

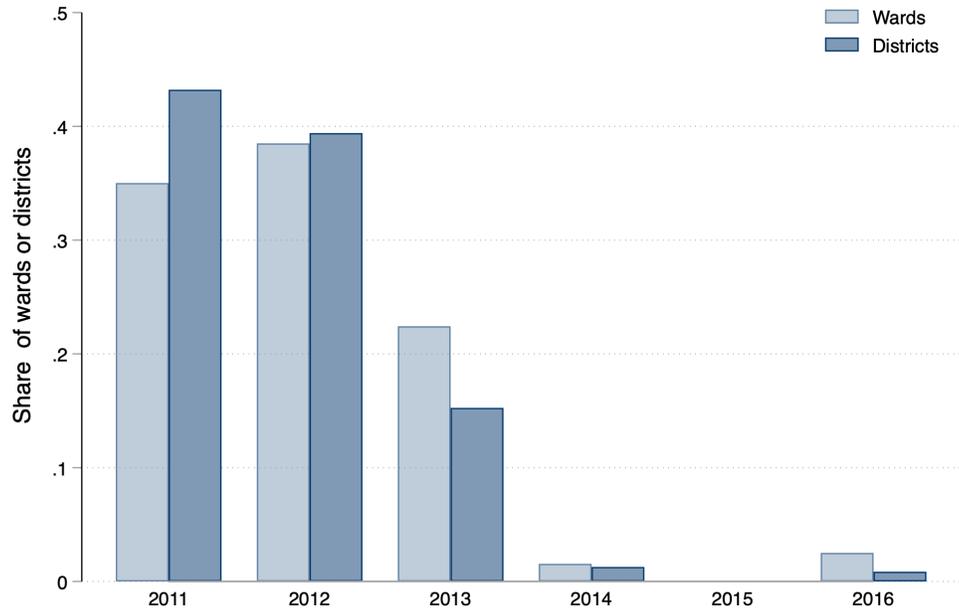
The Political Consequences of Controversial Education Reform: Lessons from Wisconsin's Act 10

Barbara Biasi and Wayne Aaron Sandholtz

Online Appendix

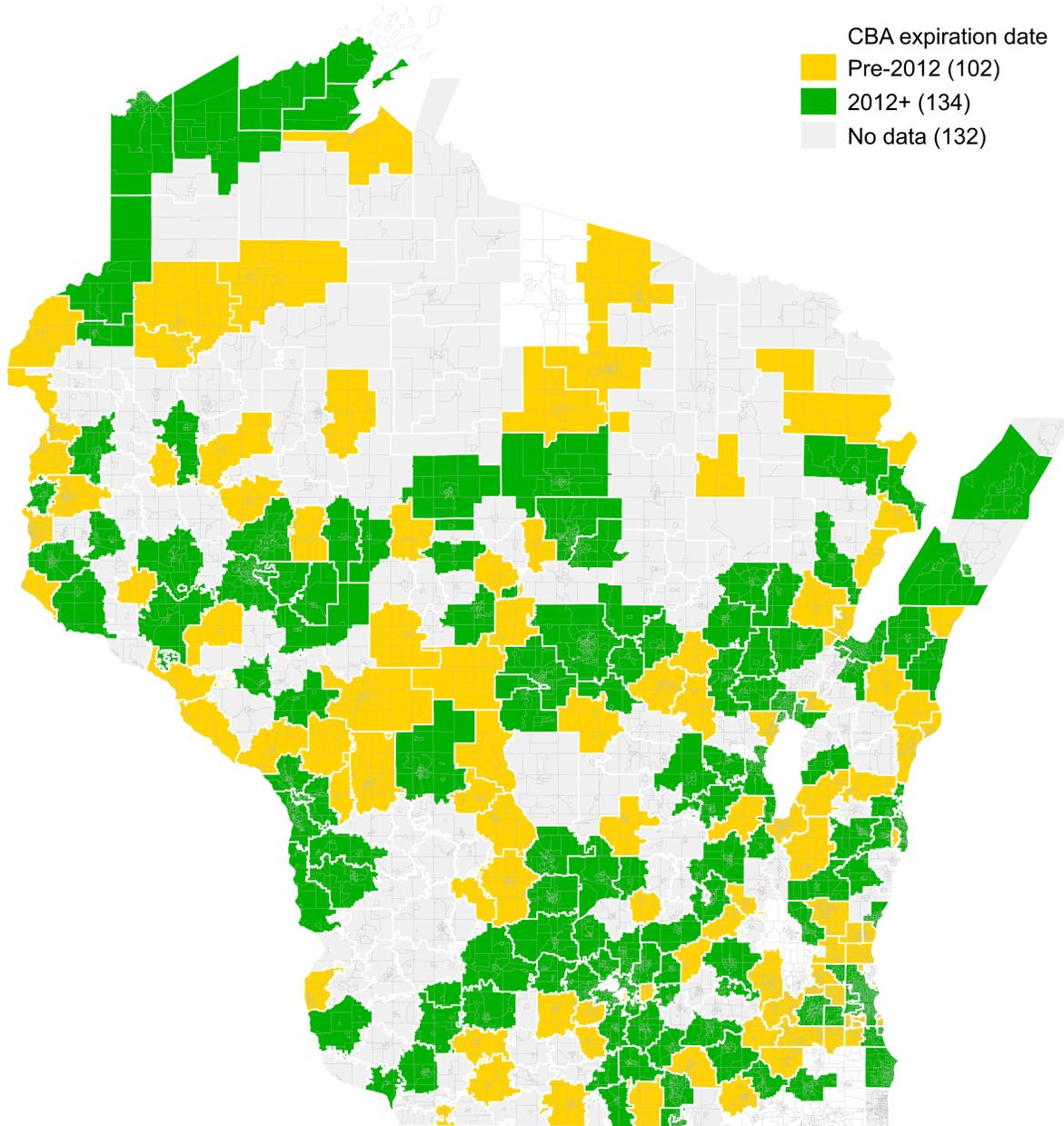
Appendix A Additional Tables and Figures

Figure A1: Distribution of Wards and Districts by CBA Expiration Dates



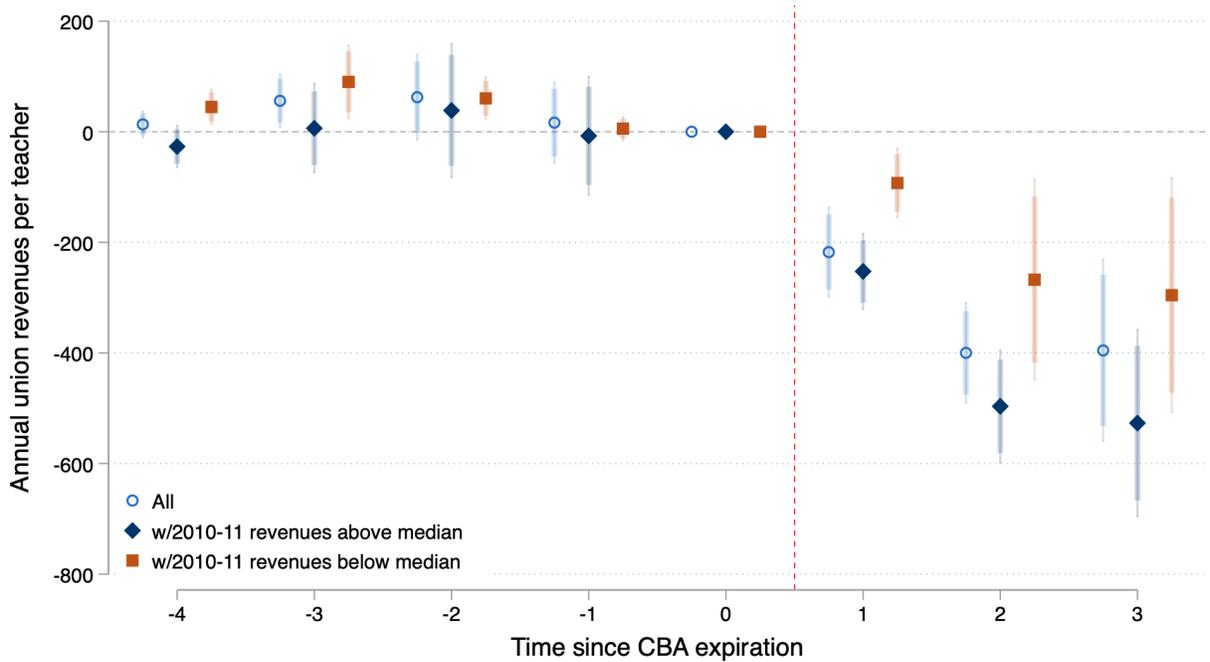
Notes: Share of wards and districts by date of expiration of the district's CBA or of its extension.

