Illinois Pension Reform and Public Labor Force Recruitment and Retention

Examining the effects of Tier 2 pension reform on public-sector recruitment and retention

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ABSTRACT

Illinois' 2011 Tier 2 pension reform substantially reduced defined-benefit generosity for all new state and local government hires by raising the normal retirement age from 60 to 67, weakening cost-of-living adjustments, and tightening the benefit formula. We estimate the causal effect on public-sector recruitment and retention using a two-step difference-in-differences design applied to matched CPS MORG panels covering 2008–2017. We find no significant effect on either margin: the post-reform shift in the Illinois recruitment differential is +0.11 pp ($p = 0.858$) and in the retention differential is −3.40 pp ($p = 0.240$). The reform does coincide with a structural break in the *predictability* of retention — regression R^2 nearly doubles post-reform — consistent with heterogeneous sorting among incumbent workers but not a detectable average treatment effect. We discuss implications for the proposed Tier 2 benefit restorations under Senate Bill 1937.

MISSION STATEMENT

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INTRODUCTION

Public-sector pensions play a central role in attracting and retaining workers, particularly through backloaded defined-benefit structures. In 2011, Illinois implemented Tier 2, significantly reducing pension generosity for new hires by increasing retirement ages, lowering cost-of-living adjustments, and tightening benefit formulas, to deal with the state's chronic fiscal deficit. Tier 2, thus, can be characterized as a classic 'policy shock', providing a natural-experiment backdrop for us to research the behavioral outcomes of pension generosity.

At the same time, the state has faced persistent public-sector labor shortages–a critical detail for policymakers as the contested pension issue comes to light again in the parliament with the Illinois 'Pension Sweetener Bill' (SB 1937). The bill aims to revise the Illinois Pension Code by increasing Tier 2 generosity to comply with the Federal 'Safe Harbor' laws, which mandate that a pension benefit must be at least as generous as Social Security benefits.

This paper investigates whether the Tier 2 reform contributed to the persistent shortages in Illinois by weakening incentives to enter and remain in public employment. Using these results, we discuss the possible labor market effects of the a converse *increase* in pension generosity through SB 1937.

1 LITERATURE REVIEW

A large and growing literature examines how pension design shapes labor supply, retirement behavior, workforce composition, and retention. Across institutional contexts, a consistent finding is that reductions in pension generosity and increases in retirement age tend to delay retirement and increase labor force participation among older workers, though the magnitude and mechanisms vary.

1.1 Pension Incentives and Retirement Behavior

A central insight in the literature is that financial incentives embedded in pension systems strongly influence retirement timing. Using longitudinal data on subjective retirement expectations, Chan and Stevens find that greater financial gains from delaying retirement significantly increase the probability of continued labor force participation, while also showing that cross-sectional estimates tend to overstate these effects because they fail to account for unobserved heterogeneity.[1]

Related work similarly emphasizes that future retirement incentives, rather than static benefit levels alone, are especially important for explaining labor supply decisions near retirement. More broadly, the literature suggests that workers respond not just to the absolute value of benefits, but to how pension wealth changes with an additional year of work.

1.2 Evidence from Pension Reforms

A second strand of literature exploits pension reforms as quasi-natural experiments to estimate causal effects of changes in pension rules.

Evidence from Finland shows that increases in the statutory retirement age can substantially raise employment among older workers. Nivalainen and Ilmakunnas study a 2017 reform that increased the retirement age from 63 to 65 in three-month increments across birth cohorts and find that the reform increased employment among affected cohorts by an average of 19 percent, with variation across education, income, and sector.[2]

Similarly, Austrian evidence shows that raising the early retirement age delays both labor market exit and pension claiming. Using variation across birth cohorts generated by reforms in 2000 and 2004, one study finds that each one-year increase in the early retirement age raises the age of labor market exit by 0.4 years and the age of pension claiming by 0.5 years on average.[3]

Evidence from the United States suggests that reductions in pension generosity do not necessarily reduce retention. A recent NBER working paper on a Texas teacher pension reform finds that reductions in annuities and early retirement options increased five-year retention by

[1] Chan and Stevens (2004)
[2] Nivalainen and Ilmakunnas (2025)
[3] Manoli and Weber (2016)

2.9 percent and ten-year retention by 1.9 percent, suggesting that discouraging early retirement can offset reductions in benefits.[4]

Cross-country evidence points in a similar direction. A study of pension reforms across Australia, Belgium, Denmark, Finland, France, Italy, Japan, New Zealand, Spain, and the United Kingdom finds that restrictive structural pension reforms generally increase labor force participation among older workers, though anticipated reforms may reduce participation in the short run because workers adjust behavior in advance.[5]

Evidence from Italy reinforces this pattern. A graduate thesis using EU SHARE data and Spain as a control finds that Italian pension reforms that raised the retirement age and shifted toward a defined contribution structure increased employment among Italians aged 60 to 69 by approximately 3.6 percentage points, with stronger effects among men and higher-educated workers.[6] Complementary firm-level evidence from Italy suggests that retaining older workers does not reduce wages, productivity, or value added per worker, challenging the idea that delayed retirement necessarily crowds out younger workers.[7]

1.3 Mechanisms and Heterogeneity

Taken together, this literature suggests that pension reforms affect labor markets primarily through the timing of retirement and the incentives surrounding early exit. Less generous benefits, later eligibility ages, and weaker early retirement options tend to push workers to remain employed longer. At the same time, these effects are not uniform across workers.

Several studies find meaningful heterogeneity by education, income, sector, gender, and health. The Finnish evidence, for example, shows that the effects of retirement-age increases vary across education levels and employment sectors.[8] Other literature on retirement expectations also suggests that low wealth and low pension wealth increase the likelihood that workers plan to remain in the labor force past age 62, implying that financial constraints shape retirement timing alongside institutional incentives.[9]

1.4 Income and Compensation Effects

The theoretical literature provides conflicting predictions on how pension reforms affect labor supply and retention. In the option value framework of Stock and Wise (1990), individuals compare the value of retiring today to the value of continuing to work in order to preserve future pension benefits. Reductions in pension generosity lower the option value of remaining employed and therefore predict earlier retirement. Similarly, Coile and Gruber (2007) emphasize that retirement decisions are forward-looking and respond to expected changes in pension wealth and benefit accrual, implying that weaker pension incentives should lead to earlier labor force exit.[10] Lazear (1986) provides a complementary perspective, modeling pensions as a form of deferred compensation designed to retain workers and induce optimal retirement timing; in this framework, reducing pension generosity weakens retention incentives and may increase turnover.[11]

However, these predictions contrast with a large empirical literature showing that pension retrenchments often increase labor supply among older workers. This divergence arises because reductions in pension generosity also generate an income effect: individuals facing lower expected retirement income may choose to work longer in order to accumulate additional savings. As a result, pension reforms create competing forces, with incentive effects pushing toward earlier retirement and income effects pushing toward delayed exit. The net effect is therefore an empirical question and depends on the relative strength of these opposing mechanisms.

Importantly, existing empirical evidence suggests that the income effect often dominates at the retirement margin, leading to delayed labor force exit among older workers following pension retrenchment. However, this body of work focuses overwhelmingly on individuals close

[4] Johnston et al. (2025)
[5] Bi and Zubairy (2023)
[6] UNKNOWN (NOWN)
[7] Carta et al. (2021)
[8] Nivalainen and Ilmakunnas (2025)
[9] Chan and Stevens (2004)
[10] Coile and Gruber (2007)
[11] Lazear (1986)

to retirement eligibility, where pension rules create discrete changes in incentives and where responses are most easily observed.

More broadly, the literature pays relatively little attention to other margins of adjustment, particularly entry into employment and sectoral choice. While retirement decisions are directly shaped by policy thresholds and are therefore amenable to quasi-experimental analysis, recruitment decisions are more diffuse and depend on expectations about lifetime compensation. As a result, there is comparatively little empirical evidence on how pension generosity affects the behavior of younger or mid-career workers, especially in terms of entry into the public sector.

This gap is particularly important in the context of public-sector labor markets. If pensions constitute a meaningful component of total compensation, reductions in pension generosity may reduce the attractiveness of public employment, affecting not only retirement behavior but also recruitment, sectoral sorting, and workforce composition. Existing studies provide limited evidence on these dynamics and typically do not examine how pension reforms influence both entry into and exit from the public sector within a unified framework.

This project builds on the existing literature by treating pension reform as a broader labor market shock rather than solely a determinant of retirement timing. Specifically, it examines how Illinois' Tier 2 pension reform affects both retention and recruitment, with a focus on age-specific labor supply, public versus private sector dynamics, and workforce composition. By analyzing both entry and exit margins, the project aims to provide a more complete account of how pension generosity shapes public-sector labor supply.

1.5 Gaps and Contribution

Despite a large and well-developed literature on pension incentives and retirement behavior, important gaps remain in our understanding of how pension design affects broader labor market dynamics. Most existing work focuses on the retirement margin, analyzing how changes in pension generosity or eligibility rules influence the timing of labor force exit among older workers. While this focus is well-motivated by the structure of pension systems and the availability of quasi-experimental variation, it leaves other dimensions of labor supply comparatively understudied.

In particular, the literature provides limited evidence on how pension generosity affects labor market entry, especially among younger or mid-career workers. Recruitment decisions differ fundamentally from retirement decisions: rather than responding to discrete eligibility thresholds, individuals must form expectations about lifetime compensation, including wages, benefits, and career trajectories. As a result, the impact of pension reforms on entry into public-sector employment is more difficult to identify and has received relatively little attention in reduced-form empirical settings.

A related gap concerns sectoral sorting and workforce composition. If pensions are an important component of total compensation, changes in pension generosity may alter the relative attractiveness of public versus private sector employment. This could affect not only whether workers remain employed, but also where they choose to work, with implications for the composition and quality of the public-sector workforce. Existing studies typically examine retirement and retention in isolation and do not capture these broader equilibrium effects.

Furthermore, most empirical analyses focus on older cohorts near retirement eligibility, where policy variation is most salient. While this approach yields credible estimates of retirement responses, it provides limited insight into how pension reforms affect the behavior of workers earlier in their careers. As a result, the literature offers an incomplete picture of how pension systems shape labor supply over the life cycle.

This project addresses these gaps by analyzing pension reform as a broader labor market shock rather than solely a determinant of retirement timing. Focusing on Illinois' Tier 2 pension system, it examines both retention and recruitment, with particular attention to age-specific labor supply, sectoral dynamics, and workforce composition. Since Tier 2 was implemented less than two decades ago, we notice that only a small portion of post-2011 public sector entrants would have reached retirement age. Our analysis, thus, also implicitly asks to what extent mid-career workers optimize inter-temporally, and even care about retirement decisions in the present, compared to other hiring decision factors like wages, insurance benefits, hours etc. By jointly analyzing entry and exit margins, the project contributes to a more comprehensive understanding of how pension generosity influences public-sector labor markets.

2 INSTITUTIONAL BACKGROUND

2.1 Illinois Defined-Benefit Pension Structure

Public-sector pensions in Illinois operate under a defined-benefit (DB) system, in which retirement benefits are determined by a formula based on an employee's earnings history and tenure rather than accumulated contributions. In contrast to defined contribution (DC) plans, where the employee bears the pension risk, the employer shoulders it in DB plans. The standard benefit formula takes the form:

$$\text{Annual Pension Benefit} = \beta \times YOS \times FAS \tag{1}$$

where β denotes the benefit multiplier, YOS represents years of service, and FAS is final average salary, typically calculated using earnings in the final years of employment.

A key feature of DB systems is that pension wealth is *backloaded*. Benefits increase nonlinearly with tenure due to both the accumulation of service years and the use of peak earnings in the benefit calculation. As a result, workers who remain in the system for longer periods receive disproportionately higher retirement benefits relative to those who exit early. This creates strong incentives for long-term employment, as workers forfeit substantial pension wealth if they leave prior to vesting or before reaching retirement eligibility thresholds.

In addition to the core formula, pension generosity depends on institutional parameters such as cost-of-living adjustments (COLAs), retirement age requirements, vesting periods, and salary caps. These features jointly determine the level and growth of retirement income and are central to the incentive effects of the pension system.

2.2 Illinois State Pension Systems

Illinois state government is responsible for funding five defined-benefit pension systems covering distinct categories of public employees. All five were created as defined-benefit plans in which benefits are determined by a formula based on years of service and final average salary, and all are funded through a combination of employee contributions, state employer contributions, and investment returns. Tier 2, enacted by Public Act 96-0889 and effective 1 January 2011, applies to new entrants in all five systems, though the specific benefit changes and their Safe Harbor implications differ across funds. Table 1 summarises the key characteristics of each system.

The three largest systems — TRS, SERS, and SURS — account for the overwhelming majority of active members and pension liabilities, and are the funds most directly relevant to the labour market analysis in this paper. JRS and GARS are much smaller and cover populations (judges and legislators) whose employment decisions are unlikely to respond to pension tier assignment in the same way as teachers or general state employees. As of the end of fiscal year 2023, the five systems collectively held $115 billion in assets against $257 billion in total liabilities, yielding a combined funded ratio of approximately 45 per cent — among the lowest of any state in the United States (Center for Tax and Budget Accountability, 2024; Commission on Government Forecasting and Accountability, 2024).

2.3 Illinois Pension Reform: Tier 1 and Tier 2

In response to growing fiscal pressure following the Great Recession, Illinois implemented a major pension reform in 2011 that introduced a two-tier system. Employees hired prior to 2011 remain in "Tier 1," while those hired thereafter are enrolled in "Tier 2," which features significantly reduced benefit generosity.

The Tier 2 reform modified several key components of the DB formula. First, it introduced a cap on pensionable salary, limiting the portion of earnings included in the benefit calculation. Second, it reduced the generosity of cost-of-living adjustments, lowering the rate at which benefits grow in retirement. Third, it increased the normal retirement age and adjusted vesting requirements, delaying access to full benefits. Collectively, these changes substantially reduced the present value of pension benefits for new hires relative to Tier 1 workers.

Importantly, due to constitutional protections, Illinois could not retroactively reduce benefits for existing employees. As a result, the reform operates entirely on the margin of new hires,

Table 1. Illinois State Pension Systems: Key Characteristics (FY 2023)

System	Acronym	Active members	Funded ratio	Employees covered
Teachers' Retirement System	TRS	≈448,000	44.8%	Public school administrators and teachers outside Chicago
State Employees' Retirement System	SERS	≈63,000	35%	General state government employees; public safety officers under alternative formula
State Universities Retirement System	SURS	≈75,000	44%	Employees of public universities and affiliated agencies
Judges' Retirement System	JRS	≈1,000	38%	Sitting judges of all Illinois courts
General Assembly Retirement System	GARS	≈300	<20%	Illinois General Assembly members
Combined (all five)		≈587,000	≈45%	

Notes: Active member counts and funded ratios are approximate, drawn from Commission on Government Forecasting and Accountability preliminary actuarial valuations for FY 2023 (Commission on Government Forecasting and Accountability, 2024) and system-level annual financial reports. The funded ratio is calculated as the market value of assets divided by actuarial accrued liabilities. The combined funded ratio reflects $115 billion in assets against $257 billion in total liabilities (Center for Tax and Budget Accountability, 2024). Chicago public school teachers are covered by the Chicago Teachers' Pension Fund (CTPF), a separately administered system not listed here. Tier 2 applies to all five state-funded systems for members first contributing on or after 1 January 2011; JRS and GARS members hired after August 2009 were already subject to modified benefit formulas under P.A. 96-0207 enacted prior to the main Tier 2 legislation.

creating a sharp discontinuity in compensation between otherwise similar workers based solely on hire date.

