Public Employee Pensions and Collective Bargaining Rights: Evidence from State and Local Government Finances

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A B S T R A C T

Using public employee retirement system financial data from the universe of state and local governments in the United States, we estimate the effects of public sector collective bargaining rights on public employee pension amounts and generosity, exploiting variation in the timing of state laws in a differences-in-differences framework. We find that collective bargaining requirements significantly and substantially increase government contributions to pensions, while reducing employee contributions, significantly increasing the overall generosity (and amount) of pension contributions and benefits. Collective bargaining requirements appear to have little effect on total public employment or payroll.

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1. Introduction

State and local governments faced tremendous budget pressures in the wake of the financial crisis. Municipal bankruptcies—of which the city of Detroit's 2013 filing is the most dramatic example—spiked from 2009 to 2014, as Figure 1 shows. Declines in tax bases and asset values as a result of the financial crisis caused a $1 trillion loss in state and local government retirement plan assets (Brown et al., 2011; Munnell et al., 2011), diverting a growing share of government revenues to restore funding levels; retirement plan contributions consumed close to a third of Detroit's annual revenues before its bankruptcy (Orr, 2013). Many observers blamed public employee unions and collectively bargained pension liabilities as major contributing factors to the budget crises (Biggs, 2014a).

Indeed, over the past five decades public employee retirement benefits have markedly increased in states that passed laws requiring collective bargaining relative to other states. Figure 2 shows that among states that eventually required collective bargaining, employee pension payouts increased by $3.5 billion between 1960 and 2008, while states without requirements increased by about $2 billion. Figure 3 shows a similar pattern holds for government contributions to public employee retirement systems. How much of this increase in pension payouts and contributions can be attributed to collective bargaining rights? The empirical analysis below attempts to answer this question.

The perceived contribution of public sector collective bargaining to government budget woes has sparked an ongoing policy debate. State legislatures in Wisconsin—one of the earliest adopters of public sector collective bargaining— and Ohio—traditionally a place of strong support for unions—passed measures in 2011 limiting collective bargaining for public employees. The Ohio measure was subsequently overturned by referendum, while the Wisconsin measure was upheld in the Wisconsin Supreme Court in 2014. The United States Supreme Court case Friedrich v. California Teachers Association, argued in January 2016, highlights the continuing policy debate surrounding collective bargaining's role in the public sector.

The impact of collective bargaining rights on public employee pensions matters not only for policy debates over state and local government finances, but also for workers. As of 2015, 39 percent of public employees were represented by a union, a level never reached in the private sector (currently 7.4 percent) even during unions' heyday in the 1940s and 1950s (Bureau of Labor Statistics, 2016). Thus collective bargaining determines the compensation for a large fraction of workers in an important sector of the economy.

And for those workers, pension benefits represent an important part of overall compensation and savings for old age. Pension benefits amount to close to one-third of wage and salary compensation (Biggs, 2014b), and are often the sole savings vehicle for old age (Choi et al., 2006).

Despite the policy and press attention given to public unions and pensions, and their importance for state and local government finances and workers, research on the effects of collective bargaining rights on public employee pensions is surprisingly incomplete. This paper attempts to fill this gap. Using public employee retirement system financial data from the universe of state and local governments we exploit

variation in the timing of state laws regarding public sector collective bargaining in a differences-in-differences framework, and find that collective bargaining requirements significantly and substantially increase government contributions to pensions, while reducing employee contributions. The increase in employer contributions is estimated to be about three times the size of the decrease in employee contributions; thus collective bargaining requirements significantly increase the overall generosity (and amount) of pension contributions and benefits. Collective bargaining requirements appear to have little effect on total public employment or payroll.

The case of Iowa illustrates the paper's empirical strategy and previews the results. The Iowa Public Employment Relations Act created a duty to bargain with public employee unions beginning in 1976, prior to which all matters of compensation for public employees were determined legislatively (Heuton, 2014). Shortly after the duty to bargain was imposed, the first public employee unions in Iowa formed in August of 1976, consistent with findings by Valletta and Freeman (1988), Zax and Ichniowski (1990), and Frandsen (2016) that collective bargaining rights significantly spur union membership. While likely many aspects of compensation and working conditions for public employees were affected by the introduction of collective bargaining rights, one stark example of a response visible in Iowa government financial data is the fraction of public employee pension contributions made by employees. Figure 5 plots the fraction of contributions made by employees for each year from 1955 to 1996. Prior to the introduction of collective bargaining rights, that fraction was a remarkably stable 50 percent. With the introduction of collective bargaining rights in 1976 the fraction drops sharply to 40 percent. The timing and sharpness of the change rule out that the observed difference is due to noise or underlying trends surrounding the change in collective bargaining rights. The empirical analysis below exploits similar variation across all states to infer the effect of collective bargaining rights on this and other pension outcomes.

This paper builds on a long literature examining the effects of unionism and collective bargaining in the public sector. Much of this literature has focused on union presence, wages, and employment, and found that collective bargaining rights lead to substantial increases in union presence and modest increases in wages (Freeman and Valletta, 1988; Zax and Ichniowski, 1990; Frandsen, 2016). This literature may miss much of the effect on compensation as a whole if there is a tradeoff between wages and retirement benefits in the union negotiation process, as suggested by Ehrenberg (1980).

Direct evidence on the effect of collective bargaining on public employee retirement benefits is much scarcer. Early evidence comparing unionized and nonunionized public employees found that unionized public employees' fringe (including pension) benefits tend to be more generous (Gustman and Segal, 1977; Ichniowski, 1980; Kearney and Morgan, 1980) and less likely to be fully funded (Mitchell and Smith, 1994). Freeman (1986) and studies cited there document that public employee unions are associated with a substantially larger increase in pensions and other fringes than straight wages and salary, suggesting that unions may be more likely to shift compensation from wages to fringe benefits, as Farber (1978) found for unionized mine workers. Lewin et al. (2012) document that public employees have relatively more generous pensions and are more likely to have defined benefit plans—which shift investment risk from the worker to the employer—than private sector workers. Within the private sector, Freeman (1985) shows that unionized workers are much more likely to have pensions.

This paper contributes to the prior literature as the first to identify the effect of collective bargaining rights on pension generosity and amount among public sector workers.

2. Institutional Background

Prior to the 1950s, public employees in all states and the federal government were prohibited from collective bargaining, in contrast with private sector workers, whose labor movement was at its zenith in the 1940s and 1950s. The difference in legal treatment of public and private sector workers was motivated in part by the concern that collective bargaining would interfere with the sovereign power of state and federal governments, or that unions' ability to influence the political process gave them undue bargaining power (Free- man, 1986). Nevertheless, the organization of public school teachers in New York City in 1961 by the American Federation of Teachers, and President Kennedy's 1962 Executive Order 10988 recognizing unions among federal employees marked the strengthening labor movement among public employees.

