

Pennsylvania's teachers are undercompensated—and new pension legislation will cut their compensation even more

Undercompensation is likely a factor in Pennsylvania's growing teacher shortage

Report • By [Jeffrey Keefe](#) • February 15, 2018

What this report finds: We find that Pennsylvania public school teachers are undercompensated relative to other full-time workers with similar education and skills. Their weekly wages are 12.1 percent lower than the wages of comparable full-time employees in Pennsylvania, and their weekly compensation (including both wages and benefits) is 6.8 percent lower. Further, we find that once new pension legislation goes into effect in 2019, the weekly compensation for new teachers will drop even lower, to 10.0 percent less than that of comparable workers.

Why it matters: Pennsylvania is suffering from a severe teacher shortage. Research suggests a correlation between compensation and the ability to attract and retain teachers. If teacher compensation decreases even further in Pennsylvania, the teacher shortage will likely only grow worse.

What can be done about it: Improving compensation could help mitigate the teacher shortage. But instead of working to improve compensation, Pennsylvania is doing the opposite: its state legislature passed laws reducing teacher pension benefits in 2010 and again in 2017 (the latter goes into effect in 2019). If we want to do something about the teacher shortage, the current trends in teacher compensation need to be reversed.

Data from the Pennsylvania Department of Education show that, from 2013 to 2015, the number of students graduating from teacher-training programs plummeted by 63 percent. A growing teacher shortage in the state is disproportionately hurting low-income and high-minority schools—with those schools increasingly relying on uncertified teachers to fill open slots.

At the same time, the state has been cutting pension benefits for public school teachers—a move that seems likely to make teaching jobs less attractive and exacerbate the current teacher shortage. Pension legislation passed in 2010 (Act 120) decreased pension benefits for teachers hired in 2011 and later, while a 2017 law (Act 5) will further cut pension benefits for teachers hired in 2019 (and beyond).

In light of the Pennsylvania's most recent pension cuts and the challenges the state faces in attracting and retaining qualified teachers, we ask two primary questions in this study: How does teacher pay compare with the pay of other comparable workers in Pennsylvania—that is, are Pennsylvania public school teachers underpaid (which could help explain the teacher shortage) or overpaid (which might justify the pension cuts)? And how will teacher compensation change under Act 5 beginning in 2019?

We further break down the compensation data to answer these questions: How does the teacher pay penalty vary by gender? And how does gender and racial/ethnic pay equity among teachers compare with pay equity among other workers?

Finally, we examine whether union membership and collective bargaining has any effect on teacher compensation.

Background

Pennsylvania is losing teachers at an alarming rate

Pennsylvania is in the midst of a growing teacher shortage. The rate of Pennsylvania teacher certifications has declined by two-thirds between 2010 and 2015 (Benshoff 2016). College students are shunning education majors, with reports indicating that enrollment fell by 36 percent in traditional teacher education programs at the 14 Pennsylvania State System of Higher Education colleges (Palochko 2016). In 2013, 16,631 students graduated from teacher-training programs; by 2015, that number had dropped to 6,125, a 63 percent decline, according to data from the state’s Department of Education (PDE) reported on WHYY public radio in Philadelphia (Benshoff 2016). Public schools are relying on an increasing number of substitute teachers to fully staff schools—but they are struggling to find qualified substitutes. In a survey conducted by WHYY, it was found that only about a quarter of the districts surveyed were able to consistently place substitute teachers in classrooms at an acceptable rate (Benshoff 2016).

The Pennsylvania teacher shortage is uneven—it affects some districts and schools more than others; some subject areas more than others; and some demographic groups more than others. A recent assessment by the Pennsylvania Department of Education (PDE 2017) indicates significant teacher shortages, requiring emergency permits for teachers,¹ have existed in Philadelphia, Pittsburgh, Erie, Harrisburg, Waynesboro, and other cities and municipalities. There are teacher shortages in a number of subject areas: special education, ESL (English as a second language), sciences, mathematics, and vocational subjects. The teacher shortage disproportionately affects low-income and high-minority schools, with high-minority schools in Pennsylvania relying on uncertified teachers at a rate of 10.7 to 1 when compared with low-minority schools, a rate that is more than two-and-a-half times greater than the national average (Learning Policy Institute 2016).

Teacher compensation matters

The Learning Policy Institute’s top recommendation for alleviating the teacher shortage is “creating competitive, equitable compensation packages that allow teachers to make a reasonable living across all kinds of communities.” Specifically, they recommend that districts serving high-need students must be able to “leverage more competitive and equitable salaries so they have a fair shot at recruiting well-qualified educators” (Sutcher, Darling-Hammond, and Carver-Thomas 2016).

The United States has lower teacher pay and higher teacher turnover rates than other developed countries (OECD 2016; Sutcher, Darling-Hammond, and Carver-Thomas 2016). A multinomial logit hazard analysis shows that higher salaries may help retain teachers in the field (Feng 2014). A study by Alicia H. Munnell and Rebecca Cannon Fraenkel (2013) reports that compensation matters in attracting qualified people into the teaching

profession. Somewhat surprisingly, they find that benefits are as important as wages for younger teachers. “In any event, cutting pensions will almost certainly have an adverse effect on the quality of people applying for teaching positions” (Munnell and Fraenkel 2013). This finding suggests that Pennsylvania’s pension reductions may have a long-term detrimental impact on recruiting and retaining qualified teachers. In turn, research suggests that failure to recruit and retain qualified teachers with competitive compensation will harm student achievement (Hendricks 2014).

Recent pension legislation will further hurt teacher compensation

Pennsylvania teachers participate in the Public School Employees’ Retirement System (PSERS). PSERS administers a defined benefit pension plan and a post-employment healthcare program for public education employees. It is responsible for collecting contributions from teachers and other plan members, school districts, and the state. PSERS invests its assets to support payments to teachers when they retire. The system was established in 1917 and has contributed to the professionalization and stability of Pennsylvania’s education labor force.

However, pension legislation passed in 2010 (Act 120) decreased PSERS benefits for teachers hired in 2011 and later, while a 2017 law (Act 5) will further cut pension benefits for teachers hired in 2019 (and beyond). Act 5 will require new teachers to participate in a pension plan that significantly shifts funding from the state and school districts onto employees. The new plan includes 401(k)-style offerings, which also shift retirement income risk onto teachers.

Methodology

Does a systematic evaluation show that Pennsylvania’s public school teachers are paid comparably to other workers of similar skills? Our research seeks to methodically answer that question.

To assess whether Pennsylvania public school teachers are comparably paid, we first need to ask two questions: compared with whom and comparing what?