Figure A2: Wisconsin Unified School Districts, by CBA Expiration Year



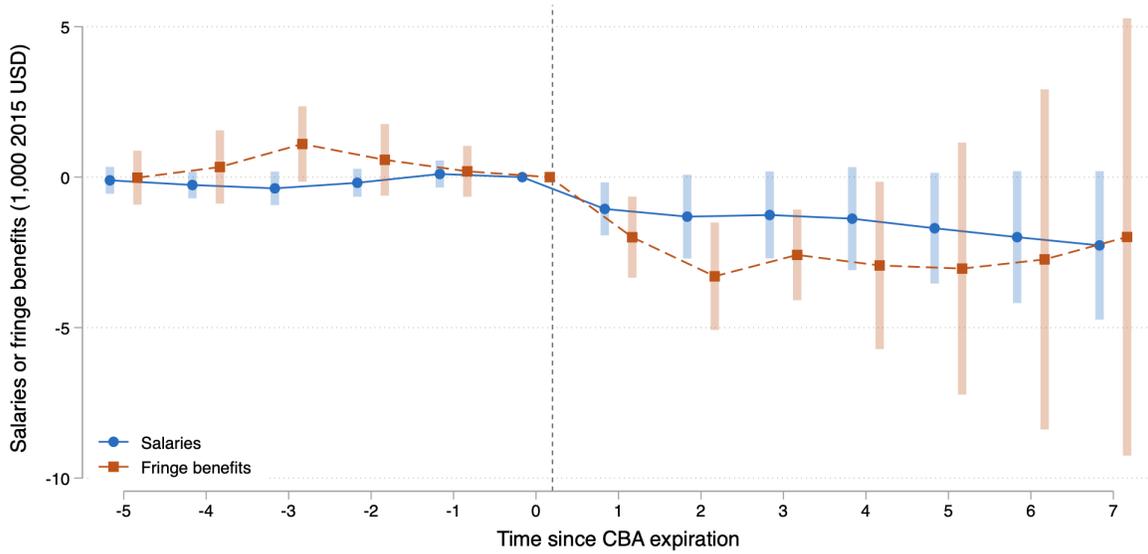
Notes: The map shows school districts by when their (extended) CBAs expired (pre-2012 vs 2012 or later). Non-unified school districts (elementary and secondary) not shown. School districts are delineated by thick white lines; wards are delineated by thin gray lines.

Figure A3: Effects of Act 10 on Union Revenues: Event Study Estimates



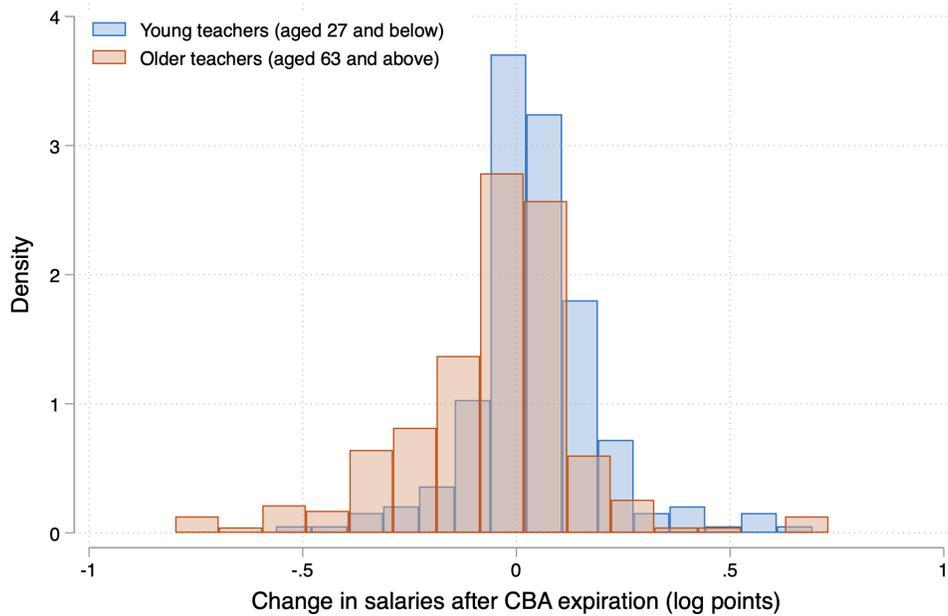
Notes: Estimates and 90% and 95% confidence intervals of the coefficients β_k in equation (1), using district-year level union revenues per member as the dependent variable, for all unions (hollow circle markers) and separately for districts with revenues per member above (diamond markers) and below (square markers) the state median in 2010-11. Observations are weighted by the number of teachers in each district. Confidence intervals are obtained using standard errors clustered at the district level.

Figure A4: Changes in Teacher Compensation After Act 10: Salaries and Benefits



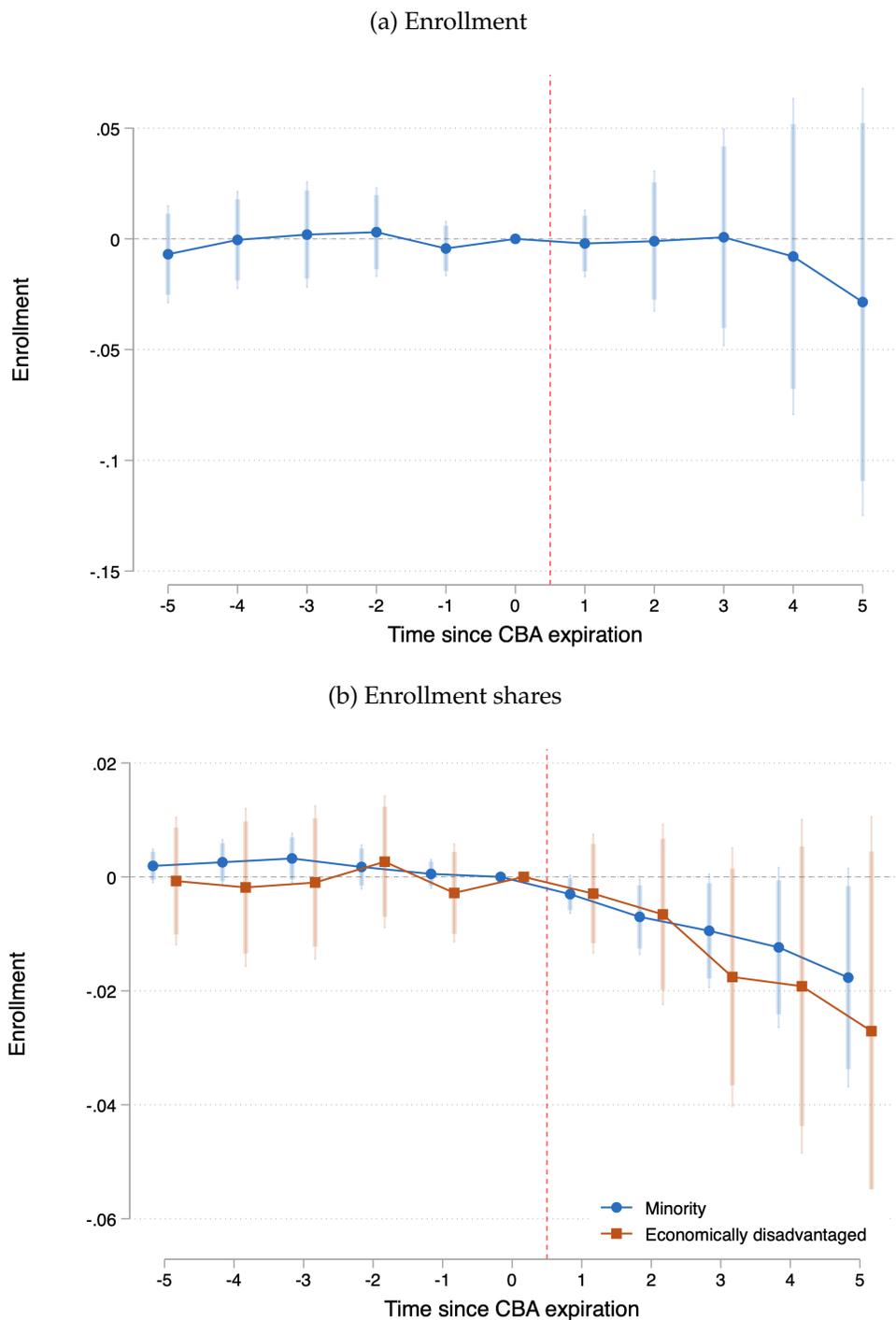
Notes: Estimates and 95% confidence intervals of the coefficients β_k in equation (1), obtained using individual-level salaries and fringe benefits as the dependent variable and controlling for district and year fixed effects. Confidence intervals are obtained using standard errors clustered at the district level.