Table 2. Comparison of Tier 1 and Tier 2 Pension Benefits in Illinois

Feature	Tier 1 (Pre-2011 Hires)	Tier 2 (Post-2011 Hires)
Eligibility	Employees entering system before Jan 1, 2011	Employees entering system on or after Jan 1, 2011
Vesting Period	10 years	10 years
Retirement Age	Age 60/50 with 30 years of service	Age 67
Early Retirement	Age 50 (penalty applies if below 60 without 30 years)	Age 62 (penalty applies below 67)
Final Avg. Salary	Highest 48 consecutive months of last 10 years	Highest 96 consecutive months of last 10 years
Salary Cap	Capped at federal limits	State-level cap (lower vs. federal)
Maximum Pension	80% of FAS	80% of FAS
COLA Eligibility	Begins after retirement (age/service dependent)	Begins at age 67 after one-year delay
COLA Structure	3% increase, compounded annually	50% of 12-month CPI, up to 3%
Return to State Employment Rules	No suspension	Payments suspended if re-employed full-time in another state system
Survivor Benefits	≈65% of pension (age-adjusted)	≈66.7% of pension (no reduction)
Child Benefits	10% of salary per child, 60% of cap max	Unchanged but subject to cap
Special Benefits for Police/Fire, etc.	Earlier retirement eligibility (age 50 with 20 years)	Delayed to age 62 with 20 years

2.4 Public-Sector Labor Shortages in Illinois

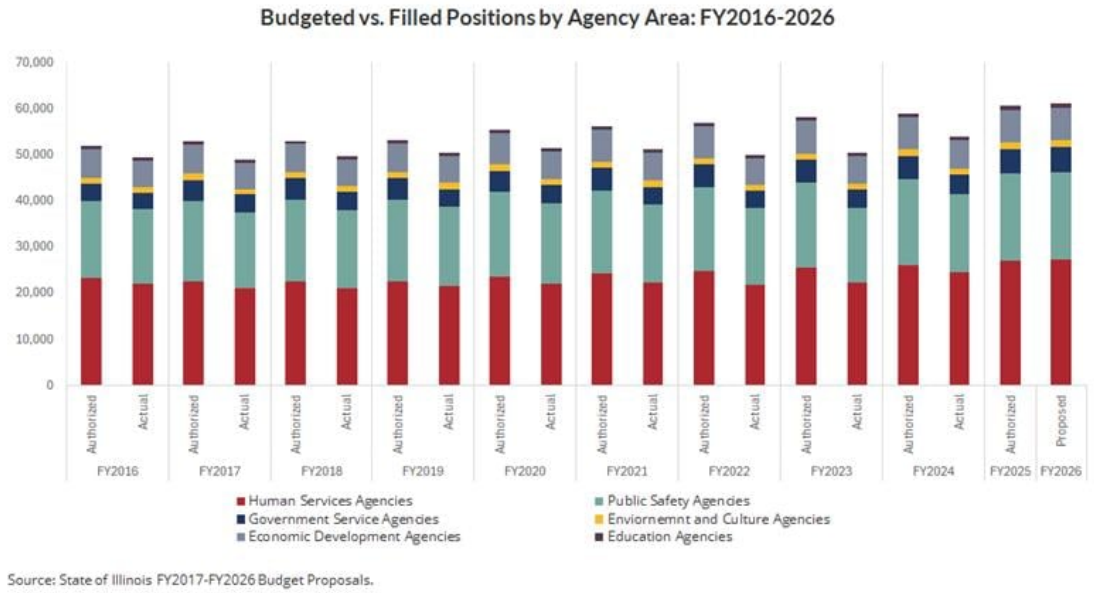


Figure 1. Illinois Labor Shortage (Padula, 2025)

Public-sector labor shortages in Illinois have become increasingly salient in recent years, with evidence pointing to persistent gaps between authorized and filled positions across state agencies. Administrative data from Illinois budget reports show that, across fiscal years 2016–2026, the number of budgeted positions consistently exceeds the number of filled positions, indicating sustained vacancies across sectors such as human services, public safety, and education Governor's Office of Management and Budget, State of Illinois (2026).

These shortages are also found in broader analyses of Illinois' public workforce. Reports from the Civic Federation document long-term challenges in maintaining public-sector staffing levels, highlighting declining workforce participation and difficulties in recruitment and retention over time Padula (2025).

Several factors contribute to these shortages. First, the COVID-19 pandemic disrupted labor supply and accelerated retirements across the public sector. Second, fiscal constraints led to policy responses such as Early Retirement Incentive (ERI) programs, which reduced the experienced workforce. Third, competition with the private sector has made it more difficult for public employers to attract workers, particularly in occupations with transferable skills. Finally, structural issues such as skill gaps further limit the pool of qualified candidates.[12]

Within this broader context, pension design represents a potential mechanism influencing labor supply. The introduction of Tier 2 reduced the generosity of pension benefits for new hires, lowering the present value of long-term compensation. Because defined-benefit pensions historically constituted a significant share of public-sector compensation, these changes may have weakened both recruitment and retention incentives.

At the same time, the relationship between pension generosity and labor shortages is theoretically ambiguous. On one hand, reduced benefits may deter entry into the public sector and increase exit rates, exacerbating shortages. On the other hand, increases in pension generosity may induce earlier retirement by raising the value of exiting the workforce, potentially worsening shortages in the short run. Over longer horizons, however, more generous pensions may improve recruitment and retention by increasing the attractiveness of public-sector employment.

These competing mechanisms motivate the central research question of this paper: whether changes in pension generosity alleviate or exacerbate public-sector labor shortages in Illinois.

[12] Padula (2025)

2.5 Proposed Reforms and Safe Harbor Compliance

Recent policy discussions in Illinois have focused on proposed modifications to the Tier 2 system, particularly in response to concerns about federal "Safe Harbor" requirements and their implications for retirement adequacy. Under current federal law, public pension systems must provide benefits that are at least as generous as Social Security in order to qualify as a substitute for Social Security coverage. There is growing concern that Tier 2 benefits may fall below this threshold for certain workers, raising the possibility that Illinois could be required to enroll affected employees in Social Security, thereby increasing payroll costs for both employers and employees.

In response, proposed legislation, including Senate Bill 1937, seeks to adjust Tier 2 parameters to restore compliance with Safe Harbor provisions while partially improving benefit adequacy. Although the exact provisions vary across proposals, the core changes typically include increasing the pensionable salary cap, modifying the cost-of-living adjustment formula, and lowering the retirement age or easing vesting requirements. These changes would increase the present value of pension benefits for Tier 2 employees, bringing them closer to Tier 1 levels while maintaining a fiscally constrained structure.

From a labor-market perspective, these proposed reforms directly target the mechanisms through which Tier 2 may have contributed to recruitment and retention challenges. By increasing benefit generosity, the reforms would raise the long-term compensation associated with public-sector employment, potentially improving recruitment outcomes and strengthening incentives for workers to remain in the system. At the same time, policymakers face a tradeoff between improving labor-market outcomes and maintaining fiscal sustainability, as more generous benefits increase long-run pension liabilities.

The existence of these proposed reforms underscores the central motivation of this paper. If Tier 2 has materially reduced the attractiveness of public-sector employment, leading to labor shortages or increased turnover, then policy efforts to partially reverse these changes may be justified on efficiency grounds. Conversely, if labor-market outcomes in Illinois are primarily driven by broader macroeconomic trends rather than pension design, then expanding Tier 2 benefits may generate fiscal costs without substantial labor-market gains.

Accordingly, the empirical analysis in this paper provides evidence that is directly relevant for evaluating these policy proposals. By estimating the impact of Tier 2 on public-sector employment and retention, we can assess whether increasing pension generosity through reforms such as Senate Bill 1937 is likely to meaningfully affect labor supply in the public sector.

Table 3. Summary of Proposed Tier 2 Reforms (Senate Bill 1937)

Policy Dimension	Proposed Change
Retirement Age	Lower normal retirement age from 67 to 65 (with 20 years of service) or 62 with maximal service credit
Early Retirement	Allow retirement as early as age 57 with reduced penalties; no change to the penalty formula
COLA	Increase COLA to compounded 3% for GARS and JRS; provide 3% non-compounding COLA for other Tier 2 workers
Final Average Salary Calculation	Calculate benefits based on 6 years of salary instead of 8 years
Pensionable Salary Cap	Increase cap on pensionable earnings to the Social Security Wage Base
Public Safety Provisions	Lower retirement age for downstate police and fire workers from 55 to 52 (with 20 years of service); allow penalty-free retirement if benefits are maximized
Benefit Generosity	Increase the present value of Tier 2 pension benefits to better align with Safe Harbor requirements

3 CONTROL GROUP CONSTRUCTION

We construct a set of other states whose institutional framework and economic characteristics are similar to Illinois, but which differed insofar as the design and timing of pension reforms, to measure the labor-market effects of changes to Tier 2 in 2011. Our objective is to approximate the counterfactual evolution of Illinois' public-sector labor market in the absence of Tier 2, under conditions where broad structural futures—defined-benefit pensions, unionization rates, and the fiscal pressures felt after 2008—are held constant, while allowing for variation in the mechanism of policy changes.

We focus on New York, Indiana, and Pennsylvania as our primary control states. These are the most appropriate comparands due to three principal criteria. First, they possess large, unionized public-sector labor markets with defined-benefit pension systems, as exists in Illinois. High rates of union membership are significant because organized labor tends to be concentrated in areas like K-12 education, where benefits are administered through independent plans and retention or retirement might be affected by collective bargaining. Second, like Illinois, these states faced significant fiscal stress between the Great Recession and 2011; which translated into analogous political dynamics. More variables related to the public sector—like leadership changes, declining long-term investment projects, or spending cuts in labor-intensive areas such as education—were affected, so commonality across states is relevant. Third, the control group implemented reforms that primarily applied to new hires and did not retroactively alter benefits for incumbent workers, so the margins of adjustment being measured here—entry into the public sector and retention—are more comparable to Illinois.

Illinois implemented a discrete and uniform reduction in pension generosity through the introduction of Tier 2, creating a sharp discontinuity between pre- and post-2011 hires. In contrast, New York adopted a more gradual two-tiered reform structure which adjusted benefits incrementally. The 2010 Tier 5 in New York reduced benefits for those retiring between 55 and 62, and the 2012 Tier 6 reform increased the retirement age for full benefits by 1 year. New York's pensions remained entirely defined-benefit, a system later replaced in Pennsylvania through a hybrid model that added a defined-benefit component. The PA reform was enacted outside the time horizon of our study (in 2017), so we expect that this change will not impact our study.

Although neither New York did not enact immediate reductions in benefits similar to Tier 2 in Illinois, their reforms did affect the overall generosity of pension in the long-term. While variation across these states should allow us to draw conclusions about the differences between these competing mechanisms, it may underestimate the effect of Tier 2 due to the impacts from even limited cuts in control states. However, if public-sector labor-market outcomes in Illinois diverge significantly from New York following reform, it would suggest that the magnitude and abruptness of benefit reductions—rather than pension reform per se—drove any observed effects. Conversely, the lack of significant differences from states with similar fiscal conditions but dissimilar policy changes would indicate dominance by broader macroeconomic or sectoral trends.

Indiana is included as a final comparison case based on its geographic proximity, and resulting exposure to similar regional labor markets, to Illinois. The state overhauled pensions in 2011, by reorganizing their administrative structure and allowing new hires the option of a purely defined-contribution plan. However, benefit levels and eligibility were not unaffected in a manner comparable to any of the aforementioned states.

3.1 Implications for Labor Market Behavior

Intrinsic differences between otherwise similar defined-benefit pensions and hybrid or defined-contribution models likely affect recruitment and retention in of themselves. It is considered in defining control states: New York maintained its fully defined-benefit system throughout the period. Thus, investment risk allocation for workers in their respective public sectors has increasingly diverged, which is why selecting a group that is representative of both frameworks is necessary.

The structure of defined-benefit pensions also determined the significance of reforms to aspects of pension policy other than payouts themselves for the generosity of each state's system. Less spending as an employer disproportionately impacts the lifetime compensation associated

Table 4. Institutional Characteristics of Treatment and Control States

	Illinois	New York	Pennsylvania	Indiana
Role	Treatment	Control	Control	Supplementary
Reform Date	2011 (Tier 2)	2010 (Tier 5) + 2012 (Tier 6)	2017 (Act 5)	Pre-existing
Reform Type	Sharp benefit cut for new hires	Gradual DB adjustments	Hybrid DB/DC	Mixed (DB/DC and DC options)
Retroactivity	No	No	Limited	Flexible
System Before	DB	DB	DB	Mixed
System After	Reduced DB	Re-tiered DB	Hybrid	Mixed
Unionization	High	High	Mid to High	Lower
Public Sector Size	Large	Large	Large	Smaller
Fiscal Stress	Severe	Mid to Severe	Mid to Severe	Moderate
Group Affected	New hires	New hires	Redesign	Mixed
Labor Market Impact	Recruitment and retention	Recruitment and retention	Recruitment and sorting	N/A

with employment in the public sector if pensions are fully defined-benefit; especially in areas such as education and the civil service, where tenures are longer on average. This may weaken recruitment by making public sector jobs less attractive versus the private sector.

Second, because defined-benefit pensions are backloaded, reducing future benefits tends to have an outside effect on retention: in these systems, workers are incentivized to keep their employment until they reach the thresholds for vesting and retirement eligibility, to avoid losing the accrued wealth in their pensions. By devaluing those future benefits, Tier 2 may weaken these retention incentives and potentially increase mid-career exit rates.

However, theoretical predictions are ambiguous: although lower pension wealth may reduce retention by decreasing the value of remaining in the system, workers may respond to reduced expected retirement income by extending their careers, thus increasing the labor supply of older workers. The net effect is therefore an empirical question.

4 DATA AND SAMPLE DEFINITION

4.1 Data Source

Our primary data source is the Current Population Survey (CPS) Merged Outgoing Rotation Groups (MORG), obtained from the U.S. Bureau of Labor Statistics. The CPS is a nationally representative monthly household survey that collects detailed information on labor force participation, employment, earnings, and demographic characteristics. The MORG extracts contain enriched information on wages, hours, and class of worker, making them particularly well-suited for analyzing labor market dynamics across sectors.

We use CPS MORG data spanning the period 2008–2015, which allows us to examine labor market transitions surrounding the implementation of Illinois pension reforms in 2011. The CPS's rotating panel structure enables limited longitudinal matching of individuals across adjacent survey years, which we exploit to construct short panels following established methods in the literature.[13]

4.2 Unit of Analysis

The unit of analysis is the individual worker observed over a two-period interval $(t, t+1)$. Each observation corresponds to an individual successfully matched across consecutive CPS survey years, allowing us to observe changes in employment sector and labor market status.

[13] Madrian and Lefgren (1999)

4.3 Sample Restrictions

We impose several restrictions to define a consistent analytic sample.

First, we restrict attention to individuals who can be matched across adjacent CPS survey years. Second, we limit the sample to working-age individuals, defined as ages 18 to 64, consistent with standard practice in labor economics to exclude retirement-driven labor supply changes at older ages.

Third, we restrict the sample to individuals with valid labor force status and sector classification in both periods. Observations with missing or inconsistent identifiers are dropped. We further restrict to individuals with valid demographic characteristics, including sex, race, and age, to ensure consistency in subgroup analysis and to align with standard CPS-based empirical work.

Finally, we exclude self-employed individuals from the 'private sector' category. The CPS class-of-worker variable distinguishes between private wage and salary workers, government employees, and self-employed workers. Because self-employment involves fundamentally different compensation structures and is not directly comparable to standard employment relationships, excluding these individuals is standard in analyses of sectoral labor dynamics.

4.4 Definition of State Public and Federal, Private Sector Employment

We classify individuals into state public and federal and private sectors using the CPS class-of-worker variable (`class94`). Individuals employed by state or local government are defined as public-sector workers in this context, since they fall under the purview of the Illinois pension reform. Federal and private-sector workers are defined as wage and salary employees in private firms. Self-employed individuals are excluded from both categories.