Starting with Wisconsin in the early 1960s, states began to pass laws authorizing or requiring local and state governments to bargain collectively with public employee unions. Collective bargaining requirements typically impose on the employer a duty to bargain with an employee union should one present itself. In 1962 Wisconsin was the only state with a law imposing such a duty to bargain, but by 2010 34 states had a requirement. Table 1, reproduced from Frandsen (2016), shows the timing of when states enacted laws either permit- ting or requiring employers to bargain collectively with public employees. Most of the relevant laws took effect in either the 1960s or 1970s, although there were a number of changes after 1980. As mentioned above, following the financial crisis several states considered limiting public sector collective bargaining, with Wisconsin and Ohio passing measures in 2011. The Ohio measure was overturned by referendum, while the Wisconsin measure was upheld in court in 2014.

3. Data

The U.S. Census Bureau's Annual Surveys of State Government Finances and Census of Governments provide the principle data for this study (U.S. Census Bureau, 2010). The Census Bureau compiles data from these sources in the machine-readable State Government Finances database. This database contains annual information on numerous revenue, expenditure, and asset holdings for each state dating back as far as 1902, although the consecutive series for all states begins in the 1950s. The revenue and expenditure categories include data on government-administered public employee retirement systems. The revenue measures provide the basis of the pension contribution outcomes used in this study, and the expenditure measures provide the basis of the benefit outcomes. Contributions are separately reported as employee contributions, local government contributions, and state government contributions. We construct our measure of employer pension contributions as the sum of local and state government contributions. Our measure of total pension contributions is the sum of employee and employer

contributions, and our measure of the fraction of contributions made by the employee is constructed by dividing employee contributions by total contributions.

Pension expenditures include a category called "Benefit Payments," defined as "payments to which participants may be entitled under a pension plan, including pension benefits, death and disability benefits due on termination of employment, and all other benefits directly paid from the retirement fund to recipients during the fiscal year surveyed (U.S. Census Bureau, 2010)." This quantity therefore comprises our benefit outcome measure. The series for several states contained observations that were clearly erroneous (e.g., missing decimal points). These observations were replaced by linear interpolations between valid years, although the results are not sensitive to the correction.

Data on public sector collective bargaining statutes are based on a dataset originally compiled by Robert Valletta and Richard Freeman (1988).[1] This dataset codes the relevant laws for every state and every year from 1955 to 1985 for five different occupational groups. This dataset was later extended by Kim Rueben to cover the years through 1996. While state laws vary substantially in their exact provisions for public sector collective bargaining, states fall roughly into three categories: collective bargaining prohibited, permitted, and required. The prohibited category includes statutes that explicitly prohibit state employers from bargaining with worker representatives, but also situations where state law makes no provision for collective bargaining, as courts have typically interpreted this as prohibiting collective bargaining (Freeman and Valletta, 1988). The permitted category includes statutes which authorize the employer to bargain and which give employee organizations the right to present proposals or meet and confer with the employer. The required category includes statutes which either imply or make explicit the duty of the employer to bargain should the workers demand it. Our regressor of interest is an indicator for whether state law requires public employers to bargain collectively should a union present itself. The vast majority of states prohibit public sector employees from striking. The few states that grant public employees the right to strike all require collective bargaining as well. Since pension information is not available for each occupation group separately, we take a weighted average of the collective bargaining requirement indicators in each state and year, using the number of public sector employees in each occupation group (based on the CPS) as weights. The necessary occupation variables are available in the CPS beginning in 1963. In practice the occupation weighting matters little, as in the vast majority of cases the collective bargaining requirement indicator is equal across the observed occupation groups.

Other data used in the study include state unemployment rates reported by the Bureau of Labor Statistics, and state GDP and population, as reported by the Census Bureau.

Table 2 reports means and sample sizes for the variables used in this study. The first column shows overall means. The second and third columns show means for the subsamples in which collective bargaining is required and not required, respectively. The sample includes 1,383 state-year observations from 1963 to 1996.[2] 629, or roughly 45 percent, are from state-years in which statutes required collective bargaining for the majority of public employees. The second row shows that in these states in fact nearly

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1. The description here closely follows Frandsen (2016).

2. From 1968 to 1976 the CPS did not separately identify all states, so during these years several state observations are missing.

all (97 percent) of public employees were covered by collective bargaining requirements. Row 3 shows that states where collective bargaining is required tend to be somewhat larger, and (in row 4) slightly more urban. The remaining rows show that states with collective bargaining requirements also tend to have larger public sectors in terms of employees and payroll, and larger and more generous public employee retirement systems, although this does not necessarily imply anything about the causal effect of the collective bargaining requirements. Causal effects will be identified in a differences-in-differences framework, as described in the following section.

4. Econometric Framework

Identifying the effects of collective bargaining requirements is complicated by the fact that states which pass such laws differ from states that do not in possibly unobserved ways that may also drive differences in public employee pension generosity. This paper takes advantage of the different timing across states of collective bargaining law changes to eliminate potentially confounding bias in a differences-in-differences design, similar to that employed in Frandsen (2016). This framework relates public employee pension generosity measure Y_{st} for state s in year t to an indicator for a law requiring collective bargaining CB_{st} in regression equations such as the following:

$$Y_{st} = \delta CB_{st} + X'_{st}\beta + \alpha_{0s} + \gamma_t + f(s, t) + \varepsilon_{st}, \qquad (1)$$

where X_{st} is a vector of time- and state-varying covariates including state GDP, unemployment rate, population, urbanicity, and right-to-work status. Measures of public sector employment and pay are considered outcome variables, and are therefore not included in the set of controls because of endogeneity concerns. The α_s terms control for any unobserved state-level factors that are constant over time. The γ_t terms control for factors that affect all states but may change from year to year, such as macroeconomic shocks. The $f(s, t)$ term controls for time-varying relative changes across states that could lead to bias even after controlling for state effects $\{as\}$ and year effects $\{\gamma_t\}$ if they are correlated with changes in collective bargaining laws. The disturbance term ε_{st} may have arbitrary serial correlation within states, but is assumed to be uncorrelated with CB_{st}. Inference is therefore clustered at the state level.