Figure A5: Distribution of Changes in Salaries, Before vs After a District's CBA Expiration



Notes: Distribution of district-level average changes in the logarithm of teacher salaries for teachers aged 63 and older (orange series) and those aged 27 and below (blue series), between the two years preceding and the two years following the expiration of each district's CBA or its extension.

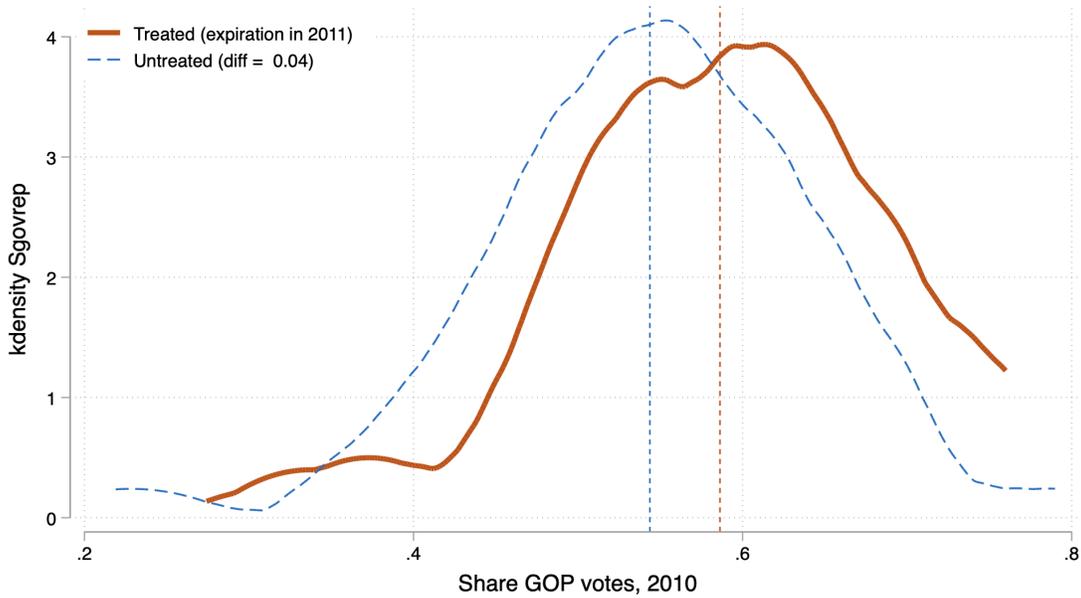
Figure A6: Enrollment and Enrollment Shares of Students in Demographic Groups: Event Study Estimates



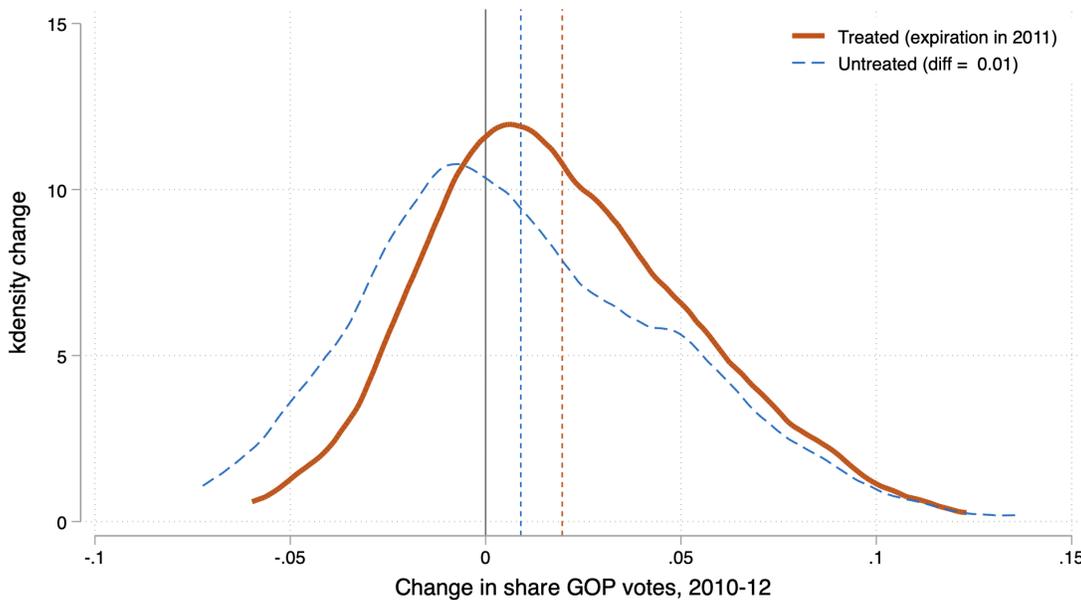
Notes: Estimates and 90% and 95% confidence intervals of the coefficients β_k in equation (1), using as dependent variables the natural logarithm of district enrollment (panel (a)) and district enrollment shares of FRPL (*Economically disadvantaged*) and Black or Hispanic students (*minority*, panel (b)). Confidence intervals are obtained using standard errors clustered at the district level.

Figure A7: Share of Votes to GOP Governor in Treated and Control Districts: Baseline (2010) and 2010-2012 Change