4.5 Key Variables

The CPS MORG provides demographic variables (age, sex, race, education) and labor market variables (employment status, class of worker, occupation, hours worked, and earnings). These variables are harmonized across years to ensure consistency.

We use CPS sampling weights to ensure representativeness of the underlying population. Weighting choices are discussed in detail in the methodology section.

4.6 Matching Procedure and Panel Construction

Although the Current Population Survey (CPS) is not a true longitudinal dataset, its rotating panel structure allows for short-term matching of individuals across survey months and years. We exploit this feature to construct two-period panels following the methodology developed by Madrian and Lefgren (1999).

CPS Rotation Structure. Households in the CPS are interviewed for four consecutive months, rotate out of the sample for eight months, and are then interviewed again for an additional four months. As a result, individuals observed in a given month of year t may reappear in the same calendar month of year $t+1$. This design enables the construction of matched samples across adjacent years.

Matching Strategy. We match individuals across CPS MORG files for consecutive years $(t, t+1)$ using a combination of household and person-level identifiers. Specifically, we follow the matching protocol outlined in Madrian and Lefgren (1999) and implemented in subsequent CPS-based studies. Individuals are linked across years using household identifiers (e.g., `HRHHID`, `HRHHID2`), person line number within the household, survey month (`intmonth`) and rotation group, and demographic consistency checks (age, sex, and race).

Matching is restricted to individuals who appear in the same survey month and rotation pattern across consecutive years, consistent with the CPS rotation design. This ensures that matched observations correspond to the same individual observed at two points in time.

Consistency and Validation Checks. To reduce false matches arising from identifier reuse or reporting error, we impose additional consistency requirements. Matched individuals must exhibit plausible changes in age (typically increasing by one year), and must have consistent sex and race classifications across periods. Observations failing these checks are discarded.

Construction of Two-Period Panels. For each matched individual, we construct a two-period observation containing all relevant variables at time t and time $t+1$. Variables are explicitly indexed by period (e.g., `public_t`, `public_t+1`), allowing us to directly observe transitions between labor market states.

Stacked Sample. We repeat the matching procedure for each adjacent year pair from 2008–2009 through 2016–2017. These two-period panels are then stacked into a single dataset, where each observation corresponds to an individual transition between t and $t+1$. This stacked structure follows the approach used in prior CPS-based transition analyses and allows us to estimate time-specific treatment effects.

Limitations. As noted by Madrian and Lefgren (1999), CPS matching is subject to potential attrition and matching error due to the survey's design and the reuse of household identifiers. Our use of strict matching criteria and demographic consistency checks mitigates these concerns, though the resulting sample is necessarily smaller than the full CPS cross-section.

Table 5. Sample Attrition Across Matching Stages

	Raw CPS		Retention Rate (%)		
Year Pair	N_t	Naive Match N	vs. Raw (t file)	Sex/Race Filter	Final vs. Raw
2008–2009	317,341	208,540	65.7	76.5	50.2
2009–2010	320,941	212,655	66.3	76.5	50.7
2010–2011	321,277	211,295	65.8	76.3	50.2
2011–2012	318,334	207,830	65.3	76.2	49.8
2012–2013	316,408	204,558	64.7	76.3	49.3
2013–2014	315,717	164,043	52.0	83.9	43.6
2014–2015	317,056	109,674	34.6	96.9	33.5
2015–2016	314,692	122,882	39.0	97.4	38.0
2016–2017	314,873	126,542	40.2	96.5	38.8

Notes: N_t is the raw CPS outgoing rotation group (MORG) count for the base year. The naive match merges households appearing in MIS 4 and MIS 8 across consecutive survey years on household and person identifiers. The sex/race filter drops matched pairs in which reported sex or race changes between periods. "Retention rate vs. raw" is the share of base-year observations surviving each stage. The sharp decline in the naive match rate for 2013–2014 onward reflects a redesign of CPS household identifiers.

5 DESCRIPTIVE EVIDENCE

This section describes the analytic sample and presents descriptive evidence on public-sector workforce trends in Illinois and comparison states. The patterns documented here are not causal, but they provide important context for the regression analysis that follows and motivate the identification strategy.

5.1 Sample Composition

The analysis is based on nine consecutive panels in pairs from the CPS Merged Outgoing Rotation Groups (MORG), covering 2008–2009 through 2016–17. Two analytical samples are constructed from these data. The **retention sample** consists of workers observed in state and local government employment in Illinois in the year t, generating between 500 and 934 person-year observations per year pair (6,544 total) after applying the CPS earnings filter. The **recruitment sample** is considerably larger, drawing on all workers outside state and local government employment across Illinois and the comparison states who are eligible to enter public employment; it contains between 2,955 and 4,842 observations per year pair (37,148 total).

Age structure

Figures 2 and 3 describe the age distribution of public- and private-sector workers across states. In the pre-reform period (2008–10), the age distributions of Illinois and comparison-state public-

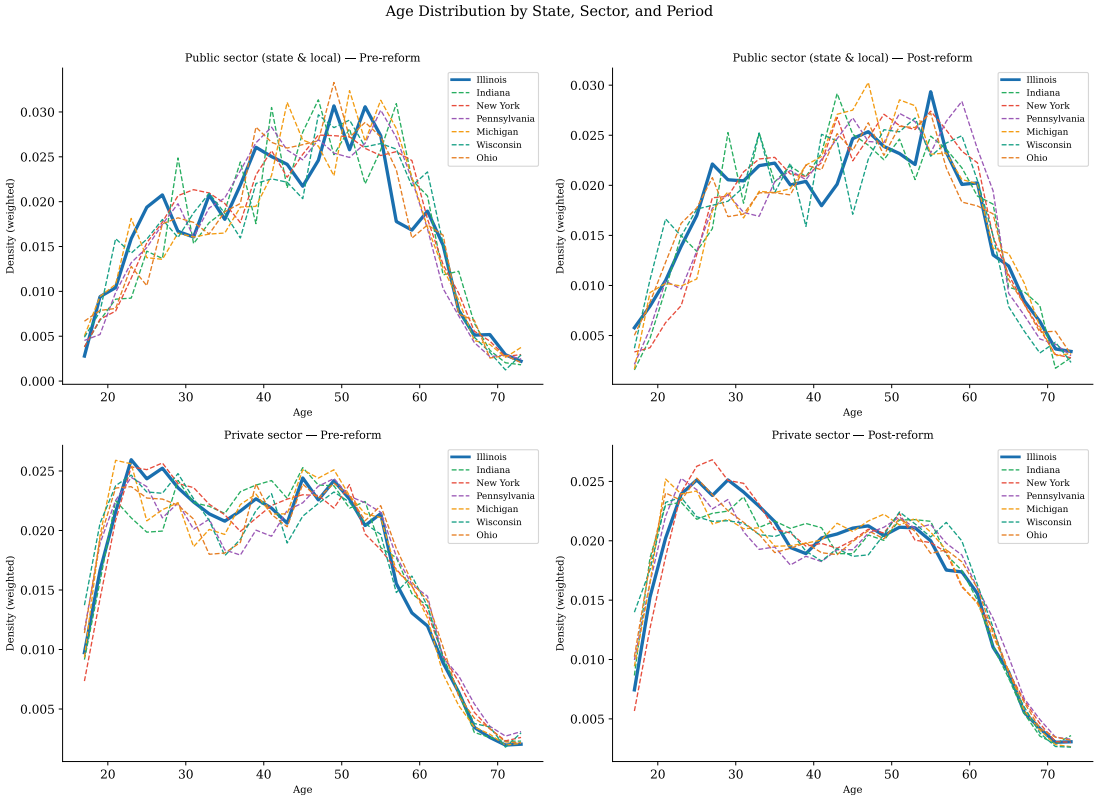


Figure 2. Age Distribution by State, Sector and Period

sector workers closely overlap, consistent with the parallel trends assumption underlying our identification strategy. The mean age of Illinois public-sector workers hovers between 43 and 45 years throughout the pre-reform window, broadly in line with Indiana, Pennsylvania, Michigan, Wisconsin, and Ohio. Michigan, Wisconsin, and Ohio are not control states, but they are included in the descriptive analysis because of their proximity and similarity to Illinois.

Following the reform, the mean age of the Illinois public-sector workforce increases gradually relative to the pre-reform baseline, consistent with reduced entry of younger workers under the less generous Tier 2 pension terms.

In the private sector, the mean age trend is broadly similar across all states, rising gradually from approximately 39 to 41 years over the period in a pattern consistent with the secular ageing of the US labor force rather than any Illinois-specific shock.

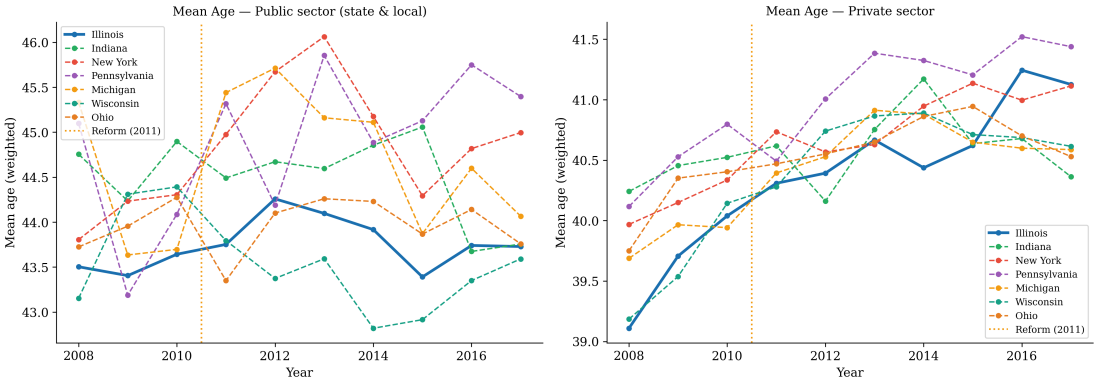


Figure 3. Mean Age

While mean age trends are relatively stable, decomposing the age distribution into its tails reveals more informative patterns. Figures 4 and 5 plot the share of the public- and private-sector workforces aged under 30 and over 50 respectively, for Illinois and all six comparison states.

The share of public-sector workers under 30 (Figure 4) is broadly stable in Illinois at approximately 27–30 per cent across the full period, tracking comparison states closely. There is no sharp post-2011 break, suggesting that the Tier 2 reform did not immediately deter young workers from entering public employment in numbers detectable at the state level. The private-sector series for the same age group is substantially more volatile across states and years—a pattern more consistent with cyclical demand variation than any pension-driven behavioral shift—providing a useful falsification check.

The over-50 share (Figure 5) tells a complementary story. Illinois enters the period with the lowest share of older public-sector workers among comparison states (≈23 per cent in 2008), and this share rises gradually to approximately 30 per cent by 2017, converging toward the comparison-state average. Critically, this ageing trend is broadly shared across all states and is not sharper in Illinois post-reform; if anything, the gap between Illinois and higher-share states narrows rather than widens after 2011. The private-sector over-50 series fluctuates widely and non-systematically across states, again consistent with secular workforce ageing rather than a reform-driven effect specific to Illinois.

Together, these figures suggest that while the Illinois public-sector workforce has aged over the study period, this trend predates the reform, is shared with comparison states, and is not visibly accelerated at the 2011 cutoff. The composition evidence is therefore consistent with the null findings from the regression analysis, and corroborates the interpretation that any pension-driven sorting effects are too gradual or too small to be detectable over the 2008–2017 window.

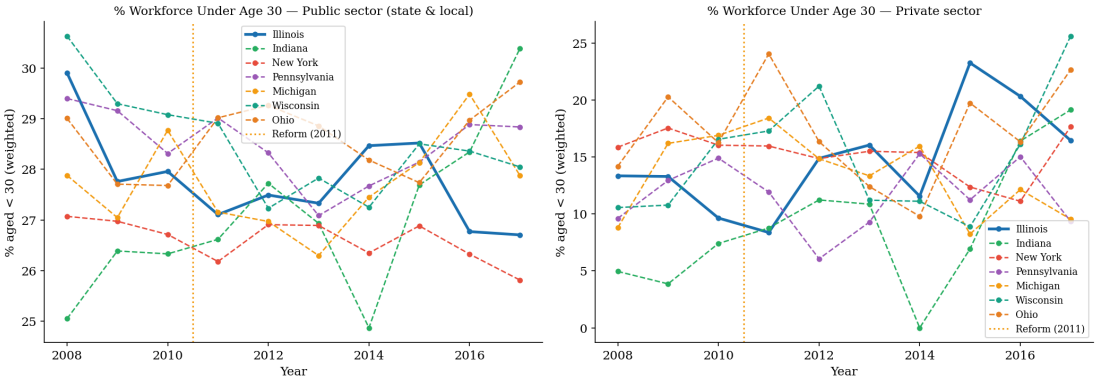


Figure 4. Percentage of Workforce Under Age 30 by State and Sector, 2008–2017. *Left panel*: share of state and local public-sector workers aged under 30, weighted by CPS final person weight, for Illinois and six comparison states. Illinois' young-worker share is broadly stable at approximately 27–30 per cent throughout the period, tracking comparison states closely with no systematic post-2011 break. *Right panel*: the corresponding private-sector series serves as a falsification check. The private-sector under-30 share is substantially more volatile across states and years—consistent with cyclical demand patterns rather than any pension-driven behavioral shift—confirming that the public-sector pattern is not artefactual.

Female representation

In Illinois, the female share of public-sector workers fluctuates between approximately 54 and 62 per cent, tracking comparison states closely with no systematic pre-to-post divergence. This indicates no persistent gender gap in retention within the Illinois public sector. In the private sector, the female share is lower across all states, ranging between approximately 46 and 50 per cent, and equally stable, consistent with the well-documented sectoral gender sorting in US labor markets.

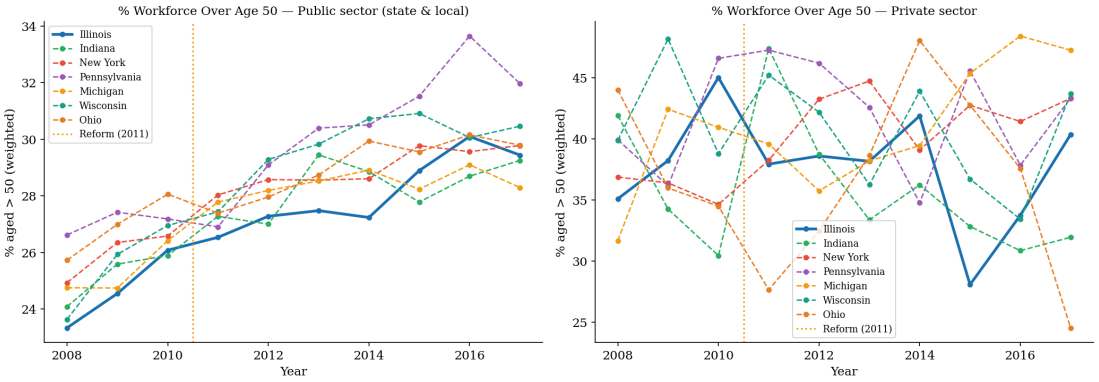


Figure 5. Percentage of Workforce Over Age 50 by State and Sector, 2008–2017. *Left panel*: share of state and local public-sector workers aged over 50, weighted by CPS final person weight. Illinois begins the period with the lowest over-50 share among comparison states (≈23 per cent in 2008) and converges upward, reaching approximately 30 per cent by 2017. This gradual ageing is broadly shared across all states; the gap between Illinois and comparison states narrows rather than widens after 2011, inconsistent with a reform-driven acceleration. *Right panel*: the private-sector over-50 series fluctuates widely and non-systematically, confirming the public-sector trend reflects secular workforce ageing rather than a policy-induced compositional shift.

