. A. (Ed.) (2016). *Social Security Programs and Retirement Around the World: Disability Insurance Programs and Retirement*. Chicago: University of Chicago Press.

Wise, D. A. (Ed.) (2017). *Social Security Programs and Retirement Around the World: The Capacity to Work at Older Ages*. Chicago: University of Chicago Press.

Yu, Z. (2024). Why are older men working more? the role of social security. *Journal of Public Economics 231*, 105071.

A Data Sources and Sample Construction

We use harmonized micro data from the Health and Retirement Study (HRS) family of surveys, which provides comparable individual-level information on employment, health, and demographics across countries. Data are publicly available at the Gateway to Global Aging Data maintained by the University of Southern California with funding from the National Institute on Aging.

The HRS family includes: HRS for the United States, ELSA for the United Kingdom, and SHARE (Survey of Health, Ageing and Retirement in Europe) for fourteen European countries and Israel. Each survey follows individuals aged 50 and above with biennial interviews. We focus on individuals aged 55–64 and use data from 2004 to 2019 (or the latest available wave for each country).

A.1 Sample Sizes

Table A1 reports the number of individuals and households in our analysis sample for each country. Our full sample includes over 160,000 individuals across sixteen countries, with over 90,000 in the focal 55–64 age group.

Table A1: Sample Size Across Countries

Country	All Ages		Ages 55–64	
	Individuals	Households	Individuals	Households
Austria	6,245	4,249	2,935	2,160
Germany	8,765	5,637	4,113	2,969
Sweden	6,665	4,355	2,970	2,164
Netherlands	6,578	4,251	3,211	2,267
Spain	8,756	5,203	3,772	2,530
Italy	8,502	5,330	4,051	2,805
France	8,363	5,502	3,977	2,828
Denmark	5,856	3,772	3,107	2,179
Greece	6,607	4,315	3,336	2,381
Switzerland	4,605	3,028	2,233	1,640
Belgium	9,852	6,600	4,786	3,487
Israel	4,035	2,479	2,042	1,402
Czech Republic	8,591	5,631	3,972	2,817
Poland	6,278	4,152	2,984	2,142
United States	42,228	26,596	29,193	18,962
United Kingdom	19,782	13,731	10,361	8,806

Notes: Sample includes all respondents aged 50 and above across all available waves (2004–2019).

Data sources: HRS for United States, ELSA for United Kingdom, SHARE for European countries and Israel.

A.2 Key Variables

Employment: We define an individual as employed if they report currently working for pay. This includes both employees and self-employed individuals. We exclude those on temporary layoff or sick leave.

Weekly hours: For employed individuals, we use self-reported usual weekly hours worked. We trim extreme values (top and bottom 1%) to reduce the influence of outliers.

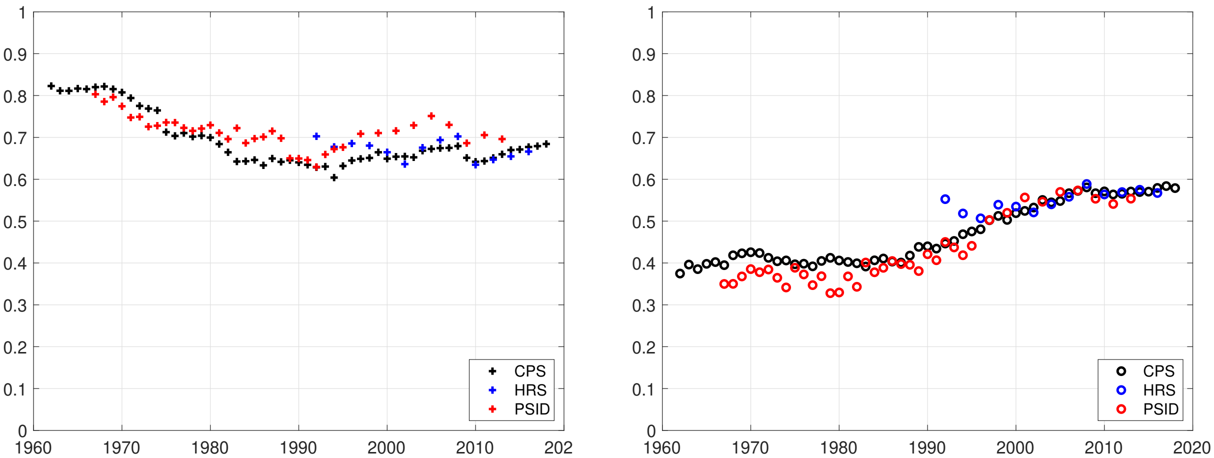
Health status: We use self-reported health on a five-point scale (excellent, very good, good, fair, poor). We define "healthy" as those reporting excellent, very good, or good health.