(a) GOP vote shares in 2010 gubernatorial election

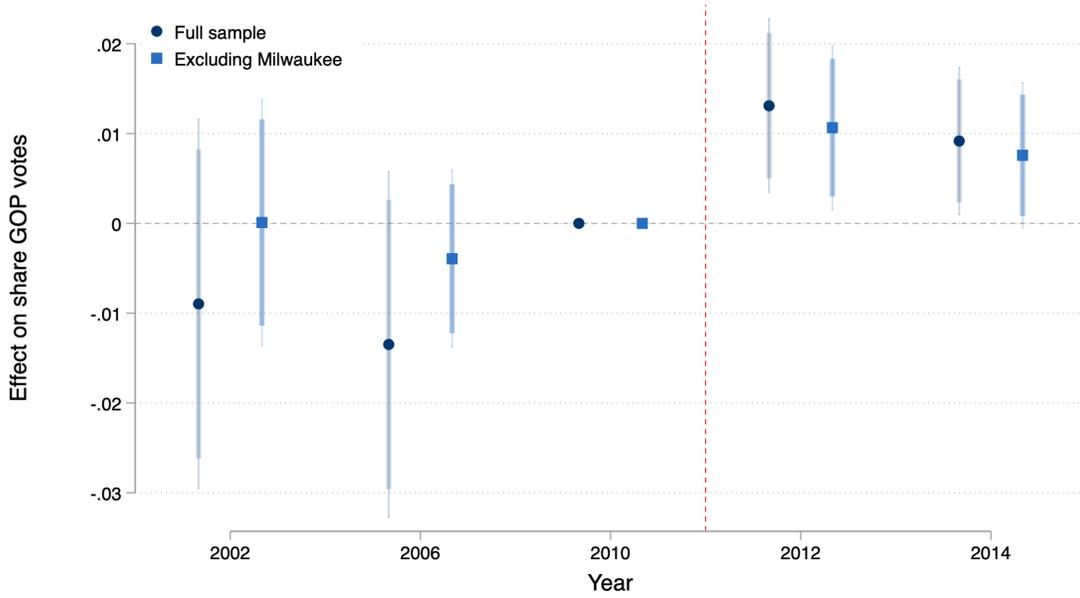


(b) Change in GOP vote shares, 2012 vs 2010



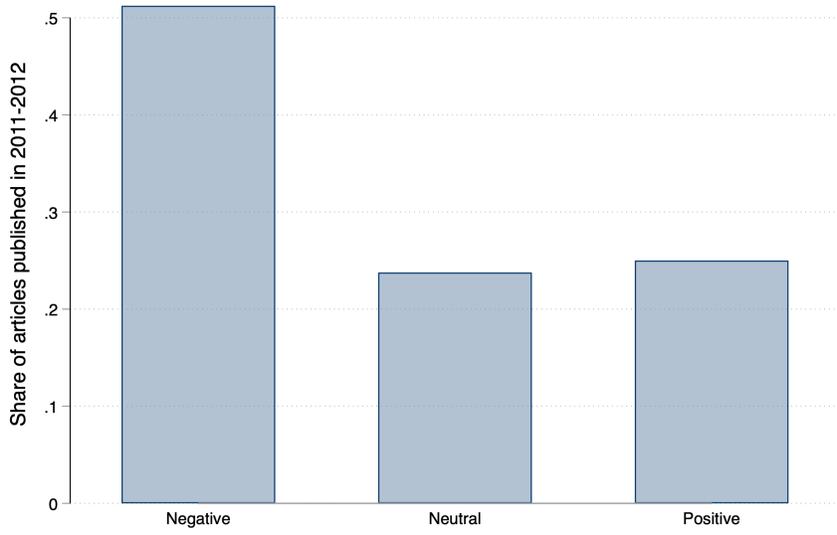
Notes: Panel (a) shows a distribution of the share of GOP votes in the 2010 gubernatorial election, separately for wards located in school districts with CBAs that expired in 2011 and were not extended (treated, thick solid line) and wards in districts with CBAs (or extensions) that expired after 2011 (untreated, dashed line). Panel (b) shows the distribution of the 2010-2012 change in the share of GOP governor votes, separately for wards located in treated and untreated districts.

Figure A8: Political Effects of Wisconsin’s Act 10: Dynamic Difference-in-Differences Estimates



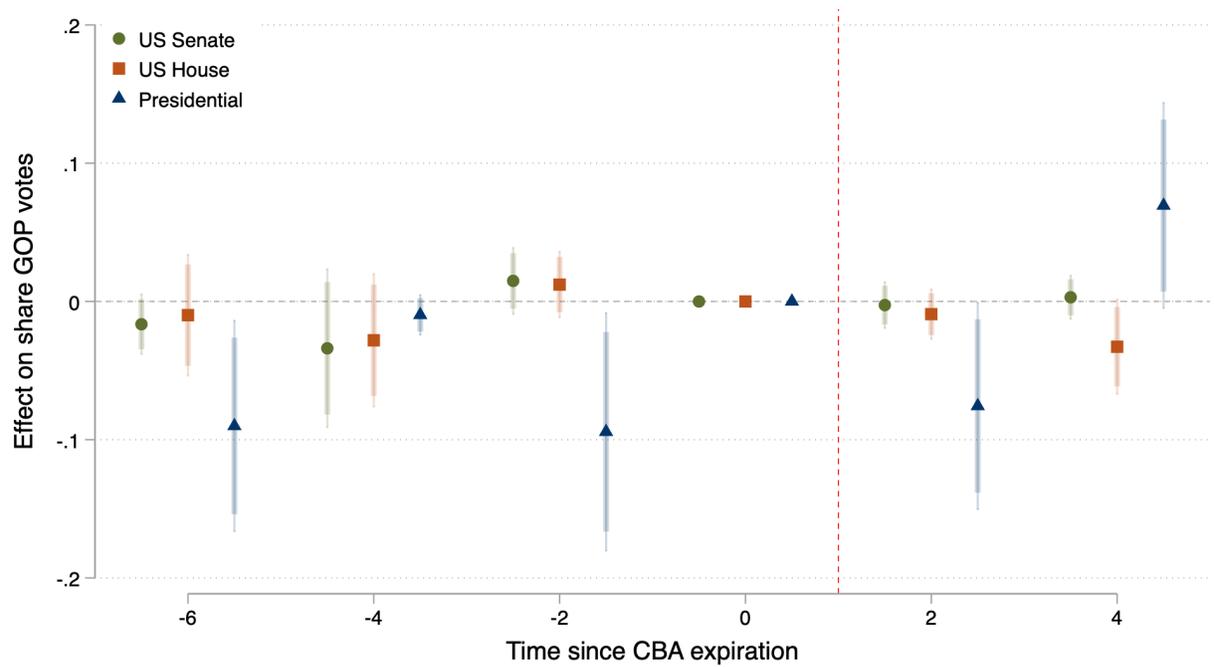
Notes: Estimates and 90% and 95% confidence intervals of the coefficients β_k in equation (3), estimated on the full sample of districts (circles), and on the sample of districts that excludes Milwaukee Public Schools (squares). The outcome variable is the GOP vote share in gubernatorial races. Confidence intervals are obtained using standard errors clustered at the district level.

Figure A9: Sentiment Analysis of Newspaper Articles on Act 10, 2011-12



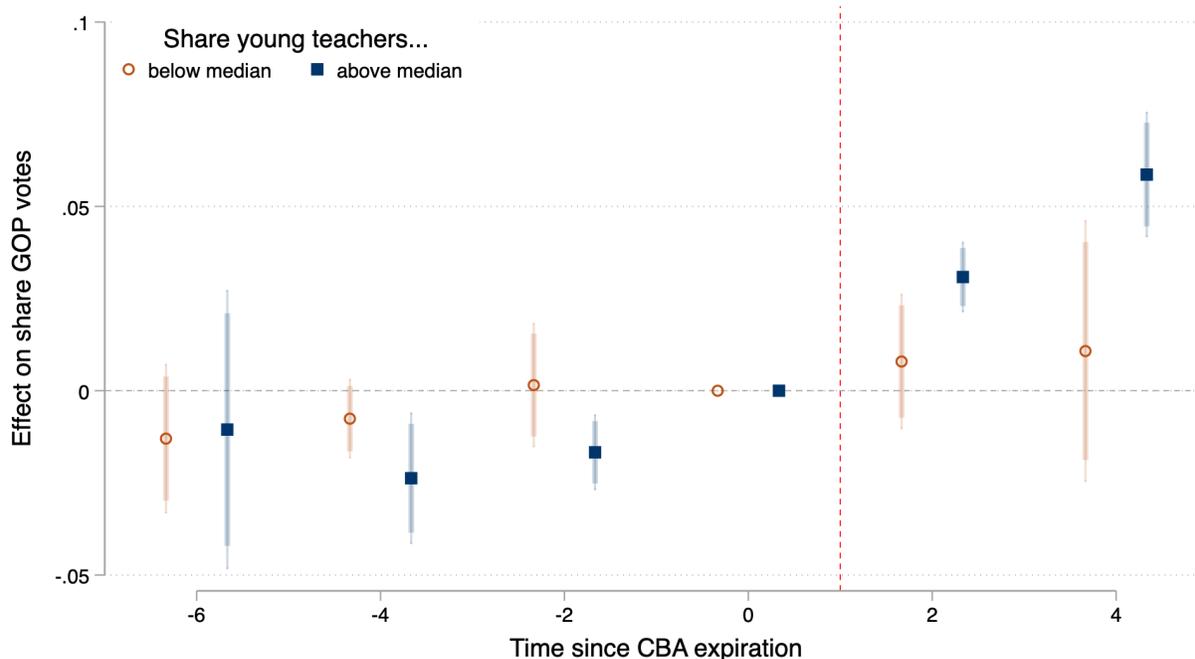
Notes: Share of articles in national and local newspapers published in 2011 and 2012 and containing the keywords “Act 10” and “school,” by news sentiment. Sentiment analysis performed using the large-language model ChatGPT 4o.