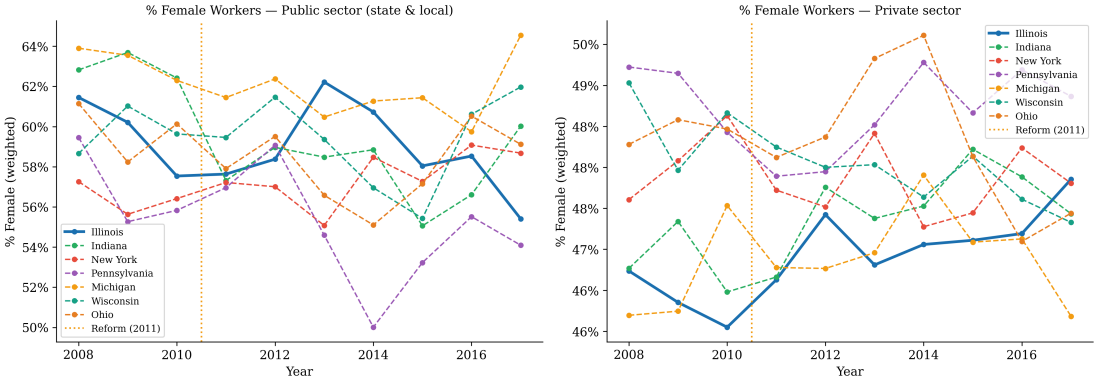


Figure 6. Female Share

Weekly Earnings

Figure 5 plots mean weekly earnings in nominal terms, weighted by the CPS earnings weight (`earnwt`) as described in Section 4. Public-sector workers earn more on average than private-sector workers throughout the study period, consistent with the well-documented public-sector compensation premium for state and local government employees in the United States. In the pre-reform period, Illinois public-sector earnings track comparison states closely, ranging from approximately \$800 to \$900 per week, providing no evidence of a pre-existing compensation divergence that might threaten identification. Post-reform, Illinois earnings continue to rise alongside comparison states, reaching approximately \$1,000–1,100 per week by 2017, consistent with ongoing collective bargaining agreements that set nominal wages independently of pension tier assignment. There is no visible post-2011 break in the earnings series that would suggest total compensation collapsed following Tier 2, at least over the horizon observable in the CPS. Private-sector weekly earnings are lower across all states, rising from approximately \$700–800 in 2008 to \$850–960 by 2017.

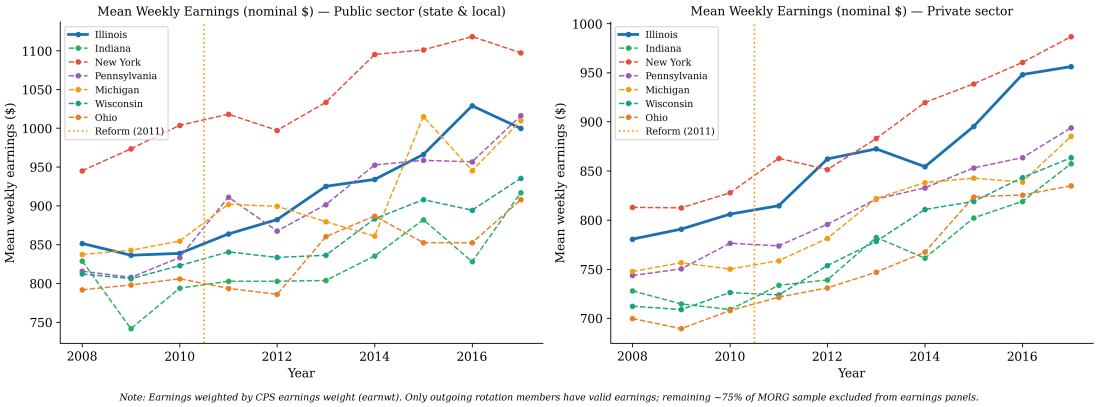


Figure 7. Weekly Earnings

Education

Figure 6 shows that Illinois public-sector workers are substantially more educated than their private-sector counterparts, a pattern that is stable across the study period. In the public sector, workers with at least a bachelor's degree account for more than half of the sample throughout 2008–2017, with graduate degree holders constituting a sizeable and gradually growing share. The private sector, by contrast, has a larger share of workers with a high school diploma or less and a smaller share of college graduates. Within the public sector, the share of workers with graduate degrees increases modestly over the post-reform period, consistent with gradual credentialing trends and potential compositional shifts as the Tier 2 cohort grows.

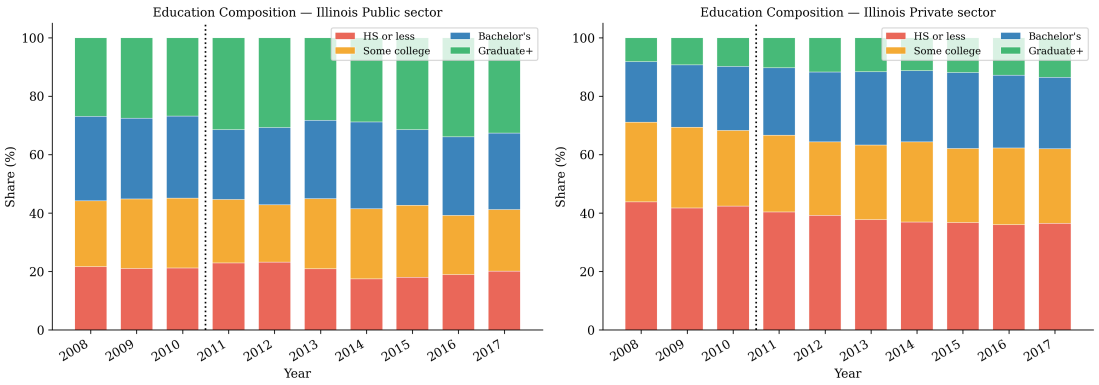


Figure 8. Education Composition

Race and ethnicity

Figure 7 presents the racial and ethnic composition of the Illinois public and private-sector workforces over time. White workers constitute approximately 75–82 per cent of the Illinois public-sector sample, with Black workers accounting for a further 15–20 per cent.[14] Both shares are broadly stable within Illinois across the study period, and the racial composition of the comparison states is similar on these dimensions. The private sector displays a broadly similar racial composition, with White workers accounting for approximately 75–85 per cent and Black workers a somewhat smaller share than in the public sector.

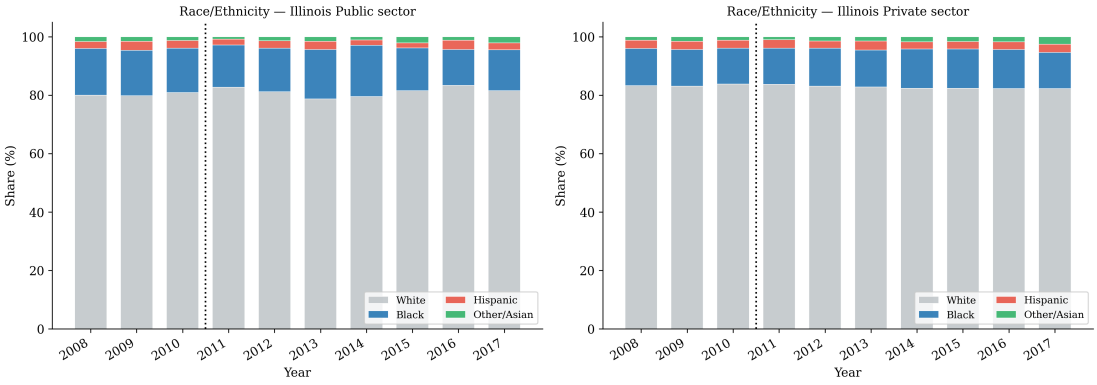
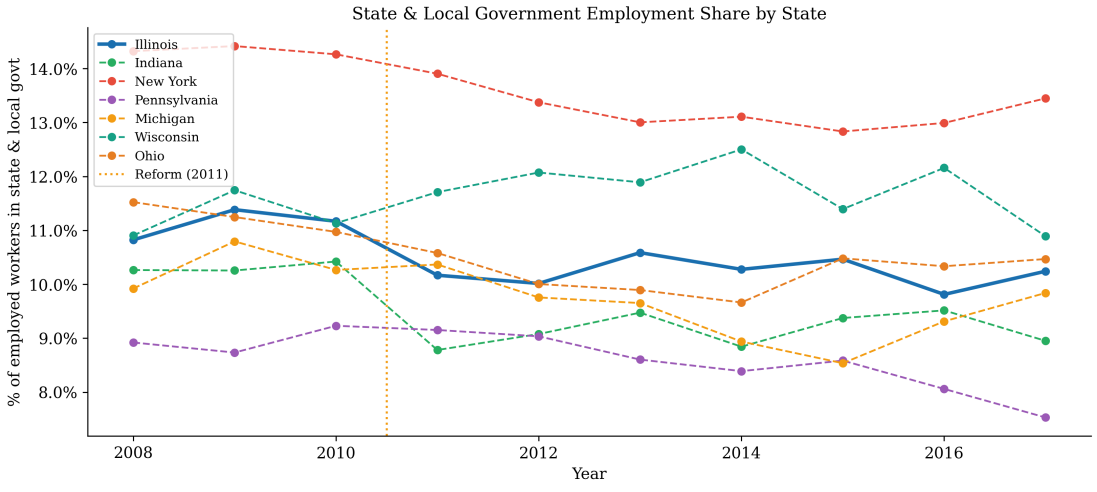


Figure 9. Race Composition

Public-sector employment share

Figure 8 shows the share of employed wage-and-salary workers in state and local government by state over time. Illinois' public-sector employment share lies broadly in line with comparison states throughout the pre-reform period, fluctuating between approximately 10 and 11 per cent. Following 2011, Illinois' share declines slightly relative to its pre-reform level, though the trend is gradual and not sharply distinct from the comparison states, whose public employment shares similarly drift downward over the post-recession period.



Note: Share computed among workers with non-missing class-of-worker variable. Weighted by CPS final person weight (finalwgt).

Figure 10. Public Employment Share

[14]The pre-2003 CPS race variable distinguishes only White, Black, and Other; Asian workers are not separately identified in these data.

6 EMPIRICAL STRATEGY

To estimate the impact of Illinois' Tier 2 pension reform on public-sector labor dynamics, we implement a two-step difference-in-differences framework that allows treatment effects to vary flexibly over time.

6.1 Step 1: Year-by-Year Difference-in-Differences

We begin by estimating a sequence of cross-sectional regressions for each adjacent year pair $(t, t+1)$. We conduct this analysis separately for two distinct outcomes capturing labor market dynamics: *recruitment* into the public sector and *retention* within the public sector.

Let $Y^{\text{entry}}_{i,t\to t+1}$ denote an indicator equal to 1 if individual i transitions from the private sector at time t to the public sector at time $t+1$, and 0 otherwise. This outcome is estimated on the sample of individuals employed outside the public sector at time t.

Similarly, let $Y^{\text{exit}}_{i,t\to t+1}$ denote an indicator equal to 1 if individual i transitions out of the public sector between t and $t+1$, and 0 otherwise. This outcome is estimated on the sample of individuals employed in the public sector at time t.

For each year t, we estimate:

$$Y^k_{i,t\to t+1} = \alpha^k_t + \beta^k_t \cdot \text{Illinois}_i + X'_{it}\gamma^k_t + \varepsilon^k_{it}, \quad k \in \{\text{entry}, \text{exit}\}, \tag{2}$$

where Illinois_i is an indicator equal to 1 if individual i resides in Illinois at time t and 0 if they reside in a control state; X_{it} is a vector of individual-level controls (e.g., age, gender, race, education); and β^k_t captures the difference in recruitment (entry) or retention (exit) outcomes between Illinois and control states for the transition $t \to t+1$.

This procedure yields two sequences of estimated coefficients, $\{\hat{\beta}^{\text{entry}}_t\}$ and $\{\hat{\beta}^{\text{exit}}_t\}$, which trace out the evolution of Illinois–control differences in recruitment and retention over time.

6.2 Step 2: Aggregating Treatment Effects

In the second step, we summarize the evolution of these estimated differences by regressing the time-specific coefficients on an indicator for the post-reform period, separately for recruitment and retention outcomes.

We define:

$$\text{Post}_t = \mathbf{1}[t > t^*],$$

where t^* denotes the implementation year of the Tier 2 reform. We then estimate, for each outcome $k \in \{\text{entry}, \text{exit}\}$:

$$\hat{\beta}^k_t = \delta^k_0 + \delta^k_1 \cdot \text{Post}_t + u^k_t, \tag{3}$$

where δ^k_1 captures the average change in Illinois–control differences in recruitment or retention after the reform, and u^k_t is an error term reflecting estimation noise in $\hat{\beta}^k_t$.

To account for heteroskedasticity arising from differing precision across $\hat{\beta}^k_t$, we estimate these regressions using weighted least squares, with weights equal to the inverse variance of the first-step estimates:

$$w^k_t = \frac{1}{\widehat{\text{Var}}(\hat{\beta}^k_t)}. \tag{4}$$

6.3 Construction of Indicator Variables

We construct a set of indicator variables to capture labor market transitions and treatment exposure. These variables form the basis of our empirical analysis.

Sector Indicators. We define an indicator for public-sector employment as:

$$\text{Public}_{it} = \mathbf{1}[\text{class94}_{it} \in \{2,3\}],$$

where `class94` denotes the CPS class-of-worker variable, and values 2–3 correspond to state and local government employment, respectively. Federal workers are excluded from this classification since their pensions are independent of Illinois pension plans. Individuals not classified as public-sector workers (and not self-employed) are categorized as private-sector workers.

Recruitment (Entry) Indicator.

$$\text{Entry}_{i,t\to t+1} = \mathbf{1}[\text{Public}_{i,t} = 0 \text{ and } \text{Public}_{i,t+1} = 1].$$

Retention (Exit) Indicator.

$$\text{Exit}_{i,t\to t+1} = \mathbf{1}[\text{Public}_{i,t} = 1 \text{ and } \text{Public}_{i,t+1} = 0].$$

Treatment Indicator.

$$\text{Illinois}_i = \mathbf{1}[\text{stfips}_i = 17].$$

Post-Reform Indicator.

$$\text{Post}_t = \mathbf{1}[t > t^*], \quad t^* = 2011.$$

Demographic Covariates. We also construct standard demographic indicators used as controls in the regression analysis, including binary indicators for gender (female), race categories, and education levels. Age is included either as a continuous variable or in bins, depending on the specification (See Table 4).

Table 6. List of Covariates

Covariate	Type	Variable name
Age	Continuous	`age`
Earnings	Continuous	`earn_wke`
Sex	Categorical	`sex`
Ethnicity	Categorical	`ethnic`
Education	Categorical	`grade_92`
Occupation	Categorical	`docc00`
Industry	Categorical	`ind02`
Union Coverage	Categorical	`unioncov`
Union Membership	Categorical	`unionmme`

6.4 Preliminary Parallel Trends Check

To validate our choice of control states used for our analysis, we performed a rudimentary parallel trends check on the average recruitment and retention rates in the Illinois state and local public workforce versus that of the control states.

$$\text{Recruitment Rate}_{(t,t+1)} = \frac{\text{Weighted employees joining state/local government}}{\text{Total weighted workforce}}$$

$$\text{Retention Rate}_{(t,t+1)} = \frac{\text{Weighted employees who stayed in state/local government}}{\text{Total weighted workforce}}$$

This was calculated for Illinois and for each control state (Indiana, Pennsylvania, and New York) for each year-pair from 2008-2017.