While the most general specification for $f(s, t)$, namely state-by-year inter-actions, would be collinear with CB_{st}, the empirical work uses several slightly more restrictive specifications for $f(s, t)$. The first is a set of state-specific linear trends $\{a_{1s} \times t\}$, which control for any unobserved state-level factors that trend over time. A second specification for $f(s, t)$ groups states by Census region (Northeast, Midwest, West, South) and includes a set of region-by-year interactions in addition to the state-specific trends and might be expected to be least susceptible to bias. The identifying assumption is that any underlying unobserved factors at the state level that influence both the outcome and the adoption of public-sector collective bargaining laws vary smoothly over time.

4.1 Test of Overidentifying Restrictions

The identifying assumptions implicit in specification (1) are strong, but, fortunately, testable. The assumptions imply that shocks to pension amount or generosity relative to a state-level linear trend should be uncorrelated with future law changes. In other words, future law changes should not "predict" past innovations in the outcome variable. This is the generalization of checking for parallel trends in the canonical two-group differences-in-differences design.

The results of this overidentification test are encouraging, and suggest that in this setting the differences-in-differences specification (1) plausibly identifies the causal effect of collective bargaining requirements on public employee pension generosity. Figure 6 plots the results of this exercise for total contributions (in thousands of dollars) to public employee retirement systems. The graph shows estimated coefficients on leads and lags of collective bargaining law changes ranging from 5 years before a law change to 6-plus year after, normalized to the period prior to a law change. The coefficients corresponding to each year prior to a law change are similar and close to zero, implying that future law changes do not, in fact, predict past innovations in the outcome, consistent with the identifying assumptions. As a preview to the results in the next section, coefficients following the law change become larger, suggesting that collective bargaining requirements increase total pension contributions, although the individual coefficients in the graph are not precisely estimated. Figures 7, 8, and 9 perform the same exercise, for employer contributions, employee contributions, and total pension benefit expenditures, respectively. In each case, the coefficients corresponding to periods before law changes are near zero, consistent with the identifying assumption.

5. Effects of Collective Bargaining Laws on Public Employee Pensions

Differences-in-differences estimates suggest that laws imposing collective bar- gaining requirements on public sector employers significantly and substantially increased pension generosity. Table 3 reports estimates of the effects of laws requiring collective bargaining on several measures of pension generosity.

First, the estimates suggest collective bargaining requirements increased the total contributions to public employee retirement systems. The first row of Table 3 reports estimated coefficients from regressions of the natural log of contributions to public employee retirement systems on an indicator for a state law requiring collective bargaining and controls. The first column shows that in the cross section, states with collective bargaining requirements have approximately 19.8 log points more contributions to public employee retirement systems than states without such laws, controlling for observed state characteristics. The differences-in-differences estimates in columns 2 through 4 control additionally for state trends (column 2), region-by-year effects (column 3), and controls for public sector right-to-work status and urbanicity (column 4). These specifications suggest that part of this difference may be due to unobserved factors, but the estimated causal effect of the laws remains a substantial and marginally significant 12.5 to 17.2 log point increase in retirement contributions.

The marginally significant increase in overall contributions masks a large and highly significant increase in employer contributions, and a more modest decrease in employee contribution amounts. The

second row of Table 3 shows estimates of the effects on the natural log of employer-contributed benefits. The estimates imply collective bargaining laws increased employers' contributions to pensions by about 23 to 29 log points. Estimates are quite stable across specifications and robust to inclusion of state trends (column 2), region- by-year effects (column 3), and additional state-year controls (column 4). The third row shows that point estimates on the natural log of employee contributions are negative, although not significantly different from zero.

The large increases in the employer contribution and possible decreases in the employee contribution imply that collective bargaining requirements significantly reduce the fraction of retirement contributions made by employees. The fourth row of Table 3 examines this outcome directly. The estimates show that the employee's contribution as a fraction of total pension contributions decreased by about 6.5 to 7.5 percentage points. These estimates are also quite stable across specifications, and are robust to the inclusion of state trends and region-by-year effects.

The next set of estimates suggests that the large increases in retirement contributions, especially on the part of employers, were also accompanied by increases in retirement benefits paid out. The fifth row of Table 3 reports effects of collective bargaining laws on the natural log of total retirement benefits. The first column shows that in the cross section states with collective bargaining requirements pay out approximately 33 log points more in public employee retirement benefits than states without such laws, controlling for observed state characteristics. The differences-in-differences estimates in columns 2 through 3 control additionally for state trends (column 2), region- by-year effects (column 3), and controls for public sector right-to-work status and urbanicity (column 4), and suggest, however, that most of this difference may be due to unobserved factors. The point estimates in these specifications are 9.5 to 13.8 log points, but are at most marginally significant.

In summary, the estimates provide evidence that collective bargaining requirements increase the amount and generosity of public employee retirement benefits. This increase in generosity was driven in part by an overall increase in pension contributions, but mostly by an increase in the portion contributed by the employer. There is suggestive evidence that benefits paid out also increased.

Are the effects on retirement benefits driven by or offset by effects on public sector payroll and employment? Differences-in-differences estimates suggest not; public sector collective bargaining requirements appear to have little effect on public sector payroll or employment. Table 4 reports estimates and standard errors from regressions of measures of state and local government payroll and full-time equivalent (FTE) employment on an indicator for collective bargaining requirements and controls. The first three rows of column (1) show that in the cross-section collective bargaining requirements are associated with slightly (but not significantly at conventional levels) larger payroll. Columns (2) through (4) show, however, that the positive association is eliminated when controlling for state effects and state trends: the difference-in-differences estimates are close to zero, relatively precisely estimated, and insignificant. The fourth through sixth rows show effects on state and local FTE employment. The first column shows that in the cross-section collective bargaining requirements are somewhat negatively associated with FTE employment. Again, however, the difference-in-differences estimates in columns (2) through (4) show much of the observed association is eliminated when

controlling for state effects and state trends, although the point estimates tend to be negative. This is consistent with the small wage effects and modest reductions in hours found in Frandsen (2016).

5.1 Discussion

What do the empirical results imply for state and local government finances and public employee compensation? This section uses the point estimates reported in the previous section together with aggregate data on state and local government budgets in back-of-the-envelope calculations to put the magnitude of the estimated effects in context.