Figure A10: Spillover Effects of Wisconsin's Act 10 onto Other Races: Event Study Estimates



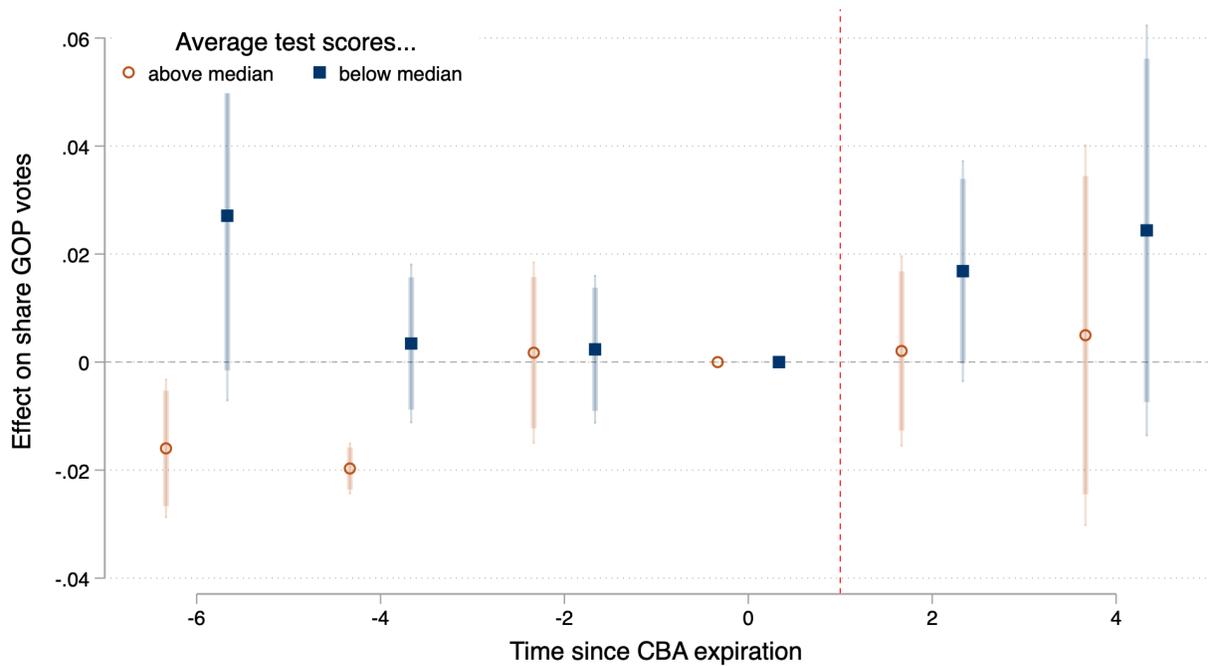
Notes: Estimates and 90% and 95% confidence intervals of the coefficients β_k in equation (1), estimated using ward-level GOP vote shares for U.S. Presidential, House, and Senate elections and controlling for ward and year fixed effects. Standard errors are clustered at the district level.

Figure A11: Winners and Losers: Event-Study Estimates by Share of Teachers Younger than 27 in District



Notes: Estimates and 90% and 95% confidence intervals of the coefficients β_k in equation (1), estimated using the GOP vote share in gubernatorial elections in each ward and year as the dependent variable and controlling for ward and year fixed effects. The squares show estimates for the subsample of districts in with a 2010-11 share of teachers aged 27 or younger above the state median and the circles show estimates for districts with a share below the median. Standard errors are clustered at the district level.

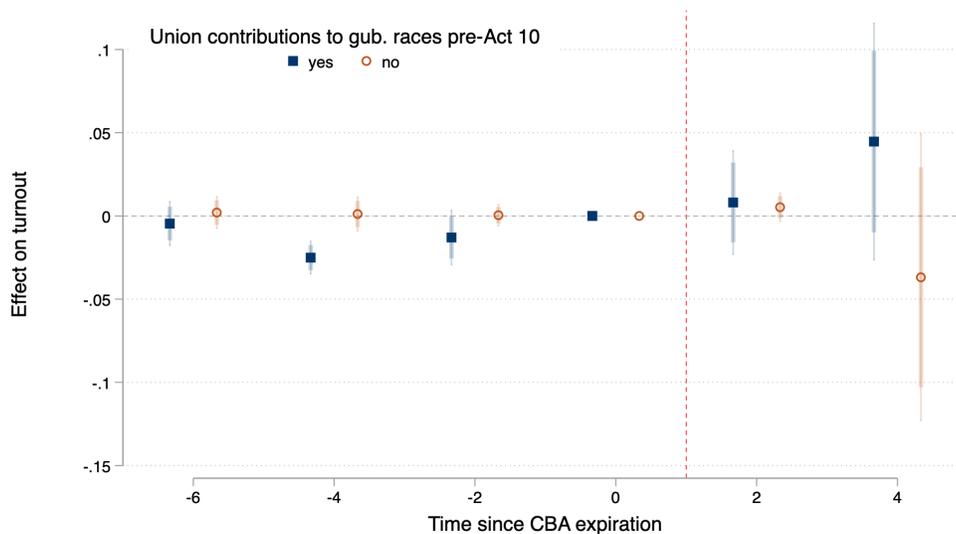
Figure A12: Winners and Losers: Event-Study Estimates by Ex Ante Student Test Scores



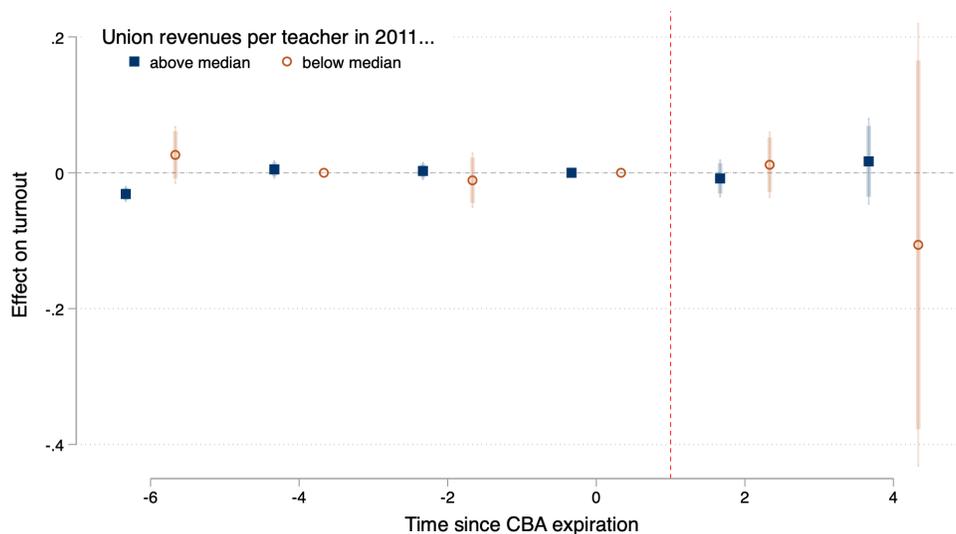
Notes: Estimates and 90% and 95% confidence intervals of the coefficients β_k in equation (1), estimated using the GOP vote share in gubernatorial elections in each ward and year as the dependent variable and controlling for ward and year fixed effects. The squares show estimates for the subsample of districts in with 2010-11 average test scores below the state median and the circles show estimates for districts with scores above the median. Standard errors are clustered at the district level.

Figure A13: The Impact of Unions on Voter Turnout. Event-Study Estimates, by Ex Ante Union Campaign Contributions and Revenues

