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Unions can reduce the public-sector pay gap

Collective bargaining rights and local government workers

Report • By Monique Morrissey and Jennifer Sherer • March 14, 2022

What this report finds: States where teachers and school staff, bus drivers, firefighters, police, and other local government workers have stronger collective bargaining rights have smaller gaps between these workers' pay and the pay of private-sector workers with similar educational attainment, age, state of residence, and hours worked. States like Colorado and Virginia, where bargaining rights have been weak or nonexistent, have lower union membership and larger public-sector pay gaps than states with strong bargaining rights.

Why it matters: Closing the public-sector pay gap especially helps Black workers and women, who are disproportionately represented in local government jobs. Addressing the public-sector pay gap is also critical for local governments facing acute, growing staffing shortages. Finally, unions help reduce inequality, promote social mobility, and advocate for better public services.

What can be done about it: Colorado is considering legislation to extend bargaining rights to local government employees, after recently extending these rights to state employees. Virginia recently took the small step of allowing employers to voluntarily bargain with unions representing local government workers. Colorado and Virginia are among the states that are moving in the right direction. Other states that have restricted collective bargaining rights should act to expand them.

SECTIONS

This is a revised and expanded version of a report published in June 2021.

In Colorado, state government employees gained the right to collective bargaining in 2020. Legislators have since proposed extending that right to teachers and school staff, firefighters, and other local government employees (Vo 2022). Other Western states, including New Mexico and Nevada, have recently made changes that strengthen collective bargaining rights for public-sector workers.

Some local government workers in Virginia have recently won the right to bargain collectively, under a new state law permitting local governments to bargain with employees upon approval of a collective bargaining ordinance or resolution. Public-sector organizing efforts are now under way in several counties, cities, and school districts in that state, where collective bargaining was previously prohibited (Borja 2022).

This brief examines how public-sector workers in states with limited or no collective bargaining rights fare compared with public-sector workers in states with well-established collective bargaining rights. To do so, we estimate pay differences between local government workers and private-sector workers with similar education and experience over the years 2015–2019. In this analysis, Virginia is among the states with no bargaining rights since the Virginia legislation was not in effect at that time. Colorado is among the states with limited bargaining rights. By contrast, 27 states had well-established collective bargaining rights for local government workers during those years.

The right to bargain collectively over pay is associated with higher union density (union membership as a share of the workforce). This brief shows that collective bargaining rights and union strength help local government workers narrow the pay gap with private-sector workers.[1] We show that the pay gap for local government workers is significantly larger in states with weak bargaining rights, like Colorado, where local government workers earn 19.2% less than their private-sector peers. The gap is even larger in states that have prohibited collective bargaining, like Virginia, which has one of the largest public-sector pay gaps in the nation, at -29.9%.

This is particularly important at a moment when state and local governments face staffing shortages and serious challenges to recruiting and retaining qualified employees. A 2019 study showed Colorado state agencies facing high employee vacancy rates even prior to the pandemic, with employee turnover rates up 73% in a decade (Jones 2019). Extending collective bargaining rights to state employees in 2020 has created new opportunities to begin addressing this crisis. An initial contract negotiated under the new law will improve benefits and boost pay for unionized state employees with a new $15 minimum wage and three years of annual 3% wage increases scheduled to begin in July 2022 (Ducassi 2021; Poblete 2021).

Nationwide since February 2020, state and local government employment levels have fallen more than in any sector except leisure and hospitality—with the lion's share of losses occurring in K–12 education. As of December 2021, public elementary and secondary school employment was down 376,300 (4.7%) from its February 2020 level on a seasonally adjusted basis, with particularly sharp declines among bus drivers, teachers, and custodians. In Colorado, public education employment fell 4.2% between 2019 and 2021, and it declined 3.8% over the same period in Virginia (Cooper and Hickey 2022).

Combined with significant pandemic pressures, low pay is a key factor driving the staffing crisis facing schools and other units of state and local government. In this report we consider how the absence of collective bargaining rights contributes to long-standing gaps between what local government workers and their similarly educated counterparts elsewhere in the economy are paid, and how expanding collective bargaining rights can help address this pay gap.

The pay gap is especially large among workers with a bachelor's degree or more education, who make up the majority of public-sector workers. Though public-sector workers have more generous benefits, these benefits do not make up for lower wages and salaries for most workers. The exception is workers with less formal education in states with strong bargaining rights, where unions raise the public-sector wage floor and bargain for more generous and secure benefits, reducing poverty and inequality and benefiting society.

Low pay for public-sector workers disproportionately affects Black workers and women, who are more likely to be employed in local government jobs. Since these workers are also disadvantaged in the broader labor market, strengthening collective bargaining rights for local government workers should reduce racial and gender inequality in the labor force and potentially attract more Hispanic, Asian American/Pacific Islander (AAPI), and other underrepresented workers to public-sector jobs.

Data and methodology

Unless otherwise noted, statistics cited in this brief are based on the authors' analysis of 2015–2019 microdata from the U.S. Census Bureau's Current Population Survey (CPS) (Flood et al. 2020). The sample includes full-time (35+ hours weekly) wage and salary workers ages 18–64 who are employed in local government or the private sector, including workers employed by private nonprofits. Statistics on benefits for private-sector and state and local government workers are from U.S. Bureau of Labor Statistics (BLS) Employer Costs for Employee Compensation (ECEC) tables for 2015–2019 (BLS 2015–2019). More information on data and methodology is provided in the methodology appendix.

Table 1

Local government workers are highly educated

Educational attainment of private-sector and local government workers

	< High school	High school	Some college	Bachelor's	Advanced degree
U.S.					
Private sector	8%	27%	28%	25%	12%
Local government	2%	16%	23%	29%	31%
Colorado					
Private sector	7%	23%	26%	31%	14%
Local government	1%	14%	23%	32%	30%
Virginia					
Private sector	7%	22%	25%	30%	17%
Local government	1%	14%	16%	28%	40%

Note: Statistics shown are for wage and salary workers ages 18–64 working 35 or more hours per week. Percentages may not sum to 100% due to rounding.

Source: Authors' analysis of U.S. Census Bureau Current Population Survey microdata, pooled years 2015–2019.

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In general, differences between states or groups of states reported in tables may or may not be statistically significant, but those highlighted in the text are statistically significant at the 0.05 level unless otherwise noted.

Who are local government workers?

Occupations. The largest occupational groups in local government are teachers, police officers, and firefighters. However, these three groups together do not constitute a majority of local government workers. Local government workers are employed in a wide variety of occupations in preschool, K–12, and higher education; public safety, courts, and corrections; child care, health care, and social services; transportation, public utilities, and sanitation; parks and recreation; housing and environmental protection; libraries, museums, historical sites, and other cultural institutions; and legislative bodies and executive offices, including those handling public finance, recordkeeping, and regulatory compliance.[2]

Education. Local government workers are highly educated. Fifty-nine percent have a bachelor's degree or higher; 31% have an advanced degree. In contrast, only 37% of private-sector workers have a bachelor's degree or higher, with 12% having an advanced degree. Local government workers in Colorado and Virginia are even more highly educated than their counterparts in the rest of the country, with 62% and 68%, respectively, having a bachelor's or advanced degree (**Table 1**).