For pension payouts and contributions, the goal is to approximate the dollar amount attributable to the effects of collective bargaining requirements in a given year, say, 2008. If $\bar{X}$ is the mean payout or contribution as of 2008 in the n^{CB} = 27 states that eventually adopted collective bargaining requirements, and $\hat{\delta}$ is the estimated effect in log points, then the total amount attributable to collective bargaining requirements in those states is approximately

$$\Delta X = n^{CB} \bar{X} \hat{\delta} / (1 + \hat{\delta}). \qquad (2)$$

The results imply that collective bargaining rights account for approximately $11.6 billion in annual state and local government pension system payouts in the states which require them. This was arrived at by evaluating expression (2) with the 2008 mean pension payout among states with public sector collective bargaining requirements of $3.5 billion (see Figure 2) and the estimated effect of collective bargaining rights on log pension payouts of .138 (see third column of Table 3). The attributed $11.6 billion of additional pension payouts represents 29.2 percent of the difference in growth in pension expenditures between states that eventually did and did not adopt collective bargaining requirements over the period 1960 to 2008 shown in Figure 2. Clearly other factors also have contributed to the observed difference, but collective bargaining requirements explain a substantial fraction.

Similarly, collective bargaining rights can account for $9.4 billion in annual state and local government contributions to employee pension systems. This calculation is based on 2008 mean contributions in states requiring collective bargaining of $1.5 billion (see Figure 3) and the estimated effect of collective bargaining rights on log employer contributions of .290 (see third column of Table 3). The additional $9.4 billion in government contributions make up 61.9 percent of the difference in growth in government pension contributions between states that eventually did and did not adopt collective bargaining requirements from 1960 to 2008.

Employee contributions, on the other hand, declined. Collective bargaining requirements account for a reduction in annual employee contributions of about $2 billion (based on a mean of $730 million and an effect on log employee contributions of -.0921). Collective bargaining requirements thus account for a net increase in contributions of $7.4 billion.

Comparing the increase in payouts of $11.6 billion to the net increase in contributions of $7.4 billion suggests that collective bargaining requirements may have contributed to pension system underfundedness, consistent with Mitchell and Smith's (1994) finding that public unions are associated with less fully-funded pension benefits. This is only suggestive, however, as a full analysis of pension

system fundedness requires data on the present value of outstanding pension obligations, something not available in the state government finances data used in this study.

While the impact of collective bargaining requirements on state and local government finances appears to be substantial, of course the counterpart is that the benefits to workers were also substantial. Taking the average salary of a full-time state employee of $50,461 as a baseline, with additional pension benefits equivalent to 29 percent of salary (Biggs, 2014b), and assuming little impact of collective bargaining rights on employment (Frandsen, 2016), the impact of collective bargaining requirements on log pension contributions of .172 (Table 3, column 3) amounts to an increase in compensation of approximately $50, 461 × .29 × .172 = $2517 per year, or approximately 5 percent of salary. This increase in pensions does not appear to crowd out other forms of compensation; these magnitudes are similar to the effects on wage and salary compensation for police and fire fighters found in Frandsen (2016). Collective bargaining requirements thus mean a substantial increase in compensation and retirement savings for public sector workers.

6. Conclusion

The introduction of collective bargaining requirements starting in the 1960s constituted a dramatic change in labor relations in the public sector with potentially major consequences for state and local government finances. This paper analyzed a set of such consequences particularly salient to ongoing state and local policy debates in the wake of the financial crisis: the impact of collective bargaining rights on public employee pensions. The estimated effects on pensions are statistically significant and economically large. Collective bargaining rights primarily led to more generous pensions; the largest estimated effects were on employer contributions. The effects on overall pension amounts, measured by total contributions or payouts, however, are also substantial. Back-of-the-envelope calculations imply that collective bargaining requirements can account for the lion's share of the observed differences in growth of government contributions to pensions over the past five decades, and may have contributed to pension plan underfundedness.

Taken together with existing evidence on the effects of collective bargaining rights on wages and employment, these results also imply that collective bargaining rights substantially increase total public employee compensation. Policy debates about collective bargaining in the public sector therefore have real stakes for state and local public finances and employee welfare.

This study has several limitations. One is that the pension outcomes combined all public employee occupation groups. Evidence from wages suggests aggregate effects may mask important heterogeneity across occupation groups. Another limitation is that the data did not include measures of the outstanding pension obligations by state, prohibiting full analysis of pension fundedness. Third, effects on pension payouts will necessarily be attenuated when looking at effects measured soon after law changes, as the number of new retirees is small; measures of contractually promised pension benefits rather than actual payouts may capture a larger effect. Identifying how the effects of collective bargaining rights on public employee pensions vary by occupation, fully analyzing their impact on public employee retirement system fundedness, and analyzing effects on contractually promised pension benefits is left to future research.

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TABLES AND FIGURES

Table 1. Timing of state laws governing public sector collective bargaining rights

	Laws		
	Before 1970	Between 1970 and 1980	After 1980
	A. Teachers		
Permitted	AK, AR, CA, GA, ID, IL, KY, MN, NE, NH, NM, OR, UT, VA, WV	AZ, CO, LA, OH, TN, WY	-
Required	CT, MA, MI, NJ, NY, RI, VT, WA, WI	AK, CA, DE, FL, HI, ID, IN, IA, KS, ME, MD, MN, MT, NV, NH, ND, OK, OR, PA, SD	IL, NE, OH, TN, NM
	B. Fire Fighters		
Permitted	AL, AK, AR, CA, ID, IL, MN, MO, NH, NM, OR, UT, VA, WV	AZ, GA, IN, KS, LA, SC	-
Required	CT, DE, ME, MA, MI, NJ, NY, PA, RI, VT, WA, WI, WY	AK, CA, FL, HI, ID, IA, KY, MN, MT, NE, NV, NH, OK, OR, SD, TX	OH, IL
			C. Police
Permitted	AK, AR, CA, ID, IL, MN, NH, NM, OR, UT, VA, WV	AZ, IN, KS, LA, SC	-
Required	CT, DE, MA, MI, NJ, NY, PA, RI, VT, WA	AK, CA, FL, HI, IA, KY, ME, MN, MT, NE, NV, NH, OK, OR, SD, TX, WI	OH, IL

Notes: Timing of passage of state laws either permitting or requiring employers to bargain collectively with public employees. Data are from Valletta and Freeman (1988), Kim Rue1b9en's update thereof, Lindy (2011), and the National Council on Teacher Quality. Reproduced from Frandsen (2016).