(a) By ex ante campaign contributions

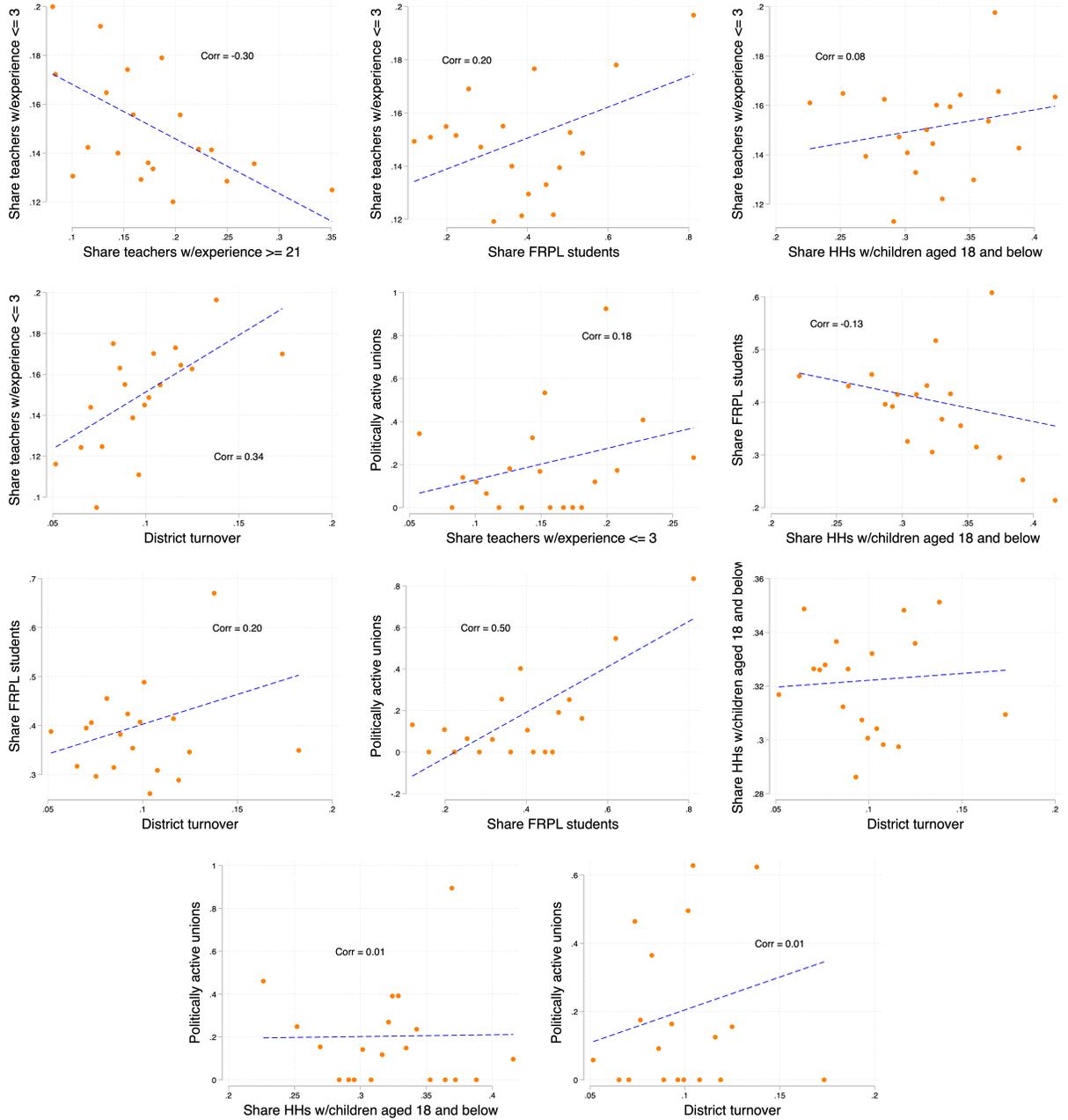


(b) By ex ante revenues



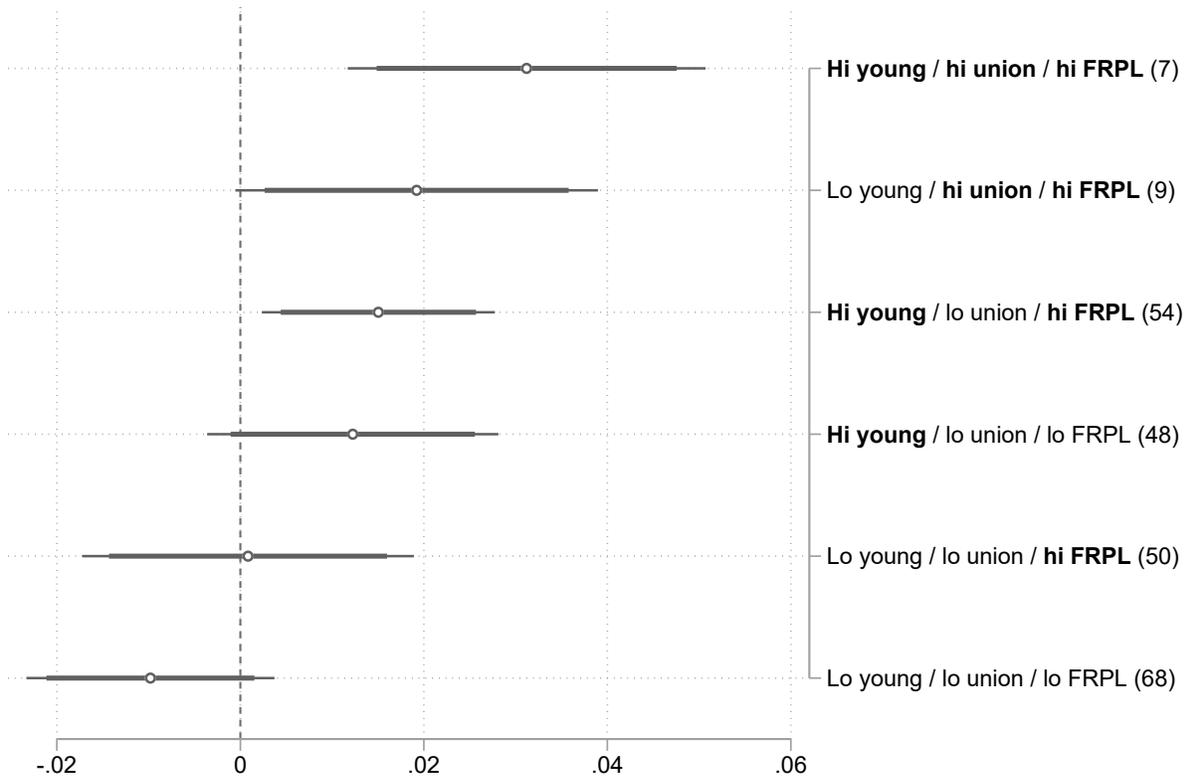
Notes: Estimates and 90-95% confidence intervals of the coefficients β_k in equation (1), estimated using voter turnout (the ratio between the number of votes cast and the number of people aged 18 and older) in each ward and year as the dependent variable and controlling for ward and year fixed effects. In panel (a), the squares show estimates for wards in districts whose unions made campaign contributions to gubernatorial races prior to 2011; the circles show estimates for wards in districts with no contributions. In panel (b), the squares show estimates for wards in districts with union revenues per teacher above the state median in 2011; the circles show estimates for wards with union revenues below the median. Standard errors are clustered at the district level.

Figure A14: Correlations Between Dimensions of Heterogeneity



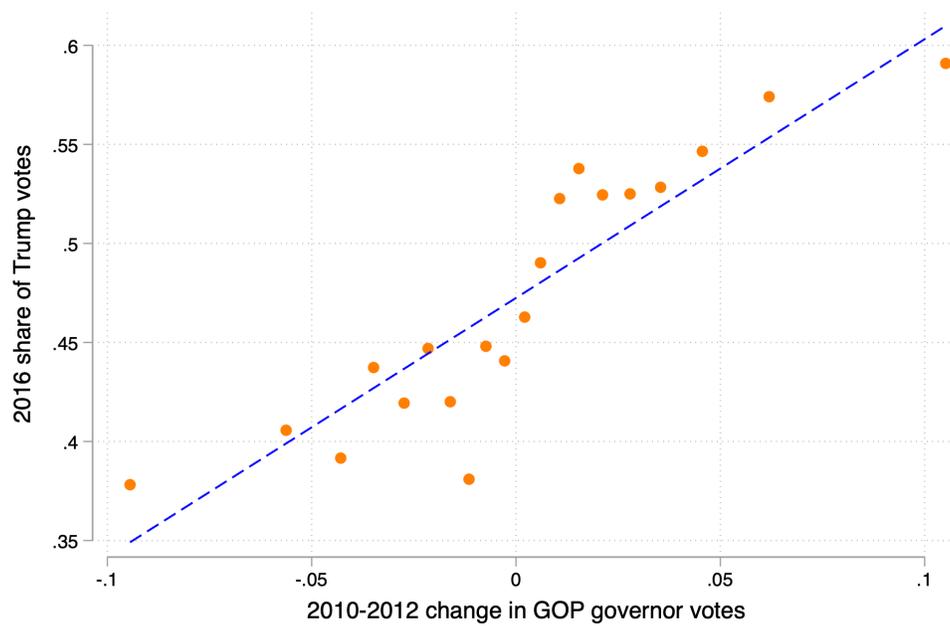
Notes: Scatter plots and correlations between various district-level characteristics, measured prior to 2011.