Education: We classify individuals as "college educated" if they have completed tertiary education (ISCED 5 or above). This includes university degrees, advanced vocational training, and equivalent qualifications.

Income and wealth: We use household income (including earnings, pensions, and capital income) and net household wealth (assets minus debts), both adjusted to 2015 purchasing power parity using OECD conversion factors.

B Validation: U.S. Employment Rates Across Data Sources

To validate our HRS-based employment measures, we compare U.S. employment rates for ages 55–64 from three sources: HRS (our main data), the Panel Study of Income Dynamics (PSID), and the Current Population Survey (CPS). Figure A1 shows that employment rates track closely across all three sources, with differences typically less than 2 percentage points.



(a) Males (b) Females

Figure A1: 55–64 Year Old Male and Female Employment Rates

Notes: Figure shows employment rates for U.S. individuals aged 55–64 from three data sources: Rand HRS (our main data), PSID, and CPS. All series show the same upward trend from 2004 to 2019, with levels differing by less than 2 percentage points. This validates our use of HRS data for cross-country comparisons.

The strong agreement across data sources confirms that our HRS-based measures accurately capture U.S. employment trends. Since SHARE uses the same harmonization procedures as HRS, we have confidence in the cross-country comparability of our employment measures.

C HRS-Family Data and the Eurostat EU-LFS

Our employment series are constructed from the HRS-family of longitudinal aging surveys (SHARE, ELSA, and HRS) and differ from employment statistics published by Eurostat based on the EU Labour Force Survey (EU-LFS), such as those reported in ?).[15] Five features of the two data collections account for the bulk of the differences.

Survey design. The EU-LFS is a large repeated cross-section designed to produce official labor-market statistics across the entire working-age population. The HRS-family surveys are longitudinal, following cohorts aged 50 and above with biennial interviews, providing individual-level data on job exits, re-entries, and hours adjustments that are essential for our margins analysis.

Employment definition. The EU-LFS applies the ILO definition (at least one hour of paid work in the reference week); the HRS-family uses "currently working for pay," which includes the self-employed but excludes those on temporary layoff. Self-employment

[15] See Graph 3.3 in ?) for cross-country employment trends for ages 55–64, 55–59, and 60–64 over 2009–2023.

among workers aged 55–64 averages approximately 18% across our sample, and reaches roughly 30% in Greece and 25% in Italy, making this difference quantitatively important for those countries.

Observation period. Our analysis covers 2004–2019 using available survey waves, whereas the EU-LFS series in ?) covers 2009–2023. The partial overlap means that differences in starting conditions—in particular Greece's acute fiscal contraction of 2009–2013, which depresses the EU-LFS starting level—can generate apparent discrepancies even when both series are internally consistent.

Age coding and sample retention. Minor differences in how national statistical offices assign age at interview introduce small discrepancies in the 60–64 band. SHARE additionally retains respondents in their origin-country sample after relocation, whereas the EU-LFS records employment at the country of current residence.

The HRS-family harmonization is appropriate for our purposes because it provides consistent individual-level data on health, wealth, and labor-market histories across all sixteen countries—information that is central to the demographic heterogeneity analysis in Section 5.