Deciding on a comparison sample

When looking at the question of teacher pay, it might seem logical to compare public school teachers with private school teachers with similar levels of education, experience, and weeks of work. However, this comparison is inadequate to the task. Private school teaching differs significantly from public school teaching; too many critical aspects of public school teaching lack private school analogues. Public schools accept all students, while private schools are often highly selective and may exclude or remove poor-performing, special needs, or disruptive students. Class sizes tend to be larger in public

schools and the workday and work year is longer. Parochial school teachers may also consider teaching a part of their religious calling and thus be willing to accept less than competitive wages (Convey 2014).

A better alternative—and one that is consistent with the standard approach to such questions—is to compare public school teachers with other full-time workers who have similar “human capital” (fundamental personal characteristics and labor market skills and, especially, education). Analyses based on comparisons of personal characteristics and labor market skills capture what comparable studies have shown to be the most important and salient attributes affecting compensation and delineate the market for comparable employees.

Existing research reveals that education level is the single most important earnings predictor (Mincer 1958). Education helps foster work-relevant skills. People invest heavily in their own and their children’s education by paying for housing in communities with good schools, paying for private school tuition, and funding the pursuit of college, professional, and advanced degrees.

Empirically, experience is the second most significant earnings predictor. People learn by doing and by handling a variety of job tasks as they advance within occupations. Most occupations reward experience, since on-the-job learning leads to greater competency and the ability to perform tasks of increasing complexity. However, we cannot control for job tenure, which is not available in our primary data source (the *American Community Survey*, U.S. Census Bureau 2011–2015). As in other labor market analyses, we control for age, which roughly controls for time in the labor market but not necessarily for time with the current employer.

Gender, race, and ethnicity are also widely found to influence compensation. Here, compensation is affected by an intermingling of productivity-related human capital differences and labor market disadvantages stemming from historical patterns of discrimination. We control for all these factors in our study. We also control for marital status and citizenship. Being married and being a citizen are also associated with higher earnings.

When making wage comparisons, most studies exclude part-time workers because their hours vary; they earn considerably less than comparable full-time workers; they are more weakly attached to the labor force; and they often lack benefit coverage. Full-time workers, on the other hand, exhibit greater labor attachment and experience. This study follows standard practice by focusing on full-time, full-year employees who work at least 35 hours per week and at least 39 weeks per year, a group that represents 80 percent of Pennsylvania’s wage earners, according to the *American Community Survey* (U.S. Census Bureau 2011–2015).

Determining what to compare

In addition to defining who will be compared, we must also define what to compare. It is not sufficient to simply compare wages, since the employer’s costs also include employer-

provided nonwage benefits. Whether an analysis examines wages or benefits, the essential issue in making a comparison is to identify the incremental costs an employer or school district incurs to employ someone (and excludes costs for prior employees, such as unfunded pension contributions). Employer costs in addition to wages may include paid time off for holidays, vacations, and personal and sick days; supplemental pay, including overtime and bonuses; insurances—particularly health insurance, but also life and disability insurance; retirement plan contributions to either defined benefit or defined contribution plans, including 401(k) plans; and legally mandated benefit contributions such as unemployment insurance, Social Security, Medicare, disability insurance, and workers' compensation insurance. These costs must be considered when computing the total compensation of an individual employee.

Determining what data to use

To obtain wage and demographic data, we use the *American Community Survey (ACS)*, an annual population survey conducted by the U.S. Census Bureau, because it provides the largest sample available to researchers. For the purpose of comparability, we extract Pennsylvania data that include all full-time, full-year wage and salary employees (that is, the data exclude self-employed workers, workers who work less than 35 hours per week, and employees who work less than 39 weeks per year). Wages include earnings before taxes or deductions that appear in employees' paychecks. We enhance the reliability of the estimates by expanding the number of observations to include five years of data from ACS survey years 2011 through 2015. The sample includes 139,449 individual observations, with 4,657 of those being teacher observations, providing us with considerable power for our statistical tests. Given that the data are retrospective, the respondents were reporting their prior year wage and salary earnings. Therefore, the ACS data we use report earnings for the years 2010 to 2014.

The role of nonwage benefits in employee compensation costs

Nonwage benefits represent a substantial portion of employee compensation costs incurred by an employer. Public school teachers' pension and retiree health benefits have historically been provided in Pennsylvania through local and state-funded plans. Pennsylvania's pension system faces a continued underfunding crisis from the legislated failure of the employers and state government to make their annual required contributions (ARC) after the financial crisis and the poor investment market conditions which affected all investors. The funded ratio declined from 86 percent to 57.3 percent between 2008 and 2016 (Conduent 2017). Nonetheless, teachers receive better health benefits both for active employees and retirees than private-sector employees, reflected in the greater share of compensation costs for insurance (which is primarily health insurance). As the next section shows, insurance (primarily health insurance) accounts for 15.8 percent of teacher compensation and teachers receive access to retiree health insurance as a post-retirement benefit that costs 1.0 percent of their current compensation (see **Table 1**).

Teachers, however, will no longer receive relatively better pensions, because of recent legislative reform, as we discuss below. What does distinguish the teachers' benefits mix is that they receive defined benefit pensions, instead of the more common 401(k) received by private-sector employees. Public-sector defined benefit pension plans help reinforce a career in public school teaching and attract new teachers.

Total compensation: Nonwage benefits

To develop a measure of total compensation, we need to evaluate the employer cost of benefits provided to employees; however, no comprehensive survey provides data on a sample of individuals that includes both their wages and their benefits or employee compensation costs. Only one reliable source of benefit information exists in the United States: the Employer Costs for Employee Compensation (ECEC) survey, which contains data collected by the Bureau of Labor Statistics as part of the National Compensation Survey, a survey of employers. The ECEC survey includes data from both private industries and state and local government. The survey reports data by census divisions (of which there are nine in the nation), not by state. We use the unpublished ECEC Mid-Atlantic Region (New York, New Jersey, and Pennsylvania) data from June 2013 to develop benefit and compensation measures for private-sector employees and state and local government employees.

For public school teachers, we use comprehensive Pennsylvania Department of Education (PDE)² data on public school teacher benefits and salaries to assess the costs of all benefits for teachers, including health insurance, the normal cost of pensions, and the cost of retiree health insurance (PDE 2017; Conduent 2017; Pennsylvania IFO 2017). We also use state data to mark up the costs of post-retirement teacher benefits, which are meager.

The ECEC pension cost data reflects the pension costs of benefits being earned by current employees but may also incorporate costs for prior employees if pension plans were previously underfunded. The use of the Pennsylvania Department of Education data allows a more accurate assessment of the costs of the pension benefits being earned in the current year by public school teachers, and it is a more accurate comparison to the ECEC pension measure for private-sector workers.