Table 2. Sample Means by Public Employee Collective Bargaining Law Status

		CB law	
	All	Required for >50% of Public Employees	Not required for >50% of Public Employees
N (number of state-years)	1,383	629	754
Fraction of public employees covered by collective bargaining requirement	0.46	0.97	0.03
Population	5,016,064	5,429,966	4,670,779
Fraction urban	0.68	0.71	0.65
State government employment (FTE)	59,764	61,408	57,629
State government payroll ($ millions)	124	138	107
Local government employment (FTE)	181,596	192,789	167,060
Local government payroll ($ millions)	344	401	269
Total public employee retirement benefit expenditures ($1,000)	340,446	506,887	201,598
Total public employee retirement benefit expenditures / population ($1,000)	0.064	0.087	0.045
Total contributions to public employee retirement system ($1,000)	484,425	672,156	327,608
Employer contributions ($1,000)	330,435	481,261	204,613
Employee contributions ($1,000)	153,990	190,895	122,995
Fraction of contributions made by employees	0.36	0.32	0.40

Notes: number of state-year observations and means for the variables listed in the left-hand column. Data are from Valletta and Freeman (1988) and the Census Bureau's Historical Database on Individual Government Finances.

Table 3. Estimated Effects of Collective Bargaining Requirements on Public Employee Pensions

Dependent variable	X-section	Difference-in-differences		
	(1)	(2)	(3)	(4)
ln(retirement contributions)	0.198**	0.125*	0.172*	0.160*
	(0.0746)	(0.0732)	(0.0864)	(0.0844)
ln(employer contributions)	0.287***	0.230***	0.290***	0.278***
	(0.0919)	(0.0817)	(0.0912)	(0.0905)
ln(employee contributions)	-0.169	-0.157	-0.0921	-0.0987
	(0.197)	(0.131)	(0.139)	(0.137)
Fraction contributed by employee	-0.0630**	-0.0685***	-0.0751***	-0.0742***
	(0.0308)	(0.0213)	(0.0218)	(0.0221)
ln(retirement benefits)	0.330***	0.0947	0.138*	0.134*
	(0.0868)	(0.0733)	(0.0744)	(0.0764)
Baseline controls?	Y	Y	Y	Y
State effects?	N	Y	Y	Y
State trends?	N	Y	Y	Y
Region x year effects?	N	N	Y	Y
Controls for right-to-work and urbanicity?	N	N	N	Y

Notes: Regression coefficients and clustered standard errors (by state) on the collective bargaining (CB) law variable. All regressions control for year effects, state unemployment rate, state GDP, the natural log of the population, and the factors indicated in the bottom rows. Data are from Valletta and Freeman (1988) and the Census Bureau's Historical Database on Individual Government Finances.
*Statistically significant at the .10 level; **at the .05 level; ***at the .01 level.

Table 4. Estimated Effects of Collective Bargaining Requirements on Public Payroll and Employment

Dependent variable	X-section	Difference-in-differences		
	(1)	(2)	(3)	(4)
ln(state government payroll)	0.0841	0.0293	0.0169	0.0131
	(0.0550)	(0.0211)	(0.0227)	(0.0216)
ln(other government payroll)	0.0793	-0.0221	-0.0106	-0.0106
	(0.0682)	(0.0188)	(0.0200)	(0.0204)
ln(total government payroll)	0.0972*	-0.0209	-0.00938	-0.0171
	(0.0496)	(0.0191)	(0.0250)	(0.0237)
ln(state government FTE employment)	-0.0659	-0.0122	-0.0272	-0.0312*
	(0.0507)	(0.0205)	(0.0174)	(0.0184)
ln(other government FTE employment)	-0.0905*	-0.0240	-0.0154	-0.0143
	(0.0489)	(0.0204)	(0.0223)	(0.0227)
ln(total government FTE employment)	-0.0639**	-0.0317	-0.0216	-0.0279
	(0.0295)	(0.0191)	(0.0229)	(0.0223)
Baseline controls?	Y	Y	Y	Y
State effects?	N	Y	Y	Y
State trends?	N	Y	Y	Y
Region x year effects?	N	N	Y	Y
Controls for right-to-work and urbanicity?	N	N	N	Y

Notes: Regression coefficients and clustered standard errors (by state) on the collective bargaining (CB) law variable. All regressions control for year effects, state unemployment rate, state GDP, the natural log of the population, and the factors indicated in the bottom rows. Data are from Valletta and Freeman (1988) and the Census Bureau's Historical Database on Individual Government Finances. *Statistically significant at the .10 level; **at the .05 level; ***at the .01 level.

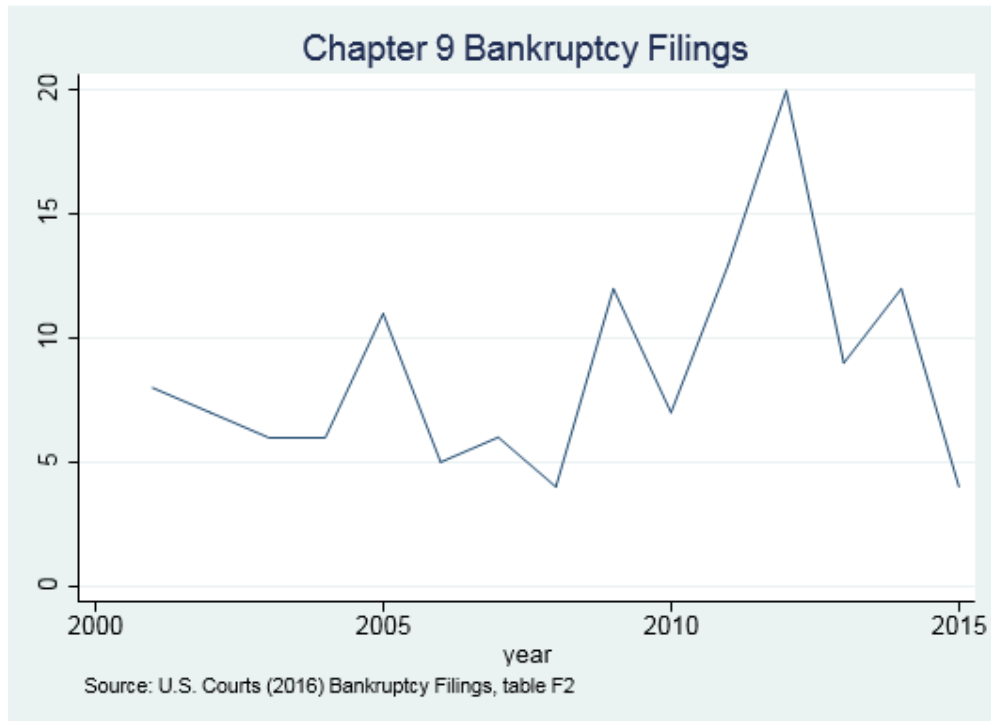**Figure 1.** Number of Chapter 9 (municipal) bankruptcy filings by year