Figure A15: Political Effects of Wisconsin's Act 10, by Groups of Districts



Notes: Estimates and 95% confidence intervals of the coefficients β_k in equation (1), for different groups of districts. 'Hi young' indicates districts with an above-median share of teachers with three years of experience or less. "Hi union" indicates districts represented by a union which was made at least one campaign donation to a Wisconsin gubernatorial campaign in the period 2002-2010. "Hi FRPL" indicates districts with an above-median share of students receiving free and reduced-price lunch. Number of districts in each cell shown in parentheses. Because no districts with politically active unions had a below-median share of FRPL students, the "Hi young / hi union / lo FRPL" and "Lo young / hi union / lo FRPL" cells are empty; this explains why the interaction of these three dimensions yields six rather than eight categories.

Figure A16: 2010-2012 Increase in Share of GOP Gubernatorial Votes and 2016 Share of GOP Presidential Votes



Notes: Binned scatterplot between the increase in the share of votes to the GOP gubernatorial candidate between 2010 and 2012 in each district (x-axis) and the share of votes for the GOP presidential candidate Donald Trump in 2016.

Table A1: Wisconsin Wards and School Districts: Summary Statistics, By Presence of An Extension

	All districts	No extension	W/extension
<i>Teachers</i>			
Share teachers w/experience < 3y (2010-11)	0.15 (0.051)	0.15 (0.052)	0.15 (0.049)
Share teachers w/experience > 21y (2010-11)	0.18 (0.067)	0.19 (0.069)	0.17 (0.065)
Teacher turnover rate (share who exits) (2010-11)	0.100 (0.030)	0.10 (0.027)	0.099 (0.032)
<i>Students</i>			
Share low-SES (FRPL) students (2010-11)	0.38 (0.19)	0.32 (0.16)	0.43 (0.19)
Std. test scores, Math (2010-11)	0.024 (0.33)	0.12 (0.28)	-0.044 (0.35)
Share HHs with children < 18 yo (2010)	0.32 (0.047)	0.32 (0.048)	0.32 (0.047)
<i>Political views</i>			
Share GOP Governor votes (2010)	0.54 (0.15)	0.60 (0.12)	0.50 (0.16)
Share GOP President votes (2008)	0.44 (0.14)	0.49 (0.12)	0.40 (0.14)
100 * #Donations pp to Dem (2010)	0.39 (0.51)	0.32 (0.57)	0.43 (0.46)
100 * #Donations pp to GOP (2010)	1.43 (1.28)	1.82 (1.68)	1.13 (0.74)
<i>Unions</i>			
Union made political donations (2002-201)	0.20 (0.40)	0.094 (0.29)	0.29 (0.45)
Union revenues per teacher (2006-11)	733.9 (1169.0)	448.4 (466.2)	879.6 (1375.2)
Number of wards	4,989	2,122	2,867
Number of districts	236	127	109

Notes: Means and standard deviations (in parentheses) of variables used in the model. The first column shows statistics on the full sample of districts included in the analysis; the second column focuses on to districts without a CBA extension; and the third column focuses on districts with a CBA extension.

Table A2: Effects of Wisconsin's Act 10 and 2010 Share of GOP Votes: Event Study Estimates

	(1)	(2)
Exposed	0.056*** (0.019)	0.056*** (0.018)
Exposed × 2010 GOP share	-0.086*** (0.032)	-0.086*** (0.030)
District FE	Yes	No
Ward FE	No	Yes
Year FE	Yes	Yes
Mean dep. var. control	0.477	0.476
N	21222	21221
Clusters (districts)	236	236
R-squared	0.92	0.95

Notes: The dependent variable is the share of GOP votes in gubernatorial elections in each ward and year. The variable *Exposed* equals one in years following a CBA expiration in each district. The variable *2010 GOP share* is the GOP vote share in the 2010 gubernatorial election in each ward. Column 1 controls for year and district fixed effects; column 2 controls for ward and year fixed effects. Standard errors in parentheses are clustered at the district level. * ≤ 0.1 ; ** ≤ 0.05 ; *** ≤ 0.01 .

Table A3: Effects of Wisconsin's Act 10 on Voter Turnout: Event Study Estimates

	All districts		Excluding Milwaukee
	(1)	(2)	(3)
Exposed	0.014 (0.015)	0.014 (0.015)	0.016 (0.016)
District FE	Yes	No	No
Ward FE	No	Yes	Yes
Year FE	Yes	Yes	Yes
Mean dep. var. control	0.463	0.463	0.470
N	21313	21313	20021
Clusters (districts)	236	236	235
R-squared	0.02	0.27	0.26

Notes: The dependent variable is a measure of voter turnout, defined as the number of votes divided by the population over 18 in each ward. The variable *Exposed* equals one in years following a CBA expiration in each district. Column 1 controls for year and district fixed effects; columns 2-3 controls for ward and year fixed effects. In column 3, we exclude the school district of Milwaukee. Standard errors in parentheses are clustered at the district level. * ≤ 0.1 ; ** ≤ 0.05 ; *** ≤ 0.01 .

Table A4: Spillover Effects of Wisconsin’s Act 10 onto Other Races: Pooled Event Study Estimates

	Senate		House		President	
	(1)	(2)	(3)	(4)	(5)	(6)
Exposed	-0.006 (0.004)	-0.005 (0.004)	-0.021 (0.013)	-0.020 (0.013)	-0.005 (0.006)	-0.005 (0.006)
District FE	Yes	No	Yes	No	Yes	No
Ward FE	No	Yes	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Mean dep. var. control	0.409	0.409	0.467	0.467	0.448	0.448
N	24239	24234	35789	35782	19453	19448
Clusters (districts)	236	236	236	236	236	236
R-squared	0.78	0.93	0.64	0.71	0.72	0.92

Notes: The dependent variable is the share of GOP votes in U.S. Senate, House, and Presidential elections (columns 1-2, 3-4, and 5-6, respectively). The variable *Exposed* equals one in years following a CBA expiration in each district. Columns 1, 3, and 5 control for year and district fixed effects; columns 2, 4, and 6 control for ward and year fixed effects. Standard errors in parentheses are clustered at the district level. * ≤ 0.1 ; ** ≤ 0.05 ; *** ≤ 0.01 .

Table A5: Political Effects of Wisconsin’s Act 10: Difference-in-Differences Estimates, Robustness Checks

	Ignoring extensions		Excluding Milwaukee		Only fully aligned wards	
	(1)	(2)	(3)	(4)	(5)	(6)
CBA after 2011 * post 2011	0.038* (0.020)	0.037* (0.020)	0.011* (0.006)	0.010* (0.006)	0.020* (0.010)	0.020* (0.010)
District FE	Yes	No	Yes	No	Yes	No
Ward FE	No	Yes	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Mean dep. var. control	0.465	0.465	0.489	0.489	0.438	0.438
N	24550	24545	22935	22930	14344	14340
Clusters (districts)	236	236	235	235	231	231
R-squared	0.73	0.93	0.72	0.92	0.77	0.93

Notes: The dependent variable is the share of GOP votes in gubernatorial elections in each ward and year. The variable *CBA after 2011* equals one for districts with CBAs expiring after 2011. All specifications control for year fixed effects; columns 1, 3, and 5 control for district fixed effects and columns 2, 4, and 6 control for ward fixed effects. Columns 1-2 are estimated considering only CBA expirations and ignoring extensions to construct the *CBA after 2011* variable. Columns 3-4 are estimated excluding Milwaukee. Columns 5-6 are estimated on the subsample of wards that do not contain district boundaries. Standard errors in parentheses are clustered at the district level. * ≤ 0.1 ; ** ≤ 0.05 ; *** ≤ 0.01 .