Table 7. Recruitment Rates: Illinois vs. Control States

Year	IL Rate	Control Avg. Rate	Gap
08–09	0.0347	0.0337	+0.0010
09–10	0.0282	0.0296	−0.0014
10–11	0.0358	0.0323	+0.0035
11–12	0.0269	0.0304	−0.0035
12–13	0.0362	0.0231	+0.0131
13–14	0.0285	0.0238	+0.0047
14–15	0.0327	0.0182	+0.0145
15–16	0.0247	0.0269	−0.0022
16–17	0.0229	0.0246	−0.0017

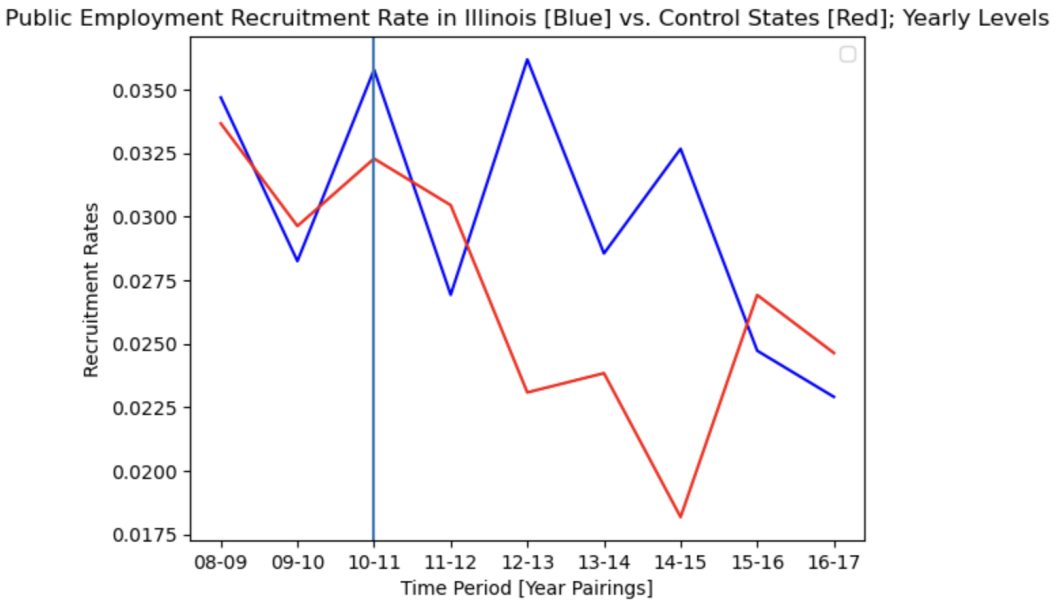


Figure 11. Rate of recruitment into state/local public sector workforce in Illinois and control states (Pennsylvania, New York, Indiana) between 2008–2017.

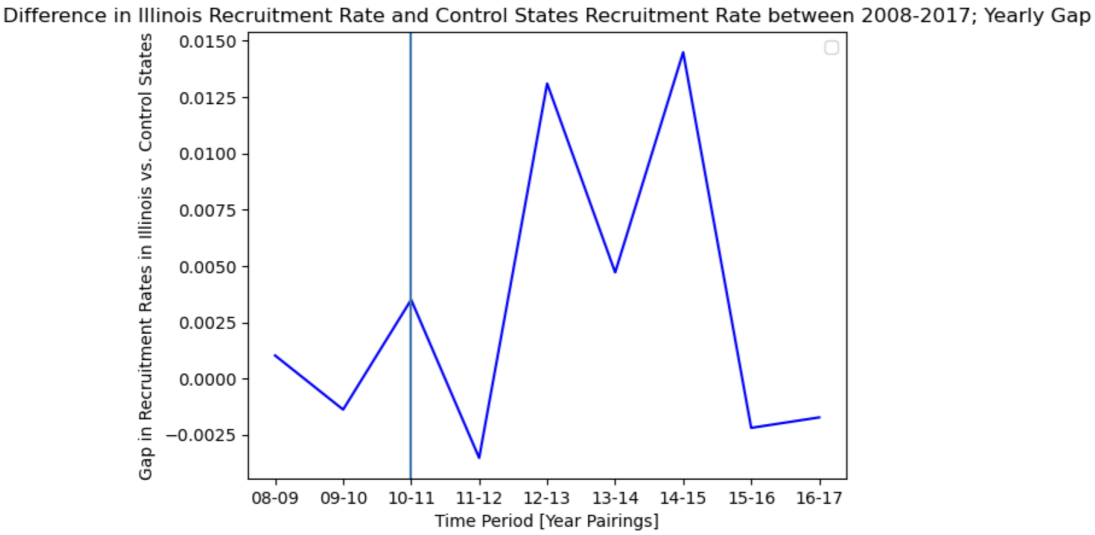


Figure 12. Gap between the state and local public sector employment recruitment rate in Illinois and the rate in the control states, 2008–2017.

Before 2011, the recruitment rates of Illinois and the control states were relatively similar. Before the 2010–2011 time period, the gap in their recruitment rates were relatively close to zero (within less than 0.0005 difference from each other), as seen in the gap graph above, and as evidenced by the visual closeness of the two trends in the yearly levels graph. The gap was roughly flat before 2011, as seen by the near-zero values in the gap graph. After the reform, we see significant visible divergence between the two recruitment rates, as compared to the very little visual divergence before 2011. The two recruitment rates are not equal, but they are much more divergent after 2011 than before, and before 2011, are within a very small margin of each other. After 2011, the divergence between the two trends widens.

We then repeated this exact calculation for the same time periods, but to find retention rates in place of recruitment rates in the public sector. We isolated individuals between the ages of 50 and 65, inclusive, so that our retention rates reflected workers who are already in the public sector workforce and nearing retirement.

Table 8. Retention Rates: Illinois vs. Control States

Year	IL Rate	Control Avg. Rate	Gap
08–09	0.6787	0.6340	+0.0448
09–10	0.6630	0.6481	+0.0150
10–11	0.7126	0.6347	+0.0779
11–12	0.6599	0.6659	−0.0060
12–13	0.6570	0.6221	+0.0349
13–14	0.6613	0.6793	−0.0180
14–15	0.7768	0.7357	+0.0411
15–16	0.7867	0.7475	+0.0392
16–17	0.7873	0.7799	+0.0074

As evidenced by the above graphs, before 2011, there was a divergence in the retention trends between Illinois and the control states, not exceeding a difference of roughly ten percent. The gap in retention rates for Illinois and the control states were greater than zero before 2011.

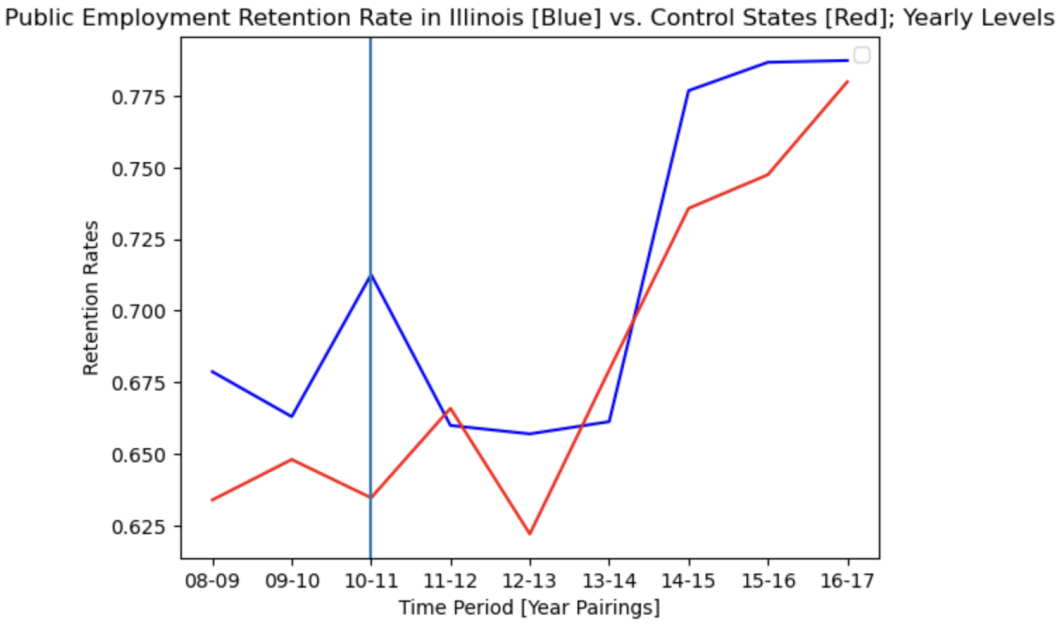


Figure 13. Retention Rates in the Public Sector Workforce in Illinois vs. Control States

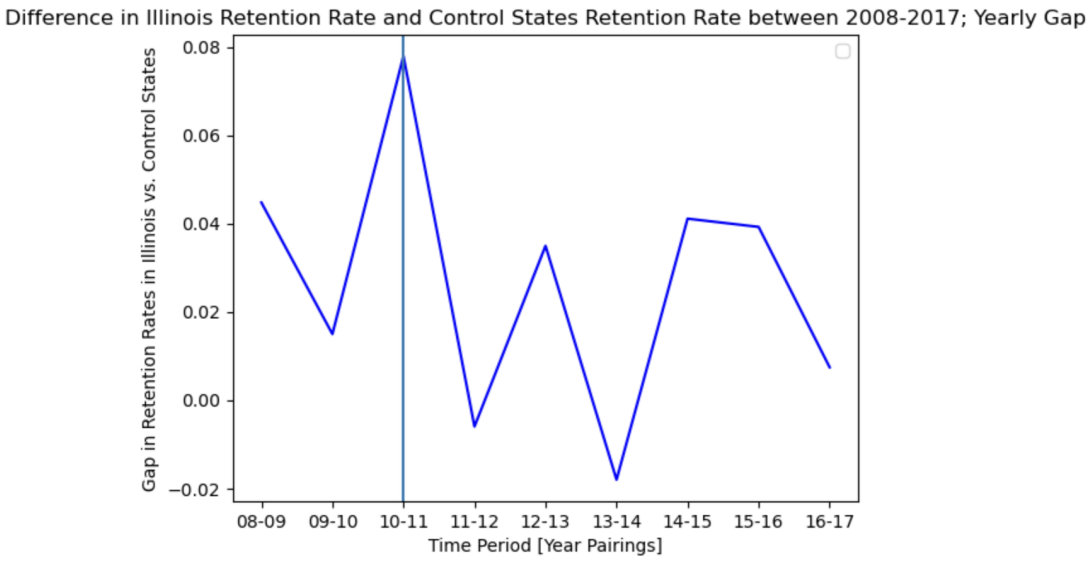


Figure 14. Gap Between Retention Rates in Illinois vs. Control States in Each Time Period, 2008–2017

6.5 Control State Exclusions

New York was excluded from the retention analysis. In our retention regression analysis, New York did not pass the trends check, but still holds in our recruitment regression for New York.

Pennsylvania was excluded from the recruitment analysis. Similarly, Pennsylvania did not pass the parallel trends check for recruitment. The parallel trends assumption still holds in our retention regression for Pennsylvania.

7 RESULTS

We present our results separately for the two measures of interest: *recruitment* into the local public sector and *retention* within the local public sector. Throughout, recruitment captures transitions from non-public to public employment, while retention is analyzed through exits from the public sector.

Within each margin, we organize our analysis into three steps: (1) We present the sequence of year-by-year difference-in-differences from the first step regressions, which trace out the evolution of Illinois-control differences over time. (2) We examine individual level covariates, highlighting how observable characteristics such as race, education and occupation levels relate to recruitment and retention outcomes. (3) We summarize these patterns using a second step regression, which aggregates the time-specific estimates into a single measure of the post-reform effect.

7.1 First-step Estimates

7.1.1 Recruitment

We begin by presenting the sequence of coefficients $\{\hat{\beta}_t^{\text{entry}}\}$ obtained from the year-by-year regressions described in Section 5. These coefficients capture the percentage-point difference in public-sector entry rates between Illinois and control states for each transition $t \to t+1$. Figure 9 plots these estimates over time, while Table 4 reports the corresponding regression results. Our parallel trends assumption is met because, as shown on the graph, none of the differences between Illinois and our control states were significant pre-reform.

Table 9. First-Stage Illinois Recruitment Effects by Year Pair

	$\hat{\beta}$ (pp)	SE (pp)	p	CI Low	CI High	N	R^2
Pre-policy (2008–2011)							
2008–09	−0.91	0.62	0.1397	−2.13	0.30	4,842	0.102
2009–10	−0.36	0.61	0.5505	−1.56	0.83	4,816	0.108
2010–11	−0.34	0.63	0.5887	−1.57	0.89	4,716	0.086
Post-policy (2011–2017)							
2011–12	−0.84	0.61	0.1674	−2.04	0.35	4,599	0.095
2012–13	+0.76	0.62	0.2218	−0.46	1.97	4,616	0.105
2013–14	−0.21	0.60	0.7259	−1.39	0.97	3,960	0.100
2014–15	+0.14	0.64	0.8236	−1.12	1.41	2,955	0.191
2015–16***	−2.04	0.63	0.0012	−3.27	−0.81	3,332	0.194
2016–17	−0.40	0.62	0.5160	−1.61	0.81	3,312	0.157
Pre avg.	−0.54						
Post avg.	−0.43						

Notes: DV: `joined_state_local` (binary). Weighted OLS with `weight_t` except log earnings (`earnwt_t`). HC1 robust SEs. $^{***}p < 0.001$; all other estimates insignificant at 10%. 2015–16 is the sole significant result (−2.04 pp, $p = 0.001$). *Robustness:* excluding New York in 2008–09 yields $\hat{\beta} = -0.51$ pp ($p = 0.320$, $N = 6{,}570$), consistent with the base result.

The post reform coefficients are noisy but with confidence intervals that always comfortably include zero. The one exception is the large negative dip at 2015–16, but it is a single-period

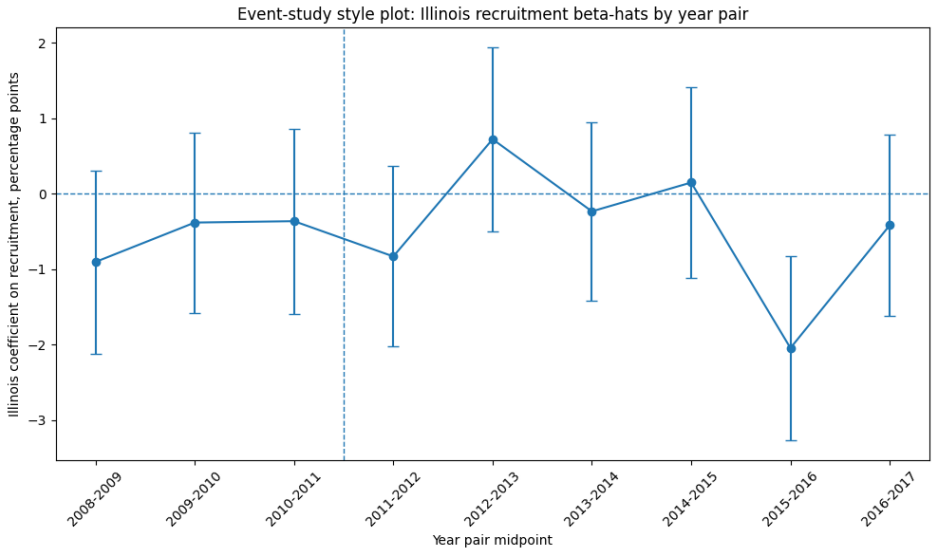


Figure 15. Recruitment Event Study

outlier that reverts in 2016–17, and the confidence interval is wide. There is no sustained post-reform decline in Illinois recruitment relative to comparison states. The recruitment panel is a null result.