Figure 2. Average public employee retirement benefit payouts by year. The solid line corresponds to states in which more than 50 percent of public employees were covered by collective bargaining requirements in 1996. The dashed line corresponds to states in which less than 50 percent were covered. Data are from the U.S. Census Bureau's State and Local Government Finances database.
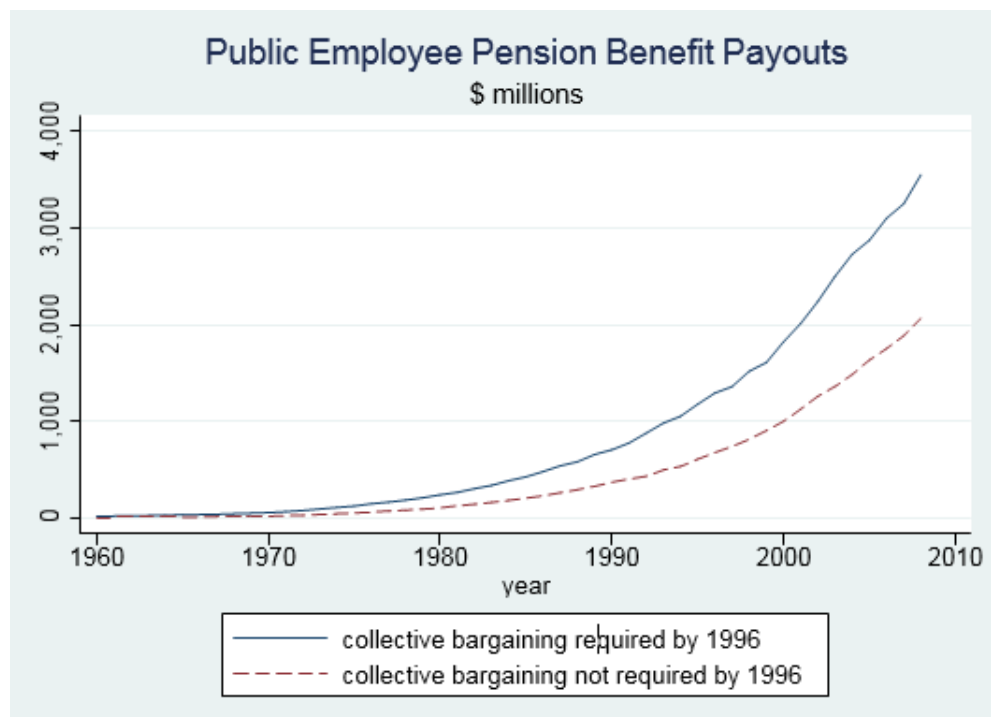
Figure 3. Average government contributions to public employee retirement systems by year. The solid line corresponds to states in which more than 50 percent of public employees were covered by collective bargaining requirements in 1996. The dashed line corresponds to states in which less than 50 percent were covered. Data are from the U.S. Census Bureau's State and Local Government Finances database.
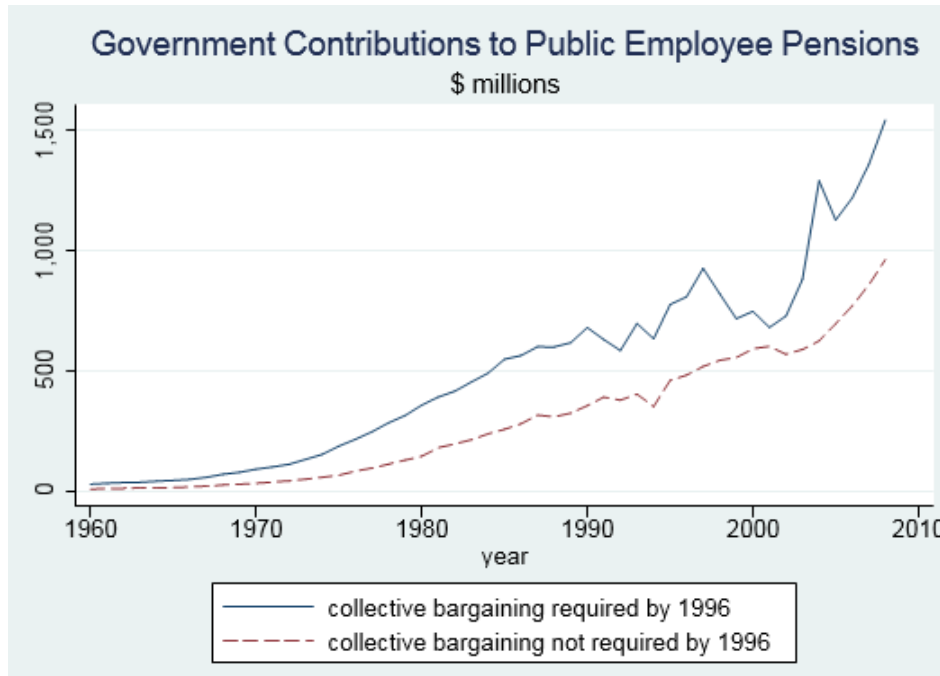
Figure 4. The number of states (excluding District of Columbia) with laws imposing on public sector employers a duty to bargain with employees. A state is considered to have a collective bargaining requirement if the requirement exists for any occupation group. Data are from Valletta and Freeman (1988) and Frandsen (2016).
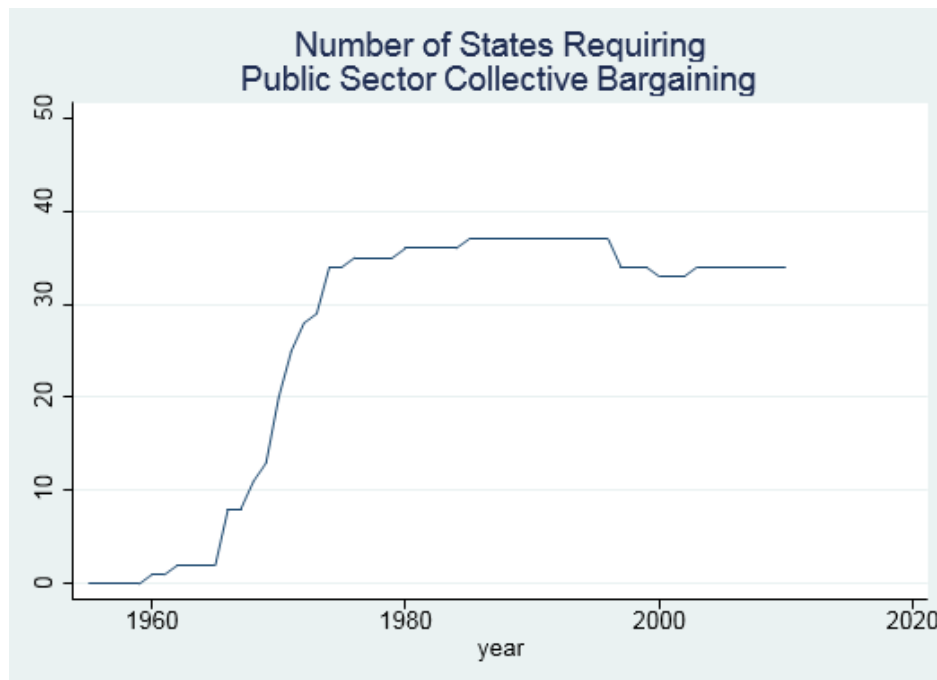
Figure 5. Fraction of contributions to Iowa's public employee retirement sys- tem made by employees for each year indicated on the horizontal axis. The vertical line shows when Iowa enacted a law requiring public employers to collectively bargain with public employees.
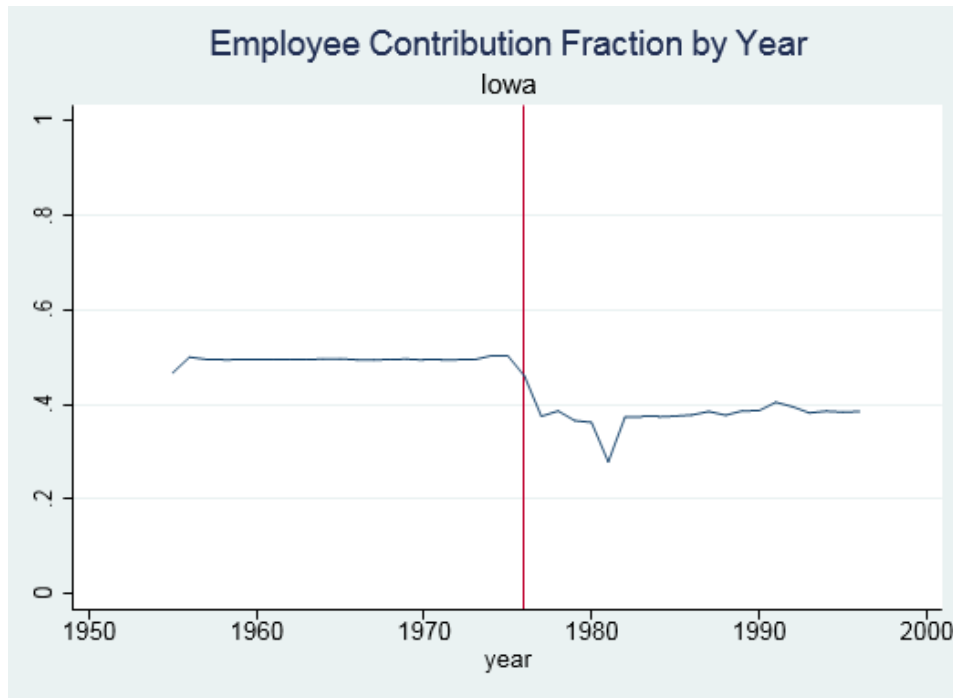