Table A6: Political Effects of Wisconsin’s Act 10: Pooled Event Study, By Ex Ante Test Scores

	Q1	Q2-Q3	Q4	All
	(1)	(2)	(3)	(4)
Exposed	0.038*** (0.011)	0.006 (0.005)	0.012** (0.006)	
Exposed * Q1				0.043** (0.017)
Exposed * Q2				0.005 (0.008)
Exposed * Q3				0.008 (0.009)
Exposed * Q4				0.008 (0.008)
Ward FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	No
Year * qtile FE	No	No	No	Yes
Mean dep. var. control	0.386	0.526	0.464	0.481
N	4894	9912	6427	19798
Clusters (districts)	44	121	71	214
R-squared	0.95	0.89	0.96	0.94

Notes: The dependent variable is the share of GOP votes in gubernatorial elections in each ward and year. We show estimates and standard deviations of the parameter β_k in equation (1), where we constrain $\beta_k = 0$ for $k < 0$ and β_k to be constant across all $k > 0$. We split the sample by the quartile of average district test scores, measured in 2010-11. Q1, Q2, Q3, and Q4 refer to the first, second, third, and fourth quartiles of each variable, respectively. Columns 1-3 and 5-7 control for ward and year fixed effects; columns 4 and 8 control for ward and quartile-year fixed effects. Standard errors in parentheses are clustered at the district level. * ≤ 0.1 ; ** ≤ 0.05 ; *** ≤ 0.01 .

Appendix B Understanding The Importance of Various Dimensions of Heterogeneity

In this section, we detail our procedure to assess the importance of various dimensions of heterogeneity in explaining the overall electoral effects of Act 10. Our analysis proceeds in steps:

1. We augment the pooled version of equation (1) (where we assume $\beta_k = 0$ for $k \leq 0$ and constant β_k for $k > 0$), by interacting the treatment variable with six district-level dimensions of heterogeneity, measured in 2010-11 unless specified (for continuous variables, we use an indicator for the district being above the median): share of teachers with three or fewer years of experience; share of teachers with 21 or more years of experience; rate of teacher turnover; fraction of students on free and reduced-price lunch (FRPL); fraction of households with children under 18; and whether the union representing the district contributed to any Wisconsin gubernatorial race in the period 2002-2010. The results of this regression can be seen in columns 1 and 2 of Appendix Table B1.
2. To avoid overfitting the model, we apply LASSO to this regression model to select the most relevant interactions. LASSO identifies three interaction terms with non-zero coefficients: the share of low-experience teachers, the share of FRPL students, and the presence of politically active unions. Columns 3 and 4 of Table B1 show the results from the same regression described above, but including only those three LASSO-selected dimensions of interactions.
3. To allow for the possibility of interactions in the effects of each dimension of heterogeneity, we estimate a regression model which interacts the treatment indicator with each of the three LASSO-selected covariates, both individually and in groups of two. (Since there are no districts which feature both politically active unions and low FRPL, the interactions *Exposed* \times *Hi FRPL* \times *Hi Union* and *Exposed* \times *Hi Young* \times *Hi FRPL* \times *Hi Union* are automatically excluded from the regression.) Columns 1 and 2 of Table B2 report the full results from this regression.
4. For ease of exposition, we report the linear combinations of interaction effects in Table B2 for each of the six cells characterized by the combination of the dimensions of heterogeneity selected by LASSO (again omitting the two empty cells). These linear combinations correspond to the full effect of Act 10 on districts in each cell. The cell-by-cell effects of Act 10 are reported in Table B3. The results are broadly consistent with those from the previous heterogeneity analyses. Positive effects on GOP vote share appear in districts with some combination of a high share of young teachers, a high share of FRPL students, and ex ante politically active unions. However, effects are largest and most significant in districts where all three measures are high.
5. Figure A15 plots these cell-by-cell effects (from the regression employing district fixed effects, column 1 in Table B3), displaying the number of districts in each cell to the right of the estimate in parentheses. (Empty cells are excluded from the graph.)

Table B1: Political Effects of Wisconsin’s Act 10: Pooled Event Study — dimensions of heterogeneity

	All dimensions		LASSO-selected	
	(1)	(2)	(3)	(4)
Exposed	-0.007 (0.009)	-0.007 (0.009)	-0.008 (0.007)	-0.008 (0.007)
Exposed × High Young Teachers	0.018** (0.008)	0.019** (0.008)	0.018** (0.008)	0.018** (0.008)
Exposed × High Old Teachers	0.004 (0.008)	0.005 (0.008)		
Exposed × High Teacher Turnover	-0.003 (0.008)	-0.002 (0.008)		
Exposed × High FRPL	0.009 (0.009)	0.009 (0.009)	0.007 (0.009)	0.008 (0.009)
Exposed × High HHs w/ kids	-0.001 (0.008)	-0.001 (0.008)		
Exposed × Politically Active Union	0.015 (0.010)	0.015 (0.011)	0.016* (0.010)	0.016 (0.010)
District FE	Yes	No	Yes	No
Ward FE	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes
Mean dep. var. control	0.474	0.474	0.474	0.474
N	23168	23162	23250	23244
Clusters (districts)	235	235	236	236
R-squared	0.74	0.94	0.74	0.94

Notes: The dependent variable is the share of GOP votes in gubernatorial elections in each ward and year. We show estimates and standard deviations of the parameter β_k in equation (1), where we constrain $\beta_k = 0$ for $k < 0$ and β_k to be the same across all $k > 0$. Columns 1 and 2 include interactions of the ‘Exposed’ dummy with all six district-level dimensions of heterogeneity. Columns 3 and 4 include only the three interactions selected by LASSO. Odd columns control for district fixed effects; even columns control for ward fixed effects. All regressions include controls for the interaction of year dummies with each of the dimensions of heterogeneity included in the regression. Standard errors in parentheses are clustered at the district level. * ≤ 0.1 ; ** ≤ 0.05 ; *** ≤ 0.01 .

Table B2: Political Effects of Wisconsin’s Act 10: Pooled Event Study, with interactions among LASSO-selected dimensions of heterogeneity

	(1)	(2)
Exposed	-0.010 (0.007)	-0.010 (0.007)
Exposed × Hi Young Teachers	0.022** (0.009)	0.022** (0.009)
Exposed × Hi FRPL	0.011 (0.010)	0.011 (0.010)
Exposed × Politically Active Union	0.018 (0.012)	0.018 (0.012)
Exposed × Hi Young × Hi FRPL	-0.008 (0.009)	-0.008 (0.009)
Exposed × Hi Young × Hi Union	-0.002 (0.016)	-0.002 (0.017)
Mean dep. var. control	0.474	0.474
N	23250	23244
Clusters (districts)	236	236
FE	District	Ward

Notes: The dependent variable is the share of GOP votes in gubernatorial elections in each ward and year. We show estimates and standard deviations of the parameter β_k in equation (1), where we constrain $\beta_k = 0$ for $k < 0$ and β_k to be the same across all $k > 0$. All regressions include district and year fixed effects. Each regression includes interactions of the ‘Exposed’ dummy with the fully saturated interactions of the three dimensions of heterogeneity selected by a LASSO reported in Table B1. Column 1 controls for district fixed effects; Column 2 controls for ward fixed effects. All regressions include controls for the interaction of year dummies with each of the dimensions of heterogeneity selected by LASSO. Standard errors in parentheses are clustered at the district level. * ≤ 0.1 ; ** ≤ 0.05 ; *** ≤ 0.01 .

Table B3: Political Effects of Wisconsin’s Act 10: Pooled Event Study, by district characteristics

	(1)	(2)
Lo young / lo union / lo FRPL	-0.010 (0.007)	-0.010 (0.007)
<i>Hi young</i> / lo union / lo FRPL	0.012 (0.008)	0.012 (0.008)
Lo young / lo union / <i>hi FRPL</i>	0.001 (0.009)	0.001 (0.009)
<i>Hi young</i> / lo union / <i>hi FRPL</i>	0.015** (0.006)	0.016** (0.006)
Lo young / <i>hi union</i> / <i>hi FRPL</i>	0.019* (0.010)	0.020* (0.010)
<i>Hi young</i> / <i>hi union</i> / <i>hi FRPL</i>	0.031*** (0.010)	0.032*** (0.011)
Mean dep. var. control	0.474	0.474
N	23250	23244
Clusters (districts)	236	236
FE	District	Ward

Notes: The dependent variable is the share of GOP votes in gubernatorial elections in each ward and year. The values shown in this table correspond to linear combinations of the interaction terms reported in Table B2 to recover the full effect of Act 10 on the different groups of districts represented by the combination of characteristics articulated in each row. “Lo young / hi union / lo FRPL” and “Hi young / hi union / lo FRPL” are excluded as no districts in the sample match these descriptions. Standard errors in parentheses are clustered at the district level. * ≤ 0.1 ; ** ≤ 0.05 ; *** ≤ 0.01 .