7.1.2 Retention

Retention was measured through exit rates from the public sector. We present the sequence of coefficients $\{\hat{\beta}_t^{\text{exit}}\}$, which capture the difference in exit rates between Illinois and control states for each transition $t \to t+1$. Figure 10 plots these estimates, and Table 5 reports the corresponding regression results. Our parallel trends assumption is met because, as shown on the graph, none of the differences between Illinois and our control states were significant pre-reform.

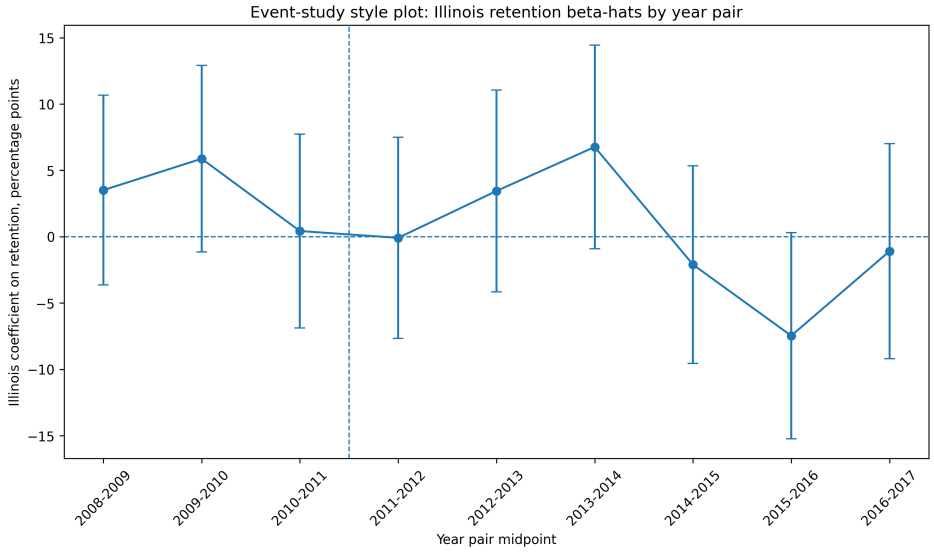


Figure 16. Retention Event Study

Post-reform, the point estimates fluctuate widely: near zero in 2011–12, rising to +7 in 2013–14, then falling sharply to around -8 in 2015–16 before recovering. The confidence intervals are large throughout — note the y-axis spans -15 to +15 percentage points — so essentially none of the post-reform estimates are distinguishable from zero at conventional significance levels.

The 2015–16 trough is the same anomalous period that appears in the recruitment panel. It likely reflects a data or matching artefact for that year pair rather than a genuine labor market shock, since it appears in both panels simultaneously and reverts immediately.

Table 10. First-Stage Illinois Retention Effects by Year Pair

	$\hat{\beta}$ (pp)	SE (pp)	p	CI Low	CI High	N	R^2
Pre-policy (2008–2011)							
2008–09	+3.51	3.65	0.3366	−3.65	10.66	930	0.127
2009–10	+5.87	3.59	0.1016	−1.16	12.90	934	0.098
2010–11	+0.42	3.73	0.9098	−6.89	7.73	866	0.127
Post-policy (2011–2017)							
2011–12	−0.09	3.87	0.9811	−7.67	7.49	803	0.123
2012–13	+3.44	3.88	0.3756	−4.17	11.05	754	0.127
2013–14	+6.76	3.92	0.0847	−0.93	14.45	660	0.255
2014–15	−2.11	3.80	0.5795	−9.56	5.35	500	0.276
2015–16	−7.47	3.96	0.0594	−15.24	0.30	568	0.289
2016–17	−1.10	4.14	0.7908	−9.21	7.01	529	0.247
Pre avg.	+3.27						
Post avg.	−0.09						

Notes: DV: `stayed_state_local` (binary). Weighted OLS with `weight_t` for all controls except log earnings, which uses `earnwt_t` (CPS earnings weight). HC1 robust SEs. Post-policy: year pairs beginning 2011. 95% CI: $\hat{\beta} \pm 1.96 \cdot \widehat{\text{SE}}$. No estimate reaches $p < 0.05$. The 2013–14 ($p = 0.085$) and 2015–16 ($p = 0.059$) estimates are marginally significant but in opposite directions.

7.2 Second-Step Estimates

7.2.1 Recruitment

Table 11. Second-Stage DiD: Post-Policy Shift in Illinois Recruitment Effect

	$\hat{\beta}$ (pp)	SE (pp)	p	CI Low	CI High
Intercept (avg. pre-policy $\hat{\beta}$)	−0.539	0.471	0.2903	−1.652	0.575
Post-policy shift (change after 2011)	+0.107	0.577	0.8579	−1.257	1.472

Notes: WLS of nine $\hat{\beta}$s on a post indicator, weighted by $1/\widehat{\text{SE}}^2$. $N = 9$. The average pre-policy effect is −0.54 pp ($p = 0.290$) and the estimated post-reform shift is +0.11 pp ($p = 0.858$), with 95% CI $[-1.3, +1.5]$ pp. The 2015–16 spike is treated as a single-year outlier by the WLS weighting.

For public sector entry, eight of nine year-pair Illinois coefficients in the first-stage regression are statistically insignificant, and the point estimates show no directional pattern across the reform period—they fluctuate between −0.9 and +0.8 pp with no pre-to-post trend. The one exception is 2015–16, where the Illinois coefficient is −2.0 pp ($p = 0.001$), the only result in either analysis that clears the 5% threshold. This estimate is, however, isolated: the adjacent 2014–15 (+0.1 pp) and 2016–17 (−0.4 pp) pairs are both close to zero and insignificant, making it difficult to attribute the 2015–16 result to the reform rather than a transitory Illinois-specific shock.

The second-stage DiD confirms the null. The pre-policy average Illinois recruitment effect is −0.5 pp ($p = 0.290$), and the post-reform shift is +0.1 pp ($p = 0.858$), with a 95% confidence interval of $[-1.3, +1.5]$ pp. The 2015–16 outlier is absorbed by the WLS weighting without generating a significant average post-reform effect.

7.3 Covariates

7.3.1 Recruitment

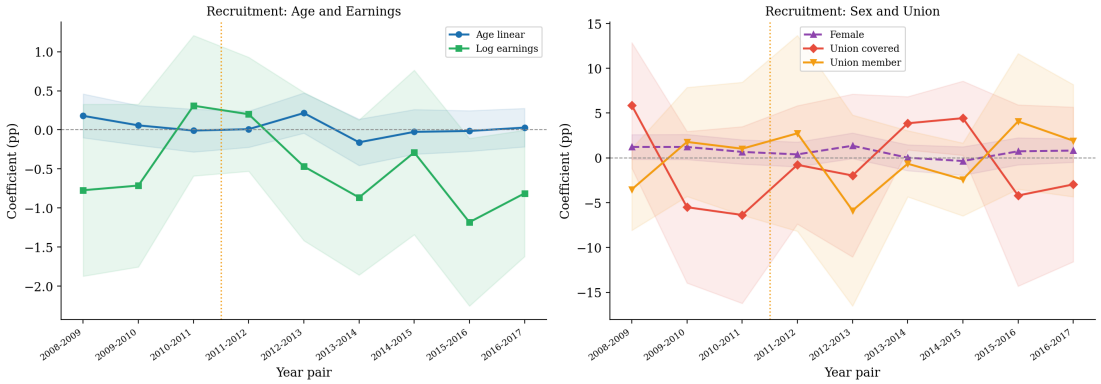


Figure 17. Covariate impact on recruitment

The recruitment covariate results contrast sharply with retention. The R^2 remains stable at ≈ 0.09–0.11 across most year pairs, rising only modestly to ≈ 0.19 in 2014–15 and 2015–16 without the pronounced structural break seen in the retention analysis. All earnings estimates now use `earnwt_t`.

The 2015–16 spike and the earnings signal. The sole statistically significant Illinois estimate is 2015–16 (-2.04 pp, $p = 0.001$). In the same year, log earnings is significantly negative (-1.18 pp, $p = 0.032$) and marginally so in 2016–17 (-0.81 pp, $p = 0.051$). A negative earnings coefficient on recruitment is the opposite of what a pension-value story would predict: workers who stand to gain more from entering public employment (higher earners) are *less* likely to enter in 2015–16, not more. This is more consistent with a compositional shift in the pool of entrants—perhaps lower-paid positions being the primary openings—than with a reform-driven response. The negative earnings effect is absent in all pre-reform years (coefficients range from -0.77 to $+0.31$ pp, all insignificant), further undermining a structural interpretation.

Union coverage. Union coverage is positive and significant in 2013–14 ($+3.86$ pp, $p = 0.011$) and 2014–15 ($+4.43$ pp, $p = 0.036$)—the opposite direction from the large negative coverage effects in the retention regressions for the same years. This divergence indicates that unionized entry-level positions remain attractive even as the reform reduced the value of long-tenure benefits, but the effect is short-lived, absent in 2015–16 and beyond.

Sex and age. The female coefficient is weakly positive in 2008–09, 2009–10, and 2012–13 ($\approx +1.2$–1.4 pp, $p \approx 0.06$–0.09) without a clear directional break around the reform. Age is uniformly insignificant. Neither variable provides evidence of heterogeneous recruitment effects.

Limits of inference. The second-stage DiD finds no significant average post-reform shift ($+0.11$ pp, $p = 0.858$, CI$= [-1.3, +1.5]$ pp). The 2015–16 result is isolated in the time series, unsupported by adjacent year pairs, and accompanied by a negative earnings signal that points away from a pension-value mechanism. *The recruitment evidence is more consistent with a transitory Illinois-specific labor-market shock in 2015–16 than with any systematic pension-reform effect on public-sector entry. No heterogeneity claim is supportable.*

7.3.2 Retention

The covariate results do not establish heterogeneous causal effects of the reform, but reveal a structural shift in the predictability of retention worth examining. All earnings estimates below use the CPS earnings weight (`earnwt_t`) rather than the demographic weight (`weight_t`); prior versions using `weight_t` for earnings produce quantitatively similar but less precisely targeted estimates.

Table 12. Selected Covariate Effects on Recruitment by Year Pair (pp)

	Pre-policy			*Post-policy*					
	08–09	09–10	10–11	11–12	12–13	13–14	14–15	15–16	16–17
Age (quadratic)									
Linear	+0.18	+0.06	−0.01	+0.01	+0.22	−0.16	−0.03	−0.01	+0.03
	(0.14)	(0.13)	(0.14)	(0.12)	(0.13)	(0.15)	(0.15)	(0.13)	(0.13)
Quadratic ($\times 10^{-3}$)	−1.8	−0.4	−0.0	+0.3	−1.9	+1.9	−0.1	−0.5	−0.3
	(1.5)	(1.5)	(1.6)	(1.3)	(1.5)	(1.8)	(1.6)	(1.4)	(1.4)
Log weekly earnings									
ln(earnwke)	−0.77	−0.71	+0.31	+0.20	−0.47	−0.87†	−0.29	−1.18*	−0.81*
	(0.56)	(0.53)	(0.46)	(0.37)	(0.48)	(0.51)	(0.54)	(0.55)	(0.41)
Sex (ref: Male)									
Female	+1.22†	+1.22†	+0.67	+0.39	+1.35†	+0.02	−0.35	+0.73	+0.81
	(0.71)	(0.72)	(0.69)	(0.70)	(0.73)	(0.74)	(0.81)	(0.77)	(0.67)
Union status (ref: Not covered)									
Union covered	+5.85	−5.51	−6.37	−0.78	−1.97	+3.86*	+4.43*	−4.20	−2.96
	(3.58)	(4.32)	(5.03)	(3.37)	(4.64)	(1.52)	(2.11)	(5.16)	(4.40)
Union member	−3.51	+1.78	+1.02	+2.74	−5.88	−0.65	−2.41	+4.07	+1.92
	(2.33)	(3.10)	(3.78)	(5.57)	(5.44)	(1.88)	(2.08)	(3.86)	(3.19)
N	4,842	4,816	4,716	4,599	4,616	3,960	2,955	3,332	3,312

Notes: SEs in parentheses. $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$, $^{\dagger}p < 0.10$. Log earnings uses `earnwt_t`; all other rows use `weight_t`. Full race, ethnicity, and occupation results in Tables A2–A3.

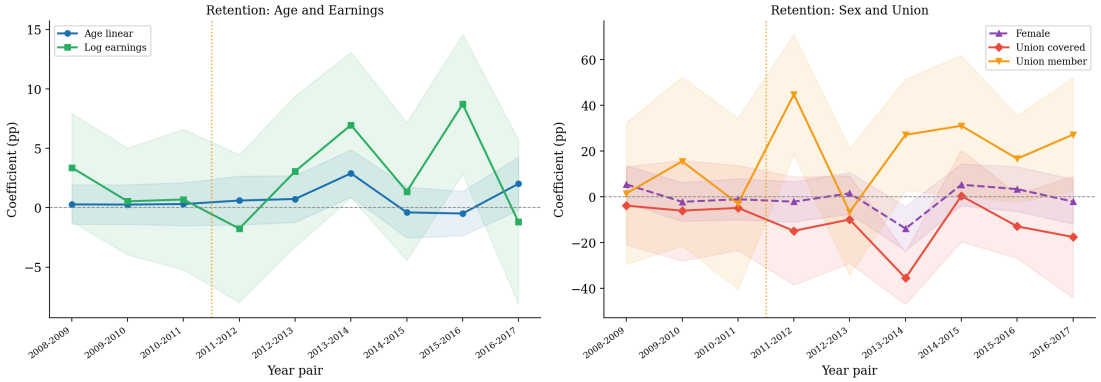


Figure 18. Covariate impact on retention

2013–14 as a turning point. Several predictors become jointly significant for the first time in 2013–14: age (linear +2.89 pp, $p = 0.005$), log earnings (+6.96 pp, $p = 0.025$), sex (−13.82 pp for women, $p = 0.005$), and union coverage (−35.46 pp, $p < 0.001$). The R^2 rises from ≈ 0.10–0.13 in all pre-reform year pairs to 0.255 in 2013–14 and 0.276–0.289 through 2016–17. The jointly positive age and earnings effects are consistent with a short-term *lock-in* response: workers with larger expected defined-benefit values (older, higher-earning) increased retention to preserve accrued rights under transitional provisions, rather than exiting. This is opposite to the direction one would predict from a pure benefit-cut effect, and is consistent with the weakly positive Illinois coefficient that year (+6.76 pp, $p = 0.085$).

2015–16 reversal and the earnings signal. The 2015–16 year pair is the strongest candidate for a delayed negative effect: the Illinois coefficient is −7.47 pp ($p = 0.059$), log earnings is again significant (+8.73 pp, $p = 0.004$), and Black workers show a large negative retention differential (−29.20 pp, $p = 0.004$) absent from all other year pairs. The persistence of a positive earnings coefficient—large in 2013–14 and 2015–16, near zero elsewhere—suggests that high earners were differentially responsive to reform-era incentives in those specific years, consistent with lock-in followed by exhaustion. However, neither the Illinois effect nor the earnings pattern carries over to adjacent year pairs, and a single-year reading cannot rule out contemporaneous Illinois-specific shocks.

The union coverage puzzle. Union coverage carries a large negative coefficient in 2013–14 (−35.46 pp, $p < 0.001$) and marginally in 2015–16 (−12.88 pp, $p = 0.070$), while union membership is simultaneously positive (+44.82 pp in 2011–12; +27.15 pp in 2013–14; +31.08 pp in 2014–15). Because both variables enter jointly, the negative coverage effect is driven by the covered-but-non-member subgroup, an atypical category whose composition likely shifted across the reform period rather than reflecting a generalized union-worker response.