Figure 6. Estimated coefficients and 95-percent confidence bars (clustered by state) from a regression of total contributions to the public employee retirement systems ($1,000) on leads and lags of collective bargaining law changes for public employees relative to the year in which the law change took effect. All regressions control for year effects, state trends, state unemployment rate, and state GDP.
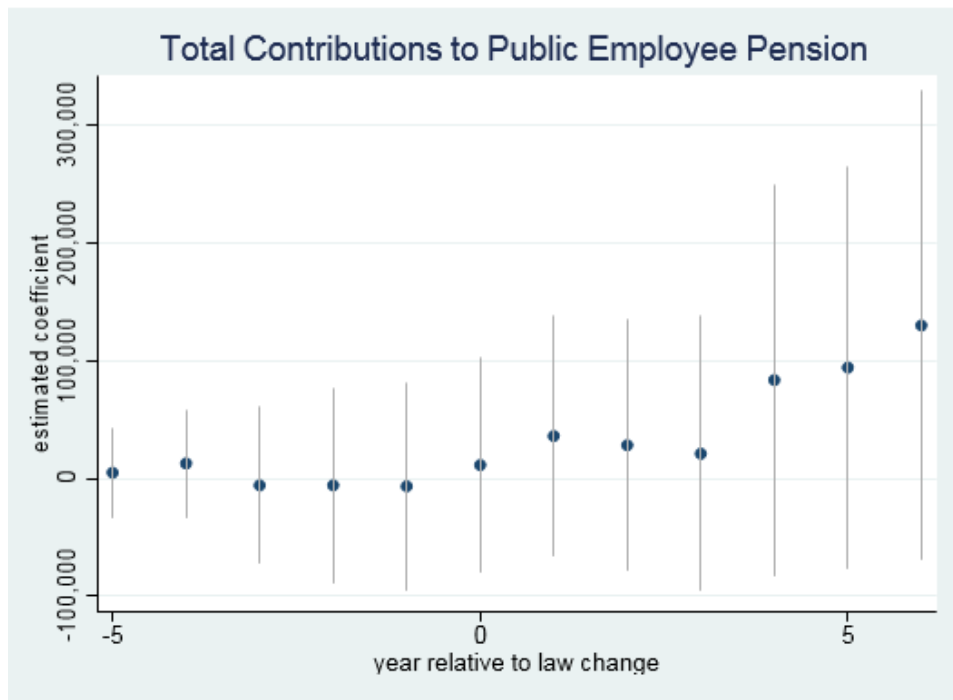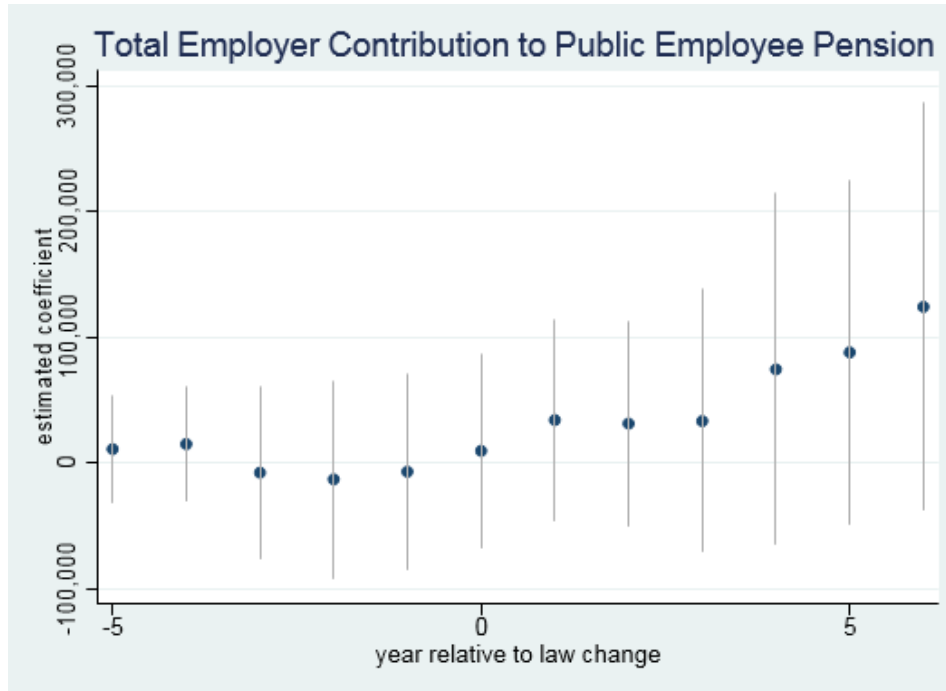
Figure 7. Estimated coefficients and 95-percent confidence bars (clustered by state) from a regression of the total employer contribution to the public employee retirement system ($1,000) on leads and lags of collective bargaining law changes for public employees relative to the year in which the law change took effect. All regressions control for year effects, state trends, state unemployment rate, and state GDP.