Race and ethnicity. White and Black workers are more likely to work in local government than Hispanic and AAPI/Other workers (**Table 2**). Black workers are overrepresented in most states despite being less likely to have the bachelor's or advanced degrees required for many public-sector jobs. The relative scarcity of Hispanic and AAPI workers partly reflects age differences, since public-sector workers tend to be somewhat older and have more work experience than private-sector workers, whereas the Hispanic and AAPI populations are growing demographic groups that tend to be younger. Hispanic workers' underrepresentation also reflects disparities in educational attainment. Hispanic workers with bachelor's degrees are as likely as white workers with bachelor's degrees to work in local government (not shown in table).

Public-sector jobs are rungs to the middle class for Black workers, who often face labor market discrimination, especially in the private sector where employers may be less likely to follow standardized hiring and promotion practices. In addition to seeking greater protections against discrimination, Black workers may be drawn to public-sector jobs because they provide more secure pension and other benefits. These benefits are especially valuable to Black workers because discriminatory policies and practices have historically relegated these workers to jobs lacking secure benefits, have prevented Black families from accumulating home equity, and have generally hindered Black Americans from achieving financial security and transferring wealth to younger generations (Rothstein 2017).

Earnings. Public-sector earnings are less unequal than private-sector earnings, with more workers clustered in the middle of the earnings distribution and fewer workers with very low or very high earnings. Local government workers at the 90th percentile of the earnings distribution earn 3.8 times what those at the 10th percentile earn. Among private-sector workers, this multiple is 5.3. Roughly three in 10 (29% of) local government workers without bachelor's degrees earn less than $15 per hour, as compared with nearly four in 10 (38%) of their private-sector counterparts.

Middle-class government jobs have societal benefits that extend beyond the workers and their families. A large middle class fosters economic and social mobility and gives talented people from modest backgrounds more opportunity to contribute to society (Krueger 2012; Olinsky and Post 2013). Careful research has found that high union density decreases inequality beyond the direct effect of raising the wage floor for members (Farber et al. 2021). The likely channels for this effect are that unions support higher minimum wages and other labor standards; change social norms and workers' expectations about pay, including spillover effects on to nonunion workplaces; decrease pay inequality within unionized workplaces; and generally support policies that foster economic opportunity and mobility.

Gender. Women are much more likely to be employed in local government jobs than men, especially in teaching. Teachers' relative pay is especially low considering that 52% of

Table 2

Black workers and women are more likely to be employed in local government

Demographic breakdown of private-sector and local government workers

Sector	White	Black	Hispanic	AAPI/ other	Women	Mean age
U.S.						
Private sector	63%	10%	19%	9%	43%	40.2
Local government	71%	11%	13%	6%	57%	43.2
Colorado						
Private sector	68%	4%	23%	5%	41%	39.1
Local government	74%	4%	17%	5%	60%	40.7
Virginia						
Private sector	62%	16%	11%	11%	44%	40.0
Local government	70%	19%	6%	5%	64%	43.3

Notes: Statistics shown are for wage and salary workers ages 18–64 working 35 or more hours per week. Racial and ethnic categories may not sum to 100% due to rounding. Hispanic refers to Hispanic workers of any race while white, Black, and AAPI/other refer to non-Hispanic whites, non-Hispanic Blacks, and non-Hispanic Asian Americans, Pacific Islanders, and other racial categories, respectively.

Source: Authors' analysis of U.S. Census Bureau Current Population Survey microdata, pooled years 2015–2019.

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teachers in the United States have advanced degrees (51% in Colorado and 58% in Virginia). The survey sample used in this analysis likely leaves out many public school teachers, because a larger-than-expected share (23%) of elementary, middle school, and high school teachers in the sample report being state employees. Many of these teachers are likely employed by local school districts but are misreported as state employees, possibly because most teachers participate in statewide benefit plans. Including these teachers in the analysis below would likely show larger pay gaps for local government workers since teachers are among the best-educated and most underpaid government workers.

How do collective bargaining rights vary across states?

The National Labor Relations Act excludes public-sector employees from coverage, leaving states to set policy on union and collective bargaining rights for public employees. Collective bargaining rights vary widely across and even within states. This brief looks at

Colorado, Virginia, and other states where local government workers had weak or nonexistent collective bargaining rights in 2015–2019, and it compares these states with states where these workers had stronger collective bargaining rights.

Collective bargaining rights can vary across several dimensions, including:

- which matters related to compensation or working conditions must be or can be discussed in bargaining;
- whether bargaining is purely voluntary on the part of employers or whether employers are obligated to bargain under certain conditions, such as majority support for the union;
- what steps a group of workers must take to gain or maintain recognition and/or legal certification as a recognized union for purposes of collective bargaining;
- what mediation or arbitration procedures are prescribed if the two sides reach an impasse in bargaining; and
- whether workers have the right to strike.

Keefe (2015), Frandsen and Webb (2017), and others have found that such differences in public-sector workers' collective bargaining rights are associated with differences in compensation. Laws governing how workers form unions and whether individual workers can opt out of paying union fees also affect workers' bargaining strength (Keefe 2015), though the agency fee issue became moot after the 2018 U.S. Supreme Court decision in *Janus v. AFSCME Council 31*. In that 5–4 decision, the Supreme Court ruled that public-sector unions could not negotiate union security agreements requiring all workers covered by a collective bargaining agreement to pay agency fees to cover the costs of representation (McNicholas, Mokhiber, and von Wilpert 2018; McNicholas 2018). Though the *Janus* decision has not had the predicted effect of reducing union membership, it has forced unions to expend resources on outreach efforts (McNicholas, Shierholz, and Poydock 2021).

Focus of this analysis

The current analysis focuses on legal rights to collective bargaining established by statute, case law, or state constitutions.

These legal rights are not the only factors in determining whether workers have the leverage to bargain for better pay and working conditions. In addition to collective bargaining and union security rights, workers' leverage also depends on local economic conditions, states' partisan tilt, unions' institutional capacity, and other factors. These factors are outside the scope of this brief, though one version of the regression analysis takes into account whether a state was among the 23 states plus the District of Columbia that allowed agency fees prior to the *Janus* ruling.

These states largely overlap with the states that require public-sector employers to engage in collective bargaining with most workers, but six states with a broad duty to bargain did not allow agency fees before *Janus* (Florida, Iowa, Michigan, Nebraska, Nevada, and South Dakota), while two states lacking a broad duty to bargain (Maryland and Kentucky) did allow agency fees.