Limits of inference. The second-stage DiD finds no significant average treatment effect (−3.40 pp, $p = 0.240$, CI= $[-8.6, +1.8]$ pp). Covariate shifts are equally consistent with Great Recession recovery dynamics, workforce attrition, or other state-level shocks. Credible heterogeneity identification would require an interaction-based DiD using individual-level exposure—proximity to vesting thresholds, years to retirement eligibility—which the current design does not support. *The reform period coincides with a measurable structural shift in the predictors of retention, but the pattern is insufficiently consistent across year pairs to support a causal heterogeneity claim.*

7.3.3 Retention

The first-stage regressions find no consistent evidence that the Illinois pension reform altered public-sector worker retention. Across nine year pairs from 2008–09 through 2016–17, the Illinois indicator is statistically insignificant in every pair at the 5% level. The point estimates oscillate in direction: mildly positive in the pre-reform period (average +3.3 pp), then mixed post-reform, with a weakly positive spike in 2013–14 (+6.8 pp, $p = 0.085$) followed by the largest negative estimate in 2015–16 (−7.5 pp, $p = 0.059$), before reverting to near zero. These opposing marginal

Table 13. Selected Covariate Effects on Retention by Year Pair (pp)

	Pre-policy			*Post-policy*					
	08–09	09–10	10–11	11–12	12–13	13–14	14–15	15–16	16–17
Age (quadratic)									
Linear	+0.27	+0.26	+0.31	+0.60	+0.73	+2.89**	−0.40	−0.49	+2.02†
	(0.85)	(0.85)	(0.92)	(1.05)	(1.00)	(1.02)	(1.09)	(0.95)	(1.14)
Quadratic ($\times 10^{-3}$)	−2.4	−4.8	−0.7	−9.3	−7.9	−32.1**	+6.0	+7.8	−19.3
	(9.2)	(9.5)	(9.8)	(10.9)	(10.6)	(10.6)	(12.0)	(10.2)	(12.7)
Log weekly earnings									
ln(earnwke)	+3.38	+0.54	+0.69	−1.76	+3.06	+6.96*	+1.36	+8.73**	−1.20
	(2.32)	(2.30)	(3.02)	(3.17)	(3.24)	(3.12)	(2.96)	(3.00)	(3.53)
Sex (ref: Male)									
Female	+5.47	−2.14	−1.02	−2.07	+1.58	−13.82**	+5.34	+3.42	−2.03
	(4.19)	(4.34)	(4.60)	(4.49)	(4.65)	(4.92)	(4.65)	(4.99)	(4.99)
Union status (ref: Not covered)									
Union covered	−3.81	−6.01	−4.78	−14.82	−9.87	−35.46***	+0.44	−12.88†	−17.50
	(8.71)	(11.23)	(9.45)	(12.05)	(9.74)	(5.83)	(10.22)	(7.11)	(13.57)
Union member	+1.51	+15.55	−2.93	+44.82***	−6.57	+27.15*	+31.08*	+16.69†	+27.25*
	(15.80)	(18.83)	(19.05)	(13.38)	(14.16)	(12.47)	(15.67)	(9.69)	(12.65)
N	930	934	866	803	754	660	500	568	529

Notes: SEs in parentheses. $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$, $^{\dagger}p < 0.10$. Log earnings uses `earnwt_t`; all other rows use `weight_t`. Full race, ethnicity, and occupation results in Tables A2–A3.

Table 14. Second-Stage DiD: Post-Policy Shift in Illinois Retention Effect

	$\hat{\beta}$ (pp)	SE (pp)	p	CI Low	CI High
Intercept (avg. pre-policy $\hat{\beta}$)	+3.338	2.110	0.1576	−0.797	7.473
Post-policy shift (change after 2011)	−3.399	2.649	0.2403	−8.592	1.793

Notes: WLS of nine $\hat{\beta}$s on a post indicator, weighted by $1/\widehat{\mathrm{SE}}^2$. $N = 9$. Computed from the updated first-stage betas using `earnwt_t` for the earnings control. Neither estimate is significant. The 95% CI for the post-reform shift $[-8.6, +1.8]$ pp spans zero by a wide margin.

results in adjacent year pairs are more consistent with sampling noise than with a coherent reform-driven trend.

The second-stage DiD formalizes this null finding. The average pre-policy Illinois retention effect is +3.3 pp ($p = 0.158$), and the estimated post-reform shift is −3.4 pp ($p = 0.240$), with a 95% confidence interval of $[-8.6, +1.8]$ pp that comfortably spans zero. There is no statistically or economically meaningful change in retention attributable to the reform.

8 MEASURING GENEROSITY

To compare pension generosity across Illinois' five public retirement systems (GARS, SERS, TRS, SURS, and JRS), we constructed a heatmap mapping final replacement rates across worker archetypes and retirement ages. We define replacement rate as:

$$\text{Replacement rate} = \frac{\text{Annual Pension Benefit}}{\text{Final Salary}}$$

We extracted key plan parameters directly from each system's 2025 Annual Comprehensive Financial Report, including vesting requirements, benefit accrual rates, final average salary rules, COLA provisions, and replacement rate caps. These parameters vary substantially across plans: for instance, GARS applies a tiered accrual schedule capped at 85% of final salary, while TRS uses a flat 2.2% accrual capped at 75%.

On the assumptions side, starting salaries and salary growth rates were calibrated using figures referenced in the reports where available, but in some cases required estimation. A uniform 4% salary growth rate was applied across profiles when plan-specific figures were unavailable.

We then defined five standardized worker archetypes (early entrant, mid entrant, late entrant, career public, and short tenure). Each archetype's salary path was constructed as $\text{Salary}(t) = \text{Starting Salary} \times (1 + \text{growth rate})^t$. Pension benefits were calculated by applying each plan's accrual formula to the final average salary, subject to applicable caps and early retirement penalties, and replacement rates were computed at five retirement ages (55, 60, 62, 65, and 67).

The most visible pattern is the gap between GARS and JRS on one side and the other systems on the other. Legislators and judges hit the statutory 85% replacement cap in nearly every scenario, regardless of when they retire or how long they worked. This reflects their high accrual rates (5% and 3.5% per year respectively) relative to the other systems.

TRS, SERS, and SURS tell a more differentiated story. Workers who enter early and stay for full careers can reach 75–80% replacement, but outcomes drop sharply for mid- and late-career entrants, particularly those who retire before the normal retirement age. A SERS or TRS worker with only 10–15 years of service retiring at 55 may replace only 22–33% of their final salary—well below what most retirement adequacy benchmarks consider sufficient.

The heatmap also illustrates the leverage of retirement age. Across all systems except GARS, delaying retirement from 55 to 67 meaningfully improves replacement rates, both because the worker accumulates more service years and because early retirement penalties are avoided.

Overall, the heatmap suggests that Illinois public pensions are highly adequate for long-tenured workers in all systems, but adequacy varies considerably for workers with shorter or interrupted careers—and the gap between GARS/JRS and the other three systems is substantial.

Table 15. Heatmap Matrix: Final Replacement Rate

Plan	Profile	Age 55	Age 60	Age 62	Age 65	Age 67
GARS	Early entrant	85.0%	85.0%	85.0%	85.0%	85.0%
GARS	Mid entrant	85.0%	85.0%	85.0%	85.0%	85.0%
GARS	Late entrant	85.0%	85.0%	85.0%	85.0%	85.0%
GARS	Career public	85.0%	85.0%	85.0%	85.0%	85.0%
GARS	Short tenure	85.0%	85.0%	85.0%	85.0%	85.0%
SERS	Early entrant	66.0%	75.0%	75.0%	75.0%	75.0%
SERS	Mid entrant	44.0%	55.0%	59.4%	66.0%	70.4%
SERS	Late entrant	22.0%	33.0%	37.4%	44.0%	48.4%
SERS	Career public	66.0%	75.0%	75.0%	75.0%	75.0%
SERS	Short tenure	55.0%	66.0%	70.4%	75.0%	75.0%
TRS	Early entrant	44.0%	75.0%	75.0%	75.0%	75.0%
TRS	Mid entrant	44.0%	55.0%	59.4%	66.0%	70.4%
TRS	Late entrant	75.0%	33.0%	37.4%	44.0%	48.4%
TRS	Career public	66.0%	75.0%	75.0%	75.0%	75.0%
TRS	Short tenure	55.0%	66.0%	70.4%	75.0%	75.0%
SURS	Early entrant	66.0%	77.0%	80.0%	80.0%	80.0%
SURS	Mid entrant	44.0%	55.0%	59.4%	66.0%	70.4%
SURS	Late entrant	22.0%	33.0%	37.4%	44.0%	48.4%
SURS	Career public	66.0%	77.0%	80.0%	80.0%	80.0%
SURS	Short tenure	55.0%	66.0%	70.4%	77.0%	80.0%
JRS	Early entrant	85.0%	85.0%	85.0%	85.0%	85.0%
JRS	Mid entrant	70.0%	85.0%	85.0%	85.0%	85.0%
JRS	Late entrant	35.0%	52.5%	59.5%	70.0%	77.0%
JRS	Career public	85.0%	85.0%	85.0%	85.0%	85.0%
JRS	Short tenure	85.0%	85.0%	85.0%	85.0%	85.0%

Notes: Entries report final replacement rates by pension plan, worker profile, and retirement age. Green cells indicate higher replacement rates; yellow, orange, and red cells indicate lower replacement rates.

These patterns connect directly to the central empirical findings of this paper in three ways. First, the replacement rate analysis clarifies precisely *what* Tier 2 changes and *for whom*. Tier 2 does not reduce the maximum replacement rate available to career public workers—the 75–80% ceiling for long-tenured SERS, TRS, and SURS employees is unchanged. Instead, it operates entirely through the *timing* of access to that ceiling: the normal retirement age rises from 60 to 67, the final average salary window doubles from 48 to 96 months, and the COLA weakens. For a mid-career SERS entrant, this means that retiring at age 60—which was fully available under Tier 1—yields 55% replacement, whereas under Tier 2 the same worker would face heavy early-retirement penalties and receive far less. The null results in the DiD regressions are therefore consistent with workers not yet responding to a change that bites most severely at the retirement margin, which lies decades in the future for the bulk of post-2011 entrants observed in the 2008–2017 CPS window.

Second, the heterogeneity visible in Table 15 helps explain why a single average treatment effect may be uninformative. The three workers most relevant to our recruitment analysis—a young teacher entering TRS, a mid-career state employee in SERS, and a university employee in SURS—face meaningfully different benefit structures and hence different incentive changes under Tier 2. Aggregating their responses into a single Illinois–control gap averages over these differences and will detect an effect only if the reform shifted behavior *on average* across all worker types, all pension systems, and all career stages. Given the heterogeneity shown in the heatmap, a null average effect is entirely compatible with economically meaningful effects concentrated among specific worker profiles—particularly the mid- and late-career entrants in SERS and TRS whose replacement rates are most sensitive to the retirement-age and FAS-window changes.

Third, the heatmap provides the rationale for the policy concern motivating Senate Bill 1937. The Safe Harbor problem is most acute precisely where the heatmap shows the most red: workers in SERS or SURS with short or interrupted careers who retire well before age 67. For these workers, Tier 2 replacement rates may fall below the Social Security equivalent benefit that federal law requires public plans to match. Restoring pension generosity through the provisions of SB 1937—lower retirement age, wider salary cap, compounding COLA—would mechanically raise replacement rates across the board, but would have the largest proportional effect on the mid- and late-career profiles whose outcomes currently fall in the orange and red cells of Table 15. Whether that improvement translates into measurable labor-market effects on recruitment or retention remains an open question; the DiD evidence from 2008–2017 does not settle it, but the replacement rate analysis establishes the mechanism through which it could.

9 DISCUSSION

9.1 Interpreting the Post-Reform Structural Break

The difference-in-differences estimates identify a structural break in Illinois public-sector workforce composition around January 2011, but three competing explanations are consistent with the same reduced-form pattern.

First, the reform was enacted in the immediate aftermath of the Great Recession, a period in which state and local government employment followed a markedly different trajectory from the private sector. As Figure 8 shows, public-sector employment shares drift downward from 2011 onward across *all* comparison states, predating any Illinois-specific shock. Figure 17 also reflects this on a US-wide scale: public sector employment reached its trough in 2013, while the private sector had already begun its recovery from the recession. Center for Economic and Policy Research (2020) document that total state and local employment in the United States did not recover its 2008 peak until 2019, and that the pace of recovery varied substantially across states. To the extent that Illinois' fiscal position was particularly constrained, hiring freezes could have shifted composition toward older, more tenured workers independently of any behavioral response to Tier 2. Our difference-in-differences design absorbs common time-series shocks, but state-specific fiscal trajectories remain a threat to identification that the parallel pre-trends in Figures 3 and 8 mitigate but cannot rule out.

Second, multi-year union contract cycles — renegotiated on a schedule orthogonal to pension tier assignment — could themselves alter staffing levels and seniority structures. The continuously

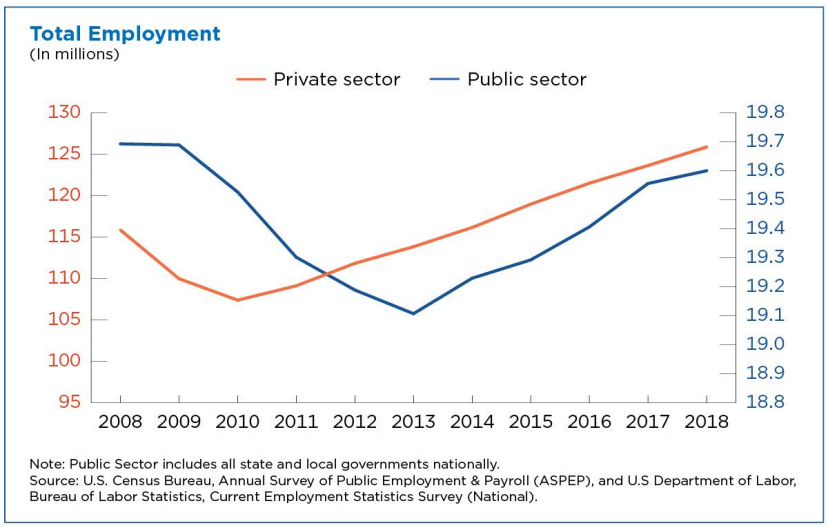


Figure 19. US Employment Recovery Post-Recession

rising earnings series in Figure 5 provides no evidence of a sharp compensation break at 2011, reducing but not eliminating this concern.

Third, and most theoretically compelling, active sectoral sorting consistent with a compensating differentials framework (Rosen, 1986): prospective workers aware of the reduced Tier 2 generosity redirect toward private employment, mechanically ageing the public-sector stock. The same compositional shift could, however, arise passively from reduced net hiring without any pension-driven behavioral response. Distinguishing these channels definitively requires administrative personnel records with new-hire characteristics and voluntary quit rates by tenure class — data beyond the scope of the CPS.

9.2 Non-Pension Determinants of Public-Sector Recruitment and Retention

Even under the sorting interpretation, the effect size may be attenuated because pension generosity is only one component of the total compensation bundle that determines sector choice.

Quinby and Sanzenbacher (2020) link CPS worker-transition data to the Public Plans Database and find that more generous pensions help recruit high-wage workers from the private sector, but that this advantage is substantially eroded when employees must make higher current-paycheck contributions to prefund those benefits — suggesting that the form, and not just the present value, of compensation matters. Survey evidence from the Pew Charitable Trusts (2017) reinforces this: among public workers under 40, job security, work–life balance, and occupation are ranked above retirement benefits as reasons to choose public employment, and more than a third of workers under 30 cannot name the type of retirement plan they hold.

The literature also documents a consistent asymmetry between the recruitment and retention margins. Koedel and Xiang (2017) study a 1999 benefit formula enhancement for St. Louis public school teachers — structurally similar to the enhancements enacted across many states in the late 1990s and early 2000s — and find no meaningful retention response among non-retirement-eligible teachers, the group most analogous to new Tier 2 entrants.