Table 1 provides the data on wages and benefits for private-sector and state and local employees based on the ECEC, along with comparable data on public school teachers developed from Pennsylvania Department of Education data (PDE 2017). Details on these data are provided in the appendix. These data reveal that benefits constitute a smaller percentage of teacher compensation (29.2 percent) than other state and local government employees' compensation (31.0 percent) but more than for private-sector employees' compensation (22.4 percent). Health insurance is the most expensive employee benefit for public school teachers, accounting for 15.8 percent of teacher compensation compared with 14.1 percent for other state and local government employees and 10.1 percent for private-sector employees (BLS 2013). Health insurance, on average, constitutes the most important benefit for all employees. Teacher compensation has been reshaped by the rising cost of health insurance. In 1987, health insurance represented 5.7 percent of

Table 1

Benefits represent a higher percentage of total compensation for Pennsylvania public school teachers than for full-time employees in the private sector

Employer costs for full-time employee wages and benefits as a percentage of total compensation, by sector, June 2013

	Private-sector employees	State and local government employees	Public school teachers
Total compensation	100.0%	100.0%	100.0%
Salary (W-2 wages)	77.6%	69.0%	70.8%
All benefits	22.4%	31.0%	29.2%
Insurance (life, health, etc.)	10.1%	14.1%	15.8%
Retirement and savings	4.5%	10.5%	6.1%
Legally required & other benefits	7.9%	6.4%	6.1%
Retiree health benefits	n.a.	n.a.	1.0%
Tuition	n.a.	n.a.	0.4%
Memo:			
Benefits mark-up on wages	1.289	1.449	1.412

Notes: "n.a." means data are not available. Due to rounding, numbers may not always add up to the precise totals.

Sources: Data for Pennsylvania public school teachers from Pennsylvania Department of Education-2017 Annual Financial Reports. Data for private-sector employees and state and local government employees from Bureau of Labor Statistics, Employer Costs for Employee Compensation (with unpublished detailed compensation data for the Mid-Atlantic Census Division), U.S. Department of Labor, June 2013.

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teacher compensation, but by 2014 it had increased to 15.8 percent of compensation (PDE 2017).

The ECEC survey reports the costs of employers' contributions to defined benefit pension plans or retirement savings accounts. Under PSERS, the teachers' pension plan, in 2016–2017, on average teachers paid 7.5 percent of their salaries and the state and school districts together contributed 8.3 percent of teacher salaries as the normal cost of teacher pensions (Conduent 2017, 22); combined, this is the incremental amount needed to pay for the pension benefits being earned by active teachers in 2017 (Conduent 2017, 6). Teachers hired in 2011, after Act 120 was passed,³ must make a greater contribution if they want the same benefits level as previously hired employees (or they can opt for a lower benefits level); the employer contribution for these teachers fell to just 2.9 percent (Pennsylvania IFO 2017, 15). However, the state has also incurred an unfunded liability arising from its failure to make necessary contributions over the last 15 years and from the poor investment markets; this contribution toward the unfunded liability amounted to 20.9

percent of salaries in 2016–2017 (Conduent 2017, 22). Taken together, the employers' share of the normal cost and the unfunded liability represent the employers' annual required contribution (ARC), which in 2017 represented 29.2 percent of salaries; 100 percent of this obligation was paid by the state and school districts (Conduent 2017, 22). In an effort to reduce costs and shift risk to employees, the state legislature enacted a pension law, Act 5 of 2017, which further reduced pensions for teachers beginning their careers in 2019–2020, replacing the defined pension plan with a parallel hybrid composed of a small defined benefit plan and a 401(k) plan. The new plan will reduce the state and school districts' normal cost to 2.68 percent for new teachers (Pennsylvania IFO 2017, 15), nonetheless leaving the unfunded liability untouched. The employer normal pension cost for all current teachers will decline from 7.7 percent in 2017–2018 to 7.4 percent in 2019–2020, but the state's annual required contribution will increase to 34.7 percent of annual teacher salaries in 2019–2020 (Conduent 2017; Pennsylvania IFO 2017), as the unfunded liability remains untouched.

In addition, we include post-retirement benefits. Teacher retiree health benefits constitute 1.0 percent of compensation. We lack the information to compare the cost of post-employment benefits for other Pennsylvania employees because the ECEC does not provide that information. Post-retirement benefits for other Pennsylvania employees would include benefits such as Health Reimbursement Arrangements (HRAs) and Voluntary Employee Beneficiary Associations (VEBAs), among other benefits. The absence of such data in our analysis understates the compensation of private-sector and nonteacher state and local public employees relative to public school teachers, thereby overstating how much teachers earn relative to comparable employees (understating the size of the teacher penalty). Our results are thus made more conservative because our data does not include these post-retirement health benefits that are occasionally provided to employees who are not public school teachers.

To develop a measure of compensation in our data, we calculate the ratio of compensation to W-2 wages (the “benefits mark-up on wages”) from Table 1 and multiply that by wages. Only those benefits that incrementally add to the employer costs of employing the current workforce are included in the benefits mark-up.

On balance, teacher benefits account for a smaller percentage of the employer cost of employee compensation (29.2 percent) than state and local government (31.0 percent) but are substantially greater than for private-sector employees (22.4 percent). Teachers also already contribute a significant share of their salary to fund the normal cost of their pension; the newly enacted pension legislation will further shift pension costs onto teachers.

Our method for estimating relative wage and compensation costs

In developing a model to compare teachers with other workers or professionals, we rely on independent variables that predict earnings. We use an enhanced human capital model to compare teachers with other full-time employees in the Pennsylvania labor force that

work more than 35 hours per week and more than 39 weeks per year. The estimate of the teacher penalty is therefore how much public school teachers earn relative to private-sector full-time Pennsylvania employees who work more than 35 hours per week and more than 39 weeks per year and have equivalent education, experience, gender, race, ethnicity, marital status, and citizenship.

The most important factor in earnings: Education level

We report demographic comparisons for the Pennsylvania full-time employees in **Table 2**. Public school teachers in the state of Pennsylvania are substantially more educated than other full-time employees. Approximately 98.9 percent of full-time Pennsylvania public school teachers hold at least a bachelor's degree, compared with 32.6 percent of other full-time employees. Since higher educational levels are strongly associated with higher earnings, public school teachers should be expected to earn substantially more than other employees in the full-time labor force. Simple averages of Pennsylvania teachers' wages are 11.0 percent higher than for all other full-time employees in the state (\$1,233 vs. \$1,111). Their total compensation—salary plus benefits—is on average 20.6 percent higher than that of other full-time employees (\$1,740 vs. \$1,443). However, when we compare the salaries of teachers (who almost universally hold college degrees) with the salaries of other Pennsylvania college graduates, we find that teachers' weekly salaries are 24.0 percent lower (\$1,237 vs. \$1,626) and their weekly compensation is 20.0 percent lower (\$1,740 vs. \$2,176).