Evolution of public-sector collective bargaining rights

Variations in collective bargaining rights among states have historical antecedents, notably in Southern states where racism contributed to the enactment of anti-union policies (Dixon 2009; Kaufman 2018; Stelzner, Hoyt, and Ramchurn 2019).

One exception to the rule that Southern states do not allow collective bargaining for most public-sector workers is Florida, where a statewide teachers' strike and strong unions flexing their muscles during the construction of Disney World pushed the state to broaden collective bargaining rights in the early 1970s (McGuire 1973; IUPAT 2017). However, with the exception of Arizona, all states that ban public-sector collective bargaining are in the South.

In 2020, Virginia repudiated this legacy by taking a step to expand public-sector collective bargaining rights to some local government workers (Rankin 2020; Schweitzer 2021). Starting in May 2021, local government bodies in Virginia can voluntarily agree to bargain with unionized workers, though this falls short of a statewide duty to bargain. In 2021, next-door neighbor Maryland took steps to extend bargaining rights to previously excluded public workers, such as community college employees and some county library staff, and is now considering proposals to add bargaining coverage for additional county libraries and graduate employees at state universities (Shwe 2022, IAMAW 2022).

Three Western states—Colorado, Nevada, and New Mexico—have also taken steps to strengthen public-sector bargaining rights since 2019 (AFSCME 2019; Hindi 2020; Lewis 2020; Goodland 2021). Nevada, where local but not state government employees had collective bargaining rights for decades, extended collective bargaining rights to state employees in 2019. New Mexico overhauled its public-sector bargaining statute in 2020, including restructuring the state's labor board system to strengthen previously weak or inconsistent enforcement of employee bargaining rights. Colorado granted collective bargaining rights to state employees in 2020 and could extend these rights to local government employees this year.

Other states have moved to weaken workers' rights in recent years. Over the past decade, six states—Indiana, Kentucky, Michigan, Missouri, West Virginia, and Wisconsin—have passed so-called right-to-work laws,[3] though the Missouri law was overturned by referendum without taking effect. The five new right-to-work states joined 22 Southern, Midwestern, and Western states that already had laws in place preventing unions from collecting fees from nonmembers to cover the cost of representation. Most of these laws were enacted in the mid-20th century (NCSL n.d.).

Though these right-to-work laws primarily affect the rights of private-sector workers—only Michigan's right-to-work law affected public-sector workers before the Supreme Court's *Janus* decision—the recent wave of right-to-work laws were part of broader attacks on union rights, and laws aimed at public-sector workers were passed in several states around the same time (García and Han 2021; Malin 2012). Indiana and Oklahoma, for example, eliminated employers' duty to bargain with public-sector workers; Nebraska implemented an arbitration procedure that limited compensation increases unless compensation was below that of comparable communities, with reduced compensation targets during economic downturns; and Wisconsin restricted the scope of bargaining to base wages, with increases capped at the rate of inflation.[4] More recently, Arkansas prohibited collective bargaining for all state and school district employees, leaving bargaining rights in place only for police, firefighters, and other city or county employees (Wickline 2021). With one exception—Iowa, discussed below—these changes took effect before or after the time frame of this study and in many cases did not affect how states would be classified for the purpose of this statistical analysis. Nevertheless, many of the changes likely had a significant impact on workers' bargaining power.

Classifying states by collective bargaining rights

The statistical analysis in the next section differentiates between (1) states where collective bargaining or similar negotiation over compensation is banned for local government workers; (2) states where such bargaining is permitted but not required; and (3) states where employers have a duty to bargain with local government workers.

These rights can vary across occupations, with public safety workers and teachers often having more rights than other local government workers. The analysis therefore differentiates between the following groups: public prekindergarten through high school teachers and teaching assistants ("teachers" for short); local police; local firefighters; and miscellaneous local government employees. (For examples of the latter, see "Occupations" in the section, "Who are local government workers?") Rights for state employees can also differ but are outside the scope of this analysis.

Classifying states by collective bargaining rights is not as straightforward as it might seem. Many states either lack laws on public-sector bargaining or rely on vague statutes and case law that can be interpreted in different ways. Tennessee, for example, formally bans collective bargaining for government employees but requires school districts to engage in nonbinding "collaborative conferencing" with teachers. Likewise, in Alabama, unions cannot negotiate binding agreements with public employers, but teachers unions can "meet and confer" with school districts. In many states, there is no statewide right to collective bargaining, but local jurisdictions may allow or even require it. Thus, while Maryland is here classified as a state where public-sector collective bargaining is permitted but not required for local government workers other than teachers, in practice it more closely resembles a duty-to-bargain state since the largest jurisdictions engage in bargaining (see, e.g., Montgomery County n.d.; Prince George's County n.d.; Baltimore City

Code 2010).

One state, Iowa, saw a change in collective bargaining rights during the 2015–2019 time frame. In February 2017, the Iowa General Assembly passed a law restricting the scope of mandatory bargaining to base wages, with wage increases capped at the level of inflation, though public safety workers were exempt from these changes. Previously, employers had a duty to bargain over a range of topics. Since bargaining exclusively over base wages gives workers little say over their compensation (because, for example, wage increases can be offset by changes to health insurance or other benefits), this is not considered collective bargaining for the purposes of this analysis. Unlike Wisconsin, however, which also restricted the scope of bargaining to base wages and capped wage growth to inflation for non-public-safety workers, Iowa continued to allow voluntary bargaining over most other topics related to compensation and working conditions (University of Iowa Labor Center 2018). Therefore, for the purposes of this study, public-sector collective bargaining in Iowa is considered "required" in 2015–2016 and "permitted" in 2017–2019 for teachers and miscellaneous local government workers, whereas bargaining for these workers in Wisconsin is considered "banned" over the entire period since the scope of bargaining is so restricted as to render it almost meaningless.

As shown in **Figure A**, there is a predictable relationship between collective bargaining rights and union density. The light blue bars indicate states where miscellaneous local government workers are barred from collective bargaining ("banned"). The middle shade denotes states where these workers may engage in bargaining but there is no statewide bargaining mandate ("permitted"). The dark blue bars identify states where employers have a duty to bargain with these workers ("required"). Union density shown in the figure is for all local government workers, including teachers, police, and firefighters, who may have stronger collective bargaining rights than other local government workers (see **Table 6** in the methodology appendix). The outliers in Figure A are Wisconsin—which had strong bargaining rights before it effectively (though not officially) ended collective bargaining—and Maryland—whose largest jurisdictions have a duty to bargain and which allows agency fees. Iowa is shown as a "permitted" state but until 2017 was a "required" state, as noted above. Virginia and Colorado are fairly typical of states with no or limited bargaining rights in those years.