Figure 8. Estimated coefficients and 95-percent confidence bars (clustered by state) from a regression of the total employee contribution to the public employee retirement system ($1,000) on leads and lags of collective bargaining law changes for public employees relative to the year in which the law change took effect. All regressions control for year effects, state trends, state unemployment rate, and state GDP.
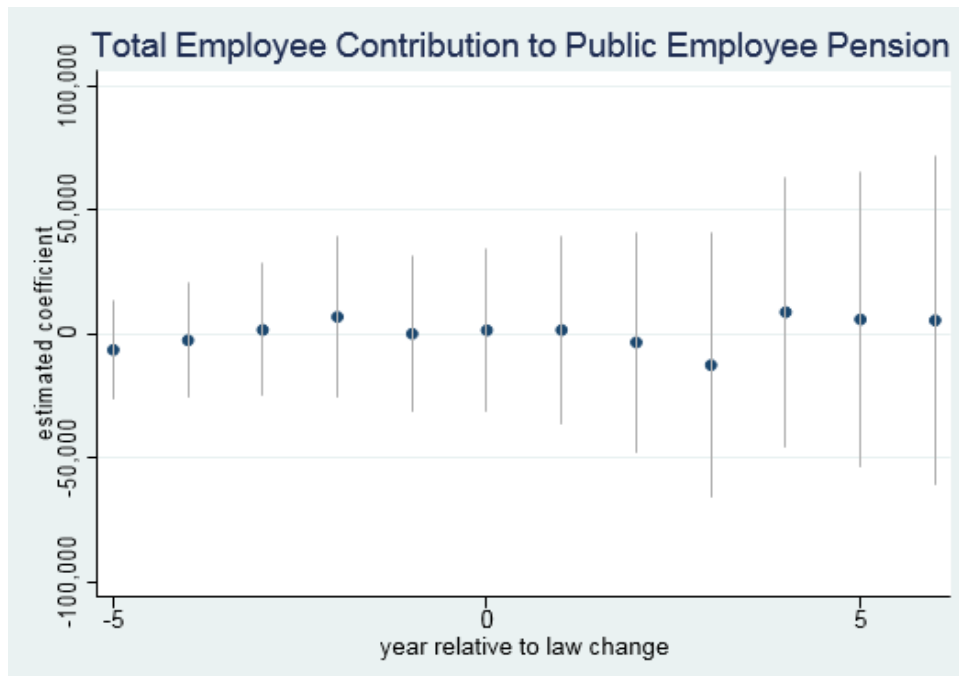
Figure 9. Estimated coefficients and 95-percent confidence bars (clustered by state) from a regression of total public employee retirement benefits ($1,000) on leads and lags of collective bargaining law changes for public employees relative to the year in which the law change took effect. All regressions control for year effects, state trends, state unemployment rate, and state GDP.
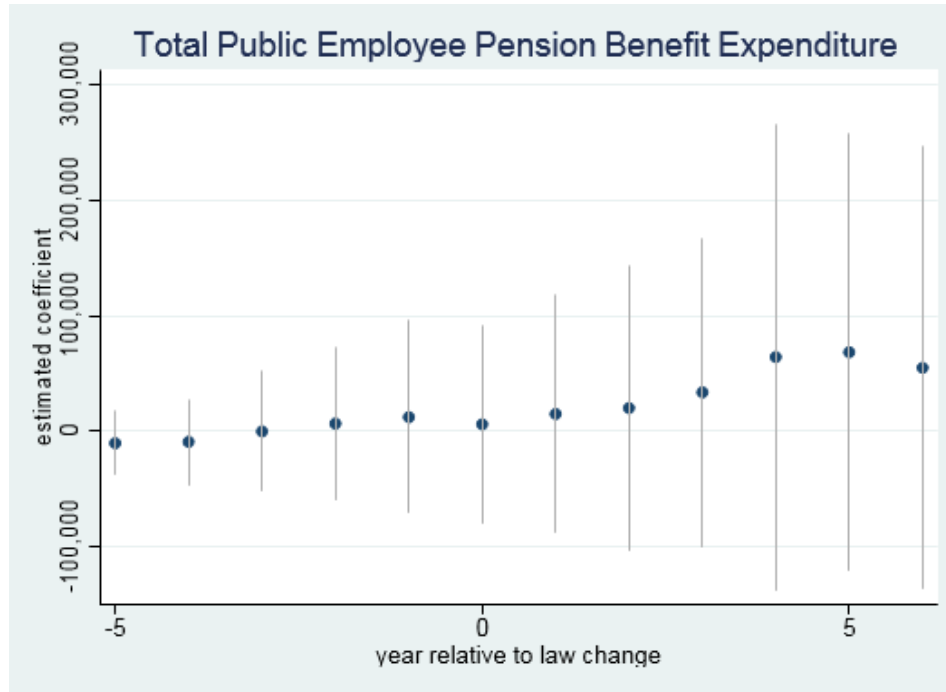
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