Moreover, the educational attainment of teachers is substantially higher than that of other full-time workers even when just looking at those workers with at least a college degree. Public school teachers are nearly nine times (8.6 times) as likely to hold a master's degree as other employees (63.6 percent vs. 7.4 percent) and more than three times as likely to hold a master's degree as other employees with college degrees (63.6 percent vs. 20.4 percent). Teachers and other full-time employees are almost equally likely to hold professional degrees (1.9 percent vs. 1.8 percent). Teachers do hold fewer doctorates, but this is a small fraction of the overall labor force, for both teachers and other full-time workers (1.3 percent vs. 0.8 percent). Overall, Pennsylvania public school teachers are more highly educated than other full-time employees in Pennsylvania.

Demographic characteristics of Pennsylvania public school teachers

The demographics of Pennsylvania public school teachers are highly distinctive and different from the demographics of Pennsylvania's full-time labor force in general. As shown in Table 2, nearly three-quarters (71.5 percent) of Pennsylvania public school teachers are women, whereas considerably less than half (40.9 percent) of other full-time workers in Pennsylvania are women. Pennsylvania public school teachers are less likely to be black (2.5 percent vs. 4.6 percent), Hispanic (1.0 percent vs. 2.7 percent), or Asian (0.6

Table 2

Pennsylvania public school teachers differ from other full-time employees on pay, education level, and other demographic and work characteristics

Compensation and demographic characteristics of Pennsylvania public school teachers compared with other full-time Pennsylvania employees, 2010–2014

	PA private-sector and state and local government employees	PA public school teachers	Difference
<i>Pay</i>			
Weekly salary	\$1,111	\$1,233	11.0%
Weekly compensation	\$1,443	\$1,740	20.6%
<i>Demographics</i>			
Female	40.9%	71.5%	30.6 ppt.
White	92.5%	96.9%	4.4 ppt.
Black	4.6%	2.5%	-2.2 ppt.
Asian	2.5%	0.6%	-1.9 ppt.
Hispanic	2.7%	1.0%	-1.7 ppt.
Married	64.5%	74.6%	10.0 ppt.
Age	44.2	41.9	-2.3 yrs.
<i>Education</i>			
High school	34.3%	0.0%	-34.3 ppt.
Some college	11.4%	0.3%	-11.0 ppt.
Associate degree	11.5%	0.6%	-10.8 ppt.
Bachelor's degree	22.1%	32.6%	10.5 ppt.
Master's degree	7.4%	63.6%	56.3 ppt.
Professional degree	1.8%	1.9%	0.1 ppt.
Doctorate	1.3%	0.8%	-0.6 ppt.
Bachelor's or higher	32.6%	98.9%	66.3 ppt.
<i>Citizenship</i>			
Noncitizen	2.3%	0.2%	-2.1 ppt.
Citizen	97.7%	99.8%	2.1 ppt.
<i>Observations</i>	134,792	4,657	

Notes: Differences are for Pennsylvania public school teachers relative to other full-time employees in Pennsylvania, and are measured as percentage point differences where the characteristic is a percentage (e.g., share female) and as percent differences for other characteristics (e.g., weekly salary). Due to rounding, numbers may not always add up to the precise totals.

Source: Author's analysis of American Community Survey 2011–2015 data (Flood et al. 2017), Employer Costs for Employee Compensation survey 2013 data (BLS 2013), and Pennsylvania Department of Education-2057 Annual Financial Reports. See appendix for further details.

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percent vs. 2.5 percent) than other full-time workers. They are also more likely to be U.S. citizens (99.8 percent vs. 97.7 percent). With respect to age, Pennsylvania public school teachers are on average 2.3 years younger (41.9 vs. 44.2 years old) and are more likely to be married (74.6 percent vs. 64.5 percent) than other Pennsylvania full-time wage earners.

Deciding whether to compare annual, weekly, or hourly wages

What are the most appropriate comparisons to make for teachers? Should we compare teachers' annual wages, weekly wages, or hourly wages with wages of other full-time workers? Our analysis focuses on the weekly wages and compensation of full-time public school teachers relative to the weekly wages and compensation of other full-time workers. The focus on weekly pay is to address concerns about "summers off" (teachers not having a 52-week work year) and the difficulty of measuring teacher work hours in a week. This section explains this decision.

First, we rule out hourly wages as a meaningful point of comparison because it requires having accurate measures of weekly work hours to be able to translate weekly wages into an hourly wage. A problem with teacher-reported weekly hours is that teachers may underreport their weekly hours by not including meetings, grading, and preparation time after formal work hours end. It is generally difficult to measure teacher weekly work hours.

When deciding whether to use weekly wages or annual wages for our comparison, we note that teachers typically work fewer weeks per year than other full-time employees because of having the "summer off." Pennsylvania teachers often have 11 unpaid weeks off in summers so they will likely have lower annual earnings unless they can supplement their income with additional work during that time. Consequently, a comparison of annual earnings is not a meaningful comparison of pay for time worked. This motivates our use of weekly wages and weekly compensation as our focus.

On the other hand, a comparison of weekly pay may *understate* a teacher wage disadvantage if teachers who desire to earn income over the summer cannot do so at the same rate of pay (Allegretto, Corcoran, and Mishel 2004; Allegretto and Mishel 2016). Also, the time that many other workers, especially professionals, spend off the job for professional development is frequently included in measures of weeks worked, but is not included for teachers (Allegretto, Corcoran, and Mishel 2004).

Our preferred comparison is the more conservative alternative of reporting weekly wage and compensation rather than alternatives (hourly or annual compensation) to avoid the "summers off" issue. Focusing on weekly wage (and compensation) comparisons requires using the annual wages data from the *American Community Survey* and then controlling for weeks worked so that our estimated teacher penalty describes a comparison of weekly wages (as if the analysis is of weekly wages obtained by dividing annual wages by weeks worked per year).⁴

Assessing earnings

To assess the earnings of Pennsylvania public school teachers, we compare their earnings with the earnings of all other full-time employees using the microdata from the *American Community Survey*. Note that the Census Bureau undertakes a process to assign wages to those who participate in the sample but do not provide earnings data. Using

characteristics of the worker, the Census Bureau estimates the worker's wage or "imputes" the wage. While ensuring a demographically representative sample, wage imputation introduces potential biases in wage estimates (Hirsch and Schumacher 2004; Allegretto, Corcoran, and Mishel 2004) because teachers are assigned imputed wages from higher-paid professionals. We delete such imputed earnings from the data because of the inherent bias and retain only the respondents' reported earnings. The teacher wage penalty is 2 percentage points larger (more negative) as a result of deleting the observations with imputed wages.