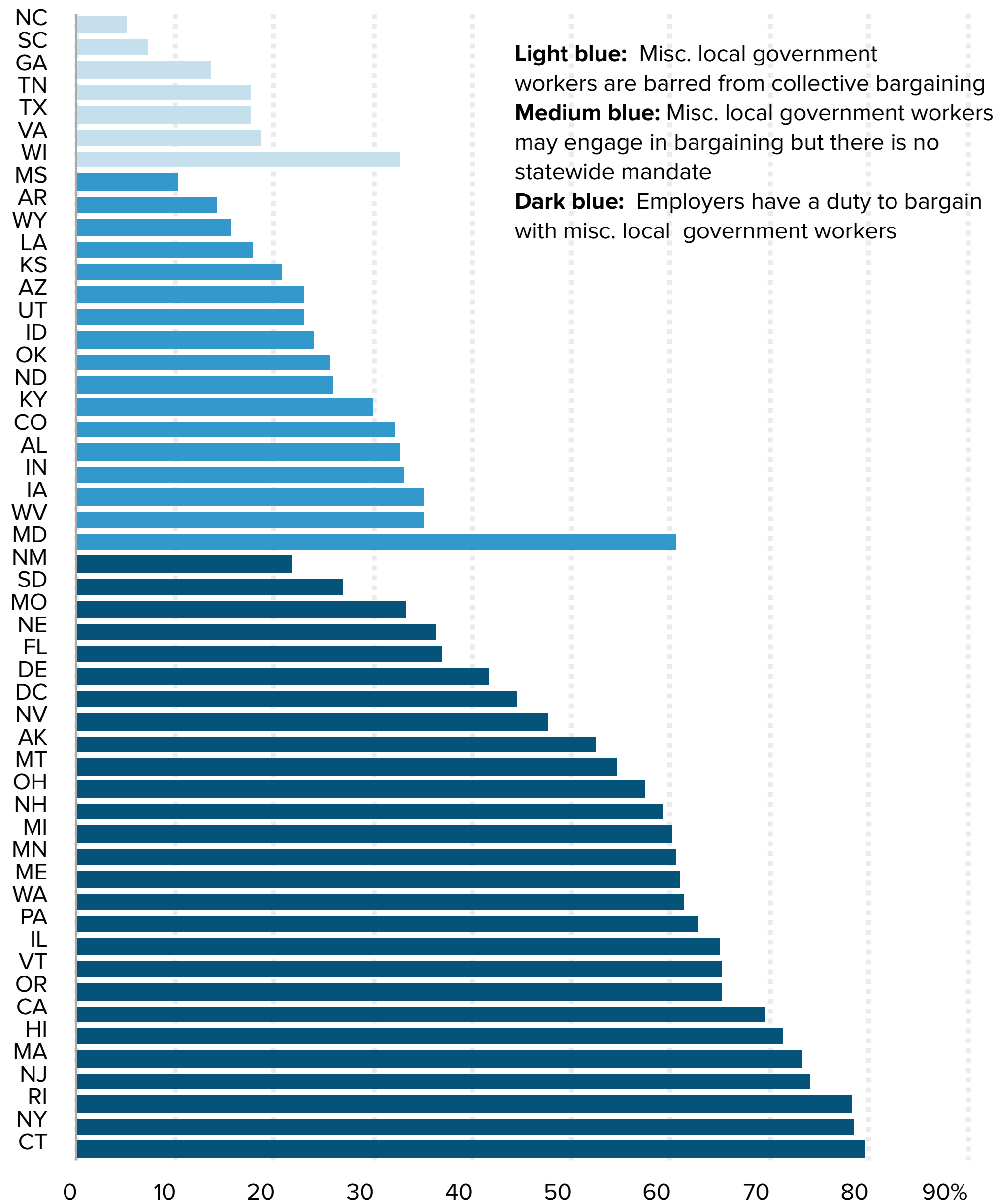
How does the pay of local government workers compare with that of private-sector workers?

On average, local government workers' weekly earnings are 14.1% lower than that of similar private-sector workers after controlling for education, age, hours worked, state, and year using regression analysis (**Table 3**) (see the methodology appendix for details). The gaps are much larger for local government workers who have no (-22.9%) or weak (-16.6%) bargaining rights than for those with strong bargaining rights (-10.5%). The gap in Colorado (-19.2%) appears somewhat larger than in other states with weak bargaining rights, though

Figure A

States that ban or limit collective bargaining rights for miscellaneous local government workers have fewer union members

Share of all local government workers belonging to a union, by state



Sources: Union density based on authors' analysis of U.S. Census Bureau Current Population Survey microdata, pooled years 2015–2019. Strength of collective bargaining rights for miscellaneous local government workers in 2015–2019 based on authors' analysis of Sanes and Schmitt 2014; Valletta and Freeman 1988; Rueben 1996; Dippel and Sauers 2019; NCTQ 2019; NEA 2020; García and Han 2021; Frandsen and Webb 2017; McNicholas et al. 2020; Brannick 2019; and Commonwealth Foundation 2021.

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Table 3

Pay gap for public-sector workers is larger in states with weak or no collective bargaining rights

Differences between local government and private-sector earnings

	Geography			Collective bargaining		
Education	**U.S.**	**Colorado**	**Virginia**	**Banned**	**Permitted**	**Required**
All	-14.1%	-19.2%	-29.9%	-22.9%	-16.6%	-10.5%
All (with add'l demographic controls)	-12.2%	-16.3%	-26.1%	-19.8%	-15.2%	-8.8%
No bachelor's	-0.6%	-2.5%	-14.2%	-13.6%	-7.9%	6.8%
Bachelor's	-23.0%	-28.6%	-37.0%	-30.1%	-23.7%	-20.6%

Notes: Strength of collective bargaining rights is based on rights accorded to miscellaneous local government workers in 2015–2019. "Banned" states are those in which miscellaneous local government workers are barred from engaging in collective bargaining. "Permitted" states are those in which local government entities may engage in collective bargaining with miscellaneous government workers but there is no statewide mandate. "Required" states are those in which local government entities are required to engage in collective bargaining with miscellaneous local government workers. Pay gap is the difference in weekly earnings of full-time local government workers ages 18–64 compared with those of their private-sector counterparts, controlling for education, age, hours worked, state, and year using regression analysis. Regression with additional demographic controls also adjusts for race, ethnicity, gender, and marital status.

Source: Authors' analysis of U.S. Census Bureau Current Population Survey microdata, pooled years 2015–2019; Sanes and Schmitt 2014; Valletta and Freeman 1988; Rueben 1996; Dippel and Sauers 2019; NCTQ 2019; NEA 2020; García and Han 2021; Frandsen and Webb 2017; McNicholas et al. 2020; Brannick 2019; and Commonwealth Foundation 2021.

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the difference between Colorado and the other states with weak bargaining rights is not statistically significant. The gap is even larger in Virginia (-29.9%) than in other states that, like Virginia, had no bargaining rights during this period.