9.3 Do Young Workers Optimise Over Long Horizons?

The standard compensating differentials framework assumes workers correctly discount the present value of pension benefits when choosing jobs. This assumption is empirically questionable for the young workers comprising the bulk of the Tier 2 cohort. The seminal work by Laibson (1997) and O'Donoghue and Rabin (1999) show that there is a systematic underweighting of distant payoffs — precisely reflecting the decision to forgo a higher pension in forty years in favour of immediate private-sector wages.

Direct evidence from the most relevant context is striking. Fitzpatrick (2015) exploits an Illinois-specific opportunity for public school employees to purchase additional pension benefits

and estimates that workers are willing to pay only 20 cents on average for a dollar increase in the present value of expected retirement benefits. She concludes that this "substantial inefficiency in compensation" casts doubt on deferred compensation as a recruitment tool. Goldhaber and Grout (2016) find that younger and less-experienced Florida public school teachers are more likely to choose a portable defined-contribution plan over an actuarially superior defined-benefit structure, consistent with high implicit discount rates for backloaded retirement income. Together these findings imply that our estimates likely represent a lower bound on the labor market effects that would obtain if workers were fully informed and optimising over long horizons, and help explain why the compositional drift in Figures 2 and 3 is gradual rather than discontinuous at 2011.

9.4 The Time Horizon for Policy-Induced Labor Market Effects

The 2008–2017 observation window may be insufficient to detect the full consequences of a reform whose primary effects operate through slow-moving cohort replacement. The Tier 2 cohort is small in 2012–2013 and grows only as natural turnover replaces Tier 1 incumbents. In large public employers with low annual turnover, only the first few Tier 2 cohorts are observed, limiting statistical power. The broader literature confirms this: Martins et al. (2009) show that firm-level effects of Portugal's 1994 retirement age reform emerged gradually over several years, and Bianchi et al. (2023) find that career spillovers from the 2011 Italian Fornero reform took multi-year horizons to materialize and were concentrated in low-promotion-opportunity workplaces — a structural feature common to large public bureaucracies. Koedel and Xiang (2017) further note that studies of permanent benefit changes consistently produce smaller estimated effects than studies of temporary early-retirement incentives (Fitzpatrick and Lovenheim, 2014), precisely because cohort replacement is a slower mechanism than individual retirement timing.

9.5 Policy Implications: Senate Bill 1937 and Tier 2 Reform

These findings are directly relevant for the proposals to reform Tier 2 described in Section 2.3, and for SB1937 in particular. This legislation would lower the normal retirement age, improve cost-of-living adjustments, raise the pensionable salary cap, and broadly increase the generosity of benefits for Tier 2 workers, with the stated goals of improving both Safe Harbor compliance and public-sector labor supply.

Our analysis does not find evidence to support the claim that Tier 2 caused a large or measurable labor shortage between 2011 and 2017. Should the null result reflect genuine behavioral insensitivity of recruitment and retention to pension generosity at the levels in question — consistent with the evidence reviewed above — expanding Tier 2 benefits would generate substantial increases in long-run pension liabilities without commensurate gains in staffing outcomes. Although the sponsors of SB1937, Senator Robert Martwick and Representative Stephanie Kifowit, have argued that reform would improve both equity and retention, the labor-market case for the bill is weak on the evidence available.

Two important caveats qualify this conclusion, however.

First, our analysis ends in 2017, well before the Tier 2 cohort grew large enough for pension-driven incentives to become widely salient. The mechanism through which Tier 2 is most likely to weaken retention — the backloaded reduction in defined-benefit wealth for long-tenure workers — operates primarily over career horizons of ten or more years. Workers hired in 2011 would not reach the typical mid-career vesting inflection point until the early 2020s, and the full cohort effect would not be observable until the 2030s. Effects that we cannot detect over 2011–2017 may become detectable as the Tier 2 cohort matures, and the fiscal cost of waiting for evidence may be substantial if reform ultimately does cause large retention losses among mid-career incumbents.

Second, the Safe Harbor compliance question is independent of the labor-market analysis. Federal law requires public pension systems to provide benefits at least as generous as Social Security for workers not covered by Social Security. If Tier 2 benefits fall below this threshold — a risk that actuarial reports increasingly highlight (Capitol News Illinois, 2024) — the administrative and fiscal consequences of non-compliance would be severe regardless of whether Tier 2 has measurably affected retention. The benefit improvements in SB1937 may therefore be warranted on compliance grounds alone, even if their labor-market impact over the first decade of Tier 2 was modest.

10 LIMITATIONS

Four limitations of the current analysis should inform how the results are interpreted and extended.

CPS matching precision. The matching procedure introduces attrition and measurement error that mechanically reduce the precision of matched-panel estimates. The confidence intervals on both second-stage estimates are wide—$[-8.6, +1.8]$ pp for retention and $[-1.3, +1.5]$ pp for recruitment—and cannot rule out effects that would be economically meaningful from a workforce-planning perspective. Our null results should be read as *no detectable effect* rather than *no effect*.

Short post-reform window. As noted above, the 2011–2017 period captures only the early phase of Tier 2 exposure. The workers most directly affected by the reform's retention incentives—long-tenure employees approaching vesting or retirement eligibility under the new formula—are unlikely to be well represented in the CPS MORG over this window.

Reduced-form design. The two-step DiD recovers a state-level average reduced-form effect. It cannot speak to distributional effects across workers with different tenure levels, pension systems (GARS, SERS, TRS, SURS, JRS), or career trajectories. The heatmap analysis in Section 8 documents substantial heterogeneity in replacement rates across these dimensions, suggesting that a distributional analysis would be both feasible and informative.

Data limitations. The CPS MORG does not identify pension tier, earnings history, or tenure with the current employer. Administrative data from the Illinois Department of Central Management Services or the pension systems themselves—which would contain exact hire dates, salary histories, and tier assignments—would support a regression discontinuity design at the January 2011 cutoff, directly comparing otherwise similar Tier 1 and Tier 2 workers.

Symmetry of pension generosity effects. A further limitation is that the reduced-form design implicitly assumes that the labor-supply effects of reducing pension generosity are symmetric with respect to increases in generosity. This need not hold. A large behavioral economics literature, rooted in prospect theory, documents that individuals weight losses more heavily than equivalent gains, implying that a reduction in expected pension wealth could reduce recruitment and retention by more than a comparable increase would improve them. Some literature estimate that labor elasticities for wage decrease are nearly double that of a wage increase (Doerrenberg et al., 2016). If this asymmetry holds, our null result—estimated entirely over a period of benefit *reduction*—may not generalize to the policy counterfactual of interest, namely whether partially restoring Tier 2 generosity through proposals such as Senate Bill 1937 would meaningfully improve public-sector staffing. A related concern is contextual asymmetry: Tier 2 took effect during a period of severe fiscal stress and weak outside labor market options, conditions under which workers may have been less responsive to the loss of pension value than they would be in a tighter labor market. Both forms of asymmetry counsel caution in using the estimated null effect of Tier 2 to forecast the labor-market impact of any proposed benefit improvement.

11 CONCLUSION

Illinois' Tier 2 pension reform represents one of the most substantial prospective reductions in public-sector pension generosity enacted by any US state in the post-recession period. By reducing the normal retirement age from 60 to 67, reducing cost-of-living adjustments, and tightening the benefit formula for all post-2010 hires, Tier 2 significantly reduced the present value of lifetime compensation for new Illinois public employees.

Using nine years of matched CPS MORG panels and a two-step difference-in-differences framework, we find that these changes did not produce a statistically or economically detectable average effect on public-sector entry or retention over the 2008–2017 window. The post-reform shift in the Illinois recruitment differential is +0.11 pp ($p = 0.858$); the post-reform shift in the retention differential is −3.40 pp ($p = 0.240$). Both are statistically indistinguishable from zero.

These null results coexist with a striking structural break in the predictability of retention—the regression R^2 nearly doubles from pre- to post-reform—suggesting that Tier 2 did alter the

composition of who stays and who leaves, even without shifting the average level. This finding is consistent with heterogeneous responses among Tier 1 workers who had varying amounts of defined-benefit wealth at stake, but cannot be given a causal interpretation without more granular individual-level data.

For policy, the most important implication is temporal. The adverse effects of Tier 2—if they materialize—are most likely to become visible in the 2020s and beyond, as the Tier 2 cohort reaches mid-career and the backloaded structure of the defined-benefit formula begins to matter for individual retirement calculations. The present paper establishes the benchmark: over the first seven years of Tier 2, we find no robust evidence that the reform measurably worsened public-sector staffing outcomes in Illinois relative to comparable states. Whether this conclusion holds as the cohort matures remains an open and consequential empirical question.

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A MATCHING RESULTS

Table 16. Detailed Match Attrition and Sample Characteristics by Merge Stage

Year Pair	Stage	N	Mean Age	Female (%)	White (%)	Black (%)	Mean Wkly. Earn.	Mean Annual Earn.	Usual Hours	Public Empl. (%)
Panel A: 2008–2009										
	Raw (t)	317,341	44.8	51.6	81.1	11.9	$789	$41,029	35.6	9.7
	Naive merge	208,540	47.5	51.9	82.6	10.7	$840	$43,670	36.0	10.5
	After sex/race	159,430	47.5	52.4	84.8	9.8	$833	$43,302	35.8	10.4
	Rejected	49,110	47.8	50.4	75.5	13.9	$861	$44,795	36.5	10.6
Panel B: 2009–2010										
	Raw (t)	320,941	45.0	51.6	81.0	12.0	$792	$41,193	35.0	9.7
	Naive merge	212,655	47.7	51.9	82.3	11.0	$843	$43,860	35.5	10.4
	After sex/race	162,710	47.6	52.4	84.4	10.0	$835	$43,431	35.3	10.3
	Rejected	49,945	48.1	50.3	75.8	14.0	$868	$45,151	36.1	10.7
Panel C: 2010–2011										
	Raw (t)	321,277	45.1	51.6	80.8	12.1	$802	$41,724	35.1	9.7
	Naive merge	211,295	47.8	52.0	82.1	11.1	$852	$44,326	35.6	10.4
	After sex/race	161,139	47.7	52.5	84.0	10.3	$846	$43,967	35.5	10.3
	Rejected	50,156	48.2	50.4	76.0	13.4	$873	$45,422	35.9	10.5
Panel D: 2011–2012										
	Raw (t)	318,334	45.3	51.5	80.6	12.2	$814	$42,329	35.2	9.3
	Naive merge	207,830	48.0	51.8	82.0	11.0	$866	$45,020	35.6	10.1
	After sex/race	158,443	47.9	52.1	84.1	10.0	$858	$44,639	35.4	9.9
	Rejected	49,387	48.3	50.6	75.3	14.1	$888	$46,152	36.2	10.4
Panel E: 2012–2013										
	Raw (t)	316,408	45.5	51.8	79.4	12.3	$832	$43,288	35.1	9.1
	Naive merge	204,558	48.2	52.0	80.8	11.4	$885	$46,003	35.6	9.8
	After sex/race	156,070	48.1	52.3	83.1	10.4	$876	$45,541	35.4	9.7
	Rejected	48,488	48.8	50.9	73.5	14.4	$911	$47,398	36.0	10.1
Panel F: 2013–2014										
	Raw (t)	315,717	45.7	51.7	79.1	12.4	$849	$44,159	35.3	9.0
	Naive merge	164,043	48.2	51.9	80.3	11.4	$894	$46,470	35.6	9.7
	After sex/race	137,660	48.0	52.2	81.7	10.9	$887	$46,115	35.5	9.6
	Rejected	26,383	49.0	50.6	73.3	14.0	$927	$48,217	36.4	10.2
Panel G: 2014–2015										
	Raw (t)	317,056	45.9	51.7	78.8	12.4	$861	$44,768	35.6	8.8
	Naive merge	109,674	47.5	51.9	78.6	12.3	$914	$47,551	35.9	9.1
	After sex/race	106,328	47.6	52.0	79.1	12.0	$915	$47,591	35.8	9.1
	Rejected	3,346	43.8	50.1	60.6	22.2	$885	$46,014	36.4	9.3
Panel H: 2015–2016										
	Raw (t)	314,692	46.0	51.7	78.5	12.5	$886	$46,089	35.8	8.8
	Naive merge	122,882	47.9	51.9	79.6	11.6	$915	$47,593	35.8	9.3
	After sex/race	119,721	48.0	51.9	80.0	11.5	$917	$47,668	35.8	9.3
	Rejected	3,161	43.6	51.8	62.1	18.6	$855	$44,434	35.8	8.2
Panel I: 2016–2017										
	Raw (t)	314,873	46.2	51.7	78.2	12.6	$909	$47,257	35.8	8.8
	Naive merge	126,542	48.1	51.9	79.4	11.7	$941	$48,957	35.9	9.0
	After sex/race	122,162	48.2	51.9	80.0	11.4	$941	$48,952	35.9	9.1
	Rejected	4,380	45.8	52.0	65.1	19.3	$944	$49,069	36.9	7.6

Notes: Stages are: (1) raw base-year file; (2) naive merge on household and person identifiers across MIS 4 and MIS 8; (3) final matched sample after dropping pairs with inconsistent sex or race reports across periods ("after

B RECRUITMENT

Table 17. First-Stage Illinois Recruitment Effects: Full Detail

	$\hat{\beta}$ (pp)	SE (pp)	p	CI Low	CI High	N	R^2
Pre-policy							
2008–09	−0.914	0.619	0.1397	−2.128	0.299	4,842	0.102
2009–10	−0.364	0.609	0.5505	−1.558	0.830	4,816	0.108
2010–11	−0.339	0.627	0.5887	−1.567	0.889	4,716	0.086
Post-policy							
2011–12	−0.843	0.610	0.1674	−2.039	0.354	4,599	0.095
2012–13	+0.755	0.618	0.2218	−0.456	1.967	4,616	0.105
2013–14	−0.211	0.601	0.7259	−1.388	0.967	3,960	0.100
2014–15	+0.144	0.644	0.8236	−1.119	1.406	2,955	0.191
2015–16	−2.038	0.627	0.0012	−3.267	−0.809	3,332	0.194
2016–17	−0.400	0.615	0.5160	−1.606	0.806	3,312	0.157
Pre avg.	−0.539						
Post avg.	−0.432						

Notes: DV: `joined_state_local`. All controls use `weight_t` except log earnings (`earnwt_t`). HC1 SEs. R^2 stable at ≈ 0.09–0.11 across most year pairs; rises modestly to ≈ 0.19 in 2014–15 and 2015–16. *Robustness:* No-NY 2008–09: $\hat{\beta} = -0.51$ pp ($p = 0.320$, $N = 6{,}570$).

C RETENTION

Table 20. First-Stage Illinois Retention Effects: Full Detail

	$\hat{\beta}$ (pp)	SE (pp)	p	CI Low	CI High	N	R^2
Pre-policy							
2008–09	+3.507	3.649	0.3366	−3.646	10.660	930	0.127
2009–10	+5.872	3.587	0.1016	−1.159	12.903	934	0.098
2010–11	+0.423	3.730	0.9098	−6.888	7.733	866	0.127
Post-policy							
2011–12	−0.091	3.867	0.9811	−7.670	7.487	803	0.123
2012–13	+3.440	3.883	0.3756	−4.169	11.050	754	0.127
2013–14	+6.762	3.922	0.0847	−0.926	14.449	660	0.255
2014–15	−2.107	3.803	0.5795	−9.561	5.346	500	0.276
2015–16	−7.470	3.963	0.0594	−15.237	0.297	568	0.289
2016–17	−1.098	4.138	0.7908	−9.209	7.013	529	0.247
Pre avg.	+3.267						
Post avg.	−0.094						

Notes: DV: `stayed_state_local`. All controls use `weight_t` except log earnings (`earnwt_t`). HC1 SEs. R^2 rises from ≈ 0.10–0.13 pre-reform to ≈ 0.25–0.29 from 2013–14 onward.