Methodology summary

In summary, before we control for various factors, Pennsylvania public school teachers, on average, receive higher weekly wages and compensation than other full-time employees in Pennsylvania but lower weekly wages and compensation than other college graduates. The structure of teacher compensation is different from that of most other employees since teachers receive a larger proportion of their compensation in employer-provided benefits, particularly health insurance. Teachers on average work fewer weeks per year than other full-time employees. Thus, to determine whether teachers are overpaid or underpaid, we ask whether the weekly earnings or weekly compensation (including all benefits) of public school teachers in Pennsylvania, given their education and experience, is higher or lower than that of comparable Pennsylvania employees.

Findings

Pennsylvania public school teachers are undercompensated

Table 3 reports the results of four equations estimating the wages and compensation of Pennsylvania teachers compared with other full-time workers who reside in Pennsylvania. The basic regression specifications include educational variables of some college, associate degree, bachelor's degree, master's degree, professional degree, and doctorate, and also controls for the effects of age/experience, gender, race, ethnicity, marital status, citizenship status, and weeks worked per year when estimating the weekly wage and compensation penalty.

As can be observed by the estimates reported in Table 3, when we control for weeks worked and other factors that influence pay, we find that teachers earn 12.1 percent lower weekly wages and 6.8 percent lower total weekly compensation than other Pennsylvania full-time employees. That is, the teacher total *compensation* penalty is smaller than the teacher *wage* penalty, reflecting the greater cost to employers of teachers' benefits relative to the benefits of most other Pennsylvania full-time employees. An analysis of annual pay shows the teacher pay penalty to be 16.5 percent for wages and 9.7 percent for total compensation. **Figure A** shows the weekly wage and compensation penalties

Table 3

Pennsylvania public school teachers earn significantly less than other similar full-time workers in Pennsylvania

Teacher wage and total compensation penalty using weekly and annual comparisons, 2010–2014, and projected total compensation penalty for new teachers in 2019–2020 under Act 5 pension plan, controlling for education and other variables

	Weekly	Annual
Wage penalty, 2010–2014	-12.1%***	-16.5%***
(Standard error)	(0.008)	(0.008)
Total compensation penalty, 2010–2014	-6.8%***	-9.7%***
(Standard error)	(0.008)	(0.008)
Total compensation penalty for new teachers under Act 5 pension plan, 2019–2020	-10.0%***	-14.3%***
(Standard error)	(0.008)	(0.008)

*p < 0.05; **p < 0.01; ***p < 0.0001

Notes: Teacher penalty is the percent by which teachers earn less than comparable nonteacher employees. Compensation penalty under Act 5 pension plan is the projected penalty for teachers in the 2019–2020 school year, when Act 5 legislation goes into effect. Table reports the estimated coefficient and the standard error on the indicator for public school teacher. The weekly wage and compensation regression specifications include educational variables of some college, associate degree, bachelor's degree, master's degree, professional degree, and doctorate, and also controls for age, age squared, female, black, Hispanic, Asian, married, noncitizen, and weeks worked per year. The specification for annual wage and compensation omits weeks worked.

Source: Author's analysis of American Community Survey 2011–2015 data (Flood et al. 2017), Employer Costs for Employee Compensation survey 2013 data (BLS 2013), and Pennsylvania Department of Education-2057 Annual Financial Reports. See appendix for further details.

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faced by public school teachers in Pennsylvania.

Pennsylvania's new pension plan will increase the teacher compensation penalty

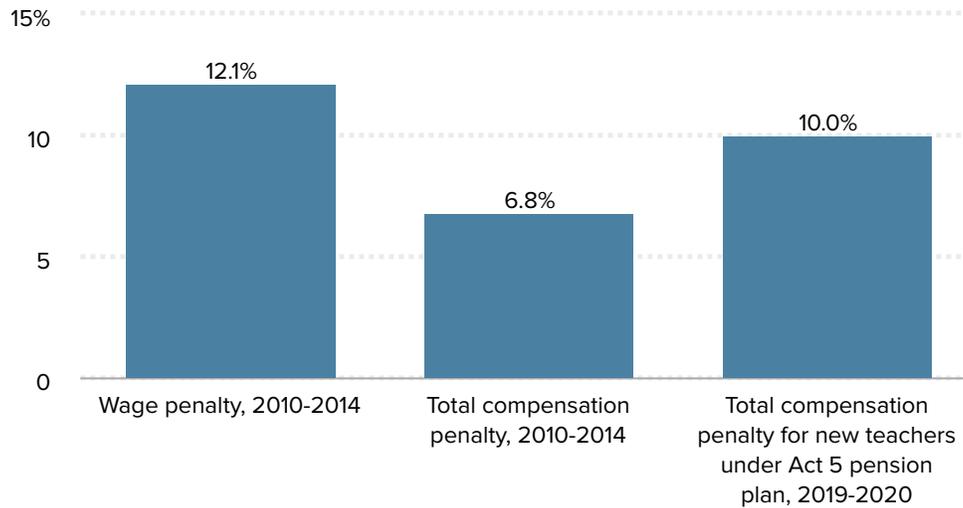
The last row of Table 3 shows how the new pension plan will affect teacher compensation: The weekly compensation penalty will increase from 6.8 percent to 10.0 percent for teachers hired in 2019 or later, as the state and school districts reduce their pension contributions and begin shifting more of the burden of retirement savings onto these new teachers. This estimate is also added to Figure A to complete the picture of the compensation pay penalty faced by Pennsylvania public school teachers. The annual total compensation penalty will increase from 9.7 percent to 14.3 percent. All of the estimated teacher wage and compensation penalties are statistically significant.

In summary, these estimates show that Pennsylvania teachers earn significantly less in wages and total compensation than comparable full-time employees in Pennsylvania.

Figure A

Pennsylvania public school teachers earn significantly less than other similar full-time workers in Pennsylvania

Teacher wage and total compensation penalty using weekly comparisons, 2010–2014, and projected total compensation penalty for new teachers in 2019–2020 under Act 5 pension plan, controlling for education and other variables



Notes: Teacher penalty is the percent by which teachers earn less than comparable nonteacher employees. Compensation penalty under Act 5 pension plan is the projected penalty for teachers in the 2019–2020 school year, when Act 5 legislation goes into effect. Figure reports the estimated coefficient and the standard error on the indicator for public school teacher. The weekly wage and compensation regression specifications include educational variables of some college, associate degree, bachelor’s degree, master’s degree, professional degree, and doctorate, and also controls for age, age squared, female, black, Hispanic, Asian, married, noncitizen, and weeks worked per year.