Whether a state allowed agency fees before the *Janus* decision appears to have been an even more important factor in narrowing the local government pay gap than whether the state had a duty to bargain. The local government pay gap in states that did not require employers to bargain but did allow unions to collect agency fees was -10.9%, versus -14.6% in states that required bargaining but did not allow agency fees. In states with both a duty to bargain and allowance of agency fees, the pay gap was -9.3% (results for regressions with agency fees not shown in table). However, both the duty to bargain and allowance of agency fees likely capture other factors that affect workers' bargaining power in each state, so the *Janus* decision banning agency fees may not have as strong an effect as is implied by this finding. Adding control variables for race, ethnicity, gender, and marital status reduces the local government gap slightly, from -14.1% to -12.2% (Table 3). Including these variables, however, has the effect of normalizing the lower pay of women and Black workers, who are more likely to be employed in local government. To the extent that the lower pay for these workers is due to discrimination rather than unobserved differences in job qualifications, this tends to minimize the public-sector pay gap between equally qualified workers (see the methodology appendix).

Pay gaps by education

The local government pay gap is largely due to lower pay for workers with bachelor's or advanced degrees (Table 3). Nationwide, the gap is -23.0% for workers with bachelor's degrees or more education and a statistically insignificant -0.6% for workers without bachelor's degrees. In states with strong collective bargaining rights, workers without bachelor's degrees actually earn 6.8% more than their private-sector counterparts, mostly because unions raise the wage floor for less educated workers. Excluding low-wage workers earning below $15 per hour, the pay for workers without bachelor's degrees is slightly higher (2.9% more) in local government in these states (not shown in the table).

Pay gaps by race/ethnicity

Racial and ethnic pay disparities are much smaller in the public sector. Whereas non-Hispanic Black workers earn 20.8% less than their non-Hispanic white counterparts in the private sector, the gap is roughly one-third the size (-7.3%) in local government. Similarly, whereas Hispanic workers earn 19.6% less than non-Hispanic white workers in the private sector, the gap is less than half (-9.4%) in local government. As in all regressions, these estimates control for education, age, hours worked, state, and year.

Because racial and ethnic pay disparities are so much larger in the private sector, non-Hispanic Black workers in local government are paid about the same as in the private sector (0.5% less, but not statistically significant). Hispanic workers are paid slightly more (+2.6%). However, this is not true in Virginia, where the local government pay gap remains large for non-Hispanic Black workers (-18.6%) and Hispanic workers (-11.4%). It is even larger for non-Hispanic white workers (-31.7%).

In Colorado, Black workers in local government are more likely to be in jobs that do not require a college degree and that typically pay more in the public sector (26.9% more, in their case). This pay premium also likely reflects greater diversity in the Denver area, where pay is higher than the state average and many public-sector workers belong to unions (pay comparisons do not control for metro area or union membership). Hispanic workers are paid roughly the same in the two sectors (1.2% more in local government than in the private sector, but the difference is not statistically significant). White workers in Colorado are more likely to be in jobs requiring college degrees and are paid 24.3% less in local government.

As shown in **Table 4**, Black and Hispanic workers especially benefit from public-sector collective bargaining. In states where employers are required to bargain, Black and Hispanic workers earn more in local government than in the private sector, where they face large racial pay gaps. However, this is not true in states where collective bargaining is banned. In states where collective bargaining is permitted but not required, Black and

Table 4

Black and Hispanic workers especially benefit from public-sector collective bargaining

Differences between local government and private-sector earnings in states with strong, weak, and no collective bargaining rights, by race/ethnicity

	Collective bargaining		
Race/ethnicity	**Banned**	**Permitted**	**Required**
White	-26.5%	-19.6%	-15.3%
Black	-10.7%	-2.3%	6.6%
Hispanic	-12.3%	-2.1%	9.4%
AAPI/other	-29.0%	-15.4%	-9.8%

Notes: AAPI = Asian American/Pacific Islander. Strength of collective bargaining rights is based on rights accorded to miscellaneous local government workers in 2015–2019. Data are from the 50 U.S. states and D.C., with states grouped by the strength of collective bargaining in each state. “Banned” states are those in which miscellaneous local government workers are barred from engaging in collective bargaining. “Permitted” states are those in which local government entities may engage in collective bargaining with miscellaneous government workers but there is no statewide mandate. “Required” states are those in which local government entities are required to engage in collective bargaining with miscellaneous local government workers. Pay gap is the difference in weekly earnings of full-time local government workers ages 18–64 compared with those of their private-sector counterparts, controlling for education, age, hours worked, state, and year using regression analysis.

Source: Authors’ analysis of U.S. Census Bureau Current Population Survey microdata, pooled years 2015–2019; Sanes and Schmitt 2014; Valletta and Freeman 1988; Rueben 1996; Dippel and Sauers 2019; NCTQ 2019; NEA 2020; García and Han 2021; Frandsen and Webb 2017; McNicholas et al. 2020; Brannick 2019; and Commonwealth Foundation 2021.

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Hispanic workers are paid about the same in both sectors (the small public-sector pay gaps shown in the table are not statistically significant). As in all regressions, these estimates control for education, age, hours worked, state, and year.

Pay gaps by gender

The gender pay gap is the same (-21.7%) in local government as in the private sector (not shown in table). Women in the public sector are disproportionately employed in teaching, an occupation in which highly educated workers are paid much less than their counterparts in historically male occupations.

How does total compensation compare in local government and the private sector?

Though public-sector workers usually have more generous benefits, these are not enough to close the compensation gap for most workers. According to the U.S. Bureau of Labor

Statistics (BLS), employee fringe benefits were equal to 36.5% of earnings in the private sector and 56.6% of earnings in state and local government (all estimates are 2015–2019 averages) (see the methodology appendix).

This is not an apples-to-apples comparison, however, because public-sector workers are better educated, work for larger employers, and are more likely to work full time than private-sector workers. Workers with these characteristics usually have more generous benefits. However, it is difficult to adjust for these combined factors using the BLS data, especially since there is no information on worker characteristics, such as educational attainment, and only limited information on employment characteristics, such as establishment size, especially for government workers. According to BLS, however, benefits for full-time private-sector workers were 38.8% of earnings, and benefits for private-sector workers in establishments with 500 or more workers were 44.5% of earnings—less than for public-sector workers but more than for private-sector workers as a whole.

In addition, the BLS measure for public-sector worker benefits is inflated because it includes amounts going to pay down, or "amortize," unfunded pension liabilities associated with past employment. Thus, while employer contributions toward state and local government pensions averaged 16.3% of earnings based on employer contributions in the BLS data, the employers' share of the normal cost of local government pensions was only 6.5%–10% of payroll based on the plans' own actuarial valuations (Aubry and Wandrei 2020).[5] Unlike the BLS measure, which includes amortization payments, normal cost estimates include only the present value of future pension benefits earned by workers in the current year.

On the other hand, the BLS measure of health benefits, expressed as a share of earnings or total compensation, may underestimate the full cost of these benefits since many government employers do not prefund retiree health benefits. Though some of the cost of health benefits for retirees is included in the BLS measure in the form of higher premiums for active workers with whom they are pooled, this does not capture the full cost of covering retirees if employers contribute a portion of retirees' health insurance premiums or if future benefits are more costly as a share of payroll than current benefits. Since retiree health benefits are more common in the public sector than in the private sector, this slightly inflates the public-sector compensation gap.

Erring on the conservative side to account for retiree health care benefits, we use the larger of the two normal cost estimates for local government pensions and add a percentage point, such that these workers' total benefits equal roughly 51% of earnings versus 44.5% for private-sector workers in large establishments. Based on an earnings gap of 14.1%, then, total compensation is roughly 10% lower for local government workers than for comparable private-sector workers (see the methodology appendix).

Employee benefits for local government workers in Virginia are less generous than in other parts of the country. In 2015–2019, retirement benefits for these workers were 7.1% of payroll, as compared with 16.3% for state and local government workers nationwide. The 7.1% figure includes 6.1% for pensions and 1.0% for retiree health and other post-employment benefits (authors' estimates based on 2015–2019 Virginia Retirement System Comprehensive Annual Financial Reports). Adding a percentage point to the BLS measure for Social Security contributions (that is, increasing it from 5.2% to 6.2%), because all government workers in Virginia participate but some public-sector workers in some states do not, benefits for Virginia public-sector workers equaled 48.4% of earnings (56.6% − 16.3% + 7.1% + 1% = 48.4%). Since these workers earn 29.9% less than their private-sector counterparts, the local government compensation gap in Virginia is 28.0%, almost certainly one of the highest in the country (see the methodology appendix).

Employer-provided retirement benefits for local government workers in Colorado are also meager, especially considering that most do not participate in Social Security. Workers shoulder most of the normal cost of their own pensions. Local government employers outside of Denver contribute as little as 2.7% of pay toward the cost of current retirement benefits—3.7% factoring in 1% for retiree health benefits (COPERA 2021)—while workers themselves contribute 8% or more (**Table 5**). Since most employers contribute 6.2% to Social Security, Colorado public-sector employers are contributing much less than what employers normally contribute toward workers' retirement and disability benefits—even employers who do not have an employer plan.

Adjusting the BLS estimate of the employer cost of state and local government employee benefits, the overall employer cost for benefits for miscellaneous local government workers who do not participate in Social Security in Colorado is 38.8% of pay (56.6% − 16.3% − 5.2% + 2.7% + 1%), coincidentally the same as for full-time private-sector workers (38.8%), but less than for private-sector workers in large establishments (44.5%). Since these workers earn 19.2% less than their private-sector counterparts, the total compensation gap for these Colorado government workers is -22.4% if these workers are compared with similar private-sector workers in large establishments (see the methodology appendix).

Collective bargaining can correct a power imbalance between workers and employers

Employment relationships almost never resemble perfectly competitive markets described in introductory economics textbooks, where employers who pay workers a penny more than the market rate would be put out of business by competitors and those who pay a penny less would lose all their workers (Manning 2005; Ashenfelter, Farber, and Ransom 2010; CEA 2016; Bivens and Shierholz 2018). In the real world, rather than a precise, nonnegotiable market wage that adjusts quickly to changes in supply and demand, employers and workers negotiate across a range of potential wages within which neither the employer nor the worker would gain by severing the employment relationship. The employer would face significant recruiting, training, and other costs associated with hiring new workers, and the employee would face significant search and other costs associated with looking for a new job.

Table 5

Colorado local government workers shoulder most of their pension cost for meager benefits

Employee and employer costs for Colorado local government employee pension benefits, by plan, 2015–2019

	Union members?	Social Security participants?	Employer normal cost (% of pay)	Employee normal cost (% of pay)
Colorado Public Employee Retirement Association-Local Division	Few or none	Few or none	2.7%	8.2%
Colorado Public Employee Retirement Association-School Division	Some	Few or none	3.7%	8.8%
Colorado Public Employee Retirement Association-Denver Public Schools Division	Most or all	Few or none	3.7%	8.8%
Denver Employees Retirement Plan	Few or none	Most or all	1.3%	8.0%
Fire & Police Pension Association of Colorado	Some	Some	5.3%	9.3%

Sources: Source for union membership: Authors' analysis of CPS microdata and other sources, including Kenney 2022; Gonzales and Meltzer 2022; Lombardi 2022; and various collective bargaining agreements with Denver Public Schools (2022) and Denver City and County (2022a, 2022b). Source for plan data and Social Security coverage: Public Plans Data (2015–2019). Data for the Fire and Police Pension Association of Colorado are for 2016–2018 due to incomplete information for 2015 and 2019. Cost rates are averages for 2015–2019.

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In these real-world circumstances, collective bargaining, like a higher minimum wage, corrects a power imbalance between individual workers and employers, who generally have informational and other advantages over individual workers. Employers also often have a strong incentive to deny individual workers a raise since it may trigger higher wage demands by other workers. Employers are also reluctant to raise wages because it is difficult for morale reasons to reduce them later in response to changing economic conditions, though real wages can be gradually eroded through inflation. These factors help explain why some private-sector employers in the post-pandemic recovery are offering hiring bonuses but appear reluctant to raise wages despite complaining about difficulties hiring workers.

Unions representing public-sector workers negotiate directly with school districts and other employers and indirectly with elected officials and the taxpayers who elect them. Politicians have an incentive to overpromise the public services they can deliver with existing revenues and to claim credit for saving taxpayers money by going after workers' compensation while ignoring the effect on services. For small-government ideologues, a disgruntled workforce slowly eroded of those workers with the best outside options may be seen as a feature, not a bug, of limits on public-sector bargaining rights—a way to tarnish the government "brand." For these politicians, weakening unions as a force in politics may be a goal in itself.

Public-sector workers, meanwhile, are reluctant to quit careers devoted to public service, especially with pension and other benefits designed to encourage retention. For this reason, elected officials and public-sector employers may be able to get away with cutting pay for extended periods before being faced with increased turnover, difficulty recruiting new workers, or even waves of strikes, as occurred among teachers in recent years or among bus drivers working under challenging pandemic conditions in 2021 (Poydock et al. 2022). However, in the long run, the quality of public services suffers when the pay gap between private-sector and public-sector compensation is larger than any advantages to working in the public sector, including, for some workers, a preference for serving the public.

In these real-world situations, closing the public-sector pay gap benefits not only workers and their families, but also the general public. The broader benefits of strong public-sector unions are outside the scope of this brief, but they include fostering social mobility, advocating for better public services, strengthening whistleblower protections, raising labor standards in all sectors, lowering poverty, and reducing expenditures on safety net programs (Banerjee et al. 2021).