Source: Author’s analysis of American Community Survey 2011–2015 data (Flood et al. 2017), Employer Costs for Employee Compensation survey 2013 data (BLS 2013), and Pennsylvania Department of Education-2057 Annual Financial Reports. See appendix for further details.

Economic Policy Institute

Given the relatively large sample size we analyze and the statistical power it permits, we have a high degree of confidence in our conclusion that Pennsylvania public school teachers are paid 6.8 percent less in weekly total compensation than other full-time Pennsylvania employees of comparable education and experience, taking into account their fewer weeks per year and the more generous health benefits they receive. Pennsylvania public school teachers earn 12.1 percent less in weekly wages than other Pennsylvania employees of comparable education and experience.

Pennsylvania public school teachers are undercompensated. The earnings equation estimates clearly indicate that Pennsylvania public school teachers are undercompensated relative to other Pennsylvania residents who work full time and have comparable levels of experience and education. And unless wages are increased dramatically in the near future, the problem will become even worse. Once the 2017 pension reform law goes into

effect in 2019, the benefits losses will increase the weekly teacher total compensation penalty from 6.8 percent to 10.0 percent.

Men face a higher pay penalty than women when they become teachers

As noted earlier, nearly three-quarters (71.5 percent) of Pennsylvania public school teachers are women, compared with 40.9 percent of the full-time workforce in Pennsylvania. It is well established that occupations with a greater share of women in them pay less than those with a lower share, controlling for education and skill (Levanon, England, and Allison 2009). Gender segregation of an occupation influences pay for all members of that occupation, male or female: the greater the share of women in an occupation, the lower the pay will be for both women and men in that occupation. The lower pay is most likely owing to the devaluation in general of work done by women and, for teachers in particular, the devaluation of the nurturing work that teachers provide (Levanon, England, and Allison 2009).

This background is necessary to understand the teacher pay penalty estimates for men and women presented in **Table 4**. When male teachers are compared with similar full-time male employees in Pennsylvania, the resulting male teacher wage penalty is substantial—28.9 percent for weekly wages. The male teacher total compensation penalty is smaller than the wage penalty but it is still substantial, at 23.8 percent when measured using weekly compensation. Men who choose teaching, a female-dominated profession, earn far less than what comparable men earn in other lines of work. This is a clear reflection of the overall depression of wages earned in female-dominated occupations.

The teacher pay penalty for women is considerably smaller, 3.3 percent on a weekly basis, suggesting that female teachers have fewer better-paying opportunities outside the teaching profession than male teachers do; such limits to women's opportunities likely further contribute to the occupational segregation of the teaching profession. There is no weekly total compensation penalty for female public school teachers in Pennsylvania; in fact, they earn a 2.7 percent premium.

When the new pension scheme is introduced, the teacher total compensation penalty for male teachers will rise to 27.0 percent and female teachers will no longer earn a premium relative to other comparable female employees (they will be paid roughly the same).

Gender pay gaps are smaller among teachers than among other workers

In this section, we examine whether gender discrimination is larger or smaller among teachers than among the Pennsylvania nonteacher workforce. We do this by examining the wage gaps among teachers and comparing them with the wage gaps among noneducation employees.

Table 4

The teacher pay penalty is higher for men than for women in Pennsylvania

Pennsylvania teacher wage and total compensation penalty using weekly comparisons, 2010–2014, and total compensation penalty for new teachers in 2019–2020 under Act 5 pension plan, by gender

	Male teachers	Female teachers
Weekly wage penalty, 2010–2014	-28.9%***	-3.3%***
(Standard error)	(0.0138)	(0.0095)
Weekly total compensation penalty, 2010–2014	-23.8%***	2.7%*
(Standard error)	(0.0138)	(0.009)
Weekly total compensation penalty for new teachers under Act 5 pension plan, 2019–2020	-27.0%***	-0.4%
(Standard error)	(0.0138)	(0.400)

*p < 0.05; **p < 0.01; ***p < 0.0001

Notes: Numbers without asterisks are not statistically significant from zero. Table reports the estimated coefficient and the standard error on the indicator for public school teacher. The weekly wage and compensation regression specifications include educational variables of some college, associate degree, bachelor's degree, master's degree, professional degree, and doctorate, and also controls for age, age squared, female, black, Hispanic, Asian, married, noncitizen, and weeks worked per year. Teacher penalty is the percent by which teachers earn less than comparable nonteacher employees.

Source: Author's analysis of American Community Survey 2011–2015 data (Flood et al. 2017), Employer Costs for Employee Compensation survey 2013 data (BLS 2013), and Pennsylvania Department of Education-2057 Annual Financial Reports. See appendix for further details.

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Table 5 presents estimates of the gender wage gaps among public school teachers and among nonteacher full-time workers in Pennsylvania, controlling for education, experience, and other factors. We find that less gender inequity exists among the teachers than among the other members of the full-time work force. Female public school teachers in Pennsylvania earn 6.6 percent less than comparable male public school teachers, while among other full-time workers, women earn 28.3 percent less than their male counterparts after controlling for the normal attributes thought to influence wages.

This considerable reduction in pay inequity for women is in part attributable to objective and transparent pay systems dictated by collective bargaining agreements (which also exist in the public sector more generally). By making pay transparent and objective, collective bargaining agreements open pay to the scrutiny of all and strengthen forces for internal equity among teachers. Collective bargaining agreements also often set wages based on education and years of experience—for example, teachers with a bachelor's degree and 10 years of experience would earn the same wage, regardless of gender, race, or ethnicity, thereby limiting the scope for possible pay discrimination. Wage differences will still arise in these estimates because of pay differentials that exist among school districts, discretion in setting starting pay, and our inability to control for job tenure in the regressions (as opposed to overall potential experience, which we control for using variables for age and age squared). Nonetheless, public school teacher pay in

Table 5

Gender pay gaps are lower among public school teachers than among other full-time workers in Pennsylvania

Gender, racial, and ethnic pay gaps among Pennsylvania public school teachers compared with pay gaps among other full-time workers in Pennsylvania, 2010–2014

	Weekly compensation gap	
	Other full-time employees in PA	PA public school teachers
<i>Female</i>	-28.3%***	-6.6%***
(Standard error)	(0.004)	(0.012)
<i>Black</i>	-7.4%***	-2.5%
(Standard error)	(0.007)	(0.042)
<i>Hispanic</i>	-9.2%***	-12.5%
(Standard error)	(0.01)	(0.082)
<i>Asian</i>	-5.9%***	4.5%
(Standard error)	(0.013)	(0.057)

*p < 0.05; **p < 0.01; ***p < 0.0001

Notes: Numbers without asterisks are not statistically significant from zero. Table reports the estimated coefficient and the standard error for specific demographic categories. The weekly compensation regression specifications include educational variables of some college, associate degree, bachelor's degree, master's degree, professional degree, and doctorate, and also controls for age, age squared, female, black, Hispanic, Asian, married, noncitizen, and weeks worked per year.