Conclusion

Teachers and school staff, bus drivers, firefighters, police, and other local government employees earned, on average, 14.1% less than comparable private-sector employees in 2015–2019. Though public-sector workers receive more generous benefits, these were not enough to close the pay gap. Total compensation was still approximately 10% lower among local government workers, though a precise estimate is not possible given data limitations.

Unions help narrow the public-sector pay gap. In states where employers have a duty to bargain with local government workers, the earnings gap is -10.5%, whereas in states where collective bargaining is banned outright, the earnings gap is -22.9%. In states where collective bargaining is permitted but not required, the gap lies in between (-16.6%).

The earnings gap was especially large in Virginia (-29.9%), which until 2021 banned public-sector collective bargaining. In Virginia, benefits for local government employees are also meager by public-sector standards, so the total compensation gap remains very large (-28.0%). Virginia local government workers are now just beginning to form unions and negotiate over their pay in multiple cities and counties since the lifting of the state's bargaining ban. Closing the compensation gap in Virginia and elsewhere would especially help Black workers and women, who are overrepresented in local government jobs.

In Colorado, where most local government employees lack collective bargaining rights, the earnings gap is -19.2%. Additionally, these Colorado workers bear most of the cost of their pension benefits and many do not participate in Social Security. Total compensation for miscellaneous local government workers who do not belong to a union and do not participate in Social Security is 22.4% lower than for comparable private-sector workers in the state.

Colorado made important progress with 2020 legislation extending collective bargaining rights to state employees, and now has the opportunity to extend bargaining rights to the roughly twice as many Coloradans who work in local government. Such measures can help the state reduce public-sector pay gaps, increase equity, especially for women and Black workers, and help public employers address critical staffing shortages to improve the stability and quality of public services for all Coloradans.

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Methodology appendix

Earnings. The pay analysis uses pooled, inflation-adjusted, 2015–2019 data from the U.S. Census Current Population Survey Outgoing Rotation Group data downloaded from the University of Minnesota's IPUMS site (Flood et al. 2020). Observations with imputed weekly earnings are dropped from the sample for reasons explained by Allegretto and Mishel (2019). Top-coded weekly earnings values are estimated separately by year and gender assuming a Pareto distribution.

The sample is restricted to full-time wage and salary workers between the ages of 18 and 64 who are employed in local government or the private sector, excluding, among others, state government, federal government, and self-employed workers. The private-sector sample includes nonprofit workers. The full-time workforce is defined as workers working 35 or more hours a week who report regular weekly hours. Though the sample includes some teachers and other workers who do not work year-round, focusing on weekly earnings permits apples-to-apples comparisons.

The regression model, using the natural log of weekly earnings as the dependent variable, is based on Allegretto and Mishel's (2019) model, with some modifications. Since the public-sector sample includes all occupations, not just teachers, the overall sample is not restricted to workers with bachelor's degrees or more education. Likewise, the coefficient of interest is the pay difference for all local government workers rather than the pay difference for teachers. Similar to Allegretto and Mishel's (2019) analysis, our analysis controls for age, including a quadratic to capture diminishing returns to experience; educational attainment (less than high school, high school, some college, bachelor's degree, advanced degree); and state. It also controls for the year and number of hours worked, which varies even among full-time workers. Allegretto and Mishel do not control for hours worked to assuage critics who claim that teachers' weekly hours may be overstated. While teachers, police, and firefighters report working longer hours than full-time private-sector workers, this is not true of other local government workers, who tend to have slightly shorter work hours. Therefore, omitting a measure of hours worked could result in an exaggerated (not conservative) measure of the pay penalty faced by local government workers.

Controls for race, ethnicity, gender, and marital status are similar to those used by Allegretto and Mishel (2019) but are not included in most regressions examining the local government earnings gap (or the local government earnings gap in states with nonexistent, weak, or strong collective bargaining rights). While such demographic characteristics are associated with differences in pay, these differences often reflect labor market discrimination rather than differences in job skills and qualifications. Since women and Black workers tend to be overrepresented in the public sector, in part because civil service hiring practices reduce the scope for discrimination, controlling for race and gender tends to explain away some of the public-sector pay gap. However, because pay differences associated with race, ethnicity, and gender may also reflect unobserved differences in work experience or other job qualifications—for example, if women are more likely to have taken time out of the labor market to care for young children—some researchers prefer to include these demographic controls as proxies for these unobserved differences. Key results are reported both ways to show that conclusions about the local government pay gap do not hinge on including or excluding these controls.

Additional regressions estimate the size of pay gaps for women and Black, Hispanic, and AAPI/Other workers within each sector, and the size of the public-sector pay gap for each demographic group. These regressions also control for educational attainment, age, year, state, and hours worked.

Employee benefits and total compensation. The source for the cost of employee benefits in 2015–2019 is the Bureau of Labor Statistics (BLS) Employer Costs for Employee Compensation (ECEC) downloaded from the BLS website for state and local government employees, full-time private-sector workers, and private-sector workers in establishments with 500 or more workers. Benefits are adjusted to exclude supplemental pay, which is added to the earnings measure. Benefits in this brief are expressed as a share of earnings or payroll, whereas those in the BLS data are expressed as a share of total compensation (converting from one to the other is straightforward).

To compare total compensation across sectors, we first normalize private-sector workers' earnings to 1 so that government workers' earnings are 0.859 if the earnings gap is -14.1% nationwide. From this, we derive total compensation by multiplying private-sector earnings by 1.445 if these workers' benefits equal 44.5% of earnings and multiplying government workers' benefits by 1.51 if these workers' benefits equal 51% of earnings. Dividing government workers' compensation by that of private-sector workers, we see that government workers' compensation is about 10% lower on average, since (0.859*1.51)/1.445 ≈ 0.898. The same logic in the Colorado case results in (0.808*1.388)/1.445 ≈ 0.776 and in the Virginia case results in (0.701*1.484)/1.445 ≈ 0.720.

The source for employer pensions (the total service cost minus employee contributions), and the annual payroll for teachers and political subdivision employees in Virginia is from

Virginia Retirement System (VRS) Comprehensive Annual Reports for 2015–2019. The cost of other post-employment benefits (OPEBs) as a share of payroll is based on the cost for all participants in the 2017–2019 VRS Comprehensive Annual Reports because these costs are not broken down by groups of workers nor are they provided for earlier years.

Unions and collective bargaining rights. The pay gap analysis includes all private-sector and local government workers, whether or not they belong to unions. Nonunion workers' pay is affected by collective bargaining rights because unions are obligated to negotiate on behalf of all workers in a bargaining unit, including those who choose not to join the union, and because there are spillover effects on workers outside the bargaining unit, including those in managerial positions, as employers adjust pay to preserve hierarchies. Therefore, estimates of the local government pay gap in states with and without strong collective bargaining rights may understate the likely impact on the public-sector pay gap of establishing bargaining rights for local government workers in isolation—that is, without strengthening private-sector workers' rights at the same time.