Source: Author's analysis of American Community Survey 2011–2015 data (Flood et al. 2017), Employer Costs for Employee Compensation survey 2013 data (BLS 2013), and Pennsylvania Department of Education-2057 Annual Financial Reports. See appendix for further details.

Economic Policy Institute

Pennsylvania overall displays much greater gender pay equity than we observe among other full-time employees.

Racial/ethnic pay gaps findings are inconclusive

We also compare racial/ethnic wage gaps among teachers with racial/ethnic wage gaps among noneducation employees.

The results are inconclusive. Table 5 shows our estimates of the racial/ethnic wage gaps among public school teachers and among other full-time workers in Pennsylvania, controlling for education, experience, and other factors. But in our analysis, we find no statistically significant pay differences between white teachers and black, Hispanic, or Asian teachers. In contrast, statistically significant racial gaps are clearly present among noneducation employees. For example, there is a 7.4 percent wage gap between black and white employees, a 9.2 percent gap between Hispanic and white employees, and a

Table 6

Black, Hispanic, and other nonwhite teachers are underrepresented in Pennsylvania classrooms

Shares of Pennsylvania students and teachers by race and ethnicity

	Students	Teachers
<i>White</i>	66.5%	95.4%
<i>Black</i>	14.8%	2.5%
<i>Hispanic</i>	11.0%	1.0%
<i>Other nonwhite races/ethnicities</i>	7.7%	1.1%

Sources: Teacher data are from author’s analysis of American Community Survey 2011–2015 data (Flood et al. 2017). Student data are from Kids Count Data Center, “Enrollment—Percent of Students (Pre-K–Grade 12) by Race and Ethnicity, State of Pennsylvania, 2016–2017” (data provided by Pennsylvania Partnerships for Children).

Economic Policy Institute

5.9 percent gap between Asian and white workers. In summary, there are statistically significant pay gaps for nonwhite workers outside of public school teaching, but no such statistically significant penalties within teaching.

Black, Hispanic, and other nonwhite workers are underrepresented in the teaching profession

While we found no statistically significant differences in pay for black, Hispanic, or Asian public school teachers relative to white teachers, there is significant racial/ethnic mismatch between teachers and pupils in the Pennsylvania school system, indicating that the teaching profession has had difficulty in attracting a diverse pool of qualified teachers. The demographic composition of students and teachers in Pennsylvania are presented in **Table 6**: black students make up 14.8 percent of the state’s student population while black teachers make up only 2.5 percent of its teaching force; 11.0 percent of students are Hispanic but only 1.0 percent of teachers are Hispanic; and 7.7 percent of students are of other nonwhite races or ethnicities, whereas 1.1 percent of teachers are of other nonwhite races or ethnicities. There is a chronic shortage of black, Hispanic, and other nonwhite teachers in the Pennsylvania school system relative to the number of black, Hispanic, and other nonwhite students in the system.

Teachers’ unions produce measurable earnings improvements for their members

This section reports on a national sample comparing the compensation of union and nonunion public school teachers across the United States in order to answer the question: Does union membership improve teacher compensation?

Prior survey research reports that teachers join unions to support the unions’ collective

bargaining activities and to further the unions' political goals (Moe 2011). Even among non-union members in what tend to be conservative, nonunion contexts, 42 percent say that they, too, would like to see collective bargaining adopted in their districts. This means that, "in the aggregate, collective bargaining actually has the support of 57 percent of all teachers [including both union and nonunion teachers] who work in nonbargaining districts" (Moe 2011). Teachers want their unions to protect their jobs and to negotiate good salaries and benefits. When asked how satisfied they are with their union as a whole, 77 percent of union members say they are either very or somewhat satisfied, and the percentages are virtually the same across districts, regardless of whether the districts engage in collective bargaining (Moe 2011). When asked about the effects of collective bargaining, "83 percent [of union members in districts with collective bargaining] think that contract rules promote student learning, 70 percent think that seniority-based transfer rights make schools more effective, and 62 percent think that principals" are liable to abuse their discretionary powers and "need to be restricted by contract rules" (Moe 2011).

More than three-quarters of teachers today (including more than 70 percent of new teachers) say that, absent the union, their working conditions and salaries would suffer. A majority of teachers also agree that without the union they would be more vulnerable to school politics and would have nowhere to turn in the face of unfair charges by parents or students. Fully 84 percent say their union protects teachers through due process and grievance procedures, with 71 percent of teachers giving "excellent" or "good" ratings to their unions (Rosenberg and Silva 2012). Union teachers were found to be more enthusiastic about teaching and less likely to leave for better-paying jobs (Gius 2013).

In this section of the report, we explore whether teachers' unions improve teacher earnings. Prior research offers mixed results. For example, Frandsen (2014) reports, in his panel data analysis, that collective bargaining laws have had a minimal effect on public school teachers' hourly wages, whereas an analysis using data from the 1980s (Zwerling and Thomason 1995) finds a 5 percent union wage premium for teachers, which increases by 2.6 percent with each 10-percent increase in teacher union density. To summarize, prior research is inconclusive as to whether unions have had an impact on public school teachers' wages.

In this study, we use the *Current Population Survey Outgoing Rotation Group* (CPS-ORG) for the years 2013 to 2015 to look at the union question. We compare the earnings of union and nonunion teachers across the United States. In comparing union and nonunion teachers, we control for education, experience, gender, race, ethnicity, marital status, disability, citizenship, region, weeks worked per year, and weekly hours of work. The results indicate that, in the United States, teacher union membership results, on average, in 5.1 percent higher wages and 5.4 percent higher total compensation for its members when compared with the compensation of public school teachers who are not union members.⁵

While teachers' unions have thus far been unable to fully offset the counterforces restraining teacher compensation, they do make a positive difference in teacher compensation. Unions clearly reduce the teacher earnings penalty (Allegretto and Tojerow 2014; Allegretto and Mishel 2016). If teachers are to continue making gains toward

equitable compensation, teachers' unions must be safeguarded against the forces that seek to undermine their political and economic power and that seek to privatize public education by redirecting funds to charter schools and voucher systems.

Conclusion

It is clear from our study that Pennsylvania public school teachers face a significant pay penalty. These results are consistent with other research on teacher pay. Allegretto and Tojerow (2014) use *Current Population Survey* data to compare teacher pay in the U.S. with wages of nonteacher professionals with similar characteristics and found that the overall teacher wage penalty for unionized public-sector teachers grew from 10 percent in 1996 to 15 percent in 2010. Their research also finds that the wage gap between private-sector teachers and nonteachers with similar education and experience is smaller among unionized teachers than among nonunion teachers. The teacher wage penalty has grown to 15 percent for unionized public-sector teachers, to 19 percent for nonunion public-sector teachers, and to 30 percent for nonunion private-sector teachers (Allegretto and Tojerow 2014, 20).