Sources consulted for assessing public-sector collective bargaining rights by state and broad occupation groups are the following:

- Sanes and Schmitt 2014
- The National Bureau of Economic Research (NBER) Public Sector Collective Bargaining Law Data Set (Valletta and Freeman 1988) and updates by Rueben (1996) and Dippel and Sauers (2019)
- The National Council on Teacher Quality (NCTQ) 2019
- The National Education Association (NEA) 2020
- Han 2019 and García and Han 2021
- Frandsen and Webb 2017
- The American Federation of State, County, and Municipal Employees (AFSCME), cited in McNicholas et al. 2020
- Brannick 2019 and the Commonwealth Foundation public-sector labor law database (Commonwealth Foundation 2021)

These secondary sources use different criteria, cover different groups of workers or years, rely on different primary sources, or differ for unexplained reasons. Where sources' assessments of collective bargaining rights conflicted, statutory language and case law cited in these sources was also consulted.

The source for whether unions were able to collect agency fees before *Janus* was an amicus brief filed by New York and other states in the *Janus* case (Schneiderman et al. 2018).

Table 6

Collective bargaining rights can vary by occupation

Local government workers' collective bargaining rights and union density by state and occupational group

State	Agency fee?	Teachers	Police	Firefighters	Misc.	Union density
AL	No	P	P	P	P	33%
AK	Yes	R	R	R	R	53%
AZ	No	P	P	P	P	23%
AR	No	P	P	P	P	14%
CA	Yes	R	R	R	R	70%
CO	No	P	P	P	P	32%
CT	Yes	R	R	R	R	80%
DE	Yes	R	R	R	R	42%
DC	Yes	R	R	R	R	45%
FL	No	R	R	R	R	37%
GA	No	B	B	P	B	14%
HI	Yes	R	R	R	R	71%
ID	No	R	P	R	P	24%
IL	Yes	R	R	R	R	65%
IN	No	R	P	P	P	33%
IA	No	P or R	P or R	P or R	P or R	35%
KS	No	R	P	P	P	21%
KY	Yes	P	R	R	P	30%
LA	No	P	P	P	P	18%
ME	Yes	R	R	R	R	61%
MD	Yes	R	P	P	P	61%
MA	Yes	R	R	R	R	73%
MI	No	R	R	R	R	60%
MN	Yes	R	R	R	R	61%
MS	No	B	P	P	P	10%
MO	Yes	R	R	R	R	34%
MT	Yes	R	R	R	R	55%
NE	No	R	R	R	R	36%
NV	No	R	R	R	R	48%
NH	Yes	R	R	R	R	59%
NJ	Yes	R	R	R	R	74%
NM	Yes	R	R	R	R	22%

Table 6 (cont.)

State	Agency fee?	Teachers	Police	Firefighters	Misc.	Union density
NY	Yes	R	R	R	R	79%
NC	No	B	B	B	B	5%
ND	No	R	P	P	P	26%
OH	Yes	R	R	R	R	57%
OK	No	R	R	R	P	26%
OR	Yes	R	R	R	R	65%
PA	Yes	R	R	R	R	63%
RI	Yes	R	R	R	R	78%
SC	No	B	B	B	B	7%
SD	No	R	R	R	R	27%
TN	No	R	B	B	B	18%
TX	No	B	R	R	B	18%
UT	No	P	P	R	P	23%
VT	Yes	R	R	R	R	65%
VA	No	B	B	B	B	19%
WA	Yes	R	R	R	R	62%
WV	No	P	P	P	P	35%
WI	No	B	R	R	B	33%
WY	No	P	P	R	P	16%

Notes: "Agency fee?" indicates whether unions were able to collect agency fees before *Janus*. "B" indicates states where local government workers were banned from engaging in collective bargaining over compensation in 2015–2019. "P" indicates states where employers are permitted to engage in collective bargaining with local government workers but there was no statewide mandate in 2015–2019. "R" indicates states where employers were required to engage in collective bargaining with local government workers in 2015–2019. Miscellaneous workers are local government workers who are not teachers or teaching assistants, police, or firefighters. Union density is the share of full-time local government workers ages 18–64 who belong to a union based on pooled 2015–2019 data. In most states, collective bargaining rights for local government workers as described in this table did not change in 2015–2019. The exception is Iowa, where local government entities were required to engage in collective bargaining over compensation (broadly defined) before 2017, but are only permitted to do so since 2017. There remains a duty to bargain in Iowa over base wages, but growth in base wages is capped at the rate of inflation. Since bargaining exclusively over base wages gives workers little say in their total compensation, this is not considered collective bargaining for the purposes of this analysis. Unlike Wisconsin, however, which also restricted the scope of bargaining to base wages for and capped wage growth to inflation, Iowa continued to allow voluntary bargaining over other forms of compensation.

Source: Authors' analysis of U.S. Census Bureau Current Population Survey microdata, pooled years 2015–2019; Sanes and Schmitt 2014; Valletta and Freeman 1988; Rueben 1996; Dippel and Sauers 2019; NCTQ 2019; NEA 2020; García and Han 2021; Frandsen and Webb 2017; McNicholas et al. 2020; Brannick 2019; and Commonwealth Foundation 2021. The source for whether unions were able to collect agency fees before *Janus* is Schneiderman et al. 2018.

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Notes

1. Though this brief focuses on the pay gap for local government workers, previous research has found similar pay gaps for state government employees, including public-sector workers in Virginia (Morrissey 2020).

2. See Wolfe and Schmitt 2018 for a detailed profile of state and local government workers.

3. “Right-to-work” (RTW) is a misleading descriptor for laws designed to undermine unions and benefit employers. For a discussion of how right-to-work laws hurt workers, see Cooper and Wolfe’s (2021) report focusing on Montana, where state legislators tried—and failed (Cunningham-Cook 2021)—to enact a right-to-work law in March 2021.

4. Other changes implemented in 2011 and 2012 include the following: Idaho made teacher collective bargaining contingent on a union validating that at least half of a district’s teachers were members, and the state limited the scope of collective bargaining to a one-year agreement on compensation; Indiana restricted the scope of public-sector bargaining to wages and related items; Michigan limited the scope of bargaining for teachers, weakened impasse procedures for police and firefighters, and allowed the state to declare a financial emergency to reject a contract agreement; Nevada took bargaining rights away from some workers and required contracts to provide for reopening during fiscal emergencies; Oklahoma restricted the right to organize and bargain collectively to employees of municipalities with populations above 35,000; Tennessee officially banned collective bargaining for teachers but required school boards to engage in “collaborative conferencing” with teachers’ representatives; and Wisconsin banned collective bargaining for state employees and eliminated agency fees for public employee unions.

5. The share 6.5% is the median employer contribution for a representative sample of plans in the Public Plans Database covering local government employees in 2015–2019, estimated for EPI by Alex Brown of the National Association of State Retirement Administrators, May 19, 2021. The share 10% is based on Aubry and Wandrei 2020.

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