When focusing on one or another component of compensation for comparison, it is easy to miss the essential point that different employee groups have different preferences and respond differently to various mixes of compensation. For example, young people have a greater preference for cash, while older workers prefer retirement benefits. Since it is impossible to assess the relative "value" of different types of compensation to different employees, what citizens need to focus on in this debate is the cost of comparable levels of total compensation, controlling for education, experience, hours of work, and other characteristics that influence employee productivity. When we look at overall compensation among Pennsylvania public school teachers, we learn that better health and pension benefits only partly compensate for lower salaries. And in the future, public pension benefits even will lag private-sector retirement benefits, increasing the teacher compensation penalty from 6.8 percent to 10.0 percent on a weekly basis and from 9.7 to 14.3 percent on an annual basis.

This increase in the teacher compensation penalty is likely to accelerate shortages that are currently being experienced in certain communities and subject areas, disproportionately affecting certain demographic groups. School districts need to address these compensation penalties as they confront shortages of qualified and motivated personnel.

About the author

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Appendix: Measuring benefits received by Pennsylvania public school teachers

Information obtained from the Pennsylvania Department of Education and several actuarial reports allow us to identify the salaries, benefits, and total compensation of Pennsylvania public school teachers, excluding the costs of unfunded pension liabilities. These data also allow us to identify the costs of specific benefits such as health insurance and pension.

The basic data are drawn from Pennsylvania Department of Education-2057 Annual Financial Reports (AFR). Total compensation is the sum of benefits and salaries, each of which is measured in the aggregate. The challenge is to gauge the costs of pensions at normal costs by excluding the costs for unfunded liabilities. Such unfunded liabilities do not reflect the incremental costs of a current teacher: rather, they reflect the costs of pensions in other years when contributions for full costs were not provided by the state.

The cost of servicing the unfunded liability is equal to 7.43 percent of salary, as determined by the actuarial analysis (Conduent 2017, Table 10). The actuaries identify the total employer contribution rate, including pension and retiree health care, to be 16.93 percent in 2014. The employer normal costs for pensions (8.57 percent) and retiree health care (0.93 percent) together are a 9.50 percent contribution. The difference between the normal costs and retiree health costs and the total employer contribution rate represents the contribution rate for the unfunded liabilities, or 7.43 percent (16.93 less 9.50 equals 7.43). Therefore the costs of unfunded pension liability in 2014 were \$646.4 million. This amount was deducted from the total benefits in the AFR tables and the total compensation in order to compute the shares of benefits and salaries in total compensation presented in Table 1: the benefits share of total compensation (excluding unfunded pension costs) is 29.2 percent, and the corresponding salary share of total compensation (excluding unfunded pension costs) is 70.8 percent. These are the key parameters needed to adjust the wages of Pennsylvania public school teachers to a measure of compensation.

We also developed data on the expenditures of specific benefits. Health care benefits are the sum of expenditures for group insurance-providers, group insurance-self, and HSA contributions. Retiree health insurance contributions are obtained from the *Pennsylvania Public School Employees' Retirement System Actuarial Valuation* report (Conduent 2017). Table 10 in that report shows the employer health insurance contribution rate as 0.93 percent (of wages). To this we have added expenditures for "other post-employment benefits." The total for retiree health and other post-employment benefits is equivalent to 1.0 percent of all compensation. These benefits are not captured by the *Employer Costs for Employee Compensation* (ECEC) data used to measure the benefit costs of employees other than public school teachers in our data, which means that including them for teachers biases our results to a lower teacher penalty. According to Table 10 (in the same actuarial report mentioned above), the contribution costs to fund the normal pension costs is 8.57 percent of wages, which implies a 6.1 percent of all compensation. The "legally required benefits" row reflects various payroll taxes such as Social Security, workers'

compensation, and unemployment insurance. The last item is the expenditures for “tuition benefits.”

Our accounting of the specific benefits yields an amount slightly (0.4 percent) larger than the amount of benefits obtained by examining the aggregate of all benefits and correcting for unfunded pension liabilities. We take this as confirmation that we have provided a full accounting since using either measure of benefits yields the same basic share of benefits in total compensation.

Endnotes

1. According to PDE’s guidelines for emergency permits, “An Emergency Permit is requested when a public school entity needs to hire an educator but is unable to locate a fully qualified individual who holds a valid and active teaching certificate in the appropriate subject area” (“[Emergency Permits](#),” downloaded January 29, 2018, from www.education.pa.gov).
2. The PDE data are from Annual Financial Reports (AFRs) submitted to the PDE by the Local Education Agency (LEA), school districts, Vo-Techs, etc. The AFRs contain detailed information about the LEA’s actual revenues and actual expenditures. We find the PDE data preferable to ECEC data for public school teachers for several reasons: One is that the ECEC does not provide data on post-retirement health benefits. Another is that the ECEC measure of employer pension contributions to the plan may include both the normal cost—the contribution necessary to fund the cost of the pension benefits being earned in the current year—and the annual required contribution (ARC), which not only includes the normal cost, but may also include amortized contributions for past underfunding of the pension trust, or, if the employer only partially funds normal cost, it will reflect that contribution.
3. Act 120 was passed in 2010 and went into effect July 2011.
4. Unfortunately, the *American Community Survey* (ACS) no longer provides data on the number of actual weeks worked. Instead, the ACS provides weeks worked in intervals, e.g., indicating that someone worked between 40 and 47 weeks. To remedy this shortcoming in the data, we use the *Current Population Survey Annual Social and Economic Supplement* (CPS-ASES) for the same year to estimate the relationship between weeks worked (which is provided) and various demographic variables and the weeks worked bracket for that observation. We use the coefficients from this estimate of the CPS March survey of Pennsylvania employees and teachers to impute (i.e., assign), based on the demographic character of the individual worker in the survey, the number of weeks worked for each worker in the ACS data. It should be noted that it makes little difference in the ultimate wage and compensation estimates whether we employ the interval measure of weeks worked (i.e., take the midpoint of the interval) or the estimate of weeks worked.
5. In the 2017 report *New Jersey Public School Teachers Are Underpaid, Not Overpaid*, we used a different model to estimate the union effect on teacher wages, which included controls for education, experience, gender, race, ethnicity, marital status, and weekly hours of work. In this report we added independent variables to the model used for the earlier report, by including controls for disability, citizenship, region, and weeks worked per year, which reduced the union wage effect from 13.2 percent to 5.1 